

13

**FOREST & TREE
RESOURCES IN
STATES AND UNION
TERRITORIES**

Introduction

13

This chapter gives information on the forest and tree cover of different States and Union Territories as per the present assessment and changes with respect to the previous assessment.

It also gives statistics about total population, urban, rural, tribal, livestock population and average population density. Forest cover within and outside recorded forest areas for 24 states and within and outside green wash boundaries for 11 States/UTs have also been given. Altitude and slope wise forest cover under different density classes and forest cover information in different forest types has also been given for each States and UTs. In addition statistics on tree cover, growing stock in recorded forest and TOF are separately given. Apart from the regular features of ISFR like forest carbon, bamboo resource, map and forest cover under different categories of fire proneness, major NTFPs, major invasive species and dia-class distribution of dominant forest species are also being presented.

District wise forest cover has been given for all the States/UTs. Change in the forest cover is based on the satellite data of the years 2019-20. The change in the different categories of forest cover and dynamics of the changes are shown for each of the States/UTs.

13.1

ANDHRA PRADESH

Geographical Area

1,62,968 sq km

Geographical Coordinates

Latitude- 12° 37' N to 19° 55' N

Longitude-76° 45' E to 84° 46' E

Population (as per Census 2011)

49.39 million

Urban 14.61 million (29.58 %)

Rural 34.78 million (70.42 %)

Tribal 2.63 million (5.32 %)

Average Population Density

308 per sq km

Livestock population

(as per 19th Live Stock Census)

56.10 million

No. of Districts

13

No. of Hill Districts

0

No. of Tribal Districts

5

Table 13.1.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	16,297	
Reporting area for land utilization	16,297	100.00
Forests	3,688	22.63
Not available for land cultivation	3,400	20.86
Permanent pastures and other grazing lands	209	1.28
Land under misc. tree crops and groves	155	0.95
Culturable wasteland	414	2.54
Fallow land other than current fallows	940	5.77
Current fallows	1,443	8.86
Net area sown	6,048	37.11

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.1.1 Forest Cover

Figure 13.1.1
Forest Cover
of Andhra
Pradesh



Table 13.1.2
Forest Cover of Andhra Pradesh (in sq km)

Class	Area	% of GA
VDF	1,994.28	1.22
MDF	13,928.75	8.55
OF	13,861.27	8.51
Total	29,784.30	18.28
Scrub	8,276.09	5.08

Table 13.1.3 District- wise Forest Cover in Andhra Pradesh

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Anantapur	19,130	0.00	212.22	785.78	998.00	5.22	11.17	1,100.38
Chittoor	15,152	0.00	1,245.35	2,028.33	3,273.68	21.61	73.25	1,240.83
East Godavari [†]	12,805	1,103.32	2,586.75	1,431.13	5,121.20	39.99	127.10	143.59
Guntur	11,391	1.00	290.33	601.59	892.92	7.84	4.92	456.87
Krishna	8,727	38.00	138.95	486.81	663.76	7.61	13.58	25.27
Kurnool	17,658	87.00	1,509.88	582.62	2,179.50	12.34	6.93	682.02
Prakasam	17,626	254.61	1,802.59	1,276.48	3,333.68	18.91	29.84	1,217.30
Sri Potti Sriramulu Nellore	13,076	27.00	629.90	812.03	1,468.93	11.23	127.27	787.18
Srikakulam [†]	5,837	0.00	154.12	706.71	860.83	14.75	41.52	389.64
Visakhapatnam [†]	11,161	67.31	1,875.27	1,831.30	3,773.88	33.81	17.45	853.86
Vizianagaram [†]	6,539	0.00	231.00	882.58	1,113.58	17.03	61.59	352.43
West Godavari [†]	8,507	376.04	544.15	808.12	1,728.31	20.32	123.91	3.60
YSR Kadapa/ Cuddapah	15,359	40.00	2,708.24	1,627.79	4,376.03	28.49	8.37	1,023.12
Grand Total	1,62,968	1,994.28	13,928.75	13,861.27	29,784.30	18.28	646.90	8,276.09

13.1.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

ANDHRA PRADESH

Table 13.1.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Andhra Pradesh (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
1,965	12,814	9,460	24,239	29	1,115	4,401	5,545
8.10%	52.87%	39.03%		0.52%	20.11%	79.37%	

*in case of Andhra Pradesh, RFA boundaries have been used.

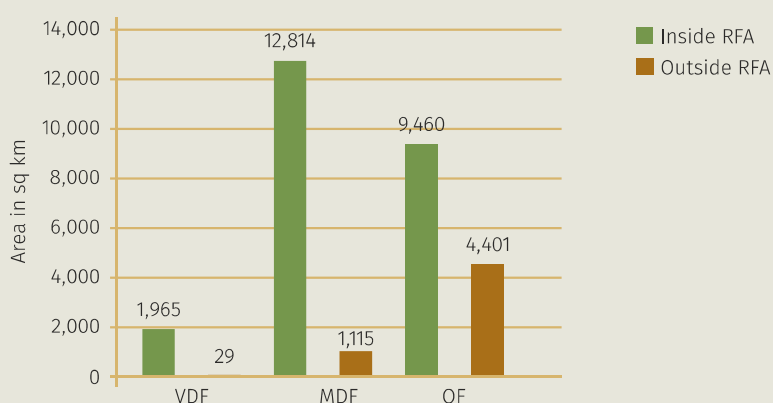


Figure 13.1.2
Forest Cover Inside and Outside of RFA in Andhra Pradesh

Table 13.1.5 Forest Cover Change Matrix for Andhra Pradesh (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,993	0	0	0	1	1,994
Moderately Dense Forest	1	13,913	4	3	17	13,938
Open Forest	0	11	13,066	10	118	13,205
Scrub	0	2	141	8,033	79	8,255
Non Forest	0	3	650	230	1,24,693	1,25,576
Total ISFR 2021	1,994	13,929	13,861	8,276	1,24,908	1,62,968
Net Change	0	-9	656	21	-668	

Table 13.1.6 Altitude-wise Forest Cover in Andhra Pradesh (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,35,122	1,082	8,549	10,683	20,314	6,313
500-1000	25,747	840	5,222	3,019	9,081	1,666
1000-2000	2,099	72	158	159	389	297
Total	1,62,968	1,994	13,929	13,861	29,784	8,276

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

Table 13.1.7 Forest Cover in different slope classes in Andhra Pradesh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,31,263	525	4,201	6,539	11,265	4,311
5-10	10,695	376	2,318	1,874	4,568	1,312
10-15	6,738	324	2,069	1,566	3,959	915
15-20	5,500	288	1,899	1,405	3,592	721
20-25	4,285	239	1,606	1,164	3,009	532
25-30	2,718	154	1,079	788	2,021	315
>30	1,769	88	757	525	1,370	170
Total	1,62,968	1,994	13,929	13,861	29,784	8,276

*(based on SRTM, Digital Elevation Model, 30 m, 2016)***Figure 13.1.3**Forest Cover
Map of
Andhra
Pradesh**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.1.2 Forest Types

The area under different forest types of Andhra Pradesh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.1.8 Area statistics of the Forest Types found in Andhra Pradesh

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C2 Southern moist mixed deciduous forest	1,752.05	4.64
2.	4A/L1 Littoral forest	51.93	0.14
3.	4B/TS2 Mangrove forest	404.14	1.07
4.	5A/C1b Dry teak forest	551.72	1.46
5.	5A/C2 Dry red sanders-bearing forest	1,085.99	2.88
6.	5A/C3 Southern dry mixed deciduous forest	14,970.34	39.66
7.	5B/C1c Dry peninsular sal forest	0.62	0.00
8.	5B/C2 Northern dry mixed deciduous forest	0.68	0.00
9.	5/DS1 Dry deciduous scrub	12,892.22	34.16
10.	5/DS2 Dry savannah forest	35.98	0.10
11.	5/E4 <i>Hardwickia</i> forest	8.73	0.02
12.	5/E9 Dry bamboo brakes	297.85	0.79
13.	5/2S1 Secondary dry deciduous forest	724.19	1.92
14.	6A/C1 Southern thorn forest	1,659.27	4.40
15.	6A/C2 Carnatic umbrella thorn forest	21.75	0.06
16.	6A/DS1 Southern thorn scrub	12.80	0.03
17.	6A/DS2 Southern <i>Euphorbia</i> scrub	0.26	0.00
18.	7/C1 Tropical dry evergreen forest	434.95	1.15
19.	7/DS1 Tropical dry evergreen scrub	17.60	0.05
	Sub Total	34,923.07	92.53
20.	TOF/Plantation	2,469.17	6.54
	Total (Forest Cover & Scrub)	37,392.24	
	Grassland forest type (outside forest cover)		
21.	5/DS4 Dry grassland	352.08	0.93
	Grand Total	37,744.32	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

Table 13.1.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	1,150.13	3.86
2.	Very highly fire prone	3,832.50	12.87
3.	Highly fire prone	4,915.11	16.50
4.	Moderately fire prone	4,153.69	13.95
5.	Less fire prone	15,732.57	52.95
	Total	29,784.00	100.00

13.1.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.1.4
Fire prone
forest areas
under different
fire prone
classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.1.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Andhra Pradesh has been estimated as given in following table.

Table 13.1.10 Tree Cover in Andhra Pradesh (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
3,914	4,679	765

13.1.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.1.11 Extent of TOF in Andhra Pradesh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
5,545	4,679	10,224

13.1.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Andhra Pradesh is given in the Table 13.1.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.1.13

Table 13.1.12 Growing Stock in Andhra Pradesh (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	119.02	115.71	-3.31	2.64
2.	Growing Stock in TOF	67.68	73.16	5.48	4.11

Table 13.1.13 Diameter class distribution of top five tree species inside RFA in Andhra Pradesh

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Anogeissus latifolia</i>	62,213	1,972	169
2.	<i>Xylia xylocarpa</i>	36,842	6,785	503
3.	<i>Lannea coromandelica</i>	21,499	2,486	42
4.	<i>Terminalia tomentosa</i>	16,112	2,016	169
5.	<i>Hardwickia binata</i>	14,453	1,642	85

13.1.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Andhra Pradesh in Rural and Urban areas are given in the Table 13.1.14 and Table 13.1.15 respectively

Table 13.1.14 Top five tree species in TOF (Rural) in Andhra Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	28.83
2.	<i>Borassus flabelliformis</i>	9.61
3.	<i>Azadirachta indica</i>	9.25
4.	<i>Cocos nucifera</i>	8.47
5.	<i>Anacardium occidentale</i>	6.03

Table 13.1.15 Top five tree species in TOF (Urban) in Andhra Pradesh

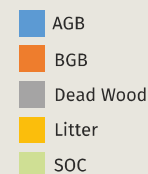
Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	15.87
2.	<i>Azadirachta indica</i>	12.49
3.	<i>Pongamia pinnata</i>	7.36
4.	<i>Mangifera indica</i>	7.13
5.	<i>Tectona grandis</i>	6.54

13.1.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 230.22 million tonnes (844.14 million tonnes of CO₂ equivalent) which is 3.20 % of total forest carbon of the country. Pool wise forest carbon in Andhra Pradesh is given in the following table.

Table 13.1.16 Forest Carbon in Andhra Pradesh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	63,951
2.	BGB	25,064
3.	Dead wood	979
4.	Litter	3,171
5.	SOC	1,37,057
	Total	2,30,222


Figure 13.1.5 Forest Carbon in Andhra Pradesh

13.1.9 Growing Stock of Bamboo

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

Table 13.1.17 Growing Stock of Bamboo in Andhra Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	6,104	4.08
Total number of culms (in millions)	2,244	4.21
Total equivalent green weight (in '000 tonnes)	27,219	6.77

13.1.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.1.18 and Table 13.1.19 respectively.

Table 13.1.18 Major NTFP species in Andhra Pradesh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Solanum nigrum</i>	Herbs	84.55
2.	<i>Hemidesmus indicus</i>	Climber	8.81
3.	<i>Cardiospermum helicabum</i>	Climber	6.63

Table 13.1.19 Major invasive species in the State inside the RFA/Green Wash in Andhra Pradesh (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	253
2.	<i>Ageratum conyzoides</i>	183
3.	<i>Chromolaena odorata</i>	99
4.	<i>Cuscuta</i> spp.	49
5.	<i>Prosopis juliflora</i>	46

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

13.2

ARUNACHAL PRADESH

Geographical Area

83,743 sq km

Geographical Coordinates

Latitude 26° 28' N to 29° 30' N

Longitude 91° 30' E to 97° 30' E

Population (as per Census 2011)

1.38 million

Urban 0.32 million (22.94 %)

Rural 1.06 million (77.06 %)

Tribal 0.95 million (68.79 %)

Average Population Density

17 per sq km

Livestock population

(as per 19th Live Stock Census)

1.41 million

No. of Districts

16

No. of Hill Districts

16

No. of Tribal Districts

16

Table 13.2.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	8,374	
Reporting area for land utilization	7,172	100.00
Forests	6,669	92.99
Not available for land cultivation	62	0.86
Permanent pastures and other grazing lands	18	0.25
Land under misc. tree crops and groves	34	0.47
Culturable wasteland	61	0.85
Fallow land other than current fallows	61	0.86
Current fallows	34	0.47
Net area sown	233	3.25

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.2.1 Forest Cover

Figure 13.2.1
Forest Cover
of Arunachal
Pradesh



Table 13.2.2 Forest Cover of Arunachal Pradesh (in sq km)

Class	Area	% of GA
VDF	21,058.37	25.15
MDF	30,175.56	36.03
OF	15,196.74	18.15
Total	66,430.67	79.33
Scrub	796.98	0.95

Table 13.2.3 District- wise Forest Cover in Arunachal Pradesh (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Changlang TH	4,662	1,809.08	1,327.54	844.39	3,981.01	85.39	-5.75	10.68
Dibang Valley TH & Lower Dibang Valley TH	13,029	1,688.91	4,806.97	2,583.83	9,079.71	69.69	-128.19	83.24
East Kameng TH & West Kameng TH	11,556	3,504.95	4,478.14	2,241.25	10,224.34	88.48	-9.78	166.20
East Siang TH	3,603	876.18	1,261.58	773.91	2,911.67	80.81	42.57	12.98
Kurung Kumey TH & Lower Subansiri TH	9,548	3,120.32	3,821.11	1,439.86	8,381.29	87.78	11.17	67.19
Lohit TH & Anjaw TH	11,402	2,016.68	3,805.80	1,547.55	7,370.03	64.64	-217.57	83.45
Papum Pare TH	3,462	981.00	1,473.11	741.92	3,196.03	92.32	11.12	7.60
Tawang TH	2,172	325.81	410.82	412.64	1,149.27	52.91	-24.88	106.79
Tirap TH	2,362	736.80	646.96	469.67	1,853.43	78.47	-7.56	76.03
Upper Siang TH	6,590	1,551.83	2,479.31	1,329.12	5,360.26	81.34	-0.47	111.98
Upper Subansiri TH	7,032	1,813.33	2,567.30	1,180.36	5,560.99	79.08	7.99	45.09
West Siang TH	8,325	2,633.48	3,096.92	1,632.24	7,362.64	88.44	64.24	25.75
Grand Total	83,743	21,058.37	30,175.56	15,196.74	66,430.67	79.33	-257.11	796.98

13.2.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.2.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Arunachal Pradesh (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
19,637	27,171	11,872	58,680	1,421	3,005	3,325	7,751
33.46%	46.31%	20.23%		18.33%	38.77%	42.90%	

in case of Arunachal Pradesh, Green Wash boundaries have been used

ARUNACHAL PRADESH

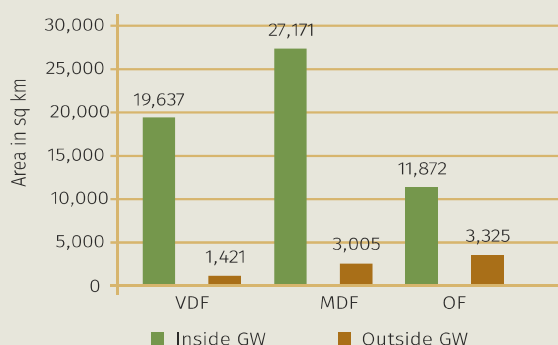


Figure 13.2.2
Forest Cover
Inside and
Outside of Green
Wash in
Arunachal
Pradesh

Table 13.2.5 Forest Cover Change Matrix for Arunachal Pradesh

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	20,918	64	76	14	23	21,095
Moderately Dense Forest	124	29,790	386	128	129	30,557
Open Forest	7	267	14,109	111	542	15,036
Scrub	0	0	18	188	23	229
Non Forest	9	55	608	356	15,798	16,826
Total ISFR 2021	21,058	30,176	15,197	797	16,515	83,743
Net Change	-37	-381	161	568	-311	

Table 13.2.6 Altitude-wise Forest Cover in Arunachal Pradesh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	11,136	1,509	3,313	2,320	7,142	70
500-1000	11,082	2,843	4,151	3,156	10,150	47
1000-2000	23,752	7,977	9,831	4,601	22,409	59
2000-3000	17,965	6,676	8,864	1,707	17,247	29
3000-4000	13,370	2,032	3,900	3,096	9,028	358
>4000	6,438	21	117	317	455	234
Total	83,743	21,058	30,176	15,197	66,431	797

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

Table 13.2.7 Forest Cover in different slope classes in Arunachal Pradesh











(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	7,629	701	1,804	1,217	3,722	77
5-10	5,608	1,435	1,961	911	4,307	52
10-15	8,588	2,508	2,998	1,449	6,955	78
15-20	11,278	3,355	3,964	1,960	9,279	102
20-25	12,494	3,649	4,456	2,209	10,314	115
25-30	12,172	3,431	4,474	2,213	10,118	115
>30	25,974	5,979	10,519	5,238	21,736	258
Total	83,743	21,058	30,176	15,197	66,431	797

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

Figure 13.2.3
Forest Cover
Map of
Arunachal
Pradesh

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.2.2 Forest Types

The area under different forest types of Arunachal Pradesh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.2.8 Area statistics of the Forest Types found in Arunachal Pradesh

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1B/C1 Assam Valley tropical wet evergreen forest (<i>Dipterocarpus</i>)	1,505.16	2.07
2.	1B/C2a <i>Kayea</i> forest	745.68	1.03
3.	1/2S1 Pioneer Euphorbiaceous scrub	103.86	0.14
4.	2B/ C1a Assam alluvial plains semi-evergreen forest	3,961.00	5.44
5.	2B/C1b Eastern sub-montane semi-evergreen forest	2,330.86	3.20
6.	2B/C1/1S1 Sub-Himalayan light alluvial semi-evergreen forest	4,077.78	5.60
7.	2B/C1/2S2 Eastern alluvial secondary semi-evergreen forest	3,777.01	5.19
8.	2/2S1 Secondary moist bamboo brakes	1,133.65	1.56
9.	3C/C3/2S2 Secondary Euphorbiaceous scrub	0.26	0.00

ARUNACHAL PRADESH

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
10.	3/1S2b <i>Terminalia-Duabanga</i>	854.57	1.17
11.	8B/C1 East Himalayan subtropical wet hill forest	15,667.69	21.53
12.	8B/C2 <i>Khasi</i> subtropical wet hill forest	1,253.62	1.72
13.	9/C2 Assam subtropical pine forest	718.82	0.99
14.	11B/C1 East Himalayan wet temperate forest	16,531.13	22.72
15.	12/C1f Low-level blue pine forest (<i>P. wallichiana</i>)	211.82	0.29
16.	12/C3a East Himalayan mixed coniferous forest	4,333.74	5.96
17.	12/DS1 Montane bamboo brakes	66.17	0.09
18.	13/C6 East Himalayan dry temperate coniferous forest	540.45	0.74
19.	14/C2 East Himalayan sub-alpine birch/fir forest	7,810.33	10.73
20.	15/C1 Birch/ <i>Rhododendron</i> scrub forest	159.22	0.22
21.	16/C1 Dry alpine scrub	481.74	0.66
	Sub Total	66,264.56	91.05
22.	TOF/ Plantation	652.68	0.90
	Total (Forest Cover & Scrub)	66,917.24	
	Grassland forest types (outside forest cover)		
23.	9/C2/DS1 Assam subtropical pine savannah	36.07	0.05
24.	12/DS3 Himalayan temperate pastures	375.10	0.52
25.	15/C3 Alpine pastures	5,446.34	7.48
	Sub Total	5,857.51	8.05
	Grand Total	72,774.75	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.2.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.2.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	35.16	0.06
2.	Very highly fire prone	959.77	1.44
3.	Highly fire prone	2,744.50	4.13
4.	Moderately fire prone	4,459.72	6.71
5.	Less fire prone	58,231.85	87.66
	Total	66,431.00	100.00

Figure 13.2.4
Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.2.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Arunachal Pradesh has been estimated as given in following table.

Table 13.2.10 Tree Cover in Arunachal Pradesh (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
848	1,001	153

13.2.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.2.11 Extent of TOF in Arunachal Pradesh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
7,751	1,001	8,752

13.2.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Arunachal Pradesh is given in the Table 13.2.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.2.13

Table 13.2.12 Growing Stock in Arunachal Pradesh (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	458.00	418.99	-39.01	9.55
2.	Growing Stock in TOF	75.08	73.48	-1.60	4.13

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Table 13.2.13 Diameter class distribution of top five tree species inside RFA in Arunachal Pradesh (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Castanopsis</i> spp.	67,024	15,779	4,717
2.	<i>Terminalia myriocarpa</i>	18,087	11,137	1,782
3.	<i>Shorea assamica</i>	17,733	5,082	891
4.	<i>Ficus</i> spp.	15,005	2,055	1,782
5.	<i>Duabanga grandiflora</i>	10,170	4,197	1,164

13.2.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Arunachal Pradesh in Rural and Urban areas are given in the Table 13.2.14 and Table 13.2.15 respectively

Table 13.2.14 Top five tree species in TOF (Rural) in Arunachal Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Castanopsis</i> spp.	17.46
2.	<i>Pinus excelsa</i>	12.67
3.	<i>Citrus</i> spp.	4.45
4.	<i>Terminalia myriocarpa</i>	4.43
5.	<i>Macaranga</i> spp.	2.60

Table 13.2.15 Top five tree species in TOF (Urban) in Arunachal Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Gmelina arborea</i>	6.39
2.	<i>Areca catechu</i>	6.06
3.	<i>Mangifera indica</i>	5.10
4.	<i>Grevillea robusta</i>	4.04
5.	<i>Artocarpus heterophyllus</i>	3.90

13.2.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 1,023.84 million tonnes (3,754.08 million tonnes of CO₂ equivalent) which is 14.21% of total forest carbon of the country. Pool wise forest carbon in Arunachal Pradesh is given in the following table.

Table 13.2.16 Forest Carbon in Arunachal Pradesh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	3,40,351
2.	BGB	1,02,229
3.	Dead wood	9,163
4.	Litter	11,802
5.	SOC	5,60,298
	Total	10,23,843

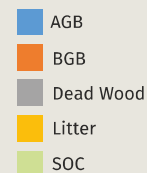


Figure 13.2.5 Forest Carbon in Arunachal Pradesh

13.2.9 Growing Stock of Bamboo

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

Table 13.2.17 Growing Stock of Bamboo in Arunachal Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	15,739	10.53
Total number of culms (in millions)	8,824	16.54
Total equivalent green weight (in '000 tonnes)	46,546	11.58

13.2.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.2.18 and Table 13.2.19 respectively.

Table 13.2.18 Major NTFP species in Arunachal Pradesh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Piper</i> spp./ <i>Piper longum</i> / <i>Piper mullesua</i>	Climber	46.27
2.	<i>Swertia chiraita</i>	Herbs	24.38
3.	<i>Thysanolaena maxima</i>	Herbs	12.94
4.	<i>Acorus calamus</i>	Herbs	5.97
5.	<i>Oroxylum indicum</i>	Tree	4.48

Table 13.2.19 Major invasive species in the State inside the RFA/Green Wash in Arunachal Pradesh (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	295
2.	<i>Mikania micrantha</i>	277
3.	<i>Ageratum conyzoides</i>	73
4.	<i>Lantana camara</i>	63
5.	<i>Acacia farnesiana</i>	53

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

13.3

ASSAM

Geographical Area

78,438 sq km

Geographical Coordinates

Latitude 24° 07' N to 28° 00' N

Longitude 89° 42' E to 96° 02' E

Population (as per Census 2011)

31.21 million

Urban 4.40 million (14.10 %)

Rural 26.81 million (85.90 %)

Tribal 3.88 million (12.45 %)

Average Population Density

398 per sq km

Livestock population

(as per 19th Live Stock Census)

17.23 million

No. of Districts

27

No. of Hill Districts

3

No. of Tribal Districts

19

Table 13.3.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	7,844	
Reporting area for land utilization	7,844	100.00
Forests	1,853	23.62
Not available for land cultivation	2,509	31.99
Permanent pastures and other grazing lands	180	2.29
Land under misc. tree crops and groves	221	2.82
Culturable wasteland	160	2.04
Fallow land other than current fallows	92	1.18
Current fallows	106	1.35
Net area sown	2,723	34.71

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.3.1 Forest Cover



Table 13.3.2
Forest Cover of Assam (in sq km)

Class	Area	% of GA
VDF	3,016.67	3.85
MDF	9,991.02	12.74
OF	15,303.82	19.50
Total	28,311.51	36.09
Scrub	227.94	0.29

Table 13.3.3 District- wise Forest Cover in Assam (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Baksa ^T	2,457	154.50	130.56	277.83	562.89	22.91	3.22	7.23
Barpeta ^T	2,282	0.00	33.42	84.28	117.70	5.16	2.52	1.09
Bongaigaon	1,093	0.00	62.32	188.37	250.69	22.94	0.56	0.11
Cachar ^T	3,786	183.15	985.06	1,059.34	2,227.55	58.84	5.21	17.43
Chirang	1,923	395.58	107.87	198.78	702.23	36.52	2.39	5.34
Darrang ^T	1,585	0.00	14.10	79.98	94.08	5.94	4.65	1.15
Dhemaji ^T	3,237	68.65	123.20	164.83	356.68	11.02	11.88	5.56
Dhubri ^T	2,176	0.98	22.65	83.02	106.65	4.90	8.19	3.84
Dibrugarh ^T	3,381	105.78	68.70	584.04	758.52	22.43	3.29	7.30
Dima Hasao ^H	4,888	268.66	1,455.08	2,428.18	4,151.92	84.94	-55.01	8.59
Goalpara ^T	1,824	13.73	139.14	251.74	404.61	22.18	8.87	2.18
Golaghat	3,502	22.95	118.12	533.13	674.20	19.25	4.29	6.74
Hailakandi	1,327	15.97	360.97	391.15	768.09	57.88	-6.25	1.49
Jorhat ^T	2,851	12.00	104.70	449.12	565.82	19.85	5.72	7.87
Kamrup ^T	3,105	50.00	454.06	462.64	966.70	31.13	3.23	3.25
Kamrup Metropolitan ^T	955	0.00	224.32	238.51	462.83	48.46	2.78	0.75
Karbi-Anglong ^H	10,434	662.07	3,657.48	3,514.36	7,833.91	75.08	-55.27	83.66
Karimganj	1,809	3.00	299.88	553.58	856.46	47.34	5.03	1.05
Kokrajhar ^T	3,296	437.60	270.40	460.86	1,168.86	35.46	2.29	4.08
Lakhimpur ^T	2,277	28.40	85.47	196.68	310.55	13.64	3.98	1.87
Morigaon ^T	1,551	10.00	42.15	124.26	176.41	11.37	2.30	4.05
Naogaon ^H	3,973	50.28	360.29	503.86	914.43	23.02	3.17	11.37
Nalbari ^T	1,052	0.00	30.93	81.07	112.00	10.65	4.89	0.01
Sivasagar ^T	2,668	8.97	150.50	540.52	699.99	26.24	10.03	5.25
Sonitpur ^T	5,204	108.88	255.79	706.69	1,071.36	20.59	1.75	15.33
Tinsukia ^T	3,790	407.83	350.49	825.06	1,583.38	41.78	0.81	15.58
Udalguri ^T	2,012	7.69	83.37	321.94	413.00	20.53	0.48	5.77
Grand Total	78,438	3,016.67	9,991.02	15,303.82	28,311.51	36.09	-15.00	227.94

ASSAM

13.3.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.3.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Assam (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
2,748	8,566	8,689	20,003	269	1,425	6,615	8,309
13.74%	42.82%	43.44%		3.24%	17.15%	79.61%	

*in case of Assam, GW boundaries have been used.

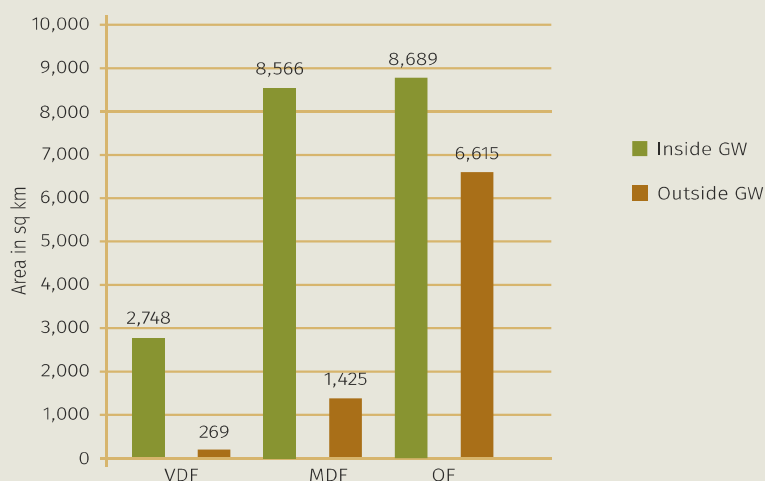


Figure 13.3.2
Forest Cover Inside and Outside of GW in Assam

Table 13.3.5 Forest Cover Change Matrix for Assam (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	2,770	12	2	0	11	2,795
Moderately Dense Forest	247	9,948	14	1	69	10,279
Open Forest	0	8	14,869	32	344	15,253
Scrub	0	0	7	160	6	173
Non Forest	0	23	412	35	49,468	49,938
Total ISFR 2021	3,017	9,991	15,304	228	49,898	78,438
Net Change	222	-288	51	55	-40	

Table 13.3.6 Altitude-wise Forest Cover in Assam (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	72,348	2,344	7,761	12,899	23,004	191
500-1000	5,315	388	2,082	2,146	4,616	36
1000-2000	775	285	148	259	692	1
Total	78,438	3,017	9,991	15,304	28,312	228

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

Table 13.3.7 Forest Cover in different slope classes in Assam (in sq km)










Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	61,901	1,777	3,842	8,707	14,326	160
5-10	6,929	395	2,277	2,504	5,176	31
10-15	4,156	265	1,643	1,788	3,696	17
15-20	2,643	216	1,074	1,158	2,448	11
20-25	1,511	162	615	647	1,424	6
25-30	759	104	308	312	724	2
>30	539	98	232	188	518	1
Total	78,438	3,017	9,991	15,304	28,312	228

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

Figure 13.3.3

Forest Cover
Map of
Assam

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

ASSAM

13.3.2 Forest Types

The area under different forest types of Assam as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.3.8 Area statistics of the Forest Types found in Assam

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1B/C1 Assam Valley tropical wet evergreen forest (<i>Dipterocarpus</i>)	1,006.79	3.51
2.	1B/C2a <i>Kayea</i> forest	216.12	0.75
3.	1B/C2b <i>Mesua</i> forest	5.53	0.02
4.	1B/C3 Cachar tropical evergreen forest	886.92	3.1
5.	2B/ C1a Assam alluvial plains semi-evergreen forest	453.68	1.58
6.	2B/C1/1S1 Sub-Himalayan light alluvial semi-evergreen forest	356.00	1.24
7.	2B/C1/1S2 <i>Syzygium</i> parkland	19.43	0.07
8.	2B/C1/2S1 Pioneer Euphorbiaceous scrub	84.52	0.29
9.	2B/C1/2S2 Eastern alluvial secondary semi-evergreen forest	348.87	1.22
10.	2B/C2 Cachar semi-evergreen forest	10,719.16	37.41
11.	2/2S1 Secondary moist bamboo brakes	857.76	2.99
12.	3C/C1a(ii) <i>Khasi</i> hill sal	40.39	0.14
13.	3C/C1b (i) East Himalayan upper <i>bhabar</i> sal	670.56	2.34
14.	3C/C2d (iv) App. Kamrup sal	759.57	2.65
15.	3C/C3b East Himalayan moist mixed deciduous forest	5,095.46	17.78
16.	3C/C3/2S1 Northern secondary moist mixed deciduous forest	505.65	1.76
17.	3C/1S1 Low alluvial savannah woodland (<i>Salmalia-Albizia</i>)	13.69	0.05
18.	3/1S2(a) <i>Terminalia-Lagerstroemia</i>	2.83	0.01
19.	4C/FS3 Creeper swamp forest	0.09	0.00
20.	4D/SS1 Eastern seasonal swamp forest	0.88	0.00
21.	5/1S2 <i>Khair-sissu</i> forest	24.19	0.08
22.	8B/DS1 Assam subtropical hill savannah woodland	9.79	0.03
23.	9/C2 Assam subtropical pine forest	119.72	0.42
	Sub Total	22,197.60	77.44
24.	TOF/Plantation	6,302.34	21.99
	Total (Forest Cover & Scrub)	28,499.94	
	Grassland forest types (outside forest cover)		
25.	4D/2S1 <i>Syzygium</i> parkland	0.65	0.00
26.	4D/2S2 Eastern wet alluvial grassland	153.18	0.57
	Sub Total	153.83	0.57
	Grand Total	28,653.77	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

Table 13.3.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	3,166.11	11.18
2.	Very highly fire prone	4,871.05	17.20
3.	Highly fire prone	3,400.46	12.01
4.	Moderately fire prone	2,653.93	9.37
5.	Less fire prone	14,220.45	50.24
	Total	28,312.00	100.00

13.3.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.3.4
Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.3.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Assam has been estimated as given in following table.

Table 13.3.10 Tree Cover in Assam (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
1,408	1,630	222

11.3.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

ASSAM

Table 13.3.11 Extent of TOF in Assam

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
8,309	1,630	9,939

13.3.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Assam is given in the Table 13.3.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.3.13

Table 13.3.12 Growing Stock in Assam

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	115.40	112.68	-2.72	2.57
2.	Growing Stock in TOF	22.96	23.94	0.98	1.35

Table 13.3.13 Diameter class distribution of top five tree species inside RFA in Assam

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Schima wallichii</i>	15,948	2,714	75
2.	<i>Tectona grandis</i>	11,449	2,520	59
3.	<i>Albizia spp.</i>	9,119	2,717	144
4.	<i>Bombax ceiba</i>	2,554	2,692	443
5.	<i>Stereospermum personatum/ colais/chelonoides</i>	1,625	1,639	449

13.3.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Assam in Rural and Urban areas are given in the Table 13.3.14 and Table 13.3.15 respectively.

Table 13.3.14 Top five tree species in TOF (Rural) in Assam

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	33.68
2.	<i>Tectona grandis</i>	4.26
3.	<i>Gmelina arborea</i>	3.70
4.	<i>Albizia spp.</i>	3.55
5.	<i>Mangifera indica</i>	3.23

Table 13.3.15 Top five tree species in TOF (Urban) in Assam

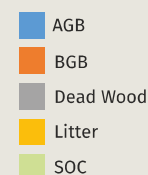
Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	42.07
2.	<i>Cocos nucifera</i>	11.11
3.	<i>Mangifera indica</i>	8.90
4.	<i>Artocarpus heterophyllus</i>	3.62
5.	<i>Anthocephalus cadamba</i>	3.23

13.3.8 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 271.37 million tonnes (995.02 million tonnes of CO₂ equivalent) which is 3.77 % of total forest carbon of the country. Pool wise forest carbon in Assam is given in the following table.

Table 13.3.16 Forest Carbon in Assam in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	87,070
2.	BGB	21,495
3.	Dead wood	1,875
4.	Litter	4,890
5.	SOC	1,56,042
	Total	2,71,372

**Figure 13.3.5 Forest Carbon in Assam**

13.3.9 Growing Stock of Bamboo

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

Table 13.3.17 Growing Stock of Bamboo in Assam

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	10,659	7.13
Total number of culms (in millions)	5,656	10.60
Total equivalent green weight (in '000 tonnes)	38,600	9.60

13.3.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.3.18 and Table 13.3.19 respectively.

Table 13.3.18 Major NTFP species in Assam

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	41.64
2.	<i>Bombax</i> spp. / <i>Bombax ceiba</i>	Tree	13.83
3.	<i>Terminalia bellerica</i>	Tree	11.10
4.	<i>Piper</i> spp./ <i>Piper longum</i> / <i>Piper mullesua</i>	Climber	8.65
5.	<i>Smilax china</i>	Climber	6.92

Table 13.3.19 Major invasive species in the State inside the RFA/Green Wash in Assam (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	457
2.	<i>Mikania micrantha</i>	242
3.	<i>Lantana camara</i>	175
4.	<i>Microcystis aeruginosa</i>	22
5.	<i>Imperata cylindrica</i>	21

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

13.4

BIHAR

Geographical Area

94,163 sq km

Geographical Coordinates

Latitude 24° 16' N to 27° 45' N

Longitude 83° 16' E to 88° 30' E

Population (as per Census 2011)

104.10 million

Urban 11.76 million (11.29 %)

Rural 92.34 million (88.71 %)

Tribal 1.34 million (1.28 %)

Average Population Density

1,106 per sq km

Livestock population

(as per 19th Live Stock Census)

32.93 million

No. of Districts

38

No. of Hill Districts

0

No. of Tribal Districts

0

Table 13.4.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	9,416	
Reporting area for land utilization	9,360	100.00
Forests	622	6.65
Not available for land cultivation	2,150	22.97
Permanent pastures and other grazing lands	15	0.16
Land under misc. tree crops and groves	248	2.65
Culturable wasteland	44	0.47
Fallow land other than current fallows	120	1.28
Current fallows	919	9.82
Net area sown	5,242	56.00

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.4.1 Forest Cover

Figure 13.4.1
Forest Cover
of Bihar



Table 13.4.2
Forest Cover of Bihar (in sq km)

Class	Area	% of GA
VDF	333.42	0.35
MDF	3,285.83	3.49
OF	3,761.54	4.00
Total	7,380.79	7.84
Scrub	235.89	0.25

Table 13.4.3 District- wise Forest Cover in Bihar

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Araria	2,830	0.00	8.10	142.78	150.88	5.33	-0.13	0.38
Arwal	638	0.00	1.63	2.51	4.14	0.65	0.14	0.39
Aurangabad	3,305	0.00	62.44	97.41	159.85	4.84	3.09	16.85
Banka	3,020	0.00	99.96	177.06	277.02	9.17	16.29	21.59
Begusarai	1,918	0.00	28.93	53.65	82.58	4.31	0.63	0.00
Bhagalpur	2,569	0.00	46.41	23.52	69.93	2.72	0.20	0.00
Bhojpur	2,395	0.00	19.44	12.55	31.99	1.34	-0.26	1.25
Buxar	1,703	0.00	2.94	2.95	5.89	0.35	0.00	0.00
Darbhanga	2,279	0.00	43.54	94.44	137.98	6.05	0.32	0.00
East Champaran	3,968	0.00	64.61	101.19	165.80	4.18	1.94	0.00
Gaya	4,976	0.00	132.03	470.52	602.55	12.11	12.24	66.50
Gopalganj	2,033	0.00	2.64	5.92	8.56	0.42	3.65	0.00
Jamui	3,098	28.97	352.76	279.44	661.17	21.34	13.22	3.21
Jehanabad	931	0.00	0.00	4.43	4.43	0.48	4.43	5.13
Kaimur	3,332	0.00	519.83	531.73	1,051.56	31.56	-4.83	25.65
Katihar	3,057	0.00	6.22	55.76	61.98	2.03	0.00	0.00
Khagaria	1,486	0.00	3.18	15.27	18.45	1.24	0.00	0.00
Kishanganj	1,884	0.00	16.32	87.23	103.55	5.50	-0.15	0.00
Lakhisarai	1,228	17.00	143.5	22.91	183.41	14.94	3.00	4.80
Madhepura	1,788	0.00	0.93	51.91	52.84	2.96	-0.04	0.40
Madhubani	3,501	0.00	40.39	164.98	205.37	5.87	1.30	0.00
Munger	1,419	37.97	223.61	24.43	286.01	20.16	2.41	9.43
Muzaffarpur	3,172	0.00	52.17	114.12	166.29	5.24	4.47	0.00
Nalanda	2,355	0.00	6.86	31.71	38.57	1.64	6.72	10.59
Nawada	2,494	0.00	214.68	302.20	516.88	20.72	3.38	18.13
Patna	3,202	0.00	19.55	8.48	28.03	0.88	4.49	0.54
Purnia	3,229	0.00	5.00	50.67	55.67	1.72	0.00	0.00

BIHAR

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Rohtas	3,881	0.14	351.25	318.52	669.91	17.26	-2.32	40.92
Saharsa	1,687	0.00	4.17	30.22	34.39	2.04	-0.23	0.00
Samastipur	2,904	0.00	105.39	48.83	154.22	5.31	0.86	0.00
Saran	2,641	0.00	26.28	33.04	59.32	2.25	0.19	0.00
Sheikhpura	689	0.00	1.00	0.19	1.19	0.17	0.19	0.00
Sheohar	349	0.00	2.00	19.57	21.57	6.18	0.99	0.00
Sitamarhi	2,294	0.00	37.41	110.38	147.79	6.44	0.01	0.00
Siwan	2,219	0.00	2.11	5.55	7.66	0.35	0.50	0.00
Supaul	2,425	0.00	3.89	130.43	134.32	5.54	-4.46	0.00
Vaishali	2,036	0.00	86.19	29.51	115.70	5.68	3.88	0.00
West Champaran	5,228	249.34	548.47	105.53	903.34	17.28	-1.32	10.13
Grand Total	94,163	333.42	3,285.83	3,761.54	7,380.79	7.84	74.80	235.89

13.4.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.4.4 Forest Cover inside and outside Recorded Forest Area (or Green Wash) in Bihar

(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
314	2,457	2,060	4,831	19	829	1,702	2,550
6.50%	50.86%	42.64%		0.74%	32.51%	66.75%	

*in case of Bihar, RFA boundaries have been used.

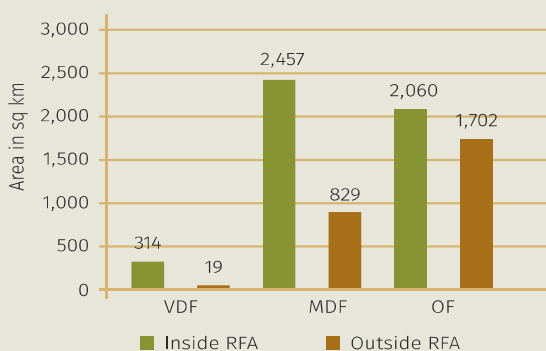


Figure 13.4.2

Forest Cover Inside and Outside of RFA in Bihar

Table 13.4.5 Forest Cover Change Matrix for Bihar (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	333	0	0	0	0	333
Moderately Dense Forest	0	3,244	27	7	2	3,280
Open Forest	0	33	3,612	17	31	3,693
Scrub	0	0	62	172	16	250
Non Forest	0	9	61	40	86,497	86,607
Total ISFR 2021	333	3,286	3,762	236	86,546	94,163
Net Change	0	6	69	-14	-61	

Table 13.4.6 Altitude-wise Forest Cover in Bihar (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	93,821	330	3,145	3,637	7,112	232
500-1000	342	3	141	125	269	4
Total	94,163	333	3,286	3,762	7,381	236

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

Table 13.4.7 Forest Cover in different slope classes in Bihar (in sq km)











Slope (In degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	91,177	172	2,132	2,942	5,246	150
5-10	1,576	72	487	372	931	32
10-15	594	38	277	177	492	19
15-20	363	25	176	116	317	13
20-25	222	15	105	72	192	10
25-30	122	7	57	43	107	7
>30	109	4	52	40	96	5
Total	94,163	333	3,286	3,762	7,381	236

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

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Figure 13.4.3
Forest Cover
Map of Bihar

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.4.2 Forest Types

The area under different forest types of Bihar as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.4.8 Area statistics of the Forest Types found in Bihar

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2/E1 Cane brakes	2.61	0.03
2.	3B/C1b Moist teak forest	4.16	0.06
3.	3C/C2b(I) <i>Bhabar-dun</i> sal	278.11	3.68
4.	3C/C3a West Gangetic moist mixed deciduous forest	176.39	2.33
5.	4D/SS2 <i>Barringtonia</i> swamp forest	1.63	0.02
6.	4D/2S2 Eastern wet alluvial grassland	11.36	0.15
7.	5B/C1a Dry Siwalik sal forest	392.89	5.20

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
9.	5B/C2 Northern dry mixed deciduous forest	2,266.39	29.97
10.	5/DS1 Dry deciduous scrub	246.39	3.26
11.	5/E2 <i>Boswellia</i> forest	327.59	4.33
12.	5/E9 Dry bamboo brakes	69.34	0.92
13.	5/1S2 <i>Khair-sissu</i> forest	2.61	0.03
	Sub Total	5,360.05	70.89
14.	TOF/Plantation	2,195.82	29.04
	Total (Forest Cover & Scrub)	7,555.87	
	Grassland forest type (outside forest cover)		
15.	4D/2S2 Eastern wet alluvial grassland	5.28	0.07
	Grand Total	7,561.15	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.4.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.4.4 Fire prone forest areas under different fire prone classes

LEGEND	
■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Table 13.4.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	24.38	0.33
2.	Very highly fire prone	471.89	6.39
3.	Highly fire prone	984.48	13.34
4.	Moderately fire prone	1,173.58	15.90
5.	Less fire prone	4,726.67	64.04
	Total	7,381.00	100.00

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13.4.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Bihar has been estimated as given in following table.

Table 13.4.10 Tree Cover in Bihar (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
2,003	2,341	338

13.4.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.14.11 Extent of TOF in Bihar (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
2,550	2,341	4,891

13.4.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Bihar is given in the Table 13.4.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.4.13

Table 13.4.12 Growing Stock in Bihar (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	26.73	30.52	3.79	0.70
2.	Growing Stock in TOF	40.46	41.04	0.58	2.31

Table 13.4.13 Diameter class distribution of top five tree species inside RFA in Bihar (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	20,756	4,788	514
2.	<i>Lannea coromandelica</i>	11,323	434	67
3.	<i>Madhuca latifolia</i>	7,377	654	139
4.	<i>Terminalia tomentosa</i>	7,058	708	137
5.	<i>Anogeissus latifolia</i>	6,266	482	0

13.4.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Bihar in Rural and Urban areas are given in the Table 13.4.14 and Table 13.4.15 respectively.

Table 13.4.14 Top five tree species in TOF (Rural) in Bihar

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	34.16
2.	<i>Dalbergia sissoo</i>	11.52
3.	<i>Borassus flabelliformis</i>	7.86
4.	<i>Litchi senensis</i>	3.86
5.	<i>Syzygium cumini</i>	3.39

Table 13.4.15 Top five tree species in TOF (Urban) in Bihar

Sl. No.	Species	Relative Abundance (%)
1.	<i>Litchi senensis</i>	13.87
2.	<i>Mangifera indica</i>	13.80
3.	<i>Bombax ceiba</i>	8.82
4.	<i>Dalbergia sissoo</i>	5.73
5.	<i>Psidium guajava</i>	4.53

13.4.8 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 56.88 million tonnes (208.56 million tonnes of CO₂ equivalent) which is 0.79% of total forest carbon of the country. Pool wise forest carbon in Bihar is given in the following table.

Table 13.4.16 Forest Carbon in Bihar in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	14,743
2.	BGB	5,249
3.	Dead wood	231
4.	Litter	785
5.	SOC	35,873
	Total	56,881



Figure 13.4.5 Forest Carbon in Bihar

13.4.9 Growing Stock of Bamboo

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

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Table 13.4.17 Growing Stock of Bamboo in Bihar

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,103	0.74
Total number of culms (in millions)	235	0.44
Total equivalent green weight (in '000 tonnes)	1,672	0.42

13.4.10 Major Invasive Species

Major invasive species as assessed from forest inventory data are presented in the Table 13.4.18.

Table 13.4.18 Major invasive species in the State inside the RFA/Green Wash in Bihar

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	261
2.	<i>Chromolaena odorata</i>	47
3.	<i>Argemone mexicana</i>	17
4.	<i>Cassia tora</i>	15
5.	<i>Senna occidentalis</i>	14

Major invasive species are given in terms of their estimated extent.

13.5

CHHATTISGARH

Geographical Area

1,35,192 sq km

Geographical Coordinates

Latitude 17°47' N to 24°06' N

Longitude 80°15' E to 84°24' E

Population (as per Census 2011)

25.55 million

Urban 5.94 million (23.24 %)

Rural 19.61 million (76.76 %)

Tribal 7.82 million (30.62 %)

Average Population Density

189 per sq km

Livestock population

(as per 19th Live Stock Census)

15.04 million

No. of Districts

18

No. of Hill Districts

0

No. of Tribal Districts

11

Table 13.5.1 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	6,314	45.79
Not available for land cultivation	1,031	7.48
Permanent pastures and other grazing lands	883	6.40
Land under misc. tree crops and groves	1	0.01
Culturable wasteland	365	2.65
Fallow land other than current fallows	253	1.83
Current fallows	290	2.10
Net area sown	4,653	33.74

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.5.1 Forest Cover

Figure 13.5.1

Forest
Cover of
Chhattisgarh

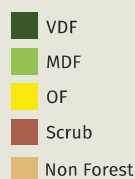


Table 13.5.2 Forest Cover of Chhattisgarh (in sq km)

Class	Area	% of GA
VDF	7,068.21	5.23
MDF	32,278.59	23.87
OF	16,369.80	12.11
Total	55,716.60	41.21
Scrub	615.26	0.45

Table 13.5.3 District- wise Forest Cover in Chhattisgarh

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bastar ^T	10,470	937.72	2,104.39	1,190.24	4,232.35	40.42	-0.51	41.52
Bijapur ^T	8,530	2,047.13	2,991.56	1,499.57	6,538.26	76.65	26.11	4.47
Bilaspur ^T	8,272	399.22	1,569.99	491.59	2,460.80	29.75	3.91	46.12
Dantewada ^T	8,298	250.57	2,325.76	1,896.47	4,472.80	53.90	9.65	39.28
Dhamtari	4,084	49.00	1,384.66	426.29	1,859.95	45.54	0.83	10.66
Durg ^T	8,535	44.00	511.74	221.41	777.15	9.11	0.76	20.86
Janjgir-Champa	3,853	2.00	22.25	127.17	151.42	3.93	1.53	13.93
Jashpur ^T	5,838	225.31	1,316.76	576.56	2,118.63	36.29	2.86	21.52
Kabeerdham	4,235	80.61	1,077.87	389.40	1,547.88	36.55	-0.84	12.58
Korba	6,598	203.00	2,313.03	884.90	3,400.93	51.54	7.23	91.02
Koriya	6,604	80.88	2,580.69	1,443.80	4,105.37	62.16	8.76	60.20
Mahasamund	4,790	4.00	515.34	428.90	948.24	19.80	3.27	29.75
Narayanpur ^T	4,653	1,126.69	1,688.70	982.04	3,797.43	81.61	1.13	19.64
Raigarh ^T	7,086	237.96	1,590.95	794.54	2,623.45	37.02	3.12	27.70
Raipur	12,383	146.00	2,402.93	1,086.92	3,635.85	29.36	5.93	53.83
Rajnandgaon ^T	8,070	31.00	1,755.64	752.81	2,539.45	31.47	4.27	46.81
Surguja ^T	15,732	714.29	3,923.54	2,471.93	7,109.76	45.19	27.15	67.27
Uttar BastarKanker ^T	7,161	488.83	2,202.79	705.26	3,396.88	47.44	0.87	8.10
Grand Total	1,35,192	7,068.21	32,278.59	16,369.80	55,716.60	41.21	106.03	615.26

13.5.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

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Table 13.5.4 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
5,358	26,478	10,631	42,467	1,710	5,801	5,739	13,250
12.62%	62.35%	25.03%		12.91%	43.78%	43.31%	

*in case of Chhattisgarh, RFA boundaries has been used

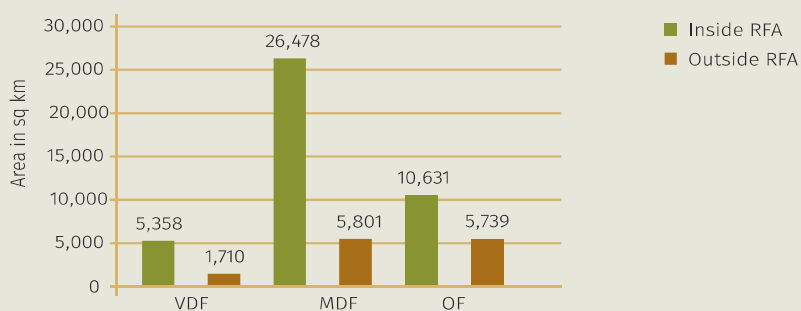

Figure 13.5.2
 Forest Cover Inside and Outside of RFA in Chhattisgarh

Table 13.5.5 Forest Cover Change Matrix for Chhattisgarh

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	7,048	2	11	0	7	7,068
Moderately Dense Forest	20	32,108	35	6	29	32,198
Open Forest	0	156	16,141	14	34	16,345
Scrub	0	0	32	566	12	610
Non Forest	0	13	151	29	78,778	78,971
Total ISFR 2021	7,068	32,279	16,370	615	78,860	1,35,192
Net Change	0	81	25	5	-111	

Table 13.5.6 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	16,045	9,634	29,109	420
500-1000	45,491	3,583	15,888	6,500	25,971	182
1000-2000	1,185	55	346	236	637	13
Total	1,35,192	7,068	32,279	16,370	55,717	615








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

Table 13.5.7 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	17,624	11,007	32,682	354
5-10	16,248	1,503	7,062	2,744	11,309	130
10-15	6,477	829	3,822	1,252	5,903	72
15-20	3,345	413	2,081	710	3,204	36
20-25	1,638	177	1,024	393	1,594	15
25-30	696	67	433	180	680	6
>30	355	28	233	84	345	2
Total	1,35,192	7,068	32,279	16,370	55,717	615

*(based on SRTM, Digital Elevation Model, 30 m, 2016)***Figure 13.5.3**Forest Cover
Map of
Chhattisgarh**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

CHHATTISGARH

13.5.2 Forest Types

The area under different forest types of Chhattisgarh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.5.8 Area statistics of the Forest Types found in Chhattisgarh (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C1c Slightly moist teak forest	3,619.06	6.44
2.	3B/C2 Southern moist mixed deciduous forest	8,778.21	15.61
3.	3C/C2e (i) Moist peninsular high level sal	843.59	1.50
4.	3C/C2e (ii) Moist peninsular low level sal	9,350.91	16.63
5.	3/E1 <i>Terminalia tomentosa</i> forest	11.92	0.02
6.	3/2S1 Dry bamboo brakes	0.76	0.00
7.	5A/C1b Dry teak forest	242.52	0.43
8.	5A/C3 Southern dry mixed deciduous forest	15,315.84	27.24
9.	5B/C1c Dry peninsular sal forest	8,591.22	15.28
10.	5B/C2 Northern dry mixed deciduous forest	7,388.21	13.14
11.	5/DS1 Dry deciduous scrub	627.82	1.12
12.	5/E9 Dry bamboo brakes	840.04	1.50
	Sub Total	55,610.10	98.91
13.	TOF/Plantation	609.99	1.09
	Total (Forest Cover & Scrub)	56,220.09	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub

13.5.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.5.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	1,935.04	3.47
2.	Very highly fire prone	3,655.58	6.56
3.	Highly fire prone	8,159.70	14.64
4.	Moderately fire prone	11,275.57	20.24
5.	Less fire prone	30,691.11	55.09
	Total	55,717.00	100.00

Figure 13.5.4
Fire prone
forest areas
under different
fire prone
classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.5.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Chhattisgarh has been estimated as given in following table.

Table 13.5.10 Tree Cover in Chhattisgarh (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
4,248	5,355	1,107

13.5.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.5.11 Extent of TOF in Chhattisgarh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
13,250	5,355	18,605

13.5.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Chhattisgarh is given in the Table 13.5.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.5.13.

Table 13.5.12 Growing Stock in Chhattisgarh (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	358.96	389.64	30.68	8.88
2.	Growing Stock in TOF	99.92	117.30	17.38	6.59

CHHATTISGARH

Table 13.5.13 Diameter class distribution of top five tree species inside RFA in Chhattisgarh (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	2,87,993	77,599	4,445
2.	<i>Terminalia tomentosa</i>	73,428	17,772	893
3.	<i>Diospyros melanoxylon</i>	63,521	9,934	565
4.	<i>Anogeissus latifolia</i>	58,889	7,922	165
5.	<i>Lannea coromandelica</i>	58,490	8,362	85

13.5.7 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 13.5.14 and Table 13.5.15 respectively.

Table 13.5.14 Top five tree species in TOF (Rural) in Chhattisgarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Shorea robusta</i>	23.33
2.	<i>Mangifera indica</i>	7.18
3.	<i>Butea monosperma</i>	6.49
4.	<i>Acacia arabica</i>	5.90
5.	<i>Madhuca latifolia</i>	5.86

Table 13.5.15 Top five tree species in TOF (Urban) in Chhattisgarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	14.67
2.	<i>Moringa spp.</i>	9.64
3.	<i>Azadirachta indica</i>	7.23
4.	<i>Tectona grandis</i>	6.00
5.	<i>Psidium guajava</i>	5.30

13.5.8 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 496.44 million tonnes (1,820.28 million tonnes of CO₂ equivalent) which is 6.89% of total forest carbon of the country. Pool wise forest carbon in Chhattisgarh is given in the following table.

Table 13.5.16 Forest Carbon in Chhattisgarh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,52,714
2.	BGB	48,947
3.	Dead wood	2,520
4.	Litter	8,487
5.	SOC	2,83,769
Total		4,96,437

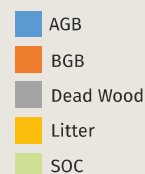


Figure 13.5.5 Forest Carbon in Chhattisgarh

13.5.9 Growing Stock of Bamboo

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

Table 13.5.17 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)	10,467	7.00
Total number of culms (in millions)	2,800	5.25
Total equivalent green weight (in '000 tonnes)	16,780	4.17

13.5.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.5.18 and Table 13.5.19 respectively.

Table 13.5.18 Major NTFP species in Chhattisgarh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	42.88
2.	<i>Ocimum spp. (Ocimum gratissimum/ Ocimum sanctum/Ocimum tenuiflorum/ Ocimum americanum)</i>	Herbs	11.76
3.	<i>Buchanania lanzan</i>	Tree	8.69
4.	<i>Diospyros melanoxylon</i>	Tree	8.48
5.	<i>Anogeissus latifolia</i>	Tree	7.67

**Table 13.5.19 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>	728
2.	<i>Ageratum conyzoides</i>	495
3.	<i>Cassia tora</i>	333
4.	<i>Triumfetta rhomboidea</i>	200
5.	<i>Chromolaena odorata</i>	183

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

13.6

DELHI

Geographical Area

1,483 sq km

Geographical Coordinates

Latitude 28°22' N to 28°54' N

Longitude 76°48' E to 77°23'E

Population (as per Census 2011)

16.79 million

Urban 16.37 million (97.50 %)

Rural 0.42 million (2.50 %)

Tribal Nil

Average Population Density

11,320 per sq km

Livestock population

(as per 19th Live Stock Census)

0.36 million

No. of Districts

9

No. of Hill Districts

0

No. of Tribal Districts

0

Table 13.6.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	148	
Reporting area for land utilization	147	100.00
Forests	1	0.68
Not available for land cultivation	93	63.27
Permanent pastures and other grazing lands	0	0.00
Land under misc. tree crops and groves	1	0.68
Culturable wasteland	10	6.80
Fallow land other than current fallows	8	5.44
Current fallows	12	8.16
Net area sown	22	14.97

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.6.1 Forest Cover

Figure 13.6.1
Forest Cover
of Delhi



Table 13.6.2 Forest Cover of Delhi (in sq km)

Class	Area	% of GA
VDF	6.72	0.45
MDF	56.60	3.82
OF	131.68	8.88
Total	195.00	13.15
Scrub	0.38	0.03

Table 13.6.3 District-wise Forest Cover in Delhi

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Central Delhi	21	0.00	2.08	2.93	5.01	23.86	0.07	0.00
East Delhi	63	0.00	1.05	2.79	3.84	6.10	0.09	0.00
New Delhi	35	1.69	5.47	9.31	16.47	47.06	0.00	0.00
North Delhi	61	0.00	2.82	1.89	4.71	7.72	0.13	0.00
North-East Delhi	62	0.00	0.99	3.15	4.14	6.68	0.15	0.00
North-West Delhi	443	0.09	8.93	8.51	17.53	3.96	-0.51	0.07
South Delhi	247	2.59	17.75	64.30	84.64	34.27	0.01	0.23
South-West Delhi	421	2.35	14.93	34.53	51.81	12.31	-0.38	0.08
West Delhi	130	0.00	2.58	4.27	6.85	5.27	0.00	0.00
Grand Total	1,483	6.72	56.60	131.68	195.00	13.15	-0.44	0.38

13.6.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.6.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Delhi

(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
3.19	16.05	39.93	59.17	3.53	40.55	91.75	135.83
5.39%	27.13%	67.48%		2.60%	29.85%	67.55%	

*in case of Delhi, RFA boundaries have been used.

DELHI

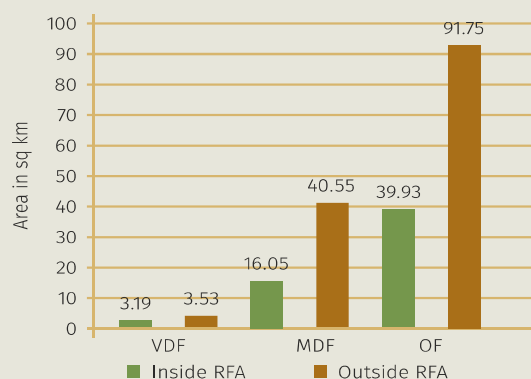


Figure 13.6.2
Forest Cover
Inside and
Outside of RFA
in Delhi

Table 13.6.5 Forest Cover Change Matrix for Delhi

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	6.72	0.00	0.00	0.00	0.00	6.72
Moderately Dense Forest	0.00	56.33	0.00	0.00	0.09	56.42
Open Forest	0.00	0.08	130.64	0.08	1.50	132.30
Scrub	0.00	0.00	0.00	0.30	0.00	0.30
Non Forest	0.00	0.19	1.04	0.00	1,286.03	1,287.26
Total ISFR 2021	6.72	56.60	131.68	0.38	1,287.62	1,483.00
Net Change	0.00	0.18	-0.62	0.08	0.36	

Table 13.6.6 Altitude-wise Forest Cover in Delhi

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,483	6.72	56.60	131.68	195.00	0.38
Total	1,483	6.72	56.60	131.68	195.00	0.38

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

Table 13.6.7 Forest Cover in different slope classes in Delhi

(in sq km)

Slope(in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,407	6.72	52.57	121.44	180.73	0.37
5-10	70	0.00	4.03	9.30	13.33	0.00
10-15	5	0.00	0.00	0.94	0.94	0.01
15-20	1	0.00	0.00	0.00	0.00	0.00
Total	1,483	6.72	56.60	131.68	195.00	0.38

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

Figure 13.6.3
Forest Cover
Map of Delhi

- LEGEND**
- Very Dense Forest
 - Moderately Dense Forest
 - Open Forest
 - Scrub
 - Non-Forest
 - Water-bodies
 - International Boundary
 - State Boundary
 - District Boundary
 - Capital

13.6.2 Forest Types

The area under different forest types of Delhi as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

DELHI

Table 13.6.8 Area statistics of the Forest Types found in Delhi

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5B/C2 Northern dry mixed deciduous forest	20.51	10.48
2.	6B/C2 Ravine thorn forest	62.95	32.16
Sub Total		83.46	42.64
3.	TOF/Plantation	112.28	57.36
Total (Forest Cover & Scrub)		195.74	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.6.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

LEGEND











	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Table 13.6.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	195.00	100.00
Total		195.00	100.00

Figure 13.6.4
Fire prone forest areas under different fire prone classes

13.6.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Delhi has been estimated as given in following table.

Table 13.6.10 Tree Cover in Delhi (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 assessment
129	147	18

13.6.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.6.11 Extent of TOF in Delhi (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
136	147	283

13.6.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Delhi is given in the Table 13.6.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.6.13.

Table 13.6.12 Growing Stock in Delhi (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	0.54	0.51	-0.03	0.01
2.	Growing Stock in TOF	1.69	1.75	0.06	0.10

DELHI

Table 13.6.13 Diameter class distribution of top five tree species inside RFA in Delhi

(in sq km)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Prosopis juliflora</i>	475	25	6
2.	<i>Acacia lenticularis</i>	172	8	0
3.	<i>Azadirachta indica</i>	45	18	0
4.	<i>Holoptelea integrifolia</i>	33	4	0
5.	<i>Ficus virene</i>	6	8	0

13.6.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Delhi in Rural and Urban areas are given in the Table 13.6.14 and Table 13.6.15 respectively

Table 13.6.14 Top five tree species in TOF (Rural) in Delhi

Sl. No.	Species	Relative Abundance (%)
1.	<i>Prosopis juliflora</i>	29.52
2.	<i>Azadirachta indica</i>	13.06
3.	<i>Eucalyptus</i> spp.	8.07
4.	<i>Leucaena leucocephala</i>	7.72
5.	<i>Ficus</i> spp.	5.29

Table 13.6.15 Top five tree species in TOF (Urban) in Delhi

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	10.77
2.	<i>Prosopis juliflora</i>	8.11
3.	<i>Polyalthia longifolia</i>	6.20
4.	<i>Morus</i> spp.	6.03
5.	<i>Ficus religiosa</i>	5.80

13.6.8 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 1.20 million tonnes (4.40 million tonnes of CO₂ equivalent) which is 0.02% of total forest carbon of the country. Pool wise forest carbon in Delhi is given in the following table.

Table 13.6.16 Forest Carbon in Delhi in different pools

(in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	263
2.	BGB	78
3.	Dead wood	5
4.	Litter	17
5.	SOC	839
Total		1,202



Figure 13.6.5 Forest Carbon in Delhi

13.6.9 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.6.17 and Table 13.6.18 respectively.

Table 13.6.17 Major NTFP species in Delhi

Sl. No.	Species	Plant type	Relative Abundance (%)
1.	<i>Lantana camara</i>	Shrub	37.74
2.	<i>Cassia tora</i>	Herbs	24.53
3.	<i>Carissa opaca</i>	Shrub	20.75
4.	<i>Parthenium hysterophorus</i>	Herbs	9.43
5.	<i>Flacourtia indica</i>	Tree	5.66

Table 13.6.18 Major invasive species in the State inside the RFA/Green Wash in Delhi (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Prosopis juliflora</i>	3.00
2.	<i>Lantana camara</i>	0.27
3.	<i>Cassia tora</i>	0.12
4.	<i>Achyranthes aspera</i>	0.12
5.	<i>Ageratina adenophora</i>	0.12

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

13.7 GOA

Geographical Area
3,702 sq km

Geographical Coordinates
Latitude-14° 53'N to 15° 40' N
Longitude-73° 40' E to 74° 21' E

Population (as per Census 2011)
1.46 million
Urban 0.91 million (62.17 %)
Rural 0.55 million (37.83 %)
Tribal 0.15 million (10.23 %)

Average Population Density
394 per sq km

Livestock population
(as per 19th Live Stock Census)
0.18 million

No. of Districts
2

No. of Hill Districts
0

No. of Tribal Districts
0

Table 13.7.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	370	
Reporting area for land utilization	361	100.00
Forests	125	34.63
Not available for land cultivation	37	10.25
Permanent pastures and other grazing lands	1	0.28
Land under misc. tree crops and groves	1	0.28
Culturable wasteland	53	14.68
Fallow land other than current fallows	-	-
Current fallows	15	4.15
Net area sown	129	35.73

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.7.1 Forest Cover

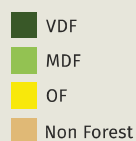


Figure 13.7.1
Forest Cover
of Goa

**Table 13.7.2 Forest Cover
of Goa** (in sq km)

Class	Area	% of GA
VDF	537.53	14.52
MDF	576.49	15.57
OF	1,130.19	30.53
Total	2,244.21	60.62
Scrub	0.00	0.00

Table 13.7.3 District-wise Forest Cover in Goa

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 Assess- ment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
North Goa	1,736	127.00	229.77	578.95	935.72	53.90	2.81	0.00
South Goa	1,966	410.53	346.72	551.24	1,308.49	66.56	3.91	0.00
Grand Total	3,702	537.53	576.49	1,130.19	2,244.21	60.62	6.72	0.00

13.7.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.7.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Goa

(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
516	329	375	1,220	22	247	755	1,024
42.30%	26.97%	30.73%		2.15%	24.12%	73.73%	

*in case of Goa, RFA boundaries have been used.

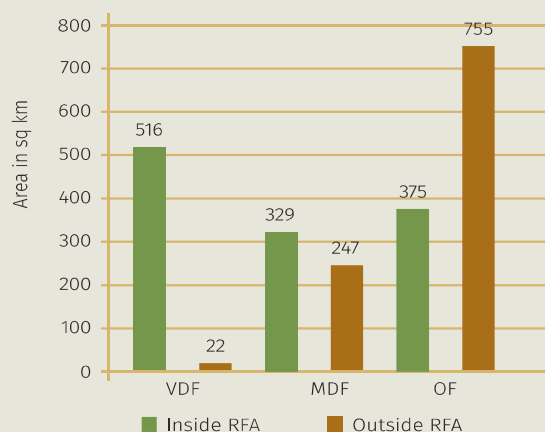


Figure 13.7.2
Forest Cover
Inside and
Outside of
RFA in Goa

Table 13.7.5 Forest Cover Change Matrix for Goa

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	538	0	0	0	0	538
Moderately Dense Forest	0	576	0	0	0	576
Open Forest	0	0	1123	0	0	1,123
Scrub	0	0	0	0	0	0
Non Forest	0	0	7	0	1,458	1,465
Total ISFR 2021	538	576	1,130	0	1,458	3,702
Net Change	0	0	7	0	-7	

Table 13.7.6 Altitude-wise Forest Cover in Goa

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,549	442	557	1,102	2,101	0
500-1000	153	96	19	28	143	0
Total	3,702	538	576	1,130	2,244	0

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

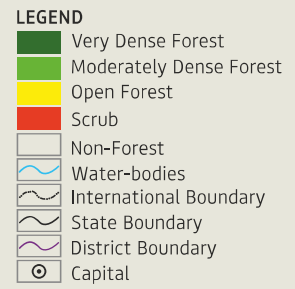
Table 13.7.7 Forest Cover in different slope classes in Goa

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,918	99	212	507	818	0
5-10	795	122	148	284	554	0
10-15	463	118	104	162	384	0
15-20	273	93	64	89	246	0
20-25	136	55	29	45	129	0
25-30	64	28	12	22	62	0
>30	53	23	7	21	51	0
Total	3,702	538	576	1,130	2,244	0

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

Figure 13.7.3
Forest Cover
Map of Goa



13.7.2 Forest Types

The area under different forest types of Goa as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.7.8 Area statistics of the Forest Types found in Goa

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1A/C4 West Coast tropical evergreen forest	506.33	22.63
2.	2A/C2 West Coast semi-evergreen forest	483.38	21.60
3.	3B/C2 Southern moist mixed deciduous forest	906.80	40.53
4.	4B/TS2 Mangrove forest	26.00	1.16
5.	5/E7 Laterite thorn forest	0.50	0.02
	Sub Total	1,923.01	85.94
6.	TOF/Plantation	314.48	14.06
	Total (Forest Cover & Scrub)	2,237.49	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

Table 13.7.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	2,244.00	100.00
	Total	2,244.00	100.00

13.7.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.7.4
Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.7.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Goa has been estimated as given in following table.

Table 13.7.10 Tree Cover in Goa (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
272	244	-28

13.7.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.7.11 Extent of TOF in Goa (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,024	244	1,268

13.7.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Goa is given in the Table 13.7.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.7.13

Table 13.7.12 Growing Stock in Goa (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	11.16	12.87	1.71	0.29
2.	Growing Stock in TOF	4.03	4.15	0.12	0.23

Table 13.7.13 Diameter class distribution of top five tree species inside RFA in Goa (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Terminalia paniculata</i>	7,178	1,875	174
2.	<i>Anacardium occidentale</i>	3,993	201	0
3.	<i>Xylia xylocarpa</i>	3,323	563	27
4.	<i>Terminalia Tomentosa</i>	2,925	616	67
5.	<i>Lagerstroemia lanceolata/ inicrocarpa</i>	536	281	107

13.7.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Goa in rural and urban areas are given in the Table 13.7.14 and Table 13.7.15 respectively.

Table 13.7.14 Top five tree species in TOF (Rural) in Goa

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca triandra</i>	26.63
2.	<i>Cocos nucifera</i>	17.41
3.	<i>Anacardium occidentale</i>	10.68
4.	<i>Acacia auriculiformis</i>	6.53
5.	<i>Terminalia paniculata</i>	3.49

Table 13.7.15 Top five tree species in TOF (Urban) in Goa

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	39.4
2.	<i>Mangifera indica</i>	9.62
3.	<i>Tectona grandis</i>	3.99
4.	<i>Artocarpus heterophyllus</i>	3.75
5.	<i>Areca triandra</i>	3.34

13.7.8 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 25.24 million tonnes (92.55 million tonnes of CO₂ equivalent) which is 0.35 % of total forest carbon of the country. Pool wise forest carbon in Goa is given in the following table.

Table 13.7.16 Forest Carbon in Goa in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	8,863
2.	BGB	2,606
3.	Dead wood	232
4.	Litter	448
5.	SOC	13,095
Total		25,244

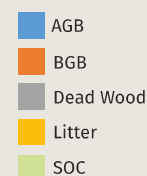


Figure 13.7.5 Forest Carbon in Goa

13.7.9 Growing Stock of Bamboo

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

Table 13.7.17 Growing Stock of Bamboo in Goa

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	288	0.19
Total number of culms (in millions)	30	0.06
Total equivalent green weight (in '000 tonnes)	257	0.06

13.7.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.7.18 and Table 13.7.19 respectively.

Table 13.7.18 Major NTFP species in Goa

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Terminalia paniculata</i>	Tree	45.58
2.	<i>Terminalia tomentosa</i>	Tree	21.22
3.	<i>Xylia xylocarpa</i>	Tree	18.43
4.	<i>Syzigium cumini</i>	Tree	4.65
5.	<i>Terminalia belerica</i>	Tree	3.26

Table 13.7.19 Major invasive species in the State inside the RFA/Green wash in Goa (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	37
2.	<i>Cassia tora</i>	8
3.	<i>Ageratina adenophora</i>	1
4.	<i>Triumfetta rhomboidea</i>	0.86
5.	<i>Acacia farnesiana</i>	0.45

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

13.8

GUJARAT

Geographical Area

1,96,244 sq km

Geographical Coordinates

Latitude- 20° 07'N to 24° 43' N

Longitude-68° 10' E to 74° 29' E

Population (as per Census 2011)

60.44 million

Urban 25.74 million (42.60 %)

Rural 34.70 million (57.40 %)

Tribal 8.92 million (14.75 %)

Average Population Density

308 per sq km

Livestock population

(as per 19th Live Stock Census)

27.12 million

No. of Districts

26

No. of Hill Districts

0

No. of Tribal Districts

9

Table 13.8.1 Land Use Pattern

Land Use Types	Area (in '000ha)	Percentage
Geographical Area	19,602	
Reporting area for land utilization	19,069	100.00
Forests	1,834	9.63
Not available for land cultivation	3,723	19.52
Permanent pastures and other grazing lands	851	4.46
Land under misc. tree crops and groves	4	0.02
Culturable wasteland	1,960	10.28
Fallow land other than current fallows	16	0.08
Current fallows	379	1.99
Net area sown	10,302	54.02

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.8.1 Forest Cover

Figure 13.8.1
Forest Cover
of Gujarat



**Table 13.8.2 Forest Cover
of Gujarat** (in sq km)

Class	Area	% of GA
VDF	377.68	0.19
MDF	5,032.19	2.56
OF	9,516.00	4.85
Total	14,925.87	7.60
Scrub	2,828.20	1.44

Table 13.8.3 District- wise Forest Cover in Gujarat

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 Assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Ahmadabad	8,107	0.00	10.56	103.05	113.61	1.40	-17.60	31.16
Amreli	7,397	0.00	64.69	200.49	265.18	3.58	4.78	90.15
Anand	3,204	0.00	6.17	27.81	33.98	1.06	-16.50	14.27
Banas Kantha ^T	10,743	0.00	354.78	461.93	816.71	7.60	-5.79	116.50
Bharuch ^T	6,509	0.00	56.02	216.93	272.95	4.19	-4.57	7.22
Bhavnagar	10,034	0.00	47.28	245.27	292.55	2.92	-0.66	79.12
Dahod	3,642	1.00	115.06	405.98	522.04	14.33	-7.78	29.35
Gandhinagar	2,140	0.00	9.40	90.69	100.09	4.68	8.04	37.84
Jamnagar	14,184	0.00	53.70	423.55	477.25	3.36	6.14	158.94
Junagadh	8,831	15.00	938.10	785.73	1,738.83	19.69	45.52	85.74
Kachchh/Kutch	45,674	0.00	282.89	2156.59	2,439.48	5.34	94.19	1,506.26
Kheda	3,953	0.00	15.04	72.95	87.99	2.23	-6.45	31.56
Mehsana	4,401	0.00	10.72	153.61	164.33	3.73	5.71	30.48
Narmada	2,817	20.00	442.80	464.43	927.23	32.92	-20.77	23.17
Navsari	2,246	18.00	121.95	222.13	362.08	16.12	-0.35	7.66
Panch Mahals ^T	5,231	0.00	201.71	531.08	732.79	14.01	22.73	50.80
Patan	5,792	0.00	0.89	97.46	98.35	1.70	-4.16	93.04
Porbandar	2,316	0.00	16.15	110.12	126.27	5.45	-0.41	40.74
Rajkot	11,198	0.00	2.64	153.64	156.28	1.40	1.96	98.84
Sabarkantha ^T	7,394	29.00	298.61	483.97	811.58	10.98	-3.69	101.78
Surat ^T	4,549	5.00	285.08	209.05	499.13	10.97	-0.93	77.92
Surendranagar	10,423	0.00	5.78	157.06	162.84	1.56	-11.15	48.10
Tapi ^T	3,139	79.68	469.28	236.38	785.34	25.02	-7.07	5.84
The Dangs ^T	1,766	210.00	739.82	404.26	1,354.08	76.67	-8.54	3.00
Vadodara ^T	7,546	0.00	139.50	452.71	592.21	7.85	-11.00	37.91
Valsad ^T	3,008	0.00	343.57	649.13	992.70	33.00	6.89	20.81
Grand Total	1,96,244	377.68	5,032.19	9,516.00	14,925.87	7.61	68.54	2,828.20

GUJARAT

13.8.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.8.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Gujarat (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
356	4,016	5,463	9,835	22	1,016	4,053	5,091
3.62%	40.83%	55.55%		0.43%	19.96%	79.61%	

*in case of Gujarat RFA boundaries have been used.

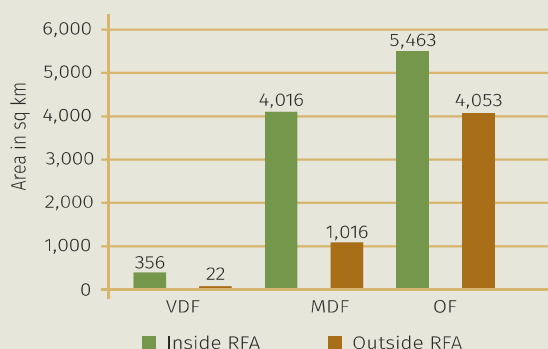


Figure 13.8.2
Forest Cover Inside and Outside of RFA in Gujarat

Table 13.8.5 Forest Cover Change Matrix for Gujarat

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	378	0	0	0	0	378
Moderately Dense Forest	0	5,022	5	1	64	5,092
Open Forest	0	5	8,966	49	367	9,387
Scrub	0	0	254	2,548	192	2,994
Non Forest	0	5	291	230	1,77,867	1,78,393
Total ISFR 2021	378	5,032	9,516	2,828	1,78,490	196,244
Net Change	0	-60	129	-166	97	

Table 13.8.6 Altitude-wise Forest Cover in Gujarat

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,95,407	329	4,693	9,305	14,327	2,823
500-1000	830	49	338	210	597	4
1000-2000	7	0	1	1	2	1
Total	1,96,244	378	5,032	9,516	14,926	2,828

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











Table 13.8.7 Forest Cover in different slope classes in Gujarat

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,85,312	121	2,265	6,466	8,852	2,431
5-10	6,265	73	1,060	1,399	2,532	250
10-15	2,322	67	736	799	1,602	82
15-20	1,257	56	489	460	1,005	40
20-25	659	37	282	244	563	16
25-30	291	17	133	105	255	6
>30	138	7	67	43	117	3
Total	1,96,244	378	5,032	9,516	14,926	2,828

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

Figure. 13.8.3
Forest Cover
Map of
Gujarat

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

GUJARAT

13.8.2 Forest Types

The area under different forest types of Gujarat as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.8.8 Area statistics of the Forest Types found in Gujarat (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C1b Moist teak forest	800.31	4.48
2.	3B/C1c Slightly moist teak forest	689.16	3.86
3.	3B/C2 Southern moist mixed deciduous forest	1,204.97	6.75
4.	4B/TS1 Mangrove scrub	618.70	3.47
5.	4B/TS2 Mangrove forest	558.57	3.13
6.	5A/C1a Very dry teak forest	770.57	4.32
7.	5A/C1b Dry teak forest	2,041.02	11.43
8.	5A/C3 Southern dry mixed deciduous forest	2,254.66	12.63
9.	5B/C2 Northern dry mixed deciduous forest	944.55	0.21
10.	5/DS1 Dry deciduous scrub	756.74	5.29
11.	5/DS4 Dry grass land	372.49	4.24
12.	5/E1 <i>Anogeissus pendula</i> Forest	65.76	2.09
13.	5/E2 <i>Boswellia</i> forest	2.07	0.37
14.	5/E3 <i>Babul</i> forest	59.48	0.01
15.	5/E5 <i>Butea</i> forest	98.30	0.33
16.	5/E8c <i>Salvadora - Tamarix</i> scrub	153.83	0.55
17.	5/E9 Dry bamboo brake	121.51	0.86
18.	5/IS1 Dry tropical riverain forest	2.08	0.68
19.	5/2S1 Secondary dry deciduous forest	36.67	0.01
20.	6A/C1 Southern thorn forest	49.43	0.28
21.	6B/C1 Desert thorn forest	1,333.94	7.47
22.	6B/DS2 Tropical <i>Euphorbia</i> scrub	964.40	5.40
23.	6/E2 <i>Acacia senegal</i> forest	944.04	5.29
24.	6/E3 <i>Rann</i> saline thorn forest	590.37	3.31
25.	6/E4 <i>Salvadora</i> scrub	22.23	0.12
	Sub Total	15,455.85	86.58
26.	TOF/Plantation	2,395.59	13.42
	Total (Forest Cover & Scrub)	17,851.44	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

Figure 13.8.4
Fire prone
forest areas
under
different fire
prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.8.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.8.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	8.08	0.05
2.	Very highly fire prone	384.42	2.58
3.	Highly fire prone	523.32	3.51
4.	Moderately fire prone	975.10	6.53
5.	Less fire prone	13,035.08	87.33
Total		14,926.00	100.00

13.8.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Gujarat has been estimated as given in following table.

Table 13.8.10 Tree Cover in Gujarat

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
6,912	5,489	-1,423

13.8.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

GUJARAT

Table 13.8.11 Extent of TOF in Gujarat

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
5,091	5,489	10,580

13.8.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Gujarat is given in the Table 13.8.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.8.13

Table 13.8.12 Growing Stock in Gujarat

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	48.31	51.22	2.91	1.17
2.	Growing Stock in TOF	82.60	78.74	-3.86	4.43

Table 13.8.13 Diameter class distribution of top five tree species inside RFA in Gujarat

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Tectona grandis</i>	52,619	2,911	200
2.	<i>Butea monosperma</i>	18,199	1,086	38
3.	<i>Terminalia tomentosa</i>	12,000	1,525	0
4.	<i>Lannea coromandelica</i>	8,894	1,581	105
5.	<i>Anogeissus latifolia</i>	8,822	750	0

13.8.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Gujarat in Rural and Urban areas are given in the Table 13.8.14 and Table 13.8.15 respectively

Table 13.8.14 Top five tree species in TOF (Rural) in Gujarat

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	27.81
2.	<i>Mangifera indica</i>	9.71
3.	<i>Prosopis juliflora</i>	6.34
4.	<i>Acacia arabica</i>	6.29
5.	<i>Tectona grandis</i>	3.76

Table 13.8.15 Top five tree species in TOF (Urban) in Gujarat

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	23.81
2.	<i>Pittosporum ferrugineum</i>	5.89
3.	<i>Polyalthia spp.</i>	5.72
4.	<i>Mangifera indica</i>	5.53
5.	<i>Jonesia asoca</i>	3.84

13.8.8 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 107.77 million tonnes (395.16 million tonnes of CO₂ equivalent) which is 1.50 % of total forest carbon of the country. Pool wise forest carbon in Gujarat is given in the following table.

Table 13.8.16 Forest Carbon in Gujarat in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	28,602
2.	BGB	9,814
3.	Dead wood	502
4.	Litter	1,634
5.	SOC	67,214
	Total	1,07,766



Figure 13.8.5 Forest Carbon in Gujarat

13.8.9 Growing Stock of Bamboo

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

Table 13.7.17 Growing Stock of Bamboo in Gujarat

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	3,547	2.37
Total number of culms (in millions)	878	1.65
Total equivalent green weight (in '000 tonnes)	10,560	2.63

13.8.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.8.18 and Table 13.8.19 respectively.

Table 13.8.18 Major NTFP species in Gujarat

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Ocimum spp. (Ocimum gratissimum/ Ocimum sanctum/Ocimum tenuiflorum/ Ocimum americanum)</i>	Herbs	41.24
2.	<i>Butea monosperma</i>	Tree	10.76
3.	<i>Cassia tora</i>	Shrub	9.96
4.	<i>Prosopis juliflora</i>	Tree	9.07
5.	<i>Diospyros melanoxylon</i>	Tree	7.61

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Table 13.8.19 Major invasive species in the State inside the RFA/Green Wash in Gujarat (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Prosopis juliflora</i>	143
2.	<i>Cassia tora</i>	132
3.	<i>Ageratum conyzoides</i>	74
4.	<i>Lantana camara</i>	69
5.	<i>Senna occidentalis</i>	36

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

13.9

HARYANA

Geographical Area

44,212 sq km

Geographical Coordinates

Latitude- 27°39' N to 30°55' N

Longitude-74°27' E to 77° 36' E

Population (as per Census 2011)

25.35 million

Urban 8.84 million (34.87 %)

Rural 16.51 million (65.13 %)

Tribal NIL

Average Population Density

573 per sq km

Livestock population

(as per 19th Live Stock Census)

8.82 million

No. of Districts

21

No. of Hill Districts

0

No. of Tribal Districts

0

Table 13.9.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	4,421	
Reporting area for land utilization	4,371	100.00
Forests	36	0.82
Not available for land cultivation	553	12.65
Permanent pastures and other grazing lands	24	0.55
Land under misc. tree crops and groves	6	0.14
Culturable wasteland	49	1.12
Fallow land other than current fallows	75	1.72
Current fallows	111	2.54
Net area sown	3,517	80.46

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.9.1 Forest Cover

Figure 13.9.1
Forest Cover
of Haryana



Table 13.9.2 Forest Cover of Haryana (in sq km)

Class	Area	% of GA
VDF	28.00	0.06
MDF	445.38	1.01
OF	1,130.10	2.56
Total	1,603.48	3.63
Scrub	158.93	0.36

Table 13.9.3 District- wise Forest Cover in Haryana

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Ambala	1,574	0.00	16.94	35.33	52.27	3.32	0.92	0.83
Bhiwani	4,778	0.00	8.12	103.30	111.42	2.33	-2.39	14.18
Faridabad	741	0.00	26.37	52.86	79.23	10.69	-0.71	17.72
Fatehabad	2,538	0.00	3.23	15.26	18.49	0.73	0.49	0.91
Gurgaon	1,258	0.00	32.65	81.06	113.71	9.04	-2.47	17.51
Hisar	3,983	0.00	11.12	46.24	57.36	1.44	-0.28	5.39
Jhajjar	1,834	0.00	0.00	25.41	25.41	1.39	-0.52	4.27
Jind	2,702	0.00	4.98	17.36	22.34	0.83	1.34	0.02
Kaithal	2,317	0.00	23.48	35.34	58.82	2.54	1.75	0.09
Karnal	2,520	0.00	3.45	28.19	31.64	1.26	-0.60	1.02
Kurukshetra	1,530	0.00	16.40	23.72	40.12	2.62	0.37	2.08
Mahendragarh	1,899	0.00	20.82	82.56	103.38	5.44	0.09	34.29
Mewat	1,507	0.00	13.76	96.65	110.41	7.33	-0.77	25.81
Palwal	1,359	0.00	1.94	11.62	13.56	1.00	-0.41	0.00
Panchkula	898	6.00	150.67	235.43	392.10	43.66	1.40	22.59
Panipat	1,268	0.00	3.14	13.31	16.45	1.30	0.57	1.23
Rewari	1,594	0.00	11.46	51.64	63.10	3.96	0.65	8.67
Rohtak	1,745	0.00	2.44	17.95	20.39	1.17	-0.74	0.46
Sirsa	4,277	0.00	2.95	55.30	58.25	1.36	1.65	0.06
Sonipat	2,122	0.00	2.83	19.21	22.04	1.04	1.07	0.87
Yamunanagar	1,768	22.00	88.63	82.36	192.99	10.92	-0.37	0.93
Grand Total	44,212	28.00	445.38	1,130.10	1,603.48	3.63	1.04	158.93

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13.9.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.9.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Haryana (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
22	155	197	374	6	290	933	1,229
5.88%	41.44%	52.68%		0.49%	23.60%	75.91%	

*in case of Haryana, RFA boundaries have been used.

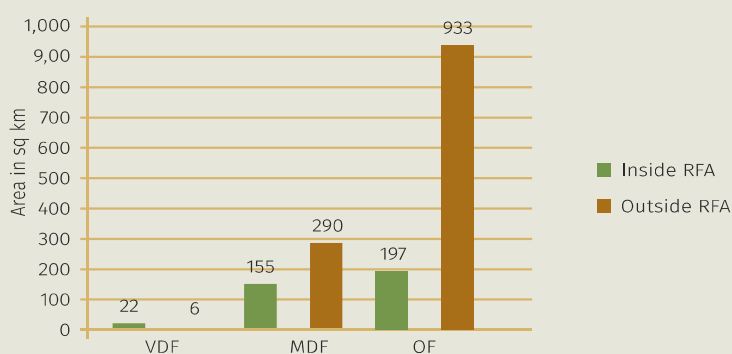


Figure 13.9.2
Forest Cover Inside and Outside of RFA in Haryana

Table 13.9.5 Forest Cover Change Matrix for Haryana

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	28	0	0	0	0	28
Moderately Dense Forest	0	436	6	1	8	451
Open Forest	0	6	1,048	8	61	1,123
Scrub	0	0	10	141	3	154
Non Forest	0	3	66	9	42,378	42,456
Total ISFR 2021	28	445	1,130	159	42,450	44,212
Net Change	0	-6	7	5	-6	

Table 13.9.6 Altitude-wise Forest Cover in Haryana

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	43,838	16	330	975	1,321	149
500-1000	330	12	94	135	241	9
1000-2000	44	0	21	20	41	1
Total	44,212	28	445	1,130	1,603	159

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

Table 13.9.7 Forest Cover in different slope classes in Haryana

(in sq km)

Slope (in Degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	42,615	14	238	789	1,041	100
5-10	1,104	7	75	130	212	23
10-15	228	4	55	85	144	14
15-20	126	2	37	55	94	10
20-25	74	1	22	37	60	6
25-30	41	0	12	21	33	4
>30	24	0	6	13	19	2
Total	44,212	28	445	1,130	1,603	159

*(based on SRTM, Digital Elevation Model, 30 m, 2016)***Figure 13.9.3**Forest Cover
Map of
Haryana**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.9.2 Forest Types

The area under different forest types of Haryana as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

HARYANA

Table 13.9.8 Area statistics of the Forest Types found in Haryana (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5B/C1a Dry Siwalik sal forest	46.15	2.63
2.	5B/C2 Northern dry mixed deciduous forest	518.73	29.53
3.	5/DS1 Dry deciduous scrub	32.07	1.82
4.	5/E1 <i>Anogeissus pendula</i> forest	97.71	5.56
5.	5/E1/DS1 <i>Anogeissus pendula</i> scrub	21.46	1.22
6.	5/E9 Dry bamboo brakes	7.11	0.40
7.	6B/C1 Desert thorn forest	86.71	4.94
8.	6B/C2 Ravine thorn forest	258.61	14.72
9.	6/1S1 Desert dune scrub	102.76	5.85
10.	9/C1a Lower or Siwalik chir pine forest	12.94	0.74
Sub Total		1,184.25	67.41
11.	TOF/Plantation	572.48	32.59
Total (Forest Cover & Scrub)		1,756.73	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.9.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.9.4
Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Table 13.9.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	20.40	1.27
3.	Highly fire prone	66.81	4.17
4.	Moderately fire prone	154.50	9.64
5.	Less fire prone	1,361.29	84.92
	Total	1,603.00	100.00

13.9.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Haryana has been estimated as given in following table.

Table 13.9.10 Tree Cover in Haryana (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
1,565	1,425	-140

13.9.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.9.11 Extent of TOF in Haryana (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,229	1,425	2,654

13.9.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Haryana is given in the Table 13.9.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.9.13

Table 13.9.12 Growing Stock in Haryana (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	4.22	4.31	0.09	0.10
2.	Growing Stock in TOF	17.56	19.26	1.70	1.08

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Table 13.9.13 Diameter class distribution of top five tree species inside RFA in Haryana (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Acacia tortolis</i>	3,083	71	0
2.	<i>Eucalyptus</i> spp.	2,446	533	34
3.	<i>Acacia catechu</i>	2,550	69	0
4.	<i>Prosopis juliflora</i>	2,250	105	0
5.	<i>Dalbergia sissoo</i>	1,459	344	0

13.9.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Haryana in Rural and Urban areas are given in the Table 13.9.14 and Table 13.9.15 respectively.

Table 13.9.14 Top five tree species in TOF (Rural) in Haryana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus</i> spp.	29.23
2.	<i>Dalbergia sissoo</i>	11.04
3.	<i>Prosopis cineraria</i>	9.03
4.	<i>Azadirachta indica</i>	6.65
5.	<i>Populus</i> spp.	5.79

Table 13.8.15 Top five tree species in TOF (Urban) in Haryana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	12.69
2.	<i>Eucalyptus</i> spp.	11.69
3.	<i>Melia azadirachta</i>	7.43
4.	<i>Morus</i> spp.	6.82
5.	<i>Prosopis juliflora</i>	6.30

13.9.8 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 10.23 million tonnes (37.51 million tonnes of CO₂ equivalent) which is 0.14 % of total forest carbon of the country. Pool wise forest carbon in Haryana is given in the following table.

Table 13.9.16 Forest Carbon in Haryana in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	2,326
2.	BGB	836
3.	Dead wood	41
4.	Litter	139
5.	SOC	6,890
Total		10,232



Figure 13.9.5 Forest Carbon in Haryana

13.9.9 Growing Stock of Bamboo

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

Table 13.9.17 Growing Stock of Bamboo in Haryana

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	39	0.03
Total number of culms (in millions)	15	0.03
Total equivalent green weight (in '000 tonnes)	33	0.01

13.9.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.9.18 and Table 13.9.19 respectively

Table 13.9.18 Major NTFP Species in Haryana

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Adhatoda vasica</i>	Shrub	47.06
2.	<i>Achyranthes aspera</i>	Herbs	33.33
3.	<i>Abrus precatorius</i>	Climber	9.80
4.	<i>Cucumis pubescens</i>	Climber	7.84
5.	<i>Asparagus adscendens</i>	Shrub	1.96

Table 13.9.19 Major invasive species in the State inside the RFA/Green Wash in Haryana (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	41
2.	<i>Prosopis juliflora</i>	29
3.	<i>Saccharum spontanem</i>	29
4.	<i>Ageratum houstonianum</i>	14
5.	<i>Leucanea leucocephala</i>	8

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

13.10

HIMACHAL PRADESH

Geographical Area

55,673 sq km

Geographical Coordinates

Latitude- 30°22' N to 33°12' N

Longitude- 75°45' E to 79°04' E

Population (as per Census 2011)

6.86 million

Urban 0.69 million (10.03 %)

Rural 6.17 million (89.97 %)

Tribal 0.39 million (5.71%)

Average Population Density

123 per sq km

Livestock population

(as per 19th Live Stock Census)

4.84 million

No. of Districts

12

No. of Hill Districts

12

No. of Tribal Districts

3

Table 13.10.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	5,567	
Reporting area for land utilization	4,577	100.00
Forests	1,124	24.56
Not available for land cultivation	1,136	24.82
Permanent pastures and other grazing lands	1,501	32.79
Land under misc. tree crops and groves	68	1.49
Culturable wasteland	120	2.62
Fallow land other than current fallows	20	0.44
Current fallows	65	1.42
Net area sown	543	11.86

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.10.1 Forest Cover



Figure 13.10.1
Forest Cover
of Himachal
Pradesh

**Table 13.10.2 Forest Cover of
Himachal Pradesh** (in sq km)

Class	Area	% of GA
VDF	3,162.99	5.68
MDF	7,100.13	12.75
OF	5,179.83	9.30
Total	15,442.95	27.73
Scrub	321.78	0.58

Table 13.10.3 District- wise Forest Cover in Himachal Pradesh

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bilaspur ^H	1,167	21.25	192.03	168.30	381.58	32.70	0.88	1.93
Chamba TH	6,522	767.89	1,011.92	673.51	2,453.32	37.62	-1.84	21.49
Hamirpur ^H	1,118	37.85	115.40	203.17	356.42	31.85	1.52	12.20
Kangra ^H	5,739	297.56	1,289.74	769.97	2,357.27	41.08	3.08	16.42
Kinnaur TH	6,401	79.81	329.28	236.22	645.31	10.08	-0.68	61.94
Kullu ^H	5,503	587.59	877.60	510.38	1,975.57	35.90	-0.72	25.10
Lahaul & Spiti TM	13,841	15.00	30.67	113.18	158.85	1.15	-1.50	14.59
Mandi ^H	3,950	371.74	757.03	646.60	1,775.37	44.95	2.35	20.25
Shimla ^H	5,131	764.89	1,073.52	584.10	2,422.51	47.21	3.10	31.28
Sirmaur ^H	2,825	156.98	669.54	567.04	1,393.56	49.33	2.69	55.52
Solan ^H	1,936	43.78	443.56	403.52	890.86	46.02	0.57	52.33
Una ^H	1,540	18.65	309.84	303.84	632.33	41.06	-0.02	8.73
Grand Total	55,673	3,162.99	7,100.13	5,179.83	15,442.95	27.73	9.43	321.78

13.10.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

HIMACHAL PRADESH

Table 13.10.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Himachal Pradesh

(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
2,820	4,923	2,901	10,644	343	2,177	2,279	4,799
26.49%	46.25%	27.26%		7.15%	45.36%	47.49%	

*in case of Himachal Pradesh, Green Wash boundaries have been used.

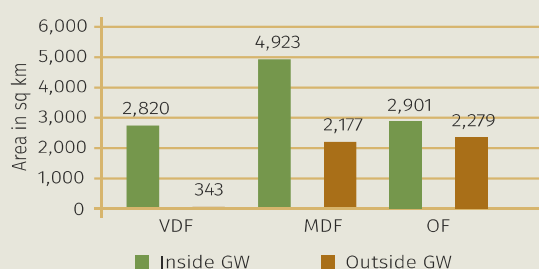


Fig 13.10.2
Forest Cover Inside and Outside of Green Wash in Himachal Pradesh

Table 13.10.5 Forest Cover Change Matrix for Himachal Pradesh

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	3,110	3	0	0	0	3,113
Moderately Dense Forest	51	7,068	5	1	1	7,126
Open Forest	2	29	5,150	1	13	5,195
Scrub	0	0	2	312	1	315
Non Forest	0	0	23	8	39,893	39,924
Total ISFR 2021	3,163	7,100	5,180	322	39,908	55,673
Net Change	50	-26	-15	7	-16	

Table 13.10.6 Altitude-wise Forest Cover in Himachal Pradesh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	2,925	25	448	358	831	16
500-1000	7,625	234	1,917	1,577	3,728	63
1000-2000	9,628	696	1,677	1,562	3,935	125
2000-3000	8,101	1,836	2,207	1,057	5,100	30
3000-4000	6,848	372	847	617	1,836	71
>4000	20,546	0	4	9	13	17
Total	55,673	3,163	7,100	5,180	15,443	322

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

Table 13.10.7 Forest Cover in different slope classes in Himachal Pradesh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	6,362	90	427	545	1,062	28
5-10	5,614	153	804	707	1,664	27
10-15	6,424	284	979	726	1,989	36
15-20	7,274	425	1,072	730	2,227	45
20-25	7,570	503	1,076	693	2,272	49
25-30	7,224	521	999	613	2,133	46
>30	15,205	1,187	1,743	1,166	4,096	91
Total	55,673	3,163	7,100	5,180	15,443	322

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

LEGEND








	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Figure 13.10.3
Forest Cover
Map of
Himachal
Pradesh

13.10.2 Forest Types

The area under different forest types of Himachal Pradesh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.10.8 Area statistics of the Forest Types found in Himachal Pradesh (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3C/C2b(I) <i>Bhabar-dun sal</i>	208.63	1.02
2.	5B/C1a Dry Siwalik sal forest	94.50	0.46
3.	5B/C2 Northern dry mixed deciduous forest	2,516.36	12.29
4.	5/DS1 Dry deciduous scrub	150.51	0.73
5.	5/DS3 <i>Euphorbia</i> scrub	5.15	0.03
6.	5/E9 Dry bamboo brakes	80.63	0.39
7.	5/1S2 <i>Khair-sissu</i> forest	1.27	0.01
8.	9/C1a Lower or Siwalik chir pine forest	1,434.74	7.01
9.	9/C1b Upper or Himalayan chir pine forest	1,324.88	6.47
10.	9/C1/DS1 Himalayan subtropical scrub	81.49	0.40
11.	12/C1a <i>Ban oak forest (Q. incana)</i>	813.58	3.97
12.	12/C1b <i>Moru oak forest (Q. dilatata)</i>	11.58	0.06
13.	12/C1c Moist deodar forest (<i>Cedrus</i>)	2,117.65	10.34
14.	12/C1d Western mixed coniferous forest (spruce, blue pine, silver fir)	2,875.96	14.05
15.	12/C1e Moist temperate deciduous forest	109.80	0.54
16.	12/C1f Low-level blue pine forest (<i>P. wallichiana</i>)	467.73	2.28
17.	12/C1/DS1 Oak scrub	235.36	1.15
18.	12/C1/DS2 Himalayan temperate secondary scrub	128.51	0.63
19.	12/C2a <i>Kharsu oak forest (Q. semecarpifolia)</i>	153.51	0.75
20.	12/C2b West Himalayan upper oak/fir forest	141.84	0.69
21.	12/DS1 Montane bamboo brakes	12.00	0.06
22.	12/E1 Cypress forest	8.64	0.04
23.	12/1S1 Alder forest	3.58	0.02
24.	13/C1 Dry broadleaved and coniferous forest (<i>Q. ilex-P. gerardiana</i>)	7.43	0.04
25.	13/C2a <i>Neoza pine forest (P. gerardiana)</i>	129.54	0.63
26.	13/C2b Dry deodar forest (<i>Cedrus</i>)	228.73	1.12
27.	13/C3 West Himalayan dry temperate deciduous forest	0.11	0.00
28.	13/C4 West Himalayan high level dry blue pine forest (<i>P. wallichiana</i>)	69.56	0.34
29.	13/C5 West Himalayan dry juniper forest (<i>J. macropoda</i>)	62.56	0.30
30.	13/1S2 <i>Populus/Salix</i> forest	4.58	0.02
31.	14/C1a West Himalayan sub-alpine fir forest	119.77	0.58
32.	14/C1b West Himalayan sub-alpine birch/fir forest	541.70	2.65
33.	15/C1 Birch/ <i>Rhododendron</i> scrub forest	45.62	0.22
34.	15/C2 Deciduous alpine scrub	9.78	0.05
35.	15/E1 Dwarf <i>Rhododendron</i> scrub	2.65	0.01
36.	16/C1 Dry alpine scrub	148.12	0.72

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
37.	16/E1 Dwarf juniper scrub	187.58	0.92
	Sub Total	14,535.63	70.99
38.	TOF/Plantation	1,213.17	5.92
	Total (Forest Cover & Scrub)	15,748.80	
Grassland Forest Types (outside forest cover)			
39.	12/DS3 Himalayan temperate pastures	1,004.58	4.91
40.	15/C3 Alpine pastures	3,721.73	18.18
	Sub Total	4,726.31	23.09
	Grand Total	20,475.11	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total Map Area, therefore, is some of forest cover, scrub and grassland forest types(found in non-forest)

13.10.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.10.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	6.81	0.04
3.	Highly fire prone	305.56	1.98
4.	Moderately fire prone	999.03	6.47
5.	Less fire prone	14,131.60	91.51
	Total	15,443.00	100.00

Figure 13.10.4
Fire prone forest areas under different fire prone classes

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■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.10.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Himachal Pradesh has been estimated as given in following table.

HIMACHAL PRADESH

Table 13.10.10 Tree Cover in Himachal Pradesh

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
829	675	-154

13.10.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.10.11 Extent of TOF in Himachal Pradesh

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
4,799	675	5,474

13.10.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Himachal Pradesh is given in the Table 13.10.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.10.13.

Table 13.10.12 Growing Stock in Himachal Pradesh

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	347.07	345.62	-1.45	7.88
2.	Growing Stock in TOF	25.19	28.30	3.11	1.59

Table 13.10.13 Diameter class distribution of top five tree species inside RFA in Himachal Pradesh

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Pinus roxburghii</i>	52,131	20,874	1,766
2.	<i>Cedrus deodara</i>	35,634	13,880	3,805
3.	<i>Pinus excelsa</i>	30,638	12,142	3,643
4.	<i>Abies pindrow</i>	11,169	9,017	3,043
5.	<i>Abies smithiana</i>	13,471	5,459	4,260

13.10.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Himachal Pradesh in Rural and Urban areas are given in the Table 13.10.14 and Table 13.10.15 respectively

Table 13.10.14 Top five tree species in TOF (Rural) in Himachal Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Pinus roxburghii</i>	23.05
2.	<i>Cedrus deodara</i>	7.95
3.	<i>Acacia catechu</i>	5.68
4.	<i>Grewia oppositifolia</i>	5.61
5.	<i>Quercus leucotrichophora</i>	4.93

Table 13.10.15 Top five tree species in TOF (Urban) in Himachal Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Pinus roxburghii</i>	11.46
2.	<i>Grewia oppositifolia</i>	7.27
3.	<i>Mangifera indica</i>	5.97
4.	<i>Morus spp.</i>	5.87
5.	<i>Cedrus deodara</i>	4.27

13.10.8 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 258.07 million tonnes (946.26 million tonnes of CO₂ equivalent) which is 3.58 % of total forest carbon of the country. Pool wise forest carbon in Himachal Pradesh is given in the following table.

Table 13.10.16 Forest Carbon in Himachal Pradesh in different pools

(in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,14,269
2.	BGB	31,880
3.	Dead wood	2,657
4.	Litter	3,328
5.	SOC	1,05,937
Total		2,58,071

**Figure 13.10.5 Forest Carbon in Himachal Pradesh**

13.10.9 Growing Stock of Bamboo

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

Table 13.10.17 Growing Stock of Bamboo in Himachal Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,027	0.69
Total number of culms (in millions)	671	1.26
Total equivalent green weight (in '000 tonnes)	2,876	0.72

13.10.10 Major NTFP and Invasive Species

Major NTFP and Invasive species as assessed from forest inventory data are presented in the Table 13.10.18 and Table 13.10.19 respectively.

Table 13.10.18 Major NTFP species in Himachal Pradesh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Berberis aristata</i>	Shrub	71.19
2.	<i>Skimmia laureola</i>	Shrub	10.22
3.	<i>Trillidium govanianum</i>	Herbs	5.02
4.	<i>Bauhinia vahlii</i>	Climber	4.83
5.	<i>Zanthoxylum armatum</i>	Shrub	4.09

Table 13.10.19 Major invasive species in the State inside the RFA/Green Wash in Himachal Pradesh (in sq km)

Sl. No.	Species	Estimated Extent
1	<i>Lantana camara</i>	321
2	<i>Ageratina adenophora</i>	19
3	<i>Ageratum conyzoides</i>	18
4	<i>Melochia corchorifolia</i>	15
5	<i>Dioscorea deltoidea</i>	14

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

13.11

JHARKHAND

Geographical Area

79,716 sq km

Geographical Coordinates

Latitude- 22° 00' N to 24°37' N

Longitude- 83° 15' E to 87° 01' E

Population (as per Census 2011)

32.99 million

Urban 7.93 million (24.05 %)

Rural 25.06 million (75.95 %)

Tribal 8.65 million (26.21%)

Average Population Density

414 per sq km

Livestock population

(as per 19th Live Stock Census)

18.05 million

No. of Districts

24

No. of Hill Districts

0

No. of Tribal Districts

17

Table 13.11.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	7,972	
Reporting area for land utilization	7,970	100.00
Forests	2,239	28.09
Not available for land cultivation	1,281	16.07
Permanent pastures and other grazing lands	127	1.59
Land under misc. tree crops and groves	121	1.52
Culturable wasteland	368	4.62
Fallow land other than current fallows	1,105	13.86
Current fallows	1,285	16.13
Net area sown	1,444	18.12

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.11.1 Forest Cover

Figure 13.11.1
Forest Cover
of Jharkhand

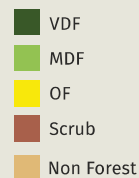


Table 13.11.2 Forest Cover
of Jharkhand (in sq km)

Class	Area	% of GA
VDF	2,601.05	3.26
MDF	9,688.91	12.16
OF	11,431.18	14.34
Total	23,721.14	29.76
Scrub	584.20	0.73

Table 13.11.3 District- wise Forest Cover in Jharkhand

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bokaro	2,883	60.99	231.94	283.07	576.00	19.98	2.45	37.95
Chatra	3,718	244.28	871.73	666.08	1,782.09	47.93	4.74	23.57
Deoghar ^T	2,477	0.00	14.30	191.50	205.80	8.31	2.09	14.04
Dhanbad	2,040	0.00	44.00	174.18	218.18	10.70	4.67	16.05
Dumka ^T	3,761	0.00	259.40	318.23	577.63	15.36	0.32	44.55
East Singhbhum ^T	3,562	54.81	591.69	434.19	1,080.69	30.34	1.31	20.91
Garhwa ^T	4,093	125.14	415.60	890.98	1,431.72	34.98	40.13	44.32
Giridih	4,962	77.16	338.56	490.19	905.91	18.26	4.67	28.92
Godda ^T	2,266	12.81	271.88	138.66	423.35	18.68	0.00	14.27
Gumla ^T	5,360	304.69	585.81	552.65	1,443.15	26.92	0.89	8.25
Hazaribagh	3,555	230.11	348.54	784.54	1,363.19	38.35	10.42	15.99
Jamtara ^T	1,811	0.00	20.84	85.18	106.02	5.85	5.38	5.32
Khunti ^T	2,535	72.97	344.59	496.18	913.74	36.04	8.25	3.11
Koderma	2,540	80.80	494.43	447.82	1,023.05	40.28	-0.42	6.37
Latehar ^T	4,291	480.36	1,308.93	613.75	2,403.04	56.00	-3.30	9.30
Lohardaga ^T	1,502	174.03	218.40	111.99	504.42	33.58	-0.20	7.66
Pakur ^T	1,811	2.96	172.40	111.64	287.00	15.85	-0.13	20.06
Palamu ^T	4,393	62.82	512.73	640.18	1,215.73	27.67	14.95	84.23
Ramgarh	1,341	30.96	109.32	190.98	331.26	24.70	2.26	14.49
Ranchi ^T	5,097	62.89	363.91	741.98	1,168.78	22.93	4.29	27.98
Sahibganj ^T	2,063	17.74	258.73	297.48	573.95	27.82	1.60	47.53
Saraikela-Kharsawan ^T	2,657	22.03	213.84	338.73	574.60	21.63	0.56	21.87
Simdega ^T	3,774	21.97	343.54	877.89	1,243.40	32.95	2.48	20.28
West Singhbhum ^T	7,224	461.53	1,353.80	1,553.11	3,368.44	46.63	2.32	47.18
Grand Total	79,716	2,601.05	9,688.91	11,431.18	23,721.14	29.76	109.73	584.20

JHARKHAND

13.11.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.11.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Jharkhand (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
1,414	5,186	5,682	12,282	1,187	4,503	5,749	11,439
11.51%	42.23%	46.26%		10.37%	39.37%	50.26%	

*in case of Jharkhand, RFA boundaries have been used.

Figure 13.11.2
Forest Cover Inside and Outside of RFA in Jharkhand

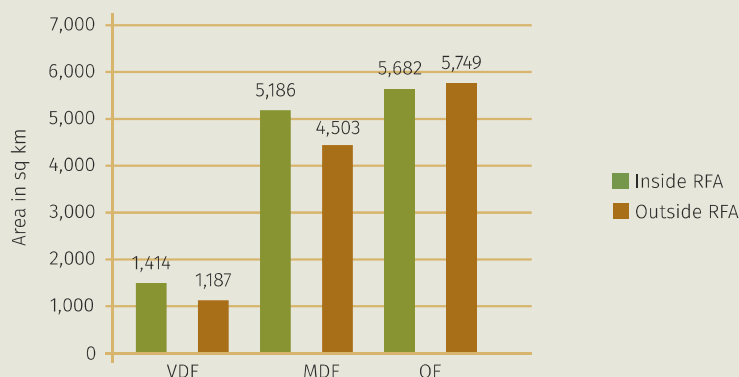


Table 13.11.5 Forest Cover Change Matrix for Jharkhand

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	2,586	13	3	0	1	2,603
Moderately Dense Forest	11	9,615	34	1	26	9,687
Open Forest	3	37	11,164	3	114	11,321
Scrub	0	1	61	567	59	688
Non Forest	1	23	169	13	55,211	55,417
Total ISFR 2021	2,601	9,689	11,431	584	55,411	79,716
Net Change	-2	2	110	-104	-6	

Table 13.11.6 Altitude-wise Forest Cover in Jharkhand

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	61,272	1,041	6,726	8,385	16,152	552
500-1000	18,051	1,493	2,839	3,006	7,337	32
1000-2000	393	67	124	40	232	0
Total	79,716	2,601	9,689	11,431	23,721	584

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

Table 13.11.7 Forest Cover in different slope classes in Jharkhand











(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	65,120	1,211	4,737	6,886	12,834	337
5-10	8,083	676	2,257	2,235	5,168	111
10-15	3,260	384	1,284	1,104	2,772	61
15-20	1,790	203	764	641	1,608	38
20-25	915	87	399	351	837	22
25-30	390	30	172	157	359	11
>30	158	10	76	57	143	4
Total	79,716	2,601	9,689	11,431	23,721	584

*(based on SRTM, Digital Elevation Model, 30 m, 2016)***Figure 13.11.3**

Forest Cover
Map of
Jharkhand

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.11.2 Forest Types

The Area under different forest types of Jharkhand as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.11.8 Area statistics of the Forest Types found in Jharkhand

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3C/C2e (ii) Moist peninsular low level sal	566.05	2.33
2.	3C/C2e (iii) Moist peninsular valley sal	64.47	0.27
3.	5B/C1c Dry peninsular sal forest	12,969.73	53.37
4.	5B/C2 Northern dry mixed deciduous forest	8,283.65	34.09
5.	5/DS1 Dry deciduous scrub	815.38	3.36
6.	5/E2 <i>Boswellia</i> forest	11.06	0.05
7.	5/E5 <i>Butea</i> forest	1.03	0.00
8.	5/E9 Dry bamboo brakes	131.84	0.54
	Sub Total	22,843.21	94.01
9.	TOF/Plantation	1,456.25	5.99
	Total (Forest Cover & Scrub)	24,299.46	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

Table 13.11.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	47.36	0.20
2.	Very highly fire prone	480.45	2.03
3.	Highly fire prone	2,159.16	9.10
4.	Moderately fire prone	4,227.02	17.82
5.	Less fire prone	16,807.01	70.85
	Total	23,721.00	100.00

13.11.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.11.4

Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.11.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Jharkhand has been estimated as given in following table.

Table 13.11.10 Tree Cover in Jharkhand (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
2,657	2,867	210

13.11.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.11.11 Extent of TOF in Jharkhand (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
11,439	2,867	14,306

13.11.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Jharkhand is given in the Table 13.11.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.11.13.

Table 13.11.12 Growing Stock in Jharkhand (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	96.22	100.80	4.58	2.30
2.	Growing Stock in TOF	71.93	74.35	2.42	4.18

JHARKHAND

Table 13.11.13 Diameter class distribution of top five tree species inside RFA in Jharkhand (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	1,81,819	12,537	834
2.	<i>Terminalia tomentosa</i>	21,830	2,778	128
3.	<i>Madhuca latifolia</i>	16,832	3,596	422
4.	<i>Anogeissus latifolia</i>	18,487	1,375	0
5.	<i>Lagerstroemia parviflora</i>	18,217	1,559	0

13.11.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Jharkhand in Rural and Urban areas are given in the Table 13.11.14 and Table 13.11.15 respectively.

Table 13.11.14 Top five tree species in TOF (Rural) in Jharkhand

Sl. No.	Species	Relative Abundance (%)
1.	<i>Shorea robusta</i>	12.37
2.	<i>Butea monosperma</i>	10.28
3.	<i>Acacia auriculiformis</i>	8.25
4.	<i>Mangifera indica</i>	7.41
5.	<i>Phoenix sylvestris</i>	6.26

Table 13.11.15 Top five tree species in TOF (Urban) in Jharkhand

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	11.71
2.	<i>Azadirachta indica</i>	7.75
3.	<i>Moringa spp.</i>	7.53
4.	<i>Cassia siamea</i>	7.08
5.	<i>Artocarpus heterophyllus</i>	4.90

13.11.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 184.81 million tonnes (677.64 million tonnes of CO₂ equivalent) which is 2.57 % of total forest carbon of the country. Pool wise forest carbon in Jharkhand is given in the following table.

Table 13.11.16 Forest Carbon in Jharkhand in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	51,017
2.	BGB	20,189
3.	Dead wood	774
4.	Litter	2,536
5.	SOC	1,09,665
	Total	1,84,811

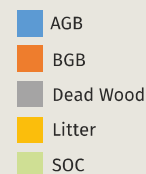


Figure 13.11.5 Forest Carbon in Jharkhand

13.11.9 Growing Stock of Bamboo

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

Table 13.11.17 Growing Stock of Bamboo in Jharkhand

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	3,717	2.49
Total number of culms (in millions)	996	1.87
Total equivalent green weight (in '000 tonnes)	6,147	1.53

13.11.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.11.18 and Table 13.11.19 respectively.

Table 13.11.18 Major NTFP species in Jharkhand

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	66.89
2.	<i>Buchanania lanzan</i>	Tree	7.63
3.	<i>Madhuca indica</i>	Tree	7.25
4.	<i>Diospyros melanoxylon</i>	Tree	5.14
5.	<i>Butea monosperma</i>	Tree	4.15

Table 13.11.19 Major invasive species in the State inside the RFA/Green Wash in Jharkhand (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	342
2.	<i>Chromolaena odorata</i>	85
3.	<i>Ageratum houstonianum</i>	18
4.	<i>Acacia farnesiana</i>	14
5.	<i>Imperata cylindrica</i>	3

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

13.12

KARNATAKA

Geographical Area

1,91,791 sq km

Geographical Coordinates

Latitude- 11° 30' N to 18° 30' N

Longitude- 74° 00' E to 78° 30' E

Population (as per Census 2011)

61.10 million

Urban 23.63 million (38.67%)

Rural 37.47 million (61.33%)

Tribal 4.25 million (6.96%)

Average Population Density

319 per sq km

Livestock population

(as per 19th Live Stock Census)

27.70 million

No. of Districts

30

No. of Hill Districts

6

No. of Tribal Districts

5

Table 13.12.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	19,179	
Reporting area for land utilization	19,050	100.00
Forests	3,073	16.13
Not available for land cultivation	2,294	12.04
Permanent pastures and other grazing lands	905	4.75
Land under misc. tree crops and groves	274	1.44
Culturable wasteland	400	2.10
Fallow land other than current fallows	688	3.61
Current fallows	1,521	7.99
Net area sown	9,895	51.94

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.12.1 Forest Cover

Figure 13.12.1
Forest Cover
of Karnataka

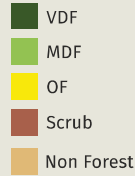


Table 13.12.2 Forest Cover
of Karnataka (in sq km)

Class	Area	% of GA
VDF	4,532.94	2.36
MDF	20,984.85	10.94
OF	13,212.20	6.89
Total	38,729.99	20.19
Scrub	4,610.76	2.40

Table 13.12.3 District- wise Forest Cover in Karnataka

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bagalkot	6,552	0.00	18.99	238.24	257.23	3.93	4.26	393.02
Ballari	8,461	0.00	110.19	627.30	737.49	8.72	-1.73	485.08
Belagavi ^H	13,433	35.99	736.99	392.68	1,165.66	8.68	24.06	671.67
Bengaluru	2,196	0.00	24.88	263.60	288.48	13.14	1.05	7.45
Bengaluru Rural	2,298	0.00	24.04	133.98	158.02	6.88	-4.73	27.00
Bidar	5,448	0.00	21.48	76.10	97.58	1.79	9.16	46.28
Chamarajanagar	5,648	93.19	1,525.16	1,112.85	2,731.20	48.36	7.01	125.82
Chikkamagaluru TH	7,202	901.63	2,584.95	478.92	3,965.50	55.06	13.72	77.10
Chikkballapura	4,244	0.00	19.73	255.59	275.32	6.49	5.62	184.37
Chitradurga	8,436	0.00	47.06	559.94	607.00	7.20	30.39	618.33
Dakshina Kannada TH	4,861	557.88	1,471.73	1,035.37	3,064.98	63.05	0.32	2.85
Davanagere	5,924	11.00	167.02	535.56	713.58	12.05	4.01	323.80
Dharwad	4,260	0.00	223.71	151.20	374.91	8.80	0.49	3.52
Gadag	4,657	0.00	0.23	140.82	141.05	3.03	-0.57	117.63
Hassan	6,814	147.67	771.51	565.63	1,484.81	21.79	6.37	73.39
Haveri	4,823	0.00	144.76	202.37	347.13	7.20	3.88	102.29
Kalaburagi	10,954	0.00	91.93	102.96	194.89	1.78	-0.16	40.89
Kodagu TH	4,102	794.32	1,886.30	577.29	3,257.91	79.42	-5.47	2.16
Kolar	3,979	0.00	58.05	325.67	383.72	9.64	2.33	67.95
Koppal	5,570	0.00	0.00	35.96	35.96	0.65	2.64	168.95
Mandya	4,962	0.00	114.15	394.18	508.33	10.24	9.01	103.68
Mysuru ^T	6,307	124.96	586.74	351.35	1,063.05	16.86	10.22	36.02
Raichur	8,442	0.00	0.94	43.29	44.23	0.52	0.00	184.91
Ramanagara	3,516	0.00	196.71	477.30	674.01	19.17	9.32	176.23
Shivamogga ^H	8,478	481.89	2,827.90	963.39	4,273.18	50.40	2.40	22.33
Tumakuru	10,597	0.00	72.34	1,250.73	1,323.07	12.49	39.03	402.96
Udupi ^I	3,582	216.53	1,383.74	656.46	2,256.73	63.00	-26.65	0.00
Uttara Kannada ^H	10,277	1,167.88	5,856.60	1,106.46	8,130.94	79.12	7.19	3.49
Vijayapura	10,498	0.00	0.00	27.12	27.12	0.26	2.07	8.71
Yadgir	5,270	0.00	17.02	129.89	146.91	2.79	-0.73	132.88
Grand Total	1,91,791	4,532.94	20,984.85	13,212.20	38,729.99	20.19	154.51	4,610.76

KARNATAKA

13.12.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.12.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Karnataka (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
3,679	12,721	6,148	22,548	854	8,264	7,064	16,182
16.32%	56.41%	27.27%		5.28%	51.07%	43.65%	

*in case of Karnataka, RFA boundaries have been used.

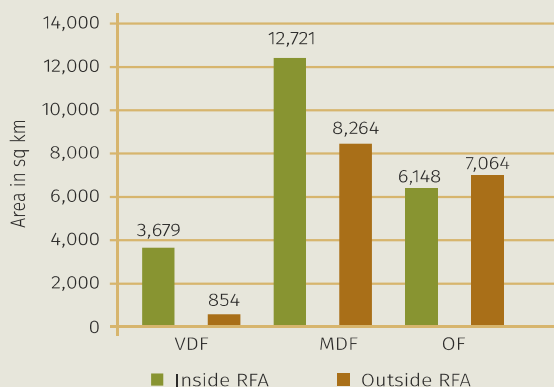


Figure 13.12.2
Forest Cover Inside and Outside of RFA in Karnataka

Table 13.12.5 Forest Cover Change Matrix for Karnataka

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	4,499	0	0	0	2	4,501
Moderately Dense Forest	34	20,954	2	0	58	21,048
Open Forest	0	12	12,898	19	97	13,026
Scrub	0	1	71	4,381	31	4,484
Non Forest	0	18	241	211	1,48,262	1,48,732
Total ISFR 2021	4,533	20,985	13,212	4,611	1,48,450	1,91,791
Net Change	32	-63	186	127	-282	

Table 13.12.6 Altitude-wise Forest Cover in Karnataka

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	41,511	1,457	5,755	2,917	10,129	318
500-1000	1,46,593	2,618	13,490	9,789	25,897	4,213
1000-2000	3,687	458	1,740	506	2,704	80
Total	1,91,791	4,533	20,985	13,212	38,730	4,611

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

Table 13.12.7 Forest Cover in different slope classes in Karnataka

(in sq km)











Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,61,569	949	9,552	8,576	19,077	2,686
5-10	15,763	978	5,364	2,408	8,750	1,004
10-15	6,715	905	2,890	900	4,695	387
15-20	3,796	721	1,640	618	2,979	275
20-25	2,122	482	848	370	1,700	158
25-30	1,085	259	450	203	912	73
>30	741	239	241	137	617	28
Total	1,91,791	4,533	20,985	13,212	38,730	4,611

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

Figure 13.12.3

Forest Cover
Map of
Karnataka

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.12.2

Forest Types

The Area under different forest types of Karnataka as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.12.8 Area statistics of the Forest Types found in Karnataka

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1A/C4 West Coast tropical evergreen forest	5,143.60	11.91
2.	2A/C2 West Coast semi-evergreen forest	4,366.52	10.11
3.	2A/2S1 West Coast secondary evergreen Dipterocarp forest	326.31	0.76
4.	2/E3 Moist bamboo brakes	1.79	0.00
5.	2/E4 Lateritic semi-evergreen forest	155.60	0.36
6.	3B/C1a Very moist teak forest	84.59	0.20
7.	3B/C1b Moist teak forest	1,771.05	4.10
8.	3B/C1c Slightly moist teak forest	942.15	2.18
9.	3B/C2 Southern moist mixed deciduous forest	4,718.62	10.93
10.	3B/C2/2S1 Southern secondary moist mixed deciduous forest	657.51	1.52
11.	4B/TS1 Mangrove scrub	10.04	0.02
12.	5A/C1a Very dry teak forest	20.47	0.05
13.	5A/C1b Dry teak forest	2,427.23	5.62
14.	5A/C3 Southern dry mixed deciduous forest	3,093.68	7.17
15.	5/DS1 Dry deciduous scrub	2,950.85	6.83
16.	5/E4 <i>Hardwickia</i> forest	409.55	0.95
17.	5/E7 Laterite thorn forest	122.34	0.28
18.	5/2S1 Secondary dry deciduous forest	37.43	0.09
19.	6A/C1 Southern thorn forest	1,891.25	4.39
20.	6A/DS1 Southern thorn scrub	3,220.54	7.46
21.	8A/C1 Nilgiri subtropical hill forest	364.46	0.84
	Sub Total	32,715.58	75.77
22.	TOF/Plantation	10,343.97	23.96
	Total (Forest Cover & Scrub)	43,059.55	
	Grassland forest types (outside forest cover)		
23.	5/DS4 Dry grassland	51.11	0.12
24.	8A/C1/DS1 South Indian sub-tropical hill savannah (woodland)	66.82	0.15
	Sub Total	117.93	0.27
	Grand Total	43,177.48	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

Table 13.12.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	71.58	0.18
2.	Very highly fire prone	930.93	2.40
3.	Highly fire prone	2,506.25	6.47
4.	Moderately fire prone	2,989.30	7.72
5.	Less fire prone	32,231.94	83.23
	Total	38,730.00	100.00

13.12.3

Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.12.4

Fire prone
forest areas
under
different fire
prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.12.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Karnataka has been estimated as given in following table.

Table 13.12.10 Tree Cover in Karnataka (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
6,257	7,494	1,237

13.12.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.12.11 Extent of TOF in Karnataka (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
16,182	7,494	23,676

13.12.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Karnataka is given in the Table 13.12.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.12.13.

Table 13.12.12 Growing Stock in Karnataka (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	334.08	302.14	-31.94	6.89
2.	Growing Stock in TOF	103.03	121.72	18.69	6.84

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Table 13.12.13 Diameter class distribution of top five tree species inside RFA in Karnataka

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Terminalia paniculata</i>	44,233	12,727	2,690
2.	<i>Tectona grandis</i>	36,695	8,889	796
3.	<i>Xylia xylocarpa</i>	29,607	8,914	700
4.	<i>Terminalia tomentosa</i>	28,690	8,335	1,446
5.	<i>Lagerstroemia lanceolata</i>	10,310	5,209	1,008

13.12.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Karnataka in Rural and Urban areas are given in the Table 13.12.14 and Table 13.12.15 respectively.

Table 13.12.14 Top five tree species in TOF (Rural) in Karnataka

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	22.99
2.	<i>Cocos nucifera</i>	12.81
3.	<i>Azadirachta indica</i>	11.66
4.	<i>Mangifera indica</i>	6.11
5.	<i>Acacia auriculiformis</i>	3.74

Table 13.12.15 Top five tree species in TOF (Urban) in Karnataka

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	24.80
2.	<i>Areca catechu</i>	21.01
3.	<i>Acacia auriculiformis</i>	4.93
4.	<i>Mangifera indica</i>	4.61
5.	<i>Tectona grandis</i>	3.55

13.12.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 376.40 million tonnes (1,380.13 million tonnes of CO₂ equivalent) which is 5.22 % of total forest carbon of the country. Pool wise forest carbon in Karnataka is given in the following table.

Table 13.12.16 Forest Carbon in Karnataka in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,22,741
2.	BGB	36,716
3.	Dead wood	2,890
4.	Litter	6,380
5.	SOC	2,07,668
	Total	3,76,395

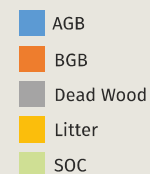


Figure 13.12.5 Forest Carbon in Karnataka

13.12.9 Growing Stock of Bamboo

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

Table 13.12.17 Growing Stock of Bamboo in Karnataka

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	8,624	5.77
Total number of culms (in millions)	2,653	4.97
Total equivalent green weight (in '000 tonnes)	35,008	8.71

13.12.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.12.18 and Table 13.12.19 respectively.

Table 13.12.18 Major NTFP species in Karnataka

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Cymbopogon citrates</i>	Herbs	45.51
2.	<i>Piper spp./Piper longum/ Piper mullesua</i>	Climber	19.55
3.	<i>Asparagus racemosa</i>	Climber	13.78
4.	<i>Curcuma aromatica</i>	Herbs	7.69
5.	<i>Ocimum spp. (Ocimum gratissimum/Ocimum sanctum /Ocimum tenuiflorum/ Ocimum americanum)</i>	Herbs	6.41

Table 13.12.19 Major invasive species in the State inside the RFA/Green Wash in Karnataka (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	1,432
2.	<i>Chromolaena odorata</i>	1,243
3.	<i>Ageratum conyzoides</i>	70
4.	<i>Acacia farnesiana</i>	61
5.	<i>Cassia tora</i>	54

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

13.13

KERALA

Geographical Area

38,852 sq km

Geographical Coordinates

Latitude- 8° 17' N to 12° 47' N

Longitude- 74° 52' E to 77° 24' E

Population (as per Census 2011)

33.41 million

Urban 15.94 million (47.70%)

Rural 17.47 million (52.30%)

Tribal 0.48 million (1.45%)

Average Population Density

860 per sq km

Livestock population

(as per 19th Live Stock Census)

2.73 million

No. of Districts

14

No. of Hill Districts

10

No. of Tribal Districts

9

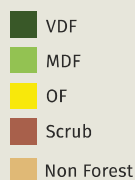
Table 13.13.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	3,886	
Reporting area for land utilization	3,886	100.00
Forests	1,082	27.84
Not available for land cultivation	559	14.38
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	2	0.05
Culturable wasteland	96	2.47
Fallow land other than current fallows	49	1.27
Current fallows	58	1.49
Net area sown	2,040	52.50

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.13.1 Forest Cover

Figure 13.13.1
Forest Cover
of Kerala



**Table 13.13.2 Forest Cover
of Kerala** (in sq km)

Class	Area	% of GA
VDF	1,944.32	5.00
MDF	9,472.00	24.38
OF	9,837.17	25.32
Total	21,253.49	54.70
Scrub	29.90	0.08

Table 13.13.3 District-wise Forest Cover in Kerala

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Alappuzha	1,415	0.00	27.00	53.54	80.54	5.69	0.64	0.00
Ernakulam TH	3,063	165.52	614.40	604.56	1,384.48	45.20	18.77	5.60
Idukki TH	4,356	355.72	1,783.33	1,016.27	3,155.32	72.44	4.67	2.51
Kannur TH	2,961	58.00	489.63	1,121.23	1,668.86	56.36	14.89	0.18
Kasaragod TH	1,989	1.90	288.70	692.97	983.57	49.45	17.09	0.00
Kollam TH	2,483	104.40	656.88	572.50	1,333.78	53.72	11.27	0.00
Kottayam	2,206	11.31	525.73	562.01	1,099.05	49.82	-5.24	0.00
Kozhikode ^H	2,345	70.77	409.94	967.11	1,447.82	61.74	10.85	0.80
Malappuram TH	3,554	142.67	424.68	1,416.32	1,983.67	55.82	2.34	6.47
Palakkad TH	4,482	402.14	637.77	1,063.77	2,103.68	46.94	20.09	12.71
Pathanamthitta	2,652	164.92	1,229.12	554.88	1,948.92	73.49	-6.60	0.51
Thiruvananthapuram TH	2,189	59.12	702.42	555.50	1,317.04	60.17	13.11	0.07
Thrissur	3,027	218.86	477.79	469.60	1,166.25	38.53	7.03	0.62
Wayanad TH	2,130	188.99	1,204.61	186.91	1,580.51	74.20	0.29	0.43
Grand Total	38,852	1,944.32	9,472.00	9,837.17	21,253.49	54.70	109.20	29.90

13.13.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

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Table 13.13.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Kerala

(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
1,804	5,299	2,576	9,679	140	4,173	7,261	11,574
18.64%	54.75%	26.61%		1.21%	36.05%	62.74%	

*in case of Kerala, RFA boundaries have been used

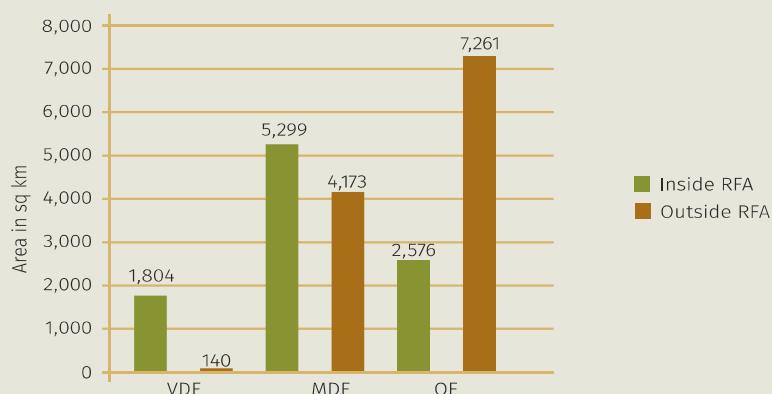
Figure 13.13.2
Forest Cover
Inside and
Outside of RFA
in Kerala

Table 13.13.5 Forest Cover Change Matrix for Kerala

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,928	5	1	0	1	1,935
Moderately Dense Forest	15	9,423	35	0	35	9,508
Open Forest	0	1	9,604	1	95	9,701
Scrub	0	0	0	13	0	13
Non Forest	1	43	197	16	17,438	17,695
Total ISFR 2021	1,944	9,472	9,837	30	17,569	38,852
Net Change	9	-36	136	17	-126	

Table 13.13.6 Altitude-wise Forest Cover in Kerala

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	28,678	178	5,193	7,985	13,356	13
500-1000	6,478	837	2,889	1,167	4,893	8
1000-2000	3,441	750	1,343	650	2,743	4
2000-3000	255	179	47	35	261	5
Total	38,852	1,944	9,472	9,837	21,253	30








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

Table 13.13.7 Forest Cover in different slope classes in Kerala

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	17,923	169	2,206	3,913	6,288	7
5-10	8,347	271	2,268	2,623	5,162	5
10-15	4,607	322	1,713	1,432	3,467	4
15-20	3,051	335	1,271	866	2,472	4
20-25	2,137	305	932	544	1,781	4
25-30	1,402	236	616	319	1,171	4
>30	1,385	306	466	140	912	2
Total	38,852	1,944	9,472	9,837	21,253	30

*(based on SRTM, Digital Elevation Model, 30 m, 2016)***Figure 13.13.3**Forest Cover
Map of Kerala**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.13.2**Forest Types**

The Area under different forest types of Kerala as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.13.8 Area statistics of the Forest Types found in Kerala

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1A/C3 Southern hilltop tropical evergreen forest	294.34	1.38
2.	1A/C4 West Coast tropical evergreen forest	3,005.85	14.10
3.	1/E2 Wet bamboo brakes	25.04	0.12
4.	1/2S1 Pioneer Euphorbiaceous scrub	18.60	0.09
5.	2A/C2 West Coast semi-evergreen forest	2,664.21	12.50
6.	3B/C1a Very moist teak forest	162.58	0.76
7.	3B/C1b Moist teak forest	130.69	0.61
8.	3B/C1c Slightly moist teak forest	442.38	2.07
9.	3B/C2 Southern moist mixed deciduous forest	1,704.93	8.00
10.	4B/TS2 Mangrove forest	8.90	0.04
11.	4C/FS1 <i>Myristica</i> swamp forest	1.56	0.01
12.	5A/C3 Southern dry mixed deciduous forest	331.95	1.56
13.	6A/C1 Southern thorn forest	1.03	0.00
14.	11A/C1 Southern montane wet temperate forest	303.98	1.43
	Sub Total	9,096.04	42.67
15.	TOF/Plantation	12,061.62	56.58
	Total (Forest Cover & Scrub)	21,157.66	
	Grassland forest types (outside forest cover)		
16.	5/DS4 Dry grassland	11.41	0.05
17.	11A/C1/DS2 Southern montane wet grassland	149.12	0.70
	Sub Total	160.53	0.75
	Grand Total	21,318.19	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.13.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.13.9 Forest Fire Prone Classes



(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	54.79	0.26
3.	Highly fire prone	461.06	2.17
4.	Moderately fire prone	1,266.42	5.96
5.	Less fire prone	19,470.73	91.61
	Total	21,253.00	100.00

Figure 13.13.4

Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.13.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Kerala has been estimated as given in following table.

Table 13.13.10 Tree Cover in Kerala (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
2,936	2,820	-116

13.13.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.13.11 Extent of TOF in Kerala (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
11,574	2,820	14,394

13.13.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Kerala is given in the Table 13.13.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.13.13.

Table 13.13.12 Growing Stock in Kerala (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	147.10	160.53	13.43	3.66
2.	Growing Stock in TOF	55.26	61.04	5.78	3.43

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Table 13.13.13 Diameter class distribution of top five tree species inside RFA in Kerala (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Tectona grandis</i>	12,882	5,220	391
2.	<i>Terminalia paniculata</i>	9,523	4,809	1,455
3.	<i>Xylia xylocarpa</i>	10,490	3,941	498
4.	<i>Syzygium cumini/ jambolanum</i> (Old)/ <i>Eugenia jambolana</i>	4,159	1,677	546
5.	<i>Lagerstroemia lanceolata/ inicrocarpa</i>	1,455	1,323	601

13.13.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Kerala in Rural and Urban areas are given in the Table 13.13.14 and Table 13.13.15 respectively.

Table 13.13.14 Top five tree species in TOF (Rural) in Kerala

Sl. No.	Species	Relative Abundance (%)
1.	<i>Hevea brasiliensis</i>	36.01
2.	<i>Areca catechu</i>	17.83
3.	<i>Cocos nucifera</i>	12.21
4.	<i>Artocarpus heterophyllus</i>	4.09
5.	<i>Swietenia mahagoni</i>	3.09

Table 13.13.15 Top five tree species in TOF (Urban) in Kerala

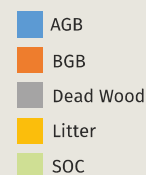
Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	33.84
2.	<i>Areca catechu</i>	13.42
3.	<i>Hevea brasiliensis</i>	8.39
4.	<i>Mangifera indica</i>	6.67
5.	<i>Artocarpus heterophyllus</i>	6.37

13.13.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 205.52 million tonnes (753.57 million tonnes of CO₂ equivalent) which is 2.85 % of total forest carbon of the country. Pool wise forest carbon in Kerala is given in the following table.

Table 13.13.16 Forest Carbon in Kerala in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	61,802
2.	BGB	17,440
3.	Dead wood	1,534
4.	Litter	3,198
5.	SOC	1,21,549
	Total	2,05,523

**Figure 13.13.5 Forest Carbon in Kerala**

13.13.9 Growing Stock of Bamboo

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

Table 13.13.17 Growing Stock of Bamboo in Kerala

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	2,404	1.61
Total number of culms (in millions)	1,087	2.04
Total equivalent green weight (in '000 tonnes)	14,681	3.65

13.13.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.13.18 and Table 13.13.19 respectively.

Table 13.13.18 Major NTFP Species in Kerala

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Hydrocotyle asiatica</i>	Herbs	52.01
2.	<i>Piper spp./Piper longum/Piper mullesua</i>	Climber	29.93
3.	<i>Curcuma zedoaria</i>	Herbs	3.68
4.	<i>Rubia cordifolia</i>	Climber	3.01
5.	<i>Phyllanthus amarus</i>	Herbs	2.68

Table 13.13.19 Major invasive species in the State inside the RFA/Green wash in Kerala (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	362
2.	<i>Lantana camara</i>	87
3.	<i>Ageratum conyzoides</i>	29
4.	<i>Ageratina adenophora</i>	9
5.	<i>Mikania micrantha</i>	3

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

13.14

MADHYA PRADESH

Geographical Area

3,08,252 sq km

Geographical Coordinates

Latitude- 21° 17' N to 26° 52' N

Longitude- 74° 08' E to 82° 49' E

Population (as per Census 2011)

72.63 million

Urban 20.07 million (27.63 %)

Rural 52.56 million (72.37 %)

Tribal 15.32 million (21.09 %)

Average Population Density

236 per sq km

Livestock population

(as per 19th Live Stock Census)

36.33 million

No. of Districts

50

No. of Hill Districts

0

No. of Tribal Districts

24

Table 13.14.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	30,825	
Reporting area for land utilization	30,756	100.00
Forests	8,708	28.31
Not available for land cultivation	3,504	11.39
Permanent pastures and other grazing lands	1,337	4.35
Land under misc. tree crops and groves	20	0.07
Culturable wasteland	967	3.14
Fallow land other than current fallows	486	1.58
Current fallows	543	1.77
Net area sown	15,191	49.39

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.14.1 Forest Cover

Figure 13.14.1
Forest Cover
of Madhya
Pradesh



Table 13.14.2 Forest Cover of Madhya Pradesh (in sq km)

Class	Area	% of GA
VDF	6,664.95	2.16
MDF	34,209.02	11.10
OF	36,618.63	11.88
Total	77,492.60	25.14
Scrub	5,456.55	1.77

Table 13.14.3 District- wise Forest Cover in Madhya Pradesh

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				% of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Alirajpur ^T	3,182	0.00	207.29	474.06	681.35	21.41	-3.07	29.72
Anuppur ^T	3,747	108.31	337.50	411.66	857.47	22.88	-11.21	46.23
Ashoknagar	4,674	0.00	265.93	421.32	687.25	14.70	-1.79	123.91
Balaghat ^T	9,229	1,407.64	2,630.88	884.26	4,922.78	53.34	-9.28	28.06
Barwani ^T	5,427	0.00	186.79	717.57	904.36	16.66	-23.63	33.67
Betul ^T	10,043	230.11	1,922.32	1,510.36	3,662.79	36.47	-0.91	157.62
Bhind	4,459	0.00	28.08	198.48	226.56	5.08	119.81	283.24
Bhopal	2,772	0.00	120.77	207.79	328.56	11.85	-0.11	70.31
Burhanpur	3,427	57.92	625.89	603.75	1,287.56	37.57	-7.00	37.74
Chhatarpur	8,687	184.01	817.24	755.89	1,757.14	20.23	-1.41	282.18
Chhindwara ^T	11,815	575.68	2,021.61	2,010.84	4,608.13	39.00	20.12	284.14
Damoh	7,306	2.00	844.92	1,739.79	2,586.71	35.41	-0.47	126.22
Datia	2,902	0.00	91.13	121.65	212.78	7.33	10.50	68.07
Dewas ^T	7,020	12.00	935.21	1,000.06	1,947.27	27.74	-8.60	43.44
Dhar ^T	8,153	0.00	115.64	528.62	644.26	7.90	-6.99	81.95
Dindori ^T	7,470	1,084.98	1,271.24	666.21	3,022.43	40.46	-9.53	123.13
East Nimar ^T	7,352	147.80	1,153.11	784.48	2,085.39	28.36	-3.73	21.94
Guna	6,390	2.00	414.00	911.50	1,327.50	20.77	-2.24	156.80
Gwalior	4,560	1.00	323.69	902.14	1,226.83	26.90	5.65	132.71
Harda ^T	3,334	19.00	523.70	396.61	939.31	28.17	-16.95	3.06
Hoshangabad ^T	6,703	271.64	1,366.15	783.41	2,421.20	36.12	-1.45	9.34
Indore	3,898	0.00	348.10	326.51	674.61	17.31	-4.12	21.69
Jabalpur ^T	5,211	40.26	501.04	560.53	1,101.83	21.14	-12.10	106.51
Jhabua ^T	3,600	0.00	30.69	189.52	220.21	6.12	-1.46	160.07
Katni	4,950	93.90	607.87	654.85	1,356.62	27.41	-4.68	36.16
Mandla ^T	5,800	691.78	1,092.55	792.65	2,576.98	44.43	-0.53	36.93
Mandsaur	5,535	0.00	42.01	198.67	240.68	4.35	-0.91	108.31
Morena ^T	4,989	0.00	96.12	665.55	761.67	15.27	21.50	367.86

MADHYA PRADESH

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Narsinghpur	5,133	61.00	655.81	623.97	1,340.78	26.12	-1.98	90.26
Neemuch	4,256	0.04	119.22	669.74	789.00	18.54	-6.69	387.01
Panna	7,135	82.95	1476.06	1,189.59	2,748.60	38.52	5.89	190.67
Raisen	8,466	22.55	1,302.18	1,346.59	2,671.32	31.55	-4.94	142.75
Rajgarh	6,153	0.00	37.86	133.94	171.80	2.79	-0.29	78.14
Ratlam ^T	4,861	0.00	2.53	72.63	75.16	1.55	15.31	111.54
Rewa	6,314	60.91	377.18	363.11	801.20	12.69	20.05	97.12
Sagar	10,252	1.00	1,138.81	1,645.43	2,785.24	27.17	-9.30	186.83
Satna	7,502	12.00	904.19	835.33	1,751.52	23.35	-1.38	165.39
Sehore	6,578	20.70	614.84	714.61	1,350.15	20.53	-7.75	53.85
Seoni ^T	8,758	237.07	1,787.12	1,038.84	3,063.03	34.97	-6.56	70.51
Shahdol ^T	6,205	122.03	818.26	1,014.41	1,954.70	31.50	-16.01	44.25
Shajapur	6,195	0.00	2.44	59.47	61.91	1.00	-1.44	64.90
Sheopur ^T	6,606	6.00	1,394.25	2,043.66	3,443.91	52.13	-16.09	130.51
Shivpuri	10,066	18.00	779.39	1,749.14	2,546.53	25.30	6.61	209.74
Sidhi ^T	4,851	315.96	881.29	805.27	2,002.52	41.28	33.36	47.02
Singrauli ^T	5,675	393.73	992.29	776.84	2,162.86	38.11	-17.27	54.41
Tikamgarh	5,048	1.00	89.73	295.58	386.31	7.65	-0.33	135.96
Ujjain	6,091	0.00	2.60	34.10	36.70	0.60	0.48	55.83
Umaria ^T	4,076	377.98	1,092.66	530.60	2,001.24	49.10	-21.34	22.90
Vidisha	7,371	1.00	344.52	431.24	776.76	10.54	-0.70	89.85
West Nimar ^T	8,025	1.00	474.32	825.81	1,301.13	16.21	-4.93	46.10
Grand Total	3,08,252	6,664.95	34,209.02	36,618.63	77,492.60	25.14	10.11	5,456.55

13.13.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

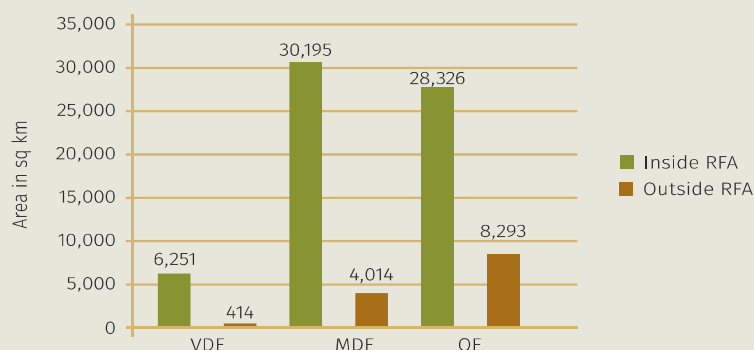
Table 13.14.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Madhya Pradesh (in sq km)

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
6,251	30,195	28,326	64,772	414	4,014	8,293	12,721
9.65%	46.62%	43.73%		3.25%	31.56%	65.19%	

**in case of Madhya Pradesh, RFA boundaries have been used.*

Figure 13.14.2

Forest Cover
Inside and
Outside of
RFA in
Madhya
Pradesh

**Table 13.14.5 Forest Cover Change Matrix for Madhya Pradesh**

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	6,660	9	3	0	4	6,676
Moderately Dense Forest	5	34,165	51	4	116	34,341
Open Forest	0	24	35,875	71	495	36,465
Scrub	0	0	510	5,289	203	6,002
Non Forest	0	11	180	93	2,24,484	2,24,768
Total ISFR 2021	6,665	34,209	36,619	5,457	2,25,302	3,08,252
Net Change	-11	-132	154	-545	534	

Table 13.14.6 Altitude-wise Forest Cover in Madhya Pradesh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	2,31,982	2,092	20,996	25,805	48,893	4,423
500-1000	75,712	4,461	13,063	10,726	28,250	1,027
1000-2000	558	112	150	88	350	7
Total	3,08,252	6,665	34,209	36,619	77,493	5,457

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

Table 13.14.7 Forest Cover in different slope classes in Madhya Pradesh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	2,65,973	3,339	21,040	25,224	49,603	4,403
5-10	25,674	1,604	7,038	5,931	14,573	707
10-15	9,369	905	3,372	2,826	7,103	224
15-20	4,283	470	1,626	1,498	3,594	80
20-25	1,884	219	719	719	1,657	29
25-30	708	86	271	277	634	9
>30	361	42	143	144	329	5
Total	3,08,252	6,665	34,209	36,619	77,493	5,457

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

MADHYA PRADESH

Figure 13.14.3
Forest Cover
Map of Madhya
Pradesh



LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.14.2 Forest Types

The Area under different forest types of Madhya Pradesh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.14.8 Area statistics of the Forest Types found in Madhya Pradesh

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C1c Slightly moist teak forest	1,889.89	2.26
2.	3B/C2 Southern moist mixed deciduous forest	1,909.35	2.28
3.	3C/C2e (i) Moist peninsular high level sal	2,746.69	3.29
4.	4E/RS1 Riparian fringing forest	15.07	0.02
5.	5A/C1a Very dry teak forest	712.34	0.85
6.	5A/C1b Dry teak forest	22,283.27	26.68
7.	5A/C3 Southern dry mixed deciduous forest	20,147.88	24.12
8.	5B/C1c Dry peninsular sal forest	4,152.12	4.97
9.	5B/C2 Northern dry mixed deciduous forest	15,752.36	18.86
10.	5/DS1 Dry deciduous scrub	5,468.47	6.55
11.	5/DS2 Dry savannah forest	1.15	0.00
12.	5/E1 <i>Anogeissus pendula</i> forest	2,813.01	3.37
13.	5/E1/DS1 <i>Anogeissus pendula</i> scrub	368.80	0.44
14.	5/E2 <i>Boswellia</i> forest	388.48	0.46
15.	5/E5 <i>Butea</i> forest	194.38	0.23
16.	5/E9 Dry bamboo brakes	734.60	0.88
17.	5/1S2 <i>Khair-sissu</i> forest	1,370.77	1.64
18.	6B/C2 Ravine thorn forest	882.97	1.06

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
19.	8A/C3 Central Indian subtropical hill forest	1.35	0.00
	Sub Total	81,832.95	97.96
20.	TOF/Plantation	1,651.45	1.98
	Total (Forest Cover & Scrub)	83,484.40	
Grassland forest types (outside forest cover)			
21.	3C/C2/DS1 Moist sal savannah	40.41	0.05
22.	5/DS4 Dry grassland	6.83	0.01
	Total	47.24	0.06
	Grand Total	83,531.64	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.14.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.14.4
Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Table 13.14.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	336.52	0.43
2.	Very highly fire prone	4,730.92	6.11
3.	Highly fire prone	10,889.70	14.05
4.	Moderately fire prone	15,231.85	19.66
5.	Less fire prone	46,304.01	59.75
	Total	77,493.00	100.00

13.14.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Madhya Pradesh has been estimated as given in following table.

Table 13.14.10 Tree Cover in Madhya Pradesh (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
8,339	8,054	-285

13.14.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.14.11 Extent of TOF in Madhya Pradesh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
12,721	8,054	20,775

13.14.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Madhya Pradesh is given in the Table 13.14.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.14.13

Table 13.14.12 Growing Stock in Madhya Pradesh (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	342.62	374.44	31.82	8.53
2.	Growing Stock in TOF	106.39	118.05	11.66	6.63

Table 13.14.13 Diameter class distribution of top five tree species inside RFA in Madhya Pradesh (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Tectona grandis</i>	3,00,466	34,156	0
2.	<i>Shorea robusta</i>	1,03,481	31,613	987
3.	<i>Anogeissus latifolia</i>	79,178	9,423	313
4.	<i>Lannea coromandelica</i>	69,528	13,578	126
5.	<i>Terminalia tomentosa</i>	57,431	18,915	383

13.14.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Madhya Pradesh in Rural and Urban areas are given in the Table 13.14.14 and Table 13.14.15 respectively.

Table 13.14.14 Top five tree species in TOF (Rural) in Madhya Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Butea monosperma</i>	19.34
2.	<i>Acacia arabica</i>	13.15
3.	<i>Azadirachta indica</i>	7.10
4.	<i>Zizyphus mauritiana</i>	6.40
5.	<i>Tectona grandis</i>	6.37

Table 13.14.15 Top five tree species in TOF (Urban) Madhya Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	13.85
2.	<i>Mangifera indica</i>	11.09
3.	<i>Leucaena leucocephala</i>	7.12
4.	<i>Psidium guajava</i>	6.89
5.	<i>Zizyphus mauritiana</i>	3.84

13.14.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 609.25 million tonnes (2,233.92 million tonnes of CO₂ equivalent) which is 8.46 % of total forest carbon of the country. Pool wise forest carbon in Madhya Pradesh is given in the following table.

Table 13.14.16 Forest Carbon in Madhya Pradesh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,71,587
2.	BGB	67,160
3.	Dead wood	2,676
4.	Litter	8,356
5.	SOC	3,59,174
	Total	6,09,250



Figure 13.14.5 Forest Carbon in Madhya Pradesh

13.14.9 Growing Stock of Bamboo

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

Table 13.14.17 Growing Stock of Bamboo in Madhya Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	18,394	12.31
Total number of culms (in millions)	4,762	8.93
Total equivalent green weight (in '000 tonnes)	22,284	5.54

13.14.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.14.18 and Table 13.14.19 respectively.

Table 13.14.18 Major NTFP species in Madhya Pradesh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Helicteres isora</i>	Shrub	43.71
2.	<i>Buchanania Lanza</i>	Tree	28.62
3.	<i>Boswellia serrata</i>	Tree	12.44
4.	<i>Embilica officinalis/Phyllanthus</i>	Tree	7.49
5.	<i>Terminalia belerica</i>	Tree	2.71

Table 13.14.19 Major invasive species in the State inside the RFA/Green wash in Madhya Pradesh (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	2,852
2.	<i>Cassia tora</i>	1,324
3.	<i>Ageratina adenophora</i>	547
4.	<i>Ageratum conyzoides</i>	439
5.	<i>Senna occidentalis</i>	229

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

13.15

MAHARASHTRA

Geographical Area
307,713 sq km

Geographical Coordinates
Latitude- 15° 35' N to 22° 02' N
Longitude- 72° 36' E to 80° 54' E

Population (as per Census 2011)
112.37 million
Urban 50.82 million (45.22 %)
Rural 61.55 million (54.78%)
Tribal 10.51 million (9.35 %)

Average Population Density
365 per sq km

Livestock population
(as per 19th Live Stock Census)
32.48 million

No. of Districts
35

No. of Hill Districts
7

No. of Tribal Districts
12

Table 13.15.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	30,771	
Reporting area for land utilization	30,742	100.00
Forests	5,220	16.98
Not available for land cultivation	3,485	11.34
Permanent pastures and other grazing lands	1,287	4.19
Land under misc. tree crops and groves	256	0.83
Culturable wasteland	924	3.01
Fallow land other than current fallows	1,261	4.10
Current fallows	1,366	4.44
Net area sown	16,943	55.11

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.15.1 Forest Cover



Figure 13.15.1
Forest Cover of
Maharashtra

Table 13.15.2 Forest Cover of
Maharashtra (in sq km)

Class	Area	% of GA
VDF	8,733.75	2.84
MDF	20,589.00	6.69
OF	21,475.01	6.98
Total	50,797.76	16.51
Scrub	4,247.39	1.38

Table 13.15.3 District- wise Forest Cover in Maharashtra

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Ahmednagar ^T	17,048	0.00	68.79	210.10	278.89	1.64	12.00	556.55
Akola	5,673	11.00	108.12	222.41	341.53	6.02	1.16	15.29
Amravati ^T	12,210	618.47	1,458.36	1,091.28	3,168.11	25.95	0.34	112.82
Aurangabad	10,131	20.00	105.70	444.52	570.22	5.63	2.29	168.98
Beed	10,693	0.00	12.32	149.23	161.55	1.51	-2.48	359.10
Bhandara	4,087	170.86	561.52	265.37	997.75	24.41	-1.17	18.57
Buldhana	9,661	25.00	143.11	426.57	594.68	6.16	3.08	161.20
Chandrapur ^T	11,443	1,320.89	1,555.39	1,173.99	4,050.27	35.40	-4.19	44.06
Dhule ^T	7,195	0.00	68.57	233.09	301.66	4.19	0.39	112.54
Gadchiroli ^T	14,412	4,705.05	3,288.46	1,909.31	9,902.82	68.71	-14.12	17.35
Gondia	5,234	895.40	739.26	310.95	1,945.61	37.17	7.02	27.18
Hingoli	4,827	0.00	9.09	102.91	112.00	2.32	1.99	48.88
Jalgaon ^T	11,765	51.00	347.31	754.44	1,152.75	9.80	5.91	97.55
Jalna	7,694	0.00	8.22	26.31	34.53	0.45	-1.95	50.11
Kolhapur ^H	7,685	64.00	1,019.47	702.11	1,785.58	23.23	-0.74	102.35
Latur	7,157	0.00	0.04	13.08	13.12	0.18	0.10	19.04
Mumbai City	157	0.00	0.00	3.20	3.20	2.04	0.20	0.00
Mumbai Suburban	446	0.00	67.05	71.92	138.97	31.16	-0.89	0.04
Nagpur ^T	9,892	400.25	902.15	696.39	1,998.79	20.21	-1.59	73.90
Nanded	10,528	58.00	442.07	438.72	938.79	8.92	2.03	122.06
Nandurbar ^T	5,955	0.00	403.68	791.61	1,195.29	20.07	-0.70	30.23
Nashik TH	15,530	0.00	346.45	733.31	1,079.76	6.95	3.21	348.82
Osmanabad	7,569	0.00	2.03	47.50	49.53	0.65	-0.13	45.93
Parbhani	6,214	0.00	3.51	36.31	39.82	0.64	-0.61	47.44
Pune TH	15,643	0.00	760.99	955.50	1,716.49	10.97	5.63	510.33

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(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Raigad ^h	7,152	13.00	1,254.21	1,683.80	2,951.01	41.26	11.55	86.23
Ratnagiri ^h	8,208	34.94	1,889.14	2,287.86	4,211.94	51.32	-0.96	3.28
Sangli	8,572	0.00	94.90	55.67	150.57	1.76	0.44	169.22
Satara ^h	10,480	117.00	569.68	591.51	1,278.19	12.20	-0.18	366.20
Sindhudurg ^h	5,207	90.93	1,383.88	1,348.87	2,823.68	54.23	-4.30	29.04
Solapur	14,895	0.00	4.98	41.88	46.86	0.31	-2.81	64.54
Thane ⁷	9,558	0.00	1,293.03	1,699.91	2,992.94	31.31	-5.15	259.03
Wardha	6,309	9.97	409.91	444.41	864.29	13.70	2.34	56.21
Washim	4,901	5.00	101.51	189.88	296.39	6.05	-0.37	30.60
Yavatmal ⁷	13,582	122.99	1,166.10	1,321.09	2,610.18	19.22	2.86	92.72
Grand Total	3,07,713	8,733.75	20,589.00	21,475.01	50,797.76	16.51	20.20	4,247.39

13.15.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.15.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Maharashtra (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
8,476	15,068	12,496	36,040	258	5,521	8,979	14,758
23.52%	41.81%	34.67%		1.75%	37.41%	60.84%	

*In case of Maharashtra, RFA boundaries have been used.

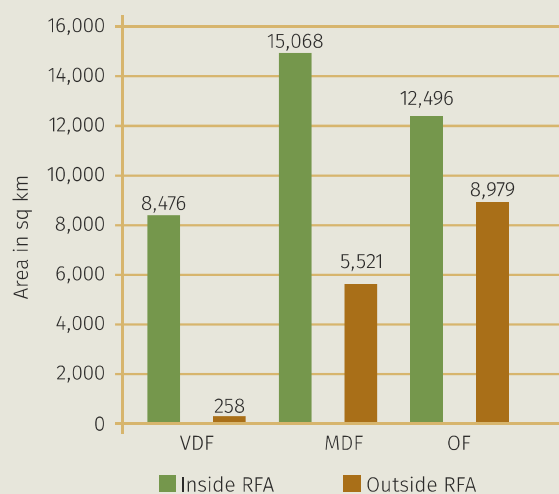


Figure 13.15.2 Forest Cover Inside and Outside of RFA in Maharashtra

Table 13.15.5 Forest Cover Change Matrix for Maharashtra

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	8,704	6	2	0	9	8,721
Moderately Dense Forest	29	20,491	8	0	44	20,572
Open Forest	0	86	21,301	3	95	21,485
Scrub	0	0	38	4,189	29	4,256
Non Forest	1	6	126	55	2,52,491	2,52,679
Total ISFR 2019	8,734	20,589	21,475	4,247	2,52,668	3,07,713
Net Change	13	17	-10	-9	-11	

Table 13.15.6 Altitude-wise Forest Cover in Maharashtra

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	2,37,017	7,604	15,453	16,110	39,167	1,336
500-1000	66,142	1,082	4,753	5,060	10,895	2,806
1000-2000	4,554	48	383	305	736	105
Total	3,07,713	8,734	20,589	21,475	50,798	4,247

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

Table 13.15.7 Forest Cover in different slope classes in Maharashtra

(in sq km)











Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	2,58,652	6,162	9,348	10,334	25,844	1,533
5-10	23,811	1,217	3,928	4,383	9,528	1,039
10-15	11,555	667	2,970	2,928	6,565	721
15-20	6,633	379	2,044	1,818	4,241	468
20-25	3,707	188	1,219	1,065	2,472	275
25-30	1,896	78	637	549	1,264	139
>30	1,459	43	443	398	884	72
Total	3,07,713	8,734	20,589	21,475	50,798	4,247

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

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Figure 13.15.3
Forest Cover
Map of
Maharashtra

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.15.2 Forest Types

The area under different forest types of Maharashtra as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.15.8 Area statistics of the Forest Types found in Maharashtra

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2A/C2 West coast semi-evergreen forest	6,659.15	12.10
2.	3B/C1b Moist teak forest	5,715.15	10.38
3.	3B/C2 Southern moist mixed deciduous forest	11,353.06	20.63
4.	4A/L1 Littoral forest	1.11	0.00
5.	4B/TS1 Mangrove scrub	28.33	0.05
6.	4B/TS2 Mangrove forest	291.94	0.53
7.	4E/RS1 Riparian fringing forest	1.18	0.00
8.	5A/C1b Dry teak forest	9,536.93	17.34
9.	5A/C3 Southern dry mixed deciduous forest	14,390.79	26.15
10.	5/DS1 Dry deciduous scrub	4,354.34	7.91
11.	5/E2 <i>Boswellia</i> forest	45.02	0.08
12.	5/E3 <i>Babul</i> forest	9.30	0.02
13.	5/E4 <i>Hardwickia</i> forest	61.28	0.11

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
14.	5/E5 <i>Butea</i> forest	10.01	0.02
15.	5/E9 Dry bamboo brakes	254.70	0.46
16.	6A/C1 Southern thorn forest	219.22	0.40
17.	8A/C2 Western subtropical hill forest	661.19	1.20
Sub Total		53,592.70	97.38
18.	TOF/ Plantation	1,441.35	2.62
Total (Forest Cover & Scrub)		55,034.05	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

Table 13.15.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	470.68	0.93
2.	Very highly fire prone	3,585.37	7.06
3.	Highly fire prone	8,540.70	16.81
4.	Moderately fire prone	9,377.92	18.46
5.	Less fire prone	28,823.33	56.74
Total		50,798.00	100.00

13.15.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.15.4

Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

MAHARASHTRA

13.15.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Maharashtra has been estimated as given in following table.

Table 13.15.10 Tree Cover in Maharashtra (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
10,806	12,108	1,302

13.15.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.15.11 Extent of TOF in Maharashtra (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
14,758	12,108	26,866

13.15.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Maharashtra is given in the Table 13.15.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.15.13.

Table 13.15.12 Growing Stock in Maharashtra (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	231.76	235.50	3.74	5.37
2.	Growing Stock in TOF	177.12	187.69	10.57	10.55

Table 13.15.13 Diameter class distribution of top five tree species inside RFA in Maharashtra (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Tectona grandis</i>	2,28,206	22,210	369
2.	<i>Terminalia tomentosa</i>	1,02,049	13,564	427
3.	<i>Anogeissus latifolia</i>	56,588	6,184	131
4.	<i>Lannea coromandelica</i>	34,533	5,763	59
5.	<i>Madhuca latifolia</i>	11,486	5,404	563

13.15.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Maharashtra in Rural and Urban areas are given in the Table 13.15.14 and Table 13.15.15 respectively.

Table 13.15.14 Top five tree species in TOF (Rural) in Maharashtra

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	15.37
2.	<i>Mangifera indica</i>	9.69
3.	<i>Acacia arabica</i>	6.53
4.	<i>Tectona grandis</i>	6.47
5.	<i>Terminalia crenulata</i>	5.44

Table 13.15.15 Top five tree species in TOF (Urban) in Maharashtra

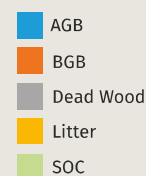
Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	11.80
2.	<i>Mangifera indica</i>	10.48
3.	<i>Azadirachta indica</i>	8.47
4.	<i>Moringa spp.</i>	3.53
5.	<i>Areca triandra</i>	3.31

13.15.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 451.61 million tonnes (1,655.90 million tonnes of CO₂ equivalent) which is 6.27 % of total forest carbon of the country. Pool wise forest carbon in Maharashtra is given in the following table.

Table 13.15.16 Forest Carbon in Maharashtra in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,37,831
2.	BGB	42,353
3.	Dead wood	2,316
4.	Litter	7,928
5.	SOC	2,61,178
Total		4,51,606

**Figure 13.15.5 Forest Carbon in Maharashtra**

MAHARASHTRA

13.15.9 Growing Stock of Bamboo

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

Table 13.15.17 Growing Stock of Bamboo in Maharashtra

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	13,526	9.05
Total number of culms (in millions)	4,117	7.72
Total equivalent green weight (in '000 tonnes)	29,112	7.24

13.15.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.15.18 and Table 13.15.19 respectively.

Table 13.15.18 Major NTFP species in Maharashtra

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Ocimum spp. (Ocimum gratissimum/ Ocimum sanctum/Ocimum tenuiflorum/ Ocimum americanum)</i>	Herbs	68.86
2.	<i>Butea monosperma</i>	Tree	7.51
3.	<i>Helicteres isora</i>	Shrub	5.85
4.	<i>Acacia catechu</i>	Tree	3.43
5.	<i>Syzygium cumini</i>	Tree	3.20

Table 13.15.19 Major invasive species in the State inside the RFA/Green Wash in Maharashtra (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	702
2.	<i>Cassia tora</i>	528
3.	<i>Cyperus rotundus</i>	170
4.	<i>Triumfetta rhomboidea</i>	153
5.	<i>Ageratum conyzoides</i>	87

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

13.16

MANIPUR

Geographical Area

22,327 sq km

Geographical Coordinates

Latitude- 23° 50' N to 25°42' N

Longitude- 92° 59' E to 94°46' E

Population (as per Census 2011)

2.86 million

Urban 0.84 million (29.21 %)

Rural 2.02 million (70.79 %)

Tribal 1.17 million (40.88 %)

Average Population Density

115 per sq km

Livestock population

(as per 19th Live Stock Census)

0.70 million

No. of Districts

9

No. of Hill Districts

9

No. of Tribal Districts

9

Table 13.16.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	2,233	
Reporting area for land utilization	2,166	100.00
Forests	1,685	77.79
Not available for land cultivation	27	1.24
Permanent pastures and other grazing lands	1	0.05
Land under misc. tree crops and groves	6	0.28
Culturable wasteland	1	0.05
Fallow land other than current fallows	0	0.00
Current fallows	0	0.00
Net area sown	446	20.59

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.16.1 Forest Cover

Figure 13.16.1
Forest Cover
of Manipur



**Table 13.16.2 Forest Cover
of Manipur** (in sq km)

Class	Area	% of GA
VDF	904.99	4.05
MDF	6,228.49	27.90
OF	9,464.79	42.39
Total	16,598.27	74.34
Scrub	1,214.98	5.44

Table 13.16.3 District- wise Forest Cover in Manipur (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bishnupur TH	496	0.00	0.78	21.50	22.28	4.49	0.78	2.14
Chandel TH	3,313	11.30	929.21	1,870.56	2,811.07	84.85	-52.28	145.71
Churachandpur TH	4,570	42.19	1,593.15	2,243.70	3,879.04	84.88	-40.47	163.69
Imphal East TH	709	0.00	56.62	207.80	264.42	37.29	-9.84	13.51
Imphal West TH	519	0.00	14.68	37.27	51.95	10.01	0.20	9.40
Senapati TH	3,271	264.74	695.58	1,131.47	2,091.79	63.95	-44.79	317.65
Tamenglong TH	4,391	392.15	1,696.10	1,706.37	3,794.62	86.42	-49.82	194.72
Thoubal TH	514	0.00	1.15	58.20	59.35	11.55	-11.41	11.90
Ukhrul TH	4,544	194.61	1,241.22	2,187.92	3,623.75	79.75	-41.00	356.26
Grand Total	22,327	904.99	6,228.49	9,464.79	16,598.27	74.34	-248.63	1,214.98

13.16.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.16.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Manipur (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
895	5,743	8,195	14,833	10	485	1,270	1,765
6.03%	38.72%	55.25%		0.57%	27.48%	71.95%	

**in case of Manipur, Green Wash boundaries have been used.*

MANIPUR

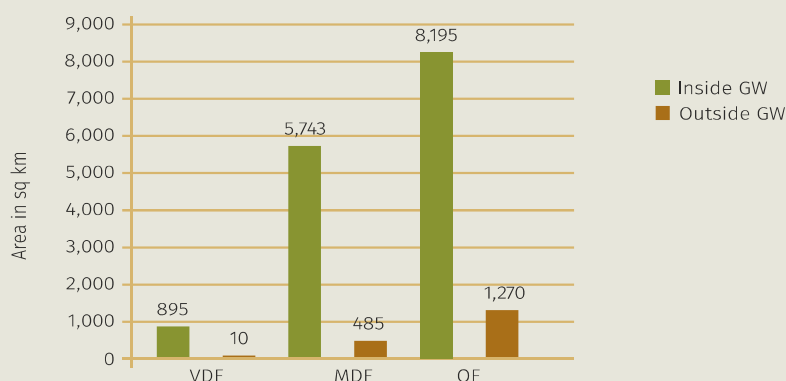


Figure 13.16.2
Forest Cover
Inside and
Outside of Green
Wash in Manipur

Table 13.16.5 Forest Cover Change Matrix for Manipur

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	899	0	0	0	6	905
Moderately Dense Forest	6	6,177	57	15	131	6,386
Open Forest	0	51	9,221	61	223	9,556
Scrub	0	0	81	1,030	70	1,181
Non Forest	0	0	106	109	4,084	4,299
Total ISFR 2021	905	6,228	9,465	1,215	4,514	22,327
Net Change	0	-158	-91	34	215	

Table 13.16.6 Altitude-wise Forest Cover in Manipur

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,303	11	999	2,011	3,021	60
500-1000	9,066	28	2,079	3,639	5,746	447
1000-2000	9,342	517	3,037	3,741	7,295	655
2000-3000	616	349	113	74	536	53
Total	22,327	905	6,228	9,465	16,598	1,215

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

Table 13.16.7 Forest Cover in different slope classes in Manipur

(in sq km)






Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	2,934	28	225	501	754	47
5-10	2,361	87	547	1,097	1,731	137
10-15	3,630	147	955	1,753	2,855	239
15-20	4,275	172	1,237	2,078	3,487	280
20-25	3,902	158	1,246	1,860	3,264	240
25-30	2,753	126	974	1,246	2,346	158
>30	2,472	187	1,044	930	2,161	114
Total	22,327	905	6,228	9,465	16,598	1,215

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

Figure 13.16.3

Forest Cover
Map of
Manipur

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.16.2 Forest Types

The area under different forest types of Manipur as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.16.8 Area statistics of the Forest Types found in Manipur

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2B/C1/2S1 Pioneer Euphorbiaceous scrub	1,263.20	6.93
2.	2B/C2 Cachar semi-evergreen forest	2,852.67	15.65
3.	2/2S1 Secondary moist bamboo brakes	1,324.51	7.27
4.	3C/C3b East Himalayan moist mixed deciduous forest	4,413.95	24.22
5.	8B/C1 East Himalayan subtropical wet hill forest	6,199.75	34.02
6.	8B/C2 <i>Khasi</i> subtropical wet hill forest	423.94	2.33
7.	9/C2 Assam subtropical pine forest	632.86	3.47
8.	11B/C1b <i>Buk</i> oak forest	530.44	2.91
9.	11B/C2 Naga hills wet temperate forest	243.92	1.34
10.	12/DS1 Montane bamboo brakes	13.49	0.07
Sub Total		17,898.73	98.21
11.	TOF/Plantation	129.64	0.71
Total (Forest Cover & Scrub)		18,028.37	
Grassland forest types (outside forest cover)			
12.	4D/2S2 Eastern wet alluvial grassland	135.48	0.74
13.	9/C2/DS1 Assam subtropical pine savannah	60.15	0.34
Sub Total		195.63	1.08
Grand Total		18,224.00	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.16.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.16.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	1,636.46	9.86
2.	Very highly fire prone	6,167.06	37.16
3.	Highly fire prone	5,423.48	32.68
4.	Moderately fire prone	2,096.16	12.62
5.	Less fire prone	1,274.84	7.68
Total		16,598.00	100.00

Figure 13.16.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.16.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Manipur has been estimated as given in following table.

Table 13.16.10 Tree Cover in Manipur (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
173	169	-4

13.16.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.16.11 Extent of TOF Manipur (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,765	169	1,934

13.16.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Manipur is given in the Table 13.16.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.16.13.

MANIPUR

Table 13.16.12 Growing Stock in Manipur

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	42.03	54.99	12.96	1.25
2.	Growing Stock in TOF	6.07	5.10	-0.97	0.29

Table 13.16.13 Diameter class distribution of top five tree species inside RFA in Manipur

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Schima wallichii</i>	30,022	3,002	1,201
2.	<i>Quercus spp.</i>	14,969	1,201	0
3.	<i>Castanopsis spp.</i>	12,609	0	0
4.	<i>Duabanga grandiflora/ sonneratioides</i>	4,804	600	600
5.	<i>Pinus kesiya/insularis</i>	3,575	1,072	0

13.16.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Manipur in Rural and Urban areas are given in the Table 13.16.14 and Table 13.16.15 respectively.

Table 13.16.14 Top five tree species in TOF (Rural) in Manipur

Sl. No.	Species	Relative Abundance (%)
1.	<i>Quercus spp.</i>	15.45
2.	<i>Castanopsis spp.</i>	12.25
3.	<i>Pinus kesiya</i>	10.89
4.	<i>Schima wallichii</i>	10.25
5.	<i>Albizia spp.</i>	3.09

Table 13.16.15 Top five tree species in TOF (Urban) in Manipur

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	12.25
2.	<i>Eucalyptus spp.</i>	7.78
3.	<i>Areca catechu</i>	5.92
4.	<i>Cedrela toona</i>	5.82
5.	<i>Syzygium cumini</i>	5.46

13.16.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 176.93 million tonnes (648.74 million tonnes of CO₂ equivalent) which is 2.46% of total forest carbon of the country. Pool wise forest carbon in Manipur is given in the following table.

Table 13.16.16 Forest Carbon in Manipur in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	47,590
2.	BGB	14,101
3.	Dead wood	880
4.	Litter	2,652
5.	SOC	1,11,708
Total		1,76,931



Figure 13.16.5 Forest Carbon in Manipur

13.16.9 Growing Stock of Bamboo

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

Table 13.16.17 Growing Stock of Bamboo in Manipur

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	8,377	5.61
Total number of culms (in millions)	1,568	2.94
Total equivalent green weight (in '000 tonnes)	11,321	2.82

13.16.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.16.18 and Table 13.16.19 respectively.

Table 13.16.18 Major NTFP species in Manipur

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Embilica officinalis/Phyllanthus</i>	Tree	37.14
2.	<i>Parkia javancia/timoriana</i>	Tree	20.00
3.	<i>Bombax spp./Bombax ceiba</i>	Tree	20.00
4.	<i>Thysanolaena maxima</i>	Herbs	17.14
5.	<i>Acquillaria mallaccensis/Aquilaria agallocha</i>	Tree	5.71

Table 13.16.19 Major invasive species in the State inside the RFA/Green Wash in Manipur

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	49
2.	<i>Mikania micrantha</i>	43
3.	<i>Microcystis aeruginosa</i>	8

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

13.17

MEGHALAYA

Geographical Area

22,429 sq km

Geographical Coordinates

Latitude- 24° 58' N to 26° 07' N

Longitude-89° 48' E to 92° 51' E

Population (as per Census 2011)

2.96 million

Urban 0.59 million (20.07 %)

Rural 2.37 million (79.93 %)

Tribal 2.56 million (21.09 %)

Average Population Density

132 per sq km

Livestock population

(as per 19th Live Stock Census)

1.95 million

No. of Districts

7

No. of Hill Districts

7

No. of Tribal Districts

7

Table 13.17.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	2,243	
Reporting area for land utilization	2,196	100.00
Forests	929	42.30
Not available for land cultivation	254	11.57
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	165	7.51
Culturable wasteland	384	17.49
Fallow land other than current fallows	153	6.97
Current fallows	58	2.64
Net area sown	253	11.52

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.17.1 Forest Cover

Figure 13.17.1
Forest Cover
of Meghalaya



Table 13.17.2 Forest Cover of Meghalaya (in sq km)

Class	Area	% of GA
VDF	560.16	2.50
MDF	9,159.89	40.84
OF	7,326.02	32.66
Total	17046.07	76.00
Scrub	662.89	2.96

Table 13.17.3 District-wise Forest Cover in Meghalaya (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
East Garo Hills TH	2,603	62.81	1,072.48	1,120.63	2,255.92	86.67	-32.04	90.31
East Khasi Hills TH	2,748	21.85	965.82	728.54	1,716.21	62.45	4.02	110.88
Jaintia Hills TH	3,819	126.36	1,424.63	980.01	2,531.00	66.27	-6.89	106.86
Ribhoi TH	2,448	127.38	1,095.66	915.27	2,138.31	87.35	0.97	59.25
South Garo Hills TH	1,887	74.50	977.40	640.02	1,691.92	89.66	-10.28	21.41
West Garo Hills TH	3,677	0.00	1,251.83	1,580.62	2,832.45	77.03	-27.77	76.33
West Khasi Hills TH	5,247	147.26	2,372.07	1,360.93	3,880.26	73.95	-0.73	197.85
Grand Total	22,429	560.16	9,159.89	7,326.02	17,046.07	76.00	-72.72	662.89

13.17.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.17.4 Forest Cover Inside and Outside Recorded Forest Area or (Green Wash) in Meghalaya (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
512	7,652	6,634	14,798	48	1,508	692	2,248
3.46%	51.71%	44.83%		2.14%	67.08%	30.78%	

*in case of Meghalaya, GW boundaries have been used.

MEGHALAYA

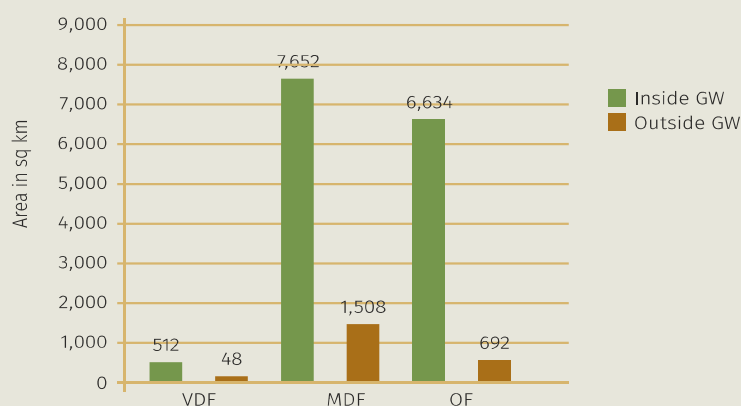


Figure 13.17.2
Forest Cover
Inside and Outside
of GW in
Meghalaya

Table 13.17.5 Forest Cover Change Matrix for Meghalaya

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	487	2	0	0	0	489
Moderately Dense Forest	73	9,112	37	6	39	9,267
Open Forest	0	33	7,244	27	59	7,363
Scrub	0	1	18	576	5	600
Non Forest	0	12	27	54	4,617	4,710
Total ISFR 2021	560	9,160	7,326	663	4,720	22,429
Net Change	71	-107	-37	63	10	

Table 13.17.6 Altitude-wise Forest Cover in Meghalaya

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	10,152	269	4,241	4,070	8,580	229
500-1000	6,239	236	2,622	2,289	5,147	316
1000-2000	6,038	55	2,297	967	3,319	118
Total	22,429	560	9,160	7,326	17,046	663

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

Table 13.17.7 Forest Cover in different slope classes in Meghalaya











(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	6,169	120	1,896	1,622	3,638	154
5-10	6,115	120	2,459	2,095	4,674	180
10-15	4,403	101	1,965	1,602	3,668	137
15-20	2,670	83	1,278	964	2,325	89
20-25	1,488	61	751	517	1,329	57
25-30	806	38	416	272	726	39
>30	778	37	395	254	686	7
Total	22,429	560	9,160	7,326	17,046	663

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

Figure 13.17.3 Forest Cover Map of Meghalaya

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.17.2 Forest Types

The area under different forest types of Meghalaya as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.17.8 Area statistics of the Forest Types found in Meghalaya

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1B/C3 Cachar tropical evergreen forest	1,515.18	8.22
2.	1/2S1 Pioneer Euphorbiaceous scrub	485.43	2.63
3.	2B/C1a Assam alluvial plains semi-evergreen forest	129.03	0.70
4.	2/2S1 Secondary moist bamboo brakes	375.66	2.04
5.	3C/C1a(ii) <i>Khasi</i> hill sal	1,176.82	6.38
6.	3C/C3b East Himalayan moist mixed deciduous forest	8,692.38	47.14
7.	8B/C2 <i>Khasi</i> subtropical wet hill forest	3,593.38	19.49
8.	9/C2 Assam subtropical pine forest	1,169.30	6.34
	Sub Total	17,137.18	92.94
9.	TOF/Plantation	581.44	3.15
	Total (Forest Cover & Scrub)	17,718.62	

MEGHALAYA

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
Grassland forest type (outside forest cover)			
10.	9/C2/DS1 Assam subtropical pine savannah	719.70	3.91
Sub Total		719.70	3.91
Grand Total		18,438.32	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

Table 13.17.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	1,588.24	9.32
2.	Very highly fire prone	3,505.49	20.56
3.	Highly fire prone	3,716.73	21.80
4.	Moderately fire prone	2,900.24	17.02
5.	Less fire prone	5,335.30	31.30
Total		17,046.00	100.00

13.17.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure 13.17.4
Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.17.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Meghalaya has been estimated as given in following table.

Table 13.17.10 Tree Cover in Meghalaya (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
710	698	-12

11.17.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.17.11 Extent of TOF in Meghalaya (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
2,248	698	2,946

13.17.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Meghalaya is given in the Table 13.17.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.17.13.

Table 13.17.12 Growing Stock in Meghalaya (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	31.28	35.54	4.26	0.81
2.	Growing Stock in TOF	18.84	20.82	1.98	1.17

Table 13.17.13 Diameter class distribution of top five tree species inside RFA in Meghalaya (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Schima wallichii</i>	16,460	1,701	73
2.	<i>Pinus kesiya</i>	6,802	1,511	121
3.	<i>Shorea robusta</i>	2,894	429	0
4.	<i>Ficus spp.</i>	1,935	143	70
5.	<i>Artocarpus heterophyllus</i>	855	400	32

MEGHALAYA

13.17.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Meghalaya in Rural and Urban areas are given in the Table 13.17.14 and Table 13.17.15 respectively.

Table 13.17.14 Top five tree species in TOF (Rural) in Meghalaya

Sl. No.	Species	Relative Abundance (%)
1.	<i>Pinus kesiya</i>	23.45
2.	<i>Pinus roxburghii</i>	17.09
3.	<i>Schima wallichii</i>	11.59
4.	<i>Areca catechu</i>	6.79
5.	<i>Pinus pectula</i>	5.71

Table 11.17.15 Top five tree species in TOF (Urban) in Meghalaya

Sl. No.	Species	Relative Abundance (%)
1.	<i>Pinus kesiya</i>	37.98
2.	<i>Pinus pectula</i>	14.18
3.	<i>Pinus roxburghii</i>	8.15
4.	<i>Areca catechu</i>	4.47
5.	<i>Schima khasiana</i>	3.99

13.17.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 183.39 million tonnes (672.43 million tonnes of CO₂ equivalent) which is 2.55 % of total forest carbon of the country. Pool wise forest carbon in Meghalaya is given in the following table.

Table 13.17.16 Forest Carbon in Meghalaya in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	55,241
2.	BGB	15,820
3.	Dead wood	1,238
4.	Litter	3,075
5.	SOC	1,08,014
Total		1,83,388



Figure 13.17.5 Forest Carbon in Meghalaya

13.17.9 Growing Stock of Bamboo

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

Table 13.17.17 Growing Stock of Bamboo in Meghalaya

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	5,007	3.35
Total number of culms (in millions)	2,199	4.12
Total equivalent green weight (in '000 tonnes)	24,745	6.16

13.17.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.17.18 and Table 13.17.19 respectively.

Table 13.17.18 Major NTFP species in Meghalaya

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	Thatch Grass	Herbs	25.99
2.	<i>Careya arborea</i>	Tree	19.49
3.	<i>Terminalia belerica</i>	Tree	15.52
4.	<i>Bauhinia variegata/Phanera varigeta</i>	Tree	11.91
5.	<i>Embilica officinalis/Phyllanthus</i>	Tree	10.11

Table 13.17.19 Major invasive species in the State inside the RFA/Green Wash in Meghalaya

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	73
2.	<i>Lantana camara</i>	21
3.	<i>Mikania micrantha</i>	21
4.	<i>Microcystis aeruginosa</i>	1

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

13.18

MIZORAM

Geographical Area

21,081 sq km

Geographical Coordinates

Latitude- 21° 56' N to 24° 31' N

Longitude- 92° 16' E to 93° 26' E

Population (as per Census 2011)

1.09 million

Urban 0.57 million (52.11 %)

Rural 0.52 million (47.89 %)

Tribal 1.03 million (94.43 %)

Average Population Density

52 per sq km

Livestock population

(as per 19th Live Stock Census)

0.31 million

No. of Districts

8

No. of Hill Districts

8

No. of Tribal Districts

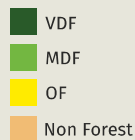
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Table 13.18.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	2,108	
Reporting area for land utilization	2,040	100.00
Forests	1,585	77.70
Not available for land cultivation	75	3.68
Permanent pastures and other grazing lands	11	0.54
Land under misc. tree crops and groves	41	2.01
Culturable wasteland	7	0.34
Fallow land other than current fallows	128	6.27
Current fallows	47	2.30
Net area sown	146	7.16

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.18.1 Forest Cover

Figure 13.18.1
Forest Cover
of MizoramTable 13.18.2 Forest
Cover of Mizoram (in sq km)

Class	Area	% of GA
VDF	156.79	0.74
MDF	5,715.24	27.11
OF	11,947.97	56.68
Total	17,820.00	84.53
Scrub	0.90	0.00

Table 13.18.3 District-wise Forest Cover in Mizoram

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Aizawl TH	3,576	30.30	1,062.67	1,971.90	3,064.87	85.71	-14.04	0.03
Champhai TH	3,185	55.36	942.90	1,375.63	2,373.89	74.53	-113.9	0.11
Kolasib TH	1,382	1.24	166.28	983.88	1,151.40	83.31	-1.15	0.00
Lawngtlai TH	2,557	0.00	700.93	1,479.99	2,180.92	85.29	-19.16	0.07
Lunglei TH	4,536	0.99	1,187.08	2,825.85	4,013.92	88.49	-8.25	0.69
Mamit TH	3,025	52.02	756.74	1,909.94	2,718.70	89.87	1.83	0.00
Saiha TH	1,399	0.00	543.88	628.98	1,172.86	83.84	-12.63	0.00
Serchhip TH	1,421	16.88	354.76	771.80	1,143.44	80.47	-18.21	0.00
Grand Total	21,081	156.79	5,715.24	11,947.97	17,820.00	84.53	-185.51	0.90

13.18.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.18.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Mizoram

(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
156	5,624	11,776	17,556	1	91	172	264
0.89%	32.03%	67.08%		0.38%	34.47%	65.15%	

*in case of Mizoram, Green Wash boundaries have been used.

MIZORAM

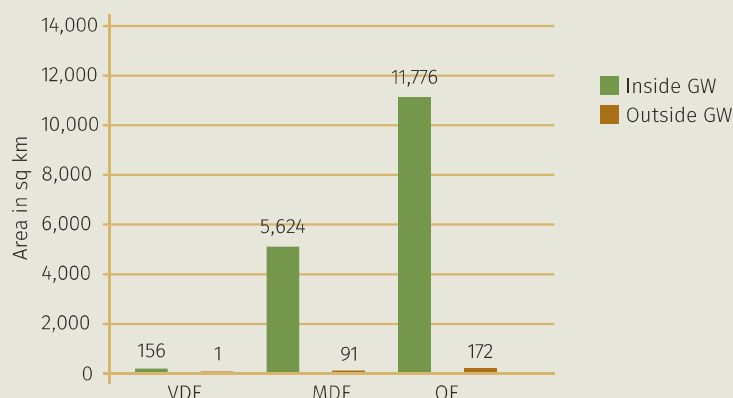


Figure 13.18.2
Forest Cover Inside
and Outside of
Green Wash in
Mizoram

Table 13.18.5 Forest Cover Change Matrix for Mizoram

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	157	0	0	0	0	157
Moderately Dense Forest	0	5,713	1	0	87	5,801
Open Forest	0	0	11,881	0	167	12,048
Scrub	0	0	0	1	0	1
Non Forest	0	2	66	0	3,006	3,074
Total ISFR 2021	157	5,715	11,948	1	3,260	21,081
Net Change	0	-86	-100	0	186	

Table 13.18.6 Altitude-wise Forest Cover in Mizoram

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	9,163	8	1,816	6,186	8,010	0
500-1000	8,205	55	2,641	4,246	6,942	1
1000-2000	3,710	93	1,257	1,516	2,866	0
2000-3000	3	1	1	0	2	0
Total	21,081	157	5,715	11,948	17,820	1

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

Table 13.18.7 Forest Cover in different slope classes in Mizoram











(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,565	7	234	894	1,135	0
5-10	2,668	22	558	1,582	2,162	0
10-15	3,625	34	875	2,119	3,028	0
15-20	4,058	31	1,089	2,339	3,459	1
20-25	3,713	23	1,095	2,096	3,214	0
25-30	2,745	16	876	1,517	2,409	0
>30	2,707	24	988	1,401	2,413	0
Total	21,081	157	5,715	11,948	17,820	1

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

Figure 13.18.3
Forest Cover
Map of Mizoram

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.18.2 Forest Types

The area under different forest types of Mizoram as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.18.8 Area statistics of the Forest Types found in Mizoram (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2B/C1/2S1 Pioneer Euphorbiaceous scrub	74.10	0.41
2.	2B/C2 Cachar semi-evergreen forest	5,580.26	30.99
3.	2/2S1 Secondary moist bamboo brakes	6,600.03	36.65
4.	3C/C3b East Himalayan moist mixed deciduous forest	5,648.50	31.37
5.	8B/C1 East Himalayan subtropical wet hill forest	7.94	0.04
6.	9/C2 Assam subtropical pine forest	92.75	0.52
	Sub Total	18,003.58	99.98
7.	TOF/Plantation	2.83	0.02
	Total (Forest Cover & Scrub)	18,006.41	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

MIZORAM

13.18.3 Fire Prone Forest Areas




Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.18.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	4,683.50	26.28
2.	Very highly fire prone	8,862.58	49.73
3.	Highly fire prone	3,369.82	18.92
4.	Moderately fire prone	543.28	3.05
5.	Less fire prone	360.82	2.02
	Total	17,820.00	100.00

Figure 13.18.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.18.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Mizoram has been estimated as given in following table.

Table 13.18.10 Tree Cover in Mizoram (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
441	444	3

13.18.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.18.11 Extent of TOF in Mizoram (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
264	444	708

13.18.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Mizoram is given in the Table 13.18.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.18.13.

Table 13.18.12 Growing Stock in Mizoram (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	21.30	28.87	7.57	0.66
2.	Growing Stock in TOF	44.11	46.05	1.94	2.59

Table 13.18.13 Diameter class distribution of top five species inside RFA in Mizoram (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Macaranga</i> spp.	15,552	173	0
2.	<i>Schima wallichii</i>	11,628	1,281	46
3.	<i>Albizia</i> spp.	6,050	782	46
4.	<i>Tectona grandis</i>	5,687	792	0
5.	<i>Dysoxylum binectariferum</i>	573	34	92

MIZORAM

13.18.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Mizoram in Rural and Urban areas are given in the Table 13.18.14 and Table 13.18.15 respectively.

Table 13.18.14 Top five tree species in TOF (Rural) Mizoram

Sl. No.	Species	Relative Abundance (%)
1.	<i>Schima wallichii</i>	9.95
2.	<i>Castanopsis</i> spp.	9.57
3.	<i>Quercus</i> spp.	6.59
4.	<i>Macaranga</i> spp.	6.04
5.	<i>Tectona grandis</i>	4.48

Table 13.18.15 Top five tree species in TOF (Urban) in Mizoram

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	14.72
2.	<i>Mangifera indica</i>	12.97
3.	<i>Schima wallichii</i>	6.30
4.	<i>Artocarpus heterophyllus</i>	5.74
5.	<i>Albizia</i> spp.	4.35

13.18.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 158.64 million tonnes (581.68 million tonnes of CO₂ equivalent) which is 2.20% of total forest carbon of the country. Pool wise forest carbon in Mizoram is given in the following table.

Table 13.18.16 Forest Carbon in Mizoram in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	48,157
2.	BGB	10,622
3.	Dead wood	758
4.	Litter	3,140
5.	SOC	95,961
	Total	1,58,638

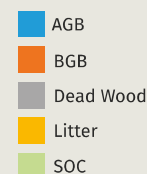


Figure 13.18.5 Forest Carbon in Mizoram

13.18.9 Growing Stock of Bamboo

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

Table 13.18.17 Growing Stock of Bamboo in Mizoram

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	4,561	3.05
Total number of culms (in millions)	1,490	2.79
Total equivalent green weight (in '000 tonnes)	12,585	3.13

13.18.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.18.18 and Table 13.18.19 respectively.

Table 13.18.18 Major NTFP species in Mizoram

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Thysanolaena maxima</i>	Herbs	61.75
2.	<i>Imperata cylindrica</i>	Herbs	10.76
3.	<i>Hedyotes scandens</i>	Shrub	7.17
4.	<i>Parkia javancia/timoriana</i>	Tree	3.59
5.	<i>Embilica officinalis/Phyllanthus</i>	Tree	3.19

Table 13.18.19 Major invasive species in the State inside the RFA/Green Wash in Mizoram (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	23
2.	<i>Mikania micrantha</i>	9
3.	<i>Imperata cylindrica</i>	4

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

13.19

NAGALAND

Geographical Area

16,579 sq km

Geographical Coordinates

Latitude- 25° 10' N to 27° 4' N

Longitude- 93° 15' E to 95° 6' E

Population (as per Census 2011)

1.98 million

Urban 0.57 million (28.86%)

Rural 1.41 million (71.14%)

Tribal 1.71 million (86.48 %)

Average Population Density

119 per sq km

Livestock population

(as per 19th Live Stock Census)

0.91 million

No. of Districts

11

No. of Hill Districts

11

No. of Tribal Districts

11

Table 13.19.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	1,658	
Reporting area for land utilization	1,653	100.00
Forests	863	52.21
Not available for land cultivation	96	5.81
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	90	5.44
Culturable wasteland	66	3.99
Fallow land other than current fallows	109	6.60
Current fallows	44	2.66
Net area sown	385	23.29

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.19.1 Forest Cover



Figure 13.19.1
Forest Cover of
Nagaland

Table 13.19.2 Forest Cover of Nagaland (in sq km)

Class	Area	% of GA
VDF	1,272.04	7.67
MDF	4,449.07	26.84
OF	6,530.03	39.39
Total	12,251.14	73.90
Scrub	824.30	4.97

Table 13.19.3 District-wise Forest Cover in Nagaland

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Dimapur TH	927	23.69	153.56	412.44	589.69	63.61	-2.40	9.23
Kiphire TH	1,130	150.26	266.76	376.46	793.48	70.22	-41.10	72.43
Kohima TH	1,463	134.19	376.40	683.89	1,194.48	81.65	11.82	57.83
Longleng TH	562	0.00	124.13	245.85	369.98	65.83	-2.42	44.05
Mokokchung TH	1,615	1.70	499.69	825.74	1,327.13	82.18	-0.48	68.27
Mon TH	1,786	31.50	418.97	694.07	1,144.54	64.08	-58.28	98.80
Peren TH	1,651	140.05	640.23	627.96	1,408.24	85.30	-6.58	89.39
Phek TH	2,026	272.17	625.46	696.06	1,593.69	78.66	-22.12	101.62
Tuensang TH	2,536	435.15	529.72	638.67	1,603.54	63.23	-96.12	166.64
Wokha TH	1,628	0.76	458.45	858.78	1,317.99	80.96	12.18	50.98
Zunheboto TH	1,255	82.57	355.70	470.11	908.38	72.38	-29.76	65.06
Grand Total	16,579	1,272.04	4,449.07	6,530.03	12,251.14	73.90	-235.26	824.30

13.19.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.19.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Nagaland

(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
1,169	3,203	4,256	8,628	103	1,246	2,274	3,623
13.55%	37.12%	49.33%		2.84%	34.39%	62.77%	

*in case of Nagaland, Green Wash boundaries have been used

NAGALAND

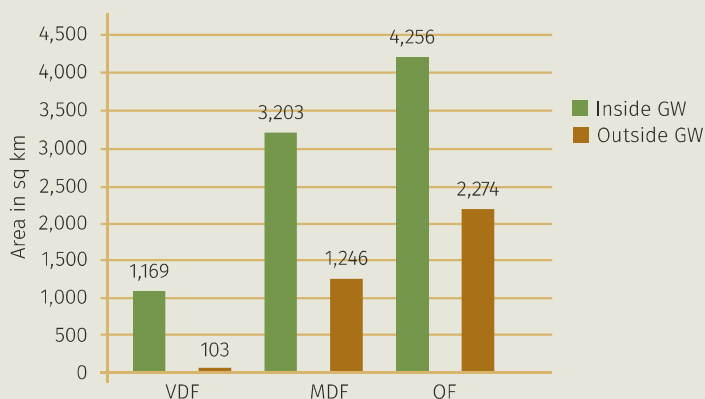


Figure 13.19.2
Forest Cover Inside
and Outside of
Green Wash in
Nagaland

Table 13.19.5 Forest Cover Change Matrix for Nagaland

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,267	0	0	0	6	1,273
Moderately Dense Forest	5	4,432	0	0	97	4,534
Open Forest	0	17	6,368	45	249	6,679
Scrub	0	0	42	582	11	635
Non Forest	0	0	120	197	3,141	3,458
Total ISFR 2021	1,272	4,449	6,530	824	3,504	16,579
Net Change	-1	-85	-149	189	46	

Table 13.19.6 Altitude-wise Forest Cover in Nagaland

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,910	0	989	2,069	3,058	80
500-1000	5,051	8	1,256	2,293	3,557	313
1000-2000	6,520	558	1,969	2,076	4,603	421
2000-3000	1,075	692	228	90	1,010	10
3000-4000	23	14	7	2	23	0
Total	16,579	1,272	4,449	6,530	12,251	824

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

Table 13.19.7 Forest Cover in different slope classes in Nagaland











(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,704	23	318	667	1,008	38
5-10	2,006	78	509	917	1,504	86
10-15	2,804	154	725	1,213	2,092	145
15-20	3,098	219	831	1,260	2,310	176
20-25	2,809	246	784	1,073	2,103	166
25-30	2,115	223	618	757	1,598	121
>30	2,043	329	664	643	1,636	92
Total	16,579	1,272	4,449	6,530	12,251	824

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

Figure 13.19.3
Forest Cover
Map of Nagaland

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.19.2 Forest Types

The area under different forest types of Nagaland as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.19.8 Area statistics of the Forest Types found in Nagaland (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1B/C1 Assam Valley tropical wet evergreen forest (<i>Dipterocarpus</i>)	82.82	0.63
2.	1/2S1 Pioneer Euphorbiaceous scrub	639.37	4.86
3.	2B/C1/2S2 Eastern alluvial secondary semi-evergreen forest	2,353.38	17.90
4.	2/2S1 Secondary moist bamboo brakes	546.69	4.16
5.	3C/C3b East Himalayan moist mixed deciduous forest	5,030.79	38.26
6.	8B/C2 <i>Khasi</i> subtropical wet hill forest	2,148.80	16.34
7.	9/C2 Assam subtropical pine forest	735.33	5.59
8.	11B/C2 Naga hill wet temperate forest	1,446.16	11.00
9.	12/DS1 Montane bamboo brakes	9.16	0.08
	Sub Total	12,992.50	98.82
10.	TOF/Plantation	129.39	0.98
	Total (Forest Cover & Scrub)	13,121.89	

NAGALAND

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
	Grassland forest type (outside forest cover)		
11.	9/C2/DS1 Assam subtropical pine savannah	26.17	0.20
	Grand Total	3,148.06	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.19.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.19.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	352.24	2.88
2.	Very highly fire prone	3,129.20	25.54
3.	Highly fire prone	4,849.90	39.59
4.	Moderately fire prone	2,477.96	20.23
5.	Less fire prone	1,441.70	11.76
	Total	12,251.00	100.00

Figure. 13.19.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.19.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Nagaland has been estimated as given in following table.

Table 13.19.10 Tree Cover in Nagaland (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
362	365	3

13.19.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.19.11 Extent of TOF in Nagaland (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
3,623	365	3,988

13.19.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Nagaland is given in the Table 13.19.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.19.13.

Table 13.19.12 Growing Stock in Nagaland (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	29.52	30.28	0.76	0.69
2.	Growing Stock in TOF	13.72	15.60	1.88	0.88

Table 13.19.13 Diameter class distribution of top five tree species inside RFA in Nagaland (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Schima wallichii</i>	9,748	1,826	0
2.	<i>Macaranga spp.</i>	9,936	228	0

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Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
3.	<i>Quercus</i> spp.	7,707	1,598	0
4.	<i>Ficus</i> spp.	5,897	456	456
5.	<i>Alnus</i> spp.	1,826	913	0

13.19.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Nagaland in Rural and Urban areas are given in the Table 13.19.14 and Table 13.19.15 respectively.

Table 13.19.14 Top five tree species in TOF (Rural) in Nagaland

Sl. No.	Species	Relative Abundance (%)
1.	<i>Schima wallichii</i>	8.46
2.	<i>Alnus nepalensis</i>	5.71
3.	<i>Duabanga grandiflora</i>	5.69
4.	<i>Macaranga</i> spp.	4.37
5.	<i>Livistona jenkinsiana</i>	4.27

Table 13.19.15 Top five tree species in TOF (Urban) in Nagaland

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	12.53
2.	<i>Mangifera indica</i>	11.22
3.	<i>Tectona grandis</i>	5.72
4.	<i>Artocarpus heterophyllus</i>	3.22
5.	<i>Cocos nucifera</i>	2.67

13.19.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 134.93 million tonnes (494.74 million tonnes of CO₂ equivalent) which is 1.87 % of total forest carbon of the country. Pool wise forest carbon in Nagaland is given in the following table.

Table 13.19.16 Forest Carbon in Nagaland in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	39,339
2.	BGB	10,618
3.	Dead wood	854
4.	Litter	2,006
5.	SOC	82,115
	Total	1,34,932

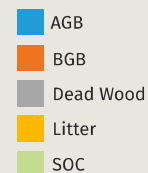


Figure 13.19.5 Forest Carbon in Nagaland

13.19.9 Growing Stock of Bamboo

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

Table 13.19.17 Growing Stock of Bamboo in Nagaland

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	3,947	2.64
Total number of culms (in millions)	2,705	5.07
Total equivalent green weight (in '000 tonnes)	32,402	8.06

13.19.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.19.18 and Table 13.19.19 respectively.

Table 13.19.18 Major NTFP species in Nagaland

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Thysanolaena maxima</i>	Herbs	79.17
2.	<i>Embilial officinalis/Phyllanthus</i>	Tree	8.33
3.	<i>Rhus semialata</i>	Tree	6.25
4.	<i>Oroxylum indicum</i>	Tree	4.17
5.	<i>Litsea citara</i>	Tree	2.08

Table 13.19.19 Major invasive species in the State inside the RFA/Green Wash in Nagaland (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	43
2.	<i>Mikania micrantha</i>	43
3.	<i>Ageratum conyzoides</i>	3
4.	<i>Parthenium hysterophorus</i>	1

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

13.20

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Geographical Area

1,55,707 sq km

Geographical Coordinates

Latitude- 17° 47' N to 22° 34' N

Longitude- 81° 22' E to 87° 29' E

Population (as per Census 2011)

41.97 million

Urban 7.00 million (16.68 %)

Rural 34.97 million (83.32 %)

Tribal 9.59 million (22.85 %)

Average Population Density

270 per sq km

Livestock population

(as per 19th Live Stock Census)

20.73 million

No. of Districts

30

No. of Hill Districts

0

No. of Tribal Districts

12

Table 13.20.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	15,571	
Reporting area for land utilization	15,424	100.00
Forests	5,814	37.69
Not available for land cultivation	2,353	15.26
Permanent pastures and other grazing lands	512	3.32
Land under misc. tree crops and groves	276	1.79
Culturable wasteland	613	3.97
Fallow land other than current fallows	777	5.04
Current fallows	1,216	7.88
Net area sown	3,863	25.05

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.20.1 Forest Cover



Figure 13.20.1
Forest Cover of
Odisha

Table 13.20.2 Forest Cover
of Odisha

(in sq km)

Class	Area	% of GA
VDF	7,212.80	4.63
MDF	20,994.90	13.49
OF	23,948.25	15.38
Total	52,155.95	33.50
Scrub	4,923.70	3.16

Table 13.20.3 District- wise Forest Cover in Odisha

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Angul	6,375	370.53	1,381.34	1,031.51	2,783.38	43.66	0.75	83.30
Balangir	6,575	70.13	223.25	846.73	1,140.11	17.34	4.85	138.72
Baleshwar ^T	3,806	22.98	133.47	228.78	385.23	10.12	2.67	46.65
Bargarh	5,837	175.03	374.33	523.95	1,073.31	18.39	22.85	23.30
Baudh	3,098	262.87	562.45	467.85	1,293.17	41.74	2.23	57.73
Bhadrak	2,505	0.00	8.70	69.10	77.80	3.11	-0.20	0.00
Cuttack	3,932	52.93	235.88	539.48	828.29	21.07	23.91	59.84
Deogarh	2,940	191.14	667.59	618.28	1,477.01	50.24	-0.15	13.90
Dhenkanal	4,452	173.92	419.50	842.10	1,435.52	32.24	-10.09	82.29
Gajapati ^T	4,325	333.48	776.54	1,513.46	2,623.48	60.65	102.11	239.42
Ganjam	8,206	164.45	1,072.39	938.77	2,175.61	26.51	70.21	918.26
Jagatsinghpur	1,668	0.00	4.62	132.18	136.80	8.20	0.52	0.00
Jajapur	2,899	6.00	71.85	231.83	309.68	10.68	3.60	47.00
Jharsuguda	2,114	2.95	174.14	158.28	335.37	15.86	2.73	25.69
Kalahandi ^T	7,920	358.88	732.04	1,348.04	2,438.96	30.79	19.16	442.88
Kandhamal ^T	8,021	661.73	2,607.29	2,134.78	5,403.80	67.37	6.09	552.36
Kendrapara	2,644	83.46	88.43	163.21	335.10	12.67	23.80	1.73
Kendujhar ^T	8,303	289.23	1,418.47	1,511.22	3,218.92	38.77	-3.24	51.62
Khordha	2,813	20.98	186.13	301.05	508.16	18.06	41.07	130.65
Koraput ^T	8,807	57.76	584.52	1,516.69	2,158.97	24.51	60.70	1,141.91
Malkangiri ^T	5,791	158.24	709.97	1,456.25	2,324.46	40.14	-11.71	48.02
Mayurbhanj ^T	10,418	1,335.21	1,717.71	1,046.19	4,099.11	39.35	4.94	32.94
Nabarangpur ^T	5,291	172.35	445.85	540.52	1,158.72	21.90	11.97	47.76
Nayagarh	3,890	188.99	965.56	560.26	1,714.81	44.08	1.06	170.39
Nuapada	3,852	86.26	481.40	721.17	1,288.83	33.46	14.37	96.66
Puri	3,479	0.00	54.13	231.59	285.72	8.21	60.63	3.68

ODISHA

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Rayagada ^T	7,073	373.37	1,145.05	1,622.91	3,141.33	44.41	-5.18	357.91
Sambalpur ^T	6,624	535.74	1,710.22	1,093.97	3,339.93	50.42	47.64	12.84
Subarnapur	2,337	43.46	185.62	167.12	396.20	16.95	45.35	8.98
Sundargarh ^T	9,712	1,020.73	1,856.46	1,390.98	4,268.17	43.95	-5.20	87.27
Grand Total	1,55,707	7,212.80	20,994.90	23,948.25	52,155.95	33.50	537.44	4,923.70

13.20.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.20.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Odisha (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
5,649	14,636	12,401	32,686	1,564	6,359	11,547	19,470
17.28%	44.78%	37.94%		8.03%	32.66%	59.31%	

*in case of Odisha, GW boundaries have been used.

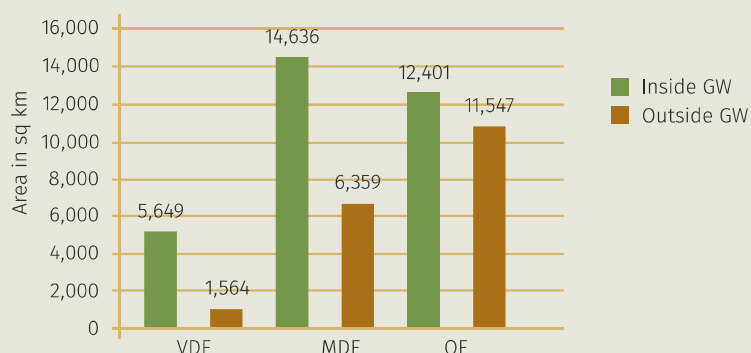


Figure 13.20.2 Forest Cover Inside and Outside of GW in Odisha

Table 13.20.5 Forest Cover Change Matrix for Odisha (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	5,984	736	219	12	19	6,970
Moderately Dense Forest	955	18,388	1,847	144	218	21,552
Open Forest	220	1,422	19,906	676	873	23,097
Scrub	31	233	730	2,808	525	4,327
Non Forest	23	216	1,246	1,284	96,992	99,761
Total ISFR 2021	7,213	20,995	23,948	4,924	98,627	1,55,707
Net Change	243	-557	851	597	-1,134	

Table 13.20.6 Altitude-wise Forest Cover in Odisha (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,19,476	3,609	13,434	16,549	33,592	2,719
500-1000	34,706	3,490	7,323	7,104	17,917	1,897
1000-2000	1,525	114	238	295	647	308
Total	1,55,707	7,213	20,995	23,948	52,156	4,924











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

Table 13.20.7 Forest Cover in different slope classes in Odisha (in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,09,048	1,643	6,504	10,928	19,075	1,754
5-10	15,890	1,538	4,383	3,939	9,860	818
10-15	10,209	1,375	3,689	3,075	8,139	727
15-20	9,130	1,070	2,854	2,531	6,455	654
20-25	6,609	767	1,929	1,836	4,532	500
25-30	3,005	465	1,040	1,041	2,546	297
>30	1,816	355	596	598	1,549	174
Total	1,55,707	7,213	20,995	23,948	52,156	4,924

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

Figure 13.20.3 Forest Cover Map of Odisha

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.20.2 Forest Types

The area under different forest types of Odisha as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.20.8 Area statistics of the Forest Types found in Odisha

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2B/C3 Odisha semi-evergreen forest	79.51	0.14
2.	2/2S1 Secondary moist bamboo brakes	197.10	0.35
3.	3B/C2 Southern moist mixed deciduous forest	1,157.79	2.07
4.	3B/C2/2S1 Southern Secondary moist mixed deciduous forest	400.35	0.72
5.	3C/C1d Peninsular (coastal) sal forest	4.42	0.01
6.	3C/C2e (i) Moist peninsular high level sal	2,425.43	4.33
7.	3C/C2e (ii) Moist peninsular low level sal	11,902.97	21.27
8.	3C/C2e (iii) Moist peninsular valley sal	911.33	1.63
9.	3C/C3/2S1 Northern secondary moist mixed deciduous forest	4,571.39	8.17
10.	4A/L1 Littoral forest	135.02	0.24
11.	4B/TS2 Mangrove forest	250.64	0.45
12.	5A/C1b Dry teak forest	154.86	0.28
13.	5A/C3 Southern dry mixed deciduous forest	5,386.95	9.63
14.	5B/C1c Dry peninsular sal forest	9,469.29	16.92
15.	5B/C2 Northern dry mixed deciduous forest	11,327.16	20.24
16.	5/DS1 Dry deciduous scrub	2,887.03	5.16
17.	5/E2 <i>Boswellia</i> forest	30.97	0.06
18.	5/E9 Dry bamboo brakes	861.00	1.54
	Sub Total	52,153.21	93.21
19.	TOF/ Plantation	3,792.21	6.77
	Total (Forest Cover & Scrub)	55,945.42	
	Grassland forest type (outside forest cover)		
20.	3C/C2/DS1 Moist sal savannah	9.66	0.02
	Grand Total	55,955.08	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

3.20.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.20.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	1,226.66	2.35
2.	Very highly fire prone	3,930.36	7.54
3.	Highly fire prone	7,634.76	14.64
4.	Moderately fire prone	10,086.77	19.34
5.	Less fire prone	29,277.45	56.13
	Total	52,156.00	100.00

Figure 13.20.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.20.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Odisha has been estimated as given in following table.

Table 13.20.10 Tree Cover in Odisha (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
4,648	5,004	356

13.20.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.20.11 Extent of TOF in Odisha (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
19,470	5,004	24,474

13.20.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Odisha is given in the Table 13.20.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.20.13.

ODISHA

Table 13.20.12 Growing Stock in Odisha

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	299.04	276.78	-22.26	6.31
2.	Growing Stock in TOF	95.02	106.87	11.85	6.01

Table 13.20.13 Diameter class distribution of top five tree species inside RFA in Odisha

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	2,10,944	34,744	3,088
2.	<i>Anogeissus latifolia</i>	48,064	7,941	820
3.	<i>Terminalia tomentosa</i>	47,458	8,197	355
4.	<i>Madhuca latifolia</i>	19,269	7,791	888
5.	<i>Schleichera trijuga</i>	10,133	4,817	678

13.20.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Odisha in Rural and Urban areas are given in the Table 13.20.14 and Table 13.20.15 respectively.

Table 13.20.14 Top five tree species in TOF (Rural) in Odisha

Sl. No.	Species	Relative Abundance (%)
1.	<i>Shorea robusta</i>	9.49
2.	<i>Mangifera indica</i>	7.63
3.	<i>Butea monosperma</i>	5.39
4.	<i>Azadirachta indica</i>	5.29
5.	<i>Madhuca latifolia</i>	5.25

Table 13.20.15 Top five tree species in TOF (Urban) in Odisha

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	10.63
2.	<i>Cocos nucifera</i>	8.73
3.	<i>Azadirachta indica</i>	6.59
4.	<i>Moringa species</i>	5.80
5.	<i>Tectona grandis</i>	5.70

13.20.8 Carbon Stock in Forest in Odisha

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 444.83 million tonnes (1,631.04 million tonnes of CO₂ equivalent) which is 6.17 % of total forest carbon of the country. Pool wise forest carbon in Odisha is given in the following table.

Table 13.20.16 Forest Carbon in Odisha in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,31,015
2.	BGB	40,441
3.	Dead wood	2,252
4.	Litter	7,671
5.	SOC	2,63,451
	Total	4,44,830

**Figure 13.20.5 Forest Carbon in Odisha**

13.20.9 Growing Stock of Bamboo

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

Table 13.20.17 Growing Stock of Bamboo in Odisha

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	11,199	7.49
Total number of culms (in millions)	3,973	7.45
Total equivalent green weight (in '000 tonnes)	23,716	5.90

13.20.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.20.18 and Table 13.20.19 respectively.

Table 13.20.18 Major NTFP species in Odisha

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	58.39
2.	<i>Madhuca indica</i>	Tree	15.52
3.	<i>Buchanania Lanza</i>	Tree	12.11
4.	<i>Schleichera oleosa</i>	Tree	3.43
5.	<i>Semecarpus anacardium</i>	Tree	2.23

Table 13.20.19 Major invasive species inside the State of Odisha with RFA/Green Wash in Odisha (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	389
2.	<i>Lantana camara</i>	137
3.	<i>Ageratum conyzoides</i>	124
4.	<i>Acacia farnesiana</i>	62
5.	<i>Dioscorea pentaphylla</i>	9

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

13.21

PUNJAB

Geographical Area

50,362 sq km

Geographical Coordinates

Latitude- 29° 33' N to 32° 32' N

Longitude- 73° 53' E to 76° 56' E

Population (as per Census 2011)

27.74 million

Urban 10.40 million (37.48 %)

Rural 17.34 million (62.52 %)

Tribal NIL

Average Population Density

551 per sq km

Livestock population

(as per 19th Live Stock Census)

8.12 million

No. of Districts

20

No. of Hill Districts

0

No. of Tribal Districts

0

Table 13.21.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	5,036	
Reporting area for land utilization	5,033	100.00
Forests	253	5.03
Not available for land cultivation	540	10.73
Permanent pastures and other grazing lands	5	0.10
Land under misc. tree crops and groves	8	0.16
Culturable wasteland	12	0.24
Fallow land other than current fallows	6	0.12
Current fallows	85	1.69
Net area sown	4,124	81.93

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.21.1 Forest Cover

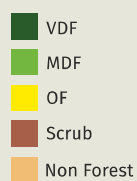


Figure 13.21.1
Forest Cover
of Punjab

**Table 13.21.2 Forest Cover
of Punjab**

(in sq km)

Class	Area	% of GA
VDF	10.58	0.02
MDF	793.11	1.58
OF	1,042.96	2.07
Total	1,846.65	3.67
Scrub	33.89	0.07

Table 13.21.3 District- wise Forest Cover in Punjab

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Amritsar	2,683	1.00	10.47	14.11	25.58	0.95	-1.20	1.22
Barnala	1,482	0.00	1.00	7.22	8.22	0.55	-0.11	0.00
Bathinda	3,353	0.00	18.85	37.59	56.44	1.68	1.01	9.10
Faridkot	1,458	0.00	3.94	14.43	18.37	1.26	-0.11	1.00
Fatehgarh Sahib	1,180	0.00	3.74	0.00	3.74	0.32	0.00	0.00
Firozpur	5,305	0.00	5.65	48.99	54.64	1.03	20.98	2.50
Gurdaspur	3,551	0.00	103.39	107.3	210.69	5.93	-1.63	0.97
Hoshiarpur	3,386	0.00	369.57	347.53	717.10	21.18	-7.10	7.00
Jalandhar	2,624	0.00	1.88	8.20	10.08	0.38	-0.53	1.00
Kapurthala	1,633	0.00	1.93	8.05	9.98	0.61	0.13	1.00
Ludhiana	3,578	0.00	22.86	29.86	52.72	1.47	-6.20	1.21
Mansa	2,198	0.00	0.98	8.94	9.92	0.45	-0.06	0.52
Moga	2,242	0.00	0.00	8.45	8.45	0.38	-0.44	0.00
Muktsar	2,593	0.00	5.97	13.97	19.94	0.77	1.62	0.00
Patiala	3,325	8.13	27.78	38.81	74.72	2.25	-0.09	2.34
Rupnagar	1,356	0.00	105.07	153.99	259.06	19.10	-2.40	3.03
Sahibzada Ajit Singh Nagar	1,094	0.00	74.35	66.04	140.39	12.83	-0.34	3.00
Sangrur	3,625	0.00	6.00	17.34	23.34	0.64	0.51	0.00
Shahid Bhagat Singh Nagar	1,282	0.00	25.45	99.92	125.37	9.78	-6.39	0.00
Tarn Taran	2,414	1.45	4.23	12.22	17.90	0.74	0.37	0.00
Grand Total	50,362	10.58	793.11	1,042.96	1,846.65	3.67	-1.98	33.89

PUNJAB

13.21.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.21.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Punjab (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
10	451	327	788	1	342	716	1,059
1.27%	57.23%	41.50%		0.09%	32.30%	67.71%	

*in case of Punjab, Green Wash boundaries have been used.

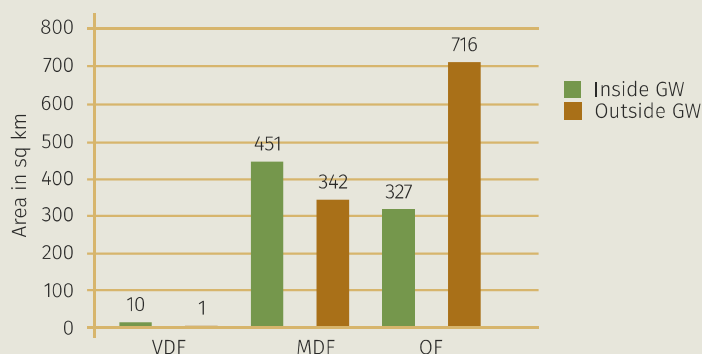


Figure 13.21.2
Forest Cover Inside and Outside of Green Wash in Punjab

Table 13.21.5 Forest Cover Change Matrix for Punjab (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	8	0	0	0	0	8
Moderately Dense Forest	3	792	0	0	6	801
Open Forest	0	1	1,009	0	30	1,040
Scrub	0	0	1	31	1	33
Non Forest	0	0	33	3	48,444	48,480
Total ISFR 2021	11	793	1,043	34	48,481	50,362
Net Change	3	-8	3	1	1	

Table 13.21.6 Altitude-wise Forest Cover in Punjab (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	49,882	11	573	888	1,472	34
500-1000	480	0	220	155	375	0
Total	50,362	11	793	1,043	1,847	34

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

Table 13.21.7 Forest Cover in different slope classes Punjab

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	48,329	10	371	666	1,047	33
5-10	1,582	1	229	220	450	1
10-15	316	0	126	107	233	0
15-20	99	0	48	37	85	0
20-25	26	0	14	9	23	0
25-30	7	0	4	3	7	0
>30	3	0	1	1	2	0
Total	50,362	11	793	1,043	1,847	34

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

Figure 13.21.3

Forest Cover
Map of Punjab

LEGEND

	Very Dense Forest		Water-bodies
	Moderately Dense Forest		International Boundary
	Open Forest		State Boundary
	Scrub		District Boundary
	Non-Forest		Capital

PUNJAB

13.21.2 Forest Types

The area under different forest types of Punjab as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.21.8 Area statistics of the Forest Types found in Punjab (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5B/C2 Northern dry mixed deciduous forest	1,241.19	65.97
2.	5/DS1 Dry deciduous scrub	10.31	0.55
3.	5/E9 Dry bamboo brakes	31.10	1.65
4.	5/1S2 <i>Khair-sissu</i> forest	0.49	0.03
5.	6B/C2 Ravine thorn forest	76.94	4.09
6.	6/1S1 Desert dune scrub	10.26	0.54
7.	9/C1a Lower or Siwalik chir pine forest	27.76	1.47
	Sub Total	1,398.05	74.30
8.	TOF/Plantation	483.52	25.70
	Total (Forest Cover & Scrub)	1,881.57	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.21.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.21.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	53.86	2.92
3.	Highly fire prone	254.95	13.80
4.	Moderately fire prone	375.30	20.32
5.	Less fire prone	1,162.89	62.96
	Total	1,847.00	100.00

Figure 13.21.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.21.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Punjab has been estimated as given in following table.

Table 13.21.10 Tree Cover in Punjab (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
1,592	1,138	-454

13.21.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.21.11 Extent of TOF in Punjab (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,059	1,138	2,197

PUNJAB

13.21.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Punjab is given in the Table 13.21.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.21.13.

Table 13.21.12 Growing Stock in Punjab

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	11.12	12.61	1.49	0.29
2.	Growing Stock in TOF	18.56	20.31	1.75	1.14

Table 13.21.13 Diameter class distribution of top five tree species inside RFA in Punjab

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Prosopis juliflora</i>	14,136	835	56
2.	<i>Acacia catechu</i>	11,241	111	0
3.	<i>Eucalyptus</i> spp.	3,720	1,184	0
4.	<i>Lannea coromandelica</i>	3,367	323	56
5.	<i>Holoptelea integrifolia</i>	2,205	607	0

13.21.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Punjab in Rural and Urban areas are given in the Table 13.21.14 and Table 13.21.15 respectively.

Table 13.21.14 Top five tree species in TOF (Rural) in Punjab

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus</i> spp.	28.16
2.	<i>Melia azadirachta</i>	19.51
3.	<i>Dalbergia sissoo</i>	8.20
4.	<i>Populus</i> spp.	8.19
5.	<i>Morus</i> spp.	3.72

Table 13.21.15 Top five tree species in TOF (Urban) in Punjab

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus</i> spp.	20.48
2.	<i>Melia azadirachta</i>	19.95
3.	<i>Morus</i> spp.	6.92
4.	<i>Dalbergia sissoo</i>	4.13
5.	<i>Azadirachta indica</i>	3.80

13.21.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 13.56 million tonnes (49.72 million tonnes of CO₂ equivalent) which is 0.19 % of total forest carbon of the country. Pool wise forest carbon in Punjab is given in the following table.

Table 13.21.16 Forest Carbon in Punjab in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	3,420
2.	BGB	1,284
3.	Dead wood	56
4.	Litter	175
5.	SOC	8,623
	Total	13,558



Figure 13.21.5 Forest Carbon in Punjab

13.21.9 Growing Stock of Bamboo

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

Table 13.21.17 Growing Stock of Bamboo in Punjab

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	280	0.19
Total number of culms (in millions)	28	0.05
Total equivalent green weight (in '000 tonnes)	113	0.03

13.21.10 Major Invasive Species

Major invasive species as assessed from forest inventory data are presented in the Table 13.21.18.

Table 13.21.18 Major invasive species in the State inside the RFA/Green Wash in Punjab (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	217
2.	<i>Ageratum houstonianum</i>	35
3.	<i>Leucanea leucocephala</i>	28
4.	<i>Senna occidentalis</i>	13
5.	<i>Imperata cylindrica</i>	13

Major invasive species are given in terms of their estimated extent.

13.22

RAJASTHAN

Geographical Area

3,42,239 sq km

Geographical Coordinates

Latitude- 23°4' N to 30° 11' N

Longitude- 69° 29' E to 78° 17' E

Population (as per Census 2011)

68.55 million

Urban 17.05 million (24.87%)

Rural 51.50 million (75.13%)

Tribal 9.24 million (13.48%)

Average Population Density

200 per sq km

Livestock population

(as per 19th Live Stock Census)

57.73 million

No. of Districts

33

No. of Hill Districts

0

No. of Tribal Districts

5

Table 13.22.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	34,224	
Reporting area for land utilization	34,287	100.00
Forests	2,756	8.04
Not available for land cultivation	4,366	12.73
Permanent pastures and other grazing lands	1,673	4.88
Land under misc. tree crops and groves	24	0.07
Culturable wasteland	3,831	11.17
Fallow land other than current fallows	1,992	5.81
Current fallows	1,742	5.08
Net area sown	17,903	52.22

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.22.1 Forest Cover



Figure 13.22.1
Forest Cover of
Rajasthan

**Table 13.22.2 Forest Cover
of Rajasthan** (in sq km)

Class	Area	% of GA
VDF	78.15	0.02
MDF	4,368.65	1.28
OF	12,208.16	3.57
Total	16,654.96	4.87
Scrub	4,808.51	1.41

Table 13.22.3 District- wise Forest Cover in Rajasthan

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Ajmer	8,481	0.00	46.49	285.07	331.56	3.91	26.45	175.72
Alwar	8,380	59.70	334.65	801.56	1,195.91	14.27	-0.75	243.08
Banswara ^T	4,522	0.00	38.52	230.09	268.61	5.94	0.19	60.17
Baran	6,992	0.00	153.66	856.39	1,010.05	14.45	-0.94	98.93
Barmer	28,387	0.00	4.79	284.43	289.22	1.02	-0.57	223.18
Bharatpur	5,066	0.00	26.33	194.73	221.06	4.36	-9.21	77.15
Bhilwara	10,455	0.00	33.31	191.00	224.31	2.15	0.12	189.76
Bikaner	30,239	0.88	28.06	250.77	279.71	0.92	24.10	49.86
Bundi	5,776	1.00	138.98	424.37	564.35	9.77	7.17	172.67
Chittaurgarh	7,822	0.00	222.01	768.04	990.05	12.66	1.25	107.42
Churu	13,835	0.00	2.44	75.25	77.69	0.56	-4.31	27.48
Dausa	3,432	0.00	11.15	105.45	116.60	3.40	-0.40	94.66
Dhaulpur	3,033	0.00	79.75	339.32	419.07	13.82	0.07	76.07
Dungarpur ^T	3,770	0.00	42.53	262.01	304.54	8.08	2.24	83.37
Ganganagar	10,978	0.00	9.87	105.22	115.09	1.05	2.17	15.78
Hanumangarh	9,656	1.01	6.80	85.16	92.97	0.96	3.01	6.71
Jaipur	11,143	12.00	97.20	445.66	554.86	4.98	2.10	272.85
Jaisalmer	38,401	3.56	48.64	270.19	322.39	0.84	-3.38	206.14
Jalor	10,640	0.00	22.67	212.94	235.61	2.21	-32.46	221.89
Jhalawar	6,219	0.00	83.39	353.28	436.67	7.02	1.09	102.57
Jhunjhunun	5,928	0.00	20.79	180.17	200.96	3.39	0.19	179.54
Jodhpur	22,850	0.00	4.26	104.99	109.25	0.48	1.47	163.53
Karauli	5,524	0.00	96.04	747.80	843.84	15.28	-26.16	300.54
Kota	5,217	0.00	153.28	391.55	544.83	10.44	-1.90	135.83
Nagaur	17,718	0.00	14.11	155.65	169.76	0.96	22.72	87.71

RAJASTHAN

(in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Pali	12,387	0.00	211.60	489.26	700.86	5.66	26.01	357.60
Pratapgarh ^T	4,449	0.00	562.97	470.80	1,033.77	23.24	-4.14	59.05
Rajsamand	4,655	0.00	129.94	386.93	516.87	11.10	-4.92	126.06
Sawai Madhopur	4,498	0.00	171.30	293.31	464.61	10.33	1.92	138.52
Sikar	7,732	0.00	31.51	170.67	202.18	2.61	9.12	198.68
Sirohi ^T	5,136	0.00	300.96	597.46	898.42	17.49	-13.49	247.50
Tonk	7,194	0.00	27.72	138.18	165.90	2.31	0.84	68.96
Udaipur ^T	11,724	0.00	1,212.93	1,540.46	2,753.39	23.49	-4.15	239.53
Grand Total	3,42,239	78.15	4,368.65	12,208.16	16,654.96	4.87	25.45	4,808.51

13.22.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.22.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Rajasthan (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
74	3,999	8,487	12,560	4	370	3,721	4,095
0.59%	31.84%	67.57%		0.10%	9.03%	90.87%	

**in case of Rajasthan, RFA boundaries have been used.*

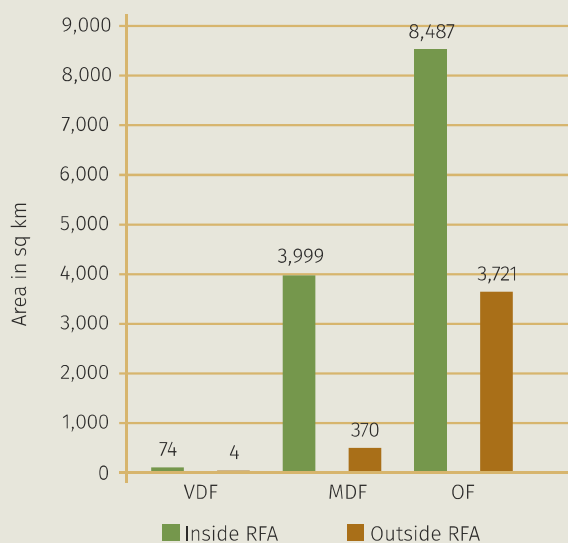


Figure 13.22.2
Forest Cover Inside and Outside of RFA in Rajasthan

Table 13.22.5 Forest Cover Change Matrix for Rajasthan

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	77	1	0	0	0	78
Moderately Dense Forest	1	4,272	36	3	30	4,342
Open Forest	0	88	11,478	253	391	12,210
Scrub	0	1	258	4,064	437	4,760
Non Forest	0	7	436	489	3,19,917	3,20,849
Total ISFR 2021	78	4,369	12,208	4,809	3,20,775	3,42,239
Net Change	0	27	-2	49	-74	

Table 13.22.6 Altitude-wise Forest Cover in Rajasthan

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,24,954	27	2,567	9,384	11,978	4,065
500-1000	17,070	51	1,688	2,776	4,515	739
1000-2000	215	0	114	48	162	5
Total	3,42,239	78	4,369	12,208	16,655	4,809

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

Table 13.22.7 Forest Cover in different slope classes in Rajasthan

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	3,15,978	21	1,569	7,215	8,805	3,471
5-10	15,796	15	849	1,922	2,786	597
10-15	4,729	12	673	1,175	1,860	294
15-20	2,656	11	542	822	1,375	196
20-25	1,650	9	382	565	956	129
25-30	901	6	219	324	549	78
>30	529	4	135	185	324	44
Total	3,42,239	78	4,369	12,208	16,655	4,809

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

RAJASTHAN

Figure 13.22.3 Forest Cover Map of Rajasthan

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.22.2 Forest Types

The area under different forest types of Rajasthan as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.22.8 Area statistics of the Forest Types found in Rajasthan (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5A/C1a Very dry teak forest	1,052.53	4.92
2.	5A/C1b Dry teak forest	45.03	0.22
3.	5B/C2 Northern dry mixed deciduous forest	8,294.34	38.78
4.	5/DS1 Dry deciduous scrub	2,335.13	10.92
5.	5/DS2 Dry savannah forest	2.87	0.01
6.	5/E1 <i>Anogeissus pendula</i> forest	3,162.27	14.78
7.	5/E1/DS1 <i>Anogeissus pendula</i> scrub	523.55	2.45
8.	5/E2 <i>Boswellia</i> forest	151.04	0.71
9.	5/E5 <i>Butea</i> forest	54.34	0.25
10.	5/E6 <i>Aegle</i> forest	1.69	0.01
11.	5/E8a <i>Phoenix</i> savannah	2.03	0.01
12.	5/1S1 Dry tropical riverain forest	49.86	0.23
13.	5/1S2 <i>Khair-sissu</i> forest	304.35	1.42
14.	6B/C1 Desert thorn forest	813.43	3.80
15.	6B/C2 Ravine thorn forest	329.48	1.54
16.	6B/DS1 <i>Ziziphus</i> scrub	164.31	0.77
17.	6B/DS2 Tropical <i>Euphorbia</i> scrub	2.92	0.01
18.	6/E1 <i>Euphorbia</i> scrub	133.47	0.62
19.	6/E2 <i>Acacia senegal</i> forest	46.44	0.22
20.	6/1S1 Desert dune scrub	969.52	4.53
	Sub Total	18,438.60	86.20
21.	TOF/Plantation	2,950.95	13.80
	Total (Forest Cover & Scrub)	21,389.55	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

Table 13.22.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	197.33	1.18
3.	Highly fire prone	366.57	2.20
4.	Moderately fire prone	705.56	4.24
5.	Less fire prone	15,385.54	92.38
	Total	16,655.00	100.00

13.22.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

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Figure 13.22.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.22.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Rajasthan has been estimated as given in following table.

Table 13.22.10 Tree Cover in Rajasthan

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
8,112	8,733	621

13.22.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.22.11 Extent of TOF in Rajasthan

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
4,095	8,733	12,828

13.22.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Rajasthan is given in the Table 13.22.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.22.13.

Table 13.22.12 Growing Stock in Rajasthan (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	24.39	26.56	2.17	0.61
2.	Growing Stock in TOF	89.07	90.63	1.56	5.09

Table 13.22.13 Diameter class distribution of top five tree species inside RFA in Rajasthan (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Anogeissus pendula</i>	51,228	606	27
2.	<i>Butea monosperma</i>	18,945	2,121	53
3.	<i>Boswellia serrata</i>	7,808	3,212	0
4.	<i>Acacia catechu</i>	9,382	122	0
5.	<i>Lannea coromandelica</i>	7,340	1,958	52

13.22.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Rajasthan in Rural and Urban areas are given in the Table 13.22.14 and Table 13.22.15 respectively

Table 13.22.14 Top five tree species in TOF (Rural) in Rajasthan

Sl. No.	Species	Relative Abundance (%)
1.	<i>Prosopis cineraria</i>	22.45
2.	<i>Prosopis juliflora</i>	10.13
3.	<i>Acacia arabica</i>	8.78
4.	<i>Azadirachta indica</i>	8.33
5.	<i>Acacia tortolis</i>	7.40

Table 13.22.15 Top five tree species in TOF (Urban) in Rajasthan

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	23.42
2.	<i>Prosopis juliflora</i>	14.89
3.	<i>Acacia arabica</i>	7.95
4.	<i>Prosopis cineraria</i>	5.92
5.	<i>Zizyphus mauritiana</i>	4.00

13.22.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 110.77 million tonnes (406.16 million tonnes of CO₂ equivalent) which is 1.54 % of total forest carbon of the country. Pool wise forest carbon in Rajasthan is given in the following table.

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Table 13.22.16 Forest Carbon in Rajasthan in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	26,714
2.	BGB	10,803
3.	Dead wood	462
4.	Litter	1,476
5.	SOC	71,319
	Total	1,10,774



Figure 13.22.5 Forest Carbon in Rajasthan

13.22.9 Growing Stock of Bamboo

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

Table 13.22.17 Growing Stock of Bamboo in Rajasthan

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,555	1.04
Total number of culms (in millions)	382	0.72
Total equivalent green weight (in '000 tonnes)	2,640	0.66

13.22.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.22.18 and Table 13.22.19 respectively.

Table 13.22.18 Major NTFP species in Rajasthan

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Butea monosperma</i>	Tree	48.33
2.	<i>Boswellia serrata</i>	Tree	23.15
3.	<i>Diospyros melanoxylon</i>	Tree	10.48
4.	<i>Wrightia arborea/Wrightia tomentosa</i>	Tree	7.30
5.	<i>Aegla Marmelos</i>	Tree	6.36

Table 13.22.19 Major invasive species in the State inside the RFA/Green Wash in Rajasthan (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Cassia tora</i>	192
2.	<i>Lantana camara</i>	108
3.	<i>Senna occidentalis</i>	100
4.	<i>Prosopis juliflora</i>	83
5.	<i>Triumfetta rhomboidea</i>	28

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



13.23

SIKKIM

Geographical Area

7,096 sq km

Geographical Coordinates

Latitude- 27° 04' N to 28° 07' N

Longitude-88° 00' E to 88° 55' E

Population (as per Census 2011)

0.61 million

Urban 0.153 million (25.15 %)

Rural 0.457 million (74.85 %)

Tribal 0.206 million (33.72 %)

Average Population Density

86 per sq km

Livestock population

(as per 19th Live Stock Census)

0.29 million

No. of Districts

4

No. of Hill Districts

4

No. of Tribal Districts

4

Table 13.23.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	710	
Reporting area for land utilization	441	100.00
Forests	334	75.74
Not available for land cultivation	10	2.27
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	4	0.91
Culturable wasteland	4	0.91
Fallow land other than current fallows	5	1.13
Current fallows	7	1.58
Net area sown	77	17.46

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.23.1 Forest Cover

■	VDF
■	MDF
■	OF
■	Scrub
■	Non Forest

Figure 13.23.1
Forest Cover
of Sikkim

**Table 13.23.2 Forest Cover
of Sikkim** (in sq km)

Class	Area	% of GA
VDF	1,101.82	15.53
MDF	1,551.06	21.86
OF	688.15	9.69
Total	3,341.03	47.08
Scrub	296.44	4.18

Table 13.23.3 District- wise Forest Cover in Sikkim

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
East Sikkim TH	954	271.67	313.00	128.60	713.27	74.77	0.55	54.19
North Sikkim TH	4,226	410.36	586.04	285.91	1,282.31	30.34	-1.74	197.17
South Sikkim TH	750	173.39	288.99	108.76	571.14	76.15	-0.68	3.71
West Sikkim TH	1,166	246.40	363.03	164.88	774.31	66.41	0.41	41.37
Grand Total	7,096	1,101.82	1,551.06	688.15	3,341.03	47.08	-1.46	296.44

13.23.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.23.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Sikkim

(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
832	879	343	2,054	270	672	345	1,287
40.51%	42.79%	16.70%		20.98%	52.21%	26.81%	

**in case of Sikkim, RFA boundaries have been used.*

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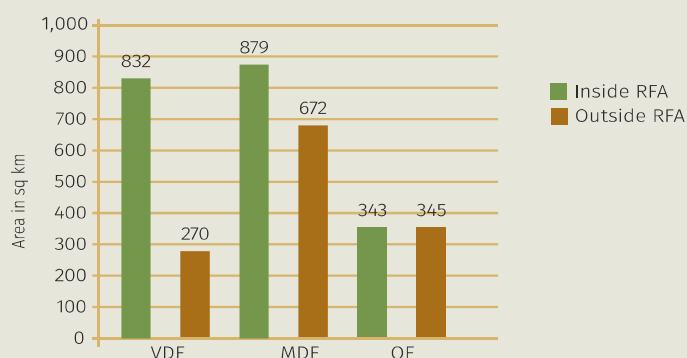


Figure 13.2.2
Forest Cover Inside
and Outside of RFA
in Sikkim

Table 13.23.5 Forest Cover Change Matrix for Sikkim

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,101	1	0	0	0	1,102
Moderately Dense Forest	1	1,550	1	0	0	1,552
Open Forest	0	0	685	1	2	688
Scrub	0	0	1	291	15	307
Non Forest	0	0	1	4	3,442	3,447
Total ISFR 2021	1,102	1,551	688	296	3,459	7,096
Net Change	0	-1	0	-11	12	

Table 13.23.6 Altitude-wise Forest Cover in Sikkim

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	50	0	20	16	36	1
500-1000	375	12	154	95	261	12
1000-2000	1,306	277	572	246	1,095	15
2000-3000	1,155	577	404	91	1,072	7
3000-4000	1,103	230	368	172	770	105
>4000	3,107	6	33	68	107	156
Total	7,096	1,102	1,551	688	3,341	296

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

Table 13.23.7 Forest Cover in different slope classes in Sikkim

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	351	13	16	7	36	8
5-10	554	48	57	25	130	20
10-15	767	109	130	54	293	34
15-20	969	167	211	89	467	45
20-25	1,062	199	266	111	576	50
25-30	1,034	198	275	116	589	18
>30	2,359	368	596	286	1,250	121
Total	7,096	1,102	1,551	688	3,341	296

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

Figure 13.23.3 Forest Cover Map of Sikkim

LEGEND

- Very Dense Forest
- Moderately Dense Forest
- Open Forest
- Scrub
- Non-Forest
- Water-bodies
- International Boundary
- State Boundary
- District Boundary
- Capital

13.23.2 Forest Types

The area under different forest types of Sikkim as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

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Table 13.23.8 Area statistics of the Forest Types found in Sikkim

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3C/C1a(I) East Himalayan sal	69.47	1.84
2.	3C/C3b East Himalayan moist mixed deciduous forest	194.86	5.15
3.	8B/C1 East Himalayan sub-tropical wet hill forest	905.73	23.93
4.	11B/C1b <i>Buk</i> oak forest	874.93	23.11
5.	12/C3a East Himalayan mixed coniferous forest	224.16	5.92
6.	12/DS1 Montane bamboo brakes	7.04	0.19
7.	14/C2 East Himalayan sub-alpine birch/fir forest	912.14	24.09
8.	15/C1 Birch/ <i>Rhododendron</i> scrub forest	128.19	3.39
9.	15/E1 Dwarf <i>Rhododendron</i> scrub	11.44	0.30
10.	15/E2 Dwarf juniper scrub	187.94	4.96
Sub Total		3,515.90	92.88
11.	TOF/Plantation	133.24	3.52
Total (Forest Cover & Scrub)		3,649.14	
Grassland forest type (outside forest cover)			
12.	15/C3 Alpine pastures	136.28	3.60
Grand Total		3,785.42	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.23.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.23.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	25.30	0.76
5.	Less fire prone	3,315.70	99.24
Total		3,341.00	100.00

Figure 13.23.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.23.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Sikkim has been estimated as given in following table.

Table 13.23.10 Tree Cover in Sikkim (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
36	39	3

13.23.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.23.11 Extent of TOF in Sikkim (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,287	39	1,326

13.23.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Sikkim is given in the Table 13.23.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.23.13.

Table 13.23.12 Growing Stock in Sikkim (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	35.32	33.91	-1.41	0.77
2.	Growing Stock in TOF	1.94	1.73	-0.21	0.10

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Table 13.23.13 Diameter class distribution of top five tree species inside RFA in Sikkim (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Schima wallichii</i>	4,073	1,284	97
2.	<i>Castanopsis</i> spp.	2,617	1,720	700
3.	<i>Shorea robusta</i>	2,869	1,127	216
4.	<i>Machilus</i> spp.	620	679	401
5.	<i>Alnus</i> spp.	475	852	100

13.23.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Sikkim in Rural and Urban areas are given in the Table 13.23.14 and Table 13.23.15 respectively.

Table 13.23.14 Top five tree species in TOF (Rural) in Sikkim

Sl. No.	Species	Relative Abundance (%)
1.	<i>Schima wallichii</i>	19.50
2.	<i>Alnus</i> spp.	8.80
3.	<i>Ficus</i> spp.	6.45
4.	<i>Macaranga</i> spp.	5.22
5.	<i>Castanopsis</i> spp.	4.13

Table 13.23.15 Top five tree species in TOF (Urban) in Sikkim

Sl. No.	Species	Relative Abundance (%)
1.	<i>Crypomeria japonica</i>	11.96
2.	<i>Schima wallichii</i>	11.77
3.	<i>Macaranga</i> spp.	9.00
4.	<i>Ficus</i> spp.	7.87
5.	<i>Prunus cornata</i>	5.41

13.23.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 55.54 million tonnes (203.65 million tonnes of CO₂ equivalent) which is 0.77 % of total forest carbon of the country. Pool wise forest carbon in Sikkim is given in the following table.

Table 13.23.16 Forest Carbon in Sikkim in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	18,024
2.	BGB	5,466
3.	Dead wood	498
4.	Litter	607
5.	SOC	30,944
Total		55,539

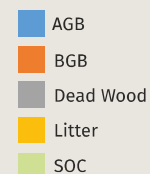


Figure 13.23.5 Forest Carbon in Sikkim

13.23.9 Growing Stock of Bamboo

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

Table 13.23.17 Growing Stock of Bamboo in Sikkim

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	994	0.67
Total number of culms (in millions)	326	0.61
Total equivalent green weight (in '000 tonnes)	624	0.16

13.23.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.23.18 and Table 13.23.19 respectively.

Table 13.23.18 Major NTFP Species in Sikkim

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Nephrolepis</i> spp.	Herbs	81.31
2.	<i>Spondias axillaris</i>	Tree	4.67
3.	<i>Diplagium</i> spp.	Herbs	4.67
4.	<i>Thysanolaena latifolia</i>	Shrub	4.67
5.	<i>Polygonum</i> spp.	Shrub	2.80

Table 13.23.19 Major invasive species in the State inside the RFA/Green Wash in Sikkim (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Glinisoga parviflora</i>	10
2.	<i>Acacia farnesiana</i>	7
3.	<i>Parthenium hysterophorus</i>	2
4.	<i>Solanum viarum</i>	1
5.	<i>Lantana camara</i>	0.44

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

13.24

TAMIL NADU

Geographical Area

1,30,060 sq km

Geographical Coordinates

Latitude- 8° 05' N to 13° 35' N

Longitude-76° 15' E to 80° 20' E

Population (as per Census 2011)

72.15 million

Urban 34.92 million (48.40 %)

Rural 37.23 million (51.60 %)

Tribal 0.79 million (1.10%)

Average Population Density

555 per sq km

Livestock population

(as per 19th Live Stock Census)

22.72 million

No. of Districts

32

No. of Hill Districts

5

No. of Tribal Districts

6

Table 13.24.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	13,006	
Reporting area for land utilization	13,033	100.00
Forests	2,157	16.55
Not available for land cultivation	2,659	20.40
Permanent pastures and other grazing lands	108	0.83
Land under misc. tree crops and groves	226	1.73
Culturable wasteland	320	2.46
Fallow land other than current fallows	1,932	14.82
Current fallows	992	7.61
Net area sown	4,639	35.60

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.24.1 Forest Cover

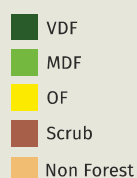


Figure 13.24.1 Forest Cover of Tamil Nadu

Table 13.24.2 Forest Cover of Tamil Nadu (in sq km)

Class	Area	% of GA
VDF	3,593.01	2.76
MDF	11,034.03	8.48
OF	11,792.19	9.07
Total	26,419.23	20.31
Scrub	757.84	0.58

Table 13.24.3 District-wise Forest Cover in Tamil Nadu

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Ariyalur	1,940	0.00	40.38	364.22	404.60	20.86	11.46	6.56
Chennai	175	0.00	6.17	6.50	12.67	7.24	-0.17	0.00
Coimbatore ^h	4,732	360.8	679.98	944.26	1,985.04	41.95	0.40	7.31
Cuddalore	3,703	0.00	47.56	342.68	390.24	10.54	-0.72	17.52
Dharmapuri ^T	4,497	261.85	835.75	605.11	1,702.71	37.86	1.57	15.06
Dindigul	6,036	251.99	782.12	843.86	1,877.97	31.11	3.57	31.9
Erode	5,760	402.17	1,128.56	765.00	2,295.73	39.86	1.27	37.50
Kancheepuram	4,483	0.00	71.79	253.52	325.31	7.26	17.53	40.29
Kanniyakumari ^h	1,684	136.08	570.22	297.30	1,003.60	59.60	0.06	0.58
Karur	2,904	2.24	42.58	73.82	118.64	4.09	0.18	7.48
Krishnagiri	5,129	94.87	827.61	695.47	1,617.95	31.55	0.54	32.76
Madurai ^h	3,710	38.87	232.76	281.59	553.22	14.91	-1.90	33.05
Nagapattinam	2,569	0.00	23.48	133.20	156.68	6.10	-2.51	0.00
Namakkal ^T	3,420	83.41	283.97	213.51	580.89	16.99	1.84	24.25
Perambalur ^T	1,756	10.03	64.81	67.33	142.17	8.10	0.91	18.79
Pudukkottai	4,644	0.77	106.51	269.85	377.13	8.12	12.34	7.30
Ramanathapuram	4,104	0.00	23.84	227.65	251.49	6.13	-5.46	6.25
Salem ^T	5,237	197.62	757.20	516.30	1,471.12	28.09	1.28	33.83
Sivaganga	4,233	0.00	37.60	293.49	331.09	7.82	1.43	5.34
Thanjavur	3,411	0.00	265.02	85.32	350.34	10.27	4.15	0.64
The Nilgiris ^h	2,565	460.67	629.51	641.20	1,731.38	67.50	0.37	8.71
Theni	2,868	183.17	471.06	529.66	1,183.89	41.28	8.60	29.42
Thiruvallur	3,394	11.00	46.10	238.42	295.52	8.71	9.85	51.41
Thiruvaur	2,274	0.46	35.65	33.96	70.07	3.08	2.60	0.00
Tirunelveli ^h	6,693	442.48	566.56	293.46	1,302.50	19.46	2.26	26.08
Tiruppur	5,187	48.28	237.66	560.25	846.19	16.31	1.76	8.81
Tiruvannamalai ^T	6,188	233.64	596.61	482.1	1,312.35	21.21	3.99	71.22

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(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Trichirappalli [†]	4,509	53.53	228.35	193.94	475.82	10.55	4.46	33.61
Tuticorin	4,745	0	25.72	226.25	251.97	5.31	-4.71	69.75
Vellore	6,075	200.98	939.55	684.45	1,824.98	30.04	6.39	76.47
Viluppuram	7,194	79.36	299.05	455.94	834.35	11.60	-23.21	47.01
Virudhunagar	4,241	38.74	130.30	172.58	341.62	8.06	-4.92	8.94
Grand Total	1,30,060	3,593.01	11,034.03	11,792.19	26,419.23	20.31	55.21	757.84

13.24.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.24.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Tamil Nadu

(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
3,320	8,580	5,631	17,531	273	2,454	6,161	8,888
18.94%	48.94%	32.12%		3.07%	27.61%	69.32%	

[†]In case of Tamil Nadu, RFA boundaries have been used.

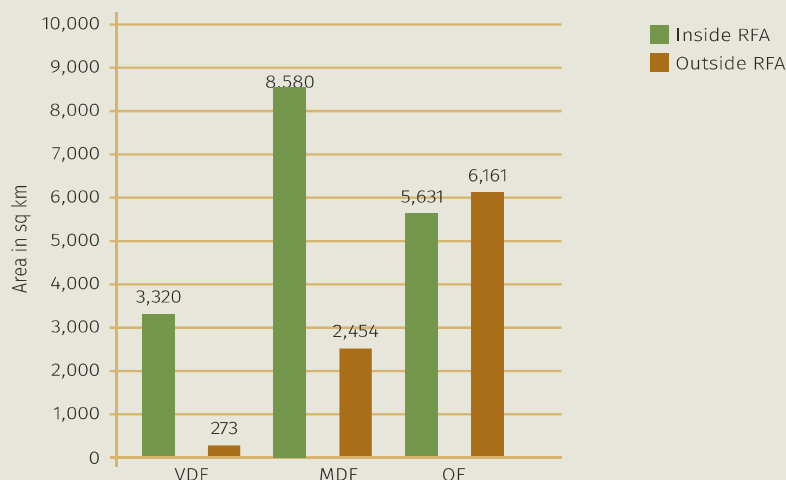


Figure 13.24.2 Forest Cover Inside and Outside of RFA in Tamil Nadu

Table 13.24.5 Forest Cover Change Matrix for Tamil Nadu

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	3,593	8	3	0	1	3,605
Moderately Dense Forest	0	11,017	4	3	6	11,030
Open Forest	0	0	11,563	12	154	11,729
Scrub	0	0	2	711	2	715
Non Forest	0	9	220	32	1,02,720	1,02,981
Total ISFR 2021	3,593	11,034	11,792	758	1,02,883	1,30,060
Net Change	-12	4	63	43	-98	

Table 13.24.6 Altitude-wise Forest Cover in Tamil Nadu

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,11,060	364	5,112	8,631	14,107	598
500-100	13,688	1,810	4,402	2,420	8,632	22
1000-2000	4,437	1,087	1,399	700	3,186	6
2000-3000	875	332	121	41	494	132
Total	1,30,060	3,593	11,034	11,792	26,419	758

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

Table 13.24.7 Forest Cover in different slope classes in Tamil Nadu

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,09,583	334	3,454	7,634	11,422	386
5-10	5,911	529	1,762	1,358	3,649	102
10-15	3,943	584	1,506	876	2,966	55
15-20	3,364	586	1,387	743	2,716	66
20-25	2,856	558	1,229	623	2,410	60
25-30	2,208	484	940	475	1,899	49
>30	2,195	518	756	83	1,357	40
Total	1,30,060	3,593	11,034	11,792	26,419	758

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

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Figure 13.24.3

Forest Cover
Map of Tamil
Nadu

LEGEND

- Very Dense Forest
- Moderately Dense Forest
- Open Forest
- Scrub
- Non-Forest
- Water-bodies
- International Boundary
- State Boundary
- District Boundary
- Capital

13.24.2 Forest Types

The area under different forest types of Tamil Nadu as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.24.8 Area statistics of the Forest Types found in Tamil Nadu

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1A/C3 Southern hilltop tropical evergreen forest	108.55	0.39
2.	1A/C4 West Coast tropical evergreen forest	679.02	2.46
3.	2A/C2 West Coast semi-evergreen forest	410.10	1.49
4.	2A/C3 Tirunelveli semi-evergreen forest	119.82	0.43
5.	2/E3 Moist bamboo brakes	322.88	1.17
6.	3B/C1a Very moist teak forest	58.65	0.21
7.	3B/C1b Moist teak forest	173.79	0.63
8.	3B/C1c Slightly moist teak forest	51.22	0.19
9.	3B/C2 Southern moist mixed deciduous forest	1,249.80	4.53
10.	3B/C2/2S1 Southern secondary moist mixed deciduous forest	260.86	0.94
11.	4A/L1 Littoral forest	7.96	0.03
12.	4B/TS1 Mangrove scrub	27.33	0.10
13.	4B/TS2 Mangrove forest	17.50	0.06
14.	4C/FS2 Submontane hill valley swamp forest	2.12	0.01
15.	4E/RS1 Riparian fringing forest	37.15	0.13
16.	5A/C1a Very dry teak forest	0.90	0.00
17.	5A/C1b Dry teak forest	157.01	0.57
18.	5A/C2 Dry red sanders-bearing forest	10.40	0.04
19.	5A/C3 Southern dry mixed deciduous forest	6,193.06	22.43
20.	5/DS1 Dry deciduous scrub	941.05	3.41
21.	5/DS2 Dry savannah forest	258.73	0.94
22.	5/DS3 <i>Euphorbia</i> scrub	3.28	0.01
23.	5/DS4 Dry grassland	51.21	0.19
24.	5/E4 <i>Hardwickia</i> forest	438.74	1.59
25.	5/E9 Dry bamboo brakes	150.98	0.55
26.	5/1S1 Dry tropical riverain forest	112.74	0.41
27.	5/2S1 Secondary dry deciduous forest	2,734.24	9.90
28.	6A/C1 Southern thorn forest	1,858.24	6.73
29.	6A/C2 Carnatic umbrella thorn forest	1,469.21	5.32
30.	6A/DS1 Southern thorn scrub	514.59	1.86
31.	6A/DS2 Southern <i>Euphorbia</i> scrub	43.50	0.16
32.	7/C1 Tropical dry evergreen forest	309.75	1.12
33.	7/DS1 Tropical dry evergreen scrub	75.99	0.27
34.	8A/C1 Nilgiri sub tropical hill forest	173.08	0.63
35.	8A/C1/DS1 South Indian sub-tropical hill savannah (woodland)	19.07	0.07
36.	8A/E1 Reed brakes (<i>Ochlandra</i>)	3.47	0.01
37.	11A/C1 Southern montane wet temperate forest	186.31	0.67
38.	11A/C1/DS1 Southern montane wet scrub	4.16	0.01

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(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
39.	11A/C1/DS2 Southern montane wet grassland	17.08	0.06
	Sub Total	19,253.54	69.72
40.	TOF/Plantation	7,825.20	28.34
	Total (Forest Cover & Scrub)	27,078.74	
	Grassland forest types (outside forest cover)		
41.	5/DS2 Dry savannah forest	107.68	0.39
42.	5/DS4 Dry grassland	232.84	0.84
43.	11A/C1/DS2 Southern montane wet grassland	194.44	0.71
	Sub Total	534.96	1.94
	Grand Total	27,613.70	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.24.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure. 13.24.4 Fire prone forest areas under different fire prone classes

Table 13.24.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	38.78	0.15
3.	Highly fire prone	470.00	1.78
4.	Moderately fire prone	1,910.94	7.23
5.	Less fire prone	23,999.28	90.84
	Total	26,419.00	100.00

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.24.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Tamil Nadu has been estimated as given in following table.

Table 13.24.10 Tree Cover in Tamil Nadu (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
4,830	4,424	-406

13.24.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.24.11 Extent of TOF in Tamil Nadu (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
8,888	4,424	13,312

13.24.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Tamil Nadu is given in the Table 13.24.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.24.13

Table 13.24.12 Growing Stock in Tamil Nadu (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	96.97	92.27	-4.70	2.10
2.	Growing Stock in TOF	76.30	82.21	5.91	4.62

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Table 13.24.13 Diameter class distribution of top five tree species inside RFA in Tamil Nadu (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Albizzia amara</i>	73,482	2,814	68
2.	<i>Anogeissus latifolia</i>	27,875	2,687	34
3.	<i>Commiphora ostdets</i>	18,806	1,218	34
4.	<i>Tectona grandis</i>	8,096	970	317
5.	<i>Ficus spp.</i>	5,110	640	237

13.24.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Tamil Nadu in Rural and Urban areas are given in the Table 13.24.14 and Table 13.24.15 respectively.

Table 13.24.14 Top five tree species in TOF (Rural) in Tamil Nadu

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	29.47
2.	<i>Azadirachta indica</i>	11.25
3.	<i>Borassus flabelliformis</i>	10.41
4.	<i>Mangifera indica</i>	5.93
5.	<i>Areca catechu</i>	4.49

Table 13.24.15 Top five tree species in TOF (Urban) in Tamil Nadu

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	32.32
2.	<i>Azadirachta indica</i>	13.32
3.	<i>Morinda oleifera</i>	5.25
4.	<i>Mangifera indica</i>	4.16
5.	<i>Borassus flabelliformis</i>	3.66

13.24.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 214.61 million tonnes (786.90 million tonnes of CO₂ equivalent) which is 2.98 % of total forest carbon of the country. Pool wise forest carbon in Tamil Nadu is given in the following table.

Table 13.24.16 Forest Carbon in Tamil Nadu in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	60,459
2.	BGB	20,671
3.	Dead wood	1,198
4.	Litter	3,102
5.	SOC	1,29,183
	Total	2,14,613



Figure 13.24.5 Forest Carbon in Tamil Nadu

13.24.9 Growing Stock of Bamboo

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

Table 13.24.17 Growing Stock of Bamboo in Tamil Nadu

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	4,001	2.68
Total number of culms (in millions)	1,021	1.91
Total equivalent green weight (in '000 tonnes)	9,215	2.29

13.24.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.24.18 and Table 13.24.19 respectively.

Table 13.24.18 Major NTFP Species in Tamil Nadu

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Albizia amara</i>	Tree	73.46
2.	<i>Cymbopogon citrates</i>	Herbs	9.02
3.	<i>Anacardium occidentale</i>	Tree	3.97
4.	<i>Embilica officinalis</i>	Tree	3.08
5.	<i>Tamarindus indica</i>	Tree	2.96

Table 13.24.19 Major invasive species in the State inside the RFA/Green Wash in Tamil Nadu
(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	1,154
2.	<i>Chromolaena odorata</i>	220
3.	<i>Solanum elaeagnifolium</i>	66
4.	<i>Ageratum conyzoides</i>	44
5.	<i>Cuscuta</i> spp.	31

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

13.25

TELANGANA

Geographical Area

1,12,077 sq km

Geographical Coordinates

Latitude-15° 50' N to 19° 55' N

Longitude-77° 14' E to 81° 19' E

Population (as per Census 2011)

35.19 million

Urban 13.61 million (38.88 %)

Rural 21.58 million (61.12 %)

Tribal 3.29 million (9.35 %)

Average Population Density

306 Per Sq km

Livestock population

(as per 19th Live Stock Census)

56.10 million

No. of Districts

10

No. of Hill Districts

0

No. of Tribal Districts

3

Table 13.25.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	11,210	
Reporting area for land utilization	11,208	100.00
Forests	2,698	24.07
Not available for land cultivation	1,441	12.86
Permanent pastures and other grazing lands	299	2.67
Land under misc. tree crops and groves	112	1.00
Culturable wasteland	182	1.62
Fallow land other than current fallows	662	5.91
Current fallows	916	8.17
Net area sown	4,898	43.70

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.25.1 Forest Cover

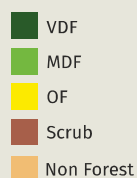


Figure 13.25.1 Forest Cover of Telangana

Table 13.25.2 Forest Cover of Telangana (in sq km)

Class	Area	% of GA
VDF	1,623.90	1.45
MDF	9,118.68	8.14
OF	10,471.40	9.34
Total	21,213.98	18.93
Scrub	2,911.37	2.60

Table 13.25.3 District- wise Forest Cover in Telangana (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Adilabad ^T	16,105	150.25	3,244.05	2,349.12	5,743.42	35.66	22.10	94.56
Hyderabad	217	0.00	4.91	13.09	18.00	8.29	-0.68	2.12
Karimnagar	11,823	74.50	854.59	1,276.93	2,206.02	18.66	217.81	275.42
Khammam ^T	13,266	730.06	2,292.84	1,485.81	4,508.71	33.99	29.57	51.89
Mahbubnagar	18,432	336.32	633.51	1,340.46	2,310.29	12.53	9.24	658.17
Medak	9,699	0.00	120.11	652.19	772.30	7.96	32.99	271.85
Nalgonda	14,240	0.15	23.11	494.93	518.19	3.64	103.75	708.64
Nizamabad	7,956	0.09	253.80	977.98	1,231.87	15.48	35.58	278.32
Rangareddy	7,493	0.02	146.10	659.99	806.11	10.76	35.69	428.24
Warangal ^T	12,846	332.51	1,545.66	1,220.90	3,099.07	24.12	145.62	142.17
Grand Total	1,12,077	1,623.90	9,118.68	10,471.40	21,213.98	18.93	631.67	2,911.37

13.25.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.25.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Telangana (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
1,551	8,651	8,494	18,696	73	468	1,977	2,518
8.30%	46.27%	45.43%		2.90%	18.59%	78.51%	

*in case of Telangana, RFA boundaries have been used.

TELANGANA

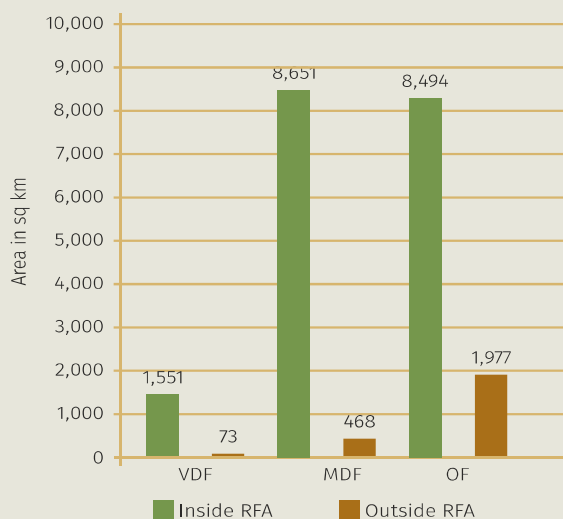


Figure 13.25.2
Forest Cover Inside
and Outside of RFA
in Telangana

Table 13.25.5 Forest Cover Change Matrix for Telangana

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	1,607	1	0	0	0	1,608
Moderately Dense Forest	17	8,748	2	2	18	8,787
Open Forest	0	365	9,706	11	105	10,187
Scrub	0	1	623	2,765	226	3,615
Non Forest	0	4	140	133	87,603	87,880
Total ISFR 2021	1,624	9,119	10,471	2,911	87,952	1,12,077
Net Change	16	332	284	-704	72	

Table 13.25.6 Altitude-wise Forest Cover in Telangana

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	88,743	1,295	7,837	7,758	16,890	2,095
500-1000	23,334	329	1,282	2,713	4,324	816
Total	1,12,077	1,624	9,119	10,471	21,214	2,911

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

Table 13.25.7 Forest Cover in different slope classes in Telangana

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,01,773	927	5,875	7,292	14,094	2,263
5-10	5,542	287	1,429	1,538	3,254	352
10-15	2,243	166	820	760	1,746	142
15-20	1,260	108	506	435	1,049	77
20-25	719	72	289	252	613	44
25-30	357	41	137	128	306	23
>30	183	23	63	66	152	10
Total	1,12,077	1,624	9,119	10,471	21,214	2,911

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

Figure 13.25.3 Forest Cover Map of Telangana

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

TELANGANA

13.25.2 Forest Types

The area under different forest types of Telangana as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.25.8 Area statistics of the Forest Types found in Telangana (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C2 Southern moist mixed deciduous forest	49.23	0.20
2.	5A/C1b Dry teak forest	3,371.64	13.87
3.	5A/C3 Southern dry mixed deciduous forest	14,383.62	59.18
4.	5/DS1 Dry deciduous scrub	5,037.40	20.72
5.	5/DS2 Dry savannah forest	5.04	0.02
6.	5/E2 <i>Boswellia</i> forest	0.77	0.00
7.	5/E4 <i>Hardwickia</i> forest	0.47	0.00
8.	5/E9 Dry bamboo brakes	16.30	0.07
9.	5/2S1 Secondary dry deciduous forest	151.94	0.63
10.	6A/C1 Southern thorn forest	320.41	1.32
11.	6A/DS1 Southern thorn scrub	0.80	0.00
Sub Total		23,337.62	96.01
12.	TOF/Plantation	859.73	3.54
Total (Forest Cover & Scrub)		24,197.35	
Grassland forest type (outside forest cover)			
13.	5/DS4 Dry grassland	108.96	0.45
Grand Total		24,306.31	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.25.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.


Table 13.25.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	571.87	2.70
2.	Very highly fire prone	2,970.26	14.00
3.	Highly fire prone	3,920.18	18.48
4.	Moderately fire prone	3,522.07	16.60
5.	Less fire prone	10,229.62	48.22
Total		21,214.00	100.00

Figure 13.25.4

Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.25.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Telangana has been estimated as given in following table.

Table 13.25.10 Tree Cover in Telangana (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
2,514	2,848	334

13.25.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.25.11 Extent of TOF in Telangana (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
2,518	2,848	5,366

13.25.6 Growing Stock in Telangana

Growing stock in the recorded forest areas (RFA) in Telangana is given in the Table 15.25.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 15.25.13

Table 13.25.12 Growing Stock in Telangana (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	80.96	80.20	-0.76	1.83
2.	Growing Stock in TOF	41.45	43.76	2.31	2.46

TELANGANA

Table 13.25.13 Diameter class distribution of top five tree species inside RFA in Telangana (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Tectona grandis</i>	72,112	4,460	166
2.	<i>Anogeissus latifolia</i>	23,921	2,434	42
3.	<i>Terminalia tomentosa</i>	20,245	3,358	87
4.	<i>Lannea coromandelica</i>	15,285	3,940	83
5.	<i>Madhuca latifolia</i>	3,859	3,113	428

13.25.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Telangana in Rural and Urban areas are given in the Table 13.25.14 and Table 13.25.15 respectively.

Table 13.25.14 Top five tree species in TOF (Rural) in Telangana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	38.93
2.	<i>Azadirachta indica</i>	13.66
3.	<i>Butea monosperma</i>	5.06
4.	<i>Borassus flabelliformis</i>	4.26
5.	<i>Tectona grandis</i>	3.99

Table 13.25.15 Top five tree species in TOF (Urban) in Telangana

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	18.35
2.	<i>Mangifera indica</i>	8.86
3.	<i>Pongamia pinnata</i>	6.84
4.	<i>Tectona grandis</i>	5.32
5.	<i>Cocos nucifera</i>	5.28

13.25.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 161.99 million tonnes (593.96 million tonnes of CO₂ equivalent) which is 2.25 % of total forest carbon of the country. Pool wise forest carbon in Telangana is given in the following table.

Table 13.25.16 Forest Carbon in Telangana in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	44,413
2.	BGB	18,415
3.	Dead wood	675
4.	Litter	2,169
5.	SOC	96,314
Total		1,61,986

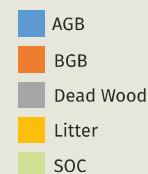


Figure 13.25.5 Forest Carbon in Telangana

13.25.9 Growing Stock of Bamboo

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

Table 13.25.17 Growing Stock of Bamboo in Telangana

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	4,535	3.03
Total number of culms (in millions)	2,008	3.76
Total equivalent green weight (in '000 tonnes)	12,516	3.11

13.24.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.24.18 and Table 13.24.19 respectively.

Table 13.25.18 Major NTFP species in Telangana

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Solanum nigrum</i>	Herbs	15.98
2.	<i>Terminalia belerica</i>	Tree	10.15
3.	<i>Desmodium gangeticum</i>	Shrub	9.72
4.	<i>Strychnos patatorum</i>	Tree	9.29
5.	<i>Strychnos nuxvomica</i>	Tree	9.07

Table 13.25.19 Major invasive species in the State inside the RFA/Green wash in Telangana
(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	133
2.	<i>Chromolaena odorata</i>	128
3.	<i>Senna occidentalis</i>	78
4.	<i>Cassia tora</i>	27
5.	<i>Argemone mexicana</i>	26

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

13.26

TRIPURA

Geographical Area

10,486 sq km

Geographical Coordinates

Latitude- 22° 57' N to 24° 32' N

Longitude- 91° 10' E to 92° 20' E

Population (as per Census 2011)

3.67 million

Urban 0.96 million (26.17 %)

Rural 2.71 million (73.83 %)

Tribal 1.17 million (31.76 %)

Average Population Density

350 per sq km

Livestock population

(as per 19th Live Stock Census)

1.94 million

No. of Districts

4

No. of Hill Districts

4

No. of Tribal Districts

4

Table 13.26.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	1,049	
Reporting area for land utilization	1,049	100.00
Forests	629	59.96
Not available for land cultivation	148	14.11
Permanent pastures and other grazing lands	1	0.10
Land under misc. tree crops and groves	10	0.95
Culturable wasteland	3	0.28
Fallow land other than current fallows	2	0.19
Current fallows	1	0.10
Net area sown	255	24.31

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.26.1 Forest Cover

■	VDF
■	MDF
■	OF
■	Scrub
■	Non Forest

Table 13.26.2 Forest Cover of Tripura (in sq km)

Class	Area	% of GA
VDF	646.76	6.17
MDF	5,211.76	49.70
OF	1,863.00	17.77
Total	7,721.52	73.64
Scrub	33.22	0.32

Figure 13.26.1 Forest Cover of Tripura

Table 13.26.3 District-wise Forest Cover in Tripura (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Dhalai TH	2,400	117.71	1,453.00	406.44	1,977.15	82.38	-6.55	2.55
North Tripura TH	2,036	48.52	1,044.60	387.57	1,480.69	72.73	0.50	18.21
South Tripura TH	3,057	235.28	1,571.31	455.23	2,261.82	73.99	-10.38	0.10
West Tripura TH	2,993	245.25	1,142.85	613.76	2,001.86	66.88	12.36	12.36
Grand Total	10,486	646.76	5,211.76	1,863.00	7,721.52	73.64	-4.07	33.22

13.26.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.25.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Tripura (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
407	3,886	1,140	5,433	240	1,326	723	2,289
7.49%	71.53%	20.98%		10.48%	57.93%	31.59%	

*in case of Tripura, RFA boundaries have been used.

TRIPURA

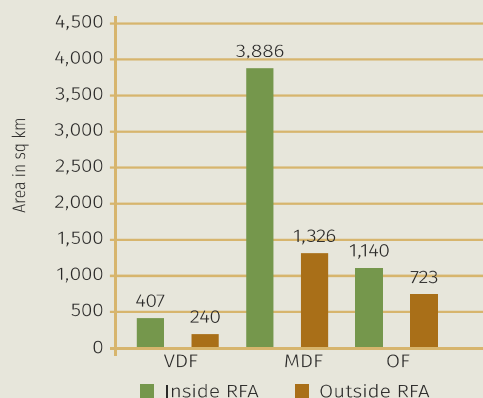


Figure 13.26.2
Forest Cover Inside
and Outside of RFA
in Tripura

Table 13.26.5 Forest Cover Change Matrix for Tripura

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	643	1	1	0	9	654
Moderately Dense Forest	4	5,195	14	0	23	5,236
Open Forest	0	8	1,811	3	14	1,836
Scrub	0	0	0	29	0	29
Non Forest	0	8	37	1	2,685	2,731
Total ISFR 2021	647	5,212	1,863	33	2,731	10,486
Net Change	-7	-24	27	4	0	

Table 13.26.6 Altitude-wise Forest Cover in Tripura

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	10,420	647	5,165	1,846	7,658	30
500-1000	66	0	47	17	64	3
Total	10,486	647	5,212	1,863	7,722	33

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











Table 13.26.7 Forest Cover in different slope classes in Tripura

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	6,067	428	2,422	950	3,800	13
5-10	2,630	172	1,593	466	2,231	4
10-15	1,059	35	720	235	990	3
15-20	446	8	300	123	431	4
20-25	179	2	114	56	172	4
25-30	68	1	41	22	64	3
>30	37	1	22	11	34	2
Total	10,486	647	5,212	1,863	7,722	33

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

Figure 13.26.3 Forest Cover Map of Tripura

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.26.2 Forest Types

The area under different forest types of Tripura as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

TRIPURA

Table 13.26.8 Area statistics of the Forest Types found in Tripura

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2B/C2 Cachar semi-evergreen forest	2,126.56	27.42
2.	2B/C1/2S1 Pioneer Euphorbiaceous scrub	1.15	0.02
3.	2/2S1 Secondary moist bamboo brakes	590.44	7.61
4.	3C/C1b(ii) East Himalayan lower bhabar sal	196.75	2.54
5.	3C/C3b East Himalayan moist mixed deciduous forest	3,052.68	39.37
Sub Total		5,967.58	76.96
6.	TOF/Plantation	1,786.80	23.04
Total (Forest Cover & Scrub)		7,754.38	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.26.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.26.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	2,491.90	32.27
2.	Very highly fire prone	1,249.76	16.18
3.	Highly fire prone	812.80	10.53
4.	Moderately fire prone	641.61	8.31
5.	Less fire prone	2,525.93	32.71
Total		7,722.00	100.00

Figure. 13.26.4 Fire prone forest areas under different fire prone

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.26.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Tripura has been estimated as given in following table.

Table 13.26.10 Tree Cover in Tripura (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
231	228	-3

13.26.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.26.11 Extent of TOF in Tripura (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
2,289	228	2,517

13.26.6 Growing Stock in Tripura

Growing stock in the recorded forest areas (RFA) in Tripura is given in the Table 13.26.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.26.13.

Table 13.26.12 Growing Stock in Tripura (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	19.74	23.13	3.39	0.53
2.	Growing Stock in TOF	6.76	7.46	0.70	0.42

Table 13.26.13 Diameter class distribution of top five tree species inside RFA in Tripura (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Hevea brasiliensis</i>	39,996	2,963	0
2.	<i>Tectona grandis</i>	7,710	1,039	0
3.	<i>Albizia</i> spp.	6,012	1,357	93
4.	<i>Shorea robusta</i>	1,645	348	41
5.	<i>Pterospermum acerifolium</i>	1,500	444	65

TRIPURA

13.26.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Tripura in Rural and Urban areas are given in the Table 13.26.14 and Table 13.26.15 respectively.

Table 13.26.14: Top five tree species in TOF (Rural) in Tripura

Sl. No.	Species	Relative Abundance (%)
1.	<i>Hevea brasiliensis</i>	58.70
2.	<i>Tectona grandis</i>	7.76
3.	<i>Areca catechu</i>	3.95
4.	<i>Schima wallichii</i>	2.62
5.	<i>Syzygium cumini</i>	2.37

Table 13.26.15: Top five tree species in TOF (Urban) in Tripura

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	21.73
2.	<i>Hevea brasiliensis</i>	15.96
3.	<i>Mangifera indica</i>	9.30
4.	<i>Areca triandra</i>	8.93
5.	<i>Cocos nucifera</i>	6.79

13.26.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 74.97 million tonnes (274.89 million tonnes of CO₂ equivalent) which is 1.04% of total forest carbon of the country. Pool wise forest carbon in Tripura is given in the following table

Table 13.26.16 Forest Carbon in Tripura in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	24,349
2.	BGB	5,358
3.	Dead wood	477
4.	Litter	1,486
5.	SOC	43,304
Total		74,974



Figure 13.26.5 Forest Carbon in Tripura

13.26.9 Growing Stock of Bamboo

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

Table 13.26.17 Growing Stock of Bamboo in Tripura

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	4,201	2.81
Total number of culms (in millions)	1,562	2.93
Total equivalent green weight (in '000 tonnes)	12,413	3.09

13.26.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.26.18 and Table 13.26.19 respectively.

Table 13.26.18 Major NTFP species in Tripura

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Thysanolaena maxima</i>	Herbs	89.66
2.	<i>Mucuna pruriens</i>	Climber	10.34

Table 13.26.19 Major invasive species in the State inside the RFA/Green wash in Tripura (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	134
2.	<i>Mikania micrantha</i>	56
3.	<i>Imperata cylindrica</i>	11
4.	<i>Saccharum spontanem</i>	5
5.	<i>Lantana camara</i>	2

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

13.27

UTTAR PRADESH

Geographical Area
2,40,928 sq km

Geographical Coordinates
Latitude- 23° 52' N to 31° 28' N
Longitude-77° 30' E to 84° 39' E

Population (as per Census 2011)
199.81 million
Urban 44.50 million (22.27 %)
Rural 155.31 million (77.73 %)
Tribal 1.13 million (0.57 %)

Average Population Density
829 per sq km

Livestock population
(as per 19th Live Stock Census)
68.71 million

No. of Districts
71

No. of Hill Districts
0

No. of Tribal Districts
1

Table 13.27.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	24,093	
Reporting area for land utilization	24,170	100.00
Forests	1,671	6.91
Not available for land cultivation	3,607	14.92
Permanent pastures and other grazing lands	66	0.27
Land under misc. tree crops and groves	283	1.17
Culturable wasteland	389	1.61
Fallow land other than current fallows	551	2.28
Current fallows	1,061	4.39
Net area sown	16,542	68.45

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.27.1 Forest Cover

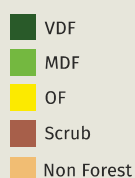


Figure 13.27.1 Forest Cover of Uttar Pradesh

Table 13.27.2 Forest Cover of Uttar Pradesh (in sq km)

Class	Area	% of GA
VDF	2,626.61	1.09
MDF	4,029.37	1.67
OF	8,161.91	3.39
Total	14,817.89	6.15
Scrub	563.38	0.23

Table 13.27.3 District- wise Forest Cover in Uttar Pradesh

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Agra	4,041	0.00	62.68	199.94	262.62	6.50	0.00	75.14
Aligarh	3,650	0.00	7.00	59.75	66.75	1.83	0.00	1.00
Ambedkar Nagar	2,350	0.00	1.00	40.16	41.16	1.75	0.04	0.08
Amroha	2,249	0.00	25.00	61.00	86.00	3.82	0.00	0.00
Auraiya	2,016	0.00	4.96	36.42	41.38	2.05	0.00	10.09
Ayodhya	2,341	6.00	9.99	73.43	89.42	3.82	0.12	0.96
Azamgarh	4,054	0.00	1.03	48.28	49.31	1.22	-0.69	0.00
Baghpat	1,321	0.00	5.00	12.06	17.06	1.29	0.00	0.00
Bahraich	5,237	240.00	156.41	159.70	556.11	10.62	6.01	6.99
Ballia	2,981	0.00	0.00	22.15	22.15	0.74	0.00	0.00
Balrampur	3,349	278.00	156.01	103.40	537.41	16.05	11.40	3.04
Banda	4,408	0.00	55.91	46.00	101.91	2.31	0.00	4.00
Bara Banki	4,402	3.00	6.14	90.29	99.43	2.26	16.36	4.33
Bareilly	4,120	0.00	7.00	38.00	45.00	1.09	0.00	0.00
Basti	2,688	1.00	5.93	24.65	31.58	1.17	2.33	0.03
Bhadohi	1,015	0.00	0.00	3.71	3.71	0.37	0.59	0.00
Bijnor	4,561	37.99	216.63	144.28	398.90	8.75	-4.71	5.52
Budaun	5,168	0.00	8.13	23.91	32.04	0.62	0.00	6.00
Bulandshahr	4,512	0.00	49.72	115.40	165.12	3.66	0.00	0.00
Chandauli	2,541	7.91	183.97	361.60	553.48	21.78	-11.78	2.50
Chitrakoot	3,216	81.30	319.19	231.20	631.69	19.64	45.29	29.84
Deoria	2,540	0.00	1.00	14.21	15.21	0.60	0.00	0.00
Etah	2,431	0.00	0.98	25.20	26.18	1.08	0.00	0.26
Etawah	2,311	0.00	62.75	188.63	251.38	10.88	0.00	45.05
Farrukhabad	2,181	0.00	14.00	33.45	47.45	2.18	0.00	2.00
Fatehpur	4,152	0.00	18.00	35.44	53.44	1.29	0.00	0.00
Firozabad	2,407	0.00	5.00	53.60	58.60	2.43	0.00	26.49

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(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Gautam Buddha Nagar	1,282	0.00	5.00	15.00	20.00	1.56	0.00	0.00
Ghaziabad	1,179	0.00	8.67	16.55	25.22	2.14	0.00	0.00
Ghazipur	3,377	0.00	1.00	28.00	29.00	0.86	0.00	0.00
Gonda	4,003	66.64	8.92	46.28	121.84	3.04	6.98	0.23
Gorakhpur	3,321	27.86	23.10	28.10	79.06	2.38	0.06	0.00
Hamirpur	4,021	0.00	80.00	147.00	227.00	5.65	0.00	14.00
Hardoi	5,986	0.00	16.98	129.80	146.78	2.45	2.93	5.27
Hathras	1,840	0.00	1.00	22.00	23.00	1.25	0.00	0.00
Jalaun	4,565	0.00	60.58	186.73	247.31	5.42	0.00	37.97
Jaunpur	4,038	0.00	10.79	58.64	69.43	1.72	2.41	0.16
Jhansi	5,024	0.00	42.00	262.05	304.05	6.05	0.00	41.96
Kannauj	2,093	0.00	0.00	27.82	27.82	1.33	0.00	0.00
Kanpur Dehat	3,021	0.00	3.00	38.00	41.00	1.36	0.00	9.00
Kanpur Nagar	3,155	0.00	7.00	59.00	66.00	2.09	0.00	3.00
Kasganj	1,955	0.00	7.67	41.13	48.80	2.50	0.00	0.00
Kaushambi	1,779	0.00	5.00	22.83	27.83	1.56	0.00	0.00
Kheri ^T	7,680	804.91	158.21	309.44	1,272.56	16.57	-0.50	4.39
Kushinagar	2,905	0.00	2.62	32.78	35.40	1.22	0.56	0.00
Lalitpur	5,039	0.00	128.89	452.40	581.29	11.54	0.00	33.18
Lucknow	2,528	0.00	162.28	224.92	387.20	15.32	8.33	1.13
Mahoba	3,144	0.00	21.00	149.00	170.00	5.41	0.00	62.00
Mahrajganj	2,952	261.09	94.10	72.57	427.76	14.49	-1.31	0.24
Mainpuri	2,760	0.00	1.00	12.64	13.64	0.49	0.00	0.00
Mathura	3,340	0.00	4.00	53.04	57.04	1.71	0.00	3.52
Mau	1,713	0.00	0.00	11.00	11.00	0.64	0.00	0.00
Meerut	2,559	0.00	34.00	34.41	68.41	2.67	0.00	0.00
Mirzapur	4,405	9.20	281.04	455.87	746.11	16.94	-57.62	51.14
Moradabad	3,718	0.00	5.00	23.00	28.00	0.75	0.00	0.00
Muzaffarnagar	4,008	0.00	14.00	52.03	66.03	1.65	-0.08	0.00
Pilibhit	3,686	471.00	86.52	128.21	685.73	18.60	-1.38	2.11
Pratapgarh	3,717	0.00	31.22	90.22	121.44	3.27	3.62	1.97
Prayagraj	5,482	6.16	26.19	123.92	156.27	2.85	27.06	28.32
Raebareli	4,609	0.00	4.00	89.69	93.69	2.03	0.15	1.32
Rampur	2,367	4.00	26.00	45.00	75.00	3.17	0.00	0.00
Saharanpur	3,689	0.00	174.00	319.18	493.18	13.37	49.92	0.38
Sant Kabir Nagar	1,646	0.00	0.86	13.54	14.40	0.87	0.40	1.00
Shahjahanpur	4,388	26.00	7.00	26.31	59.31	1.35	0.00	1.17
Shravasti	1,640	151.23	91.25	42.89	285.37	17.40	0.83	0.00

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Siddharthnagar	2,895	0.00	8.29	35.09	43.38	1.50	9.30	0.10
Sitapur	5,743	0.00	19.00	190.67	209.67	3.65	0.25	6.30
Sonbhadra	6,905	138.32	940.62	1,357.81	2,436.75	35.29	-103.54	30.18
Sultanpur	4,436	5.00	15.14	187.99	208.13	4.69	-1.90	0.02
Unnao	4,558	0.00	28.00	236.59	264.59	5.80	0.00	0.00
Varanasi	1,535	0.00	1.00	16.91	17.91	1.17	0.81	0.00
Grand Total	2,40,928	2,626.61	4,029.37	8,161.91	14,817.89	6.15	12.24	563.38

13.27.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.27.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Uttar Pradesh (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
2,463	3,002	3,678	9,143	164	1,027	4,484	5,675
26.94%	32.83%	40.23%		2.89%	18.10%	79.01%	

*in case of Uttar Pradesh, Green Wash boundaries have been used.

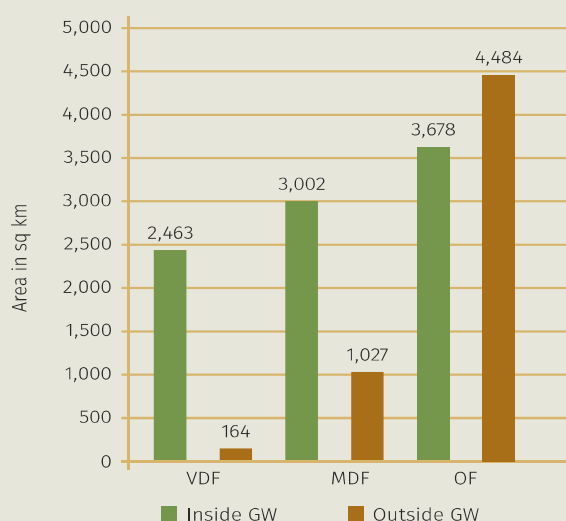


Figure 13.27.2
Forest Cover Inside and Outside of Green Wash in Uttar Pradesh

Table 13.27.5 Forest Cover Change Matrix for Uttar Pradesh

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	2,612	3	1	0	1	2,617
Moderately Dense Forest	13	4,011	31	0	25	4,080
Open Forest	1	12	7,853	19	224	8,109
Scrub	0	0	31	531	25	587
Non Forest	1	3	246	13	2,25,272	2,25,535
Total ISFR 2021	2,627	4,029	8,162	563	2,25,547	
Net Change	10	-51	53	-24	12	

Table 13.27.6 Altitude-wise Forest Cover in Uttar Pradesh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	2,40,458	2,627	3,844	7,955	14,426	562
500-1000	470	0	185	207	392	1
Total	2,40,928	2,627	4,029	8,162	14,818	563

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











Table 13.27.7 Forest Cover in different slope classes in Uttar Pradesh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	2,35,259	2,397	3,103	7,136	12,636	482
5-10	4,405	159	492	629	1,280	56
10-15	730	41	216	206	463	15
15-20	300	16	115	104	235	6
20-25	143	9	61	52	122	3
25-30	60	4	28	22	54	1
>30	31	1	14	13	28	0
Total	2,40,928	2,627	4,029	8,162	14,818	563

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

Figure 13.27.3 Forest Cover Map of Uttar Pradesh

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.27.2 Forest Types

The area under different forest types of Uttar Pradesh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.27.8 Area statistics of the Forest Types found in Uttar Pradesh (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2/E1 Cane brakes	21.75	0.14
2.	3C/C2d (i) Western light alluvium plains sal	1,532.61	9.89
3.	3C/C2d (iii) Eastern heavy alluvium plains sal	638.37	4.12
4.	3C/C3a West Gangetic moist mixed deciduous forest	399.97	2.58
5.	3C/C3/2S1 Northern secondary moist mixed deciduous forest	351.41	2.27
6.	4D/SS2 <i>Barringtonia</i> swamp forest	0.29	0.00
7.	4D/SS3 <i>Syzygium cumini</i> swamp low forest	199.21	1.29

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(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
8.	5A/C1b Dry teak forest	133.70	0.86
9.	5B/C1a Dry Siwalik sal forest	109.09	0.70
10.	5B/C1b Dry plains sal forest	60.87	0.39
11.	5B/C1c Dry peninsular sal forest	345.81	2.23
12.	5B/C2 Northern dry mixed deciduous forest	5,422.03	35.00
13.	5/DS1 Dry deciduous scrub	415.43	2.68
14.	5/DS2 Dry savannah forest	1.97	0.01
15.	5/DS3 <i>Euphorbia</i> scrub	1.03	0.01
16.	5/E1 <i>Anogeissus pendula</i> forest	430.46	2.78
17.	5/E1/DS1 <i>Anogeissus pendula</i> scrub	159.90	1.03
18.	5/E2 <i>Boswellia</i> forest	113.30	0.73
19.	5/E3 <i>Babul</i> forest	40.61	0.26
20.	5/E5 <i>Butea</i> forest	7.72	0.05
21.	5/E8a <i>Phoenix</i> savannah	2.11	0.01
22.	5/E8b <i>Babul</i> savannah	14.46	0.09
23.	5/E9 Dry bamboo brakes	70.63	0.46
24.	5/1S1 Dry tropical riverain forest	0.26	0.00
25.	5/1S2 <i>Khair-sissu</i> forest	153.25	1.00
26.	6B/C2 Ravine thorn forest	799.27	5.16
	Sub Total	11,425.51	73.74
27.	TOF/Plantation	3,966.66	25.61
	Total (Forest Cover & Scrub)	15,392.17	
	Grassland Forest Types (outside forest cover)		
28.	3/1S1 Low alluvial savannah woodland (<i>Salmania-Albizia</i>)	5.06	0.03
29.	4D/2S2 Eastern wet alluvial grassland	96.31	0.62
	Sub Total	101.37	0.65
	Grand Total	15,493.54	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.27.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Figure. 13.27.4
Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

Table 13.27.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	209.30	1.41
2.	Very highly fire prone	1,043.54	7.04
3.	Highly fire prone	1,555.38	10.50
4.	Moderately fire prone	2,070.29	13.97
5.	Less fire prone	9,939.49	67.08
Total		14,818.00	100.00

13.27.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Uttar Pradesh has been estimated as given in following table.

Table 13.27.10 Tree Cover in Uttar Pradesh

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
7,342	7,421	79

13.27.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.27.11 Extent of TOF in Uttar Pradesh

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
5,675	7,421	13,096

13.27.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Uttar Pradesh is given in the Table 13.27.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.27.13

Table 13.27.12 Growing Stock in Uttar Pradesh

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	96.04	104.39	8.35	2.38
2.	Growing Stock in TOF	97.62	106.75	9.13	6.00

Table 13.27.13 Diameter class distribution of top five tree species inside RFA in Uttar Pradesh

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	17,126	19,354	2,779
2.	<i>Tectona grandis</i>	13,220	5,071	181
3.	<i>Lannea coromandelica</i>	7,983	1,281	0
4.	<i>Syzygium cumini</i>	2,971	2,952	344
5.	<i>Terminalia tomentosa</i>	2,243	2,347	215

13.27.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Uttar Pradesh in Rural and Urban areas are given in the Table 13.27.14 and Table 13.27.15 respectively.

Table 13.27.14 Top five tree species in TOF (Rural) in Uttar Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	30.25
2.	<i>Eucalyptus</i> spp.	18.52
3.	<i>Populus</i> spp.	7.74
4.	<i>Azadirachta indica</i>	4.90
5.	<i>Dalbergia sissoo</i>	4.88

Table 13.27.15 Top five tree species in TOF (Urban) in Uttar Pradesh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	15.62
2.	<i>Mangifera indica</i>	12.03
3.	<i>Eucalyptus</i> spp.	10.64
4.	<i>Tectona grandis</i>	4.95
5.	<i>Prosopis juliflora</i>	4.12

13.27.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 117.24 million tonnes (429.88 million tonnes of CO₂ equivalent) which is 1.63 % of total forest carbon of the country. Pool wise forest carbon in Uttar Pradesh is given in the following table.

Table 13.27.16 Forest Carbon in Uttar Pradesh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	32,543
2.	BGB	10,234
3.	Dead wood	534
4.	Litter	1,825
5.	SOC	72,105
Total		1,17,241



Figure 13.27.5 Forest Carbon in Uttar Pradesh

13.27.9 Growing Stock of Bamboo

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

Table 13.27.17 Growing Stock of Bamboo in Uttar Pradesh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,832	1.23
Total number of culms (in millions)	310	0.58
Total equivalent green weight (in '000 tonnes)	1,534	0.38

13.27.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.27.18 and Table 13.27.19 respectively.

Table 13.27.18 Major NTFP species in Uttar Pradesh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Oscimum basilicum</i>	Herbs	81.11
2.	<i>Dasmotachya</i>	Herbs	8.42
3.	<i>Vetiveria zizanioides</i>	Herbs	4.62
4.	<i>Helicteres isora</i>	Shrub	2.57
5.	<i>Adhatoda vasica</i>	Shrub	1.43

Table 13.27.19 Major invasive species in the State inside the RFA/Green Wash in Uttar Pradesh

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	410
2.	<i>Cassia tora</i>	99
3.	<i>Saccharum spontanem</i>	64
4.	<i>Dioscorea pentaphylla</i>	37
5.	<i>Ichnocarpus frutescens</i>	30

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

13.28

UTTARAKHAND

Geographical Area

53,483 sq km

Geographical Coordinates

Latitude- 28° 43' N to 31° 28' N

Longitude- 77° 34' E to 81° 03' E

Population (as per Census 2011)

10.09 million

Urban 3.05 million (30.23 %)

Rural 7.04 million (69.77 %)

Tribal 0.29 million (2.89 %)

Average Population Density

189 per sq km

Livestock population

(as per 19th Live Stock Census)

4.79 million

No. of Districts

13

No. of Hill Districts

13

No. of Tribal Districts

0

Table 13.28.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	5,348	
Reporting area for land utilization	6,005	100.00
Forests	3,812	63.48
Not available for land cultivation	435	7.24
Permanent pastures and other grazing lands	208	3.46
Land under misc. tree crops and groves	394	6.56
Culturable wasteland	324	5.40
Fallow land other than current fallows	86	1.43
Current fallows	73	1.22
Net area sown	673	11.21

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.28.1 Forest Cover



Figure 13.28.1
Forest Cover of
Uttarakhand

Table 13.28.2 Forest Cover of Uttarakhand (in sq km)

Class	Area	% of GA
VDF	5,055.01	9.45
MDF	12,768.05	23.87
OF	6,482.07	12.12
Total	24,305.13	45.44
Scrub	392.37	0.73

Table 13.28.3 District- wise Forest Cover in Uttarakhand (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Almora ^h	3,144	199.09	838.28	682.43	1,719.80	54.70	0.66	6.00
Bageshwar ^h	2,241	161.56	758.66	342.45	1,262.67	56.34	-0.02	1.11
Chamoli ^h	8,030	443.08	1,573.55	693.48	2,710.11	33.75	0.68	1.00
Champawat ^h	1,766	366.88	590.37	266.91	1,224.16	69.32	-1.39	7.35
Dehradun ^h	3,088	663.25	596.85	351.48	1,611.58	52.19	2.89	86.33
Garhwal ^h	5,329	576.62	1,898.76	921.33	3,396.71	63.74	1.72	97.93
Haridwar ^h	2,360	74.47	277.35	232.12	583.94	24.74	-1.31	8.83
Nainital ^h	4,251	772.89	1,719.86	551.74	3,044.49	71.62	2.93	10.09
Pithoragarh ^h	7,090	505.54	960.17	615.04	2,080.75	29.35	0.95	42.09
Rudraprayag ^h	1,984	251.94	578.90	311.46	1,142.30	57.58	0.13	9.12
Tehri Garhwal ^h	3,642	272.89	1,084.17	707.33	2,064.39	56.68	-1.59	98.38
Udham Singh Nagar ^h	2,542	148.17	188.40	91.51	428.08	16.84	-3.71	3.14
Uttarkashi ^h	8,016	618.63	1,702.73	714.79	3,036.15	37.88	0.15	21.00
Grand total	53,483	5,055.01	12,768.05	6,482.07	24,305.13	45.44	2.09	392.37

13.28.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

UTTARAKHAND

Table 13.28.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Uttarakhand (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
4,269	9,241	3,275	16,785	786	3,527	3,207	7,520
25.43%	55.06%	19.51%		10.45%	46.90%	42.65%	

*in case of Uttarakhand, RFA boundaries have been used

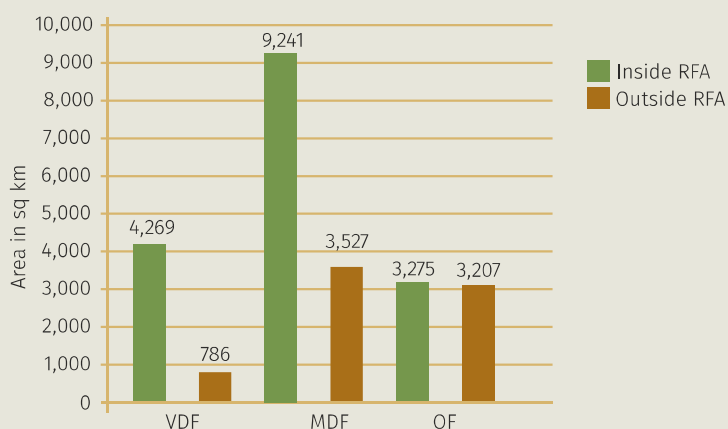


Figure 13.28.2
Forest Cover Inside and Outside of RFA in Uttarakhand

Table 13.28.5 Forest Cover Change Matrix for Uttarakhand

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	5,041	1	2	0	3	5,047
Moderately Dense Forest	12	12,726	34	1	32	12,805
Open Forest	1	32	6,360	11	47	6,451
Scrub	0	0	4	377	2	383
Non Forest	1	9	82	3	28,702	28,797
Total ISFR 2021	5,055	12,768	6,482	392	28,786	53,483
Net Change	8	-37	31	9	-11	

Table 13.28.6 Altitude-wise Forest Cover in Uttarakhand

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	7,937	627	1,627	626	2,880	13
500-1000	5,703	1,198	1,858	902	3,958	103
1000-2000	17,560	1,573	5,157	3,319	10,049	241
2000-3000	7,248	1,552	3,092	1,134	5,778	21
3000-4000	4,193	105	1,033	496	1,634	13
>4000	10,842	0	1	5	6	1
Total	53,483	5,055	12,768	6,482	24,305	392

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

Table 13.28.7 Forest Cover in different slope classes in Uttarakhand (in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	9,446	842	1,460	646	2,948	29
5-10	4,069	487	973	348	1,808	18
10-15	5,688	615	1,503	644	2,762	38
15-20	7,028	730	1,931	925	3,586	59
20-25	7,313	730	2,046	1,053	3,829	70
25-30	6,683	650	1,870	1,026	3,546	68
>30	13,256	1,001	2,985	1,840	5,826	110
Total	53,483	5,055	12,768	6,482	24,305	392

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

Figure 13.28.3 Forest Cover Map of Uttarakhand**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

UTTARAKHAND

13.28.2 Forest Types

The area under different forest types of Uttarakhand as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.28.8 Area statistics of the Forest Types found in Uttarakhand (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3C/C2a Moist Siwalik sal forest	3,402.49	12.84
2.	3C/C2b(I) <i>Bhabar-dun</i> sal forest	251.06	0.95
3.	3C/C2c Moist tarai sal forest	401.60	1.51
4.	3C/C2d(I) Western light alluvium plains sal	165.52	0.62
5.	3C/C3a West Gangetic moist mixed deciduous forest	1,055.48	3.99
6.	4C/FS2 Submontane hill valley swamp forest	0.76	0.00
7.	5B/C1a Dry Siwalik sal forest	455.92	1.72
8.	5B/C1b Dry plains sal forest	8.31	0.03
9.	5B/C2 Northern dry mixed deciduous forest	903.31	3.41
10.	5/DS1 Dry deciduous scrub	39.02	0.15
11.	5/IS2 <i>Khair-sissu</i> forest	252.36	0.95
12.	9/C1a Lower or Siwalik chir pine forest	43.15	0.16
13.	9/C1b Upper or Himalayan chir pine forest	7,295.76	27.52
14.	9/C1/DS1 Himalayan subtropical scrub	379.26	1.43
15.	9/C1/DS2 Subtropical <i>Euphorbia</i> scrub	28.37	0.11
16.	12/C1a <i>Ban</i> oak forest (<i>Q. incana</i>)	3,647.31	13.75
17.	12/C1b <i>Moru</i> oak forest (<i>Q. dilatata</i>)	122.71	0.46
18.	12/C1c Moist deodar forest (<i>Cedrus</i>)	395.23	1.49
19.	12/C1d Western mixed coniferous forest (spruce, blue pine, silver fir)	1,340.10	5.05
20.	12/C1e Moist temperate deciduous forest	202.07	0.76
21.	12/C1f Low-level blue pine forest (<i>P. wallichiana</i>)	27.66	0.10
22.	12/C1/DS1 Oak scrub	29.93	0.11
23.	12/C1/DS2 Himalayan temperate secondary scrub	14.09	0.05
24.	12/C2a <i>Kharsu</i> oak forest (<i>Q. semecarpifolia</i>)	832.04	3.14
25.	12/C2b West Himalayan upper oak/fir forest	1,454.52	5.48
26.	12/C2c Moist temperate deciduous forest	201.57	0.76
27.	12/IS1 Alder forest	8.13	0.03
28.	12/2S1 Low-level blue pine forest	22.49	0.08
29.	13/C2b Dry deodar forest (<i>Cedrus</i>)	194.73	0.73
30.	13/C5 West Himalayan dry juniper forest (<i>J. macropoda</i>)	4.28	0.02
31.	13/IS1 <i>Hippophae/Myricaria</i> scrub	67.66	0.26
32.	14/C1a West Himalayan sub-alpine fir forest	184.29	0.69
33.	14/C1b West Himalayan sub-alpine birch/fir forest	542.11	2.04
34.	14/IS1 <i>Hippophae/Myricaria</i> brakes	20.23	0.08
35.	14/IS2 Deciduous sub-alpine scrub	42.77	0.16
36.	15/C1 Birch/ <i>Rhododendron</i> scrub forest	117.18	0.44
37.	15/E1 Dwarf <i>Rhododendron</i> scrub	12.95	0.05

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
38.	16/C1 Dry alpine scrub	2.78	0.01
39.	16/E1 Dwarf juniper scrub	29.92	0.11
Sub Total		24,199.12	91.24
40.	TOF/Plantation	487.09	1.84
Total (Forest Cover & Scrub)		24,686.21	
Grassland forest types (outside forest cover)			
41.	3C/C2/DS1 Moist sal savannah	8.75	0.03
42.	3/IS1 Low alluvial savannah woodland (<i>Salmania-Albizzia</i>)	3.30	0.01
43.	12/DS2 Himalayan temperate parkland	12.38	0.05
44.	12/DS3 Himalayan temperate pastures	84.66	0.32
45.	14/DS1 Sub-alpine pastures	212.05	0.80
46.	15/C3 Alpine pastures	1,514.99	5.71
Sub Total		1,836.13	6.92
Grand Total		26,522.34	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover have also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.28.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.28.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	49.21	0.20
2.	Very highly fire prone	757.92	3.12
3.	Highly fire prone	4,070.09	16.75
4.	Moderately fire prone	5,887.70	24.22
5.	Less fire prone	13,540.08	55.71
Total		24,305.00	100.00

Figure 13.28.4: Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

UTTARAKHAND

13.28.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Uttarakhand has been estimated as given in following table.

Table 13.28.10 Tree Cover in Uttarakhand (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
841	1,001	160

13.28.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.28.11 Extent of TOF in Uttarakhand (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
7,520	1,001	8,521

13.28.6 Growing Stock in Uttarakhand

Growing stock in the recorded forest areas (RFA) in Uttarakhand is given in the Table 13.28.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.28.13

Table 13.28.12 Growing Stock in Forest (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	406.08	401.01	-5.07	9.14
2.	Growing Stock in TOF	19.13	18.40	-0.73	1.03

Table 13.28.13 Diameter class distribution of top five tree species inside RFA in Uttarakhand (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Pinus roxburghii</i>	1,21,913	52,699	4,755
2.	<i>Quercus leucotrichophora</i>	1,44,165	24,469	2,859
3.	<i>Rhododendron arboreum</i>	74,265	13,344	499
4.	<i>Shorea robusta</i>	45,977	30,513	4,010
5.	<i>Quercus semecarpifolia</i>	7,378	4,927	2,647

13.28.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Uttarakhand in Rural and Urban areas are given in the Table 13.28.14 and Table 13.28.15 respectively.

Table 13.28.14 Top five tree species in TOF (Rural) in Uttarakhand

Sl. No.	Species	Relative Abundance (%)
1.	<i>Grewia oppositifolia</i>	15.70
2.	<i>Quercus leucotrichophora</i>	11.77
3.	<i>Pinus roxburghii</i>	10.95
4.	<i>Mangifera indica</i>	10.22
5.	<i>Ficus</i> spp.	5.46

Table 13.28.15 Top five tree species in TOF (Urban) in Uttarakhand

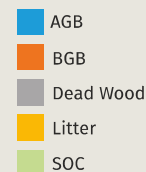
Sl. No.	Species	Relative Abundance (%)
1.	<i>Quercus leucotrichophora</i>	18.81
2.	<i>Mangifera indica</i>	11.62
3.	<i>Cedrus deodara</i>	5.93
4.	<i>Cupressus</i> spp.	3.98
5.	<i>Pinus roxburghii</i>	3.72

13.28.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 378.16 million tonnes (1,386.59 million tonnes of CO₂ equivalent) which is 5.25 % of total forest carbon of the country. Pool wise forest carbon in Uttarakhand is given in the following table.

Table 13.28.16 Forest Carbon in Uttarakhand in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	1,59,674
2.	BGB	42,893
3.	Dead wood	3,561
4.	Litter	5,184
5.	SOC	1,66,847
Total		3,78,159

**Figure 13.28.5** Forest Carbon in Uttarakhand

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13.28.9 Growing Stock of Bamboo

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

Table 13.28.17 Growing Stock of Bamboo in Uttarakhand

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,201	0.80
Total number of culms (in millions)	301	0.56
Total equivalent green weight (in '000 tonnes)	2,839	0.71

13.28.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.28.18 and Table 13.28.19 respectively.

Table 13.28.18 Major NTFP species in Uttarakhand

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Rhododendron arborium</i>	Tree	68.97
2.	<i>Myrica esculenta</i>	Tree	16.42
3.	<i>Lannea coromandelica</i>	Tree	5.66
4.	<i>Ehretia laevis</i>	Tree	4.06
5.	<i>Taxus baccata</i>	Tree	1.32

Table 13.28.19 Major invasive species in the State with RFA/Green Wash in Uttarakhand

Sl. No.	Species	Estimated Extent (in sq km)
1.	<i>Lantana camara</i>	323
2.	<i>Ageratina adenophora</i>	145
3.	<i>Saccharum spontanem</i>	56
4.	<i>Cassia tora</i>	22
5.	<i>Acacia farnesiana</i>	16

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

13.29

WEST BENGAL

Geographical Area

88,752 sq km

Geographical Coordinates

Latitude- 21° 29' N to 27° 13' N

Longitude- 85° 50' E to 89° 52' E

Population (as per Census 2011)

91.27 million

Urban 29.09 million (11.29 %)

Rural 62.18 million (88.71 %)

Tribal 5.30 million (5.80 %)

Average Population Density

1,028 per sq km

Livestock population

(as per 19th Live Stock Census)

30.35 million

No. of Districts

19

No. of Hill Districts

1

No. of Tribal Districts

12

Table 13.29.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	8,875	
Reporting area for land utilization	8,684	100.00
Forests	1,175	13.53
Not available for land cultivation	1,882	21.67
Permanent pastures and other grazing lands	2	0.02
Land under misc. tree crops and groves	48	0.56
Culturable wasteland	14	0.16
Fallow land other than current fallows	8	0.09
Current fallows	308	3.55
Net area sown	5,247	60.42

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.29.1 Forest Cover

■	VDF
■	MDF
■	OF
■	Scrub
■	Non Forest

Figure 13.29.1
Forest Cover of
West Bengal

**Table 13.29.2 Forest Cover
of West Bengal** (in sq km)

Class	Area	% of GA
VDF	3,036.51	3.42
MDF	4,208.37	4.74
OF	9,586.99	10.80
Total	16,831.87	18.96
Scrub	155.72	0.18

Table 13.29.3 District- wise Forest Cover in West Bengal

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bankura ^T	6,882	226.34	411.67	641.36	1,279.37	18.59	-6.21	34.50
Bardhaman ^T	7,024	61.17	89.76	189.75	340.68	4.85	1.37	6.67
Birbhum ^T	4,545	1.00	34.13	148.42	183.55	4.04	-1.25	7.20
Cooch Behar	3,387	0.00	27.00	322.06	349.06	10.31	0.00	0.00
Dakshin Dinajpur ^T	2,219	0.00	5.86	81.68	87.54	3.95	0.42	0.00
Darjeeling TH	3,149	721.05	682.05	946.78	2,349.88	74.62	-17.92	8.75
Hooghly	3,149	0.00	14.00	145.80	159.80	5.07	-0.20	0.00
Howrah	1,467	0.00	50.00	253.77	303.77	20.71	0.00	0.00
Jalpaiguri ^T	6,227	734.95	433.83	1,666.59	2,835.37	45.53	-27.03	39.35
Kolkata	185	0.00	0.00	1.00	1.00	0.54	0.00	0.00
Malda ^T	3,733	0.00	208.10	280.80	488.90	13.10	-2.79	0.00
Murshidabad ^T	5,324	0.00	52.33	291.15	343.48	6.45	-1.41	0.12
Nadia	3,927	1.00	160.13	318.84	479.97	12.22	-0.03	0.00
North 24 Parganas	4,094	13.02	184.98	524.98	722.98	17.66	0.00	0.00
Paschim Medinipur ^T	9,368	256.64	600.40	1,284.97	2,142.01	22.87	-19.53	27.03
Purba Medinipur ^T	4,713	1.99	198.01	619.89	819.89	17.40	-0.16	2.50
Purulia ^T	6,259	37.38	307.36	574.50	919.24	14.69	3.36	28.60
South 24 Parganas ^T	9,960	981.97	744.77	1,063.97	2,790.71	28.02	2.00	1.00
Uttar Dinajpur	3,140	0.00	3.99	230.68	234.67	7.47	-0.26	0.00
Grand Total	88,752	3,036.51	4,208.37	9,586.99	16,831.87	18.96	-69.64	155.72

13.29.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

WEST BENGAL

Table 13.29.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in West Bengal (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
2,624	2,391	2,097	7,112	413	1,817	7,490	9,720
36.90%	33.62%	29.48%		4.25%	18.69%	77.06%	

*in case of West Bengal, RFA boundaries have been used.

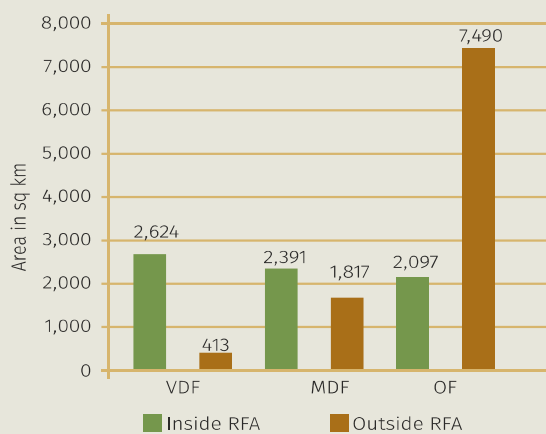


Figure 13.29.2
Forest Cover Inside and Outside of RFA in West Bengal

Table 13.29.5 Forest Cover Change Matrix for West Bengal

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	2,988	12	15	2	2	3,019
Moderately Dense Forest	46	4,087	12	4	11	4,160
Open Forest	3	105	9,492	20	103	9,723
Scrub	0	0	13	125	8	146
Non Forest	0	4	55	5	71,640	71,704
Total ISFR 2021	3,037	4,208	9,587	156	71,764	88,752
Net Change	18	48	-136	10	60	

Table 13.29.6 Altitude-wise Forest Cover in West Bengal

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	86,650	2,406	3,634	8,929	14,969	156
500-1000	807	142	281	253	676	0
1000-2000	970	267	244	364	875	0
2000-3000	292	196	45	39	280	0
>3000	33	26	4	2	32	0
Total	88,752	3,037	4,208	9,587	16,832	156

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

Table 13.29.7 Forest Cover in different slope classes in West Bengal

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	85,130	2,226	3,262	8,621	14,109	140
5-10	1,227	141	219	226	586	7
10-15	508	119	153	149	421	3
15-20	539	147	162	167	476	2
20-25	514	150	154	162	466	2
25-30	404	122	124	127	373	1
>30	430	132	134	135	401	1
Total	88,752	3,037	4,208	9,587	16,832	156











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

Figure 13.29.3

Forest Cover Map
of West Bengal

NEPAL

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

WEST BENGAL

13.29.2 Forest Types

The area under different forest types of West Bengal as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.29.8 Area statistics of the Forest Types found in West Bengal (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	2B/C1/2S3 Sub Himalayan secondary wet mixed forest	357.90	2.09
2.	3C/C1a(i) East Himalayan sal	399.41	2.34
3.	3C/C1b(i) East Himalayan upper <i>bhabar</i> sal	152.67	0.89
4.	3C/C1b(ii) East Himalayan lower <i>bhabar</i> sal	114.45	0.67
5.	3C/C1c Eastern <i>tarai</i> sal forest	323.34	1.89
6.	3C/C2d (iii) Eastern heavy alluvium plains sal	3.31	0.02
7.	3C/C2/DS1 Moist sal savannah	11.18	0.07
8.	3C/C3a West Gangetic moist mixed deciduous forest	11.74	0.07
9.	3C/C3b East Himalayan moist mixed deciduous forest	409.74	2.4
10.	3C/C3/2S2 Secondary Euphorbiaceous scrub	5.19	0.03
11.	3/IS1 Low alluvial savannah woodland (<i>Salmalia - Albizzia</i>)	31.53	0.18
12.	4B/TS1 Mangrove scrub	142.84	0.84
13.	4B/TS2 Mangrove forest	1031.1	6.03
14.	4B/TS3 Saltwater mixed forest (<i>Heritiera</i>)	472.79	2.77
15.	4B/TS4 Brackish water mixed forest (<i>Heritiera</i>)	309.38	1.81
16.	4B/TS4/E1 Palm swamp	156	0.91
17.	4C/FS2 Submontane hill valley swamp forest	7.21	0.04
18.	4D/SS2 <i>Barringtonia</i> swamp Forest	3.27	0.02
19.	5B/C1c Dry peninsular sal forest	2,766.39	16.19
20.	5B/C2 Northern dry mixed deciduous forest	250.03	1.46
21.	5/DS1 Dry deciduous scrub	29.08	0.17
22.	5/E5 <i>Butea</i> forest	22.02	0.13
23.	5/IS2 <i>Khair-sissu</i> Forest	212.56	1.24
24.	8B/C1 East Himalayan subtropical wet hill forest	469.6	2.75
25.	11B/C1a Lauraceous forest	122.32	0.72
26.	11B/C1b <i>Buk</i> oak forest	52.93	0.31
27.	11B/C1c High-level oak forest	20.03	0.12
28.	12/C3a East Himalayan mixed coniferous forest	319	1.87
29.	12/DS1 Montane bamboo brakes	8.25	0.05
30.	14/C2 East Himalayan sub-alpine birch/fir forest	12.63	0.07
	Sub Total	8227.89	48.15
31.	TOF/Plantation	8819.74	51.61
	Total (Forest Cover & Scrub)	17047.63	
	Grassland forest types (outside forest cover)		

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
32.	4D/2S2 Eastern wet alluvial grassland	35.1	0.21
33.	12/DS3 Himalayan temperate pastures	5.81	0.03
Sub Total		40.91	0.24
Grand Total		17,088.54	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.29.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.29.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	20.05	0.12
2.	Very highly fire prone	120.03	0.71
3.	Highly fire prone	425.63	2.53
4.	Moderately fire prone	1,050.42	6.24
5.	Less fire prone	15,215.87	90.40
Total		16,832.00	100.00

Figure 13.29.4 Fire prone forest areas under different fire prone classes

NEPAL

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■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.29.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in West Bengal has been estimated as given in following table.

WEST BENGAL

Table 13.29.10 Tree Cover in West Bengal

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
2,006	2,349	343

13.29.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.29.11 Extent of TOF in West Bengal

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
9,720	2,349	12,069

13.29.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in West Bengal is given in the Table 13.29.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.29.13.

Table 13.29.12 Growing Stock in West Bengal

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	54.87	61.19	6.32	1.39
2.	Growing Stock in TOF	32.63	38.70	6.07	2.17

Table 13.29.13 Diameter class distribution of top five tree species inside RFA in West Bengal

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	83,267	2,819	713
2.	<i>Acacia auriculiformis</i>	20,057	97	0
3.	<i>Lagerstroemia speciosa</i>	6,412	1,509	31
4.	<i>Tectona grandis</i>	5,713	1,958	206
5.	<i>Schima wallichii</i>	5,826	1,136	385

13.29.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in West Bengal in Rural and Urban areas are given in the Table 13.29.14 and Table 13.29.15 respectively.

Table 13.29.14 Top five tree species in TOF (Rural) in West Bengal

Sl. No.	Species	Relative Abundance (%)
1.	<i>Acacia auriculiformis</i>	14.05
2.	<i>Mangifera indica</i>	8.45
3.	<i>Areca catechu</i>	6.41
4.	<i>Eucalyptus</i> spp.	5.68
5.	<i>Borassus flabelliformis</i>	4.68

Table 13.29.15 Top five tree species in TOF (Urban) in West Bengal

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	24.27
2.	<i>Cocos nucifera</i>	10.62
3.	<i>Mangifera indica</i>	10.14
4.	<i>Artocarpus heterophyllus</i>	4.90
5.	<i>Azadirachta indica</i>	3.83

13.29.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1ha in size is 155.26 million tonnes (569.29 million tonnes of CO₂ equivalent) which is 2.16 % of total forest carbon of the country. Pool wise forest carbon in West Bengal is given in the following table.

Table 13.29.16 Forest Carbon in West Bengal in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	45,365
2.	BGB	14,119
3.	Dead wood	726
4.	Litter	2,162
5.	SOC	92,889
Total		1,55,261



Figure 13.29.5 Forest Carbon in West Bengal

13.29.9 Growing Stock of Bamboo

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

WEST BENGAL

Table 13.29.17 Growing Stock of Bamboo in West Bengal

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	702	0.47
Total number of culms (in millions)	280	0.52
Total equivalent green weight (in '000 tonnes)	1,471	0.37

13.29.10 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.29.18 and Table 13.29.19 respectively.

Table 13.23.18 Major NTFP Species in West Bengal

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	78.80
2.	<i>Madhuca indica</i>	Tree	7.22
3.	<i>Butea monosperma</i>	Tree	5.20
4.	<i>Piper spp./ Piper longum/ Piper mullesua</i>	Climber	2.12
5.	<i>Terminilia belerica</i>	Tree	1.59

Table 13.29.19 Major invasive species in the State inside the RFA/Green Wash in West Bengal (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena odorata</i>	115
2.	<i>Ageratum conyzoides</i>	36
3.	<i>Mikania micrantha</i>	27
4.	<i>Lantana camara</i>	25
5.	<i>Xanthium strumarium</i>	7

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

13.30

ANDAMAN & NICOBAR ISLANDS

Geographical Area
8,249 sq km

Geographical Coordinates
Latitude- 06° N to 14° N
Longitude- 92° E to 94° E

Population (as per Census 2011)
0.38 million
Urban 0.14 million (37.70 %)
Rural 0.24 million (62.30 %)
Tribal 0.03 million (7.50 %)

Average Population Density
46 per sq km

Livestock population
(as per 19th Live Stock Census)
0.15 million

No. of Districts
3

No. of Hill Districts
0

No. of Tribal Districts
3

Table 13.30.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	825	
Reporting area for land utilization	757	100.00
Forests	717	94.72
Not available for land cultivation	9	1.19
Permanent pastures and other grazing lands	4	0.53
Land under misc. tree crops and groves	4	0.53
Culturable wasteland	3	0.40
Fallow land other than current fallows	2	0.25
Current fallows	3	0.40
Net area sown	15	1.98

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.30.1 Forest Cover

■	VDF
■	MDF
■	OF
■	Scrub
■	Non Forest

Figure 13.30.1 Forest Cover of Andaman & Nicobar Islands

Table 13.30.2 Forest Cover of Andaman & Nicobar Islands (in sq km)

Class	Area	% of GA
VDF	5,677.98	68.83
MDF	683.07	8.28
OF	382.97	4.64
Total	6,744.02	81.75
Scrub	1.13	0.01

Table 13.30.3 District-wise Forest Cover in Andaman & Nicobar Islands (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Nicobars ^T	1,841	1,148.10	105.03	154.40	1,407.53	76.45	1.36	1.00
North & Middle Andaman ^T	3,736	2,670.96	326.37	73.67	3,071.00	82.20	0.47	0.00
South Andaman ^T	2,672	1,858.92	251.67	154.90	2,265.49	84.79	-0.59	0.13
Grand Total	8,249	5,677.98	683.07	382.97	6,744.02	81.75	1.24	1.13

13.30.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.30.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Andaman & Nicobar Islands (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
5,409	546	253	6,208	269	137	130	536
87.13%	8.80%	4.07%		50.19%	25.56%	24.25%	

*in case of A&N Islands, RFA boundaries have been used

ANDAMAN & NICOBAR ISLANDS

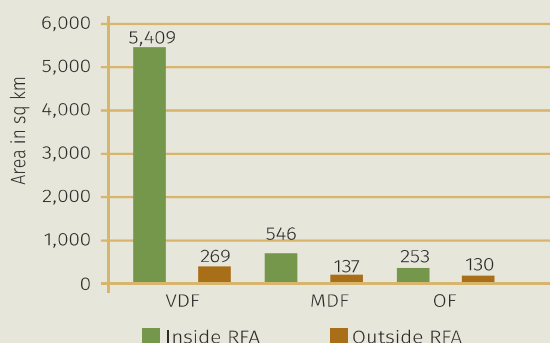


Figure 13.30.2
Forest Cover Inside
and Outside of RFA
in Andaman &
Nicobar Islands

Table 13.30.5 Forest Cover Change Matrix for Andaman & Nicobar Islands (in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	5,678	0	0	0	0	5,678
Moderately Dense Forest	0	683	0	0	1	684
Open Forest	0	0	380	0	1	381
Scrub	0	0	0	1	0	1
Non Forest	0	0	3	0	1502	1,505
Total ISFR 2021	5,678	683	383	1	1,504	8,249
Net Change	0	-1	2	0	-1	

Table 13.30.6 Altitude-wise Forest Cover in Andaman & Nicobar Islands (in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	8,238	5,667	683	383	6,733	1
500-1000	11	11	0	0	11	0
Total	8,249	5,678	683	383	6,744	1

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











Table 13.30.7 Forest Cover in different slope classes in Andaman & Nicobar Islands (in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	3,983	2,338	391	264	2,993	1
5-10	1,999	1,461	187	76	1,724	0
10-15	1,185	949	74	28	1,051	0
15-20	651	555	22	10	587	0
20-25	299	262	6	3	271	0
25-30	101	88	2	1	91	0
>30	31	25	1	1	27	0
Total	8,249	5,678	683	383	6,744	1

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

Figure 13.30.3
Forest Cover Map
of Andaman &
Nicobar Islands

LEGEND

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.30.2 Forest Types

The area under different forest types of Andaman & Nicobar Islands as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

ANDAMAN & NICOBAR ISLANDS

Table 13.30.8 Area statistics of the Forest Types found in Andaman & Nicobar Islands (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	1A/C1 Giant evergreen forest	38.47	0.57
2.	1A/C2 Andamans tropical evergreen forest	2,961.96	43.92
3.	1A/C2/E1 Andamans moist deciduous forest	160.79	2.38
4.	1A/C3 Southern hilltop tropical evergreen forest	80.95	1.20
5.	1/E1 Cane brakes	0.26	0.00
6.	1/E2 Wet bamboo brakes	22.44	0.33
7.	1/2S1 Pioneer Euphorbiaceous scrub	3.76	0.06
8.	2A/C1 Andamans semi-evergreen forest	2,049.34	30.39
9.	2/E2 Wet bamboo brakes	12.58	0.19
10.	3A/C1 Andamans moist deciduous forest	562.02	8.33
11.	3A/C1/2S1 Andamans secondary moist deciduous forest	8.04	0.12
12.	4A/L1 Littoral forest	8.02	0.12
13.	4B/TS2 Mangrove forest	616.28	9.14
	Sub Total	6,524.91	96.75
14.	TOF/Plantation	219.00	3.25
	Total (Forest Cover & Scrub)	6,743.91	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.30.3 Fire Prone Forest Areas











Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.30.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	20.39	0.30
3.	Highly fire prone	51.38	0.76
4.	Moderately fire prone	37.49	0.56
5.	Less fire prone	6,634.74	98.38
	Total	6,744.00	100.00

Figure 13.30.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.30.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Andaman & Nicobar Islands has been estimated as given in following table.

Table 13.30.10 Tree Cover in Andaman & Nicobar Islands (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
41	23	-18

13.30.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.30.11 Extent of TOF in Andaman & Nicobar Islands (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
536	23	559

ANDAMAN & NICOBAR ISLANDS

13.30.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Andaman & Nicobar Islands is given in the Table 13.30.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.30.13.

Table 13.30.12 Growing Stock in Andaman & Nicobar Islands (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	90.82	121.72	30.90	2.77
2.	Growing Stock in TOF	2.75	5.55	2.80	0.31

Table 13.30.13 Diameter class distribution of top five tree species inside RFA in Andaman & Nicobar Islands (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Dipterocarpus turbinatus</i>	7,787	3,644	596
2.	<i>Pterocarpus indicus</i>	1,891	1,702	945
3.	<i>Terminalia bialata</i>	3,191	596	622
4.	<i>Canarium euphyllum</i>	1,618	1,402	755
5.	<i>Tetrameles nudiflora</i>	1,618	1,079	539

13.30.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Andaman & Nicobar Islands in Rural and Urban areas are given in the Table 13.30.14 and Table 13.30.15 respectively.

Table 13.30.14: Top five tree species in TOF (Rural) in Andaman & Nicobar Islands

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	69.62
2.	<i>Cocos nucifera</i>	5.44
3.	<i>Ficus racemosa</i>	1.87
4.	<i>Acacia auriculiformis</i>	1.71
5.	<i>Caryota urens</i>	1.03

Table 13.30.15: Top five tree species in TOF (Urban) in Andaman & Nicobar Islands

Sl. No.	Species	Relative Abundance (%)
1.	<i>Areca catechu</i>	51.36
2.	<i>Cocos nucifera</i>	15.77
3.	<i>Mangifera indica</i>	3.81
4.	<i>Mangifera andamanica</i>	3.70
5.	<i>Artocarpus heterophyllus</i>	3.46

13.30.8 Carbon Stock in Forest

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 109.84 million tonnes (402.75 million tonnes of CO₂ equivalent) which is 1.52 % of total forest carbon of the country. Pool wise forest carbon in Andaman & Nicobar Islands is given in the following table.

Table 13.30.16 Forest Carbon in Andaman & Nicobar Islands in different pools

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	47,560
2.	BGB	15,450
3.	Dead wood	1,432
4.	Litter	1,808
5.	SOC	43,586
Total		1,09,836



Figure 13.30.5 Forest Carbon in Andaman & Nicobar Islands

13.30.9 Growing Stock of Bamboo

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

Table 13.30.17 Growing Stock of Bamboo in Andaman & Nicobar Islands

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	1,413	0.95
Total number of culms (in millions)	215	0.40
Total equivalent green weight (in '000 tonnes)	2,091	0.52

13.30.10 Major NTFP Species

Major NTFP species as assessed from forest inventory data are presented in the Table 13.30.18.

Table 13.30.18 Major NTFP species in Andaman & Nicobar Islands

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Calamus longisetus</i>	Shrub	63.87
2.	<i>Calamus palustris</i>	Shrub	35.60
3.	<i>Heritiera littoralis</i>	Tree	0.52

Major NTFP species are given in terms of relative abundance.

13.31

CHANDIGARH

Geographical Area

114 sq km

Geographical Coordinates

Latitude- 30° 39' N to 30° 49' N

Longitude-75° 41' E to 75° 51' E

Population (as per Census 2011)

1.06 million

Urban 1.03 million (97.25 %)

Rural 0.03 million (2.75 %)

Tribal Nil

Average Population Density

9,298 per sq km

Livestock population

(as per 19th Live Stock Census)

24,197

No. of Districts

1

No. of Hill Districts

0

No. of Tribal Districts

0

Table 13.31.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	11	
Reporting area for land utilization	7	100.00
Forests	0	0.00
Not available for land cultivation	5	71.42
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	0	0.00
Culturable wasteland	-	-
Fallow land other than current fallows	1	14.29
Current fallows	0	0.00
Net area sown	1	14.29

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.31.1 Forest Cover



Figure 13.31.1
Forest Cover of
Chandigarh

**Table 13.26.2 Forest Cover
of Chandigarh** (in sq km)

Class	Area	% of GA
VDF	1.36	1.19
MDF	13.51	11.85
OF	8.01	7.03
Total	22.88	20.07
Scrub	0.38	0.33

Table 13.31.3 District- wise Forest Cover in Chandigarh

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Chandigarh	114	1.36	13.51	8.01	22.88	20.07	0.85	0.38
Grand Total	114	1.36	13.51	8.01	22.88	20.07	0.85	0.38

13.31.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.31.4 Forest Cover Inside and Outside Recorded Forest Area or (Green Wash) in Chandigarh

(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
1.28	5.08	2.34	8.70	0.08	8.43	5.67	14.18
14.71%	58.39%	26.90%		0.56%	59.45%	39.99%	

*in case of Chandigarh, RFA boundaries have been used

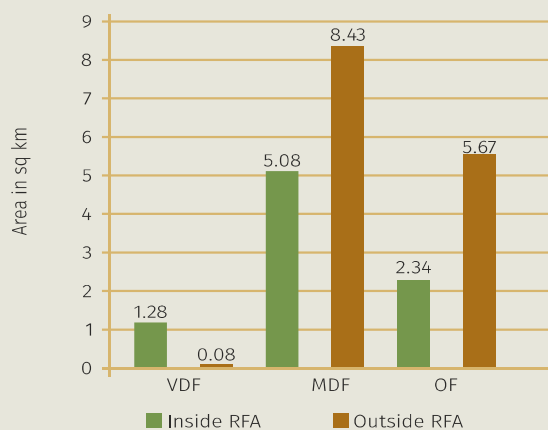


Figure 13.31.2
Forest Cover Inside
and Outside of RFA
in Chandigarh

CHANDIGARH

Table 13.31.5 Forest Cover Change Matrix for Chandigarh

(in sq km)

Class	2021 Assessment					Total
	VDF	MDF	OF	Scrub	NF	ISFR 2019
Very Dense Forest	1.36	0.00	0.00	0.00	0.00	1.36
Moderately Dense Forest	0.00	12.65	0.95	0.08	0.56	14.24
Open Forest	0.00	0.29	6.11	0.00	0.03	6.43
Scrub	0.00	0.00	0.00	0.01	0.09	0.10
Non Forest	0.00	0.57	0.95	0.29	90.06	91.87
Total ISFR 2021	1.36	13.51	8.01	0.38	90.74	114.00
Net Change	0.00	-0.73	1.58	0.28	-1.13	

Table 13.31.6 Altitude-wise Forest Cover in Chandigarh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	114	1.36	13.51	8.01	22.88	0.38
Total	114	1.36	13.51	8.01	22.88	0.38

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











Table 13.31.7 Forest Cover in different slope classes in Chandigarh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	109	1.30	12.59	7.52	21.41	0.36
5-10	5	0.06	0.92	0.49	1.47	0.02
Total	114	1.36	13.51	8.01	22.88	0.38

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

Figure 13.31.3
Forest Cover Map
of Chandigarh

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.31.2 Forest Types

The area under different forest types of Chandigarh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

CHANDIGARH

Table 13.31.8 Area statistics of the Forest Types found in Chandigarh

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5B/C2 Northern dry mixed deciduous forest	10.20	46.09
2.	5/DS1 Dry deciduous scrub	0.05	0.23
Sub Total		10.25	46.32
3.	TOF/Plantation	11.88	53.68
Total (Forest Cover & Scrub)		22.13	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.31.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.




Table 13.31.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	22.88	100.00
Total		22.88	100.00

Figure 13.31.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.31.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Chandigarh has been estimated as given in following table.

Table 13.31.10 Tree Cover in Chandigarh

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
25	15	-10

13.31.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.31.11 Extent of TOF in Chandigarh

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
14	15	29

13.31.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Chandigarh is given in the Table 13.31.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.31.13.

Table 13.31.12 Growing Stock in Chandigarh

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	0.29	0.21	-0.08	0.00
2.	Growing Stock in TOF	0.50	0.29	-0.21	0.02

Table 13.31.13 Diameter class distribution of top five tree species inside RFA in Chandigarh

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Acacia catechu</i>	202	7	0
2.	<i>Leucaena leucocephala</i>	196	9	0
3.	<i>Dalbergia sissoo</i>	96	14	0
4.	<i>Melia azadirachta</i>	64	11	0
5.	<i>Eucalyptus</i> spp.	16	5	0

CHANDIGARH

13.31.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Chandigarh in Rural and Urban areas are given in the Table 13.31.14 and Table 13.31.15 respectively.

Table 13.31.14 Top five tree species in TOF (Rural) in Chandigarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Eucalyptus</i> spp.	38.16
2.	<i>Mangifera indica</i>	12.52
3.	<i>Prosopis juliflora</i>	8.17
4.	<i>Morus</i> spp.	7.47
5.	<i>Dalbergia sissoo</i>	4.89

Table 13.31.15 Top five tree species in TOF (Urban) in Chandigarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	12.32
2.	<i>Polyalthia longifolia</i>	7.13
3.	<i>Morus</i> spp.	6.28
4.	<i>Alstonia scholaris</i>	4.18
5.	<i>Melia azadirachta</i>	3.64

13.31.8 Carbon Stock in Forest

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 0.18 million tonnes (0.66 million tonnes of CO₂ equivalent) which is 0.002 % of total forest carbon of the country. Pool wise forest carbon in Chandigarh is given in the following table.

Table 13.31.16 Forest Carbon in Chandigarh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	47
2.	BGB	15
3.	Dead wood	1
4.	Litter	3
5.	SOC	117
Total		183



Figure 13.31.5 Forest Carbon in Chandigarh

13.31.9 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.31.17 and Table 13.31.18 respectively.

Table 13.31.17 Major NTFP species in Chandigarh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Embilica officinalis/Phyllanthus</i>	Tree	43.45
2.	Mulberry	Tree	32.41
3.	<i>Ficus virens</i>	Tree	5.52
4.	<i>Syzigium cumini</i>	Tree	4.83
5.	<i>Ziziphus mauritiana/jujuba</i>	Tree	4.14

Table 13.31.18 Major invasive species in the UT inside the RFA/Green Wash in Chandigarh

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	1.00
2.	<i>Parthenium hysteropharus</i>	1.00
3.	<i>Leucanea leucocephala</i>	0.16
4.	<i>Saccharum spontanem</i>	0.05

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

13.32

DADRA & NAGAR HAVELI AND DAMAN & DIU

Geographical Area
602 sq km

Geographical Coordinates
Latitude- 20° 0' N to 20° 28' N
Longitude- 70° 00' E to 73° 15' E

Population (as per Census 2011)
0.58 million (combined Dadra &
Nagar Haveli and Daman & Diu)
Urban 0.34 million (58.51 %)
Rural 0.24 million (41.49 %)
Tribal 0.19 million (33.04 %)

Average Population Density
963 per sq km

Livestock population
(as per 19th Live Stock Census)
0.054 million (combined Dadra &
Nagar Haveli and Daman & Diu)

No. of Districts
3

No. of Hill Districts
0

No. of Tribal Districts
2

Table 13.32.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	60	
Reporting area for land utilization	52	100.00
Forests	20	38.46
Not available for land cultivation	4	7.69
Permanent pastures and other grazing lands	1	1.92
Land under misc. tree crops and groves	-	-
Culturable wasteland	0	0.00
Fallow land other than current fallows	3	5.77
Current fallows	2	3.85
Net area sown	22	42.31

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.32.1 Forest Cover

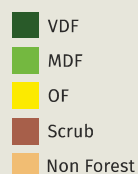


Figure 13.32.1 Forest Cover of Dadra & Nagar Haveli and Daman & Diu

Table 13.32.2 Forest Cover of Dadra & Nagar Haveli and Daman & Diu (in sq km)

Class	Area	% of GA
VDF	1.40	0.23
MDF	85.56	14.21
OF	140.79	23.39
Total	227.75	37.83
Scrub	4.85	0.81

Table 13.32.3 District-wise Forest Cover in Dadra & Nagar Haveli and Daman & Diu (in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Dadra & Nagar Haveli [†]	491	0.00	79.87	127.44	207.31	42.22	0.15	4.66
Daman [†]	72	0.00	1.93	8.94	10.87	15.10	-0.04	0.19
Diu	39	1.40	3.76	4.41	9.57	24.54	-0.01	0.00
Grand Total	602	1.40	85.56	140.79	227.75	37.83	0.10	4.85

13.32.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.32.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Dadra & Nagar Haveli and Daman & Diu (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
0.00	69.38	90.64	160.02	1.40	16.18	50.15	67.73
0.00%	43.36%	56.64%		2.07%	23.89%	74.04%	

**in case of Dadra & Nagar Haveli and Daman & Diu, RFA boundaries have been used.*

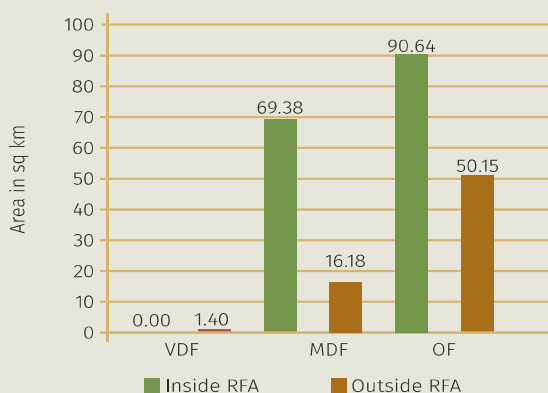


Figure 13.32.2 Forest Cover Inside and Outside of RFA in Dadra & Nagar Haveli and Daman & Diu

DADRA & NAGAR HAVELI AND DAMAN & DIU

Table 13.32.5 Forest Cover Change Matrix for Dadra & Nagar Haveli and Daman & Diu

(in sq km)

Class	2021 Assessment					Total
	VDF	MDF	OF	Scrub	NF	ISFR 2019
Very Dense Forest	1.40	0.00	0.00	0.00	0.00	1.40
Moderately Dense Forest	0.00	85.56	0.00	0.00	0.06	85.62
Open Forest	0.00	0.00	137.49	0.00	3.14	140.63
Scrub	0.00	0.00	0.00	4.85	0.27	5.12
Non Forest	0.00	0.00	3.30	0.00	365.93	369.23
Total ISFR 2021	1.40	85.56	140.79	4.85	369.40	602.00
Net Change	0.00	-0.06	0.16	-0.27	0.17	

Table 13.32.6 Altitude-wise Forest Cover in Dadra & Nagar Haveli and Daman & Diu

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	602	1.40	85.56	140.79	227.75	4.85
Total	602	1.40	85.56	140.79	227.75	4.85

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






Table 13.32.7 Forest Cover in different slope classes in Dadra & Nagar Haveli and Daman & Diu

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	432	1.39	28.54	74.03	103.96	3.11
5-10	95	0.01	24.14	35.69	59.84	1.04
10-15	45	0.00	17.81	19.04	36.85	0.69
15-20	19	0.00	9.02	8.03	17.05	0.01
20-25	7	0.00	4.05	3.00	7.05	0.00
25-30	3	0.00	2.00	1.00	3.00	0.00
>30	1	0.00	0.00	0.00	0.00	0.00
Total	602	1.40	85.56	140.79	227.75	4.85

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

Figure 13.32.3 Forest Cover Map of Dadra & Nagar Haveli and Daman & Diu**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.32.2 Forest Types

The area under different forest types of Dadra & Nagar Haveli and Daman & Diu as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.32.8 Area statistics of the Forest Types found in Dadra & Nagar Haveli and Daman & Diu (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	3B/C1b Moist teak forest	19.89	8.54
2.	3B/C2 Southern moist mixed deciduous forest	162.75	69.92
3.	4A/L1 Littoral forest	1.35	0.58
4.	4B/TS2 Mangrove forest	3.10	1.33
5.	5A/C3 Southern dry mixed deciduous forest	9.33	4.01
6.	5/DS1 Dry deciduous scrub	5.37	2.31
7.	6B/C1 Desert thorn forest	3.19	1.37

DADRA & NAGAR HAVELI AND DAMAN & DIU

Table 13.32.8 Area statistics of the Forest Types found in Dadra & Nagar Haveli and Daman & Diu (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
	Sub Total	204.98	88.06
8.	TOF/Plantation	27.79	11.94
	Total (Forest Cover & Scrub)	232.77	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.32.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.32.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	227.75	100.00
	Total	227.75	100.00

Figure 13.32.4

Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.32.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Dadra & Nagar Haveli and Daman & Diu has been estimated as given in following table.

Table 13.32.10 Tree Cover in Dadra & Nagar Haveli and Daman & Diu (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
33	32	-1

13.32.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.32.11 Extent of TOF in Dadra & Nagar Haveli and Daman & Diu (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
68	32	100

11.32.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Dadra & Nagar Haveli and Daman & Diu is given in the Table 13.32.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.32.13

Table 13.32.12 Growing Stock in Dadra & Nagar Haveli and Daman & Diu (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	0.83	0.45	-0.38	0.01
2.	Growing Stock in TOF	1.31	0.67	-0.49	0.04

Table 13.32.13 Diameter class distribution of top five tree species inside RFA in Dadra & Nagar Haveli and Daman & Diu (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Terminalia tomentosa</i>	576	0	0
2.	<i>Lannea coromandelica</i>	239	30	0
3.	<i>Madhuca latifolia</i>	119	65	0
4.	<i>Acacia catechu</i>	122	0	15
5.	<i>Terminalia belerica</i>	30	15	0

DADRA & NAGAR HAVELI AND DAMAN & DIU

13.32.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Dadra & Nagar Haveli and Daman & Diu in Rural and Urban areas are given in the Table 13.32.14 and Table 13.32.15 respectively.

Table 13.32.14 Top five tree species in TOF (Rural) in Dadra & Nagar Haveli and Daman & Diu

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	34.60
2.	<i>Phoenix sylvestris</i>	12.79
3.	<i>Tectona grandis</i>	8.69
4.	<i>Emblica officinalis</i>	5.00
5.	<i>Terminalia crenulata</i>	4.88

Table 13.32.15 Top five tree species in TOF (Urban) in Dadra & Nagar Haveli and Daman & Diu

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	20.34
2.	<i>Cocos nucifera</i>	18.73
3.	<i>Tectona grandis</i>	6.91
4.	<i>Jonesia asoca</i>	6.05
5.	<i>Alstonia scholaris</i>	5.11

13.32.8 Carbon Stock in Forest

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 1.98 million tonnes (7.26 million tonnes of CO₂ equivalent) which is 0.03 % of total forest carbon of the country. Pool wise forest carbon in Dadra & Nagar Haveli and Daman & Diu is given in the following table.

Table 13.23.16 Forest Carbon in Dadra & Nagar Haveli and Daman & Diu in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	558
2.	BGB	129
3.	Dead wood	11
4.	Litter	38
5.	SOC	1,244
Total		1,980



Figure 13.32.5 Forest Carbon in Dadra & Nagar Haveli and Daman & Diu

13.32.9 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the Table 13.32.17 and Table 13.32.18 respectively.

Table 13.32.17 Major NTFP species in Dadra & Nagar Haveli and Daman & Diu

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Lannea coromandelica</i>	Tree	23.60
2.	<i>Madhuca indica</i>	Tree	15.73
3.	<i>Acacia catechu</i>	Tree	13.48
4.	<i>Anogeissus latifolia</i>	Tree	13.48
5.	<i>Acacia arabica</i>	Tree	7.87

Table 13.32.18 Major invasive species in the UT inside the RFA/Green Wash in Dadra & Nagar Haveli and Daman & Diu

(in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Cassia tora</i>	2.00
2.	<i>Glinsoga parviflora</i>	1.00
3.	<i>Lantana camara</i>	0.27
4.	<i>Chromolaena odorata</i>	0.16
5.	<i>Ageratum conyzoides</i>	0.16

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

13.33

JAMMU & KASHMIR

Geographical Area

54,624 sq km[#]

Geographical Coordinates

Latitude- 30° 17' N to 35° 08' N

Longitude- 73° 25' E to 76° 45' E

Population (as per Census 2011)

12.54 million (including Ladakh)

Urban 3.43 million (27.38 %)

Rural 9.11 million (72.62 %)

Tribal 1.49 million (11.91%)

Average Population Density

125 per sq km (including Ladakh)

Livestock population

(as per 19th Live Stock Census)

9.20 million (including Ladakh)

No. of Districts

22

No. of Hill Districts

22

No. of Tribal Districts

0

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited.

Table 13.33.1 Land Use Pattern (Combined Jammu & Kashmir and Ladakh)

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	22,224	
Reporting area for land utilization	4,120	100.00
Forests	2,361	57.31
Not available for land cultivation	570	13.84
Permanent pastures and other grazing lands	108	2.62
Land under misc. tree crops and groves	59	1.43
Culturable wasteland	139	3.37
Fallow land other than current fallows	26	0.63
Current fallows	105	2.55
Net area sown	752	18.25

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.33.1 Forest Cover

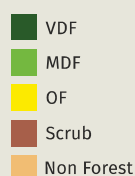


Figure 13.33.1
Forest Cover of
Jammu & Kashmir

**Table 13.33.2 Forest Cover of
Jammu & Kashmir** (in sq km)

Class	Area	% of Shapefile Area*
VDF	4,155.11	7.60
MDF	8,116.73	14.86
OF	9,115.00	16.69
Total	21,386.84	39.15
Scrub	284.32	0.52

* Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited.

Table 13.33.3 District- wise Forest Cover in Jammu & Kashmir (in sq km)

District	Shapefile Area [#]	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Anantnag ^h	2,727	128.34	465.56	481.16	1,075.06	39.42	0.87	0.76
Badgam ^h	1,250	99.38	74.70	169.22	343.30	27.46	1.46	16.71
Bandipura ^h	4,042	336.12	317.08	230.85	884.05	21.87	5.51	45.31
Baramula ^h	2,062	267.11	228.63	396.28	892.02	43.26	21.76	7.56
Doda ^h	2,411	328.18	713.92	444.60	1,486.70	61.66	0.77	1.29
Ganderbal ^h	1,620	128.24	179.80	182.62	490.66	30.29	-3.84	7.04
Jammu ^h	2,407	0.00	226.49	476.17	702.66	29.19	-64.97	22.01
Kathua ^h	2,512	108.14	628.66	594.52	1,331.32	53.00	-0.12	8.45
Kishtwar ^h	8,179	238.60	746.37	798.09	1,783.06	21.80	-1.99	8.74
Kulgam ^h	1,265	83.73	100.94	204.82	389.49	30.79	-0.75	4.98
Kupwara ^h	2,744	760.06	423.61	350.85	1,534.52	55.92	69.57	1.31
Mirpur ^h	3,759	0.00	441.75	865.14	1,306.89	34.77	69.10	25.22
Muzaffarbad ^h	4,663	827.06	462.07	450.94	1,740.07	37.32	131.04	54.21
Pulwama ^h	896	15.20	126.62	234.20	376.02	41.97	1.88	5.85
Punch ^h	4,244	313.63	1,044.85	690.25	2,048.73	48.27	-58.98	16.88
Rajauri ^h	2,635	41.12	427.67	763.60	1,232.39	46.77	-72.91	7.77
Ramban ^h	1,288	70.70	293.09	297.51	661.30	51.34	-4.94	1.46
Reasi ^h	1,932	231.63	389.48	414.59	1,035.70	53.61	-62.71	13.76
Samba ^h	921	0.00	136.24	195.21	331.45	35.99	-0.34	10.29
Shupiyan ^h	505	61.85	37.02	224.32	323.19	64.00	-0.86	1.00
Srinagar ^h	282	0.70	19.47	25.00	45.17	16.02	-0.07	0.00
Udhampur ^h	2,280	115.32	632.71	625.06	1,373.09	60.22	-0.93	23.72
Grand Total	54,624	4,155.11	8,116.73	9,115.00	21,386.84	39.15	28.55	284.32

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited.

JAMMU & KASHMIR

13.33.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.33.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Jammu & Kashmir

(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
3,036	5,432	4,708	13,176	1,119	2,685	4,407	8,211
23.04%	41.23%	35.73%		13.63%	32.70%	53.67%	

*in case of Jammu & Kashmir, RFA boundaries have been used.

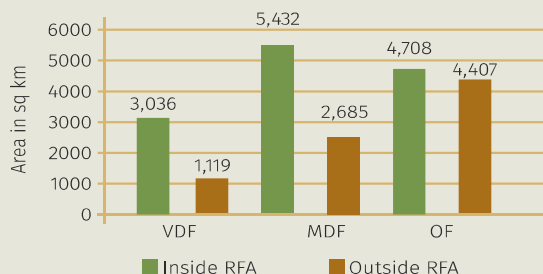


Figure 13.33.2

Forest Cover Inside and Outside of RFA in Jammu & Kashmir

Table 13.33.5 Forest Cover Change Matrix of Jammu & Kashmir

(in sq km)

Class	2021 Assessment					Total
	VDF	MDF	OF	Scrub	NF	ISFR 2019
Very Dense Forest	4,125	102	8	0	44	4,279
Moderately Dense Forest	21	7,864	45	0	160	8,090
Open Forest	8	127	8,284	4	566	8,989
Scrub	0	0	36	239	15	290
Non Forest	1	24	742	41	32,168	32,976
Total ISFR 2021	4,155	8,117	9,115	284	32,953	54,624
Net Change	-124	27	126	-6	-23	

Table 13.33.6 Altitude-wise forest cover in Jammu & Kashmir

(in sq km)

Altitude Zone (m)	Shapefile Area*	VDF	MDF	OF	Total	Scrub
0-500	4,992	0	222	825	1,047	63
500-1000	6,567	47	1,335	1,994	3,376	69
1000-2000	14,192	682	2,370	3,168	6,220	32
2000-3000	12,160	2,851	3,136	2,128	8,115	30
3000-4000	10,193	575	1,053	999	2,627	89
4000-Above	6,520	0	1	1	2	1
Total	54,624	4,155	8,117	9,115	21,387	284

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

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited




Table 13.33.7 Forest Cover in different slope classes in Jammu & Kashmir

(in sq km)

Slope (in degrees)	Shapefile Area [#]	VDF	MDF	OF	Total	Scrub
0-5	10,732	92	469	1,544	2,105	49
5-10	5,825	237	739	1,195	2,171	46
10-15	6,518	409	1,092	1,291	2,792	44
15-20	7,065	589	1,299	1,272	3,160	39
20-25	6,949	690	1,327	1,161	3,178	34
25-30	6,281	704	1,215	1,006	2,925	28
>30	11,254	1,434	1,976	1,646	5,056	44
Total	54,624	4,155	8,117	9,115	21,387	284

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

[#] Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited**Figure 13.33.3 Forest Cover Map of Jammu & Kashmir****LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.33.2 Forest Types

The area under different forest types of Jammu & Kashmir as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

JAMMU & KASHMIR

Table 13.33.8 Area statistics of the Forest Types found in Jammu & Kashmir (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	5B/C2 Northern dry mixed deciduous forest	1,606.55	6.22
2.	5/DS1 Dry deciduous scrub	442.64	1.72
3.	5/DS3 (<i>Euphorbia</i> scrub)	0.57	0.00
4.	5/E9 Dry bamboo brake	18.45	0.07
5.	5/1S2 <i>Khair-sissu</i> forest	4.42	0.02
6.	9/C1a Lower or Siwalik chir pine forest	2,725.47	10.56
7.	9/C1b Upper or Himalayan chir pine forest	1,094.20	4.24
8.	9/C1/DS1 Himalayan subtropical scrub	287.62	1.11
9.	10/C1a <i>Olea cuspidata</i> scrub forest	153.29	0.59
10.	10/C1b <i>Acacia modesta</i> scrub forest	8.98	0.03
11.	10/DS1 <i>Dodonaea</i> scrub	7.91	0.03
12.	12/C1a <i>Ban</i> oak forest (<i>Q. incana</i>)	665.70	2.58
13.	12/C1b <i>Moru</i> oak forest (<i>Q. dilatata</i>)	37.74	0.15
14.	12/C1c Moist deodar forest (<i>Cedrus</i>)	1,589.47	6.16
15.	12/C1d Western mixed coniferous forest (spruce, blue pine, silver fir)	3,217.55	12.47
16.	12/C1e Moist temperate deciduous forest	38.21	0.15
17.	12/C1f Low-level blue pine forest (<i>P. wallichiana</i>)	2,225.13	8.62
18.	12/C1/DS1 Oak scrub	106.44	0.41
19.	12/C1/DS2 Himalayan temperate secondary scrub	122.80	0.48
20.	12/C2a <i>Kharsu</i> oak forest (<i>Q. semecarpifolia</i>)	0.60	0.00
21.	12/C2b West Himalayan upper oak/fir forest	3.35	0.01
22.	12/1S1 Alder forest	3.31	0.01
23.	12/1S2 Riverain blue pine forest	53.77	0.21
24.	12/2S1 Low level blue pine forest	50.80	0.20
25.	13/C1 Dry broadleaved and coniferous forest (<i>Q. ilex</i> - <i>P. gerardiana</i>)	390.71	1.51
26.	13/C2b Dry deodar forest (<i>Cedrus</i>)	639.82	2.48
27.	13/C2/DS1 Pohu scrub	60.57	0.24
28.	13/C2/DS2 Dry temperate scrub	91.06	0.35
29.	13/C3 West Himalayan dry temperate deciduous forest	236.80	0.92
30.	13/C4 West Himalayan high level dry blue pine forest (<i>P. wallichiana</i>)	1,169.22	4.53
31.	13/1S2 <i>Populus</i> / <i>Salix</i> forest	5.02	0.02
32.	14/C1a West Himalayan sub-alpine fir forest	358.03	1.39
33.	14/C1b West Himalayan sub-alpine birch/fir forest	1,351.11	5.23
34.	14/2S1 Sub-alpine blue pine forest (<i>P. wallichiana</i>)	84.71	0.33
35.	15/C1 Birch / <i>Rhododendron</i> scrub forest	104.32	0.40
36.	15/C2 Deciduous alpine scrub	112.37	0.44
37.	15/E1 Dwarf <i>Rhododendron</i> scrub	33.60	0.13
38.	16/C1 Dry alpine scrub	609.10	2.36
39.	16/E1 Dwarf juniper scrub	75.23	0.29
Sub Total		19,786.64	76.66

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
40.	TOF/ Plantation	1,585.50	6.14
Total (Forest Cover & Scrub)		21,372.14	
Grassland forest types (outside forest cover)			
41.	12/DS3 Himalayan temperate pastures	802.44	3.11
42.	14/DS1 Sub-alpine pastures	1,155.98	4.48
43.	15/C3 Alpine pastures	2,479.28	9.61
Sub Total		4,437.70	17.20
Grand Total		25,809.84	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest types outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.33.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.33.9 Forest Fire Prone Classes

(in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	17.90	0.08
3.	Highly fire prone	321.68	1.51
4.	Moderately fire prone	857.95	4.01
5.	Less fire prone	20,189.47	94.40
Total		21,387.00	100.00

Figure 13.33.4 Fire prone forest areas under different fire prone classes

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	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.33.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Jammu & Kashmir has been estimated as given in following table.

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Table 13.33.10 Tree Cover in Jammu & Kashmir

(in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
7,944	3,511	-4,433

13.33.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.33.11 Extent of TOF in of Jammu & Kashmir

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
8,211	3,511	11,722

13.33.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Jammu & Kashmir is given in the Table 13.33.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the Table 13.33.13

Table 13.33.12 Growing Stock in Jammu & Kashmir

(in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	291.63	348.35	56.72	7.94
2.	Growing Stock in TOF	125.14	109.04	-16.10	6.13

Table 13.33.13 Diameter class distribution of top five tree species inside RFA in Jammu & Kashmir

(in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Pinus wallichiana</i>	32,267	35,184	7,492
2.	<i>Cedrus deodara</i>	14,364	14,559	9,094
3.	<i>Abies pindrow</i>	9,457	17,473	8,490
4.	<i>Pinus roxburghii</i>	14,140	16,376	3,763
5.	<i>Abies smithiana</i>	2,042	6,060	2,347

13.33.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Jammu & Kashmir in Rural and Urban areas are given in the Table 13.33.14 and Table 13.33.15 respectively.

Table 13.33.14 Top five tree species in TOF (Rural) in Jammu & Kashmir

Sl. No.	Species	Relative Abundance (%)
1.	<i>Quercus leucotrichophora</i>	7.49
2.	<i>Grewia oppositifolia</i>	6.14
3.	<i>Pyrus</i> spp.	5.76
4.	<i>Quercus dilatata floribunda</i>	4.70
5.	<i>Juglans regia</i>	4.33

Table 13.33.15 Top five tree species in TOF (Urban) in Jammu & Kashmir

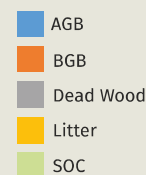
Sl. No.	Species	Relative Abundance (%)
1.	<i>Grewia oppositifolia</i>	10.09
2.	<i>Leucaena leucocephala</i>	6.47
3.	<i>Pyrus</i> spp.	5.06
4.	<i>Acacia modesta</i>	4.25
5.	<i>Mangifera indica</i>	4.16

13.33.8 Carbon Stock in Forest

The total Carbon stock of forests in the UT including the TOF patches which are more than 1 ha in size is 370.87 million tonnes (1,359.86 million tonnes of CO₂ equivalent) which is 5.15 % of total forest carbon of the country. Pool wise forest carbon in Jammu & Kashmir is given in the following table.

Table 13.33.16 Forest Carbon in Jammu & Kashmir in different pools

Sl. No.	Carbon Pools	Forest Carbon (in '000 tonnes)
1.	AGB	1,63,897
2.	BGB	45,864
3.	Dead wood	3,386
4.	Litter	4,951
5.	SOC	1,52,772
Total		3,70,870

**Figure 13.33.5** Forest Carbon in Jammu & Kashmir

13.33.9 Major Invasive Species

Major Invasive species as assessed from forest inventory data are presented in the Table 13.33.17.

Table 13.33.17 Major invasive species in the UT inside the RFA/Green Wash in Jammu & Kashmir (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	64
2.	<i>Parthenium hysterophorus</i>	24
3.	<i>Ageratum conyzoides</i>	9
4.	<i>Ipomoea fistulosa</i>	3
5.	<i>Solanum viarum</i>	2

Major Invasive species are given in terms of their estimated extent.

13.34

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Geographical Area

1,68,055 sq km[#]

Geographical Coordinates

Latitude- 32° 20' N to 37° 05' N

Longitude-72° 30' E to 80° 20' E

Population (as per Census 2011)

12.54 million (including J&K)

Urban 3.43 million (27.38%)

Rural 9.11 million (72.62 %)

Tribal 1.49 million (11.91 %)

Average Population Density

124 per sq km (including J&K)

Livestock population

(as per 19th Live Stock Census)

9.20 million (including J&K)

No. of Districts

2

No. of Hill Districts

2

No. of Tribal Districts

0

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited.

Table 13.34.1 Land Use Pattern (Combined Jammu & Kashmir and Ladakh)

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	22,224	
Reporting area for land utilization	4,120	100.00
Forests	2,361	57.31
Not available for land cultivation	570	13.84
Permanent pastures and other grazing lands	108	2.62
Land under misc. tree crops and groves	59	1.43
Culturable wasteland	139	3.37
Fallow land other than current fallows	26	0.63
Current fallows	105	2.55
Net area sown	752	18.25

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.34.1 Forest Cover

■	VDF
■	MDF
■	OF
■	Scrub
■	Non Forest

Figure 13.34.1
Forest Cover
of Ladakh

Table 13.34.2 Forest Cover of Ladakh (in sq km)

Class	Area	% of Shapefile Area*
VDF	2.27	0.00
MDF	512.10	0.30
OF	1,757.72	1.05
Total	2,272.09	1.35
Scrub	278.65	0.17

Area of shape file provided by Survey of India (August 2021). Notified Geographical area from Sol awaited.

Table 13.34.3 District- wise Forest Cover in Ladakh (in sq km)

District	Shapefile Area*	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Kargil ^h	14,202	0.00	2.24	57.30	59.54	0.42	-0.14	24.94
Leh ^h	1,53,853	2.27	509.86	1,700.42	2,212.55	1.44	18.63	253.71
Grand Total	1,68,055	2.27	512.10	1,757.72	2,272.09	1.35	18.49	278.65

Area of shape file provided by Survey of India (August 2021). Notified Geographical area from Sol awaited.

13.34.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.34.4 Forest Cover Inside and Outside Recorded Forest Area or (Green Wash) in Ladakh (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
2	179	619	800	0	333	1,139	1,472
0.25%	22.37%	77.38%		0.00%	22.62%	77.38%	

*in case of Ladakh, Green Wash boundaries have been used.

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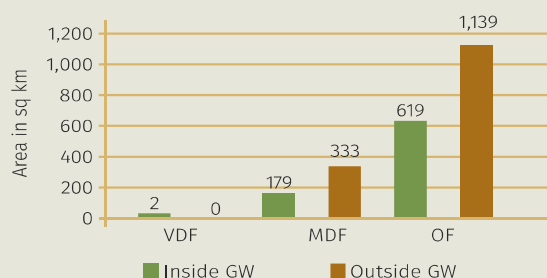


Figure 13.34.2

Forest Cover Inside and Outside Green Wash in Ladakh

Table 13.34.5 Forest Cover Change Matrix for Ladakh

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	2	0	0	0	0	2
Moderately Dense Forest	0	509	3	0	10	522
Open Forest	0	3	1,714	9	4	1,730
Scrub	0	0	2	251	5	258
Non Forest	0	0	39	19	1,65,485	1,65,543
Total ISFR 2021	2	512	1,758	279	1,65,504	1,68,055
Net Change	0	-10	28	21	-39	

Table 13.34.6 Altitude-wise forest cover in Ladakh

(in sq km)

Altitude Zone (m)	Shapefile Area*	VDF	MDF	OF	Total	Scrub
0-500	0	0	0	0	0	0
500-1000	14	0	0	0	0	0
1000-2000	1,810	0	23	55	78	4
2000-3000	7,132	0	242	766	1,008	53
3000-4000	23,449	2	246	920	1,168	187
>4000	1,35,650	0	1	17	18	35
Total	1,68,055	2	512	1,758	2,272	279

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

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited

Table 13.34.7 Forest Cover in different slope classes in Ladakh











(in sq km)

Slope (in degrees)	Shapefile Area*	VDF	MDF	OF	Total	Scrub
0-5	27,071	0	18	182	200	28
5-10	18,422	0	18	130	148	21
10-15	18,721	0	32	147	179	27
15-20	20,645	1	57	203	261	35
20-25	21,440	0	77	250	327	41
25-30	20,664	0	86	272	358	42
>30	41,092	1	224	574	799	85
Total	1,68,055	2	512	1,758	2,272	279

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

Area of shape file provided by Survey of India (August, 2021). Notified geographical area from Sol awaited

Figure 13.34.3 Forest Cover Map of Ladakh

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.34.2 Forest Types

The area under different forest types of Ladakh as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.34.8 Area statistics of the Forest Types found in Ladakh

(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	12/C1c Moist deodar forest (<i>Cedrus</i>)	3.11	0.10
2.	12/C1d Western mixed coniferous forest (spruce, blue pine, silver fir)	109.98	3.43
3.	12/C1f Low-level blue pine forest (<i>P. wallichiana</i>)	1.69	0.05
4.	12/C1/DS1 Oak scrub	0.10	0.00
5.	12/C1/DS2 Himalayan temperate secondary scrub	26.08	0.81
6.	13/C1 Dry broadleaved and coniferous forest (<i>Q. ilex- P. gerardiana</i>)	230.44	7.20

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(in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
7.	13/C2b Dry deodar forest (<i>Cedrus</i>)	2.86	0.09
8.	13/C2/DS2 Dry temperate scrub	4.02	0.13
9.	13/C4 West Himalayan high level dry blue pine forest (<i>P. wallichiana</i>)	32.21	1.01
10.	13/1S2 <i>Populus</i> / <i>Salix</i> forest	187.39	5.85
11.	14/C1a West Himalayan sub-alpine fir forest	716.97	22.39
12.	14/C1b West Himalayan sub-alpine birch/fir forest	16.62	0.52
13.	14/2S1 Sub-alpine blue pine forest (<i>P. wallichiana</i>)	168.81	5.27
14.	15/C1 Birch / <i>Rhododendron</i> scrub forest	12.28	0.38
15.	15/C2 Deciduous alpine scrub	17.65	0.55
16.	16/C1 Dry alpine scrub	543.97	16.98
17.	16/E1 Dwarf juniper scrub	670.15	20.92
	Sub Total	2,744.33	85.68
18.	TOF/Plantation	42.96	1.34
	Total (Forest Cover & Scrub)	2,787.29	
	Grassland forest types (outside forest cover)		
19.	14/DS1 Sub-alpine pastures	231.40	7.23
20.	15/C3 Alpine pastures	184.03	5.75
	Sub Total	415.43	12.98
	Grand Total	3,202.72	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). Grassland forest type outside forest cover has also been mapped. The total mapped area, therefore, is sum of forest cover, scrub and grassland forest types (found in non-forest).

13.34.3 Fire Prone Forest Areas






Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.34.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	2,272.00	100.00
	Total	2,272.00	100.00

Figure 13.34.4 Fire prone forest areas under different fire prone classes

LEGEND

■	Extremely Fire Prone
■	Very Highly Fire Prone
■	Highly Fire Prone
■	Moderately Fire Prone
■	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.34.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Ladakh has been estimated as given in following table.

Table 13.34.10 Tree Cover in Ladakh (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
-	954	-

13.34.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.34.11 Extent of TOF in Ladakh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,472	954	2,426

13.34.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Ladakh is given in the Table 13.34.12.

Table 13.34.12 Growing Stock in Ladakh (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	-	0.18	-	-
2.	Growing Stock in TOF	-	35.01	-	1.97

LADAKH

13.34.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Ladakh in Rural and Urban areas are given in the Table 13.34.13 and Table 13.34.14 respectively.

Table 13.34.13 Top five tree species in TOF (Rural) in Ladakh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Salix</i> spp.	62.48
2.	<i>Populus</i> spp.	28.30
3.	<i>Prunus</i> spp.	3.85
4.	<i>Salix tetrasperma</i>	2.79
5.	<i>Salix alba</i>	1.78

Table 13.34.14 Top five tree species in TOF (Urban) in Ladakh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Populus</i> spp.	46.17
2.	<i>Salix</i> spp.	32.05
3.	<i>Salix alba</i>	10.53
4.	<i>Salix tetrasperma</i>	7.07
5.	<i>Pyrus</i> spp.	1.89

13.34.8 Carbon Stock in Forest

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 30.70 million tonnes (112.57 million tonnes of CO₂ equivalent) which is 0.43 % of total forest carbon of the country. Pool wise forest carbon in Ladakh is given in the following table.

Table 13.34.15 Forest Carbon in Ladakh in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	13,293
2.	BGB	3,836
3.	Dead wood	269
4.	Litter	317
5.	SOC	12,987
Total		30,702



Figure 13.34.5 Forest Carbon in Ladakh

13.35

LAKSHADWEEP

Geographical Area
30 sq km

Geographical Coordinates
Latitude - 08° 15' N to 11° 45' N
Longitude - 72° E to 74° E

Population (as per Census 2011)
0.064 million
Urban 0.050 million (78.07 %)
Rural 0.014 million (21.93 %)
Tribal 0.061 million (94.80%)

Average Population Density
2,015 per sq km

Livestock population
(as per 19th Live Stock Census)
0.049 million

No. of Districts
1

No. of Hill Districts
0

No. of Tribal Districts
1

Table 13.35.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	3	
Reporting area for land utilization	3	100.00
Forests	-	-
Not available for land cultivation	1	33.33
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	-	-
Culturable wasteland	-	-
Fallow land other than current fallows	-	-
Current fallows	-	-
Net area sown	2	66.67

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.35.1 Forest Cover

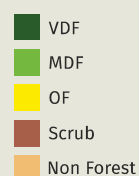


Figure 13.35.1
Forest Cover of
Lakshadweep

**Table 13.35.2 Forest Cover
of Lakshadweep** (in sq km)

Class	Area	% of GA
VDF	0.00	0.00
MDF	16.09	53.63
OF	11.01	36.70
Total	27.10	90.33
Scrub	0.00	0.00

Table 13.35.3 District- wise Forest Cover in Lakshadweep (in sq km)

District	Geo-geographical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Lakshadweep ^T	30	0.00	16.09	11.01	27.10	90.33	0.00	0.00
Grand total	30	0.00	16.09	11.01	27.10	90.33	0.00	0.00

13.35.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.35.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Lakshadweep (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
0.00	0.00	0.00	0.00	0.00	16.09	11.01	27.10
0.00	0.00	0.00		0.00	59.37%	40.63%	

There are no Green Wash / Recorded Forest Areas in Lakshadweep (vide official letter no. F. no. 72/1/2020-E & F (Part/583))

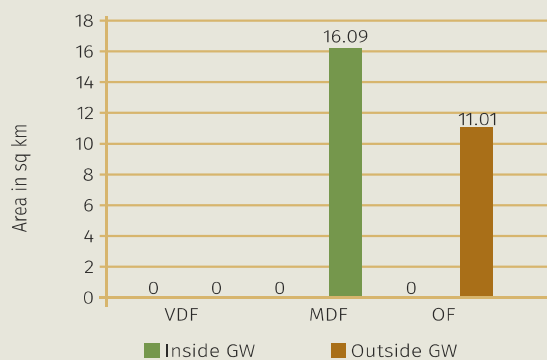


Figure 13.35.2
Forest Cover
Outside of Green
Wash in
Lakshadweep

LAKSHADWEEP

Table 13.35.5 Forest Cover Change Matrix for Lakshadweep

(in sq km)

Class	2021 Assessment					Total
	VDF	MDF	OF	Scrub	NF	ISFR 2019
Very Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00
Moderately Dense Forest	0.00	16.09	0.00	0.00	0.00	16.09
Open Forest	0.00	0.00	11.01	0.00	0.00	11.01
Scrub	0.00	0.00	0.00	0.00	0.00	0.00
Non Forest	0.00	0.00	0.00	0.00	2.90	2.90
Total ISFR 2021	0.00	16.09	11.01	0.00	2.90	30.00
Net Change	0.00	0.00	0.00	0.00	0.00	

Table 13.35.6 Altitude-wise Forest Cover in Lakshadweep

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	30	0.00	16.09	11.01	27.10	0.00
Total	30	0.00	16.09	11.01	27.10	0.00

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










Table 13.35.7 Forest Cover in different slope classes in Lakshadweep

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	30	0.00	16.09	11.01	27.10	0.00
Total	30	0.00	16.09	11.01	27.10	0.00

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

Figure 13.35.3 Forest Cover Map of Lakshadweep**LEGEND**

	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.35.2 Forest Types

The area under different forest types of Lakshadweep as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table 13.35.8 Area statistics of the Forest Types found in Lakshadweep (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	TOF/ Plantation	27.10	100.00
	Total	27.10	100.00

*Forest Types includes area under forest cover and scrub shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

13.35.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

LAKSHADWEEP

Table 13.35.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	27.10	100.00
Total		27.10	100.00

Figure 13.35.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.35.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Lakshadweep has been estimated as given in following table.

Table 13.35.10 Tree Cover in Lakshadweep (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
0.29	0.05	-0.24

13.35.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.35.11 Extent of TOF in Lakshadweep (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
27	0.05	27

13.35.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Lakshadweep is given in the Table 13.35.12.

Table 13.35.12 Growing Stock in Lakshadweep (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	0.00	0.00	0.00	0.00
2.	Growing Stock in TOF	0.07	0.05	-0.02	0.00

13.35.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Lakshadweep in Rural areas are given in the Table 13.35.13.

Table 13.35.13 Top five tree species in TOF (Rural) in Lakshadweep

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	86.28
2.	<i>Thespesia populnea</i>	4.06
3.	<i>Artocarpus altilis</i>	1.19
4.	<i>Artocarpus hirsute</i>	1.13
5.	<i>Mallotus philippinensis</i>	0.60

13.35.8 Carbon Stock in Forest

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 0.21 million tonnes (0.77 million tonnes of CO₂ equivalent) which is 0.003 % of total forest carbon of the country. Pool wise forest carbon in Lakshadweep is given in the following table

Table 13.35.14 Forest Carbon in Lakshadweep in different pools (in '000 tonnes)

Sl. No.	Species	Estimated Extent
1.	AGB	46
2.	BGB	10
3.	Dead wood	1
4.	Litter	3
5.	SOC	150
Total		210

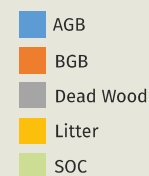


Figure 13.35.5 Forest Carbon in Lakshadweep

13.36

PUDUCHERRY

Geographical Area
490 sq km

Geographical Coordinates
Latitude- 11° 45' N to 12° 30' N
Longitude- 79° 36' E to 79° 53' E

Population (as per Census 2011)
1.25 million
Urban 0.85 million (68.33 %)
Rural 0.40 million (31.37 %)
Tribal Nil

Average Population Density
2,547 per sq km

Livestock population
(as per 19th Live Stock Census)
0.12 million

No. of Districts
4

No. of Hill Districts
0

No. of Tribal Districts
0

Table 13.36.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	48	
Reporting area for land utilization	49	100.00
Forests	0	0.00
Not available for land cultivation	20	40.82
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	1	2.04
Culturable wasteland	5	10.21
Fallow land other than current fallows	4	8.16
Current fallows	4	8.16
Net area sown	15	30.61

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2017-18)

13.36.1 Forest Cover

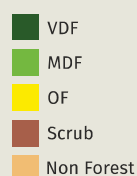


Figure 13.36.1
Forest Cover of
Puducherry

**Table 13.36.2 Forest Cover
of Puducherry** (in sq km)

Class	Area	% of GA
VDF	0.00	0.00
MDF	17.53	3.58
OF	35.77	7.30
Total	53.30	10.88
Scrub	0.00	0.00

Table 13.36.3 District- wise Forest Cover in Puducherry

(in sq km)

District	Geo-graphical Area (GA)	2021 Assessment				%of GA	Change wrt 2019 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Karaikal	157	0.00	6.83	10.06	16.89	10.76	1.72	0.00
Mahe	9	0.00	1.04	4.54	5.58	62.00	-0.09	0.00
Puducherry	294	0.00	9.66	14.72	24.38	8.29	-0.74	0.00
Yanam	30	0.00	0.00	6.45	6.45	21.5	0.00	0.00
Grand Total	490	0.00	17.53	35.77	53.30	10.88	0.89	0.00

13.36.1.1 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash)

The Forest Cover inside and outside Recorded Forest Area (RFA) has been analysed in different categories and presented in Table given below.

Table 13.36.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Puducherry (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
0.00	0.00	1.00	1.00	0.00	17.53	34.77	52.30
0%	0%	100%		0%	33.52%	66.48%	

*in case of Puducherry, Green Wash boundaries have been used

PUDUCHERRY

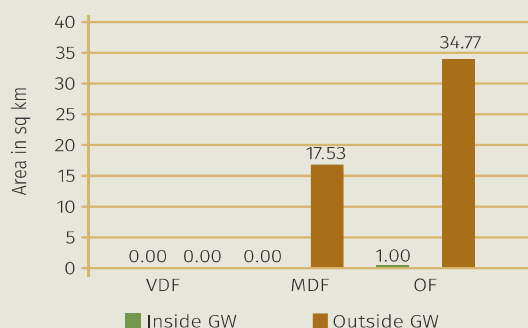


Figure 13.36.2
Forest Cover Inside
and Outside of
Green Wash in
Puducherry

Table 13.36.5 Forest Cover Change Matrix for Puducherry

(in sq km)

Class	2021 Assessment					Total ISFR 2019
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	0	0.00	0.00	0.00	0.00	0.00
Moderately Dense Forest	0	17.53	0.00	0.00	0.13	17.66
Open Forest	0	0.00	33.88	0.00	0.87	34.75
Scrub	0	0.00	0.00	0.00	0.00	0.00
Non Forest	0	0.00	1.89	0.00	435.70	437.59
Total ISFR 2021	0	17.53	35.77	0.00	436.70	490.00
Net Change	0	-0.13	1.02	0.00	-0.89	

Table 13.36.6 Altitude-wise Forest Cover in Puducherry

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	490	0.00	17.53	35.77	53.30	0.00
Total	490	0.00	17.53	35.77	53.30	0.00

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











Table 13.36.7 Forest Cover in different slope classes in Puducherry

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	449	0.00	17.14	35.04	52.18	0.00
5-10	41	0.00	0.39	0.73	1.12	0.00
Total	490	0.00	17.53	35.77	53.30	0.00

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

Figure 13.36.3 Forest Cover Map of Puducherry

LEGEND	
	Very Dense Forest
	Moderately Dense Forest
	Open Forest
	Scrub
	Non-Forest
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.36.2 Forest Types

The area under different forest types of Puducherry as per the Champion & Seth classification (1968), according to the Atlas Forest Types of India 2020 are presented in the following Table.

Table.13.36.8 Area statistics of the Forest Types found in Puducherry (in sq km)

Sl. No.	Forest Type	Area	% of the total mapped area*
1.	4B/TS2 Mangrove forest	1.64	3.13
2.	TOF/Plantation	50.77	96.87
Total		52.41	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in forest cover mapping (ISFR, 2019). The total mapped area, therefore, is sum of forest cover and scrub.

PUDUCHERRY

13.36.3 Fire Prone Forest Areas

Forest Cover under different classes of forest fire proneness is given in following table.

Table 13.36.9 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Forest Cover	% of Total Forest Cover
1.	Extremely fire prone	0.00	0.00
2.	Very highly fire prone	0.00	0.00
3.	Highly fire prone	0.00	0.00
4.	Moderately fire prone	0.00	0.00
5.	Less fire prone	53.30	100.00
Total		53.30	100.00

Figure 13.36.4 Fire prone forest areas under different fire prone classes

LEGEND

	Extremely Fire Prone
	Very Highly Fire Prone
	Highly Fire Prone
	Moderately Fire Prone
	Less Fire Prone
	Water-bodies
	International Boundary
	State Boundary
	District Boundary
	Capital

13.36.4 Tree Cover

Tree cover is defined as all tree patches of size less than 1 ha occurring outside the recorded forest area. Tree cover includes trees in all formations including scattered trees. Tree cover in Puducherry has been estimated as given in following table.

Table 13.36.10 Tree Cover in Puducherry (in sq km)

2019 Assessment	2021 Assessment	Change wrt 2019 Assessment
23	23	0

13.36.5 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. 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 following table.

Table 13.36.11 Extent of TOF in Puducherry (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
52	23	75

13.36.6 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Puducherry is given in the Table 13.36.12. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 13.36.13

Table 13.36.12 Growing Stock in Puducherry (in m cum)

Sl. No.	Growing Stock (GS)	2019 Assessment	2021 Assessment	Change wrt 2019 Assessment	% of Country's GS
1.	Growing Stock in Recorded Forest Area	0.05	0.03	-0.02	0.00
2.	Growing Stock in TOF	0.40	0.38	-0.02	0.02

Table 13.36.13 Diameter class distribution of tree species inside RFA in Puducherry (in '000)

Sl. No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Rhizophora mucronata</i>	33	23	0

PUDUCHERRY

13.36.7 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Puducherry in Rural and Urban areas are given in the Table 13.36.14 and Table 13.36.15 respectively.

Table 13.36.14 Top five tree species in TOF (Rural) in Puducherry

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	28.69
2.	<i>Azadirachta indica</i>	9.89
3.	<i>Borassus flabelliformis</i>	8.93
4.	<i>Casuarina equisetifolia</i>	6.65
5.	<i>Eucalyptus</i> spp.	5.75

Table 13.36.15 Top five tree species in TOF (Urban) in Puducherry

Sl. No.	Species	Relative Abundance (%)
1.	<i>Cocos nucifera</i>	29.03
2.	<i>Azadirachta indica</i>	14.92
3.	<i>Morinda oleifera</i>	13.01
4.	<i>Mangifera indica</i>	6.39
5.	<i>Pongamia pinnata</i>	6.32

13.36.8 Carbon Stock in Forest in Puducherry

The total Carbon stock of forest in the UT including the TOF patches which are more than 1ha in size is 0.39 million tonnes (1.43 million tonnes of CO₂ equivalent) which is 0.01 % of total forest carbon of the country. Pool wise forest carbon in Puducherry is given in the following table

Table 13.36.16 Forest Carbon in Puducherry in different pools (in '000 tonnes)

Sl. No.	Carbon Pools	Forest Carbon
1.	AGB	76
2.	BGB	17
3.	Dead wood	1
4.	Litter	5
5.	SOC	287
Total		386



Figure 13.36.5 Forest Carbon in Puducherry