

11.17

MANIPUR

11.17.1 Introduction

Manipur, a hilly State in northeastern India, lies between latitude 23°50' N to 25°42'N and longitude 92°59' E to 94°46' E, sharing international border with Myanmar on eastern side. Its covering an area of 22,327 sq km, which constitutes 0.68% of the geographical area of the country. Physiographically, Manipur can be characterized in two distinct physical regions – an outlying area of rugged hills and narrow valleys and the inner area of flat plain, with associated land forms. Manipur has a tropical climate with average annual rainfall ranging from 1,200 mm to 2,700mm and the average annual temperature ranging from 14.5°C to 38°C. The State is drained by Imphal and Bara rivers. The state has 9 districts, all of which are hilly as well as tribal. As per the 2011 census, Manipur has a population of 2.86 million of which urban and rural population are 29.20% and 70.80% respectively. The urban population of the state is an increasing trend of last decade mainly in Imphal, the capital of state. The average population density of the state is 115 persons per sq km. The Livestock population of the State as per 19th Livestock Census, 2012 is 0.70 million.

TABLE 11.17.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	2,233	
Reporting area for land utilization	2,117	100.00
Forests	1,699	80.25
Not available for land cultivation	27	1.27
Permanent pastures and other grazing lands	1.37	0.07
Land under misc. tree crops and groves	5.95	0.28
Culturable wasteland	0.74	0.04
Fallow land other than current fallows	0.06	0.00
Current fallows	0.14	0.01
Net area sown	383	18.08

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



11.17.1.1 A Brief Overview of Forestry Scenario

The State of Manipur is endowed with rich biodiversity with many endemic flora and fauna. As per the Champion & Seth Classification of Forests Types (1968), the forests in Manipur belong to five Forest Type Groups which are further divided into 11 Forest Types. Out of 126 species of bamboos reported in India, 53 species are found in Manipur. Among the trees, Teak, Pine, Oak, Uningthou (*Phoebe* spp.) Leihao (*Michelia* spp.) are the major species. Forests in Manipur are largely under the community and private ownership. Being a predominantly tribal State, lives of rural people residing in hills of the State are dependent on forests in socio-economic and socio-cultural context. Nearly 1,200 species of medicinal plants are reported from the State.

Recorded Forest Area (RFA) in the State is 17,418 sq km of which 1,467 sq km is Reserved Forest, 4,171 sq km is Protected Forest and 11,780 sq km is Unclassified Forests. In Manipur, during the period 1st January 2015 to 5th February 2019, a total of 263.20 hectares of forest land was diverted for non-forestry purposes under the Forest Conservation Act, 1980 (MoEF&CC, 2019). As per the information received from the State during that last two years, 11,346 ha of plantations were raised in the State.

One National Park, two Wildlife Sanctuaries and four Community Reserves constitute the Protected Area network of the State covering 1.01% of its geographical area. Loktak Lake is the largest fresh water lake in Eastern India, and has been declared a Ramsar site. The Keibul Lamjao National Park situated on the southern shore of the Loktak Lake is home to the endangered *Rucervus eldii* (brow-antlered deer or Sangai) also known as the dancing deer. *Lilium mackliniae* or Siroi Lily is a rare species that is only found in Manipur's Siroi hill ranges.

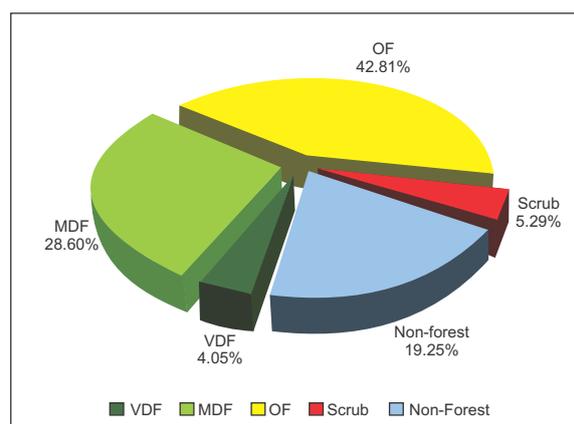
11.17.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Oct 2017 to Feb 2018, the Forest Cover in the State is 16,846.90 sq km which is 75.46 % of the State's geographical area. In terms of forest canopy density classes, the State has 905.27 sq km under Very Dense Forest (VDF), 6,386.29 sq km under Moderately Dense Forest (MDF) and 9,555.34 sq km under Open Forest (OF). Forest Cover in the State has decreased by 499.10 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.17.2 Forest Cover of Manipur
(in sq. km)

Class	Area	% of GA
VDF	905.27	4.05
MDF	6,386.29	28.60
OF	9,555.34	42.81
Total	16,846.90	75.46
Scrub	1,181.47	5.29

FIGURE 11.17.1 Forest Cover of Manipur



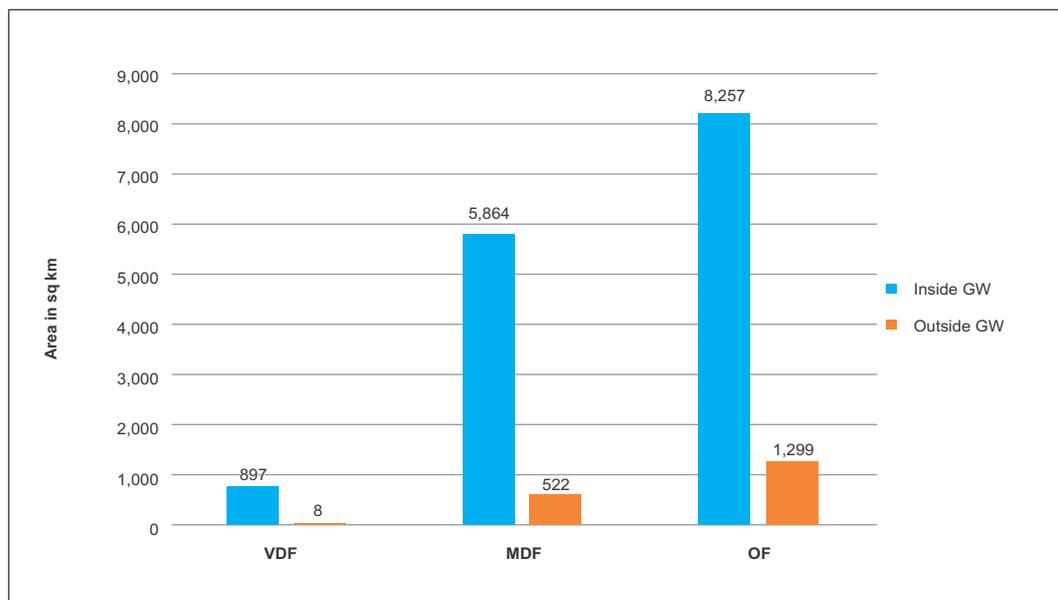
11.17.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 17,418 sq km which is 78.01% of its geographical area. The reserved, protected and unclassified forests are 8.42%, 23.95% and 67.63% respectively of the recorded forest area in the State. Due to non-availability of digitized boundary of recorded forest areas from the State, the updated Green Wash from Sol toposheets which is 17,542.42 sq km has been used as proxy to the RFA boundary and the analysis of forest cover inside and outside this area is given below.

TABLE 11.17.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) (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
897	5,864	8,257	15,018	8	522	1,299	1,829
5.97%	39.05%	54.98%		0.44%	28.54%	71.02%	

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

FIGURE 11.17.2 Forest Cover inside and outside Green Wash in Manipur**TABLE 11.17.4** District-wise Forest Cover in Manipur (in sq km)

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bishnupur TH	496	0.00	0.99	20.51	21.50	4.33	-0.50	2.00
Chandel TH	3,313	10.76	950.42	1902.17	2,863.35	86.43	-43.65	139.09
Churachandpur TH	4,570	41.92	1,614.50	2,263.09	3,919.51	85.77	-249.49	164.67
Imphal East TH	709	0.00	60.90	213.36	274.26	38.68	-3.74	15.00
Imphal West TH	519	0.00	15.66	36.09	51.75	9.97	-2.25	9.22
Senapati TH	3,271	270.75	744.46	1,121.37	2,136.58	65.32	-47.42	287.56
Tamenglong TH	4,391	388.90	1,726.75	1,728.79	3,844.44	87.55	-108.56	166.67
Thoubal TH	514	0.00	2.00	68.76	70.76	13.77	-2.24	11.14
Ukhrul TH	4,544	192.94	1,270.61	2,201.20	3,664.75	80.65	-41.25	386.12
Grand Total	22,327	905.27	6,386.29	9,555.34	16,846.90	75.46	-499.10	1,181.47

TABLE 11.17.5 Forest Cover Change Matrix for Manipur

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	905	0	0	0	3	908
Moderately Dense Forest	0	6,386	9	2	113	6,510
Open Forest	0	0	9,445	15	468	9,928
Scrub	0	0	1	1,094	16	1,111
Non Forest	0	0	101	70	3,699	3,870
Total ISFR 2019	905	6,386	9,556	1,181	4,299	22,327
Net Change	-3	-124	-372	70	429	

TABLE 11.17.6 Altitude-wise Forest Cover in Manipur

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	3,303	11	1,012	2,009	3,032 (18.00 %)	56
500-1000	9,066	28	2,116	3,709	5,853 (34.74%)	427
1000-2000	9,342	516	3,124	3,752	7,392 (43.88%)	652
2000-3000	616	350	134	86	570 (3.38%)	46
Total	22,327	905	6,386	9,556	16,847	1,181

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

TABLE 11.17.7 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	27	233	516	776 (4.61%)	49
5-10	2,361	86	566	1,098	1,750 (10.39%)	137
10-15	3,630	148	986	1,764	2,898 (17.20%)	234
15-20	4,275	173	1,273	2,104	3,550 (21.07%)	272
20-25	3,902	160	1,274	1,888	3,322 (19.72%)	233
25-30	2,753	128	993	1,260	2,381 (14.13%)	151
>30	2,472	183	1,061	926	2,170 (12.88%)	105
Total	22,327	905	6,386	9,556	16,847	1,181

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



FIGURE 11.17.3 Forest Cover Map of Manipur

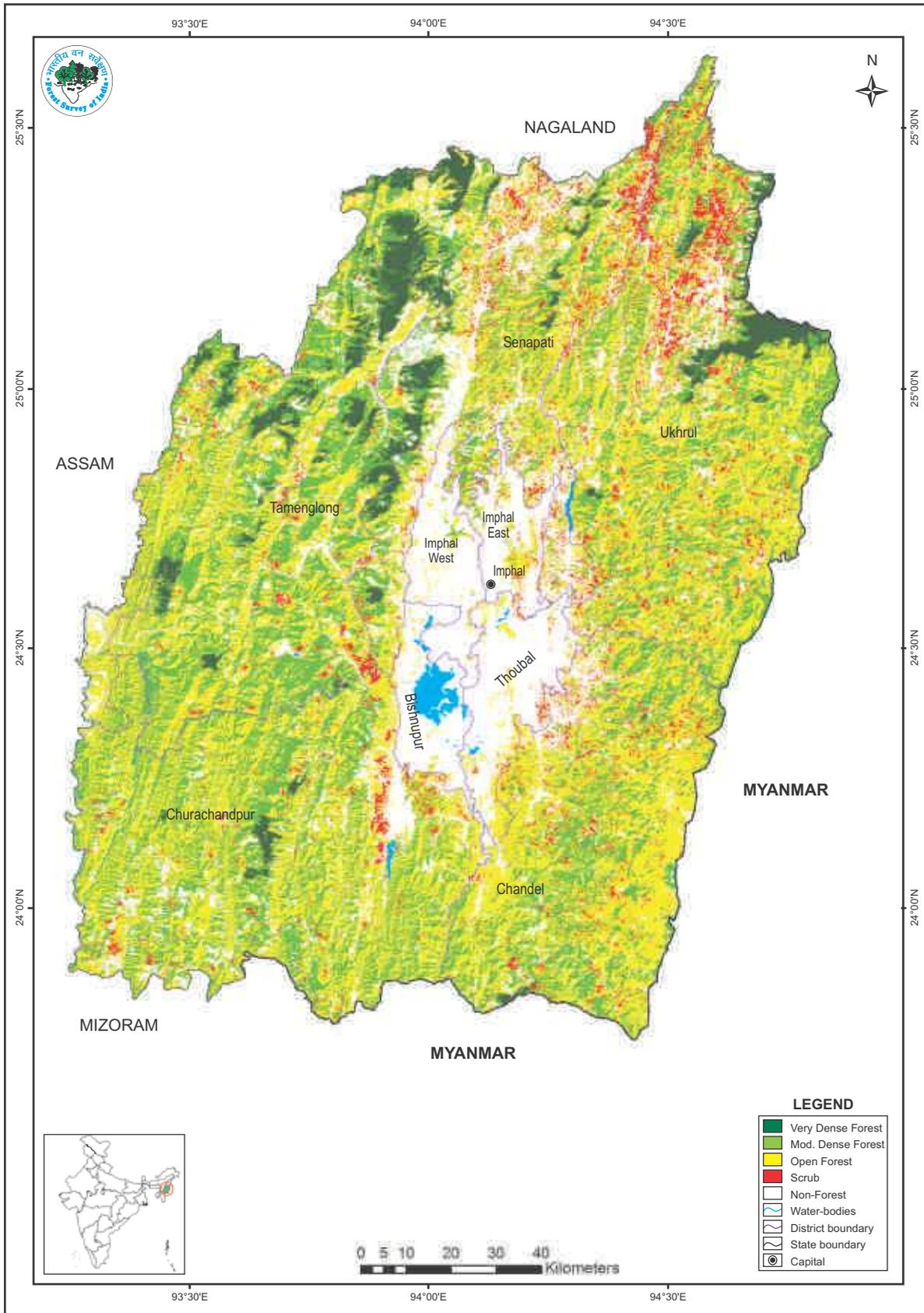


TABLE 11.17.8 Wetlands inside the Recorded Forest Area (or Green Wash) in Manipur (in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	4	10
Waterlogged	9	53
River/Stream	13	12,012
Sub - Total	26	12,075
Inland Wetlands - Man-made		
Reservoir/Barrage	3	161
Tank/Pond	6	17
Sub - Total	9	178
Wetlands (<2.25 ha)	171	171
Total	206	12,424
Total Recorded Forest (or Green Wash) Area (in ha)		17,54,242
% of Wetland area inside Recorded Forest (or Green Wash) Area		0.71%

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

11.17.3 Forest Types & Biodiversity

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

Table 11.17.9 Percentage area under different forest types of Manipur

Sl. No.	Forest Type	% of Forest cover
1.	2B/C2 Cachar Semi-Evergreen Forest	15.39
2.	2B/2S1 (Pioneer Euphorbiaceous Scrub)	7.49
3.	2/2S1 Secondary Moist Bamboo Brakes	7.47
4.	3C/C3b East Himalayan Moist Mixed Deciduous Forest	24.48
5.	4D/2S2 Eastern Wet Alluvial Grassland	0.72
6.	8B/C1 East Himalayan Sub-Tropical Wet Hill Forest	33.69
7.	8B/C2 Khasi Sub-Tropical Wet Hill Forest	2.37
8.	9/C2 Assam Sub-Tropical Pine Forest	3.54
9.	9/C2/DS1 Assam Subtropical Pine Savannah	0.30
10.	11B/C1b Buk Oak Forest	2.88
11.	11B/C2 Naga Hill Wet Temperate Forest	1.30
12.	12/DS1 Montane Bamboo Brakes	0.06
13.	Plantation/ TOF	0.31
	Total	100.00

11.17.3.1 Assessment of Biodiversity

Findings of the Rapid Assessment of Biodiversity carried out at the national level for natural forests during September 2018 to May 2019 as part of the forest type mapping exercise is summarized below in table 11.17.10 and table 11.17.11 in respect of Manipur.

TABLE 11.17.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	43
Shrub	89
Herb	56

TABLE 11.17.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Manipur

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1	Group 2- Tropical Semi-Evergreen Forests	2.49	1.56	2.02
2	Group 3- Tropical Moist Deciduous Forests	2.25	2.47	1.15
3	Group 8- Subtropical Broadleaved Hill Forests	2.26	3.71	2.88
4	Group 9- Subtropical Pine Forests	1.12	2.45	1.58
5	Group 11- Montane Wet Temperate Forests	1.48	2.67	1.75

11.17.4 Fire Prone Forest Areas

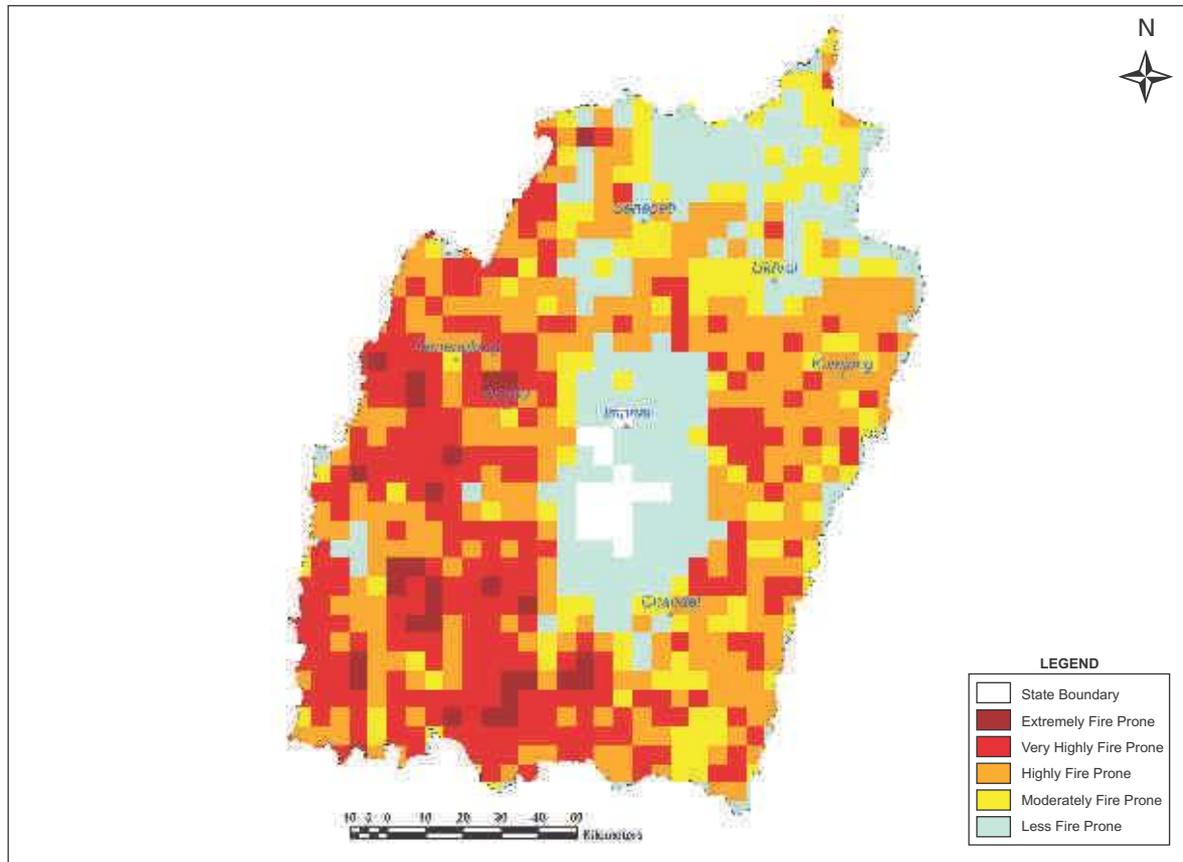
Geographical area under different classes of forest fire proneness are given in the following table.

TABLE 11.17.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1	Extremely fire prone	837.76	4.48
2	Very highly fire prone	6,269.58	33.13
3	Highly fire prone	7,008.53	35.85
4	Moderately fire prone	3,381.03	15.36
5	Less fire prone	4,404.59	11.18
	Total	21,901.49	100.00



FIGURE 11.17.4 Fire prone forest areas under different fire prone classes



11.17.5 Tree Cover

Forest cover presented in the section 11.17.2 accounts for tree patches of size 1 ha and more having canopy density more than 10%. However, trees occurring in patches of size less than 1 ha including scattered trees are assessed through sampling based methodology. Tree cover in Manipur has been estimated as given in table 11.17.13

TABLE 11.17.13 Tree Cover in Manipur (in sq km)

Tree Cover	Area
	173

Tree cover of Manipur has decreased by 47 sq km as compared to the previous assessment reported in ISFR 2017.

11.17.6 Extent of Trees Outside Forest (TOF)

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

TABLE 11.17.14 Extent of TOF in Manipur (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
1,829	173	2,002

11.17.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Manipur is given in the table 11.17.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.17.16

TABLE 11.17.15 Growing Stock in Forest (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	42.03	0.98
Growing Stock in TOF	6.07	0.37

TABLE 11.17.16 Diameter class distribution of top five species inside RFA in Manipur (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Pinus kasya</i>	9,713	2,914	0
2.	<i>Castanopsis species</i>	19,160	0	0
3.	<i>Quercus species</i>	38,152	2,948	0
4.	<i>Schima wallichii</i>	17,686	1,474	0
5.	<i>Ficus species</i>	11,791	4,422	0

11.17.8 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 178.72 million tonnes (655.31 million tonnes of CO₂ equivalent) which is 2.51% of total forest carbon of the country. Pool wise forest carbon in Manipur is given in the following table

TABLE 11.17.17 Forest Carbon in Manipur in different pools (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
44,723	13,317	508	3,924	1,16,251	1,78,723

11.17.9 Growing Stock of Bamboo

Bamboo bearing area and growing stock inside the recorded forest area (RFA)/ Green Wash in the State which include culms of 1 year age and above are given in the table 11.17.18

TABLE 11.17.18 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)	9,903	6.19
Total number of culms (in millions)	1,126	2.85
Total equivalent green weight (in 000' tonnes)	7,754	2.79

11.17.10 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 11.17.19 and table 11.17.20 respectively

TABLE 11.17.19 Top five tree species in TOF (Rural) in Manipur

Sl. No.	Species	Relative Abundance (%)
1.	<i>Quercus species</i>	19.81
2.	<i>Castanopsis species</i>	12.12
3.	<i>Pinus kasya</i>	12.05
4.	<i>Schima wallichii</i>	8.66
5.	<i>Albizia species</i>	3.57

TABLE 11.17.20 Top five tree species in TOF (Urban) in Manipur

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	10.86
2.	<i>Eucalyptus species</i>	8.16
3.	<i>Toona ciliate</i>	7.54
4.	<i>Betula cylindrostachys</i>	6.64
5.	<i>Syzygium cumini</i>	5.73

11.17.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.17.21 and table 11.17.22 respectively.

TABLE 11.17.21 Major NTFP species in the State of Manipur

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Diplagium species</i>	Herb	70.77
2.	<i>Thysanolaena maxima</i>	Herb	9.23
3.	<i>Parkia javancia</i>	Tree	9.23
4.	<i>Embilica officinalis</i>	Tree	6.15
5.	<i>Acquillaria mallaccensis</i>	Tree	3.08

TABLE 11.17.22 Major invasive species inside the State with RFA/Green Wash in Manipur (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Chromolaena naodorata</i>	88
2.	<i>Mikania micrantha</i>	78
3.	<i>Microcystis aeruginosa</i>	15

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

11.17.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Manipur

Through a nation-wide study, FSI has done estimation of dependence of people living in the villages close to forest for fuel wood, fodder, small timber and bamboo in quantified terms for each State & UT of the country (Please refer to Chapter 10 in Vol. I for details). The estimated quantities of the four produce for Manipur is given in the table 11.17.23

TABLE 11.17.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Manipur

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
38,909	2,62,086	2,923	8,618