11.18 MEGHALAYA

11.18.1 Introduction

Situated in the North Eastern part of the country, Meghalaya covers an area of 22,429 sq km, which is 0.68% of the geographical area of the country. The State lies between 24°58'N to 26°07'N latitude and 89°48' E to 92°51'E longitude and is bordered by Assam in the north and east and shares international boundary with Bangladesh in the south and west. The State has three distinct regions namely, Garo Hills, Khasi Hills and Jaintia hills. It falls in the high rainfall region and the average annual rainfall is in the range of 4,000 mm to about 11,500 mm. The wettest place on the earth Mawsynram is located in the State. Western part of the State is warmer with mean temperature ranging between 12°C to 33°C. The central upland is relatively cooler with mean temperature ranging between 2°C to 24°C. The State is drained by a number of rivers which include Sanda, Simsang Umngot and Myntdu. The State has 11 districts all of which are tribal and hill districts. As per the 2011 census, Meghalaya has a population of 2.96 million accounting to 0.24% of India's population. The rural and urban population constitute 79.93% and 20.07% respectively. The population density of the State is 132 per sq km which is much lower than the national average. The 19th Livestock census 2012 has reported a total livestock population of 1.95 million in the State.

TABLE 11.18.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	2,243	
Reporting area for land utilization	2,242	100.00
Forests	946	42.20
Not available for Land Cultivation	240	10.69
Permanent pastures & other grazing lands	-	-
Land under misc. tree crops and groves	165	7.36
Culturable wasteland	390	17.38
Fallow lands other than current fallows	155	6.91
Current fallows	60	2.69
Net area Sown	286	12.77

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

11.18.1.1 A Brief Overview of Forestry Scenario

Meghalaya is a forest rich State. Being a predominantly tribal State, lives of rural people are significantly dependent on forests in socio-economic and socio-cultural contexts. Unlike other States, forests in Meghalaya are largely under the community and private ownership. Only 1,113 sq km of forests, in Reserved Forests, Protected Forests, National Parks and Sanctuaries are under the direct control of the State Forest Department. Community and private forests are under the administrative control of the three Autonomies District Councils *viz* Khasi Hills, Jaintia Hills and Garo Hills. Shifting cultivation is still prevalent in the State. According to the official communication received from the State, extent of forest area diverted for non-forestry purposes under the FC Act, 1980 in the last five years i.e. from 2014-15 to 2018-19 is 178.7 ha. The SFD has raised 2,982 ha of plantations in the same period. The State in the year 2012 has promulgated an Act defining forest. According to the Act, 'Forest' has been defined as a compact and continuous tract of minimum 4 ha land, irrespective of ownership and where more than 250 naturally growing trees per ha of 15 cm and higher diameter at breast height (DBH) over bark are present or more than 100 naturally growing bamboo clumps per ha are present. Two National Parks, four Wildlife Sanctuaries and 65 Community Reserves constitute the Protected Area network of the State covering 2.22% of its geographical area.

11.18.2 Forest Cover

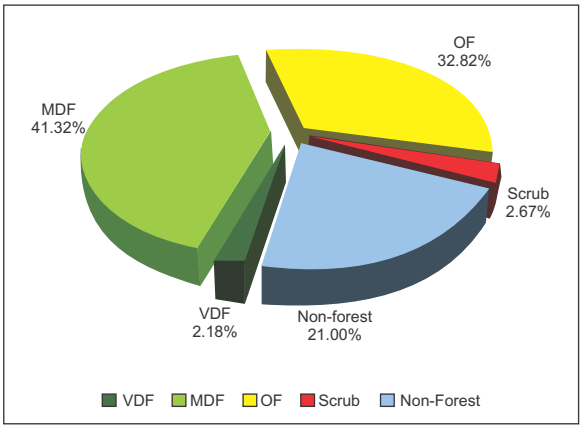
Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017 to Jan 2018, the Forest Cover in the State is 17,118.79 sq km which is 76.32 % of the State's geographical area. In terms of forest canopy density classes, the State has 488.98 sq km under Very Dense Forest (VDF), 9,267.29 sq km under Moderately Dense Forest (MDF) and 7,362.52 sq km under Open Forest (OF). Forest Cover in the State has decreased by 27.21 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.18.2 Forest Cover of Meghalaya

(in sq. km)

Class	Area	% of GA
VDF	488.98	2.18
MDF	9,267.29	41.32
OF	7,362.52	32.82
Total	**17,118.79**	**76.32**
Scrub	599.83	2.67

FIGURE 11.18.1 Forest Cover of Meghalaya



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

The State has reported extent of recorded forest area (RFA) 9,496 sq km which is 42.34% of its geographical area. The reserved, protected and unclassed forests are 11.72%, 0.13% and 88.15% of the recorded forest area in the State respectively. Due to non-availability of digitized boundary of recorded forest areas from the State, the updated Green Wash from SoI toposheets which is 17,563.20 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 11.18.3 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
442	7,743	6,659	14,844	47	1,524	704	2,275
2.98%	52.16%	44.86%		2.05%	67.01%	30.94%	

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

FIGURE 11.18.2 Forest Cover inside and outside Green Wash in Meghalaya

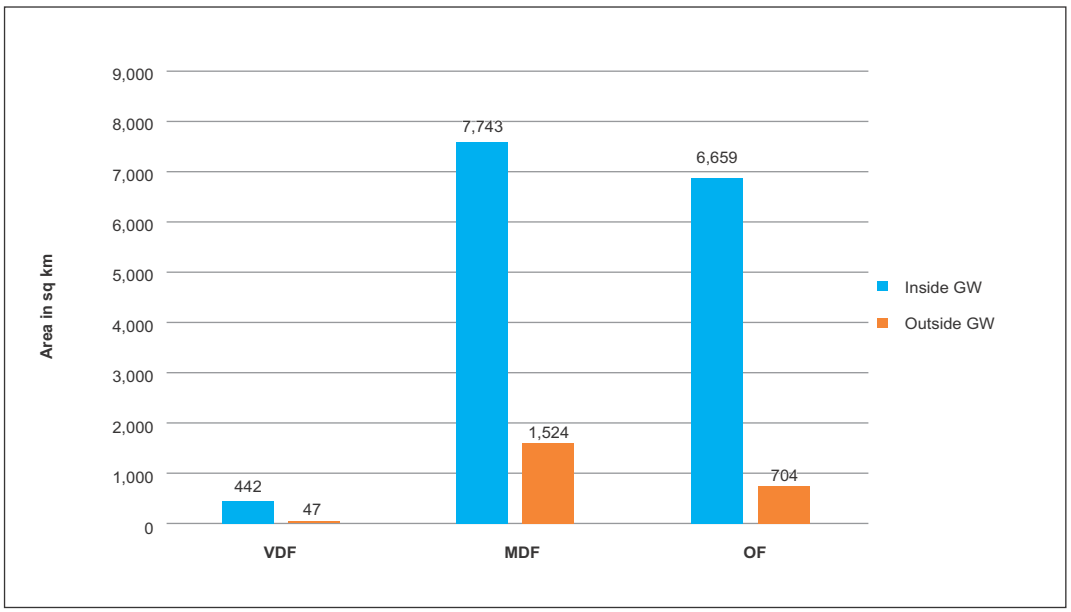


TABLE 11.18.4 District- wise Forest Cover in Meghalaya

(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			
East Garo Hills[TH]	2,603	62.73	1,085.89	1,139.34	2,287.96	87.90	21.96	60.73
East Khasi Hills[TH]	2,748	19.39	969.24	723.56	1,712.19	62.31	-38.81	109.73
Jaintia Hills[TH]	3,819	103.31	1,448.69	985.89	2,537.89	66.45	34.89	104.59
Ribhoi[TH]	2,448	127.36	1,097.30	912.68	2,137.34	87.31	-5.66	51.16
South Garo Hills[TH]	1,887	65.39	990.45	646.36	1,702.20	90.21	14.20	17.68
West Garo Hills[TH]	3,677	0.00	1,260.41	1,599.81	2,860.22	77.79	23.22	70.64
West Khasi Hills[TH]	5,247	110.80	2,415.31	1,354.88	3,880.99	73.97	-77.01	185.30
Grand Total	**22,429**	**488.98**	**9,267.29**	**7,362.52**	**17,118.79**	**76.32**	**-27.21**	**599.83**

TABLE 11.18.5 Forest Cover Change Matrix for Meghalaya

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	438	13	1	0	1	**453**
Moderately Dense Forest	50	9,202	27	7	100	**9,386**
Open Forest	0	3	7,095	47	162	**7,307**
Scrub	0	0	22	453	30	**505**
Non Forest	1	49	218	93	4,417	**4,778**
Total ISFR 2019	**489**	**9,267**	**7,363**	**600**	**4,710**	**22,429**
Net Change	36	-119	56	95	-68	

TABLE 11.18.6 Altitude-wise Forest Cover in Meghalaya

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total		Scrub
0-500	10,152	272	4,264	4,091	8,6270	(50.39%)	197
500-1000	6,239	182	2,704	2,312	5,198	(30.37%)	291
1000-2000	6,038	35	2,299	960	3,294	(19.24%)	112
Total	**22,429**	**489**	**9,267**	**7,363**	**17,119**		**600**

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

TABLE 11.18.7 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	1,925	1,629	3,674	(21.46%)	122
5-10	6,115	0	2,489	2,115	4,604	(26.89%)	146
10-15	4,403	114	1,985	1,612	3,711	(21.68%)	115
15-20	2,670	96	1,292	967	2,355	(13.76%)	78
20-25	1,488	71	759	517	1,347	(7.87%)	53
25-30	806	45	420	271	736	(4.30%)	37
>30	778	43	397	252	692	(4.04%)	49
Total	**22,429**	**489**	**9,267**	**7,363**	**17,119**		**600**

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

FIGURE 11.18.3 Forest Cover Map of Meghalaya

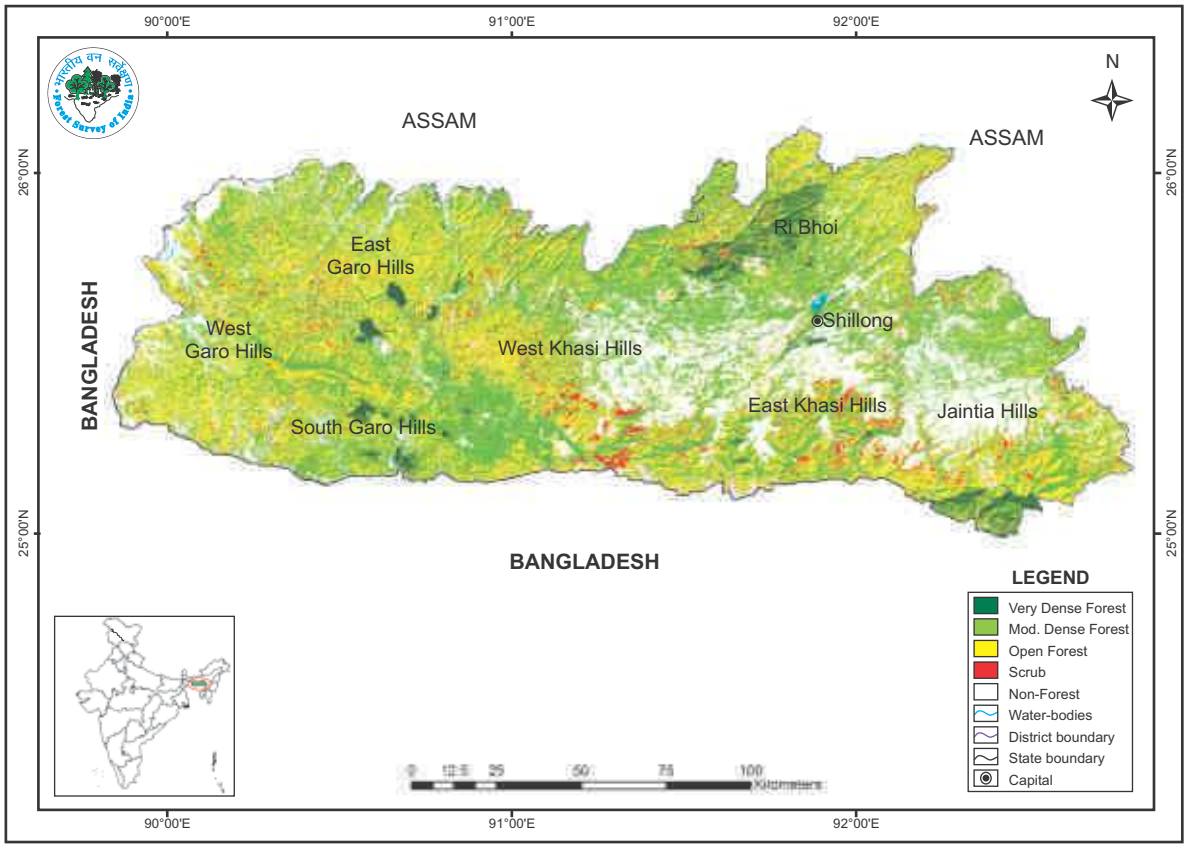


TABLE 11.18.8 Wetlands inside the Recorded Forest Area (or Green Wash) in Meghalaya

(in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
	Inland Wetlands - Natural	
Lake/Pond	11	87
Riverine wetland	4	278
Waterlogged	31	137
River/Stream	92	20,125
Sub - Total	**138**	**20,627**
	Inland Wetlands -Man-made	
Reservoir/Barrage	8	677
Tank/Pond	23	91
Waterlogged	1	1
Sub - Total	**32**	**769**
Wetlands (<2.25 ha)	74	74
Total	**244**	**21,470**

Total Recorded Forest (or Green Wash) Area (in ha)	17,56,320
% of Wetland area inside Recorded Forest (or Green Wash) Area	**1.22%**

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

11.18.3 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 Meghalaya as per the Champion & Seth classification (1968), according to the latest exercise are presented in the following table.

TABLE 11.18.9 Percentage area under different forest types of Meghalaya

Sl. No.	Forest Type	% of Forest cover
1.	1B/C3 Cachar Tropical Evergreen Forest	8.52
2.	1/2S1 Pioneer Euphorbiaceous Scrub	2.95
3.	2B/C1a Assam Alluvial Plains Semi-Evergreen Forest	0.72
4.	2/2S1 Secondary Moist Bamboo Brakes	2.13
5.	3C/C1a (ii) Khasi hill Sal	6.81
6.	3C/C3b East Himalayan Moist Mixed Deciduous Forest	47.73
7.	8B/C2 Khasi Sub-Tropical Wet Hill Forest	20.43
8.	9/C2 Assam Sub-Tropical Pine Forest	6.99
9.	9/C2/DS1 Assam sub-tropical pine savannah	1.30
10.	Plantation/TOF	2.42
	Total	**100.00**

11.18.3.1 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 11.18.10 and table 11.18.11 in respect of Meghalaya.

TABLE 11.18.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	93
Shrub	176
Herb	42

TABLE 11.18.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Meghalaya

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1.	Group 1- Tropical Wet Evergreen Forests	2.79	3.54	2.17
2.	Group 2- Tropical Semi-Evergreen Forests	1.95	3.10	0.59
3.	Group 3- Tropical Moist Deciduous Forests	3.06	3.94	1.19
4.	Group 8- Subtropical Broadleaved Hill Forests	1.76	3.66	1.86
5.	Group 9- Subtropical Pine Forests	2.01	2.36	2.59

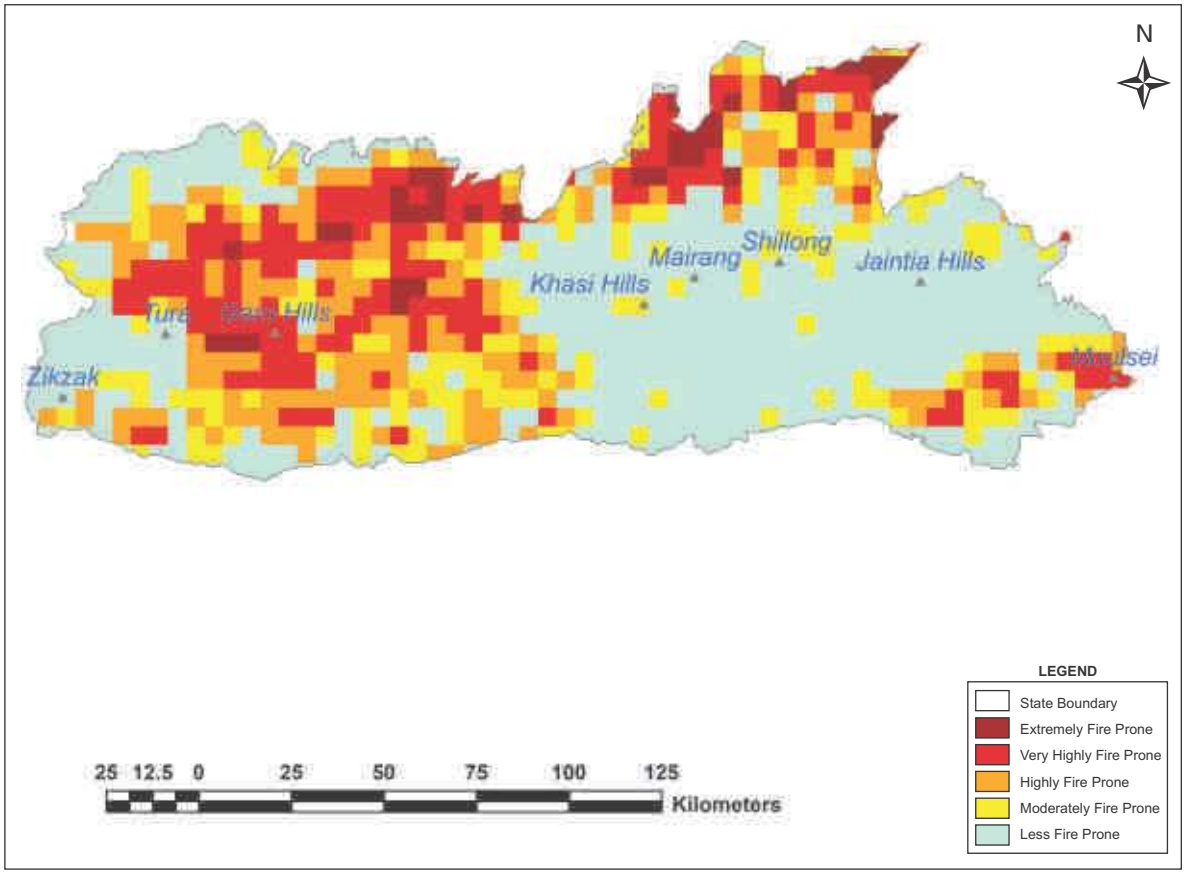
11.18.4 Fire Prone Forest Areas

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

TABLE 11.18.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1.	Extremely fire prone	1,085.11	5.74
2.	Very highly fire prone	3,479.43	18.38
3.	Highly fire prone	3,958.67	20.13
4.	Moderately fire prone	3,741.04	17.77
5.	Less fire prone	10,151.34	37.98
	Total	**22,415.59**	**100.00**

FIGURE 11.18.4 Fire prone forest areas under different fire prone classes



11.18.5 Tree Cover

Forest cover presented in the section 11.18.2 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 Meghalaya has been estimated as given in table 11.18.13.

TABLE 11.18.13 Tree Cover in Meghalaya (in sq km)

Tree Cover	Area
	710

Tree cover of Meghalaya has increased by 53 sq km as compared to the previous assessment reported in ISFR 2017.

11.18.6 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 methodology. 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 11.18.14 Extent of TOF in Meghalaya

(in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
2,275	710	2,985

11.18.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Meghalaya is given in the table 11.18.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.18.16

TABLE 11.18.15 Growing Stock in Meghalaya

(in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	31.28	0.73
Growing Stock in TOF	18.84	1.15

TABLE 11.18.16 Diameter class distribution of top five species inside RFA in Meghalaya

(in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	*Schima wallichii*	26,279	2,362	90
2.	*Pinus kasya*	13,510	3,170	262
3.	*Areca catechu*	19,248	0	0
4.	*Macaranga species*	5,623	179	0
5.	*Callicarpa arborea*	6,083	0	0

11.18.8 Carbon Stock in Forest

The total Carbon stock of forest in the State including the TOF patches which are more than 1 ha in size is 180.97 million tonnes (663.56 million tonnes of CO_2 equivalent) which is 2.54% of total forest carbon of the country. Pool wise forest carbon in Meghalaya is given in the following table

TABLE 11.18.17 Forest Carbon in Meghalaya in different pools

(in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
52,302	14,963	731	4,328	1,08,642	1,80,966

11.18.9 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 11.18.18

TABLE 11.18.18 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)	5,410	3.38
Total number of culms (in millions)	1,521	3.86
Total equivalent green weight (in 000' tonnes)	12,323	4.44

11.18.10 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 11.18.19 and table 11.18.20 respectively

TABLE 11.18.19 Top five tree species in TOF (Rural) in Meghalaya

Sl. No.	Species	Relative Abundance (%)
1.	*Pinus kasya*	36.73
2.	*Schima wallichii*	17.44
3.	*Areca catechu*	10.34
4.	*Castanopsis species*	4.34
5.	*Erythrina species*	1.41

TABLE 11.18.20 Top five tree species in TOF (Urban) in Meghalaya

Sl. No.	Species	Relative Abundance (%)
1.	*Pinus kasya*	66.88
2.	*Areca catechu*	3.87
3.	*Shorea robusta*	2.58
4.	*Pyrus communis*	2.27
5.	*Schima wallichii*	1.74

11.18.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.18.21 and table 11.18.22 respectively

TABLE 11.18.21 Major NTFP species in the State of Meghalaya

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	*Terminalia belerica*	Tree	24.74
2.	*Careya arborea*	Tree	17.53
3.	*Bauhinia variegate*	Tree	17.53
4.	*Embilica officirvalis*	Tree	15.46
5.	*Cinnamomum tamala*	Tree	11.34

TABLE 11.18.22 Major invasive species inside the State of Meghalaya with RFA/Green Wash (in sq km)

Sl. No.	Species	Estimated Extent
1.	*Chromolaena odorata*	135
2.	*Mikania micrantha*	39
3.	*Lantana camara*	39
4.	*Microcystis aeruginosa*	1

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

11.18.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Meghalaya

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 Meghalaya is given in the table 11.18.23

TABLE 11.18.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Meghalaya

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
93,381	2,20,307	898	5,821