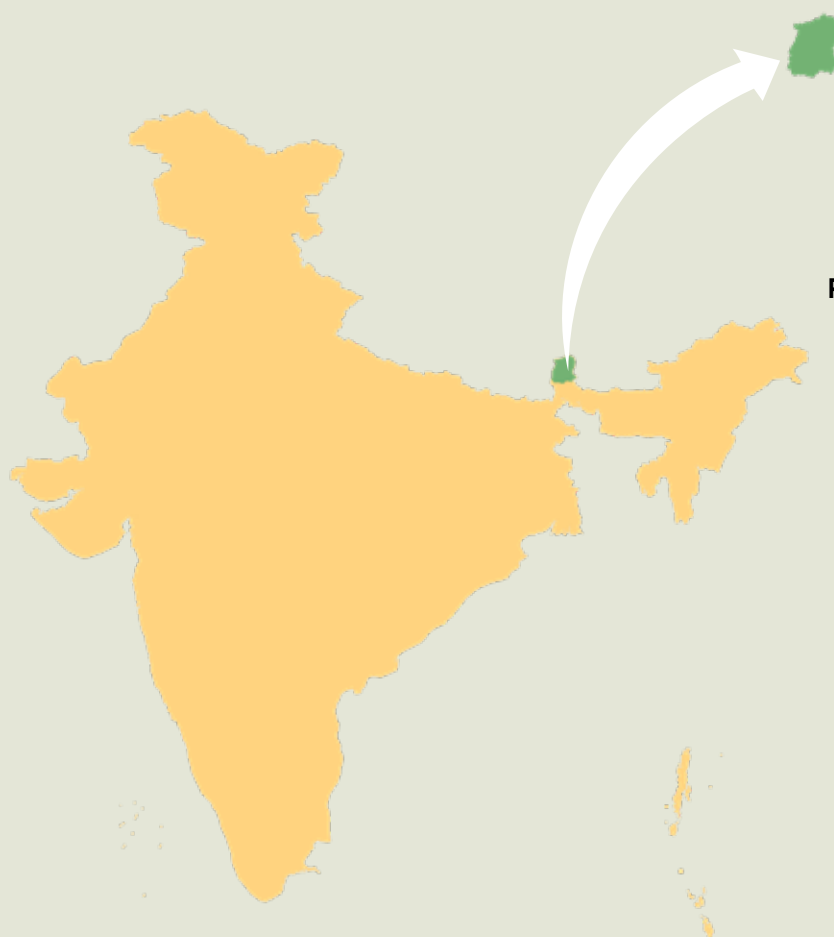




Geographical Area
7,096 km²

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 km²

Livestock Population
(as per 19th Livestock Census)
0.29 million

No. of Districts
4

No. of Hill Districts
4

No. of Tribal Districts
4

Table 10.23.1 Land Use Pattern

Land Use Types	Area (in '000 ha)	Percentage
Geographical Area	710	
Reporting area for land utilization	440.80	100.00
Forests	334.10	75.79
Not available for land cultivation	10.20	2.32
Permanent pastures and other grazing lands	-	-
Land under misc. tree crops and groves	3.60	0.82
Culturable wasteland	4.20	0.95
Fallow land other than current fallows	4.50	1.02
Current fallows	7.00	1.59
Net area sown	77.20	17.51

Source: Land Use Statistics, Ministry of Agriculture and Farmer's Welfare, GOI, (2021-22).

10.23.1 Forest Cover

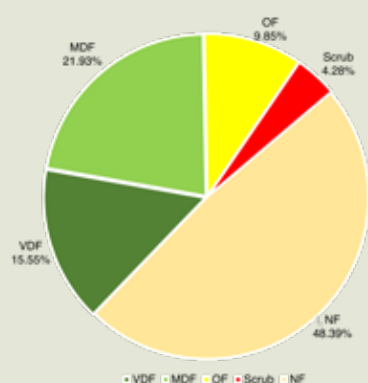


Table 10.23.2 Forest Cover of Sikkim

(km ²)		
Class	Area	% of Calculated Area by Sol
VDF	1,103.31	15.55
MDF	1,555.89	21.93
OF	699.20	9.85
Total	3,358.40	47.33
Scrub	303.49	4.28

Figure 10.23.1 Forest Cover of Sikkim

Table 10.23.3 District- wise Forest Cover in Sikkim

(km ²)								
District	Calculated Area by Sol	2023 Assessment				% of Calculated Area by Sol	Change w.r.t. 2021 Raster based*	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
East Sikkim ^H	954	268.99	313.85	132.60	715.44	74.99	4.46	50.85
North Sikkim ^H	4,226	413.00	587.47	289.86	1,290.33	30.53	1.45	203.89
South Sikkim ^H	750	170.40	284.01	108.61	563.02	75.07	0.94	4.16
West Sikkim ^H	1,166	250.92	370.56	168.13	789.61	67.72	-1.66	44.59
Grand Total	7,096	1,103.31	1,555.89	699.20	3,358.40	47.33	5.19	303.49

*Area figure calculated without normalization factor.

10.23.2 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 10.23.4 Forest Cover Inside and Outside Recorded Forest Area (or Green Wash) in Sikkim

(km ²)							
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
831.08	879.76	349.79	2,060.63	272.23	676.13	349.41	1,297.77
40.33%	42.69%	16.98%		20.98%	52.10%	26.92%	

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

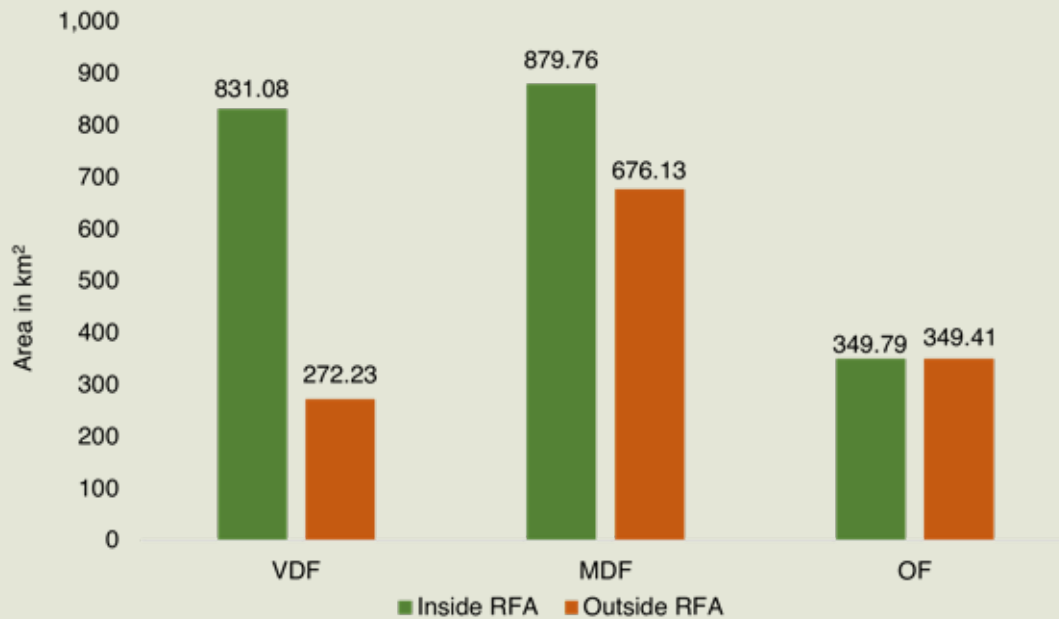


Figure 10.23.2 Forest Cover Inside and Outside of RFA in Sikkim

Table 10.23.5 Forest Cover Change Matrix Inside RFA/GW for Sikkim between 2021 Raster based and 2023 Assessments

Class	2023 Assessment inside RFA/GW					(km ²)
	VDF	MDF	OF	Scrub	NF	Total ISFR 2021 inside RFA / GW Raster based*
VDF	831.08	0.46	0.00	0.00	0.27	831.81
MDF	0.00	879.30	0.56	0.26	0.65	880.77
OF	0.00	0.00	343.19	1.07	0.87	345.13
Scrub	0.00	0.00	4.04	197.50	0.06	201.60
NF	0.00	0.00	2.00	1.77	3,151.30	3,155.07
Total ISFR 2023 inside RFA / GW	831.08	879.76	349.79	200.60	3,153.15	5,414.38
Net Change	-0.73	-1.01	4.66	-1.00	-1.92	

*Area figure calculated without normalization factor.

Table 10.23.6 Forest Cover Change Matrix Outside RFA/GW for Sikkim between 2021 Raster based and 2023 Assessments

Class	2023 Assessment outside RFA/GW					(km ²)
	VDF	MDF	OF	Scrub	NF	Total ISFR 2021 outside RFA / GW Raster based*
VDF	272.23	0.00	0.00	0.00	0.01	272.24
MDF	0.00	675.83	0.00	0.00	0.22	676.05
OF	0.00	0.00	346.90	0.00	0.31	347.21
Scrub	0.00	0.00	0.00	102.17	6.30	108.47
NF	0.00	0.30	2.51	0.72	274.12	277.65
Total ISFR 2023 outside RFA/GW	272.23	676.13	349.41	102.89	280.96	1,681.62
Net Change	-0.01	0.08	2.20	-5.58	3.31	

*Area figure calculated without normalization factor.

**Table 10.23.7 Altitude-wise Forest Cover in Sikkim**

(km ²)						
Altitude Zone (m)	Calculated Area by Sol	VDF	MDF	OF	Total	Scrub
0-500	50	0.18	20.14	15.93	36.25	1.42
500-1000	375	12.35	155.48	96.47	264.30	13.31
1000-2000	1,306	277.80	573.59	247.99	1,099.38	15.36
2000-3000	1,155	578.19	404.78	91.32	1,074.29	7.41
3000-4000	1,103	228.71	368.80	178.28	775.79	102.88
> 4000	3,107	6.08	33.10	69.21	108.39	163.11
Total	7,096	1,103.31	1,555.89	699.20	3,358.40	303.49

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

Table 10.23.8 Forest Cover in Different Slope Classes in Sikkim

(km ²)						
Slope (in degrees)	Calculated Area by Sol	VDF	MDF	OF	Total	Scrub
0-5	351	12.04	15.60	7.44	35.08	7.63
5-10	554	48.62	56.80	25.20	130.62	18.36
10-15	767	109.76	129.67	54.89	294.32	30.46
15-20	969	167.44	211.86	89.81	469.11	41.10
20-25	1,062	199.10	265.78	112.74	577.62	46.95
25-30	1,034	198.32	275.80	117.86	591.98	47.37
>30	2,359	368.03	600.38	291.26	1,259.67	111.62
Total	7,096	1,103.31	1,555.89	699.20	3,358.40	303.49

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

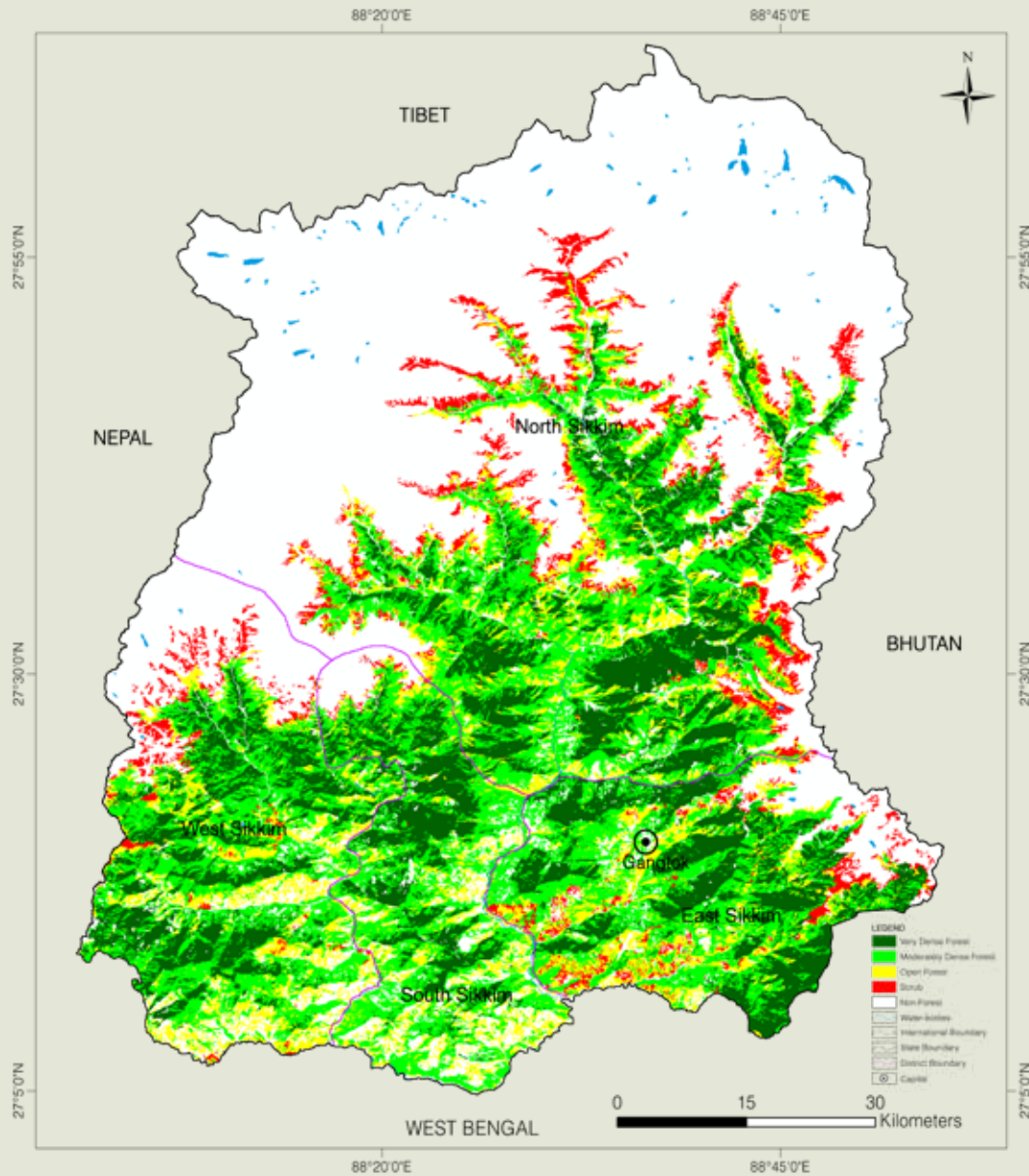


Figure 10.23.3 Forest Cover Map of Sikkim

10.23.3 Forest Types

The area under different Forest Types in Sikkim (as per the Champion & Seth Forest Classification, 1968) based on the Forest Cover Map (FCM), ISFR-2023, is presented in the following table.

Table 10.23.9 Area Statistics of The Forest Types Found in Sikkim

(km ²)			
Sl. No.	Forest Type	Area	% of the total mapped area*
1	3C/C1a(i) East Himalayan sal	69.80	1.84
2	3C/C3b East Himalayan moist mixed deciduous forest	190.98	5.03
3	8B/C1 East Himalayan subtropical wet hill forest	889.35	23.42
4	11B/C1b <i>Buk oak</i> forest	877.86	23.11
5	12/C3a East Himalayan mixed coniferous forest	223.74	5.89
6	12/DS1 Montane bamboo brakes	7.08	0.18
7	14/C2 East Himalayan sub-alpine birch/fir forest	903.18	23.78
8	15/C1 Birch/ <i>Rhododendron</i> scrub forest	145.60	3.83
9	15/E1 Dwarf <i>Rhododendron</i> scrub	11.50	0.30
10	15/E2 Dwarf juniper scrub	208.76	5.50
Sub Total		3,527.85	92.88
11	TOF/ Plantation	134.04	3.53
Total (Forest Cover & Scrub)		3,661.89	96.41
Grassland forest type (outside forest cover)			
12	15/C3 Alpine pastures	136.28	3.59
Grand Total		3,798.17	100.00

*Forest Types have been assigned to the natural forest formations under forest cover and scrub categories shown in the forest cover mapping (ISFR, 2023). 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).

10.23.4 Forest Fire

District-wise number of forest fire detected by FSI using SNPP-VIIRS sensors (This includes large, continuous and repeated forest fires) during the fire season 2022-23 & 2023-24.

Table 10.23.10 District-wise Number of Forest Fire Detected

Sl. No.	District	SNPP-VIIRS Detection during 2022-23	SNPP-VIIRS Detection during 2023-24
1	East Sikkim	4	36
2	North Sikkim	8	0
3	South Sikkim	30	39
4	West Sikkim	7	26
Total		49	101



10.23.5 Fire Prone Forest Areas

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

Table 10.23.11 Forest Fire Prone Classes

(km ²)			
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	29.72	0.81
5	Less fire prone	3,632.17	99.19
Total		3,661.89	100.00

*Forest Cover including Scrub.



Figure 10.23.4 Fire Prone Forest Areas Under Different Fire Prone Classes

10.23.6 Results Derived from NFI for Sikkim

Table 10.23.12 Number of Trees and their volume for Top 5 Species in RFA

Sl. No.	Species	No. of Trees (in '000)	Volume (M m ³)
1	<i>Symplocos theifolia</i>	7,072	0.92
2	<i>Shorea robusta</i>	6,789	3.61
3	<i>Schima wallichii</i>	6,181	2.03
4	<i>Castanopsis species</i>	5,750	5.63
5	<i>Viburnum species</i>	3,555	0.42


Table 10.23.13 Number of Trees and their Volume for Top 5 Species in Rural Area

Sl. No.	Species	No. of Trees (in '000)	Volume (M m ³)
1	<i>Schima wallichii</i>	1,688	0.412
2	<i>Ficus species</i>	940	0.068
3	<i>Alnus nepalensis</i>	447	0.119
4	<i>Alnus species</i>	445	0.220
5	<i>Macaranga species</i>	396	0.077

Table 10.23.14 Number of Trees and their Volume for Top 5 Species in Urban Area

Sl. No.	Species	No. of Trees (in '000)	Volume (M m ³)
1	<i>Schima wallichii</i>	10	0.004
2	<i>Pinus kesiya</i>	6	0.005
3	<i>Ficus species</i>	3	0.001
4	<i>Cryptomeria japonica</i>	2	0.001
5	<i>Macaranga species</i>	2	0.002

Table 10.23.15 Major NTFP Species in Sikkim

Sl. No.	Species	Habit	No. of Plants (in '000)
1	<i>Spondias axillaris/ Choerospondias axillaris</i>	Tree	198
2	<i>Machilus edulis</i>	Tree	22
3	<i>Thysanolaena latifolia/ Thysanolaena maxima</i>	Shrubs	2,85,626
4	<i>Polygonum sp.</i>	Shrubs	16,802
5	<i>Rubia cordifolia</i>	Climbers	1,77,116
6	<i>Diplazium species</i>	Herbs	1,44,17,894
7	<i>Nephrolepis species</i>	Herbs	98,08,895
8	<i>Urtica dioica</i>	Herbs	12,40,884
9	<i>Aconitum ferox</i>	Herbs	2,95,449
10	<i>Podophyllum hexandrum</i>	Herbs	88,635

Table 10.23.16 Major Invasive Species in the State inside the RFA in Sikkim

Sl. No.	Species	Estimated Extent (km ²)
1	<i>Chromolaena odorata</i>	110.41
2	<i>Galinsoga parviflora</i>	65.55
3	<i>Ageratina adenophora</i>	29.90
4	<i>Mikania micrantha</i>	24.15
5	<i>Lantana camara</i>	21.85