CHAPTER 5

TREE COVER

5.01 Introduction

Tree cover means the area covered by crown of trees that is too small to be delineated by digital interpretation of remote sensing data at 1:50,000 scale used for forest cover assessment. India's National Forest Policy aims at maintaining 33 percent of country's geographical area under forest and tree cover. FSI has been assessing country's forest cover since the 1980's using data from remote sensing satellites on a two-year cycle but tree cover due to a substantial number of trees not captured by the satellite data was estimated and reported as tree cover for the first time in 2001 assessment. This exercise, with much better inventory data on tree cover, has been continued in the present assessment as well. Thus, a complete picture of forest and tree cover in the country that can be compared with the national goal of 33 percent for forest and tree cover is available.

The present assessment of forest cover, carried out by digital processing of satellite data at 1:50,000 scale, includes forests and tree crops having 10 percent or more canopy density and with an area of more than 1.0 ha. The tree cover comprising of small patches of trees (< 1.0 ha) in plantations and woodlots, or scattered trees on farms, homesteads and urban areas, or trees along linear features, such as roads, canals, bunds, etc. has been estimated by mainly using field inventory methods. However, for estimation of tree cover for SFR 2003, high-resolution satellite data (PAN together with LISS III) has also been used. The tree crops were categorized into three classes, block, linear and scattered, based on their geometric formation. This chapter gives method used and steps involved in assessment of tree cover and presents the results for the country, different physiographic zones and all the States/UTs.

5.02 Trees Outside Forests and Tree Cover

It is important here not to confuse between Tree Cover and "Trees Outside Forests" (TOF). TOF means all tree crops outside recorded forest area. However, there are tree crops and woodlots outside forest area that are larger than 1 ha in extent and can be captured by the satellite data used for forest cover assessment. Such tree canopies are deemed to have been included in the forest cover assessment. The crown cover of residual trees outside forest area constitutes tree cover. Thus, trees included in tree cover constitute only a part of TOF.

Recognising the fact that TOF contributes significantly to socio-economic and ecological status of a country, Food and Agriculture Organisation of United Nations has given prominent place to TOF in its Global Forest Resources Assessment Report. FSI has been conducting inventory of TOF since 1991. Data for estimating tree cover has been extracted from the data of TOF collected by FSI. TOF may lie within rural areas or urban areas and has correspondingly been termed as TOF (Rural) and TOF (Urban). The country was stratified into different zones for assessment of TOF and tree cover.

5.03 Stratification of Country into Physiographic Zones

While estimating any variable, dividing the population into homogenous strata improves accuracy and reduces cost of estimation. The country has to be stratified into geographical zones, for assessment of countrywide TOF and tree cover, within which the tree species, density and growth etc. are more or less comparable. This exercise was carried out for SFR 2001 whereby the country was stratified into 14 physiographic zones. Districts or parts of districts were allocated to one or the other zone. The same 14 strata, with some minor modifications, have been used for the present assessment. A physiographic zone, on the basis of topography, latitude and altitude, besides climatic and soil properties, constitutes geographic areas that exhibit broad similarities in factors responsible for the growth of tree vegetation.

The fourteen physiographic zones are as listed below and as shown in figure 5.01:

1. Western Himalayas (WH)
2. Eastern Himalayas (EH)
3. North East (NE)
4. Northern Plains (NP)
5. Eastern Plains (EP)
6. Western Plains (WP)
7. Central Highlands (CH)
8. North Deccan (ND)
9. East Deccan (ED)
10. South Deccan (SD)
11. Western Ghats (WG)
12. Eastern Ghats (EG)
13. West Coast (WC)
14. East Coast (EC)

The list of districts falling within each physiographic zone, completely or partially, has been given in Annexure-II for information.

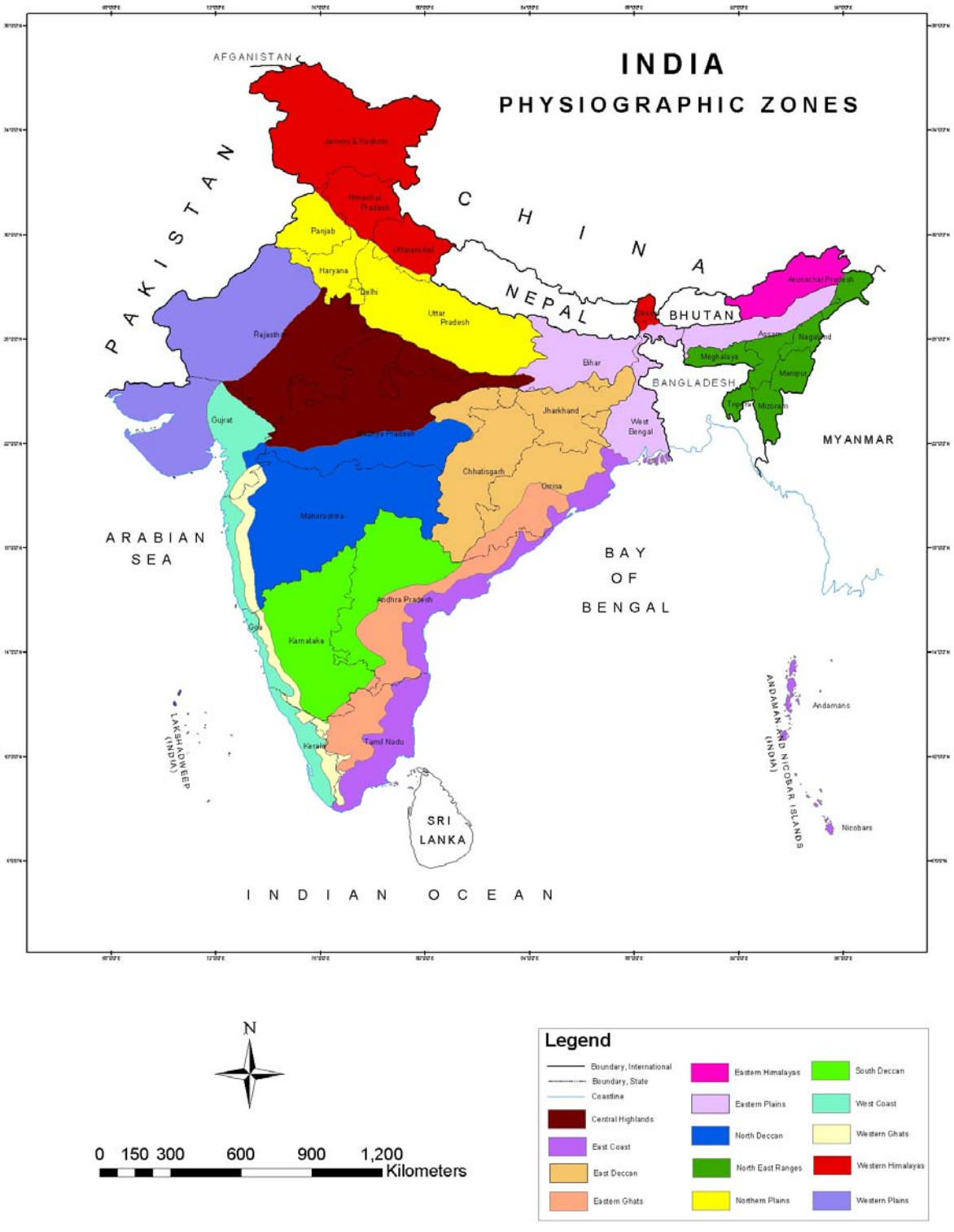

Figure 5.01: Physiographic Zones of India

5.04 Methodology for Assessment of Trees Outside Forest and Tree Cover

Earlier, inventory of TOF was done statewise by taking rural non-forest area of a state as population. The state was stratified according to agro-ecological zones and each zone was further stratified according to districts. Villages within a district were considered as sampling units. The trees were classified into eight categories viz. farm forestry, village woodlots, block plantations, road side, pond side, railway side, canal side and others. Data was processed and tree cover due to TOF was estimated by using ratio estimation method. Using this methodology, FSI had inventoried about 180 districts in different states. In SFR 2001, some of the data thus collected for districts falling within different physiographic zones were used for assessment of tree cover.

Now the approach and the methodology have been modified. Sixty districts (or 10 percent of total districts in the country) are randomly selected, with at least two districts falling within a physiographic zone. TOF (Rural) and TOF (Urban) are estimated separately using different techniques.

Assessment of TOF (Rural): Trees outside the forest have a relatively low density that makes assessment by conventional methods costly and time-consuming. Large area information is needed which can be provided by remote sensing data. Remote sensing data is used to stratify the area on the basis of geometrical formation of tree resources. High-resolution satellite imageries (e.g., IKONOS, QuickBird, etc.) provide information even up to identification of a single tree but these are cost prohibitive. The IRS LISS III data (multi spectral with resolution of 23.5m×23.5m) provides information on vegetation cover and tree canopies for patches larger than one hectare. However, LISS III data alone cannot be used for smaller patches or scattered trees. Using IRS PAN data (monochromatic but with much higher resolution of 5.8m×5.8m) one can identify a tree vegetated land as small as 0.1 ha. Thus in the modified technique, both LISS III and PAN imageries are used for stratification of TOF resources into three classes, namely block plantation (group of trees), linear plantation and scattered trees.

Raw images of IRS 1C/1D PAN and LISS III data for the period between Oct.-Dec. 2002 are acquired from National Remote Sensing Agency, Hyderabad. Thereafter, the PAN image is geometrically rectified with the help of Survey of India toposheets on 1:50,000 Scale. The LISS III image is then co registered with the rectified PAN images. PAN and LISS III images are fused using appropriate algorithm. Since mapping of TOF areas is the objective, the boundary of forest area is digitized from SOI toposheets and masked out. The remaining fused image is classified into settlement, water bodies, burnt areas, tree cover and agriculture area using appropriate classifier viz. Maximum likelihood. This classification enables the interpreter to distinguish between tree cover and other classes on fused image. This classified image is visually analysed with respect to fused images for editing and refinement for inclusion and omissions. Since a cluster of trees having 0.1 ha area or more is defined as block plantation, pixels are clumped and cluster of pixels having area less than 0.1 ha are eliminated. After editing of the classified image the final classified map is generated which is done by taking the PAN, LISS-III

and the fused images. Incorporating these corrections final classified image is prepared having three classes in TOF areas, namely, Block, Linear and Scattered. From the classified TOF map data pertaining to area under Block, Linear, Scattered and water bodies can be calculated. In addition, such areas, which do not support tree vegetation, like rivers and water bodies, riverbeds, snow covered mountains, etc. which is termed as Culturable Non Forest Area (CNFA) can also be calculated. Such information is very helpful for district level planning. The CNFA area as given in this report is less than what was given in SFR 2001 due to the fact that area under wetlands and rivers/riverbed has been estimated digitally, thereby, giving more precise estimates as compared to SFR 2001 where this information was obtained from a project report "Wetlands of India" conducted by Space Application Centre (ISRO), Ahemdabad where cartographic limitation to estimate the above was 25 ha. In this report the estimate of wetlands and rivers/riverbeds has been estimated using PAN fused with LISS data, wherein one can go down upto 0.1 ha. on the ground, thereby, leading to more precise estimates. Due to this, the area under Unculturable Non Forest Area (wetlands and rivers/riverbeds) has increased as smaller areas could be delineated.

With the help of appropriate sampling design, optimum number of plots can be randomly selected in every stratum. Since the variability in each stratum is expected to be different demanding different sample and plot sizes, pilot studies were conducted to ascertain these so that the variability of the stratum can be properly addressed. In this pilot study, 0.1 ha, 0.2 ha and 0.3 ha plots were considered for Block stratum. Similarly, strip of size 10 m × 75 m, 10 m × 100 m, 10 m × 125 m, 10 m × 150 m, 10 m ×175 m & 10 m × 200 m were considered for Linear stratum. In respect of Scattered stratum, plots of size 0.5 ha, 1.0 ha, 1.5 ha, 2.0 ha, 2.5 ha and 3.0 ha were considered for non hilly districts and 0.25 ha, 0.50 ha, 0.75 ha and 1.00 ha were considered for the hilly districts. Twenty concentric plots in each stratum were randomly selected and data was recorded. After analysis it was concluded that optimum plot size for Block and Linear strata are 0.1 ha and 10 × 125 m strip, respectively for hilly as well as non-hilly districts. In case of Scattered stratum, the optimum size of sample plot was determined as 3.0 ha for non-hilly district and 0.5 ha for hilly district. It was also concluded through pilot study that the sample sizes for Block, Linear and Scattered strata are 35, 50 and 50 respectively for non-hilly districts and 35, 50 and 95 respectively for hilly district.

Desired number of sample points are randomly generated in each stratum separately and the data on pre-decided variables like dbh, crown diameter, species name and category of plantation, etc. are collected on designed formats. Data processing is carried out following appropriate formulae corresponding to the sampling design.

The flow chart of methodology of Tree Cover mapping using remote sensing is shown in Figure-5.02

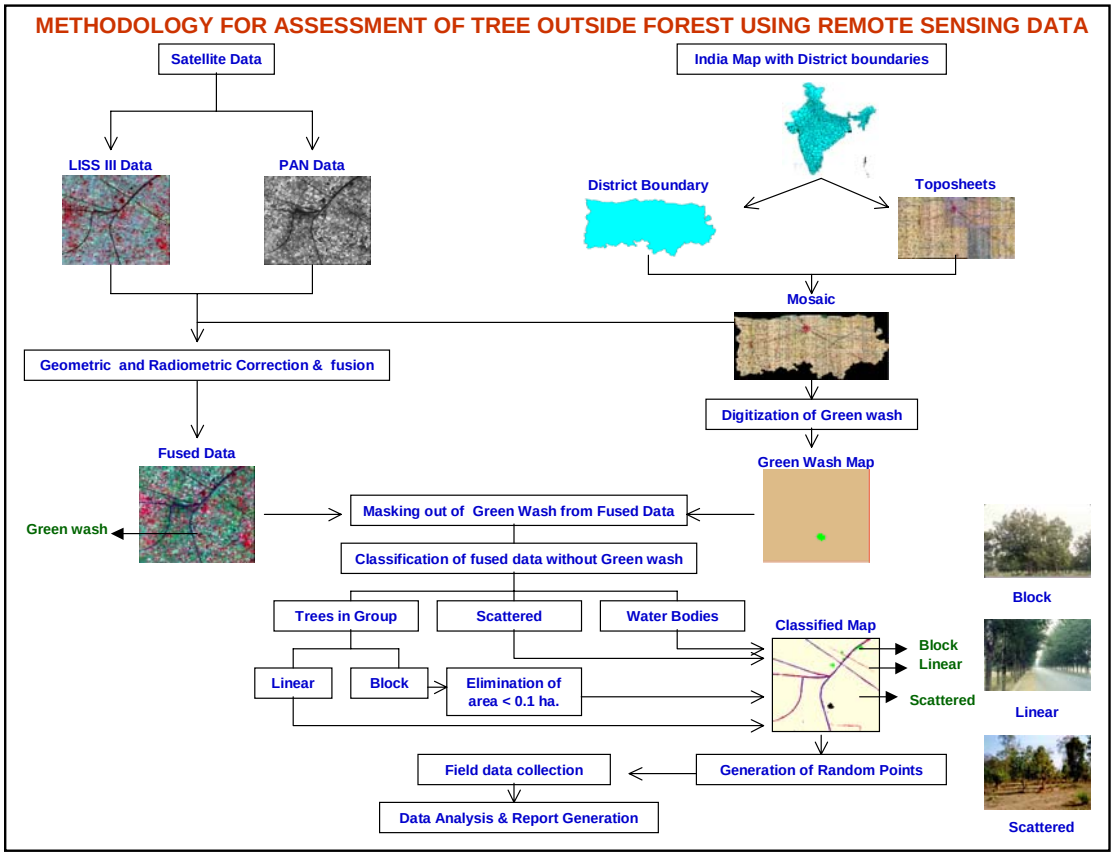

Figure 5.02: Flow chart of methodology of Tree Cover mapping

Assessment of TOF (Urban): The study areas for this survey within the selected districts are the urban centers defined in the corresponding District Census Book. Sampling frame prepared for the urban area is used for survey and inventory. National Sample Survey Organisation (NSSO), an agency under the Ministry of Statistics and Programme Implementation, Government of India, has prepared sampling frame for each urban area. This organization conducts surveys by the name of Urban Frame Survey (UFS). They divide all the urban centers of a district in blocks called UFS blocks. These blocks have clear-cut well defined natural boundaries. These blocks are formed on the basis of 600-800 population or 120-160 households and cover the whole area within the geographical boundary of town including vacant lands.

The district is divided into five categories of town as strata based on population size. UFS blocks are used as sampling units. Frame of such blocks for each district selected for TOF assessment are obtained from the NSSO. The size of the sample for a district, based on pilot studies, was between 20-60 UFS blocks. The sample blocks in each class of town are selected by using random number table. A town class wise sample list of randomly selected blocks in each district are formed and provided to concerned field parties for carrying out complete enumeration of all the trees of 10 cm and above dbh in the prescribed formats having similar parameters as for rural inventory.

However, as mentioned earlier, the data for tree cover assessment is a sub-set of the data collected for TOF and has to be extracted at the time of data processing.

5.05 Aggregation of Sample Data

The data obtained from sampling units have to be aggregated over the corresponding stratum using ratio method of estimation. At this stage care has been taken to see that aggregation of sample data does not result in any overestimation yielding inflated or erroneous values. The non-forest area within a stratum over which the aggregation has to be done may contain certain unculturable lands that cannot support tree vegetation. Such lands include wetlands, riverbeds and perennial snow covered mountains. Also, the extent of area under forest cover outside forest area, consisting of plantations and woodlots more than 1 ha in area, is not to be included for the tree cover assessment. These areas were estimated by using methodology described above from various districts spread over all the physiographic zones. All these areas must be subtracted from the non-forest area. The resultant area gives the "Culturable Non-forest Area" (CNFA) for each physiographic zone. This is the net area over which the sample data of tree cover can be aggregated to obtain the estimates for tree cover.

Physiographic Zone wise and State/UT wise estimates for the components of CNFA are given in Tables 5.01 and 5.02, respectively.

These tables reveal that only 66.6 percent or about two thirds of the total geographic area of the country is culturable non-forest area. The individual components of forest area and unculturable areas as estimated here (with respect to country's geographic area) are the recorded forest area (23.6%), blocks of forest cover (>1 ha) outside forest area (3.4%), wetlands & rivers (1.9%), riverbeds (0.50%) and cold deserts & snow bound areas (4.0%).

Table 5.01 Physiographic Zone wise Culturable Non-forest Area (CNFA)

(Area in km^2)

Physiographic Zone	Geographic Area	Recorded Forest Area	Unculturable Non-forest Area			Blocks of Forest Cover (>1 ha) outside Recorded Forest Area	Culturable Non-forest Area (CNFA)
			Wet-lands & Rivers	Riverbeds	Alpine Pasture & Snow		
	a	B	c	d	e	f	a-(b+c+d+e+f)
Western Himalayas	338,556	98,165	2,078	1,410	132,187	13,986	90,730
Eastern Himalayas	65,317	41,160	681	2,327	862	12,476	7,811
North East Ranges	133,990	78,906	1,104	0	0	21,907	32,073
Nothern Plains	295,780	13,983	4,256	3,172	0	5,586	268,783
Eastern Plains	223,339	31,826	10,098	3,219	0	7,442	170,754
Western Plains	319,098	13,813	16,554	441	0	4,395	283,895
Central Highlands	373,675	82,711	3,479	832	0	2,809	283,844
North Deccan	355,988	86,495	5,090	751	0	2,935	260,717
East Deccan	336,289	128,006	4,498	2,367	0	8,330	193,088
South Deccan	292,416	51,356	3,897	1,230	0	4,154	231,779
Western Ghats	72,381	33,960	1,065	30	0	6,512	30,814

Physiographic Zone	Geographic Area	Recorded Forest Area	Unculturable Non-forest Area			Blocks of Forest Cover (>1 ha) outside Recorded Forest Area	Culturable Non-forest Area (CNFA)
			Wet-lands & Rivers	Riverbeds	Alpine Pasture & Snow		
	a	B	c	d	e	f	a-(b+c+d+e+f)
Eastern Ghats	191,698	75,175	1,435	191	0	3,939	110,958
West Coast	121,242	21,358	5,120	355	0	10,072	84,337
East Coast	167,494	17,826	1,653	904	0	8,026	139,085
TOTAL	**3,287,263**	**774,740**	**61,008**	**17,229**	**133,049**	**112,569**	**2,188,668**

Table 5.02 State/UT wise Culturable Non-forest Area (CNFA)

(Area in km^2)

State/UT	Geographic Area	Recorded Forest Area	Unculturable Non-forest Area			Blocks of Forest Cover (>1 ha) outside Recorded Forest Area	Culturable Non-forest Area (CNFA)
			Wet-lands & Rivers	Riverbeds	Alpine Pasture & Snow		
	a	b	c	d	e	f	a-(b+c+d+e+f)
Andhra Pradesh	275,069	63,821	3,021	971	0	3,172	204,084
Arunachal Pradesh	83,743	51,540	842	2,327	862	15,668	12,504
Assam	78,438	27,018	2,361	630	0	6,114	42,315
Bihar	94,163	6,473	4,529	1,423	0	2,296	79,442
Chhattisgarh	135,191	59,772	1,655	870	0	3,300	69,594
Delhi	1,483	85	19	16	0	85	1,278
Goa	3,702	1,224	127	9	0	931	1,411
Gujarat	196,022	19,113	18,797	369	0	5,817	151,926
Haryana	44,212	1,558	591	478	0	834	40,751
Himachal Pradesh	55,673	37,033	153	102	4,934	1,085	12,366
Jammu & Kashmir	222,236	20,230	1,762	1,196	122,035	11,717	65,296
Jharkhand	79,714	23,605	1,203	611	0	2,740	51,555
Karnataka	191,791	43,084	2,396	710	0	4,921	140,680
Kerala	38,863	11,268	1,251	76	0	4,346	21,922
Madhya Pradesh	308,245	95,221	3,033	695	0	2,834	206,462
Maharashtra	307,713	61,939	5,314	614	0	7,279	232,567
Manipur	22,327	17,418	98	0	0	1,947	2,864
Meghalaya	22,429	9,496	260	0	0	5,130	7,543
Mizoram	21,081	16,717	75	0	0	1,840	2,449
Nagaland	16,579	8,629	160	0	0	3,153	4,637
Orissa	155,707	58,136	1,661	765	0	4,848	90,297
Punjab	50,362	3,084	622	501	0	865	45,290
Rajasthan	342,239	32,488	2,481	715	0	3,398	303,157
Sikkim	7,096	5,841	11	7	842	73	322
Tamil Nadu	130,058	22,877	1,185	470	0	6,675	98,851
Tripura	10,486	6,293	84	0	0	1,663	2,446
Uttar Pradesh	240,928	16,826	3,397	2,247	0	4,068	214,390
Uttaranchal	53,483	34,662	176	125	4,376	1,054	13,090
West Bengal	88,752	11,879	3,711	1,292	0	4,520	67,350
Andaman & Nicobar	8,249	7,171	12	6	0	87	973
Chandigarh	114	34	1	1	0	2	76
Dadra Nagar Haveli	491	204	8	0	0	46	233
Daman & Diu	112	1	4	0	0	11	96

State/UT	Geographic Area	Recorded Forest Area	Unculturable Non-forest Area			Blocks of Forest Cover (>1 ha) outside Recorded Forest Area	Culturable Non-forest Area (CNFA)
			Wet-lands & Rivers	Riverbeds	Alpine Pasture & Snow		
	a	b	c	d	e	f	a-(b+c+d+e+f)
Lakshadweep	32	0	2	0	0	5	25
Pondicherry	480	0	6	3	0	45	426
Total	**3,287,263**	**774,740**	**61,008**	**17,229**	**133,049**	**112,569**	**2,188,668**

5.06 Assessment of Tree Cover

The area under tree cover is a "notional" area. It is an area that is deemed to be covered by the tree canopy of all the trees included in the assessment of tree cover if all these trees are hypothetically brought together to constitute a block of tree land or forest with 70 percent canopy density. The relationship between tree size, species and crown width was used for this computation. The tree cover estimated for all the sample plots in a physiographic zone are aggregated over the CNFA of the zone. This is how tree cover was estimated in SFR 2001. However, in the present assessment, as described earlier, high resolution satellite data has been used to map tree blocks (patches between 0.1 and 1 ha in extent) and linear plantations in the non-forest rural areas. The actual area covered by such patches can be easily computed from the classified digital map using GIS methods. However, in case of urban trees and scattered trees in rural areas, the same method as used in 2001 assessment (notional tree cover at 70 percent canopy density) has been employed.

The total tree cover for a selected district was obtained by aggregation and addition of tree cover under block, linear and scattered strata. The tree cover thus obtained for selected districts within a physiographic zone was used to estimate the tree cover within CNFA for the physiographic zone by using ratio method of estimation. Adding tree cover for all the physiographic zones yielded the estimated tree cover of the country. The total tree cover for the country has been estimated as 99,896 km^2 or 3.04 percent of the country's geographic area.

Tree cover complements forest cover and should not be analysed in isolation. Data on the total number of trees or the area under tree cover alone does not convey much useful information that can be used for policy and planning purposes. A region with lower forest cover is likely to have higher number of trees in CNFA. If a forest area or tree plantation becomes highly degraded and its canopy density falls below 10 percent, it will be a loss to forest cover but may contribute to tree cover. Therefore, it must be noted here that the extent of tree cover assessed here is an appendage to forest cover. However, certain statistics that are of interest are average number of trees per ha within CNFA of a zone or a state. A high number would imply effective steps taken for tree planting by the government, municipalities, farmers and people in general. Another statistics that can be derived is the number of trees per ha of tree cover. A low number means that the trees (included in tree cover) are generally large in size and age, while a high number would indicate that such trees in that region are generally young and small sized.

5.07 Tree Cover in the Country: Physiographic Zone wise

The estimates of tree cover for each physiographic zone is given in Table 5.03. It is noted that the density of trees in the CNFA is maximum in Western Ghats (21.6 trees/ha) followed by West Coast (20.8 trees/ha), East Coast (18.4 trees/ha) and Western Himalyas (17.9 trees/ha). It may be seen against the national average that is 12.25 trees per ha of CNFA.

Table 5.03: Physiographic Zone wise Tree Cover Estimates

Physiographic Zone	Geog. Area (GA) (km^2)	CNFA (km^2)	CNFA as % of GA	Trees per ha of CNFA	Number of Trees ('000)	Tree Cover		
						Area (km^2)	% of Geog. Area	% of CNFA
Western Himalayas	338,556	90,730	26.80	17.9	162,446	4,901	1.45	5.40
Eastern Himalayas	65,317	7,811	11.96	9.1	7,136	149	0.23	1.90
North East Ranges	133,990	32,073	23.94	13.6	43,644	1,511	1.13	4.71
Northern Plains	295,780	268,783	90.87	12.8	342,813	9,746	3.30	3.63
Eastern Plains	223,339	170,754	76.46	14.3	244,420	3,014	1.35	1.77
Western Plains	319,098	283,895	88.97	6.9	196,142	7,964	2.50	2.81
Central Highlands	373,675	283,844	75.96	9.9	280,405	8,694	2.33	3.06
North Deccan	355,988	260,717	73.24	10.8	280,940	7,542	2.12	2.89
East Deccan	336,289	193,088	57.42	10.4	200,393	18,742	5.57	9.71
South Deccan	292,416	231,779	79.26	12.2	282,151	8,691	2.97	3.75
Western Ghats	72,381	30,814	42.57	21.6	66,515	4,631	6.40	15.03
Eastern Ghats	191,698	110,958	57.88	12.8	142,239	6,727	3.51	6.06
West Coast	121,242	84,337	69.56	20.8	175,505	9,569	7.89	11.35
East Coast	167,494	139,085	83.04	18.4	255,398	8,015	4.79	5.76
TOTAL	**3,287,263**	**2,188,668**	**66.58**	**12.25**	**2,680,147**	**99,896**	**3.04**	**4.56**

5.08 Tree Cover in the States and Union Territories

Tree cover data was processed further to provide information of tree cover for each state and union territory. One state may fall in one or many physiographic zones; accordingly estimation procedures were used to develop state level estimates. As such, area of different physiographic zones within one state is considered as separate strata. CNFA corresponding to the State/UT has been ascertained in a similar fashion as in case of physiographic zone. CNFA corresponding to different physiographic zones falling within a State/UT was also computed. Using estimates of tree cover of different physiographic zones, estimates of tree cover for the respective state was calculated. However, it may be noted that the State/UT wise estimates for tree cover are only indicative in nature and may have lower levels of accuracy since the sample size was calculated only to provide estimates at the physiographic zone level.

The estimates of tree cover in the States and UTs are given in Table 5.04 and in Fig. 5.03.

Table 5.04: State/UT wise Tree Cover Estimates

State/UT	Geog. Area (km^2)	CNFA (km^2)	Trees per ha	Number of Trees ('000)	Tree Cover		
					Area (km^2)	% of GA	% of CNFA
Andhra Pradesh	275,069	204,084	16.9	345,355	12,120	4.41	5.94
Arunachal Pradesh	83,743	12,504	10.8	13,470	363	0.43	2.90
Assam	78,438	42,315	14.1	59,473	935	1.19	2.21
Bihar	94,163	79,442	13.8	109,971	1,620	1.72	2.04
Chhattisgarh	135,191	69,594	10.2	71,326	6,723	4.97	9.66
Delhi	1,483	1,278	24.9	3,176	98	6.61	7.67
Goa	3,702	1,411	15.2	2,137	136	3.67	9.62
Gujarat	196,022	151,926	14.1	213,829	10,586	5.40	6.97
Haryana	44,212	40,751	12.3	50,055	1,415	3.20	3.47
Himachal Pradesh	55,673	12,366	15.5	19,127	491	0.88	3.97
Jammu & Kashmir	222,236	65,296	18.7	122,309	3,826	1.72	5.86
Jharkhand	79,714	51,555	10.4	53,858	5,012	6.29	9.72
Karnataka	191,791	140,680	11.6	162,718	5,371	2.80	3.82
Kerala	38,863	21,922	13.6	29,904	1,903	4.90	8.68
Madhya Pradesh	308,245	206,462	10.2	211,456	7,250	2.35	3.51
Maharashtra	307,713	232,567	11.5	267,733	9,320	3.03	4.01
Manipur	22,327	2,864	13.6	3,901	136	0.61	4.73
Meghalaya	22,429	7,543	13.6	10,241	352	1.57	4.67
Mizoram	21,081	2,449	14.0	3,440	130	0.62	5.31
Nagaland	16,579	4,637	13.6	6,297	217	1.31	4.67
Orissa	155,707	90,297	11.0	98,919	6,381	4.10	7.07
Punjab	50,362	45,290	12.6	57,285	1,608	3.19	3.55
Rajasthan	342,239	303,157	8.0	241,255	8,638	2.52	2.85
Sikkim	7,096	322	20.3	653	22	0.31	6.77
Tamil Nadu	130,058	98,851	13.7	135,131	4,991	3.84	5.05
Tripura	10,486	2,446	13.6	3,336	116	1.11	4.76
Uttar Pradesh	240,928	214,390	12.3	263,875	7,715	3.20	3.60
Uttaranchal	53,483	13,090	15.4	20,164	571	1.07	4.36
West Bengal	88,752	67,350	14.4	96,888	1,731	1.95	2.57
Andaman & Nicobar	8,249	973	12.1	1,178	33	0.40	3.42
Chandigarh	114	76	33.6	257	8	7.09	10.53
Dadra Nagar Haveli	491	233	21.0	489	35	7.10	15.02
Daman & Diu	112	96	10.6	102	6	5.23	6.10
Lakshadweep	32	25	13.7	35	2	7.24	9.01
Pondicherry	480	426	18.8	804	35	7.19	8.09
Total	**3,287,263**	**2,188,668**	**12.25**	**2,680,147**	**99,896**	**3.04**	**4.56**

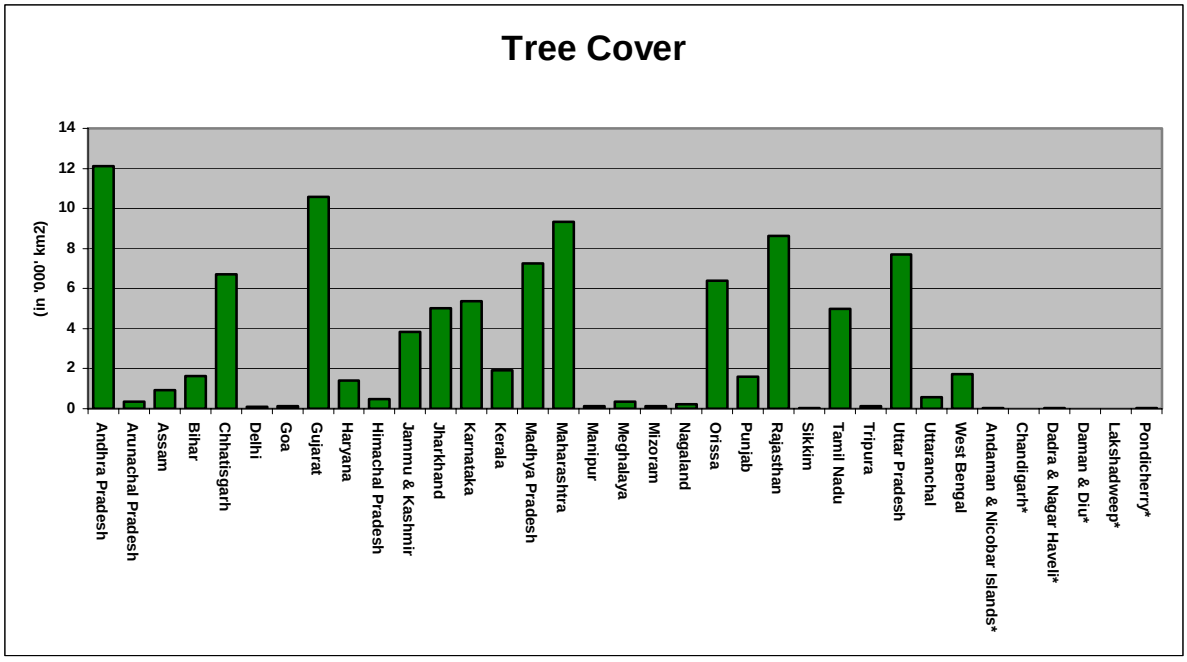

Fig. 5.03 Tree cover in States & UTs

The States/UTs with high density of trees within CNFA are Chandigarh, Delhi, Dadra & Nagar Haveli and Sikkim. The ones with low density are Rajasthan, Chhattisgarh, Madhya Pradesh and Jharkhand.

Tree cover constitutes largest area in Andhra Pradesh (12,120 km^2) followed by Gujarat (10,586 km^2), Maharashtra (9,320 km^2) and Rajasthan (8,638 km^2). Considering the percent of geographic area of the State/UT under tree cover, the highest rank goes to Lakshdweep (7.24 percent) followed by Pondicherry (7.19 percent), Dadra & Nagar Haveli (7.10 percent), Chandigarh, (7.09 percent), Delhi (6.61 percent), Jharkhand (6.29 percent) and Gujarat, (5.40 percent).

Considering the percentage of tree cover with respect to CNFA, which indicates the actual potential different States/UTs have for increasing area under tree cover, it is found that Lakshdweep, Dadra & Nagar Haveli, Pondicherry, Chandigarh, Jharkhand, Orissa, Kerala, Goa, Delhi and Chhatisgarh cover between 7-15 percent of their CNFA's. Analysing these figures in combination with the extent of forest cover outside recorded forest areas in different States/UTs, the concerned governments can determine where and how much scope is there to enhance tree-growing activities.