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Report

India

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FAO has been monitoring the world's forests at 5 to 10 year intervals since 1946. The Global Forest Resources Assessments (FRA) are now produced every five years in an attempt to provide a consistent approach to describing the world's forests and how they are changing. The FRA is a country-driven process and the assessments are based on reports prepared by officially nominated National Correspondents. If a report is not available, the FRA Secretariat prepares a desk study using earlier reports, existing information and/or remote sensing based analysis.

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Introduction

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Introductory text

Forest Survey of India (FSI) is a national organisation under the Ministry of Environment, Forests and Climate Change, Government of India. The organisation has been mandated to assess the India's forest resource periodically. Forest cover and its characteristics are assessed every two year using remote sensing technology with wall to wall approach. Growing stock and its distribution into diameter class and species, biomass stock and carbon stock are estimated through National Forest Inventory (NFI) using sample based approach. During NFI the field parties also observe the incidence of forest fire ocularly within and around sample plot in two ha area. Detection of forest fire through remote sensing technology, web based rapid response system, has also started sine November 2004. The results of FSI are published in its biennial report named as India State of Forest Report. The report contains information on forest cover at the national level and state level and changes in forest cover as comapred to the previous assesment. The information on mangrove cover is separately presented. In addition, the information on tree cover, growing stock in forest and outside forest, carbon stock in country's forest is also publised in the report. Since 1987, 15 such reports have been published which forms the most reliable basis of information about India's forest resource. The most of the tables presented in this report are mainly based on the FSI's studies.

The Indian Council of Forestry Research and Education (ICFRE), an autonomus national organisation mandated for forestry research and education has been given the responsibility by the Ministry of Environment and Forests to produce reports on forestry statistics of India periodically. Such reports are compiled by collecting data from the state forest departments. Forestry Statistics India of ICFRE has formed the second important source of information for this report. In addition, Forest Sector Report India, 2010 has also been consulted in preparation of the report.

The information on protetective network has been taken from Wildlife Institute of India who maintains the data related to wildlife.

1 Forest extent, characteristics and changes

1a Extent of forest and other wooded land

National data

Data sources

1990	References	State of Forest Report 1993
	Methods used	Full-cover forest/vegetation maps
	Additional comments	The State of Forest Report 1993 is the fourth assessment of the forest cover of India based on the visual and digital interpretation of the satellite data pertaining to the period 1989-91 on a scale of 1:250,000. The Landsat TM with spatial resolution of 30 m was used for the interpretation.
2000	References	State of Forest Report 2001 revised in SFR 2005.Further revised as per FRL.
	Methods used	Full-cover forest/vegetation maps
	Additional comments	SFR 2001 is the 8th report in the sequence. This is the first time that forest cover of the whole country has been assess digitally at 1:50,000 scale.
2005	References	State of Forest Report 2005. Further revised as per FRL/BUR-2.
	Methods used	Full-cover forest/vegetation maps
	Additional comments	SFR 2005 is the 10th assessment of the Forest Cover. This assessment was carried out using Indian Remote Sensing Satellite Data IRS-1D LISS-III with spatial resolution of 23.5 meter. The mode of interpretation was digital and the scale of mapping was 1:50,000
2010	References	National forest inventory data used for ISFR 2013 has been taken to derive the information under different categories. The proportion of VDF, MDF and Open Forest has been derived from NFI data used for ISFR 2013
	Methods used	National Forest Inventory
	Additional comments	ISFR 2013 is the 13th biennial report. The assessment was carried out using Indian Remote Sensing Satellite Data IRS P6 -LISS-III and IRS-Resourcesat2 -LISS-III with a spatial resolution of 23.5 meter. The mode of interpretation was digital and scale of mapping was 1:50,000.
2015	References	India State of Forest Report (ISFR) 2017
	Methods used	Full-cover forest/vegetation maps
	Additional comments	ISFR 2017 is the 15th biennial report. The assessment was carried out using Indian Remote Sensing Satellite Data IRS P6 -LISS-III and IRS-Resourcesat2 -LISS-III with a spatial resolution of 23.5 meter. The mode of interpretation was digital and scale of mapping was 1:50,000.

Classifications and definitions

1990	National class	Definition
	Dense Forest	All lands with tree cover of canopy density of 40 % and above
	Open Forest	All lands with tree cover of canopy density between 10 to 40 %
	Mangrove	Salt tolerance forest eco-system found mainly in tropical ans sub tropical inter tidal regions
	Scrub	All land with poor tree growth mainly of small or stunted trees having canopy density less then 10%
	Non Forest	Any area not included in the above classes

2000	National class	Definition
	Dense Forest	All lands with tree cover of canopy density of 40 % and above
	Open Forest	All lands with tree cover of canopy density between 10 to 40 %
	Scrub	All land with poor tree growth mainly of small or stunted trees having canopy density less then 10%
	Non Forest	Any area not included in the above classes

2005	National class	Definition
	Very Dense Forest	All lands, with a forest cover with canopy density of 70 percent and more.
	Moderately Dense Forest	All lands, with a forest cover with canopy density between 40-70 percent.
	Open Forest	All lands, with a forest cover with canopy density between 10-40 percent.
	Scrub	All lands, generally in and around forest areas, having bushes and or poor tree growth chiefly small or stunted trees with canopy density less than 10 percent.
	Non forest area	All lands excluding above categories including tree cover.

2010	National class	Definition
	Very Dense Forest	All lands, with a forest cover with canopy density of 70 percent and more.
	Moderately Dense Forest	All lands, with a forest cover with canopy density between 40-70 percent.
	Open Forest	

		All lands, with a forest cover with canopy density between 10-40 percent.
	Scrub	All lands, generally in and around forest areas, having bushes and or poor tree growth chiefly small or stunted trees with canopy density less than 10 percent.
	Non forest area	All lands excluding above categories including tree cover.

2015	National class	Definition
	Very Dense Forest	All lands, with a forest cover with canopy density of 70 percent and more.
	Moderately Dense Forest	All lands, with a forest cover with canopy density between 40-70 percent.
	Open Forest	All lands, with a forest cover with canopy density between 10-40 percent.
	Scrub	All lands, generally in and around forest areas, having bushes and or poor tree growth chiefly small or stunted trees with canopy density less than 10 percent.
	Non forest area	All lands excluding above categories including tree cover.

Original data and reclassification

1990	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Dense Forest	38 514.00	100.00 %	0.00 %	0.00 %
	Open Forest	24 999.00	100.00 %	0.00 %	0.00 %
	Mangrove	425.00	100.00 %	0.00 %	0.00 %
	Scrub	5 894.00	0.00 %	100.00 %	0.00 %
	Non Forest	258 821.00	0.00 %	0.00 %	100.00 %
	Total	328 653.00	63 938.00	5 894.00	258 821.00

2000	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Dense Forest	40 847.00	100.00 %	0.00 %	0.00 %
	Open Forest	26 744.00	100.00 %	0.00 %	0.00 %

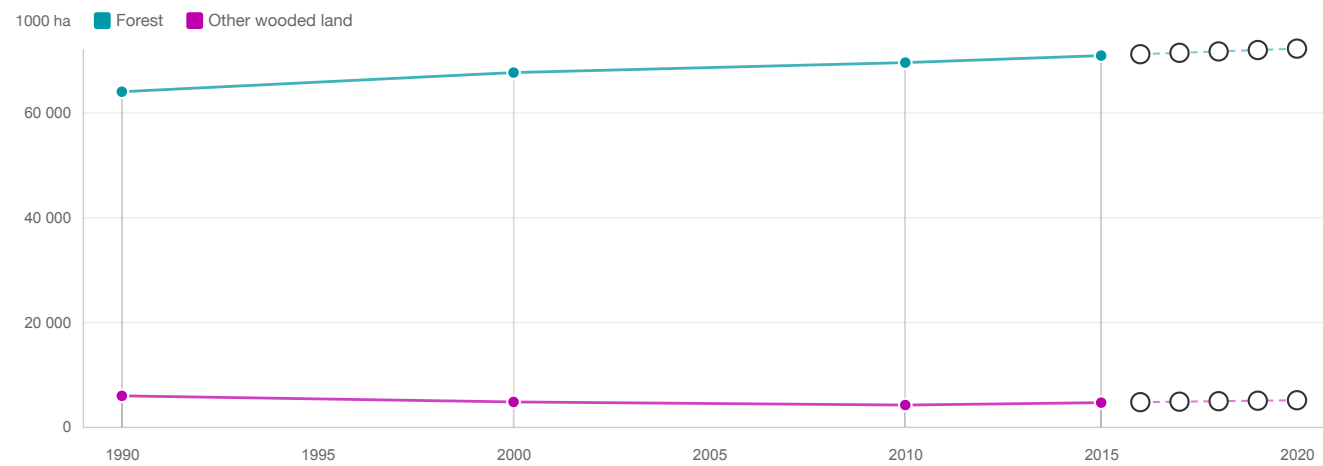
	Scrub	4 732.00	0.00 %	100.00 %	0.00 %
	Non Forest	229 766.00	0.00 %	0.00 %	100.00 %
	Total	302 089.00	67 591.00	4 732.00	229 766.00

2005	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Very Dense Forest	5 568.00	100.00 %	0.00 %	0.00 %
	Moderately Dense Forest	33 940.00	100.00 %	0.00 %	0.00 %
	Open Forest	29 575.00	100.00 %	0.00 %	0.00 %
	Scrub	3 848.00	0.00 %	100.00 %	0.00 %
	Non forest area	225 763.00	0.00 %	0.00 %	100.00 %
	Total	298 694.00	69 083.00	3 848.00	225 763.00

2010	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Very Dense Forest	8 315.00	100.00 %	0.00 %	0.00 %
	Moderately Dense Forest	31 741.00	100.00 %	0.00 %	0.00 %
	Open Forest	29 440.00	100.00 %	0.00 %	0.00 %
	Scrub	4 138.00	0.00 %	100.00 %	0.00 %
	Non forest area	223 391.00	0.00 %	0.00 %	100.00 %
	Total	297 025.00	69 496.00	4 138.00	223 391.00

2015	Classifications and definitions		FRA classes		
	Class	Area (1000 ha)	Forest	Other wooded land	Other land
	Very Dense Forest	9 816.00	100.00 %	0.00 %	0.00 %
	Moderately Dense Forest	30 832.00	100.00 %	0.00 %	0.00 %
	Open Forest	30 180.00	100.00 %	0.00 %	0.00 %

	Scrub	4 598.00	0.00 %	100.00 %	0.00 %
	Non forest area	221 915.00	0.00 %	0.00 %	100.00 %
	Total	297 341.00	70 828.00	4 598.00	221 915.00



FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest (a)	63 938.00	67 591.00	69 496.00	70 828.00	71 094.40	71 360.80	71 627.20	71 893.60	72 160.00
Other wooded land (a)	5 894.00	4 732.00	4 138.00	4 598.00	4 690.00	4 782.00	4 874.00	4 966.00	5 058.00
Other land (c-a-b)	227 487.00	224 996.00	223 685.00	221 893.00	221 534.60	221 176.20	220 817.80	220 459.40	220 101.00
Total land area (c)	297 319.00	297 319.00	297 319.00	297 319.00	297 319.00	297 319.00	297 319.00	297 319.00	297 319.00

The FAOSTAT land area figure for the year 2015 is used for all reference years

Climatic domain	% of forest area 2015	Override value
Boreal	0.00	0.00
Temperate	0.00	8.64
Sub-tropical	11.00	5.63
Tropical	89.00	85.73

Comments

The reported figures of forest area in FRA 2015 has been changed due to the fact that some of the previous years figures were revised for construction of FRL of India. Now the same figures are being reported for all international communications such as NATCOM, BUR, FRL and GFRA for maintaining the consistency. As far as the treand of forest area and other wooded land is concern, there is a gradual increase in the forest and other wooded lands since 2005.

1b Forest characteristics

National Data

Data sources + type of data source eg NFI, etc

The data source for this table is NFI data. The area under three categories namely naturally regenerated, plantation forest and other planted forest has been taken from the NFI data base for the year 2010 and 2015. For previous years (1990 & 2000), the figures already reported in earlier FRA has been taken. For the year 2016 to 2020, the proportions of these three categories as obtained for the year 2015 has been used.

National classification and definitions

The definition and classification are same as is being used by FRA.

Original data

Original data has been taken from NFI database

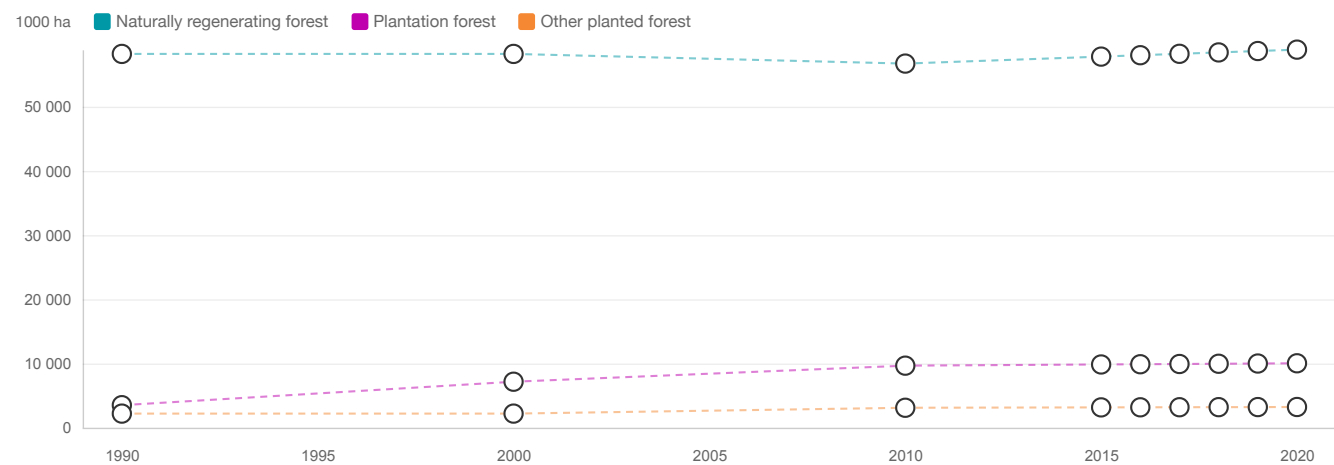
Analysis and processing of national data

Estimation and forecasting

For the year 2016 to 2020, the proportions of three categories (naturally regenerated, plantation forest and planted forest as obtained for the year 2015 has been used. For year 1990, the area under planted forest as reported in the earlier FRA has been taken. The estimates of other planted forest for 1990 has been assumed to be same as taken for 2000. The area of introduced species in planted forest has been estimated from the plantation data as given in SFR 1999. The same proportion has been applied to other years.

Reclassification into FRA 2020 categories

Reclassification is not required.



FRA categories	Forest area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest (a)	58 223.00	58 223.00	56 717.31	57 804.00	58 022.00	58 239.21	58 456.63	58 674.00	58 891.00
Planted forest (b)	5 715.00	9 368.00	12 778.69	13 024.00	13 072.00	13 121.59	13 170.57	13 219.60	13 269.00
Plantation forest	3 514.00	7 167.00	9 668.06	9 854.00	9 890.00	9 927.49	9 964.55	10 002.00	10 039.00
...of which introduced species	460.00	939.00	1 266.00	1 291.00	1 296.00	1 300.00	1 305.00	1 310.00	1 315.00
Other planted forest	2 201.00	2 201.00	3 110.63	3 170.00	3 182.00	3 194.10	3 206.02	3 217.60	3 230.00
Total (a+b)	63 938.00	67 591.00	69 496.00	70 828.00	71 094.00	71 360.80	71 627.20	71 893.60	72 160.00
Total forest area	63 938.00	67 591.00	69 496.00	70 828.00	71 094.40	71 360.80	71 627.20	71 893.60	72 160.00

Comments

1c Primary forest and special forest categories

National Data

Data sources + type of data source eg NFI, etc

The data source for Bamboo and temporarily unstocked/recently regenerated is available from NFI. The area under mangrove has been obtained from remote sensing classification. The area under Rubber has been obtained from Rubber board.

National classification and definitions

National definition and classification is same as FRA.

Original data

original data has been taken from NFI (bamboo and recently regenerated stock), Forest Cover mapping (Mangrove) and Rubber (Rubber board)

Analysis and processing of national data

Estimation and forecasting

The estimates for 1990 have been worked out with the growth of 2000 and 2005. For the year 2005 onwards till 2017, the information is available from rubber board of India. For forecasting for the year 2020, average increase for the last ten years (from 2007 to 2017 has been taken).

Reclassification into FRA 2020 categories

Since national and FRA classification are same, no reclassification is required.

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Primary forest	15 701.00	15 701.00	15 701.00	15 701.00	15 701.00
Temporarily unstocked and/or recently regenerated	3 982.00	4 073.00	4 678.00	4 015.00	4 476.00
Bamboos	7 042.00	10 500.00	13 958.00	15 687.00	17 416.00
Mangroves	426.00	448.00	463.00	492.00	521.00
Rubber wood	502.00	563.00	712.00	811.00	882.00

Comments

1d Annual forest expansion, deforestation and net change

National Data

Data sources + type of data source eg NFI, etc

The source of data for calculating the annual forest expansion and deforestation is forest cover assessment of the country based on wall to wall mapping using satellite data. The change matrix given in ISFR with respect to previous assessment has been used for calculating the annual forest expansion and deforestation.

National classification and definitions

National classifications and definitions are same as used in table 1a Extent of forest and other

Original data

The change matrix given in chapter 2 : Forest Cover in different SFRs/ISFRs has been taken as the original data. The different reports are given in FSI website (www.fsi.nic.in)

Analysis and processing of national data

Estimation and forecasting

The data beyond 2015 has been repeated.

Reclassification into FRA 2020 categories

Reclassification is not required.

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Forest expansion (a)	749.30	820.00	934.80	934.80
...of which afforestation				
...of which natural expansion				
Deforestation (b)	384.00	629.50	668.40	668.40
Forest area net change (a-b)	365.30	190.50	266.40	266.40

Comments

1e Annual reforestation

National Data

Data sources + type of data source eg NFI, etc

Seperate inforamtion is not availabe on reforestation

National classification and definitions

-

Original data

-

Analysis and processing of national data

Estimation and forecasting

-

Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Reforestation				

Comments

1f Other land with tree cover

National Data

Data sources + type of data source eg NFI, etc

The area information under agroforestry and urban setting is available from NFI. This information is available for 2010 and 2015 from ISFR 2013 and 2017 respectively. For other categories, separate information is not available. For deriving the estimates for the year 1990, 2000 and 2020, the average of agroforestry and trees in urban setting with total other lands for the year 2010 and 2015 has been taken.

National classification and definitions

The national classification and definitions is the same as that of FRA.

Original data

The original data has been taken from NFI database used for ISFR 2013 and 2017

Analysis and processing of national data

Estimation and forecasting

For estimation back and forth, the ratio of area under agro-forestry and urban with that of total land area for the year 2010 and 2015 has been taken.

Reclassification into FRA 2020 categories

As national classification is same as that of FRA, no reclassification is required.

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Palms (a)					
Tree orchards (b)					
Agroforestry (c)		5 488.00	4 743.00	6 125.00	5 368.00
Trees in urban settings (d)	235.00	233.00	182.00	279.00	228.00
Other (specify in comments) (e)					
Total (a+b+c+d+e)	235.00	5 721.00	4 925.00	6 404.00	5 596.00
Other land area	227 487.00	224 996.00	223 685.00	221 893.00	220 101.00

Comments

Separate information on Palms and Tree orchards is not available.

2 Forest growing stock, biomass and carbon

2a Growing stock

National Data

Data sources + type of data source eg NFI, etc

The data source is NFI. The information for the year 2010 and 2015 has been obtained from NFI.

National classification and definitions

The national classification and definition is the same as is being used by FRA.;

Original data

The original data has been taken from NFI database. NFI data base is a RDBMS which store all plot level inventory data in several tables. The data is processed using a data processing software developed by FSI for processing of data. The data required for reporting to FRA 2020 has been derived from the data base. it is not possible to reproduce the data base here. However, if reviewers want any specific data or clarification, FSI will be happy to provide the same.

Analysis and processing of national data

Estimation and forecasting

The growing stock of naturally regenerated forest, plantation forest and planted forest for the year 2010 and 2015 has been taken from NFI. For estimation of growing stock for the year 2016 to 2020, the annual average change between 2010 and 2015 has been taken. The breakup of the total growing stock into different categories has been taken in the same proportion as taken for 2015. The growing stock for the year 2000 has also been revised due to change in forest area. The proportion of the total growing stock has been taken in the same proportion as that of 2010.

Reclassification into FRA 2020 categories

As FRA and national classification are same, so reclassification is required.

FRA categories	Growing stock m³/ha (over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	57.50	63.50	68.85	67.99	67.78	67.58	67.38	67.18	66.99
Planted forest	177.60	119.77	93.66	91.52	91.26	90.92	90.73	90.47	90.21
...of which plantation forest	239.33	129.62	101.78	97.42	97.17	96.80	96.54	96.28	96.03
...of which other planted forest	79.05	87.69	68.44	73.19	72.91	72.63	72.68	72.41	72.14
Forest	68.24	71.30	73.41	72.32	72.10	71.89	71.68	71.47	71.26
Other wooded land									

FRA categories	Total growing stock (million m³ over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	3 348.00	3 697.00	3 905.11	3 930.00	3 933.00	3 936.00	3 939.00	3 942.00	3 945.00
Planted forest	1 015.00	1 122.00	1 196.89	1 192.00	1 193.00	1 193.00	1 195.00	1 196.00	1 197.00
...of which plantation forest	841.00	929.00	984.00	960.00	961.00	961.00	962.00	963.00	964.00
...of which other planted forest	174.00	193.00	212.89	232.00	232.00	232.00	233.00	233.00	233.00
Forest	4 363.00	4 819.00	5 102.00	5 122.00	5 126.00	5 130.00	5 134.00	5 138.00	5 142.00
Other wooded land									

Comments

The growing stock m³/ha for the plantation forest for the year 2000 is less than that of 1990, though the area of plantation foerst has increased almost double during the same period. The total growing stock of the plantation forest has increased in 2000 as compared to 1990. However, the per hectare figure has decreased because the area has doubled and the younger plants has less volume.

2b Growing stock composition

National Data

Data sources + type of data source eg NFI, etc

The data source is NFI. The species preference has been taken as per the year 2015.

National classification and definitions

The national classification and definition is the same as is being used for FRA.

Original data

The original data is taken from nFI data base for the year 2010 and 2015.

Analysis and processing of national data

Estimation and forecasting

The preference of the species has been taken as per the year 2015. Accordingly, the estimates of the growing stock were worked out for the year 1990, 2000, 2010 and 2015. The estimation for the year 2020 has been done as per the estimates of 2015.

Reclassification into FRA 2020 categories

As there is no difference between national classification and FRA classification, reclassification is not required.

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#1 Ranked in terms of volume	Shorea robusta	Sal	321.00	345.00	545.00	506.00	508.00
#2 Ranked in terms of volume	Tectona grandis	Teak	162.00	173.00	224.00	222.00	223.00
#3 Ranked in terms of volume	Pinus roxburghii	Chir pine	124.00	133.00	142.00	168.00	169.00
#4 Ranked in terms of volume	Terminalia crenulata	Saja	108.00	114.00	140.00	168.00	169.00
#5 Ranked in terms of volume	Anogeissus latifolia	Dhauda	94.00	102.00	130.00	131.00	132.00
#6 Ranked in terms of volume	Quercus semecarpifolia	Kharsu dak	82.00	88.00	75.00	86.00	86.00
#7 Ranked in terms of volume	Lannea coromandelica	Jhingan	54.00	60.00	77.00	84.00	84.00
#8 Ranked in terms of volume	Pinus excelsa	Kail	51.00	57.00	78.00	81.00	81.00
#9 Ranked in terms of volume	Quercus leucotrichophora	Bluejack oak	57.00	64.00	62.00	74.00	74.00
#10 Ranked in terms of volume	Boswelli serrata	Salai	55.00	61.00	71.00	68.00	68.00
Remaining native tree species			3 255.00	3 622.00	3 558.00	3 534.00	3 548.00
Total volume of native tree species			4 363.00	4 819.00	5 102.00	5 122.00	5 142.00
Introduced tree species							
#1 Ranked in terms of volume							
#2 Ranked in terms of volume							
#3 Ranked in terms of volume							
#4 Ranked in terms of volume							

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#5 Ranked in terms of volume							
Remaining introduced tree species							
Total volume of introduced tree species			–	–	–	–	–
Total growing stock			4 363.00	4 819.00	5 102.00	5 122.00	5 142.00

Comments

Separate information on growing stock of introduced speices is not available..

2c Biomass stock

National Data

Data sources + type of data source eg NFI, etc

The data source for biomass estimation is NFI. The data collected from the NFI plots are converted to biomass using specific gravity. Further biomass equations have been used for taking into consideration of biomass expansion factor

National classification and definitions

The national classification and definition is the same as being used for FRA.

Original data

The original data has been taken from NFI database. NFI data base is a RDBMS which store all plot level inventory data in several tables. The data is processed using a data processing software developed by FSI for processing of data. The data required for reporting to FRA 2020 has been derived from the data base. it is not possible to reproduce the data base here. However, if reviewers want any specific data or clarification, FSI will be happy to provide the same.

Analysis and processing of national data

Estimation and forecasting

The estimation for the year 2016 to 2020 has been done on the basis of information obtained for the year 2010 and 2015. The proportion in different pools have been carried out as per the estimates of 2015.

Reclassification into FRA 2020 categories

Reclassification is not required as the national and FRA classification are same.

FRA categories	Forest biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass	57.39	69.78	67.61	68.70	68.70	68.70	68.70	68.70	68.70
Below-ground biomass	18.04	21.52	21.30	21.52	21.52	21.52	21.52	21.52	21.52
Dead wood	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86

Comments

2d Carbon stock

National Data

Data sources + type of data source eg NFI, etc

The data source for carbon estimation is NFI data. The carbon estimates for the year 2000 has been reconciled with FRL estimates. The carbon estimates for the year 2010 has been taken as given in BUR-II and estimates of 2015 has been taken from ISFR 2017.

National classification and definitions

The national classification and data is same as being used for FRA

Original data

The original data is taken from NFI database. The original data has been taken from NFI database. NFI data base is a RDBMS which store all plot level inventory data in several tables. The data is processed using a data processing software developed by FSI for processing of data. The data required for reporting to FRA 2020 has been derived from the data base. it is not possible to reproduce the data base here. However, if reviewers want any specific data or clarification, FSI will be happy to provide the same.

Analysis and processing of national data

Estimation and forecasting

The forecasting for the year 2016 to 2020 has been done using the average annual change obtained from the data of 2010 and 2015. The poolwise estimation has also been obtained in the same proportion as of 2015.

Reclassification into FRA 2020 categories

Reclassification is not required as the FRA and national classification are same.

FRA categories	Forest carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Carbon in above-ground biomass	26.40	32.10	31.10	31.60	31.60	31.60	31.60	31.60	31.60
Carbon in below-ground biomass	8.30	9.90	9.80	9.90	9.90	9.90	9.90	9.90	9.90
Carbon in dead wood	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Carbon in litter	1.20	1.80	1.90	1.90	1.90	1.90	1.90	1.90	1.90
Soil carbon	58.70	56.90	56.90	56.20	56.20	56.20	56.20	56.20	56.20

Soil depth (cm) used for soil carbon estimates	30.00
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Comments

3 Forest designation and management

3a Designated management objective

National Data

Data sources + type of data source eg NFI, etc

In India the national forest statistics is not maintained by the designation of forests. However, NFAP, 1999 has provided following broad information on designation of forests for 1993. The NFAP does not provide similar information for scrub areas (other wooded lands) etc.

National data.

National Classification of Forests	Area in million hectares			
	1993	2000	2004	2011
Protection forests (for biological stabilities)	10			
Production forests (for timber Requirements of the country)	15			
Social Forests (for meeting daily needs of local communities)	25			
Protected Area (National Parks and Sanctuaries etc.)	14	15.4	15.6	16.12
Total Forest	64			
Scrub (Other Wooded Lands)				

National classification and definitions

The NFAP (1999) classifies and defines forests based on designation.

National class	Definition
Protection forests	Forest managed for biological stabilities and defined as “An area wholly or partly covered with woody growth, managed primarily for its beneficial effects on water, climate or soil rather than for forest products or services, and involving fragile lands, critical soil, catchment areas, steep slopes, and land at high altitudes. Controlled sustainable extraction of non-wood forest products are often allowed in protection forests”
Production forests	Forests managed for meeting timber requirements of the country and defined as “Forest designated for the sustained production of timber and other forest products, often with protection and/or nature conservation as recognised secondary objectives, chosen because of their potential ot provide a yield of high quality timber(or other products) in perpetuity. This category may also include degraded areas appropriate for reforestation. In general usage that term covers natural forests, forest plantations, woodlots, agroforestry plots, homestead forest etc.
Social Forests	Forests managed for meeting daily needs of local communities.
Protected Area	Forests managed as Protected Area (National Parks and Sanctuaries etc.) also termed as “Conservation area” in NFAP and defined as “Land such as national parks, reserves, protected areas, or other categories gazetted under the appropriate legislation.”

Original data

National Classification of Forests	Area in million hectares			
	1993	2000	2004	2011
Protection forests (for biological stabilities)	10			
Production forests (for timber Requirements of the country)	15			
Social Forests (for meeting daily needs of local communities)	25			

Protected Area (National Parks and Sanctuaries etc.)	14	15.4	15.6	16.12
Total Forest	64			
Scrub (Other Wooded Lands)				

Analysis and processing of national data

Estimation and forecasting

For different categories under primary designated function, the estimates for 1990, 2000 and 2005 were obtained by distributing total forest area in the same proportion as provided in the NFAP except ‘conservation of biodiversity’. For conversation of biodiversity category, the actual figures of protected area of 1990, 2000, 2010 and 2015, have been taken and increase/decrease in protected area was compensated by decrease/increase in multiple-use category. For forecasting for the year 2020, the forest area forcasted as given in table 1a has been used and area under protected networks has been forecasted on the basis of available data for the year 2015 to 2018.

Reclassification into FRA 2020 categories

reclassification is not required as the national classes matches with the FRA classes.

Primary designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production (a)	16 260.00	17 189.00	17 673.00	18 012.00	18 351.00
Protection of soil and water (b)	10 000.00	10 571.00	10 869.00	11 078.00	11 286.00
Conservation of biodiversity (c)	12 740.00	13 029.00	16 122.00	16 197.00	16 218.00
Social Services (d)	0.00	0.00	0.00	0.00	0.00
Multiple use (e)	24 938.00	26 802.00	24 832.00	25 541.00	26 305.00
Other (specify in comments) (f)	0.00	0.00	0.00	0.00	0.00
None/unknown (g)	0.00	0.00	0.00	0.00	0.00
Total forest area	63 938.00	67 591.00	69 496.00	70 828.00	72 160.00

Total area with designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production					
Protection of soil and water					
Conservation of biodiversity					
Social Services					
Other (specify in comments)					

Comments

3b Forest area within protected areas and forest area with long-term management plans

National Data

Data sources + type of data source eg NFI, etc

The data source for protected area is Wildlife Institute of India (WII). The institute is maintaining the areas under protected area network. The forest area under long term management plan has been estimated on the basis of the information given in Forest Sector Report India 2010. In the report, it has been given that out of total 781 territorial division, 535 divisions have valid working plan. This implying that 69% divisions have management plan. The same ratio has been applied on the recorded forest area under management plan.

National classification and definitions

The definition and classification is same as being used for FRA.

Original data

Original data of protected area is taken from WII. The total recorded forest area has been obtained from State Forest Departments.

Analysis and processing of national data

Estimation and forecasting

The area of protected network upto 2018 is available from WII. For 2019 and 2020, the same has been forecasted. The area under long term management plan has been estimated using ratio generated from forest sector report (69%). The entire area under the PA have the management plan.

Reclassification into FRA 2020 categories

Re-classification is not required as the national and FRA classification are same.

FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest area within protected areas	10 999.00	11 248.00	13 918.00	13 983.00	13 989.00	13 993.00	13 994.00	13 998.00	14 001.00
Forest area with long-term forest management plan	53 135.00	53 022.00	53 098.00	52 755.00	52 755.00	52 952.00	52 952.00	52 952.00	52 952.00
...of which in protected areas	10 999.00	11 248.00	13 918.00	13 983.00	13 989.00	13 993.00	13 994.00	13 998.00	14 001.00

Comments

4 Forest ownership and management rights

4a Forest ownership

National Data

Data sources + type of data source eg NFI, etc

The data source is NFI. The area under public ownership has been estimated from NFI database.

National classification and definitions

The national classification and definition are same as being used by FRA.

Original data

Orginal data is taken from NFI database.

Analysis and processing of national data

Estimation and forecasting

The information for 2010 and 2015 has been taken from NFI.

Reclassification into FRA 2020 categories

No reclassification is required.

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Private ownership (a)	9 161.00	11 571.00	12 011.00	13 081.00
...of which owned by individuals				
...of which owned by private business entities and institutions				
...of which owned by local, tribal and indigenous communities				
Public ownership (b)	54 777.00	56 020.00	57 485.00	57 747.00
Unknown/other (specify in comments) (c)	0.00	0.00	0.00	0.00
Total forest area	63 938.00	67 591.00	69 496.00	70 828.00

Comments

4b Holder of management rights of public forests

National Data

Data sources + type of data source eg NFI, etc

The data has been taken from NFI and Forest Sector report India 2010.

National classification and definitions

The national classification and definitions are same as is being used by FRA.

Original data

Original data has been taken from NFI. The area under JFM for the year 2010 has been taken from Forest Sector Report India 2010.

Analysis and processing of national data

Estimation and forecasting

The area under JFMCs has been taken from Forest Sector Report India 2010 for the year 2010. The proportion of the area under JFMCs with total area under public ownership has been calculated for the year 2010 and same ratio has been applied for the year 2000 and 2015.

Reclassification into FRA 2020 categories

Reclassification is not required.

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Public Administration (a)	54 777.00	32 001.00	32 838.00	32 988.00
Individuals (b)	0.00	0.00	0.00	0.00
Private business entities and institutions (c)	0.00	0.00	0.00	0.00
Local, tribal and indigenous communities (d)	0.00	24 019.00	24 647.00	24 759.00
Unknown/other (specify in comments) (e)	0.00	0.00	0.00	0.00
Total public ownership	54 777.00	56 020.00	57 485.00	57 747.00

Comments

The Joint Forest Management (JFM) is a participatory management regime involving the government and local communities for regeneration of degraded forest through effective protection, sharing of produce and improving the livelihood opportunities of forest dependent communities. The JFM in India has started in 1990 and have shown very encouraging results. As JFM started in 1990, the area under JFM is not available for the year 1990.

5 Forest disturbances

5a Disturbances

National Data

Data sources + type of data source eg NFI, etc

National level data is not available on disturbances

National classification and definitions

-

Original data

National level data is not available on disturbances

Analysis and processing of national data

Estimation and forecasting

National level data is not available on disturbances

Reclassification into FRA 2020 categories

-

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Insects (a)																		
Diseases (b)																		
Severe weather events (c)																		
Other (specify in comments) (d)																		
Total (a+b+c+d)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total forest area	67 591.00	-	-	-	-	69 083.00	-	-	-	-	69 496.00	-	-	-	-	70 828.00	71 094.40	71 360.80

Comments

5b Area affected by fire

National Data

Data sources + type of data source eg NFI, etc

The data source is NFI.

National classification and definitions

The national classification and definitios are same as is being used by FRA.

Original data

The original data has been taken from NFI database.

Analysis and processing of national data

Estimation and forecasting

The area figures of fire has been estimated using NFI database. The area has been estimated under 3 categories namely area affected by mild fire, modetate fire and heavy fire. As the data is taken from NFI, the estimates have been repeated for the years whcih have been calculated using the NFI data of a particular cycle.

Reclassification into FRA 2020 categories

Reclassification is not required.

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total land area affected by fire																		
...of which on forest	2 920.00	2 920.00	2 920.00	3 184.00	3 184.00	2 869.00	2 869.00	3 299.00	3 299.00	3 299.00	3 299.00	3 297.00	3 297.00	3 501.00	3 501.00	3 577.00	3 654.00	3 731.00

Comments

5c Degraded forest

Does your country monitor area of degraded forest		Yes
If "yes"	What is the national definition of "Degraded forest"?	The degraded forest is monitored partly based on canopy density. FSI carries out forest cover assessment of the country using remote sensing data on a biennial basis. The forest cover classification is done in different density classes. The area having less than 10 percent canopy is treated as degraded forest and named as scrub forest..
	Describe the monitoring process and results	The monitoring of forest cover is done using satellite data on a biennial basis. The forest cover is classified into different density classes. The change matrix is prepared between two successive assessment to monitor changes in different canopy density.

Comments

6 Forest policy and legislation

6a Policies, Legislation and national platform for stakeholder participation in forest policy

National Data

Data sources + type of data source eg NFI, etc

Different foresty related rules and regulations enacted time to time

National classification and definitions

The forest area notified under some forest act are treated as forest area.

Original data

Differnt notifications

Indicate the existence of	Boolean (Yes/No)	
	National	Sub-national
Policies supporting SFM	Yes	Yes
Legislations and regulations supporting SFM	Yes	Yes
Platform that promotes or allows for stakeholder participation in forest policy development	Yes	Yes
Traceability system(s) for wood products	Yes	Yes

Comments

6b Area of permanent forest estate

National Data

Data sources + type of data source eg NFI, etc

Data sources NFI Database. During NFI, plot wise information on different Land uses and Legal status (Government or Private) is collected. The same information has been used for calculating area under permanent forest estate

National classification and definitions

National classification and definition is same as that of FRA.

Original data

National Forest Inventory database 2002-2016. For the year 1999 & 2000, the propotion of area of permanent forest estate to Recored Forest Area has been taken.

FRA 2020 categories	Forest area (1000 ha)					
	Applicable?	1990	2000	2010	2015	2020
Area of permanent forest estate	Yes	46 204.68	46 106.16	45 068.00	46 612.00	46 612.00

Comments

7 Employment, education and NWFP

7a Employment in forestry and logging

National Data

Data sources + type of data source eg NFI, etc

The employment by production and other activities in forest is not reported at the national level. A study done by World Bank (WB, 2000) to estimate the employment potential in forestry sector in India based on 1993 data has formed the main source of this reporting. To calculate the employment in 1990, 2000, 2010 and 2015, it has been assumed that the emplyment in the eight forest related emplyment groups of the World Bank Study (WB, 2000) will follow the same trend required for FRA. The national data is availabe only for the thre categories namely wood production, fuel wood and plantation, from which employment per unit of these categories was generated. these ratios have been applied on eight emplyment categories of the World Bank. The ratio of logging was applied on forestry & logging, forest services and conservation of forest, the ratio of plantatlon was applied on plantation and ratio of fuelwood was applied on fire wood, fodder, uncultivated materials and hunting etc.

National classification and definitions

National class	Definition
Principal “Usual Status” or Principal Activity	The activity on which the person spent relatively more time preceding 365 days.
Employed in Principal Activity or Usual Status	A person is “working or employed” if he or she was engaged for a relatively longer time during the past year in one or more work activities (economic activities).
Unemployed in Principal Activity or Usual Status	A person is “seeking or available for work or unemployed” if he or she was not working but was seeking or was available for work for a relatively longer time during the past year.
Out of Labour Force (Primary Activities)	A person is “out of labour force” if he or she was engaged in non-economic activities for a relatively longer time of the reference year.
Principal Status “Worker” or “Employed	A person categorised as “worker” or “employed” on the basis of principal status is as principal status “worker” or “employed”. Explanation: Unpaid helpers, who assist in operation of an economic activity in household farm or non farm activities are also considered as workers. It does not include persons engaged in collection of firewood as a non-economic activity.
Subsidiary Status “Worker” or “Employed”	A person categorised as non worker (unemployed or “out of labour force)”who pursued some economic activity in a subsidiary capacity. Explanation: Unpaid helpers, who assist in operation of an economic activity in household farm or non farm activities are also considered as workers. It does not include persons engaged in collection of firewood as a non-economic activity.
Total Workers	Sum of Principal Status Workers and Subsidiary Status workers under “Usual Status” Classification.
Economic Activity	It includes (a) all market activities performed for pay or profit that result in production of goods and services for exchange, and (b) selected non market activities like agriculture sector activities that result in production (including gathering of uncultivated crops, forestry, collection of firewood, hunting, fishing etc.) of agriculture produce fro consumption; activities relating to the production of fixed assets for personal use (including houses, roads, wells, machinery, tools etc. for household enterprise and construction of private or community facilities free of charge)

Original data

the original data has been taken from world bank report WB. 2000. India: Alleviating Poverty through Employment. The World Bank. 2000. The following table presents the number of principal and subsidiary forest workers in 1993 in the eight forest related categories mentioned in a World Bank Study (WB, 2000).

National Class	Number in 1993 (in millions)
Firewood/fuelwood by exploitation of forest	0.049
Gathering of fodder from forests	0.014
Uncultivated materials in forests	0.300

Hunting, trapping, and game propagation	0.067
Forestry and logging	1.488
Plantations ¹	4.703
Planting, replanting and conservation of forestry	0.532
Forest services	0.344

FRA 2020 categories	Full-time equivalents (1000 FTE)											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Employment in forestry and logging	6 360.00			6 053.00			6 215.00			6 242.00		
...of which silviculture and other forestry activities												
...of which logging												
...of which gathering of non wood forest products												
...of which support services to forestry												

Comments

7b Graduation of students in forest-related education

National Data

Data sources + type of data source eg NFI, etc

The number of students in MSc and BSc for 2008 along with percentage of female has been compiled from ICFRE. The same figures has been taken for the year 2000 (as reported in FRA 2010) and 2010. The data for the year 1990 and 2015 is not availabe.

National classification and definitions

Self explaintery

Original data

The orignal data has been compiled by ICFRE.

FRA 2020 categories	Number of graduated students											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Doctoral degree												
Master's degree				565.00	311.00	254.00	565.00	311.00	254.00			
Bachelor's degree				808.00	404.00	404.00	808.00	404.00	404.00			
Technician certificate / diploma				3 000.00	60.00	2 940.00	3 000.00	60.00	2 940.00			
Total				4 373.00	775.00	3 598.00	4 373.00	775.00	3 598.00			

Comments

The data is not availabe for the year 1990 and 2015.

7c Non wood forest products removals and value 2015

National Data

Data sources + type of data source eg NFI, etc

The data has been compiled by ICFRE from different state forest departments. The data on NTFPs is not adequate and there is also issue of coverage. However, whatever data is available from the state forest department, the same has been given.

National classification and definitions

same as FRA classification

Original data

original data has been taken from different forest departments.

	Name of NWFP product	Key species	Quantity	Unit	Value (1000 local currency)	NWFP category
#1	Tendu Leaves	Diospyros melanoxylon	652 677	MT	8 391 470	8 Other plant products
#2	Resins	Pinus spp	1 057	MT	893 645	3 Raw material for medicine and aromatic products
#3	Honey		32 852	Qlt	354 507	11 Wild honey and bee wax
#4	Sal Seed	Shorea Robusta	128 998	Qlt	151 578	1 Food
#5	Grass		4 196	MT	108 635	2 Fodder
#6	Lac		3 849	Qlt	76 623	8 Other plant products
#7	Gum		12 063	Qlt	72 389	8 Other plant products
#8	Mahua	Madhuca latifolia	20 942	Qlt	33 263	1 Food
#9	Amla	Embilca officinalis	784	Qlt	3 520	1 Food
#10	Wax		11	Qlt	88	11 Wild honey and bee wax
All other plant products						
All other animal products						
Total					10 085 718	

Name of currency	INR
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Comments

8 Sustainable Development Goal 15

8a Sustainable Development Goal 15

SDG Indicator 15.1.1 Forest area as proportion of total land area 2015

Indicator	Percent							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area as proportion of total land area 2015	22.73	23.37	23.82	23.91	24.00	24.09	24.18	24.27

Name of agency responsible	Central Statistical Office, Ministry of Statistics & Programme Implementation, Govt of India
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SDG Indicator 15.2.1 Progress towards sustainable forest management

Sub-Indicator 1	Percent						
	2000-2010	2010-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Forest area annual net change rate	0.28	0.38	0.37	0.37	0.37	0.37	0.37

Name of agency responsible	Central Statistical Office, Ministry of Statistics & Programme Implementation, Govt of India
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Sub-Indicator 2	Forest biomass (tonnes/ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass stock in forest	69.78	67.61	68.70	68.70	68.70	68.70	68.70	68.70

Name of agency responsible	Central Statistical Office, Ministry of Statistics & Programme Implementation, Govt of India
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Sub-Indicator 3	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area located within legally established protected areas	15.88	19.65	19.74	19.75	19.76	19.76	19.76	19.77

Name of agency responsible	Central Statistical Office, Ministry of Statistics & Programme Implementation, Govt of India
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Sub-Indicator 4	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area under long-term forest management plan	74.86	74.97	74.48	74.48	74.76	74.76	74.76	74.76

Name of agency responsible	Central Statistical Office, Ministry of Statistics & Programme Implementation, Govt of India
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Sub-Indicator 5	Forest area (1000 ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area under independently verified forest management certification schemes	0.00	0.68	818.47	754.91	509.93	521.68	—	—