

11.6

DELHI

11.6.1 Introduction

Delhi, the National Capital Territory (NCT) of India, has a geographical area of 1,483 sq km, which is 0.05 % of the geographical area of the country. The State lies between 28°22'N to 28°54'N latitude and 76°48'E to 77°23'E longitude and is bordered by Haryana on the three sides and Uttar Pradesh on the East. The landscape of Delhi can geographically be divided into three major regions viz the low-lying Yamuna flood plains, the Aravalli Ridge and the great Gangetic plains that cover most part of the city. The altitude of the Delhi ranges from 180 m to 316 m above the mean sea level. Climate of the state is hot in summer and cold in winter. The rainfall varies from 400 mm to 600 mm. The annual temperature ranges between 3°C to 45°C. The State has 9 districts out of which none is hill or tribal. As per the 2011 census Delhi has a population of 16.79 million accounting to 1.38% of India's population. The urban & rural population constitutes 97.50% and 2.50% respectively. The population density of the NCT is 11,320 per sq km. The 19th Livestock census 2012 has reported a total livestock population of 0.36 million in the State.

TABLE 11.6.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	148	
Reporting area for land utilization	147.49	100.00
Forests	1.48	1.00
Not available for land cultivation	93.20	63.18
Permanent pastures and other grazing lands	0.06	0.04
Land under misc. tree crops and groves	1.18	0.80
Culturable wasteland	9.89	6.71
Fallow land other than current fallows	8.06	5.47
Current fallows	11.73	7.96
Net area sown	21.89	14.84

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



11.6.1.1 A Brief Overview of Forestry Scenario

As per the Champion & Seth Classification of Forest Types (1968), the forests in Delhi belong to the Type Group 5, Tropical Dry Deciduous Forest and Type Group 6 Tropical Thorn Forests. Around 67.35% of the total forest cover comes under plantation/ TOF and 32.65% constitute the natural forest, which covers 57.67 sq km of Delhi's forests.

Forest department under the Government of Delhi supervises and monitors various activities such as distribution of seedlings to public, government departments & institutions, plantations on gram sabha lands, along the roads, ridge area, river banks, railway lines etc. To promote the tree plantation activity as a mass campaign and to encourage participation of Residential Welfare Associations, Civil Society, Government organizations, educational institutions etc, the Government of NCT of Delhi, carries out the 'Greening Delhi Campaign' every year.

The Recorded Forest Area (RFA) in the State is 102 sq km of which 78 sq km is Reserved Forest and 24 sq km is Protected Forest. In Delhi, no forest land has been diverted for non-forestry purposes under the Forest Conservation Act, 1980 in the last four years (MoEF & CC, 2019).

The Protected Area network in the State has one Wildlife Sanctuary viz Asola Bhatti Wildlife Sanctuary which covers 1.96% of geographical area of the State.

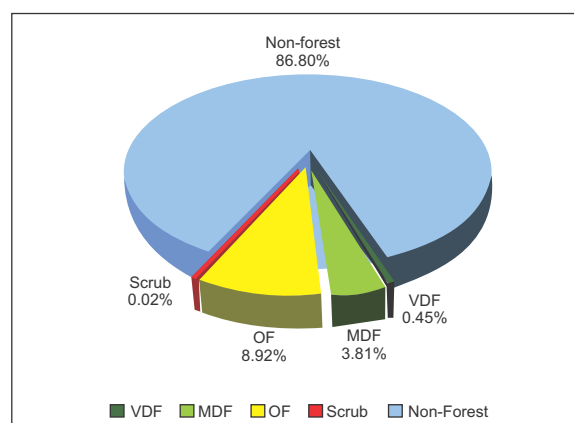
11.6.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017, the Forest Cover in the State is 195.44 sq km which is 13.18 % of the State's geographical area. In terms of forest canopy density classes, the State has 6.72 sq km under Very Dense Forest (VDF), 56.42 sq km under Moderately Dense Forest (MDF) and 132.30 sq km under Open Forest (OF). Forest Cover in the State has increased by 3.03 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.6.2 Forest Cover of Delhi
(in sq. km)

Class	Area	% of GA
VDF	6.72	0.45
MDF	56.42	3.81
OF	132.30	8.92
Total	195.44	13.18
Scrub	0.30	0.02

FIGURE 11.6.1 Forest Cover of Delhi



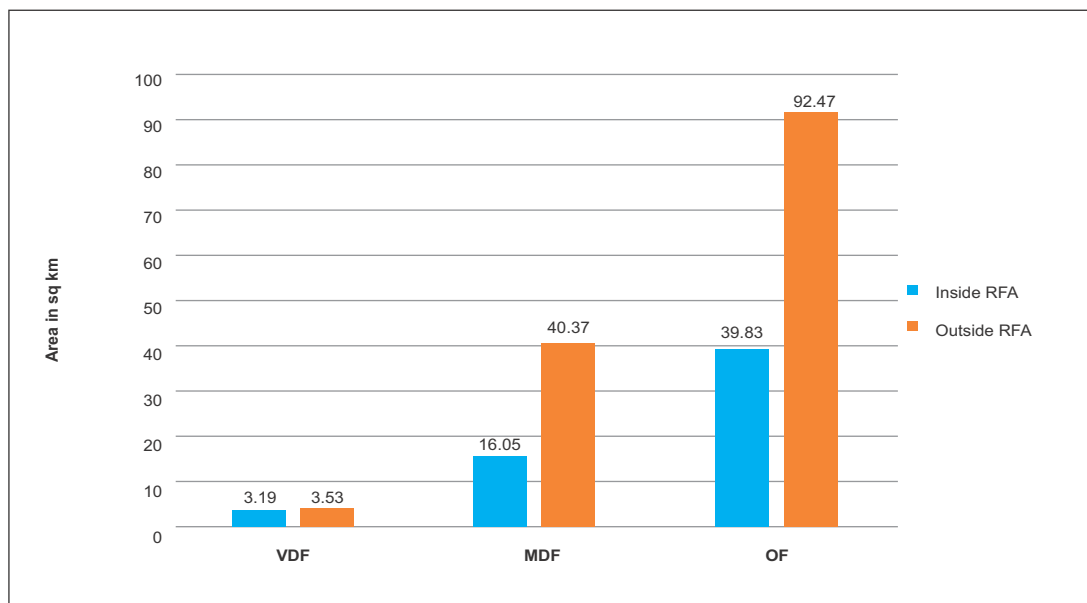
11.6.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 102 sq km which is 6.88 % of its geographical area. The reserved and protected forests are 76.48 % and 23.52 % of the recorded forest area in the State respectively. However, as the digitized boundary of recorded forest area from the State covers 102.04 sq km, the analysis of forest cover inside and outside this area is given below.

TABLE 11.6.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) in Delhi (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
3.19	16.05	39.83	59.07	3.53	40.37	92.47	136.37
5.40%	27.17%	67.43%		2.59%	29.60%	67.81%	

*in case of Delhi RFA boundaries have been used.

FIGURE 11.6.2 Forest Cover inside and outside RFA in Delhi**TABLE 11.6.4** District-wise Forest Cover in Delhi (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			
Central Delhi	21	0.00	2.08	2.86	4.94	23.52	0.00	0.00
East Delhi	63	0.00	1.05	2.70	3.75	5.95	0.05	0.00
New Delhi	35	1.69	5.47	9.31	16.47	47.06	0.06	0.00
North Delhi	61	0.00	2.82	1.76	4.58	7.51	0.00	0.00
North-East Delhi	62	0.00	0.99	3.00	3.99	6.44	0.01	0.00
North-West Delhi	443	0.09	8.77	9.18	18.04	4.07	0.49	0.02
South Delhi	247	2.59	17.75	64.29	84.63	34.26	1.28	0.23
South-West Delhi	421	2.35	14.91	34.93	52.19	12.40	1.09	0.05
West Delhi	130	0.00	2.58	4.27	6.85	5.27	0.05	0.00
Grand Total	1,483	6.72	56.42	132.30	195.44	13.18	3.03	0.30

TABLE 11.6.5 Forest Cover Change Matrix for Delhi

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	6.72	0.00	0.00	0.00	0.00	6.72
Moderately Dense Forest	0.00	56.23	0.00	0.00	0.01	56.24
Open Forest	0.00	0.00	129.03	0.00	0.42	129.45
Scrub	0.00	0.00	0.26	0.30	0.11	0.67
Non Forest	0.00	0.19	3.01	0.00	1,286.72	1,289.92
Total ISFR 2019	6.72	56.42	132.30	0.30	1,287.26	1,483.00
Net Change	0.00	0.18	2.85	-0.37	-2.66	

Main reasons for the increase in forest cover are plantation and conservation activities.

TABLE 11.6.6 Altitude-wise Forest Cover in Delhi

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	1,483	6.72	56.42	132.30	195.44 (100%)	0.30
Total	1,483	6.72	56.42	132.30	195.44	0.30

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

TABLE 11.6.7 Forest Cover in different slope classes in Delhi

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,407	6.72	52.40	122.00	181.12 (92.67%)	0.30
5-10	70	0.00	4.02	9.30	13.32 (6.82%)	0.00
10-15	5	0.00	0.00	1.00	1.00 (0.51%)	0.00
15-20	1	0.00	0.00	0.00	0.00 (0.00%)	0.00
Total	1,483	6.72	56.42	132.30	195.44	0.30

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



FIGURE 11.6.3 Forest Cover Map of Delhi

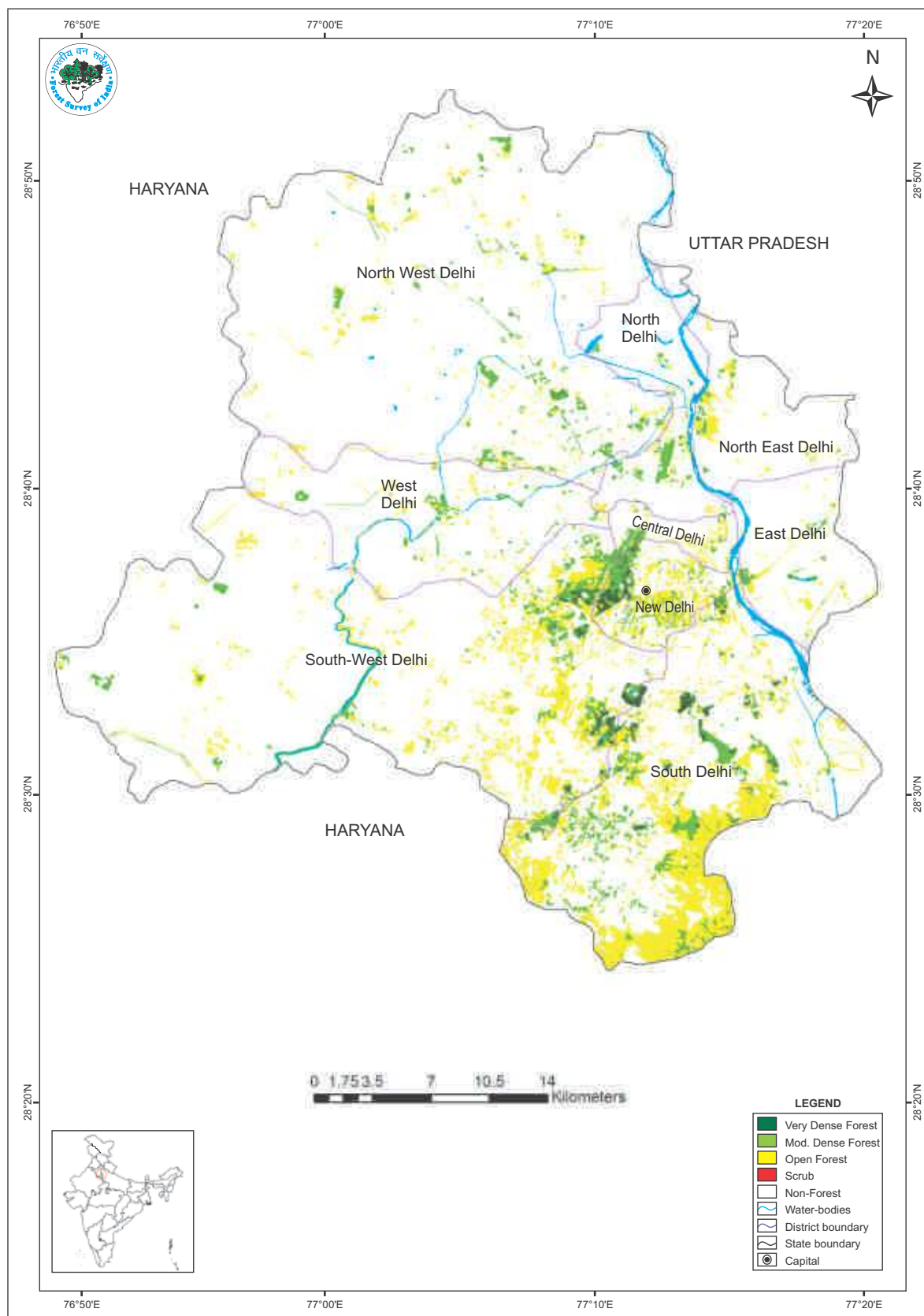


TABLE 11.6.8 Wetlands inside the Recorded Forest Area (or Green Wash) in Delhi

(in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
Lake/Pond	1	2
Riverine wetland	0	0
Waterlogged	0	0
River/Stream	0	0
Sub - Total	1	2
Inland Wetlands -Man-made		
Reservoir/Barrage	0	0
Tank/Pond	0	0
Waterlogged	0	0
Sub - Total	0	0
Wetlands (<2.25 ha)	16	16
Total	17	18
Total Recorded Forest (or Green Wash) Area (in ha)		10,204
% of Wetland area inside Recorded Forest (or Green Wash) Area		0.18%

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

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

TABLE 11.6.9 Percentage area under different forest types of Delhi

Sl. No.	Forest Type	% of Forest cover
1.	5B/C2 Northern Dry Mixed Deciduous Forest	21.73
2.	6B/C2 Ravine Thorn Forest	45.37
3.	Plantation/TOF	32.90
	Total	100.00

11.6.3.1 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 11.6.10 and table 11.6.11 in respect of Delhi.

TABLE 11.6.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	16
Shrub	11
Herb	36

TABLE 11.6.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Delhi

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1.	Group 5- Tropical Dry Deciduous Forests	1.56	*	*
2.	Group 6- Tropical Thorn Forests	0.99	2.07	3.38

*adequate number of sample plots were not available

11.6.4 Fire Prone Forest Areas

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

TABLE 11.6.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% 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	0.00	0.00
5.	Less fire prone	1,296.85	100.00
	Total	1,296.85	100.00

11.6.5 Tree Cover

Forest cover presented in the section 11.6.2 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 Delhi has been estimated as given in table 11.6.13.

TABLE 11.6.13 Tree Cover in Delhi (in sq km)

Tree Cover	Area
	129

Tree cover of Delhi has increased by 16 sq km as compared to the previous assessment reported in ISFR2017.

11.6.6 Extent of Trees Outside Forest (TOF)

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

TABLE 11.6.14 Extent of TOF in Delhi (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
136	129	265

11.6.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Delhi is given in the table 11.6.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.6.16

TABLE 11.6.15 Growing Stock in Forest (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	0.54	0.01
Growing Stock in TOF	1.69	0.10

TABLE 11.6.16 Diameter class distribution of top five species inside RFA in Delhi (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Prosopis juliflora</i>	588	12	0
2.	<i>Ficus virene</i>	18	25	0
3.	<i>Acacia lenticularis</i>	86	12	0
4.	<i>Leucaena leucocephala</i>	86	0	0
5.	<i>Cassia fistula</i>	49	0	0

11.6.8 Carbon Stock in Forest

The total Carbon stock of forests in the State including the TOF patches which are more than 1 ha in size is 1.24 million tonnes (4.55 million tonnes of CO₂ equivalent) which is 0.017% of total forest carbon of the country. Pool wise forest carbon in Delhi is given in the following table

TABLE 11.6.17 Forest Carbon in different pools in Delhi (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
277	98	2	21	838	1,236

11.6.9 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Delhi in Rural and Urban areas are given in the table 11.6.18 and table 11.6.19 respectively

TABLE 11.6.18 Top five tree species in TOF (Rural) in Delhi

Sl. No.	Species	Relative Abundance (%)
1.	<i>Prosopis juliflora</i>	35.35
2.	<i>Eucalyptus species</i>	17.42
3.	<i>Grevillea robusta</i>	12.64
4.	<i>Azadirachta indica</i>	8.35
5.	<i>Leucaena leucocephala</i>	4.03

TABLE 11.6.19 Top five tree species in TOF (Urban) in Delhi

Sl. No.	Species	Relative Abundance (%)
1.	<i>Azadirachta indica</i>	10.51
2.	<i>Morus species</i>	7.19
3.	<i>Polyalthia longifolia</i>	7.02
4.	<i>Ficus religiosa</i>	6.48
5.	<i>Prosopis juliflora</i>	5.85

11.6.10 Major Invasive Species

Major invasive species as assessed from forest inventory data are presented in the table 11.6.20.

TABLE 11.6.20 Major invasive species in the State of Delhi (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Prosopis juliflora</i>	8.13
2.	<i>Lantana camara</i>	0.72
3.	<i>Achyranthes aspera</i>	0.32
4.	<i>Ageratina adenophora</i>	0.32
5.	<i>Cassia tora</i>	0.32

Major invasive species are given in terms of their estimated extent.