Forest Cover Upgradation and Degradation in Maharashtra State: A Geographical Study

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Abstract
Maharashtra is one of the all over developed state in India. It is western part of India with a long coast along Arabian Sea. It has an area of 307713 Sq Km which is 9.36 % of the country's total area. It lies between latitude 15° 35' and 22° 02' North and longitude 72° 36 and 80° 54' East Physiographically, the state can be divided into five distinct region, namely, Deccan plateau, Central highlands Eastern Chhotanagpur plateau, Eastern Ghats and coastal plains, Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga are important rivers of the State.

This paper attempt to the statistically analyze of up-gradation and degradation of forest cover on the land of Maharashtra. The state has a tropical monsoon climate with mean annual temperature ranging between 25° C and 27.5° C and average rainfall between 1600 mm and 2000 mm. The total geographical area is 36, 07,713 Sq Km, 6 revenue division, 36 District, 355 tehsils, and 535 towns as per the Census of 2011. Paper attempt to the statistically analyze of up-gradation and degradation of forest cover on the land of Maharashtra. The state has a tropical monsoon climate with mean annual temperature ranging between 25° C and 27.5° C and average rainfall between 1600 mm and 2000 mm. The total geographical area is 36, 07,713 Sq Km, 6 revenue division, 36 District, 355 tehsils, and 535 towns as per the Census of 2011. The recorded forest area of the state is 61573.03 Sq Km reserved forests constitute 83.10 %, protected forests 10.84% and unclassed forests 6.04% of the total forest area. In terms of forest canopy density classes, the state has 8712 Sq Km very dense forest 20747 Sq km moderately dense forest and 21169 Sq Km open forest as per the ISFR 2013 & 2015.

Forest area decreased from 63,544 Sq Km to 61,724 Sq Km as per the census of 1960-61 and 2016-17, it means mostly degradation of forest day by day from the decade of 1961 to 2017 (Economic Survey of Maharashtra 2017-18).

Keywords: Forest, up-gradation, degradation, Forest area, Types of forest

Introduction
Man has continually and at an increasing rate, been changing the forms and models of his interaction with the environment. Natural processes and factors that depend on the structure and other characters of the earth and social processes and factors that depend on structure and characteristic our society have been closely interwoven. On the one hand, population of the earth is growing rapidly and by the year 2000 AD, it might exceed the 6 billion mark, while on the other hand with the technological and scientific revolution developmental activities have been accelerated to such an extent that in certain areas they have become a threat to the environment. The utilization of natural resources is growing at an alarming rate, causing great concern for their conservation. The degradation of the environment due to the industrial and other wastes discharged into the atmosphere and hydrosphere has also caused great concern and there is big question mark- what will happen next? All these environmental problems associated with development have raised several questions regarding the type and nature of development and this has given rise to the concept of sustainable development.

The environmental degradation and associated problems like desertification, soil erosion, tropical forest depletion, etc., in the third world are the consequences of present development policies. Therefore, there is a need for positive mutual adjustment between development and natural environment. The problem of deforestation has been raised mainly due to destruction of forests for various developmental or commercial activities. The growth of population, rapid expansion of cities and other settlements, land for new agricultural farms, mining, construction of roads, dams etc., have resulted in mass scale cutting of natural vegetation.

Forest has been playing a vital role in the socio-economic development of our country. They have been an important source of subsistence, employment, revenue earning, raw materials to

various industries. Their role is ecological balance, environmental stability, biodiversity conservation, food security and sustainable development has also been widely recognized particularly after enunciation of national policy, 1988.

Maharashtra is the third largest state of country, the forest in Maharashtra state has the second largest land use sector after the agriculture. It is western part of India with long coast along Arabian Sea. It has an area of 307713 Sq km, which is 9.36 % of the country's total area. It lies between latitude 15° 35' and 22° 02' North and longitude 72° 36 and 80° 54' East physiographically, the state can be divided into five distinct region, namely, Deccan plateau, Central highlands Eastern Chhotanagpur plateau, Eastern Ghats and coastal plains, Krishna, Bhima, Godavari, Tapi-Purna and Wardha-Wainganga are important rivers of the State.

Present paper attempt to the geographically and statistically analyze of distribution and observation of forest up-gradation and degradation of forest cover on the land of Maharashtra state. A forest is a complex ecosystem, which is predominantly composed of tree, shrubs and is usually a closed canopy. Forests are storehouses of large variety of life forms such as plants, mammals, birds, insects and reptiles etc. The state has a tropical monsoon climate with mean annual temperature ranging between 25° C and 27.5° C and average rainfall between 1600 mm and 2000 mm. The total geographical area is 36, 07,713 Sq Km, 6 revenue division, 36 District, 355 tehsils, and 535 towns as per the Census of 2011. The total population of the state is 96.87 million of which the rural population constituted 57.6 %. The population density is 365 persons per Sq Km. the scheduled tribes constitute 8.9 % of the population. The state has livestock population of 35955000, which has marginally increased since the census of 1971.

The recorded forest area of the state is 61573.03 Sq Km reserved forests constitute 83.10 %, protected forests 10.84% and unclassed forests 6.04% of the total forest area. In terms of forest canopy density classes, the state has 8712 Sq Km very dense forest 20747 Sq km moderately dense forest and 21169 Sq Km open forest as per the ISFR 2013 & 2015.

Forest area decreased from 63,544 Sq Km to 61,724 Sq Km as per the census of 1960-61 and 2016-17, it means mostly degradation of forest day by day from the decade of 1961 to 2017(Economic Survey of Maharashtra 2017-18).

Objective
1. To Observation and Classified to the forest in state of Maharashtra.
2. To look into the district wise distribution of forest area and forest cover, numerical data analyze and examine to importance of environment in the state of Maharashtra.

Data Base and Methodology
The present study is mainly based on the secondary data collected from the economic survey of Maharashtra 2008-09 and 2017-18, Forest department, Government of Maharashtra, annual report 2016, Forest survey of India, Dehradun, State of Forest Report 1997, India state of forest report, 2009, India's forest and tree cover contribution as a carbon sink, Ministry of Environment and forest, Government of India August 2009, State Environment Report and forest government of India, Maharashtra Forest Policy 2008, Government of India

August 2009 and electronic data have collected to the internet facility, similarly, local forest department, Satellite imageries, Books, Journals, Wikipedia the free encyclopedia etc. for the construction of per cent of various indices by applying statistical and mathematical formulas and graphical, techniques are used.

Study Area
Geographically, the state of Maharashtra extend from 15° 45' North to 22° 01' North latitude and 72° 45' East to 80° 45' East longitude. With an expansion of about 800 km from the east to west and 700 km from North to South, it has an area of 307713 Sq. km which is about one tenth of that of India. The physical structure of Maharashtra is simply vast plateau sloping eastward and bounded by hills and mountains to the west and north and a narrow coastal lowland to the west physical, the state comprises there natural division the konkan, the Sahyadri and Deccan plateau. The climate of study area is monsoon type consisting of an average rainfall of 1450 mm per annum and an average temperature 30°C.

Geology, Rock and Soil
The Deccan trap is the major geological formation of upper cretaceous Eocene era, covering almost the entire tract except in the south, where are some ridges of sandstone and quartzite. The chief varieties of the trap are basalt, amygdaloidal trap, vesicular trap and clayey trap, which with some few intertrappean sedimentary beds and numerous highly ferruginous clayey beds make up the great mass of the trap flows. The lower flows are mostly basaltic in character, the medium flows are alternately basaltic and amygdaloidal and the upper are chiefly basaltic capped by beds of clay and literate. In the Sahyadri region, the position of flow is more distinct than in further east. When carefully studied form some commanding point, they are seen to dip at a very low angle generally to the north-east. Because of their dominantly basaltic composition and tendency to form flat topped the lavas are termed plateau basalt.

Classification of Forest
Forest can be classified in different ways. The forest type depends upon the abiotic factors such as climate and soil characteristics of region. Forest in India can be broadly divided into coniferous forest and broadleaved forest. It can also be classified according to the nature of their tree species–evergreen, deciduous, xerophytes or thorn trees, mangroves etc.

Forest Types in India and Maharashtra
Climate, soil type, topography and elevation are the main factors that determine the type of forest. Forest are classified according to their nature and composition, the types of climate in which they thrive and its relationship with the surrounding environment.

Champion and Seth system of classification (1968) provides an elaborate description of forest type of India in six major groups, which are further divided into 16 type groups, and finally into 200 types including sub types and variation of forest. As per Champion and Seth classified major six forests type as like 1. Coniferous forests 2. Broad leaved forests 3. Evergreen forests 4. Deciduous forests 5. Thorn forest 6. Mangroves forests further divided into 16 type groups there were distribution of countries forest cover in different type Tropical wet evergreen forest 8.75%, Tropical Semi – Evergreen forest 3.35%, Tropical dry deciduous 30.16%, Tropical Moist deciduous 33.92%, Littoral and Swamp 0.38%,Tropical thorn 5.11%, Tropical dry evergreen 0.29%, Sub Topical Broadleaved

hill Forest 0.38%, Subtropical Pine Forest 5.99%, Subtropical Dry Evergreen Forest 0.36%, Mountain Wet Temperate 3.45%, Himalayan Moist Temperate Forest 3.79% Himalayan dry temperate 0.28%, and Sub Alpine and Alpine 3.79% as per the India State of Forest Report,, 2009, forest survey of India. The recorded forest area of the country is 769512 sq. km accounting for 23.41% of the geographical area.

Table 1: India's Forest Cover in Different Forest Type Groups 2007

Forest Type Group	Forest Cover in %
Tropical Evergreen Forest	8.75
Tropical Semi-Evergreen Forest	3.35
Tropical Moist Deciduous Forest	33.92
Littoral and Swamp Forest	0.38
Tropical Dry Deciduous Forest	30.16
Tropical Thorn Forest	5.11
Tropical Dry-Evergreen Forest	0.29
SubtropicalBroadleaved Hill Forest	0.38
Subtropical Pine Forest	5.99
Subtropical Dry Evergreen Forest	0.36
Montane Wet Temperate Forest	3.45
Himalayan Moist Temperate Forest	3.79
Himalayan Dry Temperate Forest	0.28
Sub Alpine and Alpine Forest	3.79
Total	100.00

Source: India State of Forest Report, 2009, Forest Survey of India.

State of Maharashtra forests are rich and diverse in flora and fauna. There are about 3500 flowering plant species covering and 150 families. One of the Valuable tree species teak is found to occur over an area of approx 10.18 Thousand sq. km and bamboo over 10.10 Thousand sq.km area. Maharashtra has five forest types as per the Champion and Seth's classification. These are the southern tropical semi–evergreen, southern tropical moist deciduous, southern tropical dry deciduous, Sothern tropical thorn and littoral and swamp forest. The state has 16 forest types, which belong to 6 forest type groups viz. Tropical Semi–Evergreen forest 7.73%, Tropical Moist deciduous 29.84%, Littoral and Swamp 0.08%, Tropical dry deciduous 57.41%, Topical thorn and subtropical Broadleaved hill Forest 1.54%.

It is found that as per the satellite data Oct. – Dec. 2006, the forest cover of Maharashtra state is 50650 sq km, which is 16.46% of the state's geographical area. The state has 8739 sq. km (2.84%) very dense forest 20834 sq. km (6.77%) moderately dense, 21077 sq. km (6.85%) open forest, and Scrub 4157 sq.km (1.35%) and non-forest are 252906 Sq. km (82.19%).

Distribution of Forest Area in Maharashtra

District wise distribution of forest cover in Maharashtra is presented below out of the total forest cover in Maharashtra Gadchiroli district 70.05% account for the maximum forest cover followed by Ratnagiri 51.16%, Sindhudurg 49.41% and Raigarh 40.04%, Chandrapur 35.60%, Gondiya 35.08%, and Thane 30.47% very dense forest is in Gadchiroli (46.88%) 4733 sq. km followed by Gondiya (43.96%) 884 sq. km. Chandrapur (32.96%) 1342 sq. km and Amravati (20.55%) 655 sq. km Maximum area under very dense forest is in Gadchiroli followed by Chandrapur and Gondiya towards Amravati and Nagpur district having covered very dense forest area. Out of 15th district was no very dense forest cover and out of 12 district having a below 5% area covered under very dense forest and only three district 6 to 15 per cent area covered under very dense forest because of rainfall distribution is irregularities and uneven in the state of Maharashtra.

Table 2: Status of Forest Cover in India 2007

Class	Area Sq Km	Percent of Geographical Area
Forest Cover		
Very Dense Forest	83510	2.54
Moderately Dense Forest	319012	9.71
Open Forest	289377	8.77
Total Forest Cover	**690899**	**21.02**
Non Forest Cover		
Scrub	41525	1.26
Non Forest	2554839	77.72
Total Geographical Area	**3287263**	**100**

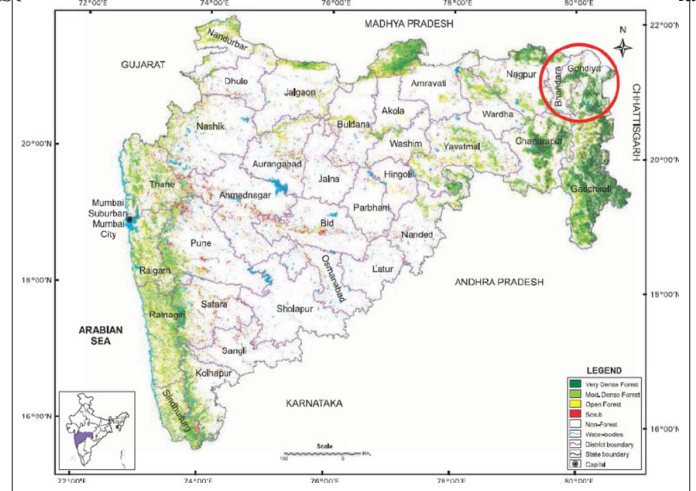**Source:** India State of Forest Report, 2009, Forest Survey of India.

Table 3: District-Wise Forest Cover in Maharashtra 2007

Sr. No.	District	%Geographic Area in Sq km	Forest Cover 2007				% of G.A.	Scrub Sq.km
			%Very Dense Forest	%Moderately dense Forest	%Open Forest	Total		
1	Ahmednagar	17048	0	24.13	75.87	100	1.68	555
2	Akola	5390	3.42	29.81	66.77	100	5.97	8
3	Amravati	12210	20.55	45.65	33.79	100	26.1	116
4	Aurangabad	10107	3.41	18.13	78.46	100	5.51	193
5	Bhandara	3588	14.59	61.28	24.13	100	24.83	21
6	Bid	10693	0.00	7.43	92.57	100	1.64	357
7	Buldana	9661	3.90	23.26	72.84	100	6.1	163
8	Chandrapur	11443	32.94	39.08	27.98	100	35.6	56
9	Dhule	7189	0.00	21.81	78.19	100	4.47	103
10	Gadchiroli	14412	46.88	33.64	19.47	100	70.05	20
11	Gondiya	5733	43.96	40.97	15.07	100	35.08	37
12	Hingoli	4686	0.00	8.77	91.23	100	2.43	47
13	Jalgaon	11765	4.39	30.63	64.98	100	10.07	69
14	Jalna	7718	1.54	24.62	73.85	100	0.84	55
15	Kolhapur	7685	3.66	58.48	37.86	100	23.1	88
16	Latur	7157	0.00	0.00	100.00	100	0.07	25
17	Mumbai	157	0.00	0.00	100.00	100	1.27	0
18	Mumbai (Sub.)	446	0.00	51.67	48.33	100	26.91	0
19	Nagpur	9892	18.39	47.11	34.50	100	20.45	77
20	Nanded	10528	6.56	47.48	45.95	100	8.68	128
21	Nandurbar	5961	0.00	34.43	65.57	100	20.37	30
22	Nashik	15530	0.00	32.23	67.77	100	7.01	319
23	Osmanabad	7569	0.00	6.98	93.02	100	0.57	49
24	Parbhani	6355	0.00	8.00	92.00	100	0.79	49
25	Pune	15643	0.00	43.71	56.29	100	11.07	493
26	Raigarh	7152	0.45	43.58	55.97	100	40.04	70
27	Ratnagiri	8208	0.79	45.51	53.70	100	51.16	2
28	Sangli	8572	0.00	65.97	34.03	100	1.68	156
29	Satara	10480	9.33	44.59	46.08	100	12.18	365
30	Solapur	14895	0.00	17.02	82.98	100	0.32	50
31	Sindhudurg	5207	3.46	53.32	43.22	100	49.41	47
32	Thane	9558	0.00	43.99	56.01	100	30.47	222
33	Wardha	6309	1.16	48.78	50.06	100	13.62	62
34	Washim	5184	1.51	34.04	64.46	100	6.4	28
35	Yavatmal	13582	4.72	42.61	52.67	100	19.18	97

Source: India State of Forest Report, 2009, Forest Survey of India.

Table 4: District Wise Forest Cover In Maharashtra 2015

Sr. No	District	Geographic area	Forest Cover 2015				% of Forest Cover to Total Geog. Area	Scrub Sq km
			% Very Dense Forest	%Moderately Dense Forest	%Open Forest	Total		
1	Ahmednagar	17048	0	24.38	75.62	100	1.66	555
2	Akola	5390	3.42	29.81	66.77	100	5.97	8
3	Amravati	12210	20.55	45.65	33.79	100	26.10	116
4	Aurangabad	10107	3.41	18.13	78.46	100	5.51	193
5	Bhandara	3588	14.59	60.63	24.77	100	24.64	21
6	Bid	10693	0	7.43	92.57	100	1.64	357
7	Buldana	9661	3.90	23.22	72.88	100	6.11	163
8	Chandrapur	11443	32.58	38.77	28.65	100	35.59	56
9	Dhule	7189	0.00	22.15	77.85	100	4.40	103
10	Gadchiroli	14412	46.85	33.47	19.69	100	70.06	20
11	Gondiya	5733	43.82	40.64	15.54	100	35.03	37
12	Hingoli	4686	0.00	8.77	91.23	100	2.43	47
13	Jalgaon	11765	4.31	30.35	65.34	100	10.06	69
14	Jalna	7718	1.54	24.62	73.85	100	0.84	55
15	Kolhapur	7685	3.65	58.25	38.10	100	23.19	88
16	Latur	7157	0.00	0.00	100.00	100	0.07	25
17	Mumbai(city)	157	0.00	0.00	100.00	100	1.27	0
18	Mumbai (Sub)	446	0.00	51.24	48.76	100	27.13	0
19	Nagpur	9892	18.40	47.04	34.56	100	20.33	77
20	Nanded	10528	6.56	47.48	45.95	100	8.68	128
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30	Solapur	14895	0.00	16.67	83.33	100	0.32	50
31	Sindhudurg	5207	3.41	52.74	43.85	100	49.49	47
32	Thane	9558	0.00	44.05	55.95	100	30.42	222
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35	Yavatmal	13582	4.72	42.63	52.65	100	19.17	97

Source: A Statistical Outline-2016, Government of Maharashtra, Forest Department
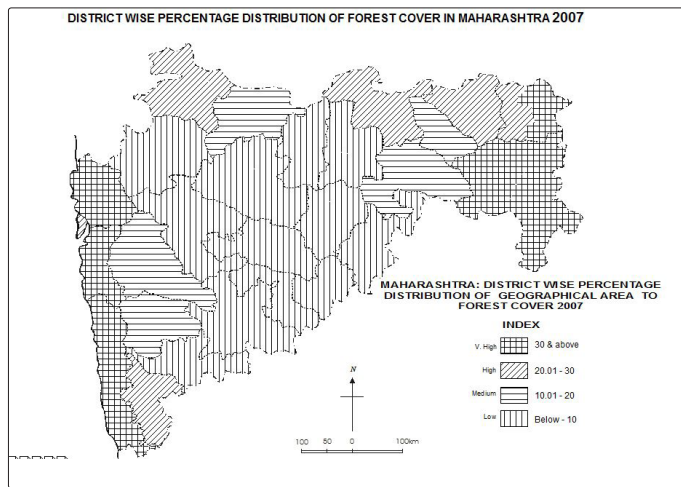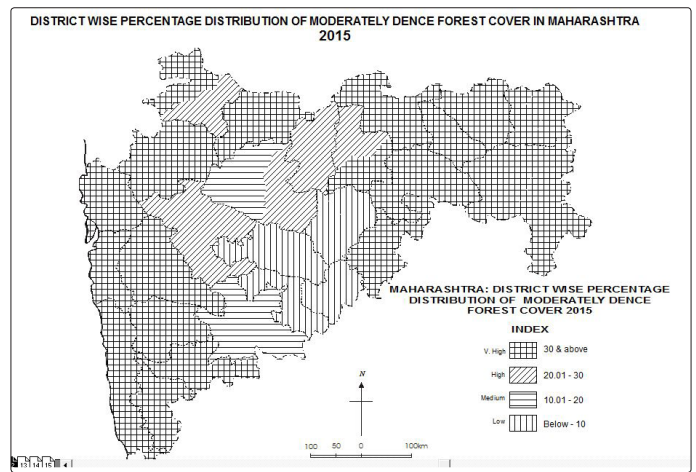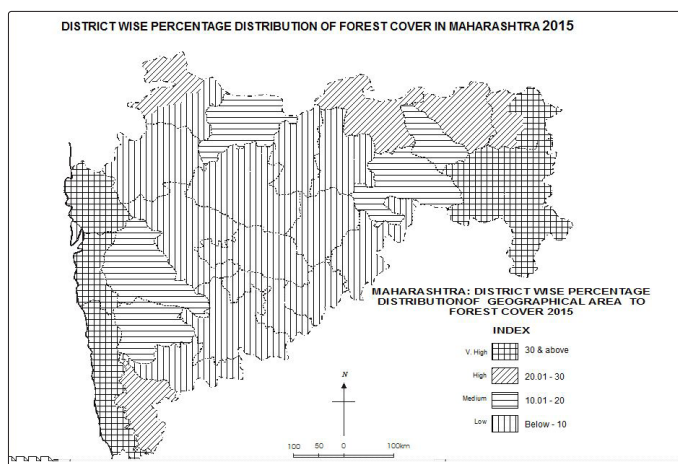
Figure 1

Figure 2

Figure 3

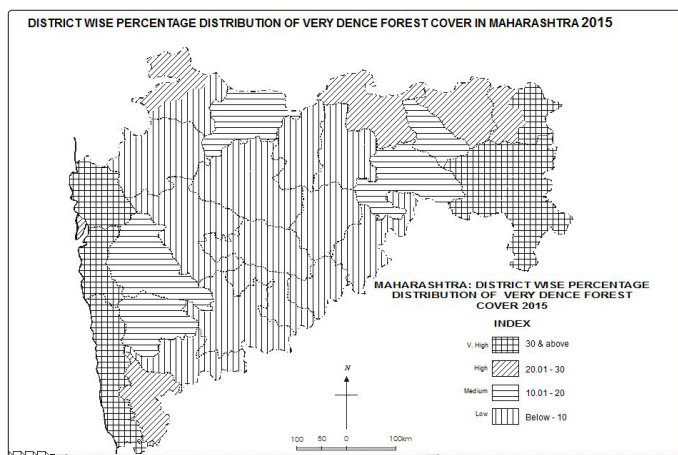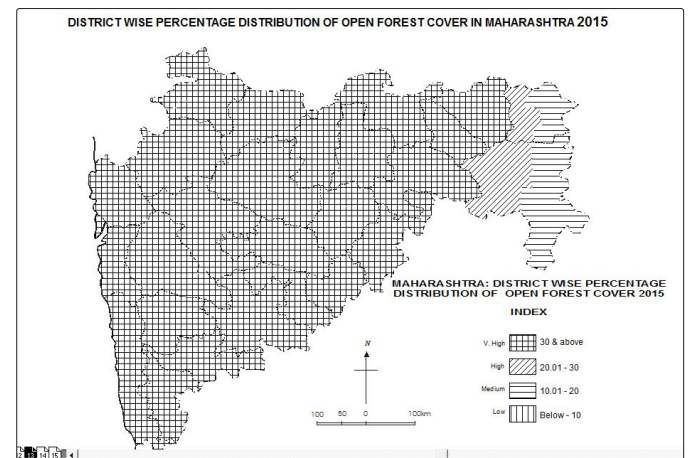**Figure 4**

Maximum area under moderately dense forest all lands covered from 20834 sq. km and it is found that out of 16 district was above 40% dense forest high moderately dense having a Sangli (65.97%), followed by Bhandara (61.28%), Kolhapur (58.48%), Sindhudurg (53.32%), Mumbai Sub. (51.67%), Wardha (48.78%), Nanded (47.48%), Nagpur (47.11%), Amravati (45.65%), Ratnagiri (45.51%), Satara (44.59%), Thane (43.99%), Pune (43.71%), Raigarh (43.58%), Yavatmal (42.61%) and Gondiya (40.97%), there were annual rainfall average is moderately therefore the visitation density have moderate out of 7th district having 25 to 40% dense forest area viz. Chandrapur, Nandurbar, Washim, Gadchiroli, Nashik, Jalgaon and Akola, 6 district becoming a 20 to 25 per cent category of moderate dense forest cover and it is found that out of 6 district below 10.05 % land covered moderately dense forest in the state of Maharashtra.
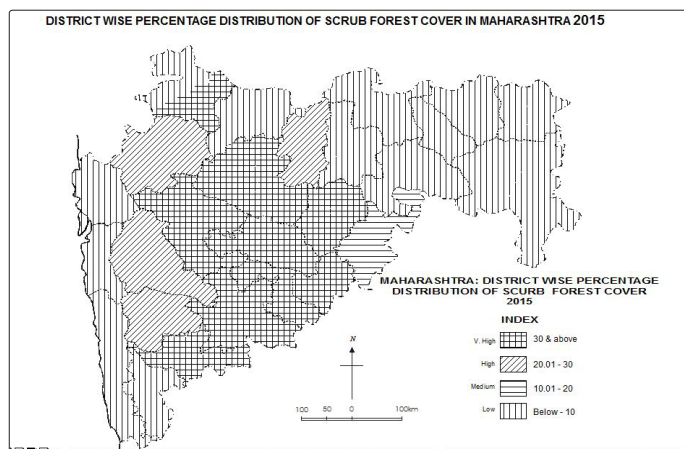

Figure 5

Figure 6

In the state of Maharashtra lands with tree cover of canopy density between 10 % to 40 % and scrub degraded forest lands with canopy density less than 10%. It is found that out of 8 districts become lands with tree cover of density between 10% to 40% viz. Kolhapur, Nagpur, Sangli, Amravati, Chandrapur, Bhandara, Gadchiroli and Gondiya, Three after the found 27 district in an above 40% lands with tree cover of canopy density category.

Causes and Effects Threats of Forest

As per the rats of development is increasing, it is putting pressure on all the natural resources around us. Forest is also depleted at a rate all over the world.

Over use and irrational use, technological and industrial growth, population growth and increasing consumption levels are major factors causing depletion of forest resource. Some other factors are mining, submergence due to big dams, shifting cultivation, use of forest lands for rehabilitation, agriculture, transport and tourism. All these activities are causing qualitative as well as quantitative depletion of forest. The forest wood is used up for construction, furniture, deriving energy and thus the increasing demand for timber, energy, paper and paper products has led to massive distribution of forests. When forest is cut, it is not just the trees that go but entire ecosystem is lost, which is invaluable. The full grown forest, existing since thousands of year can't be replaced by plantations. As forests grow very slowly, people cannot use more resources that they can produce during a growing season. It timber is felled beyond a creation limit, the forest cannot regeneration. The gaps in the forest change the habitat quality for its animal and the more sensitive species cannot survive under these changed conditions. Over – utilization forest resources. As the forest resources are exploited, the forest canopy is opened up, the ecosystem is degraded, and its wild life is seriously threatened. Forest fire is also an important threat to forests, which destroy large area of forest every year all over the world. It has detrimental impact on forest. Wild life and people living around, along with the loss of productivity, it results in increased air pollution, migration of animals to different on forest resource.

Suggestions

1. The total forest area in Maharashtra at the end of year 2007-08 was 20.10% of the geographical area. As per the 'Economic Survey of Maharashtra. 2008-09'. the aims at increasing the forest and tree cover to above 33% of the states land area. It is also provides for the use of goods and services of the forest for its local inhabitants.
2. It should be use to waste land saline solid to afforestation. For plantation of firewood, fodder and will be planted. The work will be done through social community forestry with involvement of local people.
3. Land near railway tracks, national highways, canals well is used for plantations. Green belts will be developed in urban and industrial areas to absorb carbon dioxide from the atmosphere and control the pollution. Urban forestry will be promoted on available areas in cities like gardens, open spaces, with the help of technical support from social forestry.
4. Village lands and community lands will be brought under afforestation to meet the increasing demand for timber, firewood. This work should be undertaken with involvement of Grampanchayat local people. It should be organization and individuals, promoted to do tree farming on their land.

Conclusion

It is concluded that to found 6 districts were forests covered maximum area of land out of total land. Above 30 per cent because of there were high annual rainfall frequency. Viz. Gadchiroli, Ratnagiri, Sindhudurg, Raigarh, Chandrapur and Gondiya out of 11th districts have 10% to 30% Geographical area covered from forests because of moderately annual rainfall, drought prone, some area having industrial and urbanized. Out of 11th district has become a 1% to 10% category of forest covered Geographical area. Because of there were plateau region and low rainfall district. 5th district have become below 1 per cent land covered of forests. It should be increase to forest area and conservation of trees, grassland, scrubs and other visitation. If in feature increased forest cover further increasing help to average rainfall.

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