

A Geographical Analysis of Administrative region wise area under forest covers and correlation with them in Maharashtra State

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Abstract

The present study is focus on Administrative region wise area under forest covers and correlation with them in Maharashtra State. There are six (6) administrative region (Included 36 districts) in Maharashtra state. Thus, District wise geographic area and area under forest cover data is collected from Annual forest of Maharashtra- 2019 for further study. Results shows that huge inequality and poor and negative correlation is found among the area under forest cover and geographic area of Western Maharashtra, Nashik Region, and Aurangabad administrative region. On the contrary of, other administrative region of Maharashtra shows good condition regarding area under forest in Maharashtra.

The kokan, Amravati and Nagpur regions have indicates a very strong positive correlation between geographic area and area under forest. Highest Geographic area is cover under forest in Kokan Region i.e. 42.70. Followed by Nagpur region and Amravati region, it is occupies the area under forest covers 38.48%, 15.22% respectively. Lowest area under forest cover occupies by Aurangabad Administrative region. i.e. 2.96%. Gadchiroli district is cover 68.81% geographic area under the forest, followed by Sindhudurg and Ratnagiri. i.e 54.31% and 51.33% respectively. Whereas Latur district is occupies very lowest geographical area under the forest. i.e. 0.18%. Although the amount of plantation has increased in the last one-two years, but the expected has not becoming under the forest area. About 297.56 sq.km forest area has increased from 2017 - 2019. Highest forest is increased in Kokan region in Maharashtra. On the contrary of from 2017 to 2019, about 194.6 Sq.km areas are deforested in study region. This indicate serious problem of different consequences regarding the deforestation in state of Maharashtra. There are different types of causes behind declining forest cover mention in present study. For coming out from this situation some recommendation are necessary.

Key word: Administrative region, Geographic area, area under forest cover

Introduction

Forest is a one of the important natural resource on the earth surface. It plays a most significant role for maintain a balance of the earth. They helps to reduce environmental pollution, increase the ground water level, quality of soil and also proportion of rainfall. Some of the revenue is achieved from the forest products. It is helps to improve the economy of country or a state. Many number of tribal people subsistence is depending on the forest or forest product.

The Indian Forest Act 1865 defines 'forest' as in dictionary meaning as 'land covered with trees, brushwood and jungle'. Subsequent amendment of the Act in 1878 led to areas under plantation on barren land also included as forest. In the famous T. N. Godavaraman Thirumalpad versus Union of India case in 1996, the Honorable Supreme Court of India referred to forest as in dictionary meaning, irrespective of nature of ownership and classification thereof. The Forest Survey of India (FSI) considers all land parcels greater than 1 ha in size and with more than 10% canopy cover for assessing area under forest cover in India. The National Forest Policy 1988 proposed that India should have at least 33% of its geographical area under forest/tree cover. The FSI in its 2017 assessment, reported forest and tree (trees outside forest) cover in India at 24%, and to achieve the target of 33%, it would require adding about 28 m ha under forest/ tree cover. (Govindrajulu)

In 2021, the total forest and tree cover in India is 80.9 million hectares, which is 24.62% of the geographical area of the country. . Madhya Pradesh state is occupies the highest area under forest

cover in India. Madhya Pradesh has occupies 25.14% geographical area (77,493 Sq. Km) under the forest cover. He is occupies 10.86% area out of total area under forest cover of India. After that Arunachal Pradesh (9.31%), Chhatisgad (7.80%), Orissa (7.31%), Maharashtra (7.11%) states are 2nd to 5th rank regarding the area under forest cover in India.

Maharashtra is the third largest state in India regarding the geographical area and 5th largest area under forest cover in state. He has occupies 3, 07,713 sq.km area out of the country. But we think regarding that the area under forest cover of Maharashtra; World 31 percent area under forest, 24.62 percent area under forest in India and Only 16.51 percent area under forest in Maharashtra. The state has occupied only 50 percent area under forest as the norms of National Forest Policy 1988.

Recently, area under forest cover is declining due to the construction and extension of economic activities. Therefore, the state has faced a number of natural disasters. i.e. drought, scarcity of rain and water, increasing proportion of carbon in the air, declining ground water level, soil degradation etc. Due to awareness program of forest cover, some districts has seen to positive changes in the forest cover, Therefore need to make a detailed analysis of changing area under forest cover in Maharashtra.

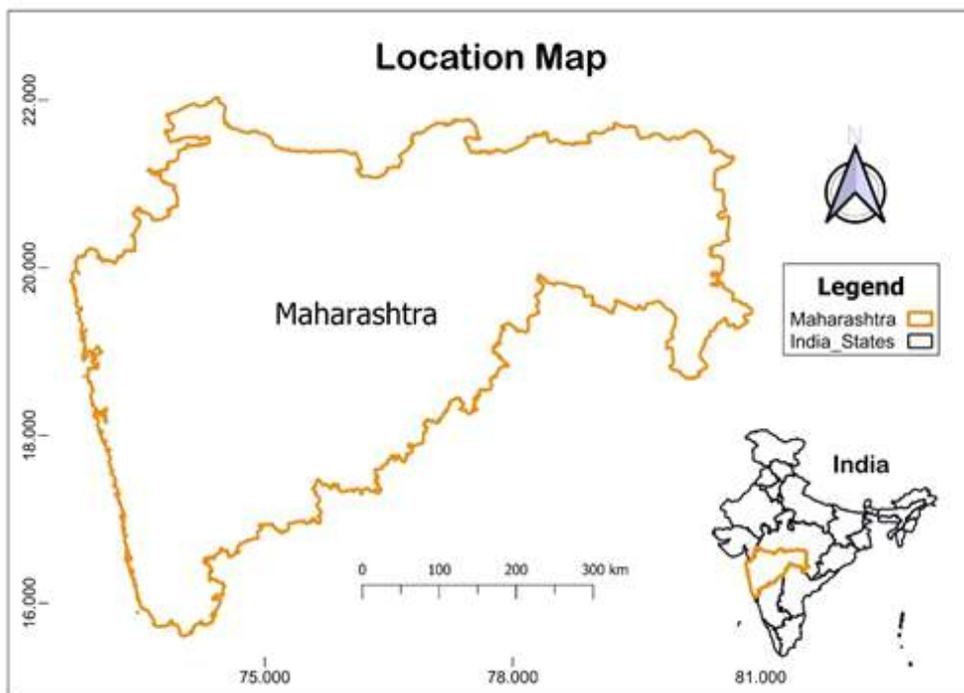
Objectives:

1. To analyses the administrative region wise area under forest covers of Maharashtra.
2. To assess the correlation between geographic area and forest cover of administrative region in Maharashtra.
3. To find out the factors affecting area under forest cover of Maharashtra.

Study Area

The state of Maharashtra is situated in the general west-central direction of the Indian subcontinent. Maharashtra is one of the 28 constituent states of India.

Map No. 1: Location Map: Maharashtra State



The state of Maharashtra extends from 15° 44' North latitudes to 22° 6' North latitudes and from 73° 06' East longitudes to 80° 54' East longitudes. The west-east length of the state of Maharashtra is about 800 km. The south-north length is 720 km. The total geographical area of the State of Maharashtra is 3,07,713 sq. km. Maharashtra covers 9.36 per cent of the total area of India and is the third largest state in India.

If we consider the state of Maharashtra, the area under forest is rapidly decreasing. In 1960, the area under forest in Maharashtra was 20.77% which has decreased to 16.50% in 2019. This means that the area under forest has decreased by 4.27% in the last 59 years. But in Maharashtra now good measures are being taken to increase this sector. Forests are considered important for Maharashtra as a resource. Forests are considered very important for the economic development and biological diversity of Maharashtra. Pagar

Data collection and Methodology

Whole state has selected as study area for present research paper. The period is selected for the present study is from 2017 to 2019. The present study is entirely based on the secondary data which is collected from Annual Forest report of Maharashtra, 2019. The Administrative region wise area under forest cover is computed by using Rank Correlation through the MS Excel.

Where,

R= Rank Correlation

$\sum d^2$ = Sum of d^2

N= Number of item

$d = R_1 - R_2$

$d^2 = (R_1 - R_2)^2$

Result and Discussion

Table No. 1: Kokan Region: Area under forest 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
1	Kokan	Sindhudurg	5207	2827.98	54.31	138.98
		Ratnagiri	8208	4212.90	51.53	46.90
		Thane, Palghar	9558	2998.09	31.17	35.09
		Raigad	7152	2939.46	41.10	22.46
		Mumbai Suburban	446	139.86	31.36	-0.14
		Mumbai	157	3.00	1.91	00
	Total	07	30,728	13, 121	42. 70	+ 243.43 - 0.14
				R= 0.93		

Source: Annual Forest report of Maharashtra, 2019

The table no. 1 represents that, geographical area and area under forest cover of Kokan region. The Kokan region occupying 42.70 % geographical area under forest covers. It occupies higher area under forest cover as per the 1988 National forest policy. Sindhudurg occupies (54.31%) a highest area

under the forest cover. After that Ratnagiri (51.53%), Thane, Palghar (31.17%), Raigad (35.09%), Mumbai Suburban (31.36%), Mumbai (3.00%) Ranked 2nd to 7th respectively area under forest cover in Kokan region. It shows the positive difference between 243.43 sq.km areas under forest from 2017 to 2019. Only -0.14 sq.km negative difference is found in Mumbai. This represents that Very strong correlation between geographical of Kokan Region area and area under forest cover.

The Table No. 2 express that, geographical area and area under forest cover of Western Maharashtra region. Western Maharashtra is a one of the developed administrative region of Maharashtra State. The highest rate of transportation, communication, agriculture and industrial development is found in

Table No. 2: Western Maharashtra: Area under forest 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
2	Western Maharashtra	Pune	15643	1710.86	10.94	2.86
		Solapur	14895	49.67	0.33	1.67
		Sangli	8572	150.13	1.75	0.13
		Satara	10480	1278.37	12.20	2.37
		Kolhapur	7685	1786.32	23.34	-9.68
	Total	05	57,685	4975.35	8.62	+ 14.03 -9.68
R= -0.08						

Source: Annual Forest report of Maharashtra, 2019

Western Maharashtra. Due to these reasons rate of area under cover is rapidly reduced in the Western Maharashtra. The Kokan region occupying only 8.62 percent geographical area under forest covers. It occupies 24.82% lesser area under forest cover as per the 1988 National forest policy. Kolhapur district occupies out of total 23.34% area under the forest cover. That is occupies the highest area under forest cover in the western Maharashtra. After that Satara (12.20%), Pune (10.94%), Sangli (1.67%) and Solapur (0.33%) districts are Ranked 2nd to 5th respectively area under forest cover in Western Maharashtra region. It shows the positive difference between only 14.03 sq.km and 9.68 sq. kms are found the negative difference between areas under forest from 2017 to 2019. This region represents that Very Strong Negative Correlation between geographical area of Western Maharashtra and area under forest cover.

Table No. 3: Nashik Region: District wise Area under forest cover - 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
3	Nashik	Nashik	15530	1076.55	6.93	8.55
		Ahmadnagar	17048	266.89	1.57	-3.11
		Jalgaon	11765	1146.84	9.75	2.84
		Dhule	7195	301.27	4.19	-6.73
		Nandurbar	5955	1195.99	20.08	3.99
	Total	05	57,493	3987.84	6.94	+ 15.38 -9.84
R= - 0.1						

Source: Annual Forest report of Maharashtra, 2019

The Table No. 3 shows that, geographical area and area under forest cover of Nashik region. The Nashik region occupies out of 6.94 percent geographical area under forest covers. As per the 1988 National forest policy, it is occupies – 26.06 % area under forest cover. In this region, Nandurbar district occupies a highest geographical area (Out of 20.08%) under the forest cover in the Nashik region. Followed by Jalgaon (9.75%), Nashik (9.63%), Dhule (4.19%) and Ahmadnagar (1.57%) districts are Ranked 2nd to 5th respectively area under forest cover in Nashik region. This region shows positive difference between only 15.38 sq.km and -9.84 sq. kms are negative difference between areas under forest from 2017 to 2019. A Perfect Negative correlation ($R = - 0.1$) found between geographical area Nashik Region and area under forest cover.

The Table No. 4 shows that, geographical area and area under forest cover of Aurangabad region. The Aurangabad region occupies out of 2.94 percent geographical area under forest covers.

Table No. 4: Aurangabad: District wise Area under forest cover - 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
4	Aurangabad	Nanded	10528	936.76	8.90	2.76
		Aurangabad	10131	567.93	5.61	-2.07
		Hingoli	4827	110.01	2.28	-0.99
		Beed	10693	164.03	1.53	-10.97
		Osmanabad	7569	49.66	0.66	2.66
		Parbhani	6214	40.43	0.65	-7.57
		Jalna	7694	36.48	0.47	-1.52
	Latur	7157	13.02	0.18	1.02	
	Total	08	64813	1918.32	2.96	+6.44 -23.12
<i>R = 0.66</i>						

Source: Annual Forest report of Maharashtra, 2019

As per National forest policy, 1988, Aurangabad region covers 30.04 percent less area under forest. Nanded district is occupies 8.90 percent area under forest out of district. Followed by Aurangabad (5.61%), Hingoli (2.28%), Beed (1.53%), Osmanabad (0.66) Parbhani (.065%), Jalna (0.47%) and Latur (0.185%) districts occupies a 2nd to 9th ranked area under forest cover in the region. Latur is occupies only 0.18 percent geographical area under the forest. Difference between 2017 and 2019 according to the forest cover of this region, 6.44 sq.km forest cover is increased in Nanded, Osmanabad and Latur district, but -23.12 sq.km forest cover negatively changes in Aurangabad, Hingoli, Beed, Parbhani, jalna district. There is clearly strong correlation (0.66) is between geographical area of Aurangabad Region and area under forest cover.

The Table No. 5 shows that, geographical area and area under forest cover of Nashik region. The Nashik region occupies out of 15.22 percent geographical area under forest covers.

Table No. 5: Amravati Region: District wise Area under forest cover - 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
5	Amravati	Amravati	12210	3167.77	25.94	-0.23
		Yavatmal	13582	2607.32	19.20	1.32
		Buldhana	9661	591.60	6.12	-3.40
		Washim	4901	296.76	6.06	-2.24
		Akola	5673	340.37	6.00	1.37
	Total	05	46027	7003.82	15.22	+2.69 -5.87
				R= 0.88		

Source: Annual Forest report of Maharashtra, 2019

As per National forest policy, 1988, Amravati region covers 17.78 percent less area under forest. In this region, Amravati district occupies a highest geographical area (Out of 25.94%) under the forest cover in the Amravati region. Amravati is the ranked 1st geographical area according to the forest cover, followed by Yavatmal (19.20%), Buldhana (6.12%), Washim (6.06%) and Akola (1.37%) districts are Ranked 2nd to 5th respectively area under forest cover in Amravati region. Difference between 2017 and 2019 according to the forest cover of this region, 6.44 sq.km positive changes are occurred in forest cover in Yavatmal and Akola district, but -5.87 sq.km negatively changes are occurred in forest cover in Amravati, Buldhana and Washim district. This region represents a Very Strong positive correlation (0.88) between geographical area of Amravati region and area under forest cover.

The table no. 6 shows that, geographical area and area under forest cover of Nagpur region. The Nagpur region occupies out of 38.48 percent geographical area under forest covers. As per National forest policy, 1988, Nagpur region covers more than 5.48 percent area under forest. In this region, Gadchiroli district occupies a highest geographical area (Out of 68.81%) under the forest cover in the Nagpur region. Gadchiroli is the ranked 1st geographical area according to the forest cover in this region, followed by Gondia (37.04%), Chandrapur (35.43%), Bhandara (24.44%), Nagpur (20.22%) and Wardha (13.66%) districts are Ranked 2nd to 6th respectively area under forest cover in Nagpur region.

Table No. 6: Nagpur Region: District wise Area under forest cover - 2019

Sr. No.	Administrative Region	District	Geographic Area (Sq. km)	Forest cover (Sq. km)	%	Diff. Bet 2017
6	Nagpur	Gadchiroli	14412	9916.94	68.81	-87.06
		Gondia	5234	1938.59	37.04	15.59
		Chandrapur	11443	4054.46	35.43	-32.54
		Bhandara	4087	998.92	24.44	-7.08
		Nagpur	9892	2000.38	20.22	-18.22
		Wardha	6309	861.95	13.66	-1.05
	Total	06	51.377	19771.24	38.48	+15.59 -145.95
				R= 0.86		

Source: Annual Forest report of Maharashtra, 2019

Difference between 2017 and 2019 accordingly to the forest cover of this region, 15.59 sq.km positive changes has occurred in forest cover in Gaondia district, but other district have found -145.95 sq.km negative changes in area under forest cover in Gadchiroli, Chandrapur, Bhandara, Nagpur and Wardha district. This region represents a Very Strong positive correlation (0.86) between geographical area of Nagpur region and area under forest cover.

❖ **Major Causes of Deforestation in Maharashtra**

1. Population Growth

The population of Maharashtra is rapidly increased from 1961 to 2011. The population of Maharashtra was only 3.95 crores in 1961 and it increased to 11.23 in 2011. At that time rate of urbanization is reached from 28.8% to 45.23% in 1961 to 2011 respectively. In this period number of needs is increased of the people. For fulfill of that needs, forest areas were used for the purpose extension of agriculture activities, shelter, industries etc. Deforestation has increased in Maharashtra near to the every city area due to urbanization, use for housing society and industries.

2. Agricultural expansion

Expansion of agriculture is a major cause of deforestation in Maharashtra. A massive deforestation has occurs the Western Ghat region and eastern Maharashtra due to the agriculture extension from the last 30 years. The land has been flattened by cutting down the trees on hills. Today agriculture is being done in this place. Apart from this, government has distributed the land under the forest to some landless people for farming. So, due to this reason reduces area under forest cover.

3. Road Construction and Road Widening

Road transportation routes are considered a very significant terms of infrastructure in Maharashtra. Many cities of Maharashtra are being connected by new roads to speed up many places. Many roads, such as the Samruddhi highway (Nagpur - Mumbai), Mumbai-Pune highway, Mumbai-Nashik road, Pune-Nashik road, Mumbai-Dhule roads are the under construction and ongoing in some places of road widening. A large number of trees were cut in this work. A large number of trees were cut down in Nashik-Tryambakeshwar and Nashik city. A large number of old, small trees are being felled under Colony Road, Smart City projects, in every municipal area. Small forests have been reduced in Are due to the construction of metro.

4. Growth of industries and suburbs

The state of Maharashtra is a famous in India as industrial development. Recently MIDC have been developed a 233 industrial zones in Maharashtra. Much more industries are expanded as this area developed. Forest quickly lost due to construction of worker settlements and colonies were developed in the industrial area of city. Area under forest of western Maharashtra is being used directly and indirectly for construction to buildings, godwons, offices, roads, hotels etc. Therefore the forest area of western Ghat is become sparse.

5. Overgrazing

Animal husbandry is an important occupation in Maharashtra. Domestic animals are taken to graze in forest areas. A large number of young plants are destroyed due to cattle grazing. This helps in reducing the number of trees and increases its rate of deforestation.

6. Use of wood as fuel

Recently about 54.77% population of Maharashtra is lived in rural. Out of that population, much more tribal population of north Maharashtra still use wood as a fuel for domestic purpose. Some

Dr. Balasaheb Mali, Dr. Jyotiram More

of the organizations, NGOs have been aware about the forest from 25 to 30 years. But trees were cut down on large scale in this place as a fuel. Therefore, area under forest cover is decreasing on a large scale.

7. Obtaining raw materials for industries :

At present about 207 registered forests based industries in Maharashtra. These industries have used a large amount of raw material of forest based raw material directly and indirectly. There are many wood cutting mills in Mumbai, Nagpur, Amravati, Chandrapur, Wardha, Nandurbar, Nawapur, Dahanu etc. this industries are cut down a large number of trees from the surrounding forest area are cut down as commercial manner.

8. Natural Causes :

Apart from human causes, due to the natural causes are the important reasons of deforestation. e.g. sudden storms, flooding of rivers, spread of insects and fungi, wildfires, etc. are these reasons are included in natural causes of deforestation.

A. Forest fire

The massive loss forest is occurring due to the forest fire. Especially in summer season, the extent of these wildfires increases. Due to these wildfire thousands of hectares of area are destroyed. About 1023 fires occurred in 2018, and about 4027 were in 2019 respectively. About 2484 hectares of forest are due to the wildfires in 2019 was only in Nagpur Region.

Thus, massive deforestation occurs in Maharashtra due to man-made and natural causes. Although the amount of plantation has increased in the last one-two years, but the expected has not becoming under the forest area.

The side effects of deforestation are being seen all over the Maharashtra. Therefore the forest conservation is become a need in Maharashtra in order to reduce the severity of all the problems. Agale

❖ Conclusion and Recommendation

Conclusion

Naturally, densely vegetation is growing on the earth surface is called as forest. Present analysis of state of Maharashtra shows an imbalance and not a correlation between geographic areas of the geographic area of Maharashtra with under forest cover as per 2019 report. The huge inequality and poor correlation is found among the area under forest cover and geographic area of Western Maharashtra, Nashik Region, and Aurangabad region. On the contrary of, some administrative region of Maharashtra shows good condition regarding area under forest in Maharashtra.

The kokan, Amravati and Nagpur regions have indicates a very strong positive correlation between geographic area and area under forest. Highest Geographic area is cover under forest in Kokan Region i.e. 42.70. Followed by Nagpur region and Amravati region, it is occupies the area under forest covers 38.48%, 15.22% respectively. Lowest area under forest cover occupies by Aurangabad Administrative region. i.e. 2.96%. Gadchiroli district is cover 68.81% geographic area under the forest, followed by Sindhudurg and Ratnagiri. i.e 54.31% and 51.33% respectively. Whereas Latur district is occupies very lowest geographical area under the forest. i.e. 0.18%. Although the amount of plantation has increased in the last one-two years, but the expected has not becoming under the forest area. About 297.56 sq.km forest area has increased from 2017 - 2019. Highest forest is increased in Kokan region in Maharashtra. On the contrary of from 2017 to 2019, about 194.6 Sq.km area

People have leads to cut down area under forest for fulfill his daily needs and improve his

Dr. Balasaheb Mali, Dr. Jyotiram More

efficiency through the several activities. As there is some environmental issues are create due to deforestation. Such as the air pollutions, soil degradation, sudden storms, flooding of rivers, spread of insects and fungi, wildfires, landslides etc. Government have made acts for the forest conservation, but gutturalizing level forest cutting is start in Maharashtra.

Recommendation

1. Government should take strong action against illegal forest cutting in study area.
2. It needs to take increasing forest area in Western Maharashtra, Aurangabad, Nashik regions in Maharashtra. Because many environmental disasters are create due to the deforestation.
3. Forest cover should increase with help of social participation.
4. People should be strictly implementation of law on the forest cutter or forest based industries.

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