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Level of Road Transport Development in India (2017): A Geographical Analysis

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Abstract: This is a theoretical paper based on the secondary data and information, basically explaining the conditions, issues and discussion of road transport development in India based on 2017 data. This paper aims to analyze the road transport indicators such as Others Road & Road Density (100 Sq km area), Road density per lakh population and Road Development Index. Also various factors have been explained which affect the process of road transport development. After that Kendall Ranking Method is adopted to find out the level of development. The intent of this article is to explain the common problems and the challenges faced by the government for development of roads.

Keywords: Roads, Density, Population, Development, Index.

I. INTRODUCTION

Road is one of the most important and popular mode of transport. Road is a symbol of motion. Truly it is said that if the community is stagnant, roads will indicate the fact. In the reconstruction of a region or a nation, roads invariably play a positive role. Outside home, most of our activities whether individual or collective greatly depends on the availability of cheap, smooth and quick mean of transport. As Jeremy Bentham points out, roads are the veins and arteries of a country through which circulation of essential elements of development activities is possible. The vast importance of contemporary road transport is a very much reflection of unrivalled convenience to the user, especially in the conveyance of persons. No other form of transport is able to provide such a comprehensive door-to-door or origin-to-destination service nor does any other mode have such an extensive route network. Apart from this, road transport also provides a feeder or connection to other modes (Saxena, 2005).The economic development of a region is dependent on easy flow of travellers and material/goods. For development of a region, irrigation, power and transport networks play an important role. Road transport networks level keeps all economic activities integrated over the region. It is observed in any developed nation that higher the economic activity, higher is transport pattern and level. Also there is always a high positive correlation between economic growth and transport level. The widening of size of market is outcome of high level of road transport network system, resulting in increment of the service zone of a producer and thus helping them to get a better price

for products. Development, as perceived in reference to economically less developed countries, is in primarily concern with the socio economic situation of the population with the ways and means for better quality of the individual lives.

In less developed economies, the changes are centrally oriented towards the fulfillment of the basic needs and for this purpose transport networks play crucial role, in addition to satisfying the status needs of the communities.

Table: 1

India: Length of Different Surfaced Metalled Roads

Year	(1) National Highways (km)	% change	(2) State Highways (km)	% change	(3) Other P.W.D Roads\District Roads (km)	% change	(4) Zila Parishad Roads (km)	% change
1970-71	23,276		51,744		1,98,640		36,402	
1980-81	31,520	35%	90,250	74%	3,01,230	52%	89,416	146%
1990-91	33,399	6%	1,24,847	38%	3,90,931	30%	2,10,453	135%
2000-01	57,679	73%	1,29,862	4%	6,10,516	56%	2,75,786	31%
2010-11	70,934	23%	1,61,920	25%	8,80,553	44%	5,39,896	96%
2015-16	1,01,011	42%	1,70,237	5%	5,33,493	-39%	9,98,624	85%
2016-17	1,14,158	13%	1,69,096	-1%	5,56,794	4%	10,21,602	2%

Source: Statistical Abstract of Haryana 2020-21

Table: 2

India: Length of Different Surfaced Metalled Roads

Year	(5) Village Panchayat Roads (km)	% change	(6) C.D./Panchayat Samiti Roads (km)	% change	(7) Urban Roads (km)	% change	(8) Project Roads (km)	% change	Total (1-8) Roads (km)	% change
1970-71	12,316		16,105		53,359		6,106		3,97,948	
1980-81	26,131	112%	38,497	139%	85,877	61%	20,755	240%	6,83,676	72%
1990-91	45,028	72%	52,669	37%	1,36,644	59%	30,368	46%	10,24,339	50%
2000-01	55,675	24%	36,691	-30%	1,91,797	40%	56,541	86%	14,14,547	38%
2010-11	—		—		2,91,894	52%	76,845	36%	20,22,042	43%
2015-16	—		—		3,96,458	36%	1,09,727	43%	23,09,550	14%
2016-17					4,06,867	3%	1,35,743	24%	24,04,260	4%

Source: Statistical Abstract of Haryana 2020-21

Current status of transportation network is a reflection of the bygone era of the economy, social conditions and political setup. Transportation networks also signify the impressions of the past as it evolves gradually through the history experiencing stages like diffusion, concentration and saturation. After independence of India in 1947, every area got attention in planning period, leading to construction of interlinking roads and work started on development of road network on a fast pace which is evident from Table 1&2.In India roads are classified in 8 different categories based upon ownership from union level to panchayat level. Roads connecting various states are under control of central government for construction and upkeep; these are termed as National Highways. In 1970-71, length of national highways was 23,276 kilometers and there was rapid rise in the development of national highways. On annual basis from 1970-71 to 1980-81, growth rate was 35%. On every decadal basis, growth rate for development of national highways is positive from 1970-71 to 2016-17 indicating constant focus on development of roads by central government. Similar trend is visible in state highways also; there is average annual growth rate of 2.5% in construction of new state highways. State highways length was 51,744 kilometers in 1970-71 that rose to 1,69,096 kilometres in 2016-17. One interesting point of observation is working of local bodies like Zila Parishads/village panchayats /PWD/ projects in which growth rate of new roads is strikingly high than central and state governments. If we consider 1980-81 decade, growth rate of national and state highways is 35% and 74% respectively, but growth rate of PWD, Zila Parishad and Panchayat roads is 52%, 146% and 112%. Similar trend is evident throughout coming decades up to 2010-11. Above table 1 & 2 concludes that local bodies kept a high stress on development of new roads in a span extending from 1970 to 2015. On an overall basis, yearly growth rate of 72 % in the decade of 1970-80 reduced to 43% in 2010-11.

Hence it is an important aspect to study the state level of road transport in India. Four indicators have been selected to study the levels of road transport network:-

(1).Others Road Density (Others Road /100 SqKm)

(2).Road Density (Metalled Road /100 Sq. Km).

(3). Road Length/ Lakh Persons.

(4). Road Development Index.

After the final calculations, the data on above indicators was classified and tabulated. Result is plotted on the map in order to find out the comparative level of road transport development obtained on the basis of these four indicators in the state of India for 2017. Ultimately, the data relating to these four indicators is transformed and combined into composite scores and the result is further plotted on the map in order to find out the general level of transport development for 2017.

1). Other District Road Length / 100 Sq. Km:-

To access the comparative development of roads in the states, the link roads/100 Sq. km is one of indicator. This indicator is the sum total of Other District Roads (ODR) per /100 Sq. km. This is an important indicator to analyze the level of road transport in any area. The concept behind it is the, expansion of ODR shows the link of one village to another village. The development of a region is also affected by the length of National

Highways and State Highways because these are the basic corridors through which demand and service flows between two places. But ODR's are the necessary veins which supply raw material to these corridors as rural to urban areas, and urban to rural areas. The following table presents a clear picture of classes along with values and names of states.

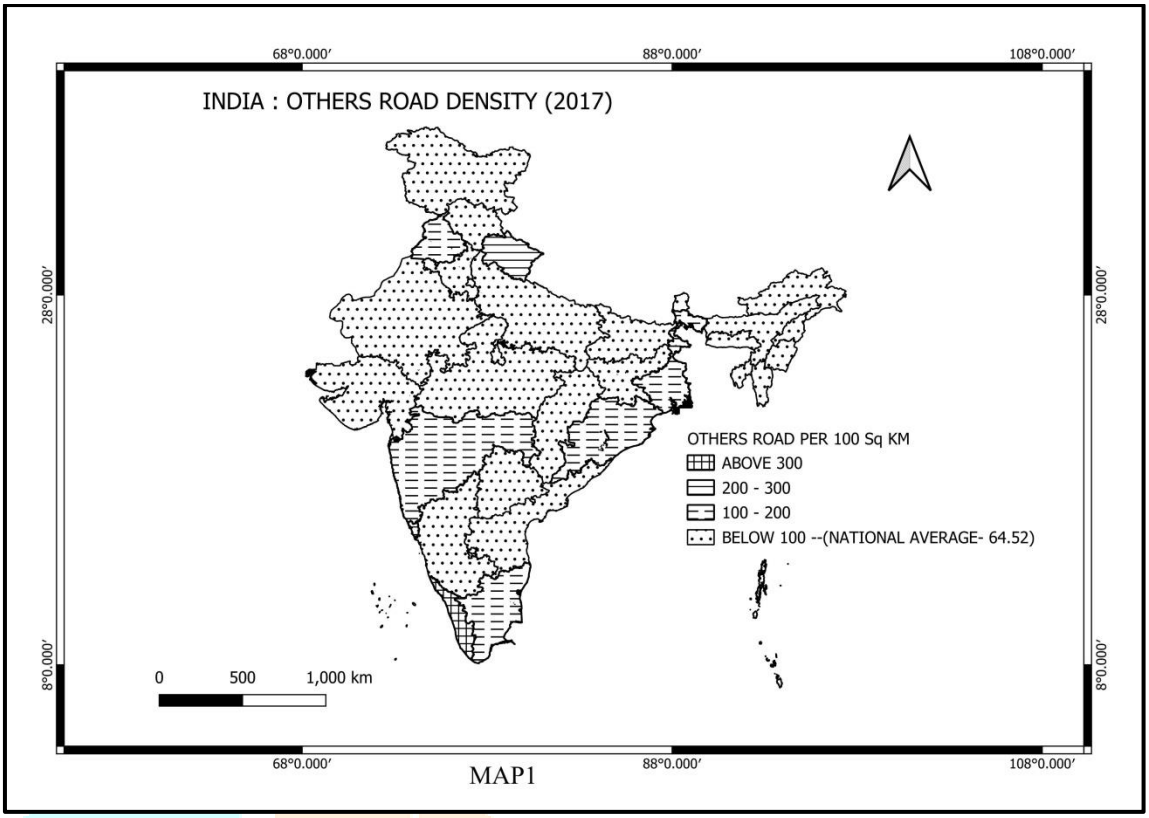
Table: 3

India: Level of Road Transport

State		Others Road Density (Per 100 Sq. KM)	Road Density (Per 100 Sq. KM)	Road length (Per Lakh Population)	Road Developme nt Index
Sr No	All India*	64.52	179.4	487.18	1.00
1	Andhra Pradesh	58.49	11	357.78	0.06
2	Arunachal Pradesh	10.44	44.21	2675.74	0.25
3	Assam	27.03	430.63	1082.43	2.40
4	Bihar	68.92	222.54	201.3	1.24
5	Chhattisgarh	22.40	72.37	383.03	0.40
6	Goa	217.94	450	1142.17	2.51
7	Gujarat	51.33	92.19	299.35	0.51
8	Haryana	74.54	184.08	321.03	1.03
9	Himachal Pradesh	12.34	112.82	915.01	0.63
10	Jammu and Kashmir	9.06	28.52	505.42	0.16
11	Jharkhand	24.89	87.65	211.81	0.49
12	Karnataka	88.31	188.25	590.95	1.05
13	Kerala	414.57	619.18	720.11	3.45
14	Madhya Pradesh	49.42	111.16	471.8	0.62
15	Maharashtra	100.87	202.78	555.26	1.13
16	Manipur	32.04	123.67	1074.23	0.69
17	Meghalaya	24.76	102.27	773.17	0.57
18	Mizoram	12.08	52.24	1003.64	0.29
19	Nagaland	67.74	218.58	1831.64	1.22
20	Orissa	136.30	195.03	723.47	1.09
21	Punjab	172.32	276.98	502.79	1.54
22	Rajasthan	18.44	77.61	387.46	0.43
23	Sikkim	39.37	160.46	1864.79	0.89
24	Tamilnadu	140.50	201.01	362.37	1.12
25	Tripura	3.97	409.36	1168.37	2.28
26	Uttar Pradesh	9.79	28.96	34.92	0.16
27	Uttrakhand	234.26	800.36	4243.93	4.46
28	West Bengal	108.96	362.88	352.85	2.02
29	Union Territory	---	---	---	---

Source: Statistical Abstract of Haryana 2020-21, Information of Telangana included in Andhra Pradesh.

The national average of ODR density of the study area per 100 Sq. km is 64.52 in 2017. Twelve states are having more value of this indicator than the national average and sixteen states are having this indicator value lower than the national average. It is concluded from the (Table-3 & Map-1), Kerala has high score of (414.57) more than 300 km in 2017. It is evident from the (Map-1) that central part of the country is more developed in terms of ODR/ 100 Sq. km.

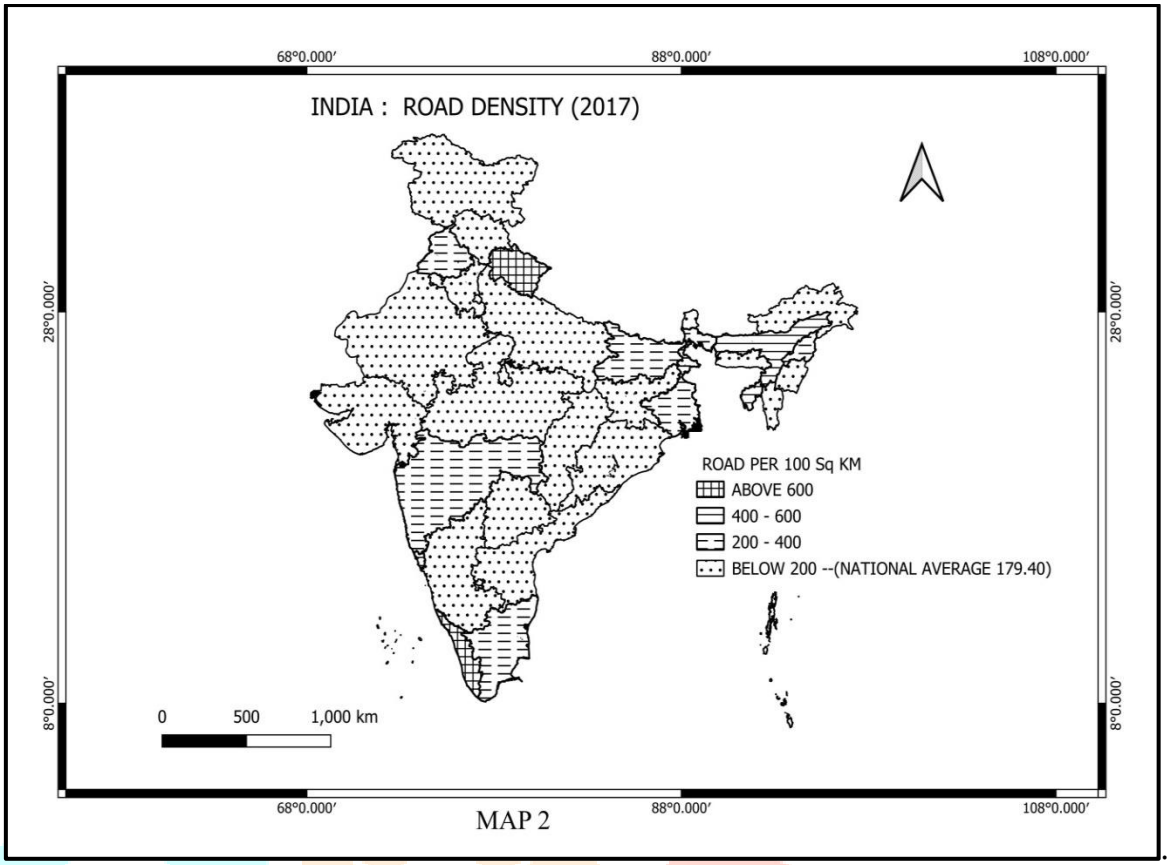


MAP1

The greater incidence of cash crops like sugarcane, rice and sunflower etc., has further stimulated the growth of others roads and transport network in these states. The states having ODR density between 200-300 kms are two in numbers, Goa and Uttrakhand have high level of ODR density. The states having ODR density between 100-200 kms are five in number, namely Maharashtra (100.87), Orissa (136.30), Tamilnadu (140.50), West Bengal (108.96) and Punjab (172.32) has medium level of ODR density. Twenty one states had low level of ODR density in 2017 below 100, namely Tripura (3.97), Jammu and Kashmir (9.06), Uttar Pradesh (9.79), Arunachal Pradesh (10.44), Mizoram (12.08), Himachal Pradesh (12.34), Rajasthan (18.44), Chhattisgarh (22.40), Meghalaya (24.76), Jharkhand (24.89), Assam (27.03),Manipur (32.04), Sikkim (39.37), Madhya Pradesh (49.42), Gujarat (51.33),Andhra Pradesh (58.49),Nagaland (67.74), Bihar (68.92), Haryana (74.54), Karnataka (88.31).

2). Road Density (Metalled Road Length / 100 Sq. km):-

This is one of the most reliable indicators of development in an area, particularly because the density per Square unit area provides the more basic variable. It describes the actual existence of specialized routes on the ground which connects bigger villages or it may go for greater mobility by connecting large number of villages of smaller size. India showed 179.4 roads per 100 Sq km in 2017 (Table-3). The value of this indicator ranges from 800.36km in Uttrakhand to 11 km in Andhra Pradesh. Fourteen states have this indicator value above the national average and remaining fourteen states have below to it.



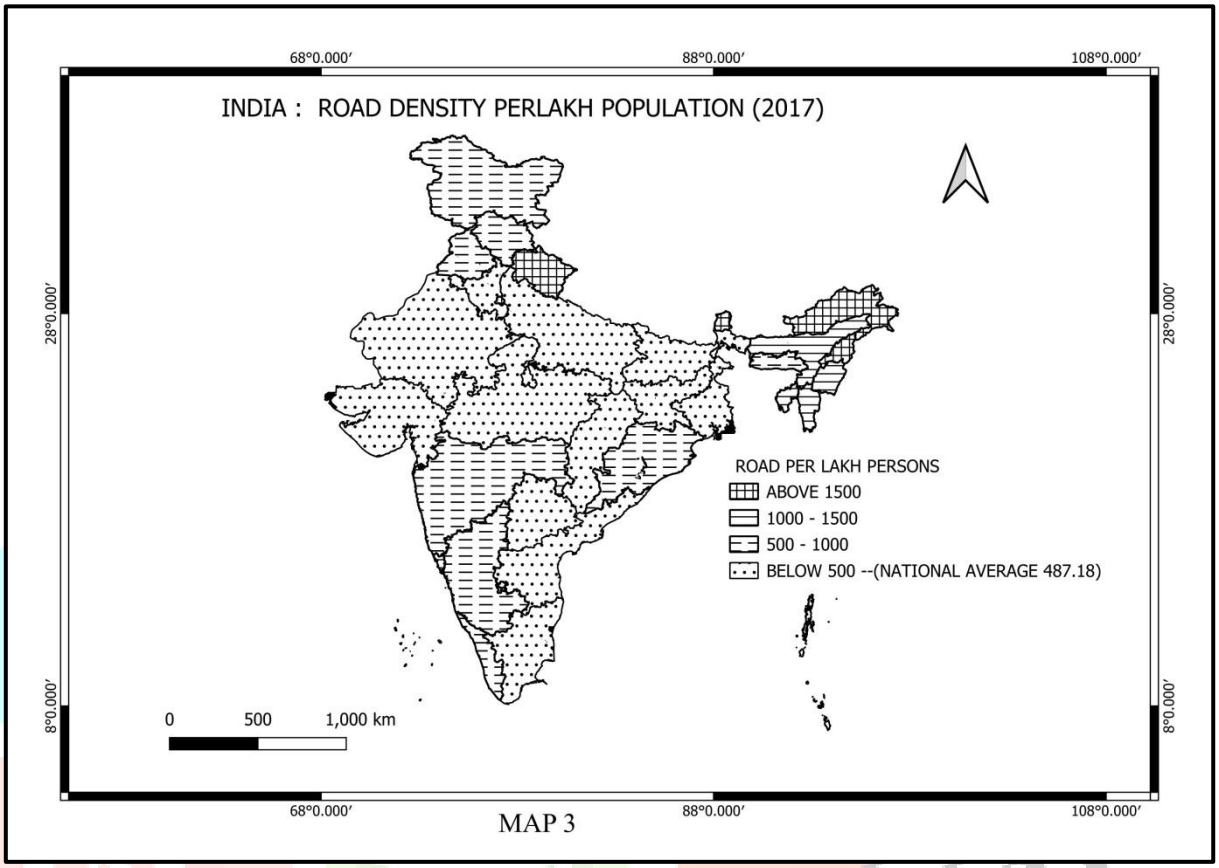
MAP 2

On the basis of this indicator all states classified into four distinct classes (Map-2). There were two states namely Uttrakhand and Kerala which had very high road density in 2017 i.e. more than 600 km of road/100Sq. km. The principal reason behind the growth of Uttrakhand and Kerala was starting of industrialization and tourism. It had considerably enhanced the transport connectivity. The two states Tripura (409.36) and Assam (430.63) lie in second category ranging values from400 to 600 km. All these states had high road density in 2017. The third category ranging with 200-400 km had six states namely Tamilnadu (201.01), Maharashtra (202.78), Nagaland (218.58), Bihar (222.54) and Punjab (276.98), west Bengal (362.88). These states have more and less the same factors causing the road density in a medium level. The lowest class below 200 kms is in Andhra Pradesh (11), Jammu and Kashmir (28.52), Uttar Pradesh (28.96), Arunachal Pradesh (44.21), Mizoram (52.24), Chhattisgarh (72.37), Rajasthan (77.61), Jharkhand (87.65), Gujarat (92.19), Meghalaya (102.27), Madhya Pradesh (111.16), Himachal Pradesh (112.82), Manipur (123.67), Sikkim (160.46), Haryana (184.08), Karnataka (188.25) and Orissa (195.03).The reverse is true about the states having lower values of this indicator. However, the area and the length of road hardly exhibit any significant sign of positive relationship, instead the administrative status, number of market and service centers.

3). Length of Metalled roads / Lakh persons:-

Density of roads measured in terms of population is also a significant and one of the most reliable measures of transport network level in a region (Berry 1960, Taaffe, Morrill and Gould 1963).The study of road density per lakh persons is more useful to know the economic status of the people of that area. It was noticed that less dense populated states have high road mileage in terms of persons. General speaking, thickly

populated states have less road mileage .However some other factors also disturb the sequence in this respect. Four categories of development of states have been identified on the basis of this indicator (Table-3& Map-3). The value of this indicator ranges from 34.92 in Uttar Pradesh to 4243.93kms in Uttrakhand. The national average length of roads/per lakh persons in India is 487.18 kms with eleven states are having values above the average and the remaining seventeen below it.



MAP 3

It is evident (Table-3 &Map-3) that four states namely, Nagaland (1831.64), Sikkim (1864.79), Arunachal Pradesh (2675.74) and (4243.93) kms in Uttrakhand had very high level of development with value more than 1500 km of the said indicator. The second category as high level of density ranges between 1000-1500 km includes five states namely Mizoram (1003.64), Manipur (1074.23), Assam (1082.43), Goa (1142.17) and Tripura (1168.37). A brief look at the population level and the road length clearly indicate that there was an inverse relationship between population of states and the length of roads. Another category of medium class ranges from 500-1000 kms. Eight states are located in this category in 2017, Punjab (502.79), Jammu and Kashmir (505.42), Maharashtra (555.26), Karnataka (590.95), Kerala (720.11), Orissa (723.47), Meghalaya (773.17), and Himachal Pradesh (915.01). Next category show Roads / per lakh population kms below 500 kms and eleven states as Uttar Pradesh (34.92), Bihar (201.3), Jharkhand (211.81), Gujarat (299.35), Haryana (321.03), West Bengal (352.85), Andhra Pradesh (357.78), Tamilnadu (362.37), Chhattisgarh (383.03), Rajasthan (387.46), Madhya Pradesh (471.8) are located in this category in 2017. Mostly were highly populated and urbanized.

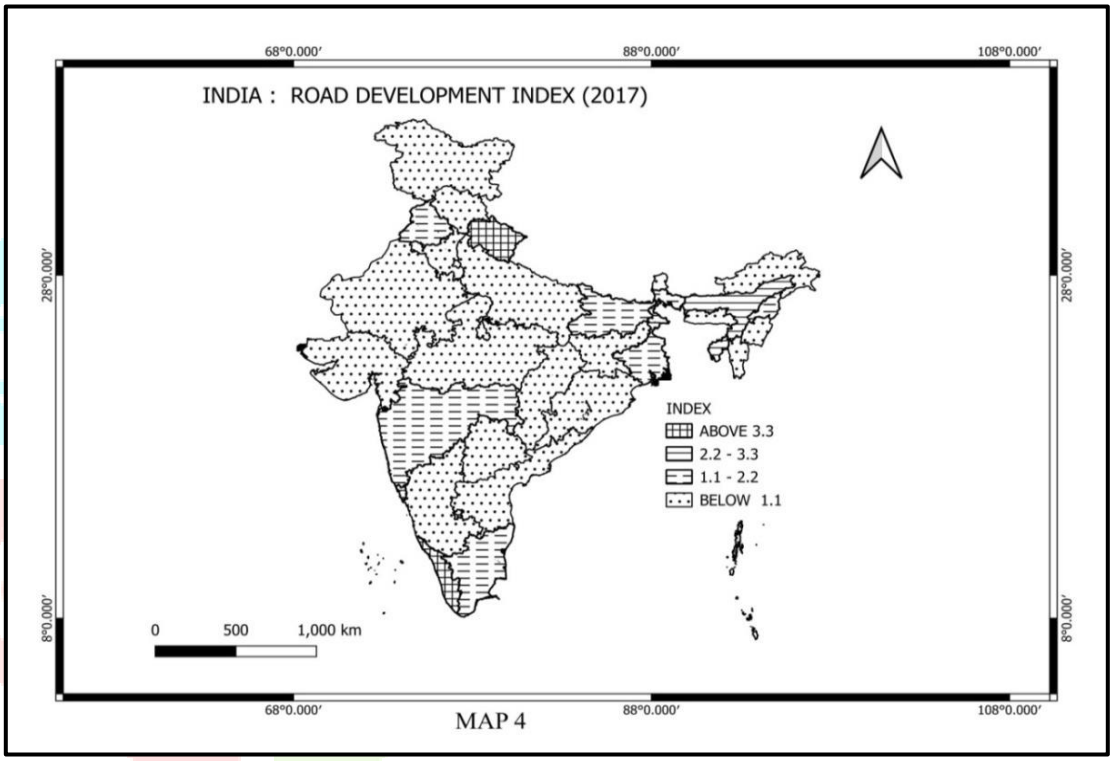
4). Road Development Index:-

The concept behind the analysis of this indicator is to find out the relative development of roads in an area to that of the division.

Formula used for calculating the above indicator is :

$$\text{Road density} = \frac{\text{Road Density of State}}{\text{Road Density of Country}}$$

On the basis of this indicator all the states have been divided into four categories (Table-3 & Map-4).The value of this indicator varies from 0.06 in Andhra Pradesh to 4.46 in Uttrakhand in 2017.



MAP 4

Fourteen states showed values more than 1.0 and fourteen states below to it. Uttrakhand and Kerala had very high level of road index development with 4.46 and 3.45 respectively. As per this indicator the states having value less than 1.00 shows less development with respect to its area and as well as in the total area. Score value, 1.00 shows an indication of moderate development and value greater than 1.00 indicates the high development respectively to its total area. The values of these above four indicators have been transformed into composite scores to identify the general level of road transport development for the year 2017. These composite scores have been calculated with the help of Kendall's Ranking method. M.G. Kendall used this method while measuring the agriculture efficiency in England and Wales in1939. The same method has been used by Mitra "Levels of Regional Development -1961" in classifying the Indian districts into four quartiles of development using 35 indicators of regional development. On the basis of composite score four level of transport development have been identified in the four categories (Table-3&Map-5).

Table: 3

India: Level of Road Transport Development

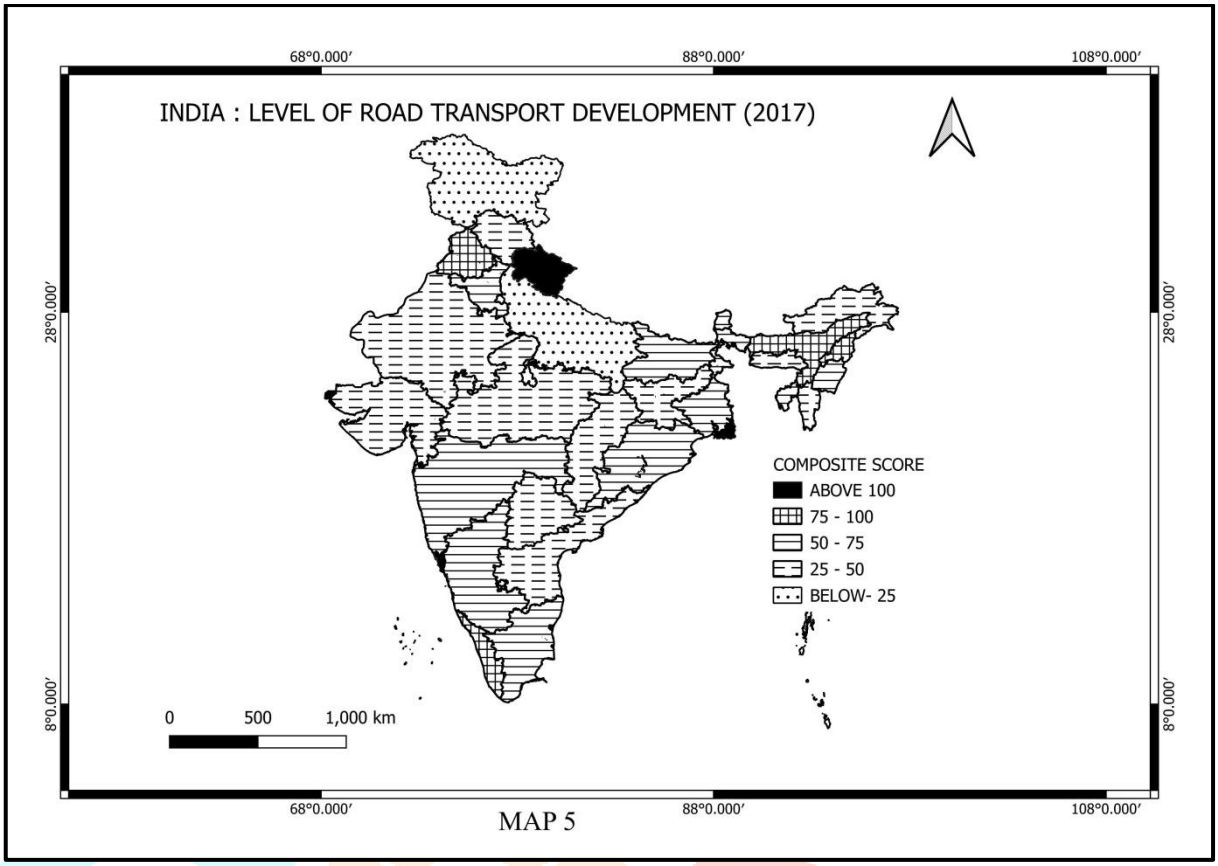
Sr.no	Composite Score	Level Categories	States
1	Above 100	Very High	Goa-101, Uttrakhand-111
2	75-100	High	Kerala-98, Assam-83, Nagaland-82, Punjab-81,
3	50-75	Medium	Haryana (54), Manipur (59), Bihar (62), Karnataka (67), Sikkim (67), Tamilnadu (68), Maharashtra (73), Tripura (73), Orissa (74), and West Bengal (74)
4	25-50	Low	Andhra Pradesh (25), Chhattisgarh (29), Jharkhand (29), Rajasthan (31), Mizoram (35), Gujarat (37), Arunachal Pradesh (39), Madhya Pradesh (47), Meghalaya (47) , Himachal Pradesh (49)
5	Below 25	Very Low	Jammu and Kashmir-19, Uttar Pradesh-10

Source: Calculated by authors

It is evident that (Table–3 & Map-5) only two states namely Uttarakhand (111) and Goa-(101) had high composite score values i.e. more than 100 in very high level category of road transport development in 2017. Four states were having the high composite score values varying within the range of 75-100 as Punjab (81), Nagaland (82), Assam (83), and Kerala-(98).

Ten states as Haryana (54), Manipur (59), Bihar (62), Karnataka (67), Sikkim (67), Tamilnadu (68), Maharashtra (73), Tripura (73), Orissa (74), and West Bengal (74) are having composite score values in the range of 50-75 lying in the medium level category of road transport. Again ten states like Andhra Pradesh (25), Chhattisgarh (29), Jharkhand (29), Rajasthan (31), Mizoram (35), Gujarat (37), Arunachal Pradesh (39), Madhya Pradesh (47), Meghalaya (47) , Himachal Pradesh (49) having values between 25-50 category of low level road transport whereas Jammu and Kashmir (19), Uttar Pradesh scoring (10) lies in the category of very low level of road transport.

Uttarakhand state which had very high level of road transport in 2017 also scored high in all four indicators as others road & road density per Sq 100 km, road density per lakh population (Map-1, 2, 3, 4). Greater number of markets, service centers, industrial development, total area ratio, agricultural development and tourism are the basic factors which affected the level of road transport development in above very high and high categorized states. Also reverse is true about the states categorized with low and very low level of road transport. Above analysis reveals that levels of highways development, well-being of industrial and agricultural sectors, as well population size have influenced the level of transport development in India to a major extent, while the geographical area of state have least impact on the road transport development.



MAP 5

CONCLUSION: The level of socio-economic development in any area is characterized by level of road development as roads acts as catalyst for promotion of development. Roads provide basic infrastructure for growth of business. The present study focused on road network development in 28 states of India and concludes the disparity in road networks. Uttarakhand and Goa have recorded very high levels of road network development attributing to industrial and tourism activities. Similarly Kerala, Punjab and Assam witnessed high level of road network development as flat plain supporting agriculture in Punjab, Kerala because of tourism hub and industrial estate, Assam as corridor for eastern part of India. Rest states have Medium to low road development level, except Jammu & Kashmir and Uttar Pradesh which lie in very low category. In case of Jammu & Kashmir, reason for lack of development is mainly due to terrorism, whereas in case of Uttar Pradesh reason is very high population.

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