Role of Road Connectivity in Socio-Economic Development of Shahada Tehsil of Nandurbar District (Maharashtra)

Prof. Mina N.Patel   **Dr. Uttam V.Nile**

Abstract:

Recent trends in the developmental process has been depends on the transport network. The transport is playing a very important role in socio-economic development of rural areas and the study region is not an exception in this present research paper attempted has been made to find out the role of road connectivity in socio-economic development in Shahada tehsil of Nandurbar district. The road network map was prepared on basic of Google map; Connectivity Composite Score was calculated with the help of Beta Index and Cyclomatic Index. Here lower the CCS value, higher the connectivity and vice versa. Therefore high connectivity villages are choosing the criteria of above 5000 population in a tehsil. Road network is considered to be one of the keys to regional development of a region. A Connectivity Index can be used to quantify how well a roadway network connects destinations place.

The correct connectivity and the right orientation are needed in an urgent way in order to make a development to road network. However, the attention that is given to the development of the road network especially in the rural areas of Nandurbar district is insufficient. Thus, the analysis of the road network in the Shahada tehsil is the main focus of this paper. Beta, Gama, Alpha indices and other measures such as correlation index were calculated in this study in order to assess the road network for the tehsil. - The present paper focused on the role of road transport in development of Nandurbar district in Maharashtra. The study determines connectivity and accessibility of surface network, and delineates the transport region.

Key Words- *Road network, connectivity and assecibility, Beta Index, Cyclomatic Index, Socio-economic Development, Correlation.*

Introduction

The transport is act as very important role in development of any region, basically, transport network is regarded as a set of an interconnected route linking of numerous destinations within and outside the region and provide a pace for agitation to people and commodities. It real sense, it serves manifold functions for regional development. The relation between transport and economic or regional development is a matter of practical as well as theoretical importance and one that has received considerable attention over many years in both advanced and developing countries. The Geographer is more concerned with spatiotemporal implications of such developments and their impact upon the activities in a particular region. Geographical study of transportation and its relationship with socioeconomic development is an important and developing field of research. Transport network is a set of geographic locations inter connected in a system by a number of routs (Kansky, 1963) whereas the connectivity of a network is the degree of completeness of links between nodes', (Robinson & Bamford, 1978). Some scholars has been attempted to find outcorrelation between connectivity and development such as Saxena H. M. (1980) had try to understand correlation of connectivity with development in all districts of Rajasthan State. Sadhana H. Bhendkar (1985) researcher attempted to examined road connectivity for Vidarbha in Maharashtra. R. V. Vinod et all. (2003) corelates transport network of roads and railways in Kasaragod taluk, Kasaragod district of Kerala and found that the coastal area is well connected with road network and the eastern hilly region has poor connectivity and accessibility. Sandip Sasane , and Nanasaheb Shelk (2016) these are study the Role of Road Connectivity in Socio-Economic Development of Shrirampur Tehsil of Ahmednagar

District (Maharashtra) Therefore some researcher analysed the correlation between road connectivity and socio-economic development in various parts of the nation.

The present study researcher attempts to analyse the connectivity pattern and development of road network in the study region district through connectivity indices such as alpha, beta, gamma the sum of which gives the Aggregate Transport Score (ATS) and the density of roads has also been calculated. Shahada is one of the most preferred tehsil of Nandurbar district and it is the second administrative division headquarter of the district .It is tehsil bordered connected to the northeast boundary is Madyapradesh state of India, southern side is connected to the Dhule district of Maharashtra and western side bordered as to be rest of tehsil of Nandurbar and Gujarat state.

Review of Literature:-

Report of Asian institute of transport development summaries that the existing level up understanding of the casual relationship between transport infrastructure and human' well being' in a general and poverty in a particular is inadequate. Most of the evidences in this regard is anecdotal and not based on an important element in both direct and indirect intervention for poverty reduction ,there has so far been little attempt at formal accounting poverty in a transport project typically, investment projects in the transport sector are evaluated by cost benefit analysis (CBA) Primarily in term of efficiency consideration .

Sasane Sandip and Shelke Nanasaheb (2013) shows that the correlation between composite connective Score (CCS)and socio economic development score has been analyzed by Karl Pearson's correlation method for Shrirampur Tehsil. The Karl Pearson's correlation coefficient (r value) is only 0.0 1 which is showing very big weak correlation between road connectivity and economic development in Shrirampur tehsil .

Samanta Pradeepa Kumar (2015) evaluated that the development of rural infrastructure in general and rural transport infrastructure in particular is very crucial in India. Rural road most connectivity ensures access to critical services and opportunities and fosters sustainable poverty reduction programs as well as employment generation through industrialization in rural areas.

Vikas (2017) explain that and increased interest in rural road investment potential as a developed in recent years, This is mainly due to the need for development of rural as well as the positive impact that road investment could generate on rural communities ,should they have an adequate support roads infrastructure network that is sustained over the long term. It is however complex task establish the impact of especially rural road investments, as the benefits received this investment are difficult to quantify.

Mamun Abdulla A and Paul Subrata Kumar (2018) well plan rural road connectivity is a vital component for the socio economic development of rural people by providing access to amenities like education ,health ,marketing etc. it has been established that investments in rural roads lifts rural people above the poverty line .The evidence also indicates that as the proper rural connectivity improve the economy and rural roads always leads to increase in agriculture production and productivity by bringing in new land into cultivation and rural poverty levels come down .In India there had been imbalance development of the rural road network and basically based on the population only.

Sing Richa (2019) shows the accessibility of roads in rural areas opens up better opportunities for the rural people like ease to market centers incentives from agriculture goods increase in marketing of dairy products and other basic facilities.

Roads reduce transportation cost and the cost of consumption and production of goods and services .with easier access to markets and technology ,improved road expand farm and non farm production through increase availability of relevant input and lower input costs (Binswanger,Khandker ,and Rosenzweig,1993, Levy,1996)At the household level road development contributes to higher productivity and demand for labour (World Bank ,2000

)and improve education and health including those for women and girls (Bryceson andHowe,1993;Levy.1996).The importance of infrastructure in agriculture and rural development is well documented.

Noteworthy contribution in the field : several scholars attempted to relation of transport network and development as Asher. Sam and Poul Novosadz (2016)analyzed Market access and structural Transformation Rachel Glennerster and Tavneet Suriy (2013) showes the rural roads and intermediate trade .Gannon ,Colin and Zhi Liu(1997) focused on poverty and transport Jones,S. (2006):infrastructure challenges in East and South Asia ,Sing A.K. (2010) focused on GIS based rural road network planning for developing countries. Lopes,R.B.&Lopes N.(2013), write on Methodology for Definition of Road Network in Rural A,reas of Nepal Swaminathan CG ,Lal NB, Ashok K explained a system approach to rural development.

Study Area
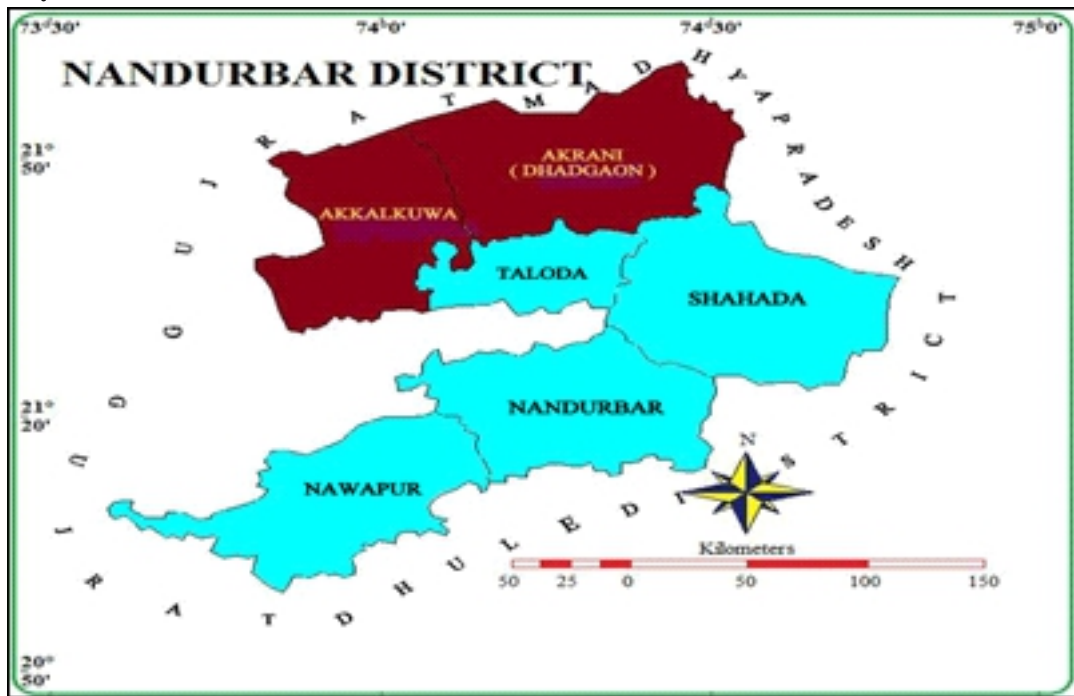
Shahada Tehsil is located in the Northern part of Nandurbar district of Maharashtra state and is extended between 21° 54 to 20° 30 N latitudes and 74° 46 to 74° 30 E longitudes. The total geographical area of the tehsil is 1,181.27 sq.km which covers 183villages.In the district there are 6 tehsil Shahada Tehsil is one of them. The net cultivated area in 2011 was 843.40 sq. km. About 70 percent of the area is irrigated by   dug wells, putting high pressure on groundwater resources of the Tehsil. The total population of tehsil is 3,46,352 (Census2011) and almost 90 percent of the workforce is engage in the agriculture, horticulture, animal husbandry and Sugar Industries, sutgiranies. The Tehsil has a subtropical monsoon climate. March, April, and May are the hottest months while December and January are the coldest. The maximum temperature recorded during summers is about 44°C and it is as low as 8°C in winters. The Tehsil receives an approximate average rainfall of 888 mm and more than 75percent of which occurs during the monsoon period (July–September)

Data Source and Research Methodology

In the present study for analysis the existing system of transportation network of major

district road, other district road and village road at all the central places of the study region. For the present investigation the data and information has been collected from both primary and secondary sources, but the main emphasis on secondary data sources.

Alpha index (α) This index is the ratio of the actual to the maximum number of circuits. The range of this index is 0 to 1 (zero means no circuits and 1 means the network is thoroughly interconnected)

Alpha index (α) = e-v+1/2v-5   where; e - number of links in the network ,v- vertices /nodes

Beta index The value of this index can be calculated by dividing the number of links by the number of nodes. The range of this value is from 0 to 1, if it is zero, it means that there are no links whereas if it is one, it means the graph is complete [8, 9]. The larger the value of Beta, the higher connectivity in the network. The Beta value increases as transport networks become more developed and efficient. Beta index β = e/v

Gamma index (γ): This index is considered one of the most reliable measurements by which the connectivity degree can be determined. Gamma index γ = e/3(v-2)

The present study is based on Secondary data.Secondary data has been obtained from District census Handbook, PWD Office and Panchayat samiti of Shahada. Selected as sample villages more than 5000 population in Shahada tehsil of Nandurbar District.In present study Nodes and Edges are calculated trough tehsil map it was provided by Administrative officer of PWD .The road transport connectivity has been calculated by various indices i.e. Beta index and cyclomatic index. The composite connectivity score calculated with the help of MS - Excel

Objective:-
1.To analyze the tehsil connectivity measures and level of connectivity of road transport network.
2. To study the role of transport network and level of socio-economic development of each tehsil in this region.

Results and Discussions

The table no.1. is clearly reveals in this table the Alpha,Beta,Gamma and cyclometric index as well as CCS of the study region. highest Alpha index is recorded in Sarangkheda with 0.94, followed by Mahsawad , mohide- ts-and Prakasha with 0.69,0.57.and 0.53 respectively .lowest Alpha index observed in Lonkheda and Mandane with 0.36 and 0.42 respectively the highest Beta index is recorded in Mahsawad and Prakasha with 1.66. followed by Mandane,Sarangkheda and Mohide -t-Shahade with 1.58 and 1.5 Similarly Lowest Beta Index recorded in Lonkheda with 1.37

Sr. No	Name of village	edges€	vertices(v)	Alpha Index	Beta Index	Gamma	cyclomatic Index	ccs
Table No.1 Village wise Rank of Connectivity of Shahada Tahsil
1	Mahsawad	9	15	0.69	1.66	0.71	7.0	8.66
2	Lonkheda	11	8	0.36	1.37	0.61	5.0	6.37
3	Mandane	19	12	0.42	1.58	0.63	8.0	9.58
4	Mohide -t-Shahade	9	6	0.57	1.5	0.75	4.0	5.5
5	Sarangkheda	19	12	0.94	1.58	0.63	8.0	9.58
6	Prakasha	15	9	0.53	1.66	0.71	7.0	8.66

(Source: Computed by Researcher)

Highest Gamma index found Mohide -t-Shahade with 0.75 followed by Mahsawad and Prakasha ,Lonkheda and Madane with 0.63,0.61 and 0.63 respectively highest cyclometric index noticed in Mandane and Sarangkheda with 8.0 followed by Mahsawad and Prakasha with 7.0 and lowest cyclomatic index measured in Mohide -t-Shahade with 4.0

The analysis of road connectivity data has been based on to various transport index .The CCS computed by adding respective rank of Beta index and cyclomatic number. On thebasis of CCS Shahada has been divided into 2 categories highest and lowest. Here lower CCS value higher the connectivity and vice-versa like Lonkheda with 5.5.These indices shows the connectivity of the network.

SrNo	Name of village	Beta Index	Gamma	cyclomatic Index	Aggregate transport score
Table No. 2 Aggregate transport score and structural indices					
1	Mahsawad	1.66	0.71	7.0	9.37
2	Lonkheda	1.37	0.61	5.0	6.98
3	Mandane	1.58	0.63	8.0	10.21
4	Mohide -t-Shahade	1.5	0.75	4.0	6.25
5	Sarangkheda	1.58	0.63	8.0	10.21
6	Prakasha	1.66	0.71	7.0	9.37

(Source: Computed by Researcher)

Table No.2 Indicates the Aggregate transport score and structural indices of the study region

Highest Aggregate transport score found in Sarangkheda and Mandane with 10.21 and 10.20 followed by Prakasha and Mahsawad with 9.37 and 9.37 lowest Aggregate transport score observed in Mohide -t-Shahade and Lonkheda with 6.25 and 6.90 respectively. Source : Computed by Researcher

Socio-Economic Development Composite Score In order to facilitate analysis, three categories of high, medium and low economic development have been determined on the basis of composite scores by adding population density, sex ratio, literacy rate, workers of total population percent noticed that Here lower the composite score value, higher the socio economic development and viceversa.

Composite Connectivity Score The composite connectivity scores (CCS) have been computed by adding respective ranks of Beta and Cyclomatic number. On the basis of CCS, Shahada tahsil has been divided into three categories of high, medium and low connectivity. Here lower the CCS value, higher the connectivity and vice versa. Therefore high connectivity villages are Mohide -t-Shahade (4) Lonkheda (5) while Mandane and Sarangkheda (8) low connectivity found in shahada tehsil

	Name of village	Area in sq.km.	pop. Density	literacy rate	workers of total pop. in percent	sex ratio	composite score
Table No. 3 Shahada Tehsil :Village wise rank of socio-economic Development							
1	Mahsawad	11.08	776.44	62.53	42.14	1041	1933.19
2	Lonkheda	4.91	2241.14	69.13	36.2	1134	3485.41
3	Mandane	18.24	305.04	67.32	42.81	1043	1476
4	Mohide -t-Shahade	21.69	312.86	55.46	46.5	1017	1453.51
5	Sarangkheda	19.95	398.89	66.39	54.43	1027	1566.66
6	Prakasha	36.92	274.45	59.4	50.83	1034	1455.6

Source: Computed by Researcher

Conclusions Researcher found the co-relation of Road Connectivity and Socio-Economic factors.Besides that researcher computed Composite Connectivity Scores (CCS) inrespective ranks of beta and Cyclomatic number. On the basis of CCS study region has been divided into three categories of high, medium and low connectivity. Here lower the CCS value, higher the connectivity and vice versa. Therefore high connectivity villages are Mohide -t-Shahade, Prakasha, Mandane) While low connectivity found in Lonkheda and Mahsawad Sarangkheda most of the sample villages are away from the central place. In order to proper analysis, three categories of high, medium and low Socio-Economic development have been determined on the basis of composite scores. On the basis of Composite Score Here lower the composite score value, higher the socio-economic development and viceversa Mohide -t-Shahade, (1453.51), , Lonkheda (3485.41)etc. Shahada city has been found medium Socio-Economic development. Correlation between Composite Connectivity Score (CCS) and Socio-Economic Development Score has been analyzed by Karl Person's Correlation method.

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*Prof. Mina N.Patel
(Research Scholar)
Department of Geography
&Research Center ,
P.S.G.V.P.M'S ASC College,
Shahada Dist.Nandurbar,425409

**Dr. Uttam V.Nile
(Guide)
Department of Geography
&Research Center ,
P.S.G.V.P.M'S ASC College,
Shahada Dist.Nandurbar,425409