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Need of Transit-Oriented Development for Raigarh City

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Abstract: ***Raigarh city is an expeditious growing industry as well as the populated city in Chhattisgarh (INDIA), spread over an area of 7086 Km^2. Raigarh city is classified by its rising Population, Urbanization, Motorization, Pollution, and low per capita income. The rapid rate of Industrialization and Urbanization in the past few decades has led to unprecedented growth in the city population and subsequently in the city limits. A lack of proper planning and land use controls has resulted in fast extending beyond city areas. The objective of the paper is to understand the growth patterns of Raigarh City and the existing transportation networks to plan and phase out a proper TOD network by understanding the present scenario of the traffic condition of the city and identify the parameters necessary for the implementation of TOD at Raigarh City. The proposal of the state government in setting up Naya Raigarh involves the transformation of old Raigarh into a better-planned and laid-out city. Expansion and redevelopment of a city require proper research and planning in laying out the transportation network of the city to ensure equitable access of public transportation to all, bringing in the concept of Transit Oriented Development (TOD).***
Keywords: Transit-oriented development, transportation planning, origin-destination surveys, Raigarh city, Population.

I. INTRODUCTION

Raigarh city is situated in the Chhattisgarh State of India, it is a district headquarter. The city is known for its mineral as well as silk industries. Its total population over the past two decades increasing from 12,65,529 in 2001 to 1493984 in 2011. Raigarh city has a very dense and narrow marketplace and curving road.

As compared to other cities, Raigarh has grown in population and urbanization. In this city the major problem is mixed traffic due to absence of proper city planning has resulted in fast extending old city boundaries. This greatly increased the number and length of trips on motorized transport. Longer trips make cycling and walking less feasible, while increased vehicle traffic makes cycling and walking less safe. Increased vehicle traffic has resulted in frequent accidents, parking problems, congestion, vehicle density, etc.

Traffic has grown tremendously in Raigarh city in recent years due to industrialization. As traffic starts to increase, the congestion on the roads starts to hurdle the safe and efficient movement of traffic. Due to heavy traffic, the possibility of accidents is more and serious problems of environment pollution and parking problems has occurred. Therefore it becomes necessary to give attention to transportation and study the need for better geometric design, capacity, signals, roadway marking, street lighting, etc. Implementing this type of large-scale project like Transit Oriented Development requires massive financial support. Transit projects when implemented affect the existing city boundaries. Addition in to the existing networks of the Raigarh transport system which majorly comprises a bus, railways, and taxis would have its impression in all ridership statistics. This change in ridership network pattern would also have an impression on the particular area.

II. TRANSIT-ORIENTED-DEVELOPMENT

Transit-Oriented Development (TOD) generally refers to a high degree of development with the pedestrian point of view, located within easy and simple walking space of a major public transit station. Transit-Oriented Development means providing systematic traffic movement, proper width for vehicles, signals, camber, pedestrian walkways, etc. In other words, TOD defines modify or reestablished the existing or new city. This refers to an initiative to urban design management to promote urban development of high density along mass transit passage. This is a form of urban development that collection of a greater mixture of land uses over a high quality or frequency transport system. The transport mode either train, metro rail, bus terminals are designed to be the focus for the improvement or development and ideally becomes the community ‘heart’. It is where people work, shop, meet, play, relax and live.

A Transit-Oriented Development is a combined use of commercial and development design to maximize approach to public transport and regularly incorporates features to encourage transit ridership. The objective of TOD is to minimize congestion on the road network and demand for new roads. All the advantages of TOD finally make the city attractive and feasible urban development.

Some of the design principles that can be used to design Transit-Oriented Developments are:

1) Pedestrian favorable
2) Environment friendly for non-motorized transport
3) Efficient public and Para-transport arrangement supporting the transit network
4) Multimodal interchange and roads connectivity
5) Well managed parking etc.

Since rapid transit is a new and successful phenomenon in Indian cities, planning for densification of development along transit corridors, encouraging compact development, and improving transit accessibility and ridership are just being introduced. In Transit-Oriented strategies in countries like Singapore and China have focused on catalyzing development along transit-oriented corridors. The strategies or planning have been implemented on an ongoing basis and distinct targets have been introduced for improving transit accessibility and ridership.

India is a country where there are so many variations to be found. There are different types of population mixes in India and all regions have different population densities. Population density also affects road traffic. The width of the road is less and the population density is more, then there is more traffic jam and there is a greater amount of air, noise and environmental pollution. Transit-oriented development is done in a particular area to overcome this type of problem.

III. DATA COLLECTION FOR RAIGARH CITY

For Raigarh where industrialization and urbanization are taking place at a rapid rate, the need for a planned and efficient transportation system is necessary. This city is emerging as an industrial city at the fastest rate with the growing of the population and expanding area wise. The industries like JSPL, NALWA Steel And Power Ltd, Sky Alloys & Power Pvt Ltd, MSP Steel & Power Ltd, etc. which surrounds the Raigarh have burgeoned the growth rate of the city with people migrating continuously from different states in the prospect of job opportunities. People‘s personal preferences and freedom get to communicate in increased ownership and use of personalized vehicles. People‘s personal preferences and freedom get to communicate in increased ownership and use of personalized vehicles. Consequently, the traffic on the roads has been increased tremendously in the last 18-19 years. The rate of growth of vehicles (car, motorbike, trucks, etc.) has been about 9 to 10 % per year. The public transport situation has changed over the past decade. The result is visible in various terms of increasing congestion on the roads and the quality of air (i.e. increase percentage of carbon mono-oxide, carbon-di-oxide, etc.)

In recent, many measures have been taken by the management but it is not enough for the existing city. More planning needed for the existing urban traffic and hence TOD is one of solution which can change the scenario of the Raigarh. The scope of the implementation of TOD gets widened up because of the proposal of Naya Raigarh, involving the transformation of old Raigarh into a better planned and laid-out city. Located around 10 kilometers (6.2137 miles) to the southeast of the city, Naya Raigarh would serve as the industrial capital of the state and cater to the infrastructure needs of industry and enterprises in the region. Naya Raigarh is spread over an area of approximately 600 acres and includes many villages like Kondatarai, Aurda, etc. form the core of the Naya Raigarh. About half of the total acquired land is being used for afforestation, roads, public conveniences, gardens, water facilities, sports complexes, green belts, etc.

TOD can be best implemented in the newly expanding area of the city and joining the existing city. Naya Raigarh is going to expand in 1500 Km^2 approximately taking villages within it. Due to the stabilization of NTPC, Lara near the proposed Naya Raigarh area is developing at a rapid rate. The transportation facility needs to be improved for the development of the city. Infrastructure like roads, sewage needs to be more planned and organized so that it can link the existing and the new city efficiently.

The population of Raigarh (urban) in the year 2001 was 115908 with a total area was 911 Km^2 having a density of 128/ Km^2. In the next decade, the city developed at a fast rate due to industrialization and urbanization. There were so many changes in the demography of the Raigarh. Many industries came up during that time like Jindal Steel and Power Limited, MSP Steel & Power Ltd, etc. The need for public transportation increases due to the increase in daily ridership. Many villages came within the map of the Raigarh city and extension of the boundaries of the city took place. As a result of the increase in city population according to census 2011 rise to 150019 with the population density of 145/ Km^2.The Raigarh city area extended to 1032 Km^2. At that time large migration took place from a nearby village and the other states. Many residential, commercial areas have been developed, and consequently, the density of the city rises.

Table 1 Population, Area and Density of Raigarh City

Year	Population	Area	Density
2001	115908	911 Km^2	128 per Km^2
2011	150019	1032 Km^2	132 per Km^2
2021 (projected)	194155	1196 Km^2	162 per Km^2
2031 (Projected)	251274	1675 Km^2	150 per Km^2

As the population of the city is one of the major factors which need to be considered for planning for the development of the city through the implementation of the Transit-Oriented Development. Before the planning of any projects, it is mandatory to forecast the future population of the city. Whenever the large implementation of such a program is done, it is always performed for the projected population keeping in view the future years. The traffic of the city is mainly dependent on the population density. For this purpose, the population has been forecasted for the next two decades i.e. 2021 and 2031.

Before the forecasting, it was also necessary to determine the boundaries of the city in the next twenty years. Based on urbanization and the development of the area, new boundaries have been determined. The population has been forecasted by considering the census of 2001 and 2011 with the help of the Geometric Increase Method. It was found that in the year 2021, the city's population will be around 194955 with the population density of 162/ Km^2 of the city was estimated up to 1196 Km^2 in 2021 on extending the existing boundaries of the city.

After the study and analysis, it was presumed that in the year 2031 the development of the city will occur at a more rapid rate and the area of the city will increase accordingly. Due to more planning and efficient urbanization, the density of the city will decrease. Many roads and new infrastructure will come up during that time. Due to more interconnected roads and links, connecting the Naya Raigarh area and the existing city, more opportunities will come up. In the planning of Naya Raigarh, many villages will come onto the map of the city as a result the area will increase. The area was determined as 1675 Km^2 in the year 2031 by designing new boundaries of the city. The density of the city will be 150/ Km^2.

The origin and destination survey has been carried out on some of the villages which are within the area of the proposed Naya Raigarh. The study of O&D in the village named Kondatarai, Aurda, Jakela, is defined as the study area. These villages are close to the Kondatarai and study of this area is really necessary before planning a scientific Transit Oriented Development. The main purpose for which the study in this area is required is to determine the extent of preliminary preparation for organizing the survey. The study of O&D has been carried out by the Home Interview Method. The information which is mainly yielded through the O&D study in this area is

1) Origin and Destination of the trips.
2) Land use of the zones of origin and destination.
3) Household characteristics of the trip-making family.
4) Time of the journey.
5) Trip purpose.
6) Mode of travel.
7) Number of vehicle in each family.

A random sample of the population is selected as per origin and destination survey and collecting the travel data. The additional data including socio-economic and other detail has also been collected to be useful for forecasting traffic and transportation growth.

IV. ANALYSIS

To decide the actual desire of the road user and to find the necessity of various Traffic Management Systems, origin and destination survey has prepared. The survey has been carried out from villages within the Naya Raigarh and existing Raigarh city. To survey O&D, the geographical area of the city has been analyzed. The total city is divided into 11 major chauk which connect the major points of the city. The major road is again divided into 4 zones.

1) *Zone 1:* Chakradhar Nagar
2) *Zone 2:* Jute mill area
3) *Zone 3:* JSPL area
4) *Zone 4:* City center

a) *Zone 1-* The road which links the Chakradhar Nagar and Gopi talkies road through Kelo Bridge has the only way which connects the one to the other side of the river. The traffic is more during the peak hours like the government offices, colleges, the amusement park is located in this zone. One of the major problems faced by the passenger is the railway crossing due to which frequent jam occurs and accidents are common. As these roads have high traffic volume so, an overbridge can be provided in that area which can link Chakradhar Nagar and marine drive.

b) *Zone 2-* The traffic volume for the road linking the Subhash Chowk and the Transport Nagar is very high. The fly-over bridge extending up to the jute mill area has high-density daily ridership which reduces traffic on the other roads which are mainly congested with narrow lanes.

c) *Zone 3-* The road which links Kewdabadi and the JSPL has high-density mixed traffic. The thickest line in the desire line chart shows this road. As this road link the industries and the city, the movement of the heavy vehicle and the public transport are large in density. Due to the diversion through the by-pass road, the heavy vehicles are diverted to the by-pass road.

d) *Zone 4-* The high-density traffic is along the Station Road to the Kevdabadi because of lots of movement of autorickshaw, bikes, cars, etc. from Railway Station to the Kevdabadi. This is the only road which links the main chauks i.e. Ghadi chauk and Handi chauk.

Table 2 Data collection from Road users

Origin and Destination Survey											
Sl. No.	Name	Address	Member	No. of Vehicles	Bycycle	2 Whee	4 Wheels	Heavy	Origin	Destination	No. of trips/day
1	P r Sao	Village- Aurda, Raigarh Chhattisgarh	10	7	2	3	2		Village- Aurda, Raiga	Raigarh	2
2	Janak ram sao	Village- Aurda, Raigarh Chhattisgarh	16	5	2	3			Village- Aurda, Raiga	Raigarh,Pussor	4
3	dileshwar sao	Village- Aurda, Raigarh Chhattisgarh	5	4	3	1			Village- Aurda, Raiga	Pussor	4
4	usat ram shriwas	Village- Aurda, Raigarh Chhattisgarh	3	1	1				Village- Aurda, Raiga	Mauhapali	2
5	dileshwar sahu	Village- Aurda, Raigarh Chhattisgarh	5	4	1	1	2		Village- Aurda, Raiga	Raigarh,Pussor	2
6	jitendra sahu	Village- Aurda, Raigarh Chhattisgarh	5	4	3	1			Village- Aurda, Raiga	Raigarh, Pussor,Kodatari	6
7	arjun kumar saao	Village- Aurda, Raigarh Chhattisgarh	4	2	1	1			Village- Aurda, Raiga	Raigarh, Pussor,Kodatari	4
8	lochan prasad sao	Village- Aurda, Raigarh Chhattisgarh	16	7	3	3	1		Village- Aurda, Raiga	Raigarh,Kodatarai	4
9	tejram	Village- Aurda, Raigarh Chhattisgarh	9	3	1	2			Village- Aurda, Raiga	Raigarh	2
10	hariram ogre	Village- Aurda, Raigarh Chhattisgarh	10	3	1	2			Village- Aurda, Raiga	Raigarh, Pussor,Kodatari	2
11	umashankar sao	Village- Aurda, Raigarh Chhattisgarh	9	4	2	2			Village- Aurda, Raiga	Raigarh, Pussor,Kodatari	6
12	santosh Sao	Village- Aurda, Raigarh Chhattisgarh	11	6	5	1			Village- Aurda, Raiga	Raigarh	2
13	babulal satnami	Village- Aurda, Raigarh Chhattisgarh	10	3	3				Village- Aurda, Raiga	Raigarh	3*2
14	uddhav lal sao	Village- Aurda, Raigarh Chhattisgarh	10	6	2	2	2		Village- Aurda, Raiga	Raigarh,Kodatarai	2*2=4
15	hemsager sanwani	Village- Aurda, Raigarh Chhattisgarh	4	1		1			Village- Aurda, Raiga	Raigarh	2
16	raju sanwani	Village- Aurda, Raigarh Chhattisgarh	5	3	2	1		0	Village- Aurda, Raiga	Raigarh	2
17	vijay sanwani	Village- Aurda, Raigarh Chhattisgarh	4	1	1				Village- Aurda, Raiga	Kodatarai	2
18	shyam sundar	Village- Aurda, Raigarh Chhattisgarh	4	2		2			Village- Aurda, Raiga	Raigarh,Kodatarai	2
19	chantdramani patel	village- Jakela, Raigarh Chhattisgarh	5			1		1	village- Jakela, Raigar	Raigarh,Ghrgoda,Kodatari	2
20	surendra patel	village- Jakela, Raigarh Chhattisgarh	5	1		1			village- Jakela, Raigar	Raigarh	2
21	bharat lal	village- Jakela, Raigarh Chhattisgarh	6	3	1	2			village- Jakela, Raigar	Sariya,Pussorr,Raigarh	4
22	fulchand	village- Jakela, Raigarh Chhattisgarh		4	2	2			village- Jakela, Raigar	Pussor,Kodatari	4
23	makhanlal pradhan	village- Jakela, Raigarh Chhattisgarh	3	3	2	1			village- Jakela, Raigar	Raigarh	2
24	malikram	village- Jakela, Raigarh Chhattisgarh	4	1					village- Jakela, Raigar	Raigarh	2
25	jagmohan	village- Jakela, Raigarh Chhattisgarh	5	2		2			village- Jakela, Raigar	Raigarh	3

V. CONCLUSION

It can be observed from the origin and destination survey that there are one or two roads in the maximum case in each zone which carries the bulk of the traffic in the city, the major ones being the Railway Station Road, Handi Chauk Road, Jindal Road, Gopi Talkies Road, Chakradhar Nagar Road and Kotra Road. Most of the roads in the city are riddled with the same issues, the major ones being the absence of pedestrian footpaths and a traffic signal system, presence of mixed traffic, less pavement width as per traffic volume, absence of traffic facilities, and absence of drainage facilities and encroachment of pavement width. These roads can be given high priority for up-gradation and enhancement in the due course of time as these would be the major roads where future public transportation and mass transit routes would be proposed and planned.

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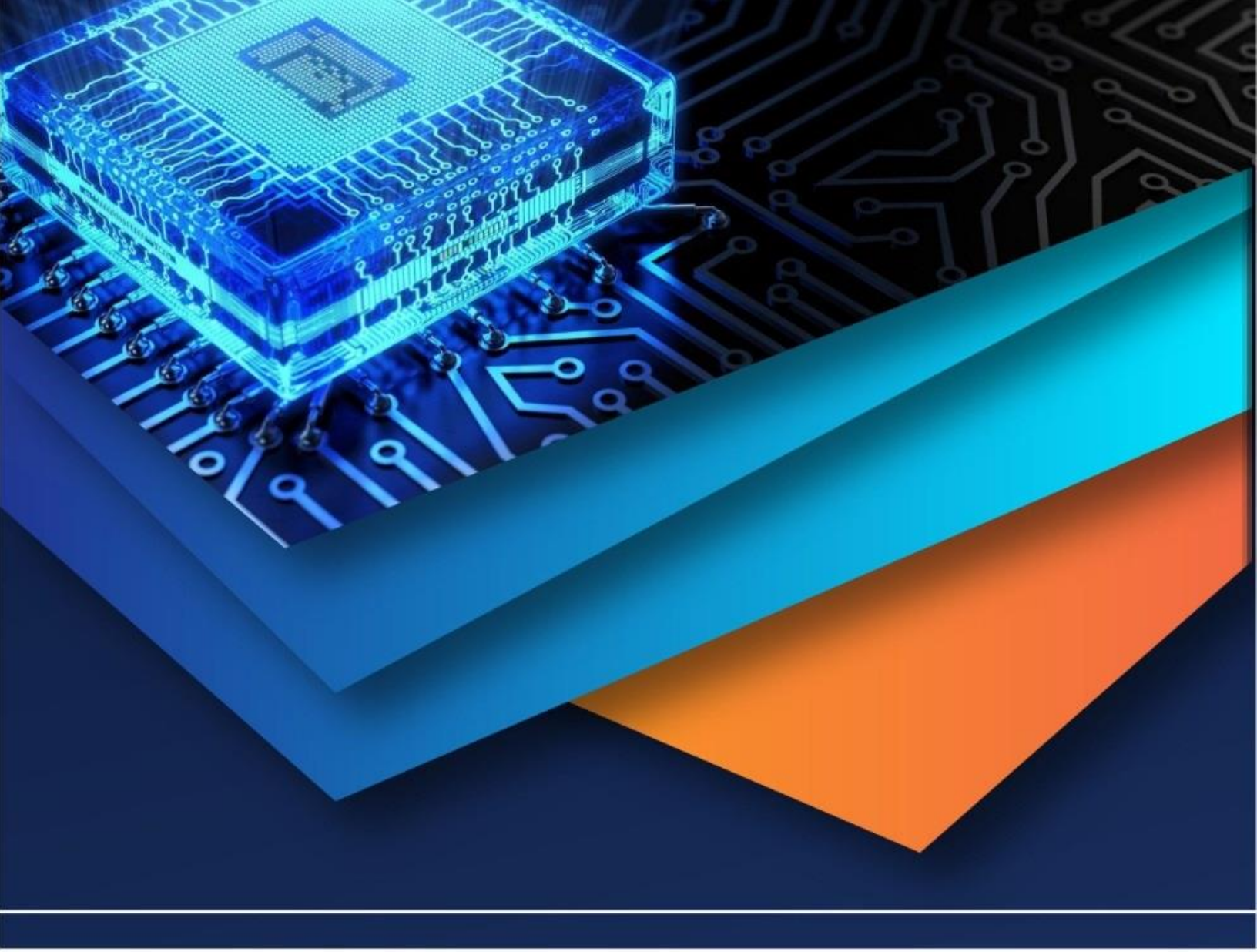

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