Original Research Paper

Urban Planning

TRAFFIC CONGESTION IN BILASPUR MUNICIPAL AREA

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ABSTRACT   Major metropolitan passages in Indian urban communities are conveying fundamentally high traffic prompting close to immersed conditions for broadened top hours. As blended landuse and significant excursion drawing in/creating foundations are by and large situated along such passages for better availability, huge side grating is likewise seen along these hallways. Indian urban areas have been seeing a fast expansion in vehicular populace, particularly close to home vehicle, in the new past. Given the requirements in expanding street widths, this increment in vehicles has brought about a radical drop in degrees of administration on metropolitan streets. Though gridlock disturbs business exercises and diminishes usefulness level, research has shown that it might likewise be an image of development in an economy. As the economy develops and genuine pay of family builds, vehicle populace floods up, adding to gridlock, especially inside urban areas. Gridlock is a never-ending issue for the supportability of transportation advancement. Gridlock creates setbacks, burden, and monetary misfortunes to each part of advancement of a metropolitan space, just as air contamination, commotion contamination and so forth Recognizable proof and evaluation of gridlock are critical for leaders to start moderation techniques to further develop the general transportation framework's maintainability. The traffic congestion is presently concentrated near the market places, schools, colleges and government offices at peak hours. To ease traffic congestion, identifying the state of road traffic should be considered first. The sequence steps targeted traffic facilities or the traffic management measures. Even though the road development authorities are trying to keep pace with the developmental activities of the city, the threshold has been reached and new solutions to control the traffic congestion has to be taken. No sooner will the state of roads in Bilaspur be like the highly congested roads of Raipur the neighbouring city. If appropriate measures are not taken at the right time, it will be a never ending problem, as roads cannot be widened at a later stage.

KEYWORDS :

1. Introduction:
1.1 Bilaspur Planning Area:
Bilaspur city is the second biggest city in the province of Chhattisgarh, arranged at 113 km (70.2 miles) north of the state capital, Raipur. The topographical region of the city according to Master plan, 2031 is 34,580 hectares with a populace of 3, 30,106 (2011 Census). The High Court of Chhattisgarh is additionally situated in the city, subsequently, naming it the Nyaydhani (Legal Capital) of Chhattisgarh. Other than this, it is additionally a significant city for Indian railroad. Bilaspur is the zonal Headquarters of South East Central Railway which involves Bilaspur, Nagpur and Raipur Divisions. It is third cleanest and fourth longest rail line station in India.

1.2 What is Traffic?
Traffic on street comprises of street clients including walkers, ridden or grouped creatures, vehicles, road vehicles, transports and different movements, either separately or together while utilizing the public method of direction the movement. Coordinated traffic by and large has grounded needs, paths, option to proceed, and traffic signal at convergences. Traffic is officially coordinated in numerous purviews, with checked paths, intersections, convergences, exchanges, traffic lights.

1.3 What is Traffic Congestion
The convergence of the financial potential and populace in the metropolitan regions brings about the event of exceptionally huge vehicle needs in a spatially restricted region, and when these requirements are met simultaneously, the blockage happens. This applies to blockage in regard of both the street organization and the vehicles. Critical disparities between the vehicle needs and the conceivable outcomes of their gathering at the ideal degree of value can be seen. Traffic congestion in Indian metropolis roads is extended enormously due to the growing rate of urbanization. Globalization of the Indian financial system and the improvement in economic fame of the residents has as well brought on better effect on the transport system. Growing insufficiency of public transport, growing price of automobile ownership and immigration of people to city outer edge has brought about big use of private modes, congestion the road system. Traffic congestion in metropolis areas has broad problem observed by people of Central Business District (CBD), except it has now stretched and intensified within the city periphery and close via suburban are as additionally. The congested traffic flow has led to enlarge in vehicular emissions which have spoiled the urban air superiority. Traffic congestion has a ways achieving multiplying possessions on the economic, climate, environment and universal exceptional of lifestyles. Now not any of the cities in India has an affordable stability of the modal divide of diverse transport modes.

1.4 Fundamental Reasons For Congestion:
1-Too numerous vehicles for the street because of lacking mass travel choices or different reasons.
2-Obstacles in the street causing a blockage and consolidation. These can be any of the accompanying:

On street stopping
Street work
Path conclusion because of utility work
Street reducing
A mishap

3-Traffic flags out of sync ordinarily deliberately or infrequently when the PCs are failing.
4-Inadequate green time
5-Too numerous walkers crossing not allowing vehicles to turn
6-Too many trucks out and about because of deficient rail cargo openings
7-Overdevelopment in regions where the mass travel framework is as of now packed and the street framework is deficient.
8-Increasing populace and in-satisfactory dispersion of land use can be the main element of gridlock

2. Literature Review:
2.1 Introduction-
During the beyond couple of many years, there has been an expanding interest for quicker portability which prompts expanded vehicular use which thusly drives advancement of more number of thruways. Such advancement acquires advantages to society terms of quicker versatility and simple openness. Anyway then again it forces its own expense straightforwardly on giving vehicle administrations like foundation, staff, gear costs and in a roundabout way as far as the effect on the climate, most quite commotion and air contamination; make a trip delay because of gridlock; and the death toll and property harm because of street mishaps. This proposition centers around two significant parts of street transport exercises to be specific: gridlock and street mishaps in Bilaspur city.

The longing to show up at the genuine speedy prompts wild driving in the city and Indiscretion of traffic rules which prompts less limit to

lethal accidents. With no exclusion a couple of bits of National Highway roads, State Highway and Major District Highway of Bilaspur are fundamentally Hotspots and a couple of bits of the roads are particularly interstates. Central marks of Road setback and gridlock to complement further have attracted the thought of various specialists of different districts of the planet during the last four to fifty years.Both gridlock and street mishaps involve a conservative and enthusiastic seat on society, diminish the effect of gridlock and mishaps. An extreme arrangement is diminish both the clog and in this way mishaps at the same time. To build up connection between gridlock and street mishaps stays vital. A few creators from UK investigated on the connection between the gridlock and street mishaps. Shefer (1994) and Shefer and Rietveld, 1997 proposed a theory that there is an opposite connection among blockage and mishaps. In a less blocked street organization, the normal speed of traffic would be regularly high which is probably going to bring about more street fatalities; then again, in a clogged street organization, traffic would be increasingly slow reason less fatalities. This expanded gridlock might prompt more mishaps because of expanded traffic volume; in any case, those mishaps might be less serious. This recommends that the complete outer expense of mishaps might be less in a blocked condition comparative with an uncongested condition. Thusly, gridlock might further develop street wellbeing. In any case, gridlock diminishes portability which in this manner diminishes financial efficiency. However this theory needs an exact confirmation with genuine information.

Several other authors Baruya (1998), Noland and Quddus (2005) and Kononov et al. (2008) who investigated the effects of traffic congestion on road accidents using real-world data and econometric models such Poisson or negative binomial regression models. However a weak proxy was used in their studies for traffic congestion, such as the "proportion of vehicles slower than half the speed limit", differences between spatial locations, employment density and level of traffic flow. These proxies may not appropriately or truly represent levels of traffic congestion, and thus the results from econometric models may be biased. Since improving road safety is an important objective for transport policy makers, considerable development has to be made in all aspects of the road transport system which involves three main parties:

(i) Roads (for which government, local authorities and roadway infrastructure engineers are responsible);
(ii) Vehicles (for which vehicle manufactures and vehicle owners are responsible); and
(iii) Road users (for which drivers, passengers and pedestrians are responsible).

Henceforth an accident analysis involving all the above said factors is the pre- requisite for effective planning. Various other factors that may affect road accidents

also need to be evaluated and controlled for, such as traffic flow and road geometry such as horizontal curvature, gradient and number of lanes. Therefore to effectively improve road safety (in terms of both accident frequency and severity, see discussion below), it is necessary to fully understand what and how these factors affect road accidents. Once the risk factors are identified, government or transport policy makers can develop corresponding measures to improve road safety. As such, this thesis examines the impact of traffic congestion on road accidents while controlling for various other factors that may affect road accidents.

2.2 GIS in Traffic Congestion-
A GIS offers a productive method for entering, making due, recovering and showing spatial information. The parts of a GIS-based framework are equipment, programming, information, methodology and individuals. The information incorporates realistic components and non-graphical components. For instance, the realistic component might be a guide of the street framework and the non-graphical component might be a quality table of street attributes. In methodology, examination and factual strategies, different questions, and information security issues may likewise be incorporated. Individuals included incorporate directors, PC researchers, organizers, specialists and information users.A GIS-based framework is a decent apparatus that can be utilized to oversee and control all transportation related information for the administration frameworks. As per Rao, A.

M. (2014), "Geographic Information System, throughout the long term, has arisen as one of the effective mechanical apparatuses in the field of transportation designing. It has shown incredible applications in various fields including transportation. Progressively, metropolitan and transportation organizers and experts are observing that the mix of conventional transportation research strategies with the additional worth of GIS capacities including incorporation of geological spatial-examination and map making, gives a vigorous stage to both customary and imaginative transportation and traffic exercises. The different benefits of GIS make it an alluring choice to be utilized to confront the arising traffic issues. The upside of GIS can be ascribed to its ability to adapt to the enormous volume of information with geographic spatial qualities. GIS has an enormous information base stockpiling limit, which can coordinate information from divergent sources. While working with traffic speed, coordinating spatial and non-spatial information from various sources turns into a great concern. In addition, alongside incredible information combination capacities, it is additionally an extraordinary representation instrument as it produces important guides aiding dynamic process."As per Spear, B. D. (1992) "Geographic Information Systems (GIS) are significantly more than PC produced maps. A GIS is a complex information base administration framework planned explicitly for spatially referred to information, Using area as the normal reference, a GIS empowers one to show various data sets as layers on a guide and afterward join information in one layer with that in another utilizing topological relationship. For instance, with a GIS a travel organizer can overlay a proposed transport course on an area information base of enumeration parcel populace and decide the expected market of transport riders dwelling inside a quarter mile of the transport course. Since transportation is intrinsically a spatial action, GIS is especially appropriate to be a stage for overseeing a large part of the information utilized in transportation applications. Also, quick advances in microcomputer and illustrations workstation innovation during the beyond couple of years have moved GIS from the centralized server climate to the work area of the transportation proficient, where it is developing into a fundamental investigation apparatus very much like the word processor, bookkeeping page, or information base chief."

2.3 World Wide Traffic Related Death Rates-
- The yearly worldwide street crash insights according to the Association for Safe International
- Street Travel (ASIRT) is as per the following:
- Almost 1.3 million individuals kick the bucket in street crashes every year, on a normal of 3,287 passings per day
- An extra 20-50 million are harmed or incapacitated.
- The greater part of all street traffic passing's happen among youthful grown-ups in the age bunch 15-44.
- Street car accidents rank as the ninth driving reason for death and record for 2.2% of all passing's universally.
- Street crashes are the main source of death among youngsters ages 15-29, and the subsequent driving reason for death worldwide among youngsters ages 5-14.
- Every year almost 400,000 individuals under 25 pass on the universes streets, on normal north of 1000 per day.
- North of 90% of all street fatalities happen in low and center pay nations, which have not exactly 50% of the world's vehicles.
- Street crashes cost USD $518 billion around the world, costing individual nations from 1-2 percent of their yearly GDP.
- Street crashes cost low and center pay nations USD $65 billion yearly, surpassing the aggregate sum got being developed help.

2.4 Road and Road Users
Daganzo, C.F. (1997), formulated a Simple traffic analysis procedure. The study discussed a simple approximate procedure for traffic analysis that can be described geometrically without calculus. He divided article into two main parts: section one focuses on queued traffic, and section 2 which extends the results to mixed traffic. This yields the total vehicle-hours and vehicle-miles of travel in a time interval, and the vehicular accumulation as a function of time. The predictions made with this method should be practical and easy to test. The method is somewhat more complicated but also more general than that in Newell. The paper shows that the particular one works within certain tolerances, and that errors in the model parameters also have a limited effect. These results can help discriminate between model errors and calculation errors in a validation effort. The second part of the article examines traffic streams that include queued and unqueued traffic, as well as bottlenecks. In this model, simulation with multiple vehicle classes, drivers that wish to travel at different speeds and

certain rules of a simulation with multiple vehicle classes. The bottleneck models are assumed to have a well-defined capacity and always to allow the maximum possible flow consistent with: the availability of upstream traffic, the presence of a downstream queue and the capacity. The capacity can be time-dependent and endogenous. Dholiya, P. and Shinkar, P. (2016), conducted to identify the accident prone location on the selected stretch and improvement suggested based on Accident Servility Index (ASI) method and the authors identified top most 3 accident prone stretches.

3. Profile Of Study Area
3.1 Planning Area-
Bilaspur city is the second largest city in the state of Chhattisgarh, situated at **113** km (**70.2** miles) North of the state capital, Raipur. The geographical area of the city as per Master plan, 2031 is **34,580** hectares with a population of **3,30,106** (2011 Census). The High Court of Chhattisgarh is also located in the city, thereby, naming it the Nyaydhani (Legal Capital) of Chhattisgarh. Besides this, it is also an important city for Indian railway. Bilaspur is the zonal Headquarters of South East Central Railway which comprises of Bilaspur, Nagpur and Raipur Divisions. It is 3rd cleanest and 4th longest railway station in India.

3.2 Location-
Geographically the state of Chhattisgarh can be divided into three broad regions. The Northern hills, the Central Plains, and Bastar Plateau. Bilaspur is in the north of Central plains. Bilaspur is situated on the banks of the rain-fed Arpa River. Which originates from the high hills of the Maikal Range of Central India. Its cardinal point is **22'05"** north latitude and **82'25"** east longitude.

3.3 Regional Connectivity-
The Bilaspur locale is encircled by Koria region in the North, Shahdol area of Madhya Pradesh in South, Raipur region in the East and Korba, Janjgir - Champa areas in the West. The city is associated with Mumbai and Kolkata through National Highway organization. Bilaspur is on NH-130 associating Raipur and Ambikapur. While NH-49 beginnings from Bilaspur and closures at Kharagpur another public thruway NH 130 An is recently reported what begins from Bilaspur and end at Podi through Mungeli Kawardha converging with NH 12A to associate Bilaspur with Jabalpur. Other public expressways are SH 7 and SH 5.

Distance From Bilaspur	Name of Major Settlement
20 - 40	Kota, Akaltara, Pamgarh,Takhatpur
41 - 60	Kotami, Lormi, Mungeli, Nawagarh, Bhatapara, Nandghat, Baloda Bazar, Kasdol, Shivrinarayan, Janjgir - Champa, Kusmunda.
61 - 80	Amarkantak, Pandaria, Bemetara, Simga, Neora, Kharora, Nawagarh, Jaijaipur, Korba, Katghora, Gaurela, Pendra.
81 - 100	Pasan, Puta, Kure kela, Sakti, Malkhurda, Sarsiwa, Pithora, Tumgaon, Berla, Saja, Kawardha

3.4 Land Use Distribution-
Land use is important to govern the growth of the different activities. Certain percentage of land is reserved for different activities. This helps in balancing all the activities and avoiding excess of a particular activity. It also helps in pollution management by segregating different activities by means of certain restrictions and regulations called as zoning, categorization of permissible.

3.5 Existing Land Use
The existing land-use observed in study area is predominantly residential 45.5% followed by industrial 12.3%, Traffic & Transportation 19.4%, Public & Semi-Public 15.5%, Recreational 1.4% and commercial 5.9%.and non-permissible activities, conforming and non-conforming land uses etc. Land use planning in master plan is binding for all the activities and no development should take place which do not conform to the assigned land use. Bilaspur Development Plan 2011 has been prepared under which land use categorization is given.

3.6 Proposed Land Use-
The Proposed land-utilize saw in concentrate on region is prevalently private 40.3% followed by modern 16%, Traffic and Transportation 15.85%, Public and Semi-Public 13%, Recreational 9.9%, Commercial 5%.
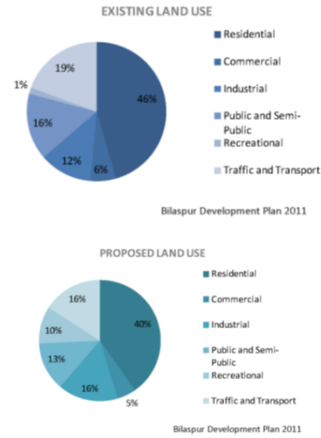

Bilaspur Development Plan 2011

Bilaspur Development Plan 2011

Table Land use

S.NO	LAND USE	Existing 1998			Proposed 2011		
		AREA	%	Density rate	Area	%	Density rate
1	RESIDENTIAL	706	45.5	2.21	5	40.3	3.25
2	COMMERCIAL	91	5.9	0.28	242	5	0.4
3	INDUSTRIAL	191	12.3	0.6	786	16	1.28
4	PUBLIC SEMI PUBLIC	240	15.5	0.75	624	13	1.04
5	RECREATIONAL	21	1.4	0.06	478	9.9	0.8
6	TRAFFIC AND TRANSPORT	301	19.4	0.94	768	15.8	1.28
	TOTAL	1550	100	4.84	2903	100	8.05

4. Suggestions:
- The city is expecting an increase in its population due to the prospects from increasing number of Coaching institutes and favorable climate. This will lead to more traffic congestion that must be foreseen at the appropriate time before the situation goes out of control. From the research outcomes and the questionnaires to the users and experts suggests the following measures in controlling the traffic congestion and in reducing the fatality from accidents in Bilaspur City:
- The city has several bus stops adjacent to the traffic signals that causes traffic jams. The location of bus stops near the intersection of two or more roads or near traffic signal points must be relocated.
- Scientific speed control humps has to be installed near the premises of Schools and accident prone areas to avoid over-Speeding of vehicles. Streets that join the major roads should have humps before intersection, if signal lights are not 141 installed. This will allow vehicle entering the major road to reduce speed and observe other vehicles on the major roads.
- Humps in road can help reduce the speed of the vehicles. On the other hand, it also leads to accidents as many do not observe it immediately. Whereas, a 3D hump, that looks like a hump but not a hump in reality, can be a better solution in major roads like National Highways and Ring Roads.
- Roads with high density of vehicles and limited road width should allow only one way traffic to avoid congestion.
- Posts or bollards can be placed to restrict access to large vehicles in roads and to slow down the speeding vehicles, especially in residential areas. But, there must be an alternative route available for large vehicles such Fire Engines and Emergency Service vehicles.
- Traffic police must create awareness in the importance of following traffic rules as many drivers in the city do not follow them properly. They must ensure that the licenses are issued to competent drivers only and that they are trained well.

5. Conclusion-
The city of Bilaspur has a well-connected network of roads. In the Maharaja's period, the roads in Bilaspur were very less. Bullock carts and Tonga (cart pulled by horses) were the only means of transportation in this period. Slowly, the city expanded and the need for transport increased. No private and public vehicles were available except for few vehicles owned by the Maharaja himself for his own

use. The roads were very narrow and congested then, but during the British rule, the four major roads were developed in the city for the administrators to travel.

After the independence, the government had established several educational institutions in the city that attracted several people to the city, increasing the demand for more road transport. By the year 2000, several industrial areas(NTPC and SECL) were also developed. The city also became a favorite tourism centre. The city grew faster and so did the road network. But the limitation to widen the roads and curbing on the increasing vehicular density has troubled the city. New residential layouts are developing faster than ever before that will add pressure to the city's transportation.

Even though the road development authorities are trying to keep pace with the developmental activities of the city, the threshold has been reached and new solutions to control the traffic congestion has to be taken. No sooner will the state of roads in Bilaspur be like the highly congested roads of Raipur the neighboring city. If appropriate measures are not taken at the right time, it will be a never ending problem, as roads cannot be widened at a later stage.

The traffic congestion is presently concentrated near the market places, schools, colleges and government offices at peak hours. The total number of vehicles in the year 2003-04 was only 10,912, which had increased to 60,100 in the year 2015-16. This statistics is only the registered vehicles in Bilaspur Transport Office, but the number of vehicles plying in the roads of Bilaspur is much more than this, as the city roads has vehicles that are registered from other cities and states around Bilaspur that comes with immigrants.

The availability of data is an important factor for every research, especially for studies like road traffic accidents. Registering every accidents and maintaining proper databases with accurate locations would help the assessment of accident incidents. Further research can be conducted to create models in GIS to assess, forecast and manage the congestion in the city.