

**GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES**  
**REMEDIAL MEASURES OF TRAFFIC CONGESTION FOR CENTRAL BUSINESS**  
**DISTRICT AREA- A REVIEW**

Sachin N. Kalbende<sup>\*1</sup>, Dr. Prafulla J. Wadhai<sup>2</sup>, Prof. Akshay Gulghane<sup>3</sup> & Prof. Sujesh D. Ghodmare<sup>4</sup>

<sup>\*1,2,3&4</sup>Civil Engineering, G.H. Raisoni C.O.E., Nagpur, India

**ABSTRACT**

The center of the city is the center of all major activities that reflect the culture of the urban center in the most holistic way, and often have a unique functional significance. Such centers work through transport nerves and several nodes. So I wish to choose a CBD city where the available physical infrastructure within the CBD cannot be further expanded and want to find remedial measures for the same, because it is need to manage available resources and make the most of it. This paper consists of the review on various researches and the work done by various persons to find out the ways to minimize the traffic congestion in CBD areas, which further helps me to find out the best remedial measure for my selected CBD area.

**I. INTRODUCTION**

Traffic congestion has been one of the major problems that most metropolies are competing, so many measures have been taken to ease congestion. The identification of congestion characteristics is believed to be the first step in this effort as it is a necessary guide to the selection of appropriate measures. Crowding in perception and reality - affects the flow of people and goods and is closely related to the high level of accessibility and mobility history. Traffic congestion wastes time and energy, causing pollution and stress, reducing productivity and bringing costs to society.

There are two main categories of congestion reasons: micro-level factors (such as those related to road traffic) and macro-level factors related to the overall demand for road use. Congestion is "triggered" at the "micro" level (eg, on the road), and factors that are "driven" at the "macro" level lead to the incidence of congestion and its severity. The micro factor is. E.g. Many people and cargoes have to move at the same time, and the vehicle space is limited. Many trips may be delayed by irregular but frequent events: accidents, vehicle breakdowns, unreasonable traffic signals, large-scale social gatherings, political gatherings, bad weather and other special events that cause various traffic congestion problems. On the other hand, macro-level factors, such as land use patterns, employment patterns, income levels, car ownership trends, infrastructure investment, and regional economic dynamics, may also lead to congestion.

The core of the city is the center of all major activities, reflecting the metropolitan culture in the most comprehensive way, with functional significance. In the old cities, the space used for transportation has remained largely unchanged over the years, and the demand for such space has experienced a huge rise. The old city center has such physical characteristics that it is not allowed to improve innovation and functionality. Therefore, one of the main tasks of the Planning Association is to study changes in the existing infrastructure to better manage it, especially the CBD.

**II. LITERATURE REVIEW**

Satyakumar M., Anil R., and Sivakumar B. (Civil Engineering Dimension, Vol. 16, No. 1) March 2014[1], In this research paper, researchers attempted to use mobile phones for cost-effective travel time estimation and prediction methods. Researchers say many applications or alternatives can be developed in India, using existing infrastructure itself rather than building new infrastructure on valuable urban land, where local detectors are used to measure speeds at specific points along the road surface. Due to installation and maintenance costs, such detectors are installed in relatively small sections, which results in limited coverage of the entire transportation network. Moreover, the simple measurement speed at any particular point along the road is not easy to portray various traffic

interruptions as delays, stagnation points. Another method used is video observation, but this method takes a lot of time for further explanation and analysis. To overcome these problems, the Advanced Traveler Information System (ATIS) has recently been developed to provide real-time information to road users and help them make decisions, such as route selection, departure time selection, and more. The Variable Message Sign (VMS) (evaluated by Sutandi) is one of the Intelligent Transportation Systems (ITS) for crowded roads. All of these alternatives require real-time information, and for this information, GPS can be very helpful for real-time traffic data information.

**Wasim Hashmi Syed, AnsarYasar, Davy Janssens, Geert Wets, (The 5th International Conference on Ambient Systems, Networks and Technologies) [2]**

In Pakistani cities, commuters are helpless in terms of cost and time due to traffic problems. The planned city of Islamabad with a population of 2 million (Gridiron model) was selected to collect data on 10-11 different commute running start and end routes. The Twin Cities in Rawalpindi are only a few kilometers away from Islamabad, so each city has about 100,000 commuters per day, causing many traffic problems and a lack of public transportation systems, adding more difficulties to them. Some obstacles observed bad behavior in commuting. There were no restrictions on establishing schools in the residential/main avenue area, road construction/repair, traffic signals were incorrect, and weather conditions such as rain/storm. For the above-mentioned special obstacles, a unique situation has emerged in the subcontinent and adjacent countries, which does not exist anywhere else in the world. Here, the study starts with a very basic approach and gradually compares the empirical data with the developed model; the model will be adjusted until there is a good predictive ability. The products developed are used to guide commuters on the path and help commuters reach their destinations at the lowest cost within the stipulated time. The start and end points of the commuters will be predefined and the route options will be provided to the commuters.

**Rakesh Kumar, Fatima Electricwala World Academy of Science, Engineering and Technology, International Journal of Civil. Architectural, Structural and Construction Engineering Vol:8 No:6 2014[3].**

In Indian cities, one of the main drivers of the BRT system is to reduce travellers' dependence on private vehicles and increase the share of public transport in sustainable urban transport systems. Since there is no non-motorized traffic (biking, walking), travel costs increase, but because of the high mortality rate, that is, 390,000 in 2001, the risk is extremely high. The increase in the number of bridges and bridges increases the speed of traffic and leads to high traffic deaths for pedestrians, bicyclists and 2-wheelers. According to the 2001 census, the city of Surat is considered to be a research area with an area of 312 square kilometers and a population of 2.4 million. The typical length of Surat is less than 6 kilometers. Due to the increase in per capita income and industrial reforms, the average speed is 20 kilometers per hour, which may increase. NMT shares rose 15%, while walking mode stocks rose 40%. Public transportation accounts for 3%, intermediate public transportation accounts for 11%, and motor vehicles account for 30%. The population of 2-wheelers and cars is 450 and 75 respectively. Surat's CCh emissions are estimated to be approximately 0.035 tons per capita per year. The selected study corridor is the Dumas holiday canal road - Sarthana-Jakatnaka Highway, which is 23.5 kilometers long and is used in combination. Transportation, ecological footprint is a resource management tool used to assess the area of land and water needed by the population. Obtain the resources it consumes and absorb its waste under the current transportation system.

**Todd Litman, "Smart Congestion Relief 24 March 2013, [4].** Traffic congestion refers to incremental delays and vehicle operating costs caused by interactions between vehicles, especially when traffic is close to road capacity. Traffic congestion and congestion reduction are a major issue and an important planning goal, using traditional methods to estimate congestion, such as road service levels and monetized congestion costs, in accordance with traditional planning. These methods have great weaknesses, such as:

Based on mobility planning, it is assumed that mobility itself is a purpose, not a way to achieve accessibility. They tend to ignore the effects of other forms of access, such as wider roads and faster vehicle traffic trends, to reduce non-motorized conditions and stimulate sprawl.

Measure congestion strength instead of total congestion costs. It ignores the traveler transfer mode or reduces congestion that is avoided when the vehicle's total journey is reduced. The travel time index even means that if the crowded vehicle travels, the congestion will drop.

Exaggerate the value of crowded monetization by using unrealistic baseline speeds and travel time costs. Neglect or underestimate the resulting traffic and induced travel impacts, including traffic congestion, traffic accidents, energy consumption, downstream pollution emissions and decentralized development patterns.

**Rao, Amudapuram Mohan, and KalagaRamachandraRao. International Journal for Traffic and Transport Engineering 2, no. 4 (2012): 286-305 [5]** Congestion can be measured in a variety of ways using different parameters. Speed is such a parameter. The peak period nominal speed is a weighted average of the speeds on the highway and the main road, which allows comparison of highways and major trunk road networks between urban areas. It is recommended to use the ratio of the peak period to the off-peak speed as a direct measure of congestion. There are many speed-based indices used to measure congestion. The Corridor Flow Index (CMI) measures the personnel carrying capacity of a corridor. The flow of people is the product of the flow of people and the number of people during peak hours. The CMI or turnover rate is defined as the product of the vehicle occupancy and travel speed during peak hours. The deceleration index measurement represents the ratio of the speed drop to the free flow condition.

**Todd Litman "Smarter congestion relief in Asian cities: Win-win solutions to urban transport problems", 2013[6]**, In most cities, traffic congestion is a major problem. There are many possible congestion reduction strategies that have significant indirect costs or benefits. Inclusive and multimodal analysis is very important when evaluating these strategies. The old planning paradigm assumes that traffic congestion is the most important urban traffic problem, and road expansion is the preferred solution. But congestion is actually a generally moderate cost, less than other transportation costs, such as vehicle costs, accident risks, parking costs and environmental damage, and road expansion may increase a large amount of indirect costs. Therefore, reducing traffic congestion in a way that increases these other costs would be detrimental. If you reduce other costs, the value of reducing congestion strategies is even higher. Chronic traffic congestion can be seen as an indicator of more basic transportation system problems, including inadequate transportation options, under- pricing and under-development. In this case, road expansion usually only provides short-term traffic congestion and often worsens traffic problems. Road expansion is also unfair to those who rely on walking, cycling and public transportation, so they do not directly benefit and are subject to increased traffic. A more effective approach is to reduce congestion plans, including improvements to alternative models, effective transportation pricing and pricing reforms, smart growth development and land use policies, and a combination of support activities.

Although they may only provide modest short-term congestion reductions, their effects are often synergistic (the total impact is greater than the sum of their respective impacts) and increase over time. Therefore, these win-win strategies are usually the most effective and fair. In developing countries where most residents rely mainly on walking, cycling and public transportation, a win-win congestion reduction strategy is particularly applicable. When choosing a solution to a congestion problem, decision makers and the public must understand these issues.

**Li Jie, Hcnk J. van Zuylen, (EWGT2013 – 16th Meeting of the EURO Working Group on Transportation), 2013[7]**, With the development of countries such as China, the transportation system is an important part of the social economic system. The high pressure of the transportation infrastructure can be seen on urban roads, with no difference between peak hours and off-peak hours. It is worth noting that the capacity of China's urban intersections seems to be 20% to 30% lower than Europe and North America (Li et al. 2012). Traffic safety is another problem in China because of the high number of road deaths. World Bank statistics China's per capita GDP has reached \$5.11 lakh crores (8.7%) in 2009. However, passenger car ownership is still at a low level in 2009: 47 cars per 1,000 inhabitants. Starting in 2009 China has become the world's largest auto market. In 2011, the vehicle sales volume was 18 million units, and the number of vehicles in China exceeded 100 million, making it the second largest vehicle country in the world. The rapid growth of vehicle ownership has also added new driving force. Only about 10% of drivers are over 50. There is evidence that younger drivers with limited driving experience are more at risk for more mature drivers, which has an impact on driving performance and safety. Many Chinese cities Attempts to reduce traffic growth through rationing (with a fixed quota for the number of cars in the city), road or congestion pricing, and vehicle usage restrictions (prohibiting the use of specific vehicles on specific dates).

**Sun Ye, (International Conference on Applied Physics and Industrial Engineering)2012[8]**, With the development of China's economy, urbanization has also followed, resulting in traffic congestion. If we do not take any measures to control traffic congestion, it will not only increase the cost of personal travel, but the entire municipal transportation system will be paralyzed and the sustainable development of the city will be limited. The core of traffic congestion is the imbalance between supply and demand. Increasing road supply can't solve problems effectively, so more and more experts hope to find new openness in demand management, and put forward many demand management methods, such as congestion charging (motor vehicles entering a certain region or at specific intervals will be charged) Special fee). The main purpose of congestion charging is to increase traveler's travel expenses, prompt people to choose the appropriate journey time and journey mode, disperse the time and space traffic demand, improve the overall speed of the vehicle, and guide the passengers to change the traffic structure and change the journey of the private car. The journey of transportation will alleviate the contradiction between supply and demand, realize the smooth flow of roads, achieve the purpose of reducing pollution, saving energy, and maintaining traffic safety, and realize the sustainable development of transportation and cities.

**Abhiram R. Supekar, April-June 2008[9]**, Traffic conditions are critical and confusing in millions of cities. The urbanization process is in progress. But the lack of infrastructure development, especially roads, road transport and public transport systems, has led to a personalization model. People encounter bottlenecks at intersections; violations lead to accidents, long journey times, air and noise pollution.

For this crucial problem, transport options are:

- Mass transportation system
- Avoid using 2 wheelers, automatic rickshaws, cars to reduce traffic for more than 3 million people; bus transportation can't cope with larger meters. Therefore, it requires high-density public transportation systems, such as suburban trains, Underground city. The city of Pune is a good example of the normality of this concept.

Due to current urban traffic conditions, more and more vehicles are causing traffic jams on narrow roads, especially in the different directions of cities from popular commercial centers, shopping malls, banks and other commercial establishments. Due to the traffic of the vehicles, traffic signals cannot effectively control traffic, resulting in road and road traffic accidents. Slow heavy-duty traffic causes air pollution, leading to diseases such as asthma and bronchitis. The public transport system is not sufficient to meet the needs of the public, so it is necessary to diagnose and analyze the situation.

**Todd Litman, "The Value of Downtown (Victoria Transport Policy Institute), 2013[10]**, The city centre (CBD) is a relatively small central pedestrian area that is the center of business, tourism and cultural exchanges. It plays an important role in the regional economy and identity. Since many important resources are within walking distance, many activities are effectively carried out in the city centre. It includes, inter alia, major financial and legal services such as banks, law firms, government offices, city halls, courts, and municipalities. Many CBDs also include entertainment and art events, and more and more downtown or adjacent residential developments. Until the middle of the 20th century, business activities in the city centre were close to major commercial activities, as commercial needs were close to major transportation hubs, but now many suburbs are developing more like traditional cities with walk able downtown. Urban development can reinvest in the area in the form of high-density apartments through new activities. Market research shows that about one-third of homebuyers prefer to live in mixed-use new urban communities (if any) . With proper support, the city centre can succeed and provide many economic, social and environmental benefits. The city centre has many unique features such as business and employment centers, tourism, agglomeration efficiency, traffic diversity, cultural exchanges, and affordability. Environmental and health benefits. The city centre seems unattractive because it is related to social issues such as poverty, crime and conflict.

**National Urban Transport Policy, 2006[11]**, The policy suggests providing more and more urban residents with safe, affordable, fast, comfortable, reliable and sustainable access to find work, education, entertainment and other needs in our cities. This is achieved in the following ways:

- Incorporating urban transportation as an important parameter at the urban planning stage rather than being a consequential requirement

- Encouraging integrated land-use and transport planning in all cities so that travel distances are minimized, and access to livelihoods, education, and other social needs, especially for the marginal segments of the urban population is improved.
  - Improving access of business to markets and the various factors of production
  - Bringing about a more equitable allocation of road space with people, rather than vehicles, as its main focus.
  - Encourage greater use of public transport and non-motorized modes by offering Central financial assistance for this purpose
  - Enabling the establishment of quality focused multi-modal public transport systems that are well integrated, providing seamless travel across modes
  - Establishing effective regulatory and enforcement mechanisms that allow a level playing field for all operators of transport services and enhanced safety for the transport system users
  - Establishing institutional mechanisms for enhanced coordination in the planning and management of transport systems.
  - Introducing Intelligent Transport Systems for traffic management
  - Reducing pollution levels through changes in travelling practices, better enforcement, stricter norms, technological improvements, etc.

### III. CONCLUSION

By reviewing the numbers of papers of many researchers i have differentiate the work of each researcher and make a remark of how their work is useful for my project work as follows:

Sr. No.	Author	Suggested Remedial Measures	Suitability and Standard
1	Satyakumar M., Anil R., and Sivakumar B	To overcome the problems they suggested to use Advanced Traveler Information System (ATIS)	Medium
2	Wasim Hashmi Syed, AnsarYasar, Davy Janssens, Geert Wets	To solve traffic problems they use special type of commentators which helps the peoples to choose correct and economical path to reach their destination.	Medium
3	Rakesh Kumar, Fatima Electricwala	His studies suggested that how to reduce the construction cost of bridge and road construction.	Low
4	Todd Litman	He suggest to adopt new and economical methods to estimate traffic congestion.	Medium
5	Rao, Amudapuram Mohan, and Kalaga Ramachandra Rao	He suggested to use The Corridor Flow Index (CMI) measures the personnel carrying capacity of a major corridor	Medium

Based on the review papers the work done by Stayakumar M. Anil R. and Sivakumar B. on use of Advance Traveler Information System to solve the traffic congestion problem is barely helpful in my project work. Also the methods suggested by Todd litman to estimate the traffic congestion is helps me to determine best and perfect method for the region which I will choose for my project work.

### REFERENCES

1. Todd Litman, "Smart Congestion Relief" - *Comprehensive Analysis Of Traffic Congestion Costs and Congestion Reduction Benefits*. Victoria Transport Policy Institute, 24 March 2013.

2. Rao, Amudapuram Mohan, and Kalaga Ramachandra Rao. "Measuring Urban Traffic Congestion-A Review." *International Journal for Traffic and Transport Engineering* 2, no. 4 (2012): 286-305
3. Todd Litman "Smarter congestion relief in Asian cities: Win-win solutions to urban transport problems", 2013
4. Li Jie. Henk J. van Zuylen, "Road Traffic in China" (EWGT2013 - 16th Meeting of the EURO Working Group on Transportation),2013.
5. Sun Ye. "Research on Urban Road Traffic Congestion Charging Based on Sustainable Development" (International Conference on Applied Physics and Industrial Engineering), 2012.
6. Abhiram R. Supekar."Transport option and traffic management in urban areas: Case study of Pune city.". April-June 2008.
7. Todd Litman. "The Value of Downtown "(Victoria Transport Policy Institute).
8. National Urban Transport Policy. 2006
9. Vendors and Informal Sector: A Case-Study of Street **Vendors** of Surat City, C. N. Ray, Assem Mishra. November 2011.