

A Review on Effective Solution of Traffic Congestion Concerns Arising in the Rewa City

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Abstract - Road traffic has increased exponentially in recent years, leading to issues including traffic jams, delays, collisions, and environmental damage. In both wealthy and emerging nations, traffic congestion is a real annoyance to society. It impacts users of both private and public transportation, and in addition to reducing economic efficiency, it has a host of detrimental social effects. This study reviews the several variables that contribute to traffic congestion, identifies the causes, and presents the effects of the congestion. The main approaches and corrective actions taken by different researchers and the government are examined. It is determined that the rise in the number of private vehicles per km is the most frequent cause of traffic jams. The primary causes of the congestion issue have been recognized as the vehicle to road capacity ratio, inadequate geometrical characteristics, poor lane discipline, insufficient road capacity for peak hour traffic, roadside parking, poor urban system planning, etc.

The most obvious result of congestion is longer travel times, particularly during rush hours. Moreover, drivers become agitated and behave violently when circulation moves slowly. It also leads to health issues and a rise in environmental problems. Positive outcomes in the form of less traffic, shorter travel times, and more effective traffic flow on city roadways are the aim of this review study.

Key Words: traffic congestion, traffic volume, traffic signal, SIDRA software, Rotary intersection.

1. INTRODUCTION

Numerous steps have been tried to reduce traffic congestion because it is one of the main problems that most metropolises face. Since it provides crucial direction for choosing the best solutions, it is thought that identifying the features of congestion should be the first step in such efforts. Both in theory and in practice, congestion affects the flow of people and goods and is closely related to the past of great accessibility and mobility. Traffic jams cost society money, reduce productivity, create stress and pollution, and waste time and energy.

Congestion usually happens when there is more traffic in each lane, which lowers vehicle speed. The current infrastructure cannot handle the increased traffic demand. The effective flow of traffic is also impacted by lane restrictions and roadside activities. A large portion of working hours are lost on the roads as a result of traffic congestion, which negatively affects the economy overall. India, one of the nations with the fastest rates of development in the world, has a huge number of cars, both private and public.

There are numerous types of traffic, including recurring and non-recurring traffic. Recurrent traffic eventually creates patterns of

congestion. For example, take into account the morning and evening rush hours, which occur every weekday in accordance with business and school hours.

Non-recurring traffic jams happen all at once and don't repeat. Examples include accidents and car breakdowns, public rallies, social gatherings, and traffic congestion brought on by the worst weather. Regardless of whether it occurs frequently or not, it needs to be tracked and prevention strategies put in place. Considering the many proposed solutions to the congestion problem, this paper compares various congestion approaches.

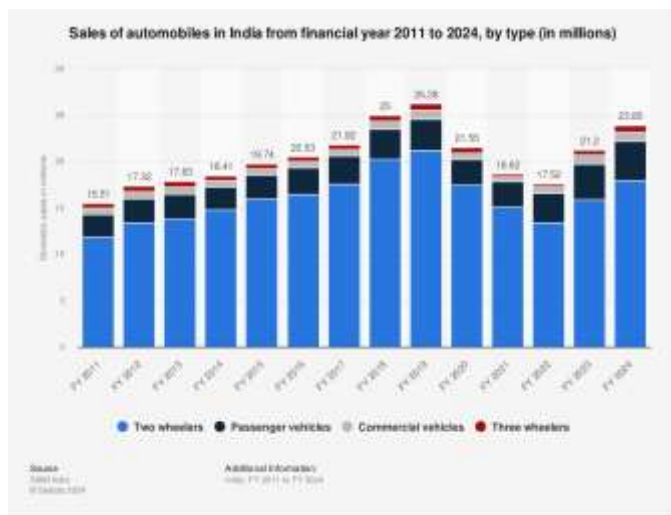
2. PROBLEM OCCURS DUE TO TRAFFIC CONGESTION:

After China, India has the second-highest population in the world. Because there are so many cars on the road, Indian cities are actually more crowded than those in any other country. It is common knowledge that traffic moves at the speed of its slowest element. India's traffic is diverse, and in addition to regular urban transportation, networks of two-wheelers, auto rickshaws, bullock carts, and hand-pulled rickshaws all significantly increase traffic.

Despite public transportation, the use of private vehicles is rising as a result of poor route connectivity. In India, it also contributes to traffic congestion. The congestion has also gotten worse due to a startling 100-fold increase in the number of motorized vehicles.

Among the main issues that were noted were uncontrolled on-street parking, illegal parking, encroachment of main carriageways, poor lane discipline, inadequate pedestrian facilities, poor public transportation quality, improper bus stop location and design, vehicles with a variety of operational and technological characteristics, traffic heterogeneity, and poor roadway condition.

As we've spoken about, traffic has grown to be a significant issue that makes daily life difficult. The causes of congestion are examined, and sources are identified.



3. CAUSES OF TRAFFIC CONGESTION

When cars either halt completely or travel slower than usual, traffic congestion results. Nobody finds the situation pleasant. Below is a discussion of some of the causes of traffic congestion:-

- **Narrow Roads:** Streets that are too narrow because to illegal possession on the road are contributing to traffic jams.
- **Illegal Parking:** Traffic congestion is caused by vehicles parked on the road.
- **Population growth:** As the population grows, so does the need for transportation.
- **Greater Public Purchasing Power:** India's citizens have more money, which is driving increasing demand for private transportation. However, the nation's existing highways and roads cannot accommodate or keep up with the increase in vehicles. As a result, traffic congestion is alarmingly increasing.
- **Inadequate city development planning:** Although many cities have long-term growth plans, they are not carried out correctly. Roadside land is frequently seen to have been illegally stopped, however these kinds of measures are ineffectual due to the ambiguous development plan.
- **Broken traffic lights:** When traffic signals malfunction, a traffic gridlock results. Because to a poor infrastructure for public transportation, there are far too many automobiles on the road. Road construction, accidents, double parking, and other issues are examples of road blocking impediments. overdevelopment in areas where mass transit systems are already overcrowded. Congestion has a number of negative effects, including increased travel time and economic loss. Since it is anticipated that the number of vehicles will grow significantly, it is vital to comprehend the causes of traffic jams.

4. CONGESTION IMPACTS

Congestion increases economic costs and affects urban regions and the people who live there by causing slower speeds, lineups, and longer travel times and reside there. The quality of life, stress levels, and safety of non-vehicular road space users, such

as those who utilize sidewalks and properties alongside roads, are all impacted indirectly by traffic.

One of the main causes of what is known as photochemical smog is the slow-moving cars in traffic jams, which also produce various nitrogen oxides and hydrocarbons that are released into the atmosphere. Below is a list of the impacts of congestion from earlier research.

- Travel time increase.
- Increased fuel usage results in fuel loss.
- Time loss because of unexpected traffic.
- Traffic congestion has an effect on the environment by released harmful gases.
- Shorter lifetime of the road surface.
- An increase in the price of vehicle maintenance as a result of mechanical component wear and tear.
- Impatient drivers may be more likely to drive aggressively and carelessly, which increases the risk of accidents.
- Negative psychological effects on individuals, which may have an influence on interpersonal relationships and work productivity.

In order to reduce the impacts of congestion few measures had been adopted by various researchers and authorities.

5. LITERATURE REVIEW

G. Palubinskas, et al. (2010) For the purpose of identifying traffic congestion, a new model technique for image time series obtained by an airborne optical 3K camera system is provided. It allows us to develop traffic parameters that includes both the average speed, one of the key traffic characteristics, and the vehicle density. Parameters like the start and end of congestion, how long it lasted, and travel times. The method relies on prior knowledge, a simple traffic model, and the recognition of vehicles on a road segment through change detection of two images with a short time lag. According to testing results, the proposed technology for identifying traffic congestion on roadways in along-track circumstances has a great deal of potential

K.R. Priyarakshitha (2018) The author concluded that if the majority of people of a particular city starts using the mass transport system, then the roadway congestion can be decreased. This is because the roadway area covered by a mass transport vehicle will be lesser than the area required by private vehicles owned by equal number of passengers. However, mass transportation will only be adopted by the people when its efficiency is high as compared to private vehicles. This efficiency could be money, travel time, safety, and comfort.

Babitha Elizabeth Philip et al. (2019) developed a queuing theory-based model for straight lines that helps in the effective movement of traffic flow and significantly reduces traffic congestion. The queue length created in the lane can be calculated with the help of the model. The smooth movement of traffic in the lane will be affected by the propagation of the queue back across the network when the flow in the lane exceeds the lane capacity. The survey data was used to create final samples, which were then examined to determine whether or not they were congested. There was discussion of the general causes, impacts, and remedies for traffic congestion.

S. Berrouk et al. (2020) It is suggested to use a fuzzy inference-based method to assess urban traffic congestion. The recommended fuzzy approach is used to calculate the levels of congestion using traffic data, including vehicle numbers, speed, etc. Uncertain problems can be solved using this technique. Three distinct measurements, the speed ratio, volume to capacity ratio, and decreasing speed ratio, each employ unique criteria to represent a certain aspect of the traffic situation. The suggested fuzzy inference method takes into consideration even the smallest variations in the input congestion measurements, and when combined with other methods, it creates a more precise picture of the traffic situation. Since it is based on natural-language principles that precisely reflect how drivers perceive the traffic situation, such a model has a higher level of accuracy. The suggested approach can be used to assess traffic on individual roads, arterials, or the entire highway network.

Md. A. Shah et al. (2020) It is important to find a solution for heterogeneous traffic on poor roadway of developing countries like India. A mathematical model is developed. The proposed effort involves modelling at a single traffic intersection and managing congestion using a minor lane bypass in a road network. The work was divided into two phases, the first of which involved conceptually modelling the proposed system using activity theory, and the second of which involved simulating the conceptually modelled system using MATLAB 7.0. It has been established that the results are both competitive and satisfactory.

Tsutomu Tsuboi (2021) uses shock wave theory to develop the "forwarding traffic congestion" and "stacking traffic congestion" models of traffic congestion. In this study, traffic data is collected every minute, around-the-clock, using traffic monitoring cameras. The equation is created using the critical traffic density (k_c) and jam traffic density (k_j) from the theory of traffic flow, and the shock wave is transmitted in both the forward and backward directions. When the shock wave value is zero, either there is no congestion and the traffic is moving smoothly, or there is complete gridlock and no movement. As a result, the definitions of $c > 0$ condition and $c = 0$ condition, respectively, are "forward flowing traffic congestion" and "stacking traffic congestion," respectively. These models can be used to explain why there is traffic congestion and suggest solutions for India.

Hazratullah Paktin et al (2021) proposed In order to achieve smooth traffic flow, reduce the number of accidents, and make the facilities pedestrian-friendly, traffic management policies and measures would be helpful. The solutions are produced in two stages, the first being shortterm actions and the second being medium- and long-term ones. Intelligent transportation systems and high-quality public transportation must be taken into account in plans for the medium and long terms.

Nawsheen Tarannum Promy et al. (2022) presented an automated traffic control system. Semi-structured interviews and a number of questions on the issues that cause severe traffic in the city were used in a study to identify requirements. The interview's goal was explained to the participants, who were then questioned about the issues that cause extreme traffic in the city. By visiting several sites, the requirements were determined based on answers. A mobile application for the suggested parking system and a hardware prototype were developed as two parts of the proposed automated traffic control and management system. The traffic control process is automated using this

system, saving time, money, and labour. The proposed system, which makes use of solar energy, will help increase public awareness of traffic regulations and ease congestion at a busy city's 4-way intersection.

6. SOLUTIONS TO REDUCE THE CONGESTION

A case study of Indore City offered a few workable ways to address the traffic issue, including extending the route, implementing a one-way regime, and creating a new alternate road segment. Roadway widening gives multilane highways more overall capacity, which in turn allows for faster vehicle flow per unit of time.

The authors of a study offered the following solutions: the construction of stops and stations for cars and buses, the assignment of stations in specific locations, the signalization of intersections, the management of these improvements, the improvement of bottleneck intersections, parking improvements, mid-block Uturning and right-turning points, the issuance of driving licenses to only professional drivers, the strict enforcement of traffic regulations, the necessity of informing all drivers in various ways to take the rules and regulations seriously.

The odd-even plan, a traffic restriction policy implemented by the Delhi government, permits private vehicles with odd registration numbers to operate on odd days and vehicles with even registration numbers to operate on even days. In order to outlaw cars, alleviate traffic, and lessen pollution from vehicles, steps were taken to expand public transportation, including more buses and more frequent metro service. The authors of a different research offered the idea of reducing traffic by prohibiting large commercial vehicles. Because there is now more room for other lightweight vehicles, the removal of large commercial vehicles led to smooth traffic flow. Although this regulation works very well, it is not applicable to city buses or commercial locations.

The main purpose of Traffic Management System (TMS) techniques is to improve traffic efficiency and safety on current roads in the short and medium term. Additionally, TMS maximizes the usage of already-existing infrastructure without harming the environment. These techniques are cost-effective. Road widening, the installation of control systems, modifications to the geometric design components, and restrictions on movement in specific areas are all part of traffic management.

WORLDWIDE SOLUTIONS Interventions to Reduce Traffic Congestion-

- Optimise traffic-light management
- Use CCTV to monitor road conditions
- Enforce existing road traffic laws
- Charge for workplace parking
- Improve cycling infrastructure
- Light rail
- Improve perceptions of buses
- Improve bus services

- Existing rail network
- Develop and refine park-and-ride
- Extend residents' parking zones
- Use Inbound Flow Control

The One-hit Solution-

- Widen roads
- Narrow roads
- Add bus lanes
- Build tunnels
- Remove bus lanes
- Make buses free
- Build a new ring road
- Build a light rail network
- Ban cycling • Switch off traffic lights
- Ban cars from city centres
- Build more car parks
- Close through-routes to private vehicles
- Close car parks
- Make park-and-ride free
- Build more park-and-rides
- Introduce a congestion charge/road pricing

7. CONCLUSIONS

One significant social issue that requires particular attention is traffic congestion. The material mentioned above comes to the conclusion that:-

- The primary cause of traffic congestion is the rise in the number of private vehicle owners per km of road or per million people.
- People use their own cars because there are insufficient facilities and connectivity for public vehicle users, which causes traffic congestion and, consequently, an increase in accidents every day.
- The primary causes of traffic jams include improper parking, main highway encroachment, inadequate pedestrian facilities, mixed traffic on one roadway, inadequate traffic management, inadequate traffic control, etc. Congestion can be reduced by implementing the following strategies, which include road widening, bottleneck intersection improvements, appropriate traffic management, adherence to traffic laws, public awareness campaigns, parking and pedestrian amenities, road maintenance, etc.
- Adding bus lanes, enlarging parking spaces, providing bus subsidies, imposing a congestion fee or other road pricing, banning private vehicles from utilizing through routes, and

other measures were among the options suggested by government representatives from all around the world.

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