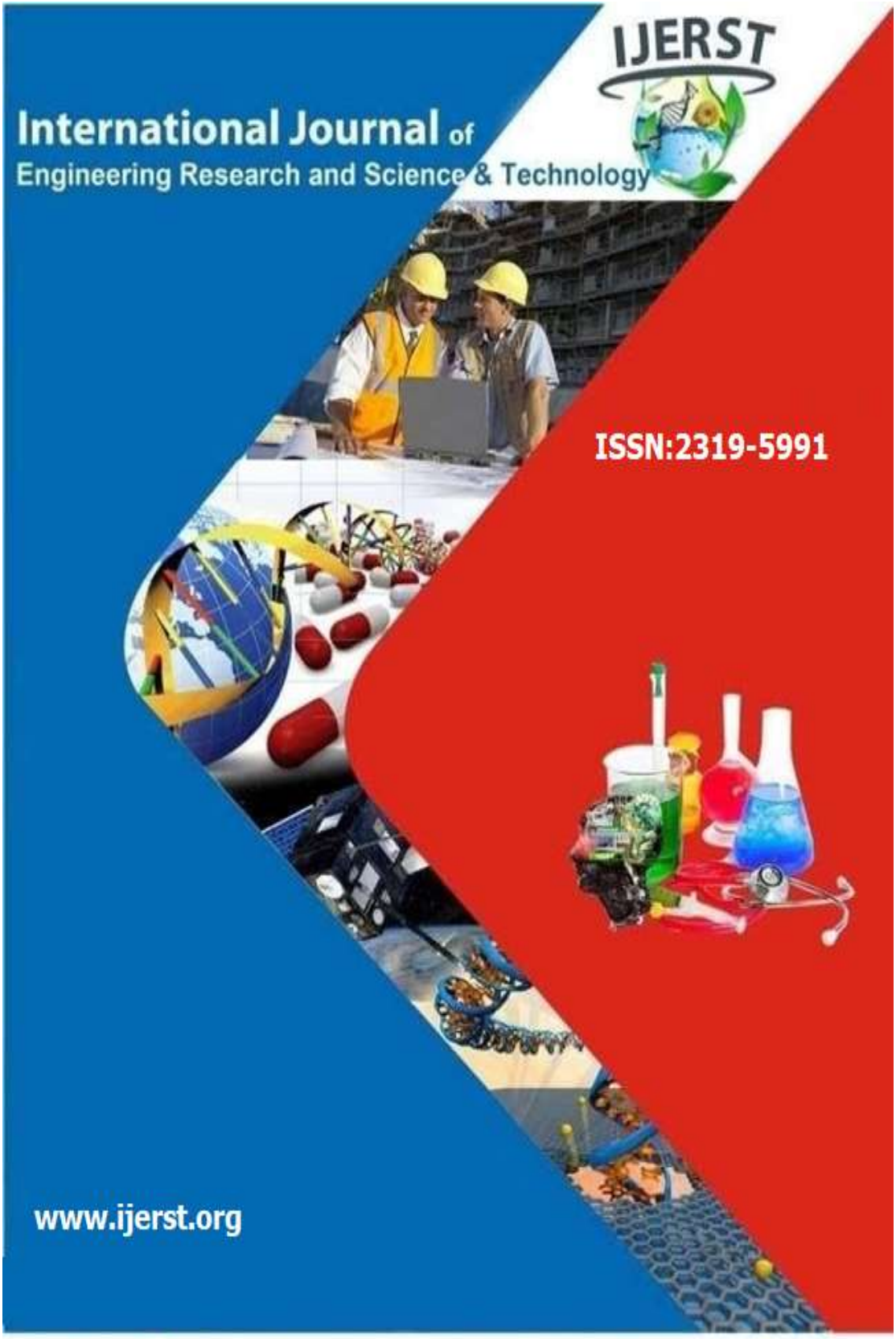

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IMPACT OF INTERVENING SOCIOECONOMIC AND ENVIRONMENTAL FACTORS ON URBAN TRAFFIC CONGESTION

[1] Nagaratna Sajjan,[2] Mr.K. Ramu
[1]Student,[2] Assistant Professor
Department Of Civil Engineering
AM REDDY MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY,
Petlurivaripalem,Andhra Pradesh

Abstract:
Due to a complex interaction of environmental and socioeconomic variables, Hyderabad, one of the fastest-growing metropolitan cities in India, is facing severe urban traffic congestion. In Hyderabad, especially in highly populated neighborhoods like LB Nagar, Malakpet, and Dilsukhnagar, urban traffic congestion is a major problem due to the city's fast population growth. Congestion in these areas is the focus of this research, which intends to analyze the role of environmental and socioeconomic variables. The study shows that factors including business activity, pollution levels, road infrastructure, population density, automobile ownership, and the availability of public transportation all have a role in traffic problems. This research aims to identify the main causes that contribute to traffic congestion by conducting field surveys, analyzing traffic statistics, and interviewing stakeholders. Income, employment, and irregularities in urban planning are socioeconomic factors that substantially impact travel behavior and traffic flow. The already difficult task of getting around cities is made much more so by environmental issues like noise and air pollution. In order to reduce traffic, the results call for better land use planning, more efficient public transportation, and more coordinated urban transport strategies. The findings of this study may help politicians and urban planners in Hyderabad develop long-term plans for the efficient and safe control of traffic along the city's most congested thoroughfares.

I. INTRODUCTION

Particularly in emerging nations and places where urbanization is taking place at a fast pace, urban traffic congestion is becoming an increasingly serious issue on a worldwide scale. It shows itself as an overabundance of cars, sluggish traffic, and other obstacles to the smooth movement of people and things on roadways. There are serious social, economic, and environmental ramifications to this phenomena, making it more than just an annoyance. To create solutions that work in the long run, it is essential to understand how these components interact with each other. The fundamental cause of traffic congestion is an excess of vehicles on the road compared to the available space. But this disparity is usually the result of a cascade of interrelated social, economic, and environmental factors rather than a single incident. The socioeconomic elements that impact people's travel choices and demands include their demographics, economic situation, and behavioral traits. When we talk about environmental considerations, we're talking about how the built and natural environments affect traffic flow and the ecological imprint that comes from it. Congestion in metropolitan areas has far-reaching effects. Wasted fuel, higher operating expenses for companies and commuters, lost productivity from longer travel times, and decreased economic efficiency are all major negatives from an economic perspective. From a social perspective, traffic jams cause commuters to feel more stressed, exhausted, and bored, lower their quality of life, and put themselves at risk of health problems due to

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extended exposure to pollution. Polluting the air with more greenhouse gases and dangerous particulate matter, adding to noise pollution, and maybe even influencing the spread of cities and the loss of natural habitats are all negative effects on the environment. This introductory section lays the groundwork for a detailed examination of the environmental and socioeconomic variables that exacerbate traffic congestion in metropolitan areas. Investigating these complex factors will help us understand the issue better, which in turn will lead to more effective solutions that will make cities safer, greener, and more livable for everyone. Extensive Strategy for Congestion: In order to grasp why a Comprehensive Congestion Plan is necessary, it is helpful to examine the origins of transportation issues in a city, the forms they assume, the reactions of both residents and municipal officials, and the subsequent iterations of these issues. The absence of an appropriate transportation and land use system is the primary problem with any unplanned city. A more disorganized rise in travel demand is a direct result of rising urbanization. Urbanites will continue to choose the easy way out—their own cars—until the municipal officials catch on and do something about it. Once again, this is being propelled by the rising wealth that comes with more and more people settling into metropolitan areas. The city's urban transport system is feeling the strain as the number of private vehicles on the road continues to climb. There are five main groups who have an interest in urban transportation systems: the people who really utilize the system, the environment, the city government, the people who actually drive the local economy, and the region around the city. Congestion, the primary and ultimate consequence of rising vehicle use, causes challenges of varied severity for various system stakeholders. More time spent traveling is bad for the consumer. Pollution is bad for the city environment. The municipal government is stuck with the inefficient use of transportation resources and can only think of spending more money on transportation systems, which usually means expanding and improving the roads already in place to reduce traffic. The production cost for manufacturers is increased due to the lack of an adequate freight infrastructure and system. Regional transportation has difficulties in the area due to the fact that it must constantly navigate through local urban traffic and congestion. On an as-needed basis, local officials enhance the supply of transport infrastructure, such as highways or public transport corridors, to combat the aforementioned issue of congestion and its several aspects. Public funding for urban transportation rises as a result, and the impact of transportation networks on cities grows. However, more transportation infrastructure means more people driving, which increases traffic congestion.

II. LITERATURE REVIEW

Bing Liua, , Linli Yan b , Zhiwei Wang (2017) In order to better plan and develop urban roads, this article seeks to identify a reclassification method that might strike a compromise between the competing needs of congestion, street activity, and green transport priority. Inadequate bus priority, cramped space for non-motorized transport, and street life decay are just a few of the issues that have arisen as a consequence of the single classification standard based on car-oriented congestion, which is condemned in this paper's first review of current road classification provisions. Next, it examines how different countries handle updating and adjusting road classifications. It then lays out a theoretical framework for urban road reclassification by clarifying the relationship between three factors: place and congestion, multi-modes and differentiated priorities, and the standardization and flexibility of the road classification system. A three-dimensional road classification system incorporating "hierarchy of Congestion, types of street activity and travel mode priority" is proposed in this article, which claims that urban roads must be reclassified in light of green transport and street revival. To address the policy transition from a "car-oriented" to a "people-oriented" focus, the new HAM system is

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anticipated to provide a more holistic, adaptable, and balanced approach to urban road design that can accommodate various forms of green transportation and a wide range of street activities. (Issa, Yazan, 2014), "Many urban highways were either constructed or improved to accommodate the widespread motorization of Chinese cities, driven by the rising demand for automobile transport. In their view, the "multi-modal transport network with complementary advantages" did not meet the standards set forth by Code TPUR, despite the fact that a road network focused on automobiles has grown exponentially over the last 20 years. Urban and transportation planners are understandably worried about the results of this road categorization, which do not adhere to green mobility standards. Because it establishes the right-of-way for various surface modes and the quality of space for many road users, the urban road system is seen as an integral component of this change. The importance of reclassifying urban roads to coordinate multi-modal traffic and facilitate street activities cannot be overstated. This will lead to improved road conditions for green modes and, in turn, enhance street vitality. The road classification system has lock-in effects on the overall layout of transport networks and urban areas. (Aranasan, 2012). A car-oriented road classification system that divided the "traffic and place" and "movement and access" functions has caused the disintegration of non-motorized networks and the decline of place functions, necessitating a new method for reclassifying urban roads. The concept of urban road categorization is starting to shift, and it is now acknowledged that roads have integrated many purposes. One way that the "place" dimension may help loosen up road planning and design is by taking congestion demands and vehicle access into account. To adequately address the hopes of the surrounding regions, it must take into account cross-scale congestion, environmental capacity, and community values. When it comes to multi-modal transport systems, however, the mobility and access functions provide a wider range of compatibility.

III. METHODOLOGY

In order to determine how societal and environmental variables affect traffic congestion in cities, this research used a mixed-method approach. To guarantee a thorough comprehension of the matter, the process incorporates quantitative and qualitative investigation.

Socioeconomic Considerations

People Per Unit Area

Dense populations may be seen in both Malakpet and Dilsukhnagar. The number of people who have to go to work each day has increased dramatically, according to survey data and public records, because of how densely populated residential regions are. Especially during rush hour, this is a major factor in traffic congestion.

• 75% of locals who participated in the poll said they traveled little more than 5 kilometers to get to and from job or education.

• Effect: Greater congestion in congested areas caused by shorter trips taken by private automobiles.

Workplaces and Business Centers

Numerous shops, tutoring institutions, and retail complexes can be found in Dilsukhnagar, a prominent commercial neighborhood. A lot of people from outside the site come here, mostly students and shopping.

• The coaching center schedules cause the weekday afternoon traffic to peak.

• Effect: Economic operations are time-sensitive, leading to severe yet irregular congestion.

Access to Public Transportation

Although both regions are accessible by TSRTC buses and MMTS trains (Malakpet station), there is still an issue with last-mile connection.

• Over 40% of respondents would rather drive or ride a two-wheeler than use the bus because of the infrequent service or long distances between stops.

• Congestion is worsened when people rely more on their own vehicles.

First Zone: LB Nagar, Second Zone: Malakpet,

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and Third Zone: Dilsukhnagar Urban Traffic Jams

In Hyderabad's southern region, you'll find LB Nagar, a significant residential and business area.

• Traffic Problems: Greater automobile ownership is a result of fast urbanization and high population density, which causes traffic bottlenecks more often, particularly around rush hour.

Major Important Causes of Congestion: Bottlenecks are caused by a combination of factors, including overcrowded public transportation, narrow highways, and increasing economic activity.

Management of Transportation Demand: Efforts to enhance urban transportation infrastructure and traffic flow are insufficient. Improving a city's services and infrastructure can only go so far. Consequently, limiting the expansion of transportation demand is also essential. In any case, urban transportation services may never be sufficient to meet demand. That is why it is crucial to include a "Transport demand management" program into strategy. To promote more environmentally responsible travel habits, TDM encompasses a broad array of initiatives aimed at changing people's travel decisions across four dimensions: when, where, why, and how. We must take the initiative to design travel needs in a way that they may be met in a sustainable, equitable, efficient, and effective manner. The four pillars of TDM work together to provide a comprehensive strategy for transportation demand management.

Suggestions for enhancing progress connectivity:

The term "connectivity" is used in this study to refer to the degree to which roads are linked to one another. Streamlining traffic flow on roadways is the primary goal of the suggestions made in this paper. "Congestion" (i.e., ease of mobility) and "accessibility" (i.e., the ability to transit from an origin to a desired destination) are two attributes of such efficiency. There are several advantages to increased connection than just enhanced Reduced emissions of greenhouse gases are one consequence of improved accessibility and reduced congestion, which in turn increases the possibility of transportation (via better pedestrian connections and shorter, more direct walk journeys). Enhanced connection has many other advantages, such as faster emergency response times, more efficient municipal service delivery, and more capacity on arterials to meet the requirements of long-distance travel in the area. Increased connection and speed come with certain minor compromises, such as pedestrian safety and automobile miles driven, but those details are outside the scope of this paper. Improving connection is taken for granted as a clear net advantage in this study. The best ways to enhance connection are implemented prior to and during the subdivision phase of development, according to our research and comprehension of Texas Local Government Code, Title 7 - Regulation of Land Use, Structures, Businesses, and Related Activities. Municipal, extraterritorial jurisdiction (ETJ), or unincorporated county levels of government are all vested with the administrative responsibility of conducting subdivision reviews under Texas law. Prior to the submission of subdivision applications, local governments should establish criteria and assessment tools that require planned highways and linked subdivisions in order to enhance connectivity. Applicants may oppose and the criteria for connection may not hold up in court, even if they are based on good planning judgment. In order to circumvent these possible obstacles, the tools suggested in the report's Major Thoroughfare and Subdivision sections will call for preliminary preparation by the county or municipality and will need revising the subdivision laws to set out certain guidelines and processes. There is a chance to execute site-specific enhancements and fine-tune the municipalities' connection policies via the methods proposed under the Comprehensive Planning and Zoning sections. Local governments have many funding choices when it comes to Capital Improvement Programming (CIP) planning, which is used to

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finance projects that link communities and corridors.

IV. RESULTS

The study's results, gathered from the Hyderabad urban areas of Malakpet and Dilsukhnagar, are detailed in this section. Examines the role of environmental and socioeconomic elements in the development of traffic congestion in such highly populated regions. Surveys, secondary sources, and field observations were used to collect the data. Centers for the Management of Congestion: In today's rapidly expanding urban areas, traffic congestion is a major problem that impacts people's ability to go about their everyday lives, as well as economic output and environmental sustainability. The Indian city of Hyderabad is notorious for its heavy traffic, especially in three important areas: LB Nagar, Malakpet, and Dilsukhnagar. There is a lot of pressure on the transportation networks in these places because of the high population density, varied land use, and fast rising car ownership rates.

An exhaustive and organized database collecting precise traffic congestion data for these zones is essential for tackling these issues. Data from this database will include topics including traffic flow, different kinds of vehicles, times of heavy congestion, road conditions, accessibility of public transportation, and environmental factors like noise and air pollution.

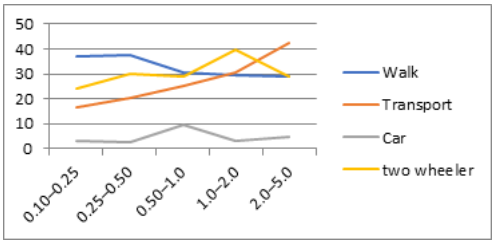
The main goal of this project is to create a database system that integrates LB Nagar, Malakpet, and Dilsukhnagar data linked to congestion. This resource is designed to assist policymakers, urban planners, and traffic engineers in evaluating congestion patterns, pinpointing bottlenecks, and developing plans for sustainable urban mobility and targeted traffic management.

The database's goal is to help alleviate traffic congestion, enhance public transit planning, and enhance the quality of life for those living in and commuting to these important metropolitan areas by using accurate and current data.

Solutions for Congestion Management Centres: LB Nagar, Malakpet, and Dilsukhnagar are three of Hyderabad's fastest-growing neighborhoods, and they have a serious problem with urban traffic congestion. Congestion, lengthier commute times, and air pollution have all been exacerbated by the world's expanding human population, more people owning cars, and more diverse land use patterns. Efficiently managing traffic congestion calls both concerted actions and cutting-edge technology solutions. For the purpose of real-time traffic monitoring, analysis, and management, a Congestion Management Centre (CMC) acts as a central hub. To provide you a full picture of the traffic situation right now, it combines data from a lot of different places, such public transportation networks, traffic cameras, and GPS. Congestion management in LB Nagar, Malakpet, and Dilsukhnagar may be greatly improved with the establishment or improvement of such a center. This would allow for faster reactions to occurrences, greater synchronization of traffic signals, and optimum route planning. These hubs have the potential to improve sustainable urban transportation, lessen the severity of congestion, increase the safety of commuters, and enable proactive traffic management. In order to improve traffic conditions in these important cities, effective traffic control solutions must be used.

Table: Existing Modal Split in Hyderabad Cities

City Population (in millions)	Walk	Transport	Car	two wheeler
0.10–0.25	37.1	16.4	3.3	24.1
0.25–0.50	37.8	20.6	2.6	29.8
0.50–1.0	30.7	25.4	9.5	29.1
1.0–2.0	29.6	30.6	3.3	39.6
2.0–5.0	28.7	42.3	5.0	28.9



Overall case study of central cities of Hyderabad:

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Performance evaluation – Traffic efficiency (Congestion)

Each of the three bus lines has been divided into four route segments of a certain length for the purpose of evaluating the impact of the priority measures on passenger congestion; this yields a total of twenty-four route segments, eight for each line. To find out how much time the bus saved during peak hours, we compared the time before and after the priority was put in place for each section of the route. Additionally, before and after the deployment, average vehicle traffic journey times (Lb nagar) were monitored for a number of route segments of certain lengths on the private transport network that were found to be impacted by the core city of Hyderabad Congestion.

Using the congestion as a measure, we can see how the plan affects the public and private transportation lines individually, with equal weights given to each section of the route.

CONCLUSION

Congestion in Malakpet and Dilsukhnagar is due to more than just more vehicles on the road or bad infrastructure, according to studies of urban traffic. Congestion behavior and traffic patterns are greatly influenced by environmental and socioeconomic variables. High population density, unregulated urbanization, business concentration, and inefficient public transit are important socioeconomic factors. Poor connection and congestion in public transportation networks force many inhabitants to rely on personal cars or automobiles, adding to the load on already packed roadways.

Extreme weather, such as severe rains, makes traffic move more slowly due to environmental issues such narrow roads, a lack of green areas, and badly maintained drainage systems. Prolonged traffic congestion have also led to a rise in noise and air pollution, which has negative effects on public health and the environment.

In order to tackle these issues, city planners need to think outside the box when it comes to building new roads. Investment in public transportation, more enforcement of traffic laws, more environmentally friendly policies, and improved coordination between land use and transportation planning are all necessary. Cities like Malakpet and Dilsukhnagar may benefit from long-term solutions to traffic and urban quality of life issues if their leaders take social and economic factors into account.

Implications for the Future

This study's results on Malakpet, Dilsukhnagar, and the surrounding districts show how environmental and socioeconomic variables are becoming more important in causing traffic jams in cities. Still, a lot more work has to be done in this area before we can construct an urban transportation system that is both efficient and environmentally friendly: Additional locations in Hyderabad or other Tier-1 and Tier-2 cities may be included in future studies to analyze patterns and discover trends on a city or regional level. This will allow for expanded geographic coverage. Research in the future can take advantage of environmental sensors, real-time traffic monitoring systems, and GPS data to examine live congestion patterns and how they are correlated with variables like weather and air quality, all thanks to the development of smart city technologies.

• Utilization of Predictive Models and AI: Artificial intelligence (AI) models may be trained to anticipate traffic jams based on changing socioeconomic variables, such as the timing of festivals, increases in gasoline prices, or building projects.

• Policy Intervention Evaluation: In densely populated regions like Dilsukhnagar and Malakpet, future research might assess the efficacy of certain traffic regulations like as congestion charges, carpooling incentives, and odd-even vehicle laws

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