



Effective Optimisation and Solutions for Traffic Congestion in Pune

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ABSTRACT

Traffic congestion is a condition in transport that is characterized by slower speeds, longer trip times, and increased vehicular queueing. Traffic congestion on urban road networks has increased substantially since the 1950s. When traffic demand is great enough that the interaction between vehicles slows the traffic stream, this results in congestion. While congestion is a possibility for any mode of transportation, this article will focus on automobile congestion on public roads.

As demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in. When vehicles are fully stopped for periods of time, this is known as a traffic jam or (informally) a traffic snarl-up or a tailback.

Drivers can become frustrated and engage in road rage. Drivers and driver-focused road planning departments commonly propose to alleviate congestion by adding another lane to the road. This is ineffective: increasing road capacity induces more demand for driving.

Mathematically, traffic is modeled as a flow through a fixed point on the route, analogous to fluid dynamics.

CHAPTER 1 INTRODUCTION

1.1 General

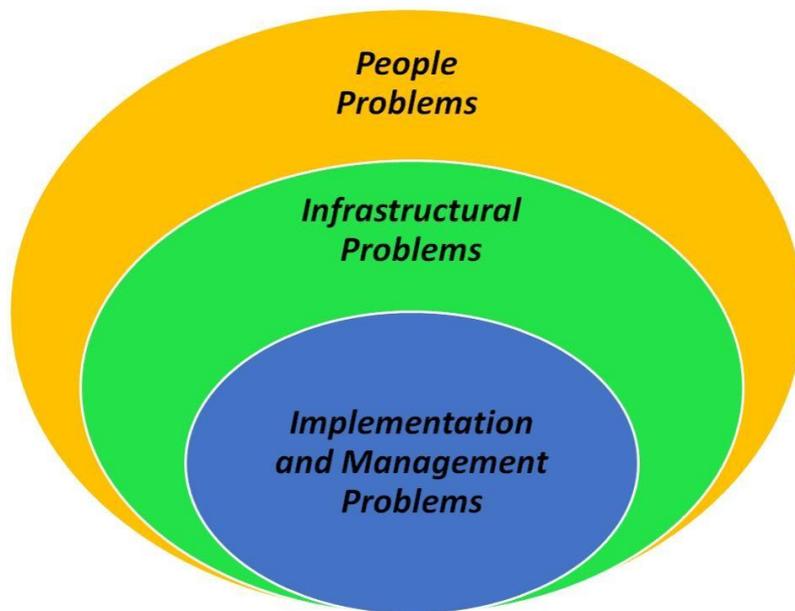
The Transportation is one of the most important components of a developing city and which is necessary for ensuring the growth of an urban area. An efficient network of transportation services is required to support the complex activity patterns within cities. Also there is a strong relation-between transportation and city development. The increased transportation demand requires an effective transportation planning process. The fundamental purpose of transportation is to provide efficient access to various activities that satisfy human needs for a heterogeneous variety of societal groups.

Therefore the general goal of transportation planning is to meet this need for mobility. Urban transportation planning contains a sequence of activities including inventing the present condition of the area such as the land use patterns and the travel demand produced from this land developments. Forecasting of these land use,

population, travel demand are required for preparation of the development plans. The purpose of this travel-forecast of the urban transportation planning process is to perform a conditional prediction of travel demand in order to estimate the likely transportation consequences of the several transportation alternatives that are being considered for implementation. The objectives of the study are as given below: (i) To assess the existing condition of road network and to identify the traffic bottleneck locations,(ii) To collect the traffic volume on selected roads and to assess the extent of shortfall of the road system,(iii)To collect the parking characteristics of the roads , (iv) To find the pedestrian crossing volumes in the main road,(v) To formulate a suitable road development plan keeping in view the growth potentials of the study area ,(vi) To prepare the suggestions and improvement plans for the study area by considering future developments of the city,(vii) Preparation of detailed engineering/structural design of the improvement proposals The scope of the study is confined to Pune Municipal Town.

Traffic congestion has been increasing in much of the world, developed or not, and everything indicates that it will continue to get worse, representing an undoubted menace to the quality of urban life. Its main expression is a progressive reduction in traffic speeds, resulting in increases in journey times, fuel consumption, other operating costs and environmental pollution, as compared with an uninterrupted traffic flow. Congestion is mainly due to the intensive use of automobiles, whose ownership has spread massively in Latin America in recent decades. Private cars have advantages in terms of facilitating personal mobility, and they give a sensation of security and even of heightened status, especially in developing countries. They are not an efficient means of passenger transport, however, since on average at rush hours each occupant of a private car causes about 11 times as much congestion as a passenger on a bus. The situation is further aggravated in the region by problems of road design and maintenance in the cities, a style of driving which shows little respect for other road users, faulty information on traffic conditions, and unsuitable management by the responsible authorities, which are often split up among a host of different bodies. The cost of congestion is extremely high. According to conservative calculations, for example, increasing the average speed of private car journeys by 1 km/hr and that of public transport by 0.5 km/hr would give a reduction

in journey times and operating costs worth the equivalent of 0.1% of the gross domestic product (GDP) The harmful effects of congestion are suffered directly by the vehicles that are trying to circulate. They are not only suffered by motorists, however, but also by users of public transport –generally lower-income persons—who not only take longer to travel from one place to another but also have to pay higher fares on account of congestion. All city- dwellers are also adversely affected, in terms of a deterioration in their quality of life through such factors as greater air and noise pollution and the negative long-term impact on the healthiness and sustainability of their cities, all of which makes it vitally necessary to keep congestion under control.



Pune traffic has increased by 105 times as a result of population growth, whereas the road network has only grown by 6 times. The city's present road network accounts for 7% of the total, whereas the efficient demand is 15%. Inadequate road networks result in massive heavy traffic and time wasting rather than excellent urban movement across the metropolis. Roads in the city are in deplorable state. On city roadways, there are a few potholes in between. The city's road infrastructure has not grown in lockstep with the growing number of automobiles

20 most congested cities	20 slowest cities (traffic speed)	10 Fastest cities (traffic speed)
1 Bangalore	1 Kolkata	1 Ranipet
2 Mumbai	2 Bangalore	2 Srinagar
3 Delhi	3 Hyderabad	3 Kayamkulam
4 Chennai	4 Mumbai	4 Jammu
5 Kolkata	5 Varanasi	5 Thrissur
6 Hyderabad	6 Patna	6 Palakkad
7 Pune	7 Delhi	7 Chandigarh
8 Jaipur	8 Bhalgalpur	8 Alwar
9 Coimbatore	9 Bihar Sharif	9 Thoothukkudi
10 Ahmedabad	10 Chennai	10 Panipat
11 Patna	11 Muzaffarpur	
12 Chandigarh	12 Aligarh	
13 Kochi	13 Darbhanga	
14 Thiruvananthapuram	14 English Bazar (West Bengal)	
15 Begusarai	15 Gaya	
16 Kozhikode	16 Allahabad	
17 Nagpur	17 Ranchi	
18 Ranchi	18 Dhanbad	
19 Vijayawada	19 Akola	
20 Bhopal	20 Pune	

■ A heavily congested road in Pune.
HT FILE PHOTO

CHAPTER 3

PROBLEM STATEMENT

- **Air Pollution:** According to data gathered by the Indian Institute of Tropical Meteorology (IITM), 2018 was the second most polluted year since 2013. The Urban Emissions Air Pollution Knowledge Assessment programme shows that air quality in Pune is still a major public health concern. According to the study, yearly levels of PM_{2.5} air pollution in Pune frequently exceed health-based pollution guidelines, based on global chemical transport models and satellite surveillance. Source: NRDC air pollution
- **Insufficient Public Transports:** The rapid growth of the automobile population, combined with a shaky public transportation system in the form of the Pune Mahanagar Parivahan Mahamandal Ltd (PMPML), has resulted in severe traffic congestion, increased commuting time, an increase in the number of road accidents, and extreme stress during peak hours. There are at least 1,000 buses lacking from the present fleet of 1300 buses (including many buses undergoing maintenance) and 150 electric buses with regular failures. As a result, individuals are compelled to use private cars, two-wheel vehicles, taxis and auto rickshaws, resulting in an increase in the number of vehicles on the road.
- **Safety Concern:** People intend to break the traffic rules during rush hours, instead tited to unsafety on road for pedestrian, accidents and traffic congestion. Most of Auto rickshaw drivers are a problem in the city due to their rash driving, they control the roadways and use unsafe shortcuts to get ahead, putting their passengers lives at jeopardy. Work on road repairs and extension has been ongoing for the past two years and has yet to be finished. As a result, pedestrians have a difficult time walking on the road due to the poor state of the whole stretch. The absence of street lights on various roads, market stalls and roadside vendors intruding on the road and leaving minimal space for traffic flows, causing a danger to pedestrians.
- **Inadequate Transit Management:** Throughout peak hours, i.e., 9:00 a.m. to 11:00 a.m. and 6:00 p.m. to 8:00 p.m., traffic becomes more congested and disorganized in sectors where most schools and colleges are situated, particularly in Peth areas with narrow
- **Illegal Parking:** Illegal parking on the road has been creating jams every day. On-road parking of vehicles is one of the main reasons behind serious traffic jams in different parts of the Pune city. 4.6
- **Increasing number of population:** All the areas under Pune city are facing an increasing number of populations which is a bad indicator for the traffic management and this could be a vital reason behind traffic problems. 4.7
- **Higher Purchasing power of the public:** Due to the higher purchasing power of the citizen of Pune city the numbers of vehicles is increasing every day but existing roads, subways, FOB and highway are not

constructing according to the increasing number of vehicle. As a result traffic jams is increasing at an alarming rate. 4.8

- **Improper Planning of City Development:** City Development planning is not proper. Roads, Highways and service roads are not preplanned. 4.9 **Improper Lane Management:** Lane management is an important fact in managing the traffic in Pune. Many types of the vehicles try to overtake the vehicles even in the single undivided road. This is the main reason that the city roads are unequipped with the lane dividers which divide the lane into incoming and outing traffic.

- Aim & Objective

3.1.1 Aim

Traffic Management and Planning: Implementing effective traffic management strategies, including intelligent traffic signal systems, dedicated lanes for public transport, and optimized traffic flow patterns, can contribute to reducing congestion.

Infrastructure Development: Investing in road infrastructure, including the construction of new roads, flyovers, and alternative routes, can help distribute traffic more evenly and alleviate congestion in specific areas.

Technological Solutions: Leveraging technology, such as intelligent transportation systems, real-time traffic monitoring, and smart parking solutions, can enhance overall traffic management and efficiency.

3.1.2 Objectives

- Identify and categorize delays related to material management in construction projects to gain a comprehensive understanding of the causes and their frequency.
- To identify the roadside friction locations on varying widths of urban, arterials and subarterials in wagholi, pune region.
- To predict influence of the friction points on the vehicular speed on urban roads.
- Road accident analysis according to yearly variation

CHAPTER 4 METHODOLOGY

In order to study the factors causing traffic problems in major cities in India, an incorporated methodology is applied in this research. This mainly includes the literature review, direct observation and monitoring the traffic scenario with the help of a website that records the traffic in Pune City. With a focus on the above methods, this paper mainly aims to study the current situation of traffic in Pune city and to list down the factors and conceptual frame work of the relationships between the factors causing the traffic congestion.

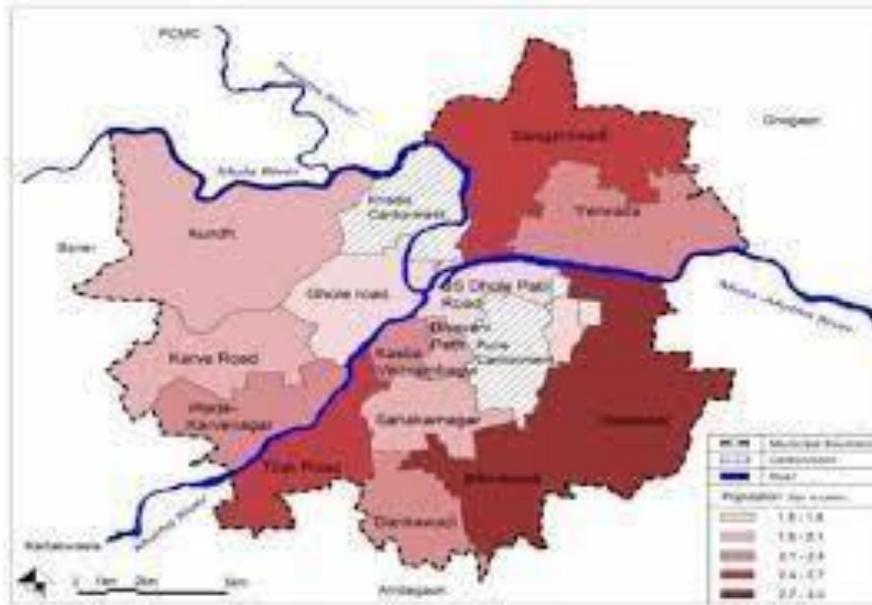
2 methods were used for the study: **Monitoring** and **Research** carried out by other researchers.

- **Monitoring**

The researcher relied on the traffic monitoring website such for the statistical data. The website gives a lot of insights with respect to the kind of traffic and the trends of traffic congestion, the area where traffic congestion is high as well as the time of the day when congestion is high.

Pune Traffic Report generated, ranked Pune to be the 5th most congested city in the world in 2019, with the congestion levels recorded at 59% (Figure 6). Around 43,247,828 km were covered for the survey and it was

observed that around 49% congestions were recorded on the highways and 63% congestions were recorded on the non-highways, concluding that congestion are seen in both types of roads. The same report also recorded evening rush as everyday rush hours.



Identify the important junctions and roads in the study area

Conduct reconnaissance survey and prepare key plans

Collection of primary data through different traffic survey

- speed and delay survey
- road inventory survey
- pedestrian survey
- parking survey
- traffic volume survey
- accident survey

Tabulation and analysis of the collected data

Traffic projection for 2031

Analysis of the results obtained

Suggesting of improvement plans

The weekly Traffic congestion comparison of major cities of India such as; Mumbai, Bengaluru, New Delhi and Pune, show the problem of the traffic problems. It is clearly visible from the above Figure 7 that all the major cities including Pune, face major traffic congestion problems all throughout the year 2019 as well as the first 3 months of 2020. The lock down was imposed in the month of April 2020, which is clearly evident in the subsequent recordings. Therefore, it is essential to find out the factors that cause traffic congestion, which leads to an infinite amount of man-hours wasted in waiting in the congestion's as well as a lot of wastage of precious fuel being burnt creating a huge pressure on the infrastructure that is already stretched to its brink. The identification of the factors causing the congestion can lead to finding the solutions and measures taken to overcome the congestion and plan a better traffic management system.

Many research papers have been studied carefully by considering every possible parameter. Literature survey is definitely the most important part of any project as it shows us direction to proceed and gives us an insight about the research done by various authors around the world. We are able to set achievable objectives for our project. Various papers related to traffic management techniques and solutions, were considered to get an outlook towards the problem, as it turns out traffic congestion is a very common problem in today's date. Then papers about various types of Survey which gave the exact idea about the problem and local people's insight on the seriousness of the problem. This included study of the area, interaction with local people, officials and experts, etc. The Preliminary Survey included collecting data by conducting various surveys like Volumetric Study, Road-Side Interview Surveys, Occupancy Factor Survey, Origin-Destination Survey, Speed and Delay Survey, Accident Survey, etc. Based on the observations made during the field surveys and analysis of data obtained by those surveys, the most obvious and common problems have been identified and correct solutions were then formulated as per the area of study. The cost of these alternative solutions and their impact on the traffic flow or congestion, were calculated using various Computer software/simulations. The impact of Metro Rail Project was also considered.

Reconnaissance Survey: A reconnaissance survey was conducted on 22-09-2015 to study the area and to get an overall idea about the existing traffic and transportation scenario.

Locations identified for traffic surveys: During the reconnaissance survey, locations and/or stretches were identified for conducting the Traffic volume survey, Speed and Delay survey, Parking Survey and Pedestrian Survey.

Intersections Chosen for the Study: The major intersections chosen for the study in Angamaly Municipal Town are listed below:

1. Airport Junction
2. Signal Junction
3. Bank Junction And Road Intersection

CHAPTER 5 EXPECTED OUTCOME

The expected outcomes of this project include:

- i. Detection of congestion and reduction of traffic: traffic control unit gets information from the sensors and peripherals and helps to identify congestion of traffic. Based on the detection, the system takes self-decisions and performs an operation to reduce traffic.

- ii. Traffic light timing in real-time: The smart traffic management system helps traffic light to operate in real-time conditions. Traffic operates based on traffic congestion automatically.
- iii. Safety from road accidents: Due to the deployment of this system, the chances of road accidents can be minimized.
- iv. Reduction in pollution: Due to the good management of traffic flow, pollution can be reduced. People can save fuels and due to fuel saving, it leads to a reduction in pollution.

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