

## A STUDY OF DAY-TO-DAY TRAFFIC CONGESTION INCREASE IN COIMBATORE CITY THROUGH DESIGN THINKING

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### ABSTRACT

Traffic congestion has become a ubiquitous issue in urban centres, significantly impacting the quality of life and economic productivity. Coimbatore, a burgeoning city in southern India, has experienced a substantial rise in day-to-day traffic congestion in recent years. This study aims to investigate the causes, trends, and potential solutions to the escalating congestion in Coimbatore. The research employs a multi-faceted approach, integrating data analysis from traffic monitoring systems, surveys among commuters, and interviews with urban planning experts. By examining traffic patterns, infrastructure development, population growth, and urban expansion, the study seeks to identify the primary factors contributing to the congestion. Preliminary findings indicate that rapid urbanization, increased vehicular ownership, insufficient road infrastructure, lack of effective public transportation, and evolving travel patterns are key elements exacerbating the congestion. Furthermore, the study highlights the impact of commercial and residential developments on traffic flow.

**KEYWORDS:** Traffic, Congestion,

Coimbatore.

### INTRODUCTION

Transportation plays a vital role in everyday life. Traffic congestion not only affects the nation's economy but also has a physiological effect on the road users. In addition, congestion will increase pollution and accelerates the process of global warming. With the rapid growth of urban traffic, the capacity of the roads has reached the saturation limit and traffic congestion has become in stable. Identifying the frequently congested road sections, estimating their influence on the entire road network, improving the connectivity and accessibility of the whole road network through local traffic reformation, have become important issues to transportation planners and managers. Traffic congestion can be characterized by the decrease in speed, the increase in travel time and the increase of vehicle's queue on the road. In addition, traffic congestion happens when the road demand exceeds the road capacity. Establishing an effective traffic congestion analysis and monitoring the evolvement of congestion state and making appropriate suggestions will provide strong support to transportation management and planning.

### EMPATHY

Design Thinking Stage	Potential Questions
Empathy	Why day to day increase traffic jam in Coimbatore city?
	What was the main reason of traffic jam increasing?
	Why road and maintenance works are incomplete?
	What are the problems faced by the peoples in the traffic jam situation?

### STATEMENT OF THE PROBLEM:

Coimbatore is the Second largest city of Tamilnadu with all its wealth of IT hubs, Educational Institutions, and varied business start-ups increasing the population growth of the city by which the city stands as Manchester of South India. The

transport structure is in such a way that the city is confined within six arterial roads bordering the city. The city holds 265 bus transports totally with passenger capacity around 0.2 million. Other than bus transports there are many other sources for transport in the city including, auto-rickshaws, share autos, call taxis,

Omni buses, self-vehicles like car,  
bike, and 'n' number of vehicles used  
by institutions

and industries. Since Coimbatore is a well-planned and cleaned city among other metro cities like Bangalore, Kochi, Chennai etc., in South India, the same is destroyed due to annoying vehicular growth in last decades. The city with exaggerated students and IT hands arises a question regarding punctual travel to schools, colleges, offices

and rate of accidents in peak hours besides vast transport facilities. Poor roads or incomplete road works and bridge works has led to the ineffectiveness and collapse of the COIMBATORE road traffic system. An effort has been made to study the traffic volume of Avinashi Road NH47, Trichy Road, NH81, Sathy Road NH209, Mettupalayam Road NH67 and Other Corporations Road. **Define**

**Problem Statement:**

Design Thinking Stage	Interference
Define	1. What are the problems faced by the passengers during the traffic congestion? 2. What are the solutions to be provided for the problem faced by the passengers during the traffic jam?

Throughout the years, several strategies, methods, remedies and theories have been implemented by government but there is no response. Traffic congestion is the recent and not solved issue in Coimbatore city. So, the change of a new roads and alternative roads for blocking areas or constructed areas. The idea of using Design Thinking in traffic congestion will help to improve the strategy of success as well as to solve the problem faced by passengers while faced traffic congestion.

**SCOPE OF THE STUDY:**

This research work covers the road works and construction work-based system in Coimbatore with special focus to passengers' point of view and their functions operationalization, problems and government policies to regulate this industry as to deliver maximum satisfaction to the public. This study comprises of the busiest roads in Coimbatore that plays a important role in day to day life of a common man and those roads which helps to move the goods and commodities. The study suggests a useful recommendation to road transportation management in Coimbatore.

**OBJECTIVES OF THE STUDY:**

- To identify the accident risk zones using overlay analysis
- To identify the zones prone to traffic congestion.
- To suggest solutions to minimize the traffic congestion and accidents.
- To estimate the reduction in the risk zones in the study area after implementation of the proposed suggestions.

**LIMITATIONS OF THE STUDY:**

**Infrastructure Challenges:** Coimbatore may face limitations in infrastructure, such as narrow roads, inadequate public transportation systems, lack of proper signage, poorly designed intersections, and insufficient parking spaces. This can lead to bottlenecks and congestion during peak hours.

**Population Growth:** With the city's expanding population, the number of vehicles on the road has significantly increased, leading to overcrowding on roads and highways, resulting in congestion.

**Lack of Alternative Transportation:** The absence of well-established alternative transportation options like efficient public transport, safe cycling lanes, or carpooling initiatives leads to more individual vehicle usage, adding to the traffic volume.

**RESEARCH METHODOLOGY:**

Research methodology refers to the systematic, theoretical analysis of the methods applied to a field of study. It involves the principles, techniques, and procedures used by researchers for conducting research, gathering data, analysing information, and drawing conclusions. Research methodology is fundamental in guiding the researcher in exploring, answering questions, and solving problems in an organized and rigorous manner. Here are key components:

**Research Design:** This is the overall plan or structure for the research, including the type of study (qualitative, quantitative, mixed-methods),

the methods of data collection, and the analysis to be conducted.

**Data Collection Methods:** These are the techniques used to gather information, such as surveys, experiments, interviews, observations, or secondary data analysis. The choice depends on the research question and the nature of the study.

**Sampling:** Determining the sample size and selection methods is crucial. It involves choosing a subset of individuals or items from a larger population that will represent it for the research.

**Data Analysis:** This involves the procedures for analyzing the collected data, including statistical analysis (if applicable), qualitative analysis, or other methods to make sense of the information gathered.

**Validity and Reliability:** Ensuring that the research methods used are sound, reliable, and capable of generating accurate and consistent results.

**Ethical Considerations:** It is vital to ensure that the research is conducted ethically, considering the well-being of the participants and adhering to the guidelines set forth by ethical review boards.

**Research Instruments:** Such as questionnaires, interview guides, or other tools developed to collect data should be validated and reliable.

**Time and Resources:** Planning and managing the time frame and resources available for conducting the research is essential.

**Documentation and Reporting:** The method of recording and reporting the research findings, such as research papers, reports, or presentations, is a significant aspect of the methodology.

#### TOOLS USED

Percentage analysis

Chi-Square

ANOVA

#### REVIEW OF LITERATURE

**Aditya et al., (2017)** – investigated the designing, implementing and analysing Revealed and Stated Preference questionnaire surveys. The Revealed Preference (RP) survey has been conducted on commuters using the newly operational metro rail line which has provided the much-needed east-west connectivity in Mumbai city, whereas an appropriately designed Stated Preference (SP) experiment has been administered on the commuters living within the catchment of a proposed additional metro rail line.

**Pengjun et al., (2018)** – studied the city Beijing which is a well-known historical capital of the country China with increased urban expansion and city size are the lead role to opt for metro transit in the city. The metro passengers find difficult to access metro transits due to urbanization of the city and the study involves the investigation on use of Bi-Cycle as a travel mode to/from the metro transits.

**Zhongnan et al., (2015)** – examined a dynamic data from mobile applications such as Baidu Heat Map and POI to quantify the space use situation around metro stations in central city of Shanghai. A model is established on this basis to describe the relationship between space use situation and other characteristics of station areas.

**Oleg et.al., (2016)** – studied the safety metro escalators is important to determine the degree of escalators wear and the term of remaining life. To ensure safety of metro tunnel escalators it is required to assess the technical condition of escalators outspent their standard service term for potential extension of their service term until they are replaced. The article considers the methods for such assessment, the experience of its application and new methods for monitoring of the technical condition of operated escalators.

**S.A.Mulay C.S.Dekhne R.M.Bapat (2019)** mainly focuses on the ITS covering various domains like evolutionary computing and intelligent systems, mobile computing and applications ,GPS Etc. During the peak hours such as office and school timings there is long traffic lines and more waiting time on traffic leads to breaking of traffic rules. The researcher presented in this paper three modules which addressing the issues of traffic management.

**Wei et al., (2014)** – studied about the passenger flow which is the foundation of making and coordinating operation plans for the metro system, and therefore, a variety of studies were conducted on transit assignment models. This paper first discusses the main route constraints of which the train schedule is the most important, that distinguish rail networks from road networks. Then, a two-step approach to generate route choice set in a metro network is proposed. Particularly, the improved approach introduces a route filtering with train operational information based on the conventional method.

#### DATA ANALYSIS AND INTERPRETATION:

##### 1) How often do you experience inconvenience regarding Coimbatore's traffic?

Table: 1

PARTICULARS	FREQUENCY	PERCENTAGE
Almost all the time	52	43.7%
Sometimes	13	11%
Rarely	49	41.2%
Occasionally, but it doesn't bother me	2	1.7%
Never experienced traffic before and I am satisfied with it	3	2.5%
<b>TOTAL</b>	<b>119</b>	<b>100%</b>

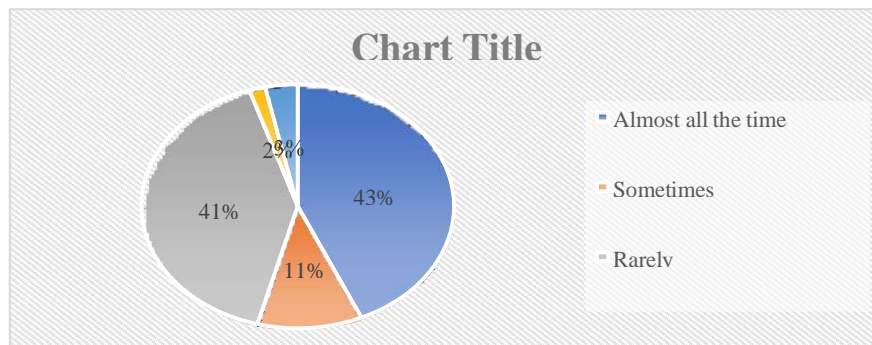
**Statistics**

**Inconvenience traffic**

N	Valid	119
	Missing	0

**Inconvenience traffic**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Almost all the time	52	43.7	43.7	43.7
	Rarely	13	10.9	10.9	54.6
	Sometimes	49	41.2	41.2	95.8
	Never experienced traffic before and I am satisfied with it	2	1.7	1.7	97.5
	Occasionally, but it doesn't bother me	3	2.5	2.5	100.0
	Total	119	100.0	100.0	



**INTERPRETATION:**

The above table indicates that 43.7% of the respondents are say Almost all the time. 11% of

the respondents are say Sometimes, 41.2% of the respondents are say Rarely, 1.7% of the

respondents are say Occasionally, but it doesn't bother me and remaining 2.5% of respondents are say Never experienced traffic before and I am

satisfied with it.  
 How was your mood during the traffic time?

2) Table: 2

PARTICULARS	FREQUENCY	PERCENTAGE
Very good	38	31.9%
Good	17	14.3%
Neutral	44	37%
Bad	14	11.8%
Very bad	6	5%
<b>TOTAL</b>	<b>119</b>	<b>100%</b>

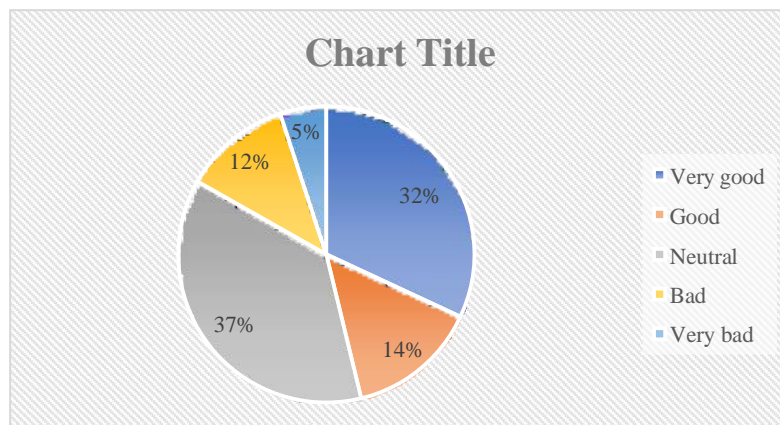
**Statistics**

Your mood in traffic

N	Valid	119
	Missing	0

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bad	14	11.8	11.8	11.8
	neutral	44	37.0	37.0	48.7
	Very good	38	31.9	31.9	80.7
	Very bad	6	5.0	5.0	85.7
	Good	17	14.3	14.3	100.0
	Total	119	100.0	100.0	

Your mood in traffic



**INTERPRETATION:**

The above table indicates that 31.9% of the respondents are Very good mood in traffic jam. 14.3% of the respondents are good mood in traffic jam, 37% of the respondents are Neutral mood in traffic jam, 11.8% of the respondents are Bad mood in traffic jam and remaining 5%

of the respondents are Very bad mood in traffic jam.

**3) How much time does traffic delay you to back home?**

**Table:3**

PARTICULARS	FREQUENCY	PERCENTAGE
I am always on time	17	14.3%
Less than 20 minutes	41	34.5%
More than 30 minutes	41	34.5%
an hour	9	7.6%
More than an hour	11	9.2%
<b>TOTAL</b>	<b>119</b>	<b>100%</b>

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Traffic delay	119	3.0336	1.17121	1.00	5.00

**Chi-Square Test**

Traffic delay

	Observed N	Expected N	Residual
an hour	9	23.8	-14.8
less than 20 minutes	41	23.8	17.2
I am always on time	17	23.8	-6.8
more than 30 minutes	41	23.8	17.2
more than a hour	11	23.8	-12.8
Total	119		

**Test Statistics**

	Traffic delay
Chi-Square	42.891 <sup>a</sup>
df	4
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 23.8.

**INTERPRETATION:**

The above table indicates that 14.3% of the respondents are traffic delay back to home in I am always on time. 34.5% of the respondents are traffic delay back to home in Less than 20 minutes, 34.5% of the respondents are traffic delay back to

home in More than 30 minutes, 7.6% of the respondents are traffic delay back to home in an hour and remaining 9.2% of the respondents are traffic delay back to home in More than an hour.

**4) What is the main cause of traffic congestion along your daily route?**

**Table: 4**

PARTICULARS	FREQUENCY	PERCENTAGE
Road construction / Road works	50	42%
Double parking	26	21.9%
Accidents	7	5.9%
Rush hours	11	9.2%
Construction bridge / flyovers	21	17.6%
None of the traffic congestion faced	4	3.4%
<b>TOTAL</b>	<b>119</b>	<b>100%</b>

**Descriptive Statistics**

	N	Mean	Std. Deviation	Minimum	Maximum
Main cause traffic	119	2.7731	1.27184	1.00	6.00

**Chi-Square Test**

**Main cause traffic**

	Observed N	Expected N	Residual
construction bridge / flyovers	21	19.8	1.2
Double parking	26	19.8	6.2
Road construction / Road works	50	19.8	30.2
Accidents	7	19.8	-12.8
Rush hours	11	19.8	-8.8
none of the traffic congestion faced	4	19.8	-15.8
Total	119		

**Test Statistics**

	Main cause traffic
Chi-Square	72.748 <sup>a</sup>
df	5
Asymp. Sig.	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.8.

**INTERPRETATION:**

The above table indicates that 42% of the respondents are main cause of traffic jam is Road construction / Road works, 21.9% of the respondents are main cause of traffic jam is Double parking, 5.9% of the respondents are

main cause of traffic jam is Accidents, 9.2% of the respondents are main cause of traffic jam is Rush hours, 17.6% of the respondents are main cause of traffic jam is Construction bridge / Flyovers and remaining 3.4% of the respondents are main cause of traffic jam is None of the traffic congestion faced.

**5) What are the usually traffic congestion hour you faced on yours normal working days in morning?**

**Table: 5**

PARTICULARS	FREQUENCY	PERCENTAGE
7:00AM - 8:00AM	13	10.9%
8:00AM - 9:00AM	79	66.4%
9:00AM - 10:00AM	24	20.2%
10:00AM - 11:00AM	3	2.5%
<b>TOTAL</b>	<b>119</b>	<b>100%</b>

**Descriptives**

Morning traffic

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
7:00AM - 8:00AM	13	1.3846	.50637	.14044	1.0786	1.6906	1.00	2.00
8:00AM - 9:00AM	79	2.0759	.78073	.08784	1.9011	2.2508	1.00	3.00
9:00AM - 10:00AM	24	1.8333	.81650	.16667	1.4886	2.1781	1.00	4.00
10:00AM - 11:00AM	3	3.0000	.00000	.00000	3.0000	3.0000	3.00	3.00
Total	119	1.9748	.79684	.07305	1.8301	2.1194	1.00	4.00

**ANOVA**

Morning traffic

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.970	3	2.990	5.213	.002
Within Groups	65.955	115	.574		
Total	74.924	118			

**INTERPRETATION:**

The above table indicates that 10.9% of the respondents are Morning traffic rush hours between 7:00AM – 8:00AM. 66.4% of the respondents are Morning traffic rush hours between 8:00AM – 9:00AM, 20.2% of the respondents are Morning traffic rush hours between 9:00AM 10:00AM and remaining 2.5% of the respondents are Morning traffic rush hours between 10:00AM – 11:00AM.

**FINDINGS:**

Majority (43.7%) of the respondents are **ALMOST ALL THE TIME** faced traffic congestion

Majority (37%) of the respondents are mood in traffic jam is **NEUTRAL**  
 Majority (34.5%) of the respondents are faced the traffic time back to home delay is **MORE THAN 30 MINUTES**  
 Majority (42%) of the respondents are says main causes of traffic jam is duringhappened **ROAD CONSTRUCTION / ROAD WORKS**

Majority (72%) of the respondents are facing **RUSH HOURS IN MORNING** is between 8:00PM – 9:00PM

**SUGGESTIONS**

Should finish the construction first then Government should Try to complete their construction works on time and once the work

started in a place that should be done completely then they should move to another projects, that would help to Clear jams. Use alternative roads instead of cutting down the trees at road sides for extension of roads. Increasing our road facility to construct extra lanes and alternative roads then increase traffic signals and control rush hours to avoid traffic jam.

#### CONCLUSION

Effective management of traffic flow will ensure safe and secured the traffic movement. The population of Coimbatore is increasing due to the presence of major educational and industrial institutions. As a result, recently the population in the city rose. Existing city road network is not adequate to the needs of the increasing traffic volume. There are so many road intersections in Coimbatore city road network. There are no separate lanes for slow moving vehicles as dueto which the problems like traffic congestion delay and road accidents occur at the major road intersection in Coimbatore city. The accident locations and suggested some possible alternative or corrective measures were given to improve the transportation system in these locations, from which the decision maker can select suitable measure for the location. The method is found to be effective in identifying the black spots, provided sufficient secondary data is available.

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#### PLATFORMS:

Google chrome

Chat GPT