

# Examination of Traffic Congestion and Remedial Measures, Coimbatore City

S.D.Anitha Selvasofia, G. Prince Arulraj, V.G.Srisanthi

**Abstract:** During the past few years, there has been high growth of demand for road transportation. The volume of road traffic has increased continuously over years due to the increase in the vehicle population, buying power, rented cab services, increasing economy activities and urbanisation. Road accidents and traffic congestion impose a burden on the society. Reducing the traffic congestion and road accidents are very important for efficient road transportation. With the increase in population in Coimbatore, the number of vehicles also increased. 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. The vehicle population in Coimbatore has increased at an alarming rate. In the year 2014-15, around 27100 two wheelers, 4800 cars and 1800 other transport vehicles have been registered. In the year 2015-16, 33000 two wheelers, 6700 cars and 3040 other vehicles have been registered. The increase in the percentage comes to 20%, 40%, 40% respectively during the years 2014-15, 2015-16. Coimbatore has a large number of floating population. The traffic on its roads has increased so much that it often becomes very difficult to cross a road. During the peak hours of the day, we find an unending stream of buses, trucks, cars, tempos, scooters, motor-cycles and cycles are seen in many roads. Most of the drivers of the vehicles do not observe traffic rules. Other than this, accident data opinion survey was also carried to know the problems faced by the pedestrians. After analyzing all the data, remedial measures such as widening of road, removal/relocation of bus stops, implementation of speed breakers and introduction of manned and unmanned traffic signals are suggested in the study area. An overall analysis was carried out to determine the effects of introducing the remedial measures. It is found that the traffic congestion can be reduced if the remedial measures are implemented.

**Key Words:** Accident study, Traffic volume, Traffic congestion, manned traffic signals, traffic signals

## I. 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 have 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

**Revised Manuscript Received on December 30, 2019.**

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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.

## A. Risk Zone

Risk zone is the zone where the occurrences of accidents are repetitive and the level of risk is high. To identify the risk zone, highest accident rate and a major cause of accident in these zones are studied.

## B. Geographic information system

GIS makes it possible to integrate different kinds of geographic information, such as digital maps, aerial photographs, satellite images and global positioning system data (GPS), along with associated tabular database information (e.g., 'attributes' or characteristics about geographic features). Using GIS, you can incorporate all of this information into a single system and execute common database operations. For example, GIS allows you to perform statistical analysis or spatial queries, to explore 'what-if' scenarios, and to create predictive models.

## C. Benefits of GIS

GIS benefits organizations of all sizes and in almost every industry. There is a growing awareness of the economic and strategic value of GIS. The benefits of GIS generally fall into five basic categories:

- Cost saving and increased efficiency
- Better decision making
- Improved communication
- Better record keeping
- Managing geographically
- GIS application in transportation

GIS-T is one of the leading GIS application fields. Many GIS-T applications have been implemented at various transportation agencies and private firms. They cover much of the broad scope of transportation and logistics, such as infrastructure planning and management, transportation safety analysis, travel demand analysis, traffic monitoring and control, public transit planning and operations, environmental impacts assessment, intelligent transportation systems (ITS), routing and scheduling, vehicle tracking and dispatching, fleet management, site selection and service area analysis, and supply chain management.

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Each of these applications tends to have its specific data and analysis requirements. For example, representing a street network as centerlines may be sufficient for transportation planning and vehicle routing applications. A traffic engineering application, on the other hand, may require a detailed representation of individual traffic lanes.

## II. STUDY AREA

Coimbatore corporation lies between the latitude and longitude of 11°1'6"N 76°58'21"E It is located on the banks of the Noyyal River, in south western part of Tamil Nadu at an elevation of 411m above mean sea level. It covers an area of 287.2893 sq.km. As there is a huge availability of employment in the city, the people from adjoining cities and states enter the Corporation area and the NH roads are designed for the people to pass through the city which results in heavy traffic congestion. The study area is shown in figure 1.

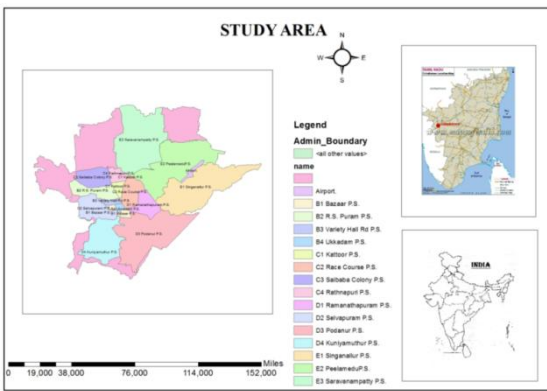


Fig 1. Study area

## III. OBJECTIVES OF THE STUDY

- The study has been carried out with the following objectives
- 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.

## IV. DATA COLLECTION

The accident data for the years 2010-2016 for Coimbatore city were collected from the police department. The accidents were classified into three types namely (i) accidents without injury (safe), (ii) accidents that caused injury and (iii) accidents that resulted in death. The details of the accidents are given in Table I

Table-I Classification of Accidents

Year	Safe	Injury	Human loss
2010	8	8	19
2011	83	90	155
2012	217	196	370
2013	249	239	421

2014	352	307	539
2015	298	285	490
2016 (up to March 2016)	174	151	266

Table-II Details of vehicles/ pedestrians involved in accidents

Year	2 Wheeler	4 Wheeler	Heavy Vehicle	Pedestrian
2010	10	13	5	7
2011	129	108	37	54
2012	259	354	71	99
2013	424	251	122	112
2014	596	291	160	151
2015	359	252	288	174
2016	244	213	62	72
Total	2021	1482	745	669

From the Table, it can be seen that 41% of the accidents are caused by two Wheeler, 30% of accidents are caused by four wheeler, 15% of accidents are caused by heavy vehicle and 14% of accidents are caused by pedestrians. By limiting the speed of two wheelers and four wheelers, by providing pathways for pedestrians and by diverting heavy vehicles through ring roads, the number of accidents can be reduced.

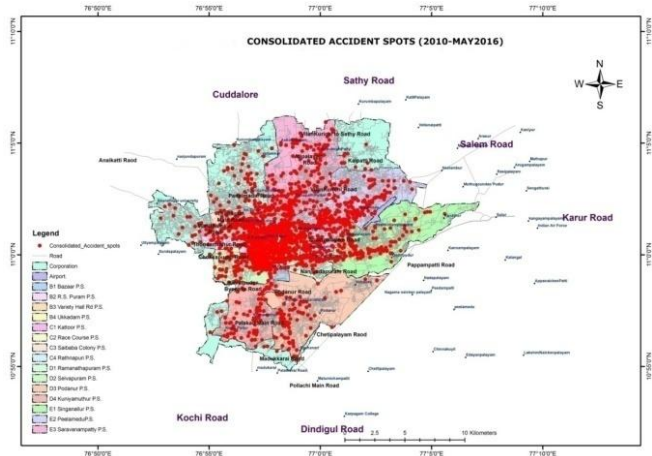


Fig 2. Consolidated Accident Spots

From the Figure 2, it can be seen that majority of the accidents have taken place very close to the centre of the city. The details of the traffic volume data that have taken place during the peak hour and non peak hour are given in Table III.

**Table-III Traffic Volume Data**

Place	Traffic Volume data Passenger Car unit (PCU)									
	Bus /Truck		Car		Auto		Two Wheeler		Cycle	
	PH	NPH	PH	NPH	PH	NPH	PH	NPH	PH	NPH
Saravanampatti	884	2210	4596	11490	300	750	5200	13000	25	46
SRPMills	564	1410	4120	11501	275	687.5	4800	12000	24	53
Ganapathy	750	1875	5000	13251	241	602.5	5300	13250	33	63
Sai Baba Kovil	550	1375	3850	9865	200	500	9421	23550	40	69
Thudiyalur	495	1237	4600	10510	198	495	8425	21061	32	54
GowndanPalayam	368	920	2950	7375	175	437	7950	19875	41	56
Lakshmi Mill	1165	2912	8023	20057	595	1487	8595	21488	55	61
PSG Tech	1350	3375	9500	23750	600	1500	9000	22500	23	39
KMCH	1250	3125	10500	26250	623	1557	9623	24055	49	55
West Club	690	1725	4700	11750	490	1250	6250	15625	51	63
Singanallur Junction	750	1875	4836	12090	493	1236	6300	15750	62	73
Sulur	650	1625	4900	12250	485	1135	5293	13234	56	60

PH- Peak Hour, NPH-Non-Peak Hour

Table III gives the details of volume of traffic during Peak Hours (PH) and Non Peak Hours (NPH). These data were obtained after carrying out traffic survey for a month. 8.00 am to 10.00 am and 1.00 pm to 2.00 pm, 4.00 pm to 6.00 pm, 8.00 pm to 9.00 pm were considered as peak hours.

From the above Table, it can be seen that the traffic volume is high in almost all places. However, the traffic volume is found to be high near, Lakshmi mills junction, PSG College of Technology, KMCH, and Sai baba kovil. Also from Table 3 it can be seen that the number of accidents are high in Avinashi road and Mettupalayam road. Larger traffic volume has represented in more accidents. Hence suitable measures are to be taken in highways to reduce the traffic congestion. If ring road is formed then the buses, trucks and other vehicles which needed not have to come to the city also use inner city roads. Hence diverting the vehicles through the ring roads will reduce congestion and accidents of city. The following factors are considered to reduce the traffic congestions.

- Number of lanes
- Road category
- Land use and Land cover
- Traffic volume data
- Bus stops

### V.OVERLAY ANALYSIS

Overlay Analysis Has Been Carried Out To Identify the Zones Prone To Congestion Giving the Weightages Given In Table IV.

**Table-IV Factors Considered for Traffic Congestion with Possible Weights**

S.No	Factors affecting occurrence of accidents	Possible variations	Weights assigned for Separate analysis
1	Number of lanes	Two lane	2
		4 lane, 6 lane	1
2	Road Category	ODR	1
		MDR	2
		SH	3
		NH	4
3	Land use and Land cover	Agriculture and Water Bodies	1
		Barren Land	2
		Open Land	3
		Commercial	4
		Residential	5

4	Traffic Volume	Low	1
		Medium	2
		High	3
		Very High	4
5	Bus stops	<0.5 km (high)	3
		0.75km(Medium)	2
		>0.75km(Low)	1

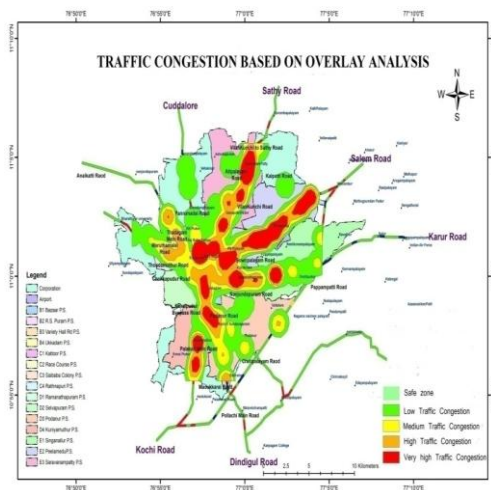
required in the very highly congested and highly congested zones.

It can be seen from Figure 4 that, along the place of congestion, many bus stops, bus stops near traffic signals, bus stops near intersections are seen which cause traffic congestions. In order to reduce the traffic congestion, few bus stops were removed, few were relocated, few automatic and manned traffic signals were introduced.

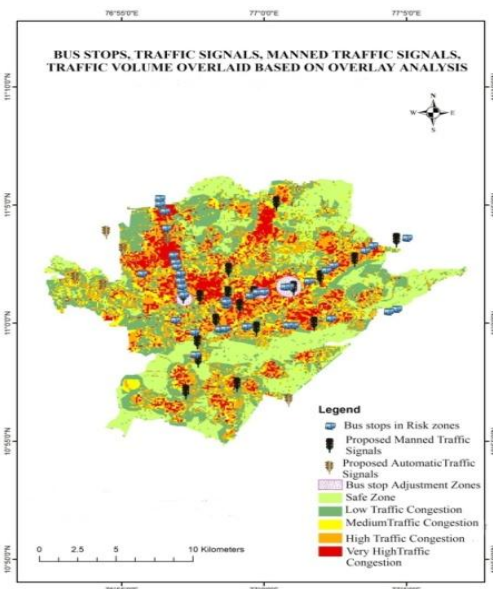
### VI.RESULT AND DISCUSSIONS

Based on the overlay analysis, 17 places have been identified as accident prone zones and the proposed remedial measures are given in Table V.

The results of the overlay analysis are shown in Figure 3



**Fig 3 Traffic Congestion in National Highway & State Highway based on overlay analysis**



**Fig 4 Bus stops, Traffic signals, manned traffic signals, Traffic volume overlaid based on overlay analysis.**

Figure 4 shows the bus stops located in very high congested zones. It also gives the proposed traffic signals



Table- V: Remedial Measures

S.No	Place of Accident	Reason for Accident	Remedial Measures
1	Avinashi road Peelameduinfront of Arunachala hotel	While signal opening vehicles drove over speed	Speed control to be enforced.
2	Avinashi road chinniyampalayam Bus stop	Non availability of foot path,	To provide foot path mark Pedestrian crossing.
3	Sathy road Saravanamapatty near Avin Booth	Due to over speed	To Display the accident cases
4	L& T By pass road near SathyEngg Collage	Absence of street light and center Median	To provide Street light and Make a center median
5	Avinashi road GKNM Signal	Due to over speed	To Make a speed breaker on cut roads
6	VK Road Indira nagar near Srinivasa traders	Over speed	Make a speed breaker
7	Avinshi road Chinniyampalayam near KGM hospital	Over speed	To close the cut roads
8	Avinashi road near JM Bakkerly signal	Over speed	To display the accident photos flex
9	Trichy road singanallur Near Shanthi gears	Over speed	Make pedestrian cross line and to provide police signal
10	Avinashi road near sitra signal	Rash and negligent driving	To Display Awareness Accident Photos
11	Avinashi road near GKNM Signal	Over speed	To Display Awareness Accident Photos
12	Trichy road near Singanallur Signal	Over speed	To Display Awareness Accident Photos
13	Avinashi road Chinniampalayam near KGM hospital	No pedestrian cross Line	Make a speed breaker in cut roads
14	Kamarajar road Singanallur Bus Stand	Over speed	Make a speed breaker
15	L&T By Pass road near SakthiEngg Collage	No street lights	To provide street lights
16	Sowripalayam Indiranagar in front of D.No 98	Over speed	No street lights
17	SNR road near Ramakrishna Dental Hospital	Rash Driving	Make a speed breaker

**VII. 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 due to 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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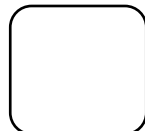


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## AUTHORS PROFILE



**Anitha Selvasofia** completed her U.G Degree in Civil Engineering in the year 2004 in Karunya Institute of Technology, Coimbatore. She completed her M.E Geo-Informatics in the year 2007 at College of Engineering, Guindy. She obtained her Ph.D. Degree on 'Identification of accident prone zone and minimizing the traffic congestion flow using GIS' in 2019 under Anna University, Chennai. She has published 11 papers in International Journals and 2 papers in International Conference and 3 papers in National conferences. She has organized 2 National Conferences. At present she is working as Assistant Professor (Sr.Gr) at Sri Ramakrishna Engineering College, Coimbatore .



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**Dr. Srisanthi** completed her Bachelor's degree in PSG College of Technology, Coimbatore in 1988 and did Masters in Structural Engineering in 1994 at CIT. She obtained her Ph.D. Degree on 'Efficiency of Friction Damper System in Rigid Frames' in 2004 under Bharathiar University. She published papers in International and National Conferences. She is the Life Member of professional Bodies like Institution of Engineers (India), Indian Society for Technical Education, Indian Association of Structural Engineering, Indian Society for Earthquake Engineering, Indian Concrete Institute and Association of Structural Rehabilitation. Dr. V.G. Srisanthi is working as Professor & Head in department of Civil Engineering at Coimbatore Institute of Technology, Coimbatore, India. She is guiding researchers for their doctoral programmes and projects for under graduate and post graduate students. Dr. Srisanthi has established unique Bi-Axial (2m x 2m) Shake Table in Structural Engineering laboratory for testing of 2D & 3D structural models under dynamic loading. She has received research grants and funding from various agencies like AICTE (Rs.9.6 Lakh), UGC (Rs.4.3 Lakhs), UNDP (Rs.4.75 Lakhs) and INSDAG (2.5 lakhs).