CHAPTER-VII
FINDINGS, SUGGESTIONS AND CONCLUSION

7.1. FINDINGS:

The main aim of the present research was to understand the developments in road network, study the growth in vehicle density, and assess the traffic congestion and road accidents in Mysore City. The major findings of the study are as follows:

7.1.1. Development of roads & Vehicle density:

a) The total road network in the City as surveyed in the year 1972-73 was 725.96 kilometers, in the year 2005-06 was 2322.42 kilometers and in the year 2016 was 2445.41 kilometers.

b) The city presently has 2445.41 kilometers of total road length of which 42.5 kilometers is the Outer Ring Road and 67 kilometers is National and State Highway. The city has 33 major circles for intersections and 35 one-way roads as of 2016.

c) The City is well connected with a well planned network of roads. But the increasing density of vehicles due to increasing population including migrated people from other cities and states has made it difficult to manage. Total number of vehicles in the year 2003-04 was 10,912, which had increased drastically to 60,100 in the year 2015-16.

d) Number of motor-cycles registered in the city increased steadily in 2015-16 with 49,952 units from 9,146 units in the year 2003-04. Light motor vehicles, like cars, also had a steady increase in the numbers registered from 398 in the year 2003-04 to 7,462 in the year 2015-16.

e) The numbers of auto-rickshaws registered were fluctuating constantly between 2003 and 2016. The least registration of 486 units was in the year 2003-04 and the maximum registrations of 1,210 units were made in the year 2008-09.
f) The numbers of buses registered have declined drastically from 334 units in the year 2012-13 to 72 units in the year 2015-16, with the highest registration of 418 units in the year 2007-08.

7.1.2. Traffic Congestion in Mysore City

Many roads in Mysore City faces traffic congestions at different time periods due to several factors. The traffic congestion were thus assessed for 06.00am, 10.00am, 02.00pm, 06.00pm and 10.00pm on an average for both weekdays and weekends. The time-wise assessment of traffic congestion revealed the following:

a) Few roads adjacent to the major vegetable markets in the city were found to be congested on both weekdays and weekends particularly during 06.00 am. The road connecting the Mall of Mysore and the JSS Hospital has a large wholesale vegetable market that supplies vegetables and fruits to almost all the retail markets in the city. The market is usually active from 04.00am to 08.00am everyday and the market owners and local residents rush in, causing heavy traffic congestion.

b) Most of the major roads connecting the schools, colleges, offices and city bus stand during 10.00am were found to be slow moving as it is the peak hours in the city during weekdays. Slow moving traffic can be seen on JLB road near railway station, Irwin road, Bangalore-Nilgiri road near suburban bus stand, Jayachamarendra Wadiyar circle, parts of Mizar road and Lokaranjan Mahal road and some parts of KRS Road. On weekend, slow moving traffic are comparatively lesser than weekdays, but are found in JLB road near Ramaswamy circle, part of Malavalli-Mysore road near ring road intersection and parts of Mangalore-Mysore Highway.

c) Slow moving traffic can be frequently found in parts of city’s core areas at 02.00pm on weekdays in the Western and North eastern parts of the city. High congestion are common near suburban bus stand circle, Krishna Vilas Road adjacent to Maharani P.U. College, part of N.S. Road near Shanthala Theatre, roads near Ramaswamy circle and Vonti Koppal circle and RPG Tele-cable road near ring road intersection. On weekends, traffic movement is slow near commercial areas and congested in Mangalore-Mysore Highway near hootgalli circle, part of Bangalore-Mysore road near Columbia Asia Hospital circle, JLB
road near Ramaswamy circle, KRS road near Vonti Koppal circle and NS Road near Shanthala theatre.

d) At 06.00pm weekdays, traffic gets congested typically near Vonti koppal circle, part of Dr.Rajkumar Road near RTO East, part of Mangalore-Mysore highway nearby Hootagalli Santhe, near Vijaya Bank circle and part of Vishwa Manava Double road. Whereas, on weekends, the traffic congestion is commonly found in central core area of the city, part of KRS road in Vonti Koppal circle, parts of NS Road near Shanthala theatre, parts of Mangalore-Mysore Highway near Hootgalli circle, part of Adhichuchangiri road adjacent to Apollo hospital and Bangalore-Mysore road near Columbia Asia Hospital.

e) Traffic congestion eases out by 10.00pm in the city and only a few roads near the commercial areas and shopping centers faces a slow moving traffic. On weekdays, slow moving traffic is commonly found in parts of ring road intersecting Mananthavadi road, parts of T.Narasipura road, part of Bogadi road and part of M.G. Road adjacent to the Mall of Mysore. Whereas, congestion is high near Infosys Road on weekends.

7.1.3. Road accidents in Mysore City

a) A total of 902 incidences of accidents were reported in Mysore City in the year 2013 in which 141 people died. The accidents were highest in the months of January and September and the least accidents were found in the month of May for the year 2013.

b) 446 accidents were reported in N.R. Sub-Division, 273 accidents in the K.R. Sub-division and 183 accidents in Devaraja sub-division in the year 2013.

c) The highest numbers of incidences of accidents (247 accidents) have occurred between 06.00 pm and 10.00 pm, which is the highest, compared to accidents in other time zones.

d) 87 accidents has occurred between 10.00 pm and 06.00 am, marking the least number of accidents as the vehicle density is lower compared to other timings.
e) The two-wheeler vehicles accounts for 41.13% of the total accidents occurred in Mysore City. Signal jumping, drunken driving and over-speeding have caused the hike in the numbers of two-wheeler accidents.

f) Four wheeler accidents accounts for 32.92 % of the total accidents in the city due to over-speeding, drunken and rash driving.

g) The accidents by three wheeler vehicles i.e. Auto Rickshaws accounts for 10.08% of the total accidents in Mysore City due to careless driving and the violation of traffic rules.

h) The accidents by six wheelers including the buses and trucks accounts for 15.85% of the total accidents due to rash driving and over-speeding.

i) 79 percent of the total occupants involved in the accidents were male occupants and only 21 percent were female occupants.

j) The central part of the city has the majority of accident hotspots and the surrounding areas with less traffic density have less significant hotspots. Areas beyond the ring road have more cold spots.

7.2. SUGGESTIONS:

The city is expecting an increase in its population due to the prospects from increasing number of IT companies and favorable climate. This will lead to more traffic congestion that must be foreseen at the appropriate time before the situation goes out of control. From the research outcomes and the questionnaires to the users and experts suggests the following measures in controlling the traffic congestion and in reducing the fatality from accidents in Mysore City:

(i) The city has several bus stops adjacent to the traffic signals that causes traffic jams. The location of bus stops near the intersection of two or more roads or near traffic signal points must be relocated.

(ii) Scientific speed control humps has to be installed near the premises of Schools and accident prone areas to avoid over-speeding of vehicles. Streets that join the major roads should have humps before intersection, if signal lights are not
installed. This will allow vehicle entering the major road to reduce speed and
observe other vehicles on the major roads.

(iii) Humps in road can help reduce the speed of the vehicles. On the other hand, it
also leads to accidents as many do not observe it immediately. Whereas, a 3D
hump, that looks like a hump but not a hump in reality, can be a better solution
in major roads like National Highways and Ring Roads.

(iv) Roads with high density of vehicles and limited road width should allow only
one way traffic to avoid congestion.

(v) The sub-urban bus stand is located in the heart of the city operating more than a
thousand buses per day to other cities and states. Relocating this Bus Stand to
the outskirts of the city can solve the congestion issues near the central part of
the city. Though a satellite bus stand at the outskirts is provided, it is not fully
functional. Building more bus stations in the outskirts of the city can stop the
inflows of inter-city and inter-state buses inside the city.

(vi) Posts or bollards can be placed to restrict access to large vehicles in roads and to
slow down the speeding vehicles, especially in residential areas. But, there must
be an alternative route available for large vehicles such Fire Engines and
Emergency Service vehicles.

(vii) Traffic police must create awareness in the importance of following traffic rules
as many drivers in the city do not follow them properly. They must ensure that
the licenses are issued to competent drivers only and that they are trained well.

(viii) Provide more traffic signal lights at intersections having high vehicle densities
and maintain the existing signal lights. Some signal lights within city lack
proper maintenance and are not frequently working. Map 7.1 shows the
suggested locations for the traffic signal lights depending on the traffic density
and accident occurrences. Table 7.1 shows the traffic sub-division-wise
locations for the installations of new traffic signal lights to control the increasing
number of road traffic accidents.
Map 7.1: Existing traffic signals lights with suggested locations for new installations

Table 7.1: Suggested locations for installing new traffic signal lights

<table>
<thead>
<tr>
<th>K.R. Traffic Limits</th>
<th>N.R. Traffic Limits</th>
<th>Devaraja traffic Limits</th>
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<tbody>
<tr>
<td>Koutilya Circle</td>
<td>Fountain Circle</td>
<td>Chirag Junction</td>
</tr>
<tr>
<td>RTO (09) Circle</td>
<td>FTS Circle</td>
<td>Nazarbad Circle</td>
</tr>
<tr>
<td>Court Junction</td>
<td>N.R. Mohalla Circle</td>
<td>District Police Office Circle</td>
</tr>
<tr>
<td>Chamundi Puram Junction</td>
<td>Shivaji Road SBI Junction</td>
<td>Forum City Centre Mall Junction</td>
</tr>
<tr>
<td>Srinivasa Circle</td>
<td>K.R. Hospital Circle</td>
<td>Bunnur Ring Road Junction</td>
</tr>
<tr>
<td>Gun House Circle</td>
<td>Mathru Mandali Junction</td>
<td>Mahadevapura Ring Road Junction</td>
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<tr>
<td>Ooty Road Junction</td>
<td>Surya Bakery Junction</td>
<td>Naguvanahalli Ring Road junction</td>
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<td>H.D.Kote Ring Road Junction</td>
<td>Highway Circle</td>
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<td></td>
<td>Temple Road Junction</td>
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(ix) Traffic violation has been the major reason for accidents in the city. Traffic Police Department must penalize the offenders to curb this problem. Use of CCTV cameras at major circles can help identify the violators of traffic rules.

(x) The City Corporation and the Urban Development Authority must identify suitable parking places for commercial areas and make no parking zone for narrow roads with high traffic flow.

(xi) The city corporation must cut the branches of old trees on the road sides that might suddenly fall during heavy rain to avoid congestion and damages to life and properties.

(xii) The city can cultivate the habit of car pooling, where people can share their car with others moving to the same office or destination. This would reduce the number of vehicle on road and save the fuel consumption.

(xiii) To avoid fatalities from ramming the vehicles to side barriers, the concept of rolling barrier can be beneficial. An Australian Company named KSI Global Australia Pty Ltd has designed the rolling barriers that allow the colliding vehicle to move forward rather than letting it to overturn. Roller Safety Barrier has the design and effectiveness to curtail road fatalities by converting collision shock energy to rotational energy reducing the impact. Safety Roller has been designed to be used on centre lines to divide traffic, off ramps / on ramps, bridges and extreme hazards. It will have a tolerance up to 100 km/hr and 25 degree impact angle.

*Source: KSI Global Australia Pty Ltd*

*Fig. 7.1: Safety roller barriers installed by KSI Global Australia Pty Ltd. in Thailand*
A concept of movable dividers can be used to control congestion issues to great extend. Some roads have more traffic towards one direction at the morning hours and to the opposite direction in the evening hours. Adjusting the width of the road according the vehicle density can ease out the problem of congestion. The Fig. 7.1 show the traditional 4 lane tracks (2/2) and the concept of 5 lane track with movable barrier depending on peak hours.

![Fig. 7.1: Traditional lanes and the planned 5 lane with movable barriers](image)

(xv) Major Roads like the Ring Road and National Highways within the city limits must have speed breakers installed before intersections or severe turns. This can avoid rash driving and in turn reduce the accidents due to over speeding. Use of barricades as speed breakers (Plate 7.1) is hazardous especially during heavy rain and storm as it overturns and the two-wheelers accidently hit them. Recently, new designs of retractable speed breakers (Plate 7.2) have been installed in certain parts of the city which is much safer than the use of barricades.

![Plate 7.1: Use of barricade as speed breakers in Bogadi Gadige Road](image)
(xvi) Installing speed detectors in wide roads can reduce the number of over-speeding vehicles.

(xvii) Use of mercury lights and high beams in motorcycles, cars and buses effects the visibility of the opposite vehicle driver. Traffic Police department must ensure to curb the use of mercury and high beam lights within city limits at night to avoid accidents.

(xviii) Driving schools must be given strict guidelines and instructions to train the upcoming drivers well and to stress the importance of obeying the traffic rules.

(xix) Pedestrians visiting the city bus stand and sub-urban bus stand find it difficult to cross the roads and sometimes even lead to traffic congestion and accidents too. Hence, to reduce the intervention of pedestrians in these roads, construction of footbridges above the roads is essential.

(xx) The junctions with more accidents lack sufficient Traffic signals hence the installation of traffic signals with traffic cops at peak hours would help to reduce the incidences.

7.3. CONCLUSION:

The city of Mysore has a well-connected network of roads. In the Maharaja’s period, the roads in Mysore were very less. Bullock carts and Tonga (cart pulled by horses) were the only means of transportation in this period. Slowly, the city expanded and the need for transport increased. No private and public vehicles were available except for few vehicles owned by the Maharaja himself for his own use. The roads were very
narrow and congested then, but during the British rule, the four major roads were developed in the city for the administrators to travel.

After the independence, the government had established several educational institutions in the city that attracted several people to the city, increasing the demand for more road transport. By the year 1970, several industrial areas were also developed. The city also became a favorite tourism centre. The city grew faster and so did the road network. But the limitation to widen the roads and curbing on the increasing vehicular density has troubled the city. New residential layouts are developing faster than ever before that will add pressure to the city’s transportation.

Even though the road development authorities are trying to keep pace with the developmental activities of the city, the threshold has been reached and new solutions to control the traffic congestion has to be taken. No sooner will the state of roads in Mysore be like the highly congested roads of Bangalore the neighboring city. If appropriate measures are not taken at the right time, it will be a never ending problem, as roads cannot be widened at a later stage.

The traffic congestion is presently concentrated near the market places, schools, colleges and government offices at peak hours. The total number of vehicles in the year 2003-04 was only 10,912, which had increased to 60,100 in the year 2015-16. This statistics is only the registered vehicles in Mysore Transport Office, but the number of vehicles plying in the roads of Mysore is much more than this, as the city roads has vehicles that are registered from other cities and states around Mysore that comes with immigrants and tourists.

The present research focused on the development of roads and its networks and the growth of vehicles registered within the city. Based on the data collected from the Mysore City Traffic Police department, the questionnaire survey and the GPS crowdsourced data from Google databases, the traffic congestions within the city limits were mapped and analyzed for five different timings, 06.00am, 10.00am, 02.00pm, 06.00pm and 10.00pm on both the weekdays and weekends.

It was found that the road traffic congestion varied widely between each timing due to several factors. Wholesale vegetable market areas with narrow roads in the early hours of weekdays and weekends were the main reason for the congestion in some
parts of the city. Whereas, areas near the schools, colleges, government offices and major IT firms had higher congestion during the opening and closing hours, usually known as the peak hours in the city. Night hours usually observe less congestion in majority of the areas, with exceptions like areas near city and sub-urban bus stands.

The accident data for the year 2013 were collected from all the Traffic Police stations and due to some space constraint, some of the stations had already destroyed the data pertaining to the solved cases prior to the year 2013. Hence, only an years data was used for the analysis. The location of all the accidents for the year 2013 were plotted on the map based on different time periods (06.00am to 10.00am, 10.00am to 02.00pm, 02.00pm to 06.00pm, 06.00 pm to 10.00pm and 10.00pm to 06.00am), types of vehicles involved and gender of the occupants involved in the accidents. The fatalities due to road accidents were also mapped to identify the locations with high severity of accidents. The kernel density for the accidents was analyzed for the highest number of occurrences per square kilometers of distances.

The areas near the central part of the city, major intersection without proper traffic signals and high traffic congested areas have the maximum number of accidents in the city. Managing the city traffic becomes further difficult during the Mysore Dasara festival celebration between September and October and in summer holidays where tourists flood in to the city. Absence of proper management strategies, the city would have to witness a total chaos.

The road accidents in the city is showing an increasing trend which is at an alarming state. If proper action is taken at the moment, the number of occurrences can be reduced. Several measures are suggested in section 7.2 of this chapter that can be followed to reduce the issues related to congestion and accidents. The use of GIS by the traffic police department can also help them monitor and manage the traffic congestions, study the incidences and reduce the fatalities by accidents.

The availability of data is an important factor for every research, especially for studies like road traffic accidents. Registering every accidents and maintaining proper databases with accurate locations would help the assessment of accident incidents. Further research can be conducted to create models in GIS to assess, forecast and manage the congestion in the city.