INTRODUCTION:

Public Transport System in most Indian cities is rapidly deteriorating because of the increasing travel demand and inefficient transportation system. There are various problems related with public transport such that tremendous increase in number of accidents, Environmental degradation, Congestion, overcrowding due to inadequate system, Frequency of service and schedule is not strictly adhered.

Volume-Demand-to-Capacity Ratio (V/C) is a measure that reflects mobility and quality of travel of a facility or a section of a facility. It compares roadway demand (vehicle volumes) with roadway supply (carrying capacity). It should preferably be in the region 0.6-0.8 for proper regulation of traffic. For most roads in Bangalore the V/C ratio is higher than normal as shown in the table below:

<table>
<thead>
<tr>
<th>SL NO</th>
<th>NAME OF THE ROAD</th>
<th>V/C RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nrupatunga Road</td>
<td>3.62</td>
</tr>
<tr>
<td>2</td>
<td>District Office Road</td>
<td>2.51</td>
</tr>
<tr>
<td>3</td>
<td>K.G. Road</td>
<td>2.51</td>
</tr>
<tr>
<td>4</td>
<td>Lalbagh Fort Road</td>
<td>2.67</td>
</tr>
<tr>
<td>5</td>
<td>Puttanna Chetty</td>
<td>2.45</td>
</tr>
<tr>
<td>6</td>
<td>Richmond Road</td>
<td>2.26</td>
</tr>
<tr>
<td>7</td>
<td>M.G. Road</td>
<td>2.26</td>
</tr>
<tr>
<td>8</td>
<td>Chord Road</td>
<td>2.51</td>
</tr>
<tr>
<td>9</td>
<td>Tumkur Road</td>
<td>2.62</td>
</tr>
<tr>
<td>10</td>
<td>Sankey Road</td>
<td>1.52</td>
</tr>
</tbody>
</table>

Table 1.1: V/C ratio for Bangalore roads

Adding to the traffic is the pollution which is rapidly increasing and disrupting the climate of the area. The pollution data clearly states the decline of the environment as a whole. In order to overcome these problems, a solution to provide better flow of traffic has been proposed via this project. The project aims at creating a healthy environment for the public and provides hassle free transport system to the passengers.

Bus Rapid Transit System (BRTS) is an innovative, high capacity, low cost public transport solution that can significantly improve urban mobility. Implementation of BRTS by creating segregated bus lanes and re-designing intersections, conflicts between buses and other motorized traffic can be reduced leading to a sharp decrease in the number of accidents and fatalities for buses and other motorized two-wheelers. Apart from reduction in accidents, an exclusive bus lane carries significantly more people than an adjoining general traffic lane.
during the peak travel periods. The number of bus riders in an exclusive bus lane exceeds the number of automobile occupants using adjacent lanes. Thus exclusive travel ways result in increased capacity and reduction in travel time. Urban Planners and Administrators have found Bus Rapid Transit System (BRTS) as efficient, cost effective and simple as compared to other Metro System in Bangalore. This is one of the types of public transport which is a bus based mass transit system. Recently the Department of Urban Land Transport approved the idea of priority lanes with Bangalore by yellow lane demarcation lines. However, barely hours after the lines were painted, traffic returned to usual. The objective of this paper is to study the BRT system for Bangalore city based on qualitative parameters. This will help when designing future systems and feasibility of the system under different circumstance. This BRTS network has been designed as such that it also takes into account of the solutions by the BRTS around the world. Particular emphasis has been made to assess the feasibility of BRT options as compared to the physical and infrastructural capacity of the road network of Bangalore city in the particular stretch.

A proposed route from Nayandahalli to Jayanagar for a stretch of 8kms was taken up for creating a BRTS schedule for reducing accidents and travel time. Hourly Survey from traffic signals throughout the route and calculation of v/c ratio indicated that the capacity of the currently prevailing system is insufficient. The segregated vehicle information data also indicated an abrupt increase in traffic during peak hours. Hence for reducing the traffic and better effective use of the roadway space available, roadway design for BRTS for the entire route is done keeping in mind the various road widths at different places. The design of roadway is done for 40m, 35m, 30m and 25m widths. Junctions are marked and feasible methods of elevated bus stations, elevated roundabouts are implemented for the entire route keeping in mind all the possible constraints.

The outcomes of implementing BRTS through the proposed route map would result in economic benefits such as reduced travel times, improved road conditions and also social benefits like easily accessibility to buses, reduced accidents and injuries. It would also account to an abrupt increase in BMTC revenues, as more people would be attracted to using buses if the travel time was reduced considerably. BRTS can be considered more feasible considering the fact that the current project in Bengaluru, Namma Metro costs around Rs. 200 crores for 1km length whereas BRTS costing around Rs. 15-20 crores for the same stretch of road. Adding to that, BRTS is to be built on an existing infrastructure whereas a whole new infrastructure has to be setup for a metro rail project which takes a lot of time.

This study shows the currently prevailing transport and traveling scenario and the characteristics of existing condition of the proposed route map of Bangalore. Emphasis has been made to assess the feasibility of BRT options as compared to the physical and infrastructural capacity of the roads of the route from Nayandahalli to Jayanagar. Finally, a set of recommendations have been proposed to improve the currently prevailing physical, infrastructural and operational condition of the transportation system aims at introducing modern mass rapid transit system in Bangalore to meet the future enormous demand.

**OBJECTIVE:**
1. To reduce the travel time of the vehicles.
2. To reduce the vehicle demand to capacity ratio.
3. To improve the mass transport system.
4. To reduce the accidents rate.

**METHODOLOGY:**
1. A routemap was selected keeping in mind the feasibility of BRTS and regular travelling by the users.
2. Signals spotted for survey throughout the route map.
3. Hourly survey was carried out for a duration of 4 hours at peak hours and to calculate the number of vehicles.
4. The highest intensity of traffic was found and the timings were inferred.
5. Survey of carriageway revealed the inadequacy for most roads in the currently prevailing scenario.
6. According to survey data V/C ratio was calculated to determine the current traffic density.
7. Survey was carried out to measure the width of the carriageway along the route.
8. Videos were made to observe the direction and density of traffic flow.
9. Survey data were collected and excel sheet was created accordingly to study the data.
10. Based on the study following, structure of carriage way for different width was proposed.
11. A different methodology for 25m, 30m and 35m was adopted as per IRC Code books and keeping the constraints in consideration.
12. Flyovers of 80m length to be constructed at various junctions to provide movement to traffic coming from intersecting roads.
13. Flyovers constructed only for the movement of Buses and no other vehicles allowed.
14. Bus stops are provided at strategic locations and at places where the width of the road is above 30m.
15. All Bus stops except 4 throughout the route map provided at the currently prevailing bus stops to avoid problems to the public.
16. Five elevated bus stops are provided at
   a. Hoskerahalli Signal,
   b. Kamakhiya Theatre Signal,
   c. Devegowda Petrol Pump,
   d. Jss Circle
   e. Apollo Cradle Hospital Signal
17. JSS Circle is an intersection of 5 roads coming and meeting at a junction. To overcome the problem of Buses travelling in two directions, an elevated circle is to be constructed which would be accessible only to buses and buses can take a left towards Jayanagar/ Basavangudi or travel right and continue in the BRT lanes towards Banshankari Bus station.
18. At some points where no methodologies could be worked out, encroachments had to be done to provide BRT.

**CONCLUSION:**

The length of stretch for BRT system is 9.35km and with a design speed of 30km/hr with the signal stops time 7 minutes the expected travel time is 25 minutes but according to current prevailing scenario the travel time is 45 minutes. The number of accidents occurring due to hit and run, negligence driving etc were 29 in 2015 and 45 in 2014. We have designed a BRT system with the following features to reduce travel time by 15min, accident by 20% and avoid congestion.

**Dedicated bus lanes**

A separate width of 7 meters is provided to bus lanes, the separation of carriageway and bus lane is done by road barricades, to reduce construction cost of dedicated bus lane grass could be provided in between of pavements and concrete road is constructed only on side of wheels. Due to dedicated bus lanes there is no intersection of traffic flow and buses
which allows free flow of traffic. The v/c ratio of the carriageway also comes down to ideal i.e. 1.06 -1.23 and is a main factor to reduce travel time and avoid congestion.

**Elevated bus stops for five stops**
Provision of elevated bus stop facilitates smooth passage of people boarding bus and makes the BRT system hassle free. Primary survey data suggests incoming traffic flow from all directions at these stops exceeds the v/c ratio by a factor of 2.4, therefore, elevated bus stops would increase the width of carriageway by 2m for a length of 70m on either side and the predicted v/c ratio would come down to 1.06-1.24 which is ideal.

**Elevated JSS circle**
Elevated bus circle is required at JSS Circle, since the BRT system has been made an open BRT and according to the route of the system it turns right towards Banashankari Bus Station. To allow buses to flow to and fro from 5th cross road elevated Circle is provided since the JSS circle has 5 intersection and constructing bus corridors on roadway gets complicated thus elevated JSS circle helps the free flow of traffic by increasing carriageway by 2m on either side for 70m and promotes smooth flow of traffic.

**E-ticketing**
Provision of smart cards instead of manual ticketing done by conductor makes the ride hassle free for passengers.

**Smart signals**
Bus stations at Hosakerehalli Signal, Kamakya Theatre Signal, Devegowda Petrol Bunk Signal, Apollo Hospital Signal, JSS Circle, are provided with smart signals, the working of the signal is not based on timer system but it identifies the number of vehicle and works according to an algorithm initial stop time before BRT was estimated to be 15min but by application of smart signal it get reduced to 7mins.

**Increase in ridership**
Studies conducted in cities using BRT has suggested that BRT system has attracted riders and according to survey 30% of riders used private vehicles before. Hence it is predicted that by applying the BRT system will increase ridership and reduce the number of private vehicles in the carriageway.

**V/c ratio stabilized**
If BRTS is implemented and the number of buses increased, providing the public with hassle free journey, more number of people will be persuaded to use public transport. A decrease of 30% vehicles was seen after the implementation of BRTS in Ahmedabad. Even if 20% of the vehicles in the route decrease, and buses don’t run on the vehicle lanes, the V/C ratio will come down to 0.6-0.8 for most part of the route, creating a hassle free journey without much traffic for the travelers.

**FUTURE WORK:**
Detailed area survey, population, economic growth of the area has to be carried out to improve the mass transportation constantly. Alignment in the center of the road, station with off board fare collection and bus priority at intersections work has to be carried out in order to implement BRTS for longer stretch.