

# International Journal of Innovative Research in Science, Engineering and Technology

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## Analysis of Traffic Flow using Q-GIS (Case study at Vandalur Junction, Chennai)

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**ABSTRACT:** Rapid urbanization results in increasing growth of motor vehicles. The Cheapest mode of transport are buses and share autos. There is huge numbers of private vehicles and two wheelers on road. Growth of vehicles has ultimately led to traffic congestion and road accidents. Such incidents can be reduced by proper planning and management measures. In this paper an attempt is made to analyze the traffic flow and optimize the use of existing road through GIS technology. The Vandalur junction on NH45 is taken for study which is one of the busiest junction that connects southern part of Tamil Nadu to Chennai. The geometrics of roads and traffic flow conditions were analyzed through Q GIS and proper suggestions made for free flow of vehicles.

**KEYWORDS:** Traffic flow analysis, Q-GIS, Traffic management, Junction

### I. INTRODUCTION

The information on traffic volume is an important input required for planning, analysis design and operation of roadway systems. Efficient methods of traffic survey and analyzes of traffic data are an integral component of development of highway. Traffic analysis is the process of intercepting and examining the number of vehicles on the road and deducing the pattern of traffic flow. Due to rapid growth of vehicle ownership, there is a demand of efficient methods of traffic survey and analysis [1]. The magnitude of vehicular interaction and traffic conditions is the prerequisite for better operation and management of any roadway. Traffic management measures as the result of level of service[3]. The performance measures of congestion such as the average queue length, arrival and saturation flow rates as well as the average waiting time of vehicle per cycle have been calculated for a better understanding of the traffic situation in the city[4]. GIS has been an efficient information technology tool in transportation engineering because of its ability to perform a spatial intersect on network overlays and analysis of traffic data and intersection of topologically related tables and providing output in understandable forms[6]. In a GIS, integration proceeds by referencing all objects to some common locational framework. The aim of this study is to examine and analyze road traffic congestion within the study area using GIS, with a view to providing solutions to the problem it poses. The objectives were set to (i) examine the traffic flow pattern and identify the sources and causes of traffic congestion in the study area (ii) carrying out spatio-temporal analysis of traffic congestion using Q-GIS and (iii) identifying alternative routes and suggest suitable alternative ways to mitigate the congestion.

### II. STUDY AREA DESCRIPTION

Vandalur is one of the major traffic area in the Chennai city and situated in Kancheepuram district in the state of Tamilnadu. It is called the Entrance Gate for Chennai city. Vandalur forms the junction of the Vandalur, Kelambakkam Road, Connecting the Grand Southern Trunk Road (GST) with Old Mammallapuram Road (OMR). The outer ring road (Vandalur-Minjur) is a major transport corridor being developed along the periphery of Chennai Metropolitan Area by the CMDA. This junction is the connecting point for vehicles that ply to and from Kelambakkam. It takes a lot of time,

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patience and effort for pedestrians and vehicle-users to cross the junction. That is because Aringar Anna Zoological Park is located near the signal and thousands of people visit the zoo every day. The visitor traffic is very high during public holidays and festivals and weekends which include large number of adults and children. Apart from this, there are pedestrians who cross the GST Road to the Kelambakkam road. Many educational institution and villages are located along this road. so there may be heavy traffic flow in Vandalur junction.

### III. DATA COLLECTION AND ANALYSIS

It is essential to know the magnitude and purpose of traffic data to be collected which will then determine the methods of data collection to be adopted. The most common method of collecting traffic flow data is the manual method. This method can be expensive in terms of manpower but it is necessary at intersections where vehicles are to be classified and turning movements are to be recorded in the direction of traffic flow. Permanent traffic counting teams are normally set up to carry out the counting at the various locations of intersection.



Fig.1. Vandalur Junction, Chennai, Tamil Nadu

The duration of the count is determined prior to commencement of traffic counting. At our study area, hundreds of vehicles pass through in few seconds especially in the peak hours. The traffic flow was seen varying during the peak hours and the non peak hours. The peak hours (9 AM to 10 AM and 5 PM to 6 PM) were taken into consideration for the recording of the maximum traffic movements. The peak hours are mainly caused by office going people, shopkeepers, school and college going people majorly. This is the time at which traffic movement is maximum and therefore the actual capacity of the road under consideration is measured. As this junction connects the southern part of Tamil Nadu with Chennai, most of the commuters make use of this at week end. Therefore the traffic load would seem to be higher than usual from Friday evening and Monday morning. The vehicles are classified as Four wheelers, Buses, Three wheelers and Two wheelers. The average traffic data for peak hours of Monday morning and Friday evening are recorded.

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**Table 1.** Traffic volume data Monday (9.00 am TO 10.00 am)

TYPE	From Chennai to		From Kelambakkam to		From Chengalpattu to	
	Kelambakkam	Chengalpattu	Chengalpattu	Chennai	Chennai	Kelambakkam
Four Wheeler	1030	2015	700	656	1900	745
Bus	60	115	50	45	122	68
Auto-Three Wheeler	100	170	95	60	246	112
Two Wheeler	1350	2700	1100	600	3045	1600
<b>Total</b>	<b>2550</b>	<b>5000</b>	<b>1945</b>	<b>1361</b>	<b>5313</b>	<b>2525</b>

**Table 2.** Traffic volume data Friday (5.00 pm to 6.00 pm)

TYPE	From Chennai to		From Kelambakkam to		From Chengalpattu to	
	Kelambakkam	Chengalpattu	Chengalpattu	Chennai	Chennai	Kelambakkam
Four Wheeler	600	1200	550	500	1200	650
Bus	40	70	35	30	90	130
Auto-Three Wheeler	65	115	70	50	250	80
Two Wheeler	850	1900	800	812	2500	1250
<b>Total</b>	<b>1555</b>	<b>3285</b>	<b>1455</b>	<b>1392</b>	<b>4040</b>	<b>2110</b>

**Vandalur Junction - Traffic Volume Data  
Peak Hour Monday (9 AM to 10 AM)**



**Fig.2.** Traffic Volume Data during Peak Hours

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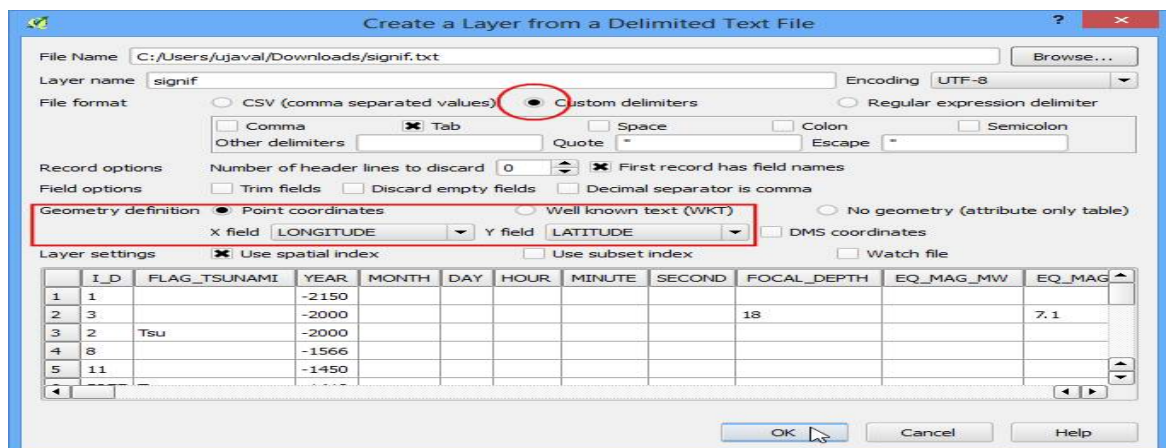
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### A. Importing Excel or CSV files using QGIS

The data collected by manual method is then transferred into a Personal Computer (PC) in a Excel (\*.XLS) format. The Excel files are then converted in to Comma Separated Values (CSV) text format by using Microsoft Excel software for QGIS text data import. Examine the tabular data source. To import this data to QGIS, you will have to save it as a text file and need at least 2 columns which contain the X and Y coordinates. If you have a spreadsheet, use Save As function in your program to save it as a Tab Delimited File or a Comma Separated Values (CSV) file. Once you have the data exported this way, you can open it in a text editor such as Notepad to view the contents. In case of the Significant Earthquake Database, the data already comes as a text file which contains latitude and longitude of the earthquake centers along with other related attributes. You will see that each field is separated by a TAB.

Many times the GIS data comes in a table or an Excel spreadsheet. Also, if you have a list lat/long coordinates, we can easily import this data from QGIS project.

1. Open QGIS. Click on Layers ▶ Add Delimited Text Layer.
2. In the Create a Layer from a Delimited Text File dialog, click on Browse and specify the path to the text file (CSV) you created. In the File format section, select Custom delimiters and check Tab. The Geometry definition section will be auto-populated if it finds a suitable X and Y coordinate fields. In our case they are *LONGITUDE* and *LATITUDE*. You may change it if the import selects the wrong fields. Click OK.



**Note:** It is easy to confuse X and Y coordinates. Latitude specifies the north-south position of a point and hence it is a Y coordinate. Similarly Longitude specifies the east-west position of a point and it is a X coordinate.

3. Next, a Coordinate Reference System Selector will ask you to select a coordinate reference system. Since the earthquake coordinates are in latitudes and longitudes, you should select **WGS 84**. Click OK.
4. You will now see that the data will be imported and displayed in the QGIS canvas.

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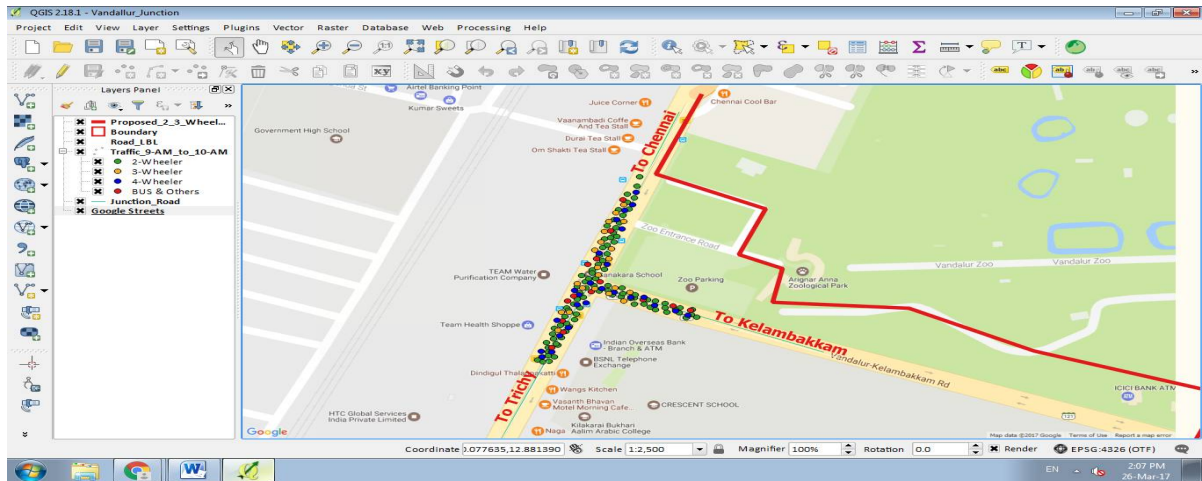


Fig.3. Traffic volume data analysis for route diversion

## IV. RESULTS AND DISCUSSION

### A. DISCUSSION ON VEHICLE COMPOSITION

During Peak hours the Vehicle composition shows that fifty percent of total traffic was two wheelers. Only ten percent was bus traffic. Two wheelers traffic proportion is high due to the proximity of the location to University and Zoological park. Buses were almost fully occupied due to more people were travelling by bus from distant places. It can be seen that more than thirty five percentage of people were travelling by car from distance places.

Based on the Traffic Data, the following scenarios will be highlighted:

<p><b>1. From Chennai to Kelambakkam</b></p> <ul style="list-style-type: none"> <li>● 2-Wheeler : 50 %</li> <li>● 3-Wheeler : 6 %</li> <li>● 4-Wheeler : 35 %</li> <li>● Bus &amp; Others : 9 %</li> </ul>	<p><b>2. From Chennai to Trichy</b></p> <ul style="list-style-type: none"> <li>● 2-Wheeler : 40 %</li> <li>● 3-Wheeler : 9 %</li> <li>● 4-Wheeler : 43 %</li> <li>● Bus &amp; Others : 8 %</li> </ul>
<p><b>3. From Kelambakkam to Trichy</b></p> <ul style="list-style-type: none"> <li>● 2-Wheeler : 48 %</li> <li>● 3-Wheeler : 8 %</li> <li>● 4-Wheeler : 32 %</li> <li>● Bus &amp; Others : 12 %</li> </ul>	<p><b>4. From Kelambakkam to Chennai</b></p> <ul style="list-style-type: none"> <li>● 2-Wheeler : 55 %</li> <li>● 3-Wheeler : 5 %</li> <li>● 4-Wheeler : 31 %</li> <li>● Bus &amp; Others : 9 %</li> </ul>

### B. DISCUSSION ON DIRECTIONAL DISTRIBUTION

High traffic flow was towards Trichy during evening peak hour (4 PM to 6 PM) which indicates tidal flow towards north-south. It was evening rush hour. So flow was higher towards the south. High traffic was flowing towards Chennai North during peak hour (9 AM to 10 AM). It was morning rush hour.

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## C. DISCUSSION ON EXISTING PHYSICAL FEATURE OF THE ROAD NH45

There is a vacant land of forest department between the road and the actual ticketed entrance of the zoo. Such huge place is currently used as a greenery park by Forest department and not leveraged to ease out the traffic flow at the junction. There is a bus stop on the Kelambakkam road very near to the junction and there are lots of private vehicles parked on the same road near the bus stop. This forms a huge obstruction to the free flow of left turning traffic at the junction. There are lots of private buses parked in the evening on the open space near junction thus blocking the free flow of traffic towards southern part of Tamil Nadu.

## V. RECOMMENDATIONS AND CONCLUSION

The intention of this study is provide a solution to traffic chocked at vandalur junction. Spatial data pertaining to this junction was carried out manually and using Q-GIS software. Findings of the analysis showed that two wheeler count was high almost all the days. Decongestion analysis was carried out considering the existing road geometry and conditions using Network Analyst software. Major suggestion like providing an alternative routes for two wheelers and through traffic to mitigate the traffic congestion. Some of minor alterations as follows also recommended:

1. Provide a mandatory left turn lane to Kelambakkam utilizing the forest department space in front of the ticketed entrance of the zoo
2. Relocate the bus stop on the kelambakkam road from near the junction to beyond the Zoo vehicular entrance.
3. Provide a similar mandatory left turn for the traffic from Kelambakkam to Tiruchy.
4. Relocate the zoo pedestrian entrance near the newly constructed bridge facing North.
5. Parking of vehicles on road side should be prohibited.
6. Considering the development taking place at vandalur junction, construction of flyover may be encouraged and divert the right turning traffic to Kelambakkam from Trichy to use the flyover to return back to the junction for a free left to Kelambakkam.
7. Public transport system needs to be strengthened so that use of individual vehicles is to be restricted using peak hours.

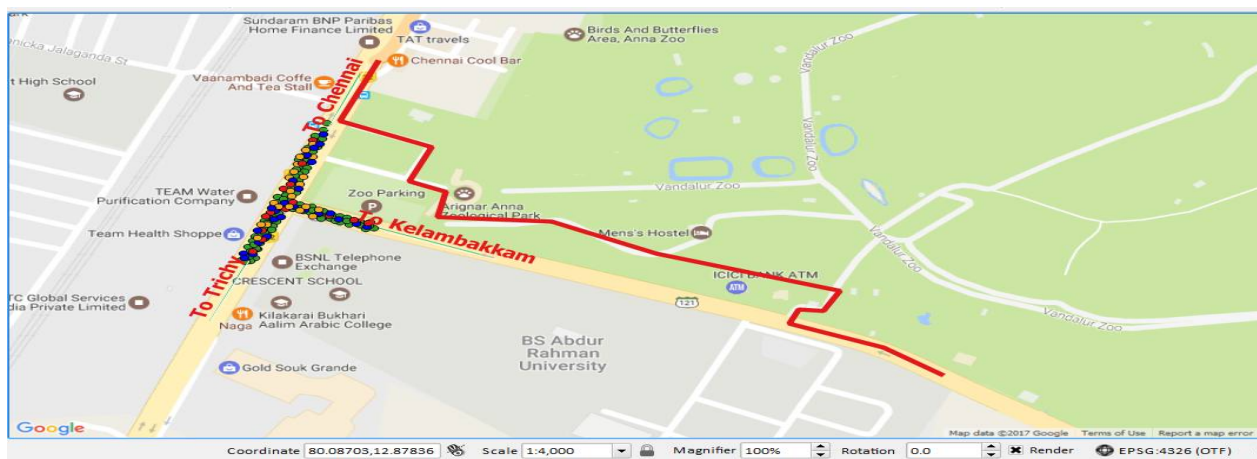


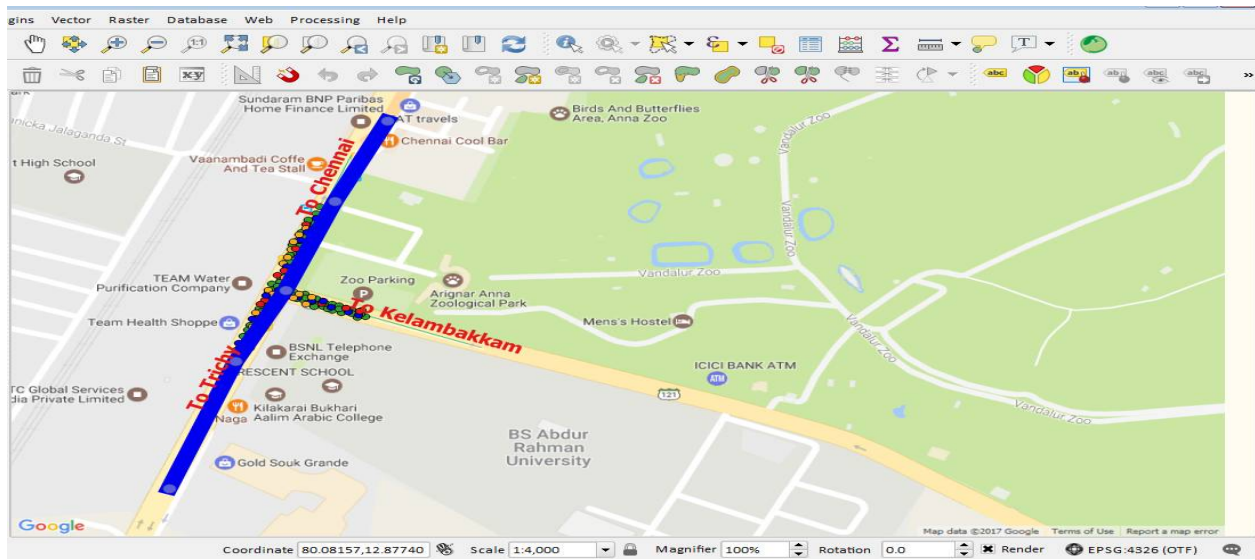
Fig. 4. Proposed divert route for 2-Wheelerss and 3-Wheelers

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**Fig.5. Proposed construction of bridge will help to bypass the junction**

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