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Traffic Volume Analysis on Surrounding Temple Area Madurai

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Abstract

The road transportation is a highly complex sector and for a country it can be termed as a strategic infrastructure sector. Traffic congestion is mainly affecting the city transportation. Delays in travelling time, people are affected due to heavy traffic congestion, and waiting time in signalized intersection are more. Increasing growth rate of vehicles is being observed every year. Road construction can never keep up with demand. Road building is an expensive way of dealing with travel demand. With already 1.2 billion cars in our planet, some forecasts analysis has shown around 4 billion cars by 2050. In Madurai city, the average annual growth rate witnessed about 38% with two wheelers exhibiting a highest growth rate of 27% followed by trucks 22%. The average annual growth rate for cars, auto rickshaws and buses are 13%, 14% and 8% respectively. Madurai city is also called the temple city, it attracts large number of tourist vehicle into the heart of the city, the floating population is of the order of 2,00,000. Being a heritage city, in Madurai the surrounding temple area have more traffic accumulation on every day. Presence of whole sale market, grocery market and private transport offices in the Central Business District (CBD) attracts large number of heavy goods vehicle into the central part of the city increases the congestion level in the main arterial roads and other main roads. Also excessive delays, lack of facilities for pedestrians are the key problems at intersection. All major estates are located along the periphery of the Municipal Corporation, and serve the town in terms of employment opportunity. There are some Small Scale Industries located within the City. Therefore management of traffic systems becomes the need of the hour, utilizing the existing facilities. This study presents the detailed analysis of the inventories of existing travel pattern, existing transportation facilities are analysis in the phase. In this report scope, project study area, transportation problems in surrounding temple area, methodology, tools and techniques, analysis of existing travel and transportation pattern, were discussed.

Keywords— ***Classified Traffic Volume Survey; Composition of Vehicles; HCM; Level of Service; Madurai; Peak hour; PCU***

I. Introduction

Traffic management – "It is that aspect of management which deals with the planning, organizing, coordinating and regulating traffic operations, tools and methods so as to ensure safe, convenient and economic transportation of persons and goods." As the traffic on existing road system in cities grows, congestion becomes a serious problem. Medium and long term solutions like widening roads, providing elevated fly-over and constructing bypasses and urban expressways are costly. Simple and inexpensive solutions can tide over crisis for some time. Transportation system management is a package of short term measures to make the most productive and cost effective use of existing transportation facilities, services and modes.

II. PROJECT STUDY AREA

Madurai city which is developed around the temple has a CBD around the temple. Three National Highways (NH-7, NH-49 and NH-45B) beside State Highways and district roads are passing through the city. Partial ring road connects NH-45B with NH-7 on Tirunelveli side. Absence of continuous ring road forces the by passable traffic to enter into the city and cause

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congestion in the city. Being an important tourist destination, it attracts large number of tourist vehicle into the heart of the city, the floating population is of the order of 2, 00,000. Madurai being a tourist place attracts large number of tourist throughout the year. The city is mainly depending on the tourism related activity for the economy in addition to other industries. In the coming year tourism will remain key factor and continue to attract tourist. Considering the above, change in travel pattern in the city will be minimum. Also the city has reached saturation level in the land development. Any change in travel pattern would necessitate huge land acquisition and resettlement issues.

Keeping in view the limitation in the data available, the accuracy level in the future travel demand and the nature of city travel demand modeling is not considered.

Figure 1. Surrounding Temple Area Madurai

Figure 2 Zoning and Major Road Network Madurai City

III. ISSUES IDENTIFIED IN SURROUNDING TEMPLE AREA

Like any other metropolitan cities in India, Madurai also faces many transport problems. Low travel speed, high accident rate involving fatalities and increased vehicular pollution are mainly due to:

- Narrow roads with heavy traffic congestion.
- Little possibility of expansion of road network due to heavily built-up areas.
- Frequent traffic jams at numerous road intersections;
- 75% of composition of traffic consisting of low occupancy vehicles, two wheelers;
- Very high number of auto rickshaws', share autos
- High parking demand due to proliferation of personalized vehicles.
- More encroachments in road.
- Since there is no proper traffic planning on West Masi and South Masi streets, there is heavy traffic congestion.

Surrounding Temple area Madurai	Veli Streets
	Marret streets
	Masi streets
	Avanimoola streets
	Chithirai Streets

- Big commercial establishments are situated on these streets.
- Two-wheelers are parked in a haphazard way and auto rickshaw drivers never follow traffic rules, causing inconvenience to the public.
- In fact, there is no space for pedestrians to walk because even the platforms are occupied by two-wheelers. Hence it is requested that the traffic police streamline traffic flow on these streets.
- Very high population density pattern noticed inside the Corporation limits is deteriorating the quality of life.
- Increases in vehicle volume.

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- Have a much traffic Jams in CBD area, have Delay time in traffic jam.
- Delays in signal.
- Parking problems.
- Improper management in Bus stops.
- Violation of traffic Rules and Regulations.
- Improper road management.
- Currently, increased demand for urban services is proving as bottleneck for present development of the City.

IV. METHODOLOGY

Secondary Data

To collect the Accident data and Growth rate of the Vehicles in the Statistics department for the study area and analysis the growth rate of the vehicles in Madurai city. In Madurai city, the average annual growth rate witnessed about 38% with two wheelers exhibiting a highest growth rate of 27% followed by trucks 22%. The average annual growth rate for cars, auto rickshaws and buses are 13%, 14% and 8% respectively. As per the statistic report from the year 2014 the numbers of Registered Commercial Vehicles are 3786, and non commercial Vehicles are 48,096 numbers registered. The total number of Registered Vehicles in the year 2014 is 4 55,469(i.e. Both Commercial and Non Commercial Vehicles).

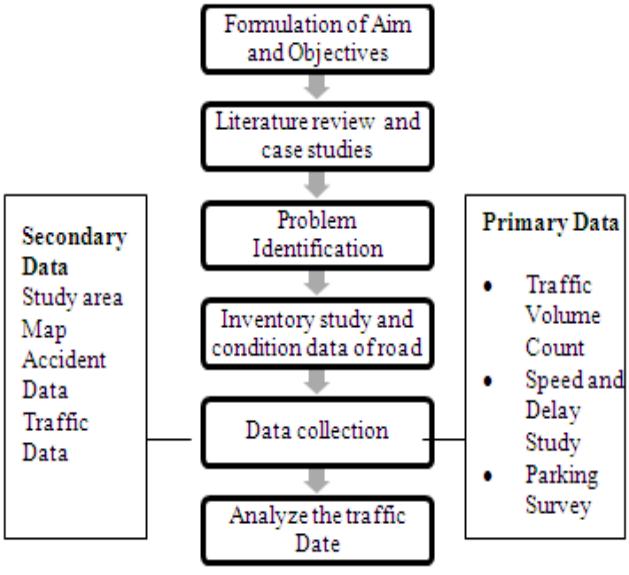

Figure 3 Methodology

4.4. TRAFFIC SURVEYS

- Traffic Volume Count Survey
- Inventory of existing roads

TRAFFIC VOLUME COUNT SURVEY

Introduction

One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time. It is also terms as flow and it is expressed in vehicles per hour or vehicles per day.

Knowledge of the vehicular volume using a road network is important for understanding the efficiency at which the system works at present and the general quality of service offered to the road users. Knowing the flow characteristics one can easily determine whether a particular section of the road is handling traffic much above or below its capacity. If the traffic is heavy the road suffers from congestion with consequent loss in journey speed. Congestions also lead to traffic hazards. Volume counts are therefore indicators of the need to improve the transport facilities and are invaluable tool in the hands of transportation planner.

4.4.1.2 Types of Volume Measurement

Volume count varies considerably with time. Hence, several types of measurement of volume are commonly adopted to average these variations. These measurements are described below:

4.4.1.3 Average Annual Daily Traffic (AADT)

This is given by the total no. of vehicles passing through a section in a year divided by 365.

This can be used for following purposes:

- Measuring the present demand for service by the street or highway
- Developing the major or arterial street
- Evaluating the present traffic flow with respect to the street system
- Locating areas where new facilities or improvements to existing facilities are needed.

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Average Annual Weekday Traffic (AAWT)

This is defined as the average 24-hour traffic volume occurring on weekdays over a full year.

Average Daily Traffic (ADT)

An average 24-hour traffic volume at a given location for some period of time less than a year.

It may be measured for six months, a season, a month, a week, or as little as two days. An ADT is a valid number only for the period over which it was measured.

Average Weekday Traffic (AWT)

An average 24-hour traffic volume occurring on weekdays for some period of time less than one year, such as for a month or a season.

Methods of Volume Count

The methods available for traffic counts are listed below:

- Manual methods
- Combination of manual and mechanical methods
- Automatic devices
- Moving observer method
- Photographic methods
- We have adopted the manual methods for the volume count.

Counting Periods

The time and length that a specific location should be counted depends upon the data desired and the application in which the data are used. Counting periods vary from short counts at spot points to continuous counts at permanent stations. Hourly counts are generally significant in all engineering design, while daily and annual traffic is important in economic calculations, road system classification and investment programs. Continuous counts are made to establish national and local highway use, trends of use and behavior and for estimating purposes. Some of the more commonly used intervals are:

1. 24-hour counts normally covering any 24-hour period between noon Monday and noon Friday. If a specific day count is desired, the count should be from midnight to midnight.
2. 16 hour counts usually 5:30 am to 9:30 pm or 6 am to 9 pm.
3. 12 hour counts usually from 7 am to 7 pm
4. Peak Period counting times vary depending upon size of metropolitan area, proximity to major generators and the type of facility. Commonly used periods are 7 to 9 am and 4to 6 pm.

Field Procedure:

- The data is recorded conveniently by the five-dash system, whereby vertical strokes are entered for the first four vehicles, followed by an oblique stroke for the fifth vehicle so as to depict a total of five.
- Three observers were used in each stretch of road for counting number of vehicles and also for classifying the vehicles.
- The Counting was done for a period of 24 hours from 5:00am to 5:00am .The field data sheet prescribed by the Indian Road Congress Standard is shown in the annexure. This form is intended to last for four hours, but if the hourly flow is large, one form may be needed for one hour.

V. ANALYSIS OF TRAFFIC DATA

The traffic data are collected in the study area in per week and 24 hours a day and analysis are carried out. And analysis in the volume count survey the composition of vehicles in daily and analysis the weekly volume of the vehicle in existing study area and find the morning and evening peak hours in the week days. The inventory survey are carried in the study area and to done in the Auto Cadd. The existing road details and carriage way width, road type are analyzed in the existing road in surrounding temple area on Madurai city. The street inventory is carried through the study area. In the analysis part the volume of the vehicles on the week days and weekly volume of the vehicles are done.

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In the results are shown the volume of the vehicles in per hour on the week days on the surrounding temple area Madurai city on the graphical representation.

5.1. In the results are shown the volume of the vehicles in per hour on the week days on the surrounding temple area Madurai city on the graphical representation.

- One of the fundamental measures of traffic on a road system was the volume of traffic using the road in a given interval of time.
- It was also termed as flow and it was expressed in vehicles per hour or vehicles per day.
- When the traffic is composed of a number of types of vehicles it is the normal practice to convert the flow into equivalent passenger car unit(PCU).
- Passengers Car Unit Values For the various composition of vehicles are as per the standards shown in the table

Table 1 PCV Value for the Vehicles

Vehicle Type	PCU Value
Cars, light commercial vehicles	1.0
Buses and medium heavy commercial vehicles	3.0
Motorcycles and scooters	0.75
Pedal cycles	0.5
Animal drawn Vehicles	4 to 6

5.1 CLASSIFIED TURNING MOVEMENT SURVEY AT INTERSECTIONS

Turning movement surveys will be carried out at major intersections is necessary for analyzing and timing traffic signals, determining capacity and Intersection Traffic Characteristics. Intersection turning movement surveys were conducted at locations. The survey is done in the Morning 6 am to night 10.00 pm, totally 16 hours the survey is carried over the intersections. The intersections names are mention below:

1. Periyar Junction
2. Ellis Nagar Junction
3. Crime Branch Junction
4. Vadamalaiyan Hospital Junction
5. St. Mary Church Junction
6. Vilakathoon Junction
7. Munichalai Junction
8. Yanaikal Junction
9. Simmakal Junction
10. Duke Hotel Junction
11. MeenakshiBazzarJunction
12. Railway Station Junction

Figure 4 Intersection on Surrounding Temple area Madurai

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Table 2 Peak Hour Volume at Intersections

Sl. No	Name of the Intersection	Peak Period		Volume in PCU	
		Morning (am)	Evening (pm)	Morning (am)	Evening (pm)
1	**Periyar Junction**	**09:30-10:30**	**19:00-20:00**	**7861.7**	**8583.5**
2	Ellis Nagar Junction	09:30-10:30	19:45-20:45	3959.7	5400.4
3	Crime Branch Junction	11:45-12:45	12:00-13:00	5626.2	5892.4
4	Vadamalaiyan Hospital	09:30-10:30	17:15-18:15	3790.4	6009.9
5	St. Mary Church Jn.	10:00-11:00	17:00-18:00	6300.2	6361.5
6	Vilakathoon Junction	11:00-12:00	16:00-17:00	2674.8	2864.2
7	Munichalai Junction	10:00-11:00	19:45-20:45	1896	2894.8
8	**Yanaikal Junction**	**09:30-10:30**	**17:30-18:30**	**11033**	**9136.6**
9	**Simmakal Junction**	**08:45-09:45**	**18:30-19:30**	**7129.4**	**8200.2**
10	Duke Hotel Junction	10:15-11:15	19:30-20:30	1992.7	2536.9
11	Meenakshi Bazzar Jn.	09:30-10:30	12:00-13:00	9668.8	6563.4
12	Railway Station Junction	10:15-11:15	17:00-18:00	1554.8	1442.1

5.2 CLASSIFIED VOLUME OF VEHICLES IN VELI STREETS

The traffic volume count analysis on major streets surrounding temple area. To conduct the volume count survey in West veli Streets both directions towards periyar and simmakal, East Veli Street, and South Veli Street. The analysis is done on hourly variations and compositions of the vehicles on the streets. In this survey is done in the mid block of the road section in one week.

NORTH VELI STREET

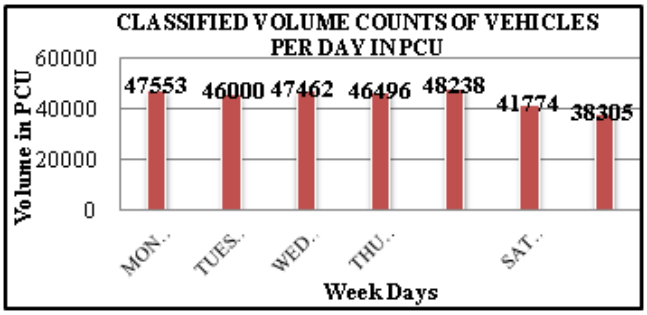

Figure 5 Classified Volume of Vehicles per day in PCU at North Veli Street

Composition of Vehicles in North veli Street

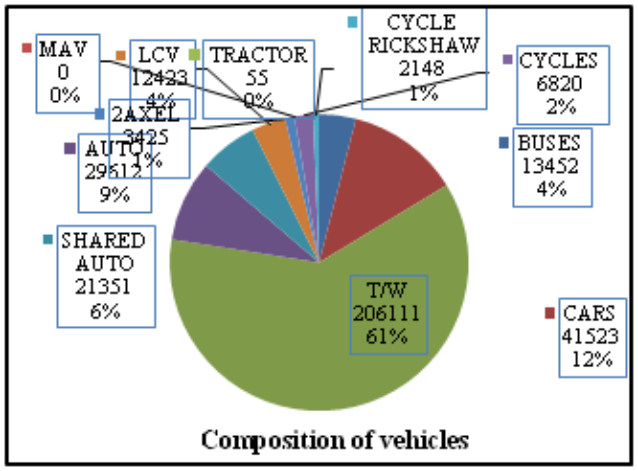

Figure 6 Composition of Vehicles in North Veli Street

WEST VELI STREET

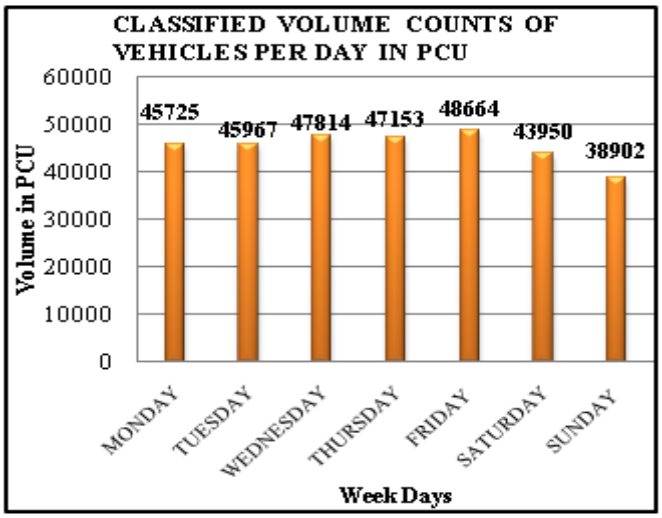

Figure 7 Classified Volume of Vehicles per day in PCU at West Veli Street

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Composition Of Vehicles in West veli Street

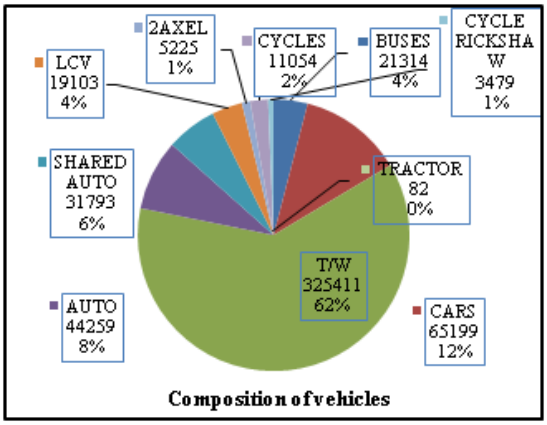

Figure 8 Composition of Vehicles in West Veli Street

EAST VELI STREET

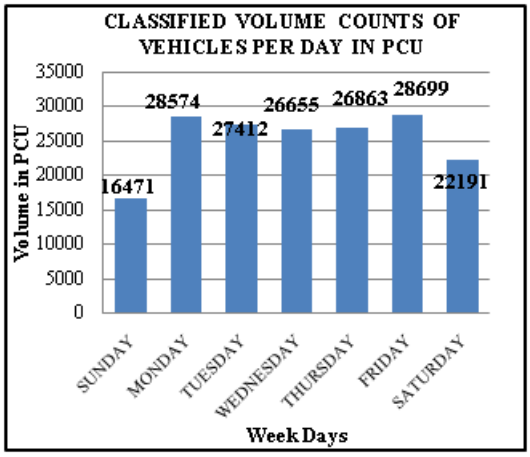

Figure 9 Classified Volume of Vehicles per day in PCU at East Veli Street

Composition Of Vehicles in East veli Street

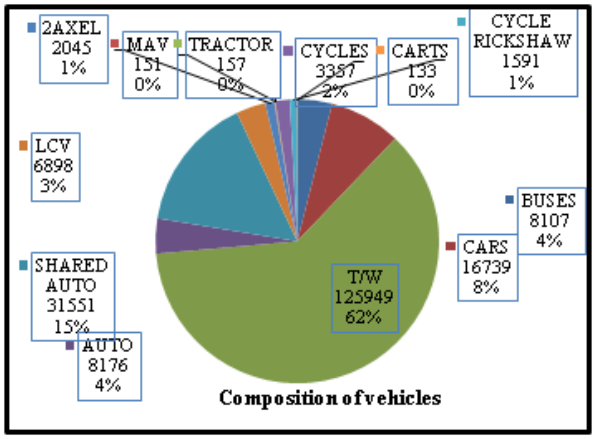

Figure 10 Composition of Vehicles in East veli street

SOUTH VELI STREET

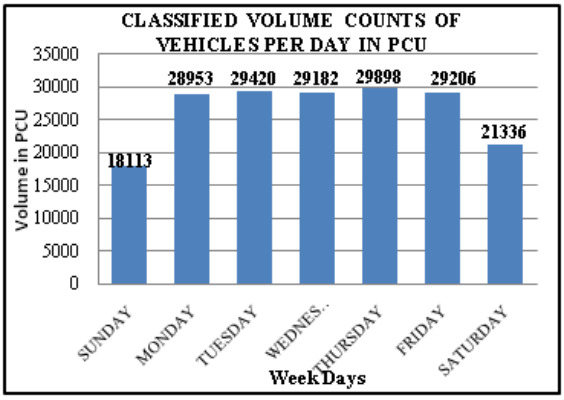

Figure 11 Classified Volume of Vehicles per day in PCU at South Veli Street

Composition of Vehicles in South veli Street

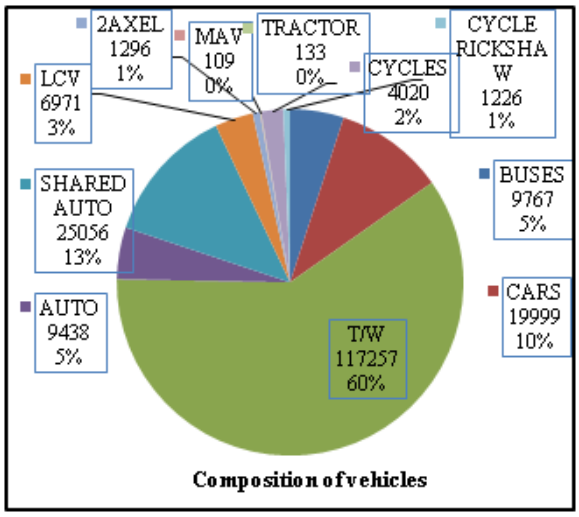

Figure 12 Composition of Vehicles

- The most volume accumulation on the west veli street towards simmakal.
- In the both stretch on the west veli street have the high volume in the morning and evening peak hour.
- In the south veli street have the high volume in the morning 8 am to 9 am have the volume of above 2500. Because in the street have more attracts the schools and colleges and in the south veli street have the more residential zones.
- In the West Veli Street Towards Simmakal have the high volume accumulation zone in the

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analysis. In Monday the volume of vehicle count is 47553 whereas in Tuesday 46000, Wednesday 47462, Thursday 46496 and Friday have accumulate the more volume of vehicles in the street. Due to the seasonal activities and festival time the temple attracts the more tourist and local peoples surrounding area and in the day time of volume measurement the people are attracted for shopping and other activities. Sunday has less volume of the vehicles, due to the holidays for shops and bazaar in the surrounding area. The commercialized activities are reduced in Sunday.

- In the East Veli Street have low volume have below the 30000 PCU on per day. In Monday the volume of vehicle count is 28574 whereas in Tuesday 27412, Wednesday 26655, Thursday 26863 and Friday 28699 and Saturday 22191 and Sunday 16471 have accumulate volume of vehicles in the Street.
- To compare the west veli and East Veli Street the Volume is below 50% on the East Veli street.
- In the South Veli Street have volume in the level of 30000 PCU. It have the values of In Monday the volume of vehicle count is 30583 whereas in Tuesday 29536, Wednesday 29536, Thursday 28722 and Friday 29169 and Saturday 22619 and Sunday 16347 have accumulate volume of vehicles in the Street.
- To compare all the streets Friday have more volume and Composition of Vehicles. All the streets are accumulation on the Friday.
- In the Compositions of the vehicles the Two Wheelers and Scooters have the 60 to 68% of the total Vehicles.
- In the East Veli street have 15% compositions of the Shared Auto Vehicles.
- All the Streets have the 8 to 14% composition of car with taxi.
- In the east veli streets have composition of 8 to 20 nimbers of animal carts in daily.
- The cycle and Cycle Rick shaws are more contributes in the East veli and West Veli street towards simmakal.
- More city buses are accumulated in the west veli street both streets.
- The Institutional buses are more accumulated in the South veli street in the morning and evening.

Peak Hour Analysis

Table 3 Peak Hour at Surrounding Temple area Streets

Location	Week Days	Peak Period		Volume in PCU	
		Morning (a.m)	Evening (p.m)	Morning (a.m)	Evening (p.m)
North Veli Street	Monday	11.00-00.00	16.00 – 17.00	2862	2849
	Tuesday	9.00-10.00	16.00 – 17.00	2875	2894
	Wednesday	10.00–11.00	16.00 – 17.00	2958	2785
	Thursday	10.00 – 11.00	16.00 – 17.00	2944	2788
	Friday	**10.00 – 11.00**	**16.00 – 17.00**	**2990**	**2844**
	Saturday	11.00 – 00.00	17.00 – 18.00	2879	2794
	Sunday	10.00 – 11.00	18.00 – 19.00	2479	2566
West Veli Street	Monday	10.00 - 11.00	16.00 – 17.00	2977	2785
	Tuesday	10.00 - 11.00	16.00 – 17.00	2856	2758
	Wednesday	10.00 – 11.00	16.00 – 17.00	2985	2785
	Thursday	10.00 – 11.00	16.00 – 17.00	2944	2785
	Friday	**10.00 –**	**16.00 –**	**2984**	**2854**

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		11.00	**17.00**		
	Saturday	10.00 – 11.00	17.00 – 18.00	2515	2670
	Sunday	10.00 – 11.00	18.00 – 19.00	2436	2538
East Veli Street	Monday	9.00 - 10.00	19.00 – 20.00	2648	2356
	Tuesday	**9.00 - 10.00**	**15.00 – 16.00**	**2693**	**2367**
	Wednesday	9.00 - 10.00	15.00 – 16.00	2614	2267
	Thursday	9.00 - 10.00	15.00 – 16.00	2596	2311
	Friday	9.00 - 10.00	17.00 – 18.00	2661	2386
	Saturday	8.00 - 9.00	16.00 – 17.00	1765	1898
	Sunday	8.00 - 9.00	18.00 – 19.00	1365	1425
East Veli Street	**Monday**	**8.00 – 9.00**	**16.00 – 17.00**	**3020**	**2629**
	Tuesday	8.00 – 9.00	16.00 – 17.00	2902	2599
	Wednesday	8.00 – 9.00	16.00 – 17.00	2868	2569
	Thursday	8.00 – 9.00	16.00 – 17.00	2860	2454
	Friday	8.00 – 9.00	16.00 – 17.00	2860	2570
	Saturday	8.00 – 9.00	16.00 – 17.00	1889	1908
	Sunday	8.00 – 9.00	19.00 – 20.00	1336	1462

LEVEL OF SERVICES (Highway Capacity Manual)

When a road is carrying a traffic equal in volume to its capacity under ideal roadway and traffic conditions, the operating conditions become poor. Speed drops down and the delay and frequency of stops mount up. The service which a roadway offers to the road user can vary under different volumes of traffic. The Highway Capacity Manual has introduced the concept of Level of Service to denote the level of facility one can derive from a road under different operating characteristics and traffic volumes.

The following are the factors which might be considered in evaluating the level of service.

- Speed and travel time, including the operating speed and travel time consumed in travelling over a section of roadway.
- Traffic interruptions or restrictions, with due considerations to the number of stops per mile, delays involved and the speed changes necessary to maintain pace in the traffic stream.
- Freedom to manoeuvre to maintain the desired operating speeds.
- Driving comfort and convenience reflecting the roadway and traffic conditions.
- Economy, with due consideration operating cost of the vehicle.

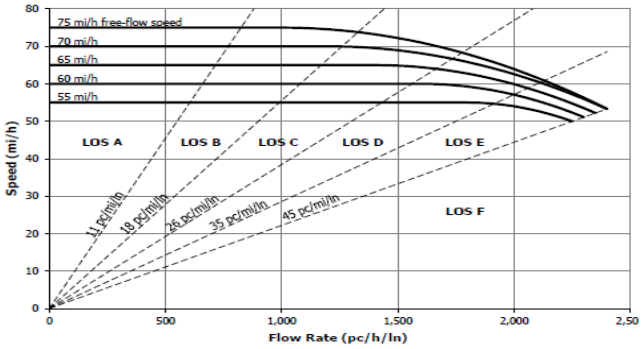

Figure 13 Level of Services with Speed and Flow Rate

References

1. Abhiram R.Supekar (2011), "Transport options and Traffic Management in Urban Areas: A case Study of Pune City".

2. P.S.Bhargavi, N. Kannaiya Raja, "A study on the effective traffic management of roads to reduce road accidents in Tamil Nadu". International Journal of

Enterprise Innovation Management Studies (IJEIMS) Vol2. No2. July-Dec (2011) ISSN: 0976-2698

3. S.A.Mulay, C.S.Dhekne, R. M. Bapat, T. U. Budukh, S. D. Gadgil, "Intelligent City Traffic Management and Public Transportation System".

4. Amudapuram Mohan Rao , Kalaga Ramachandra Rao, "Measuring Urban Traffic Congestion –A Review" International Journal for Traffic and Transport Engineering, 2012, 2(4): 286 – 305.

5. Town and country planning organization government of india ministry of urban development June, 2011, "Strategy for integrated urban transport planning and spatial planning and measures for decongesting the cities".

6. Khaled Mahmud, Khonika Gope & Syed Mustafizur Rahman Chowdhury, "Possible Causes & Solutions of Traffic Jam and Their Impact on the Economy of Dhaka City"

7. Geetam Tiwari, "Urban transport priorities meeting the challenge of socio-economic diversity in cities- case study Delhi" India 20th South African Transport Conference South Africa, 16 – 20 July 2011

8. Geetam Tiwari, Joseph Fazio and Sushant Gaurav, "Traffic planning for non-homogeneous traffic". Sadhana Vol. 32, Part 4, August 2007, pp. 309–328.

9. Mallikarjuna C, "Developing And Validating A Simulation Model For Heterogeneous Traffic"

10. Ilse M. Harms , Karel A. Brookhuis, "Dynamic traffic management on a familiar road: Failing to detect changes in variable speed limits"

11. Margaret-Avis Akofio-Sowah et al "Managing Ancillary Transportation Assets: The State of the Practice", Journal of Infrastructure systems (20) (2014)

12. Dana Sitanyiova et al "GIS Application for managing and maintaining road network in Ulaanbaatar" Journal of Architecture Civil Engineering Environment (3) (2013)

13. Indian Highways report, June (2013)

14. Ayesha Mahmood et al "Highway Asset Management using Geographical Information System (GIS)" Journal of Advancing Civil, Architectural, and Construction Engineering & Management (6) (2012)

15. AASHTO Transportation Asset Management Guide (2011)

16. "A Strategic framework to Support the implementation of Transportation Asset Management in State Transportation Agencies" developed by the FHWA TAM Expert Task Group (2011)

17. Jatin Pandey and Darshana Pathak Joshi, "GIS Based Road Information and Management System: A Case study of 2010 Disaster in Uttarakhand" JERS/Vol.II/ Issue III/July-September,2011/124-127

18. Mohd Zulkifli B. MohdYunus et al "Managing Road Maintenance Using Geographic Information System Application" Journal of Geographic Information System (2) (2010)

19. Misbah Uddin Khan et al "Establishing optimal pavement maintenance standards using the HDM-4 Model for Bangladesh" Journal of Civil Engineering(IEB), 38(1) (2010) 1-16

20. R. Sudhakar "Pavement Maintenance Management System for Urban Roads Using HDM-4" Indian Geotechnical Society Chennai Chapter (2009)