

# A Case Study on Traffic Volume Estimation

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**Abstract:** In this paper, a systematic method is used to discover the traffic flow rate, the purpose of creating this paper is to discover the problems caused by the vehicular traffic and the solution regarding to this is being generated. This paper includes the survey of number of vehicles at peak hour of the day; it will help in defining the value of vehicles per hour, their distribution in terms of wheels and Level of Service. The vehicular density is distributed in terms of their wheels and the growths in vehicles are also calculated and the level of service for each of the path has found by comparing the current passenger car unit values to the previous year passenger car unit values to find the impact on the Level of service of the flow. An effort has made to justify all of the work by presenting the values in terms of graphs and pie and bar charts.

**Keywords:** Passenger car unit, Level of service, Volume/Lane Capacity, Manual Survey, Volume counts, Forecasting, Mitigations.

## I. INTRODUCTION

In the past few years, the development of on land infrastructure has drastically increased due to the development in Economy. The on land development directly affects the people's travel. Traffic congestion has become increasingly serious, and traffic accidents have occurred frequently in many cities. These have become traffic management problems that need to be solved. [10.11]. as the vehicular growth is increasing in the nation, Traffic Impact Analysis (TIA) which also known as Traffic Impact Assessment is requires. TIA is relationship between growth in traffic and urban development.

In this paper, the manual method has used to determine the Passenger Car Unit (PCU); in which the traffic has been observed for Vaishnodevi Circle which consists of sixteen paths. The survey has been conducted for all the sixteen paths during peak hours and the PCU values have been found and compared with the previous year PCU values to determine the growth in PCU values, Vehicular density and Level of Service (LOS).

The values found through this particular survey will provide the data of vehicle flow as well as the percentage share of vehicles, growth of the traffic, lane capacity of the current lanes, critical paths and the view towards the impact of increasing PCU value and its effects on the transportation system.

## II. OBJECTIVES AND NEED OF STUDY

One of the most primary factors of the traffic on the road is the volume of traffic engaging the road in a given period of time; which is also termed as flow and it is expressed as vehicles per day or vehicles per hour. The traffic is a heterogeneous system which is composed of number of vehicles. It is common practice to convert the traffic flow into equivalent Passenger Car Unit (PCU) by using certain factors defined in IRC-106-1990.

Once the flow is calculated, one can easily determine whether the particular intersection is carrying traffic above or below the capacity of lane. If the traffic is heavy then the particular intersection will suffer from a congestion which will affect the flow as well as the speed of the vehicles. This leads to increase in journey time and economic loss due to decreased speed and increased journey time.

There for traffic volume estimation data are require to implement new schemes for improvement of road network and also to allocate the scare economic resources in the most efficient way. If traffic volume estimation data are available over the past number of years, then the rate of increase in traffic flow in the past number of years can be

easily determined. Extrapolating the past trend data with present and future, a reasonable indication of the future rate of growth of traffic can be found. If a average annual flow of vehicles and the length of the highway are known, the annual vehicle kilometer of travel can easily be determined. The pavement design of road depends upon the number of vehicles using a road.. The maintenance needs of a highway are often based on the vehicles using the road. Traffic regulatory and control systems are designed on the basis of accurate vehicle volume estimation data. The designs of signal and road junction are possible only if the traffic volume estimation data is available.

## III. METHODS FOR VECHICLE COUNT

To count the number of vehicles passing through a particular section there are two methods [1].

- (1) Mechanical counters
- (2) Manual count

### 1. Mechanical Counters:

Mechanical counters are of two types; fixed (permanent) type or portable type. These counters can automatically record the total number of vehicles crossing a particular section of the

road in a given period of time. These counters works by the effect of impulses or stimuli caused by the traffic movement on a pneumatic hose placed across the roadway or by using sensors. These electrically operated counters records the vehicle count for a section of a road.

**2. Manual Count:**

In this method, a field team is employed to record the traffic volume on the prescribed record sheets. By using this method it is possible to obtain data which cannot be collected by mechanical counters method; such as vehicle classification, pedestrian counts; but it is a very time consuming method which cannot be practiced for 24 hours of the day. Hence it is necessary to carry out the survey for the various period of time and find the peak hours. Once the peak hours are known the survey count will give the maximum PCU value for the

particular section. This method is very commonly adopted due to the specific advantages over other methods.

**IV. TRAFFIC VOLUME SURVEY**

Traffic volume survey was carried out at Vaishnodevi circle, Ahmedabad, Gujarat. To carry out the survey manual count method has been used to count vehicles. The following steps were performed to carry out the traffic volume estimation survey.

1. Preparation of site layout
2. Determination of PCU values
3. Traffic volume analysis

The information about type of road, type of lane and locations are shown in table 1.

Table I LOCATION INFORMATION

Sr no.	Name of road	Survey location	Type of lane	Type of road	Standing vehicles
1	Zundal to Shantigram	Vaishnodevi Circle	2 lane road	Arterial	Yes
2	Gnadhinar to Zundal	Vaishnodevi Circle	2 lane road	Arterial	Yes
3	Shantigram to Sarkhej	Vaishnodevi Circle	3 lane road	Arterial	Yes
4	Shantigram to Rajkot	Vaishnodevi Circle	2 lane road	Arterial	Yes
5	Zundal to Sarkhej	Vaishnodevi Circle	2 lane road	Arterial	Yes
6	Zundal to Rajkot	Vaishnodevi Circle	2 lane road	Arterial	Yes
7	Sarkhej to Rajkot	Vaishnodevi Circle	2 lane road	Arterial	Yes
8	Sarkhej to Shantigram	Vaishnodevi Circle	2 lane road	Arterial	Yes
9	Sarkhej to Zundal	Vaishnodevi Circle	2 lane road	Arterial	Yes
10	Rajkot to Shantigram	Vaishnodevi Circle	2 lane road	Arterial	Yes
11	Rajkot to Zundal	Vaishnodevi Circle	2 lane road	Arterial	Yes
12	Rajkot to Sarkhej	Vaishnodevi Circle	2 lane road	Arterial	Yes
13	Zundal to zundal (U-Turn)	Vaishnodevi Circle	2 lane road	Arterial	Yes
14	Rajkot to Rajkot(U-Turn)	Vaishnodevi Circle	2 lane road	Arterial	Yes
15	Shantigram to Shantigram(U-Turn)	Vaishnodevi Circle	2 lane road	Arterial	Yes
16	Sarkhej to Sarkhej(U-Turn)	Vaishnodevi Circle	2 lane road	Arterial	Yes

**1) Preparation of Site Layout:**



Figure 1 Site layout

**2). Determination of PCU Values:**

Once the site layout is prepared; manual vehicle count survey starts. This has been carried out by determining the peak hours for the vaishnodevi circle. The sample survey table of one of the 16 path is shown in table 2 as well as the comparison of current and previous year PCU values are plotted in bar chart in figure 2 and table 3.

Table II SAMPLE SURVEY DATA

Classified Traffic Volume Study									
Location : <b>VaishnoDevi Circle</b>							Date: 02-02-2019		
Direction: <b>Gandhinagar to Zundal (Path-1)</b>							Time: 8:00 - 9:45 AM		
Time	Fast Moving Vehicle						Slow Moving Vehicles		P.C.U.
	Two Wheeler	Three Wheeler	Four Wheeler	L.C.V.	H.C.V.	Bus	N.M.V.	Others	
8:00-8:15	5	1	7	0	1	1	0	0	16.35
8:15-8:30	8	0	4	1	1	0	0	0	13.6
8:30-8:45	6	3	2	1	2	1	2	0	21.1
8:45-9:00	8	2	7	1	0	1	1	0	20.5
Total	27	6	20	3	4	3	3	0	71.55
9:00-9:15	7	1	10	0	4	0	0	0	31.85
9:15-9:30	11	2	7	0	2	0	0	0	26.05
9:30-9:45	11	2	6	0	5	1	0	0	25.55
	Total 33	8	26	0	12	1	0	0	83.45

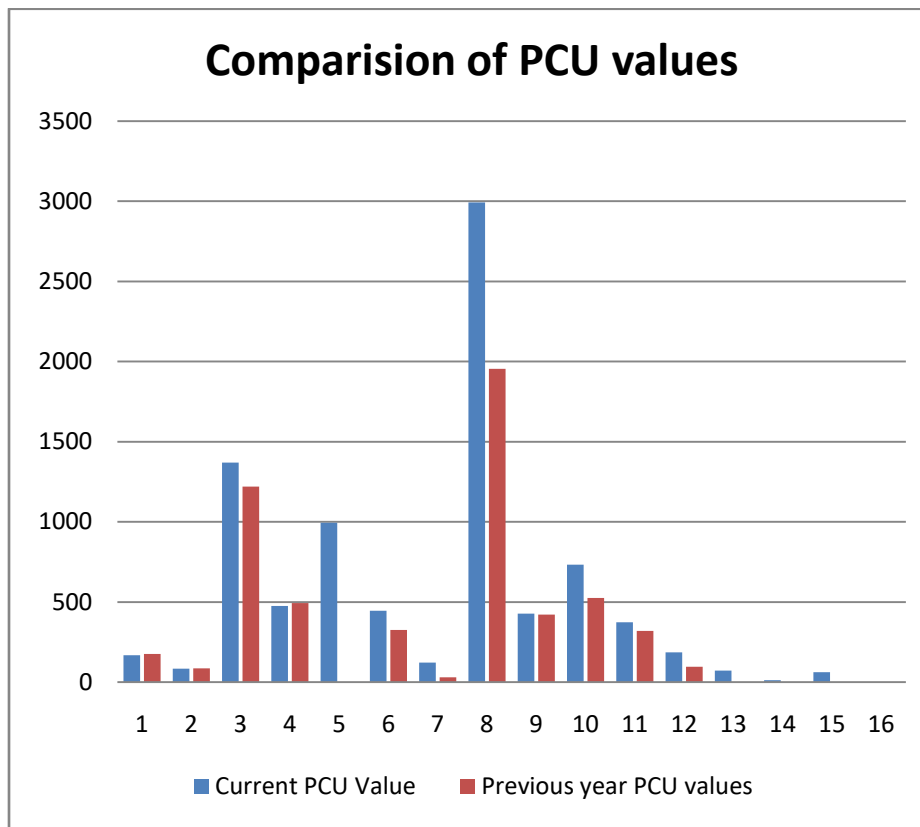


Figure 2 PCU value comparison

Table III COMPARED PCU VLUES

No.	Name of Road	Current PCU Year PCU	Previous year PCU Year PCU	% Increase
1	Zundal to Shantigram	168.55	175.4	-3.90%
2	Gandhinagar to Zundal	83.45	86.4	-3.41%
3	Shantigram to sharkhej	1369.2	1220.5	12.18%
4	shantigram to rajkot	475.2	492.2	-3.45%
5	zundal to sarkhej	994.75	0	NIL
6	Zundal to rajkot	446.05	324.5	37.45%
7	Sarkhej to Rajkot	121	30.9	291.58%
8	Sharkhej to shantigram	2992.05	1955.5	53.00%
9	Sarkhej to zundal	426.95	421	1.41%
10	Rajkot to shantigram	733.7	524.2	39.96%
11	Rajkot to Zundal	374.25	320.2	16.88%
12	Rajkot to Sarkhej	185.7	95.4	94.65%
13	Zundal to Zundal(U-turn)	72.5	0	NIL
14	Rajkot to Rajkot(U-Turn)	11.4	0	NIL
15	Shantigram to Shantigram (U-Turn)	61.8	0	NIL
16	Sharkhej to Sharkhej(U-Turn)	0	0	NIL

3) Traffic Volume Analysis:

Traffic volume analysis is done with the help of Level of Service (LOS) figure 4[3]. By dividing the current traffic volume to the lane capacity, LOS is determined. LOS for all the 16 path is shown in table 4 and bar chart( figure 3.) It gives the value of threshold of traffic on particular path.

Level of Service (LOS)	Volume/Capacity Ratio (V/C)	Level of Comfort	Nature of flow
A	<0.30	Highest	Free Flow
B	0.30 – 0.50		Reasonably free flow
C	0.50 – 0.70		Stable flow
D	0.70 – 0.90	Threshold	Approaching unstable flow
E	1.00		Unstable flow
F	>1.00	Lowest	Forced flow

Figure 4 Level of service

IV. CONCLUSION

Some valuable outcomes has been found out from the following traffic volume analysis that from all the 16 paths; there are two paths which are approaching to the unstable flow, which will definitely going to cause congestion on the route no 4 and 8 as they are crossing the Limit of LOS which is a stable flow; another enlightening fact is that the value of PCU has been increased to 48.75% on average compared to the previous year value and from the survey data it is found that the majority of the traffic is caused by 4-wheelers which shows the increased demand of 4- wheelers in market compared to 2- wheelers.

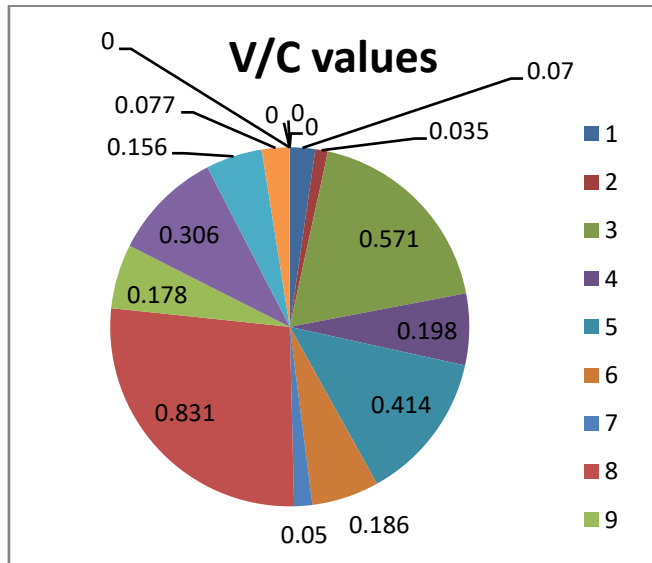


Figure 3 V/C ratios

Table IV V/C RATIOS

Sr No.	Name of Road	Type	PCU Values	Capacity(as per IRC 106:1990)	V/C	LOS
1	Zundal to Shantigram	2 Lane Road	168.55	2400	0.07	A
2	Gandhinagar to Zundal	2 Lane Road	83.45	2400	0.035	A
4	shantigram to rajkot	2 Lane Road	1369.2	2400	0.571	C
3	Shantigram to sharkhej	2 Lane Road	475.2	2400	0.198	A
5	zundal to sarkhej	2 Lane Road	994.75	2400	0.414	B
6	Zundal to rajkot	2 Lane Road	446.05	2400	0.186	A
7	Sarkhej to Rajkot	2 Lane Road	121	2400	0.05	A
8	Sharkhej to shantigram	3 Lane Road	2992.05	3600	0.831	D
9	Sarkhej to zundal	2 Lane Road	426.95	2400	0.178	A
10	Rajkot to shantigram	2 Lane Road	733.7	2400	0.306	B
11	Rajkot to Zundal	2 Lane Road	374.25	2400	0.156	A
12	Rajkot to Sarkhej	2 Lane Road	185.7	2400	0.077	A
13	Zundal to Zundal(U-Turn)	U-Turn	72.5	NIL	NIL	NIL
14	Rajkot to Rajkot(U-Turn)	U-Turn	11.4	NIL	NIL	NIL
15	Shantigram to Shantigram (U-Turn)	U-Turn	61.8	NIL	NIL	NIL
16	Sharkhej to Sharkhej(U-Turn)	U-Turn	0	NIL	NIL	NIL

#### ACKNOWLEDGEMENT

I would like to extend my hearty thanks with a deep sense of gratitude and respect to all those who has provided us immense support and guidance during our survey. I would like to thank my Principal and Head of Department for providing a vision about the system. I have been greatly benefited from their regular critical reviews and inspiration throughout my work. I would like to express our sincere thanks to our internal guide, who gave us an opportunity to undertake such a practical and great innovative work. We are grateful to them

for their guidance, encouragement, understanding and insightful support in this survey process.

#### REFERENCES

- [1]. TRAFFIC VOLUME STUDY BY Ahjoliya Dhruvi1, Dholu Smit, Patel Ketu H., Tarpara Yash, Patel Yash, Bhavya Solanki, Volume VII, Issue VI, June 2018 | ISSN 2278-2540.
- [2]. L.R KADIYALI (traffic engineering)
- [3]. Critical Assessment of road capacities on Urban Roads-A Mumbai case-Study
- [4]. IRC 106:1990-Guidelines for Capacity of Urban Roads in Plain areas