



Suggestive Measures for Traffic Congestion and Road Safety Awareness in Shimla City

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Abstract: Traffic engineering is a branch of civil engineering that deals with safe, smooth, and timely transportation of people and goods on roadway mode of transportation. This smooth flow depends on various characteristics of traffic like traffic volume, speed, and density. After passage of some years of construction of a road, it no longer accommodates smooth flow of traffic because of various reasons like growth in population, growth in economy and increase in no. of vehicles. For these issues a traffic volume survey is carried out to check the congestion and traffic delays because of vehicles and based on the results preventive measures are suggested. Every year, millions of people lose their lives because of road accidents globally. Road safety awareness is an important factor when it comes to smooth passage of traffic. Improving road infrastructure is alone not enough for the safe transportation of goods and passengers, but proper knowledge of road signs and guidelines is also important. The conclusions of this study will be useful for regulating smooth and safe flow of traffic.

Keywords: Traffic volume count, Traffic congestion, Speed and delay studies, Road safety awareness.

INTRODUCTION

Traffic congestion is one of the utmost problem every country is facing right now. Every country is trying their level best to resolve the problems related to traffic problems according to their resources and budget. The first step in resolving the problem of traffic congestion is traffic volume count. It is done for planning of new road or improving the existing road facility. Traffic volume is described as the no. of vehicles passing through a particular section of road in a fixed duration. It helps in finding out different types and no. of vehicles passing

through a given location. It helps in determining peak flow hour and influence of pedestrians on smooth flow of traffic. Traffic volume count can be done for different time durations like hourly basis, and daily basis. There is heterogeneous traffic on road, so we use passenger car unit (PCU) according to size of vehicle and convert the no. of vehicles into PCU. PCU helps in calculating the level of service of any observed road and helps in determination of vehicle carrying capacity, congestion, and peak hour of a road. Traffic is not same during the whole day at a particular road section. So, it is important to take the traffic volume count at each interval of the day to get the most precise results.

There are mainly two methods to find the traffic volume count, manual method, and automatic method. Manual method requires a field team to record traffic volume on the formatted record sheets. But it is not practically feasible to manually count the vehicles for all the 24 hours of the day. First the change in traffic volume during the hours of day and the daily and weekend variations are observed.

Manual methods are of two types, direct method, and indirect method. In direct method manual readings are noted down using tally method or my manual counter. For indirect methods data is collected with the help of video recordings, later the videos are re-winded the readings are taken.

Improving traffic facilities alone cannot ensure the safe travel of commuters. Road safety also plays a major role in smooth and safe travel of people and goods. Road accidents are the main cause of deaths, disabilities around the whole world. It is one of the worst things that can happen to a road user. The main reasons for accidents are

- 1) Weather conditions.
- 2) Rash driving.
- 3) Over speeding.
- 4) Drunk driving.
- 5) Violating traffic signals and rules.
- 6) Unaware of traffic rules and regulations.

Some people get their driving license with unfair means so they do not have proper knowledge about the rules and regulations. Road safety awareness survey helps in gathering information about the drivers who needs awareness about the rules and regulations. As the population is increasing rapidly, the no. of vehicles is also increasing. Which means no. of

accidents is also increasing due to various reasons. So, it is important to aware drivers with various rules and regulations that are important during driving for their and other's safety.

LITERATURE REVIEW

Traffic volume is directly linked to the emission of harmful gases in the environment. Pedestrians are directly in contact with the emissions released from the vehicles. After pedestrians, nearby buildings and facilities are facing the issue of pollution. To overcome this problem proper natural air ventilation plan should be there so that direct effect of emissions can be reduced (Wang et al., 2021).

The traditional way of doing origin – destination survey requires high investments, more labour and more time. Traffic counting devices are installed in between the area under observation to collect the survey data (González et al., 2019).

The origin – destination is not same every time of the day. During morning hours, the origin and destination data differs from as that of evening. So, for the accurate details of the survey we install traffic sensor at various junctions to get accurate data in a hassle-free manner (Fu et al., 2019).

Carbon dioxide emissions from vehicles is high when vehicle is moving at a lower speed (heavy gear 1st and 2nd). It increases both fuel consumption and CO₂ emissions from the vehicle. To reduce the emissions shifting of gear upwards as early as possible is must.(Beckx et al., 2007).

To reduce the travel time for users a dynamic transport model should be made so that bottleneck traffic congestion should be avoided. All routes and network should be planned in such a manner so that traffic can be diverted and full use of carriageway capacity should be made (Lazar et al., 2021).

Road accidents occurs mainly because of 4 factors human behaviour, vehicle efficiency, environmental conditions, and infrastructural characteristics. Old accident records should be considered for the accident analysis and accidental spots should be classified based on frequency like frequent, possible, and occasional (Colagrande, 2022).

Pollution caused by traffic near schools is a major concern for the government and the parents. In this growing age students are vulnerable of getting sick due to pollution. It can

cause asthma and other respiratory diseases to students. Diverting traffic from the nearby roads of school is proposed in the study (An et al., 2021).

Incident detection system is widely used in California for prevention of accidents and traffic congestion. Incident management devices are installed on highways, they collect important information like lane closed, accident, traffic congestion etc. and sends reports to the traffic department. It displays the same message on the display boards on the highway so that people drive cautiously(Nathanail et al., 2017).

Accidents at intersections is increasing day by day. Generally, two types of accidents occur at the intersection, head to side and head to rear. To avoid these collisions good sight distance should be there and construction of bus bays should be done. Pedestrians walking near the intersections should be banned and proper traffic signals should be used near diversions (Mitra et al., n.d.).

Accessibility is directly linked with the traffic volume. If accessibility of services is good at an area, the traffic volume is generally higher at those locations. Traffic controlling devices should be installed at proper locations for better readings of traffic volume count (Yang et al., 2015).

METHODOLOGY

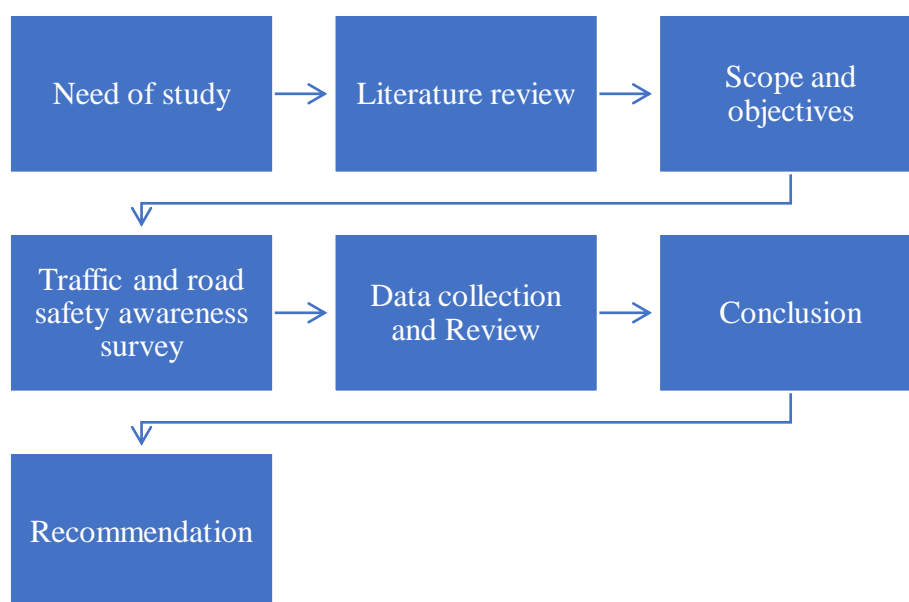


Figure 1 steps involved in the study

STUDY AREA

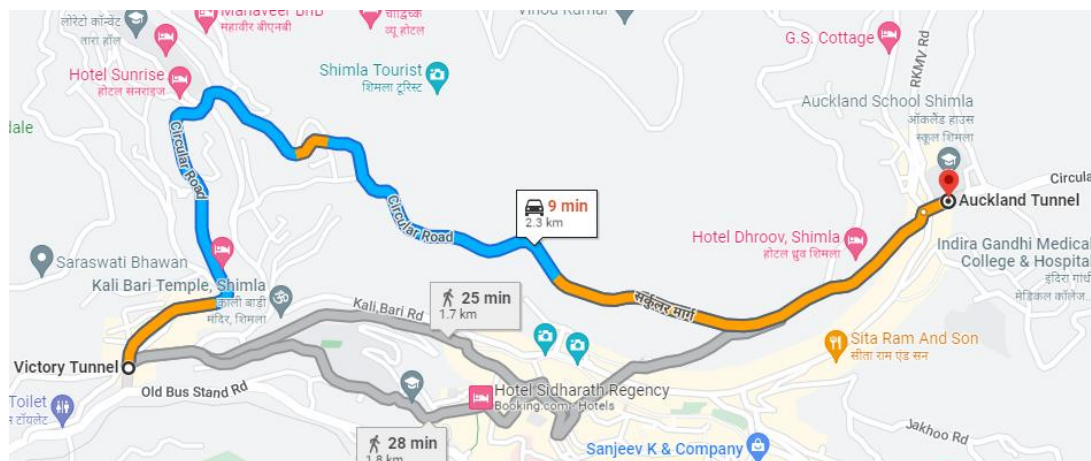


Figure 2 Area under observation victory tunnel to Auckland tunnel Shimla

(Latitude 31.107055, Longitude 77.170890)

<https://www.google.com/maps>

The study area is a 2.3 Kms long stretch on NH-5 which connects Shimla to various important locations like Kufri, Narkanda, IGMC (Indra Gandhi medical college) Shimla. Traffic congestion is the main problem of this road stretch, as it is used by both locals and tourists for their offices, school, colleges and travelling respectively.

a. DATA COLLECTION

This study finds two types of data, traffic volume data of different time intervals on weekly basis and awareness regarding road safety amongst drivers from 5 December 2022 to 26 February 2023. Later the data is analysed and concluded.

PCU, Capacity and Level of service.

Level of Service (LOS) of a traffic facility is used to relate the quality of traffic service for a given flow rate. Six LOS letters namely A, B, C, D, E, and F, where A denote the best service quality and F denote the worst facility with congested flow.

Table 1 LOS of mid-block section

LOS	QUALITY	V/C	DESCRIPTION
A	Free flow	0.6	High level of physical and phycological comfort.
B	Reasonable free flow	0.7	Reasonable level of physical and phycological comfort.
C	Near free flow	0.8	Local deterioration possible with blockages.
D	Medium flow	0.85	Non recoverable local disruptions
E	At capacity flow	0.9	Minor disturbances resulting breakdown
F	Congested flow	1.0	Breakdown of flow capacity drops

RESULT AND DISCUSSIONS

A) Traffic volume study.

Congested points in observed road



Figure 3 Narrow point on road



Figure 4 Absence of shoulders

From the above Figures (Figure 2 & Figure 3), it is clearly visible that in some locations the road is not wide enough to ensure the smooth passage of traffic. In figure 2 it can be seen that the road is narrow due to which large vehicle faces difficulty in manoeuvring. While Figure 3 shows lack of shoulders on road, making it difficult for drivers to drive and pedestrians to walk.

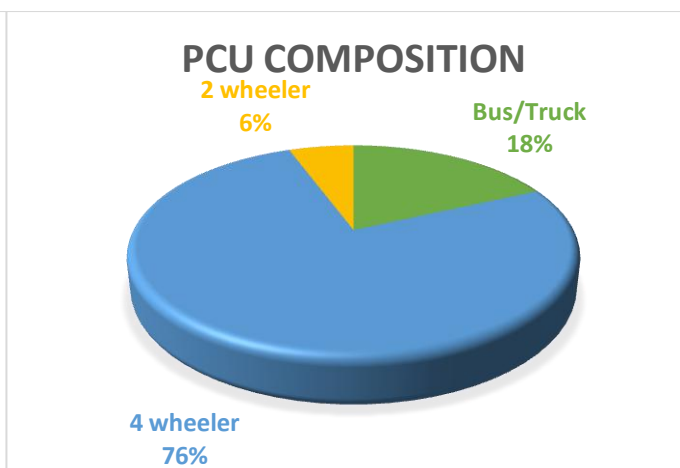
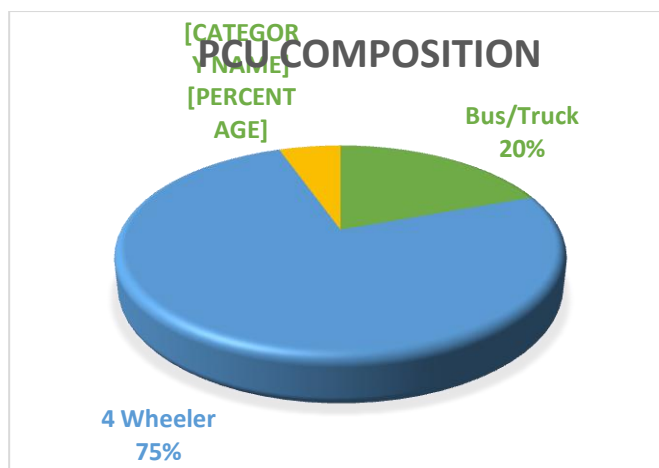


Figure 5 PCU composition during 7 AM to 7 PM from Victory tunnel to Auckland tunnel Shimla

Figure 6 PCU composition during 7 AM to 7 PM from Auckland tunnel to Victory tunnel Shimla

From figure 5 and figure 6, it is clearly observed that 4-wheeler contributes 75-76%, buses and trucks contributes 18-20% and 2-wheeler contributes 5-6% respectively to the traffic volume. So, we can say that people use their personal vehicles more than public transport for commuting.

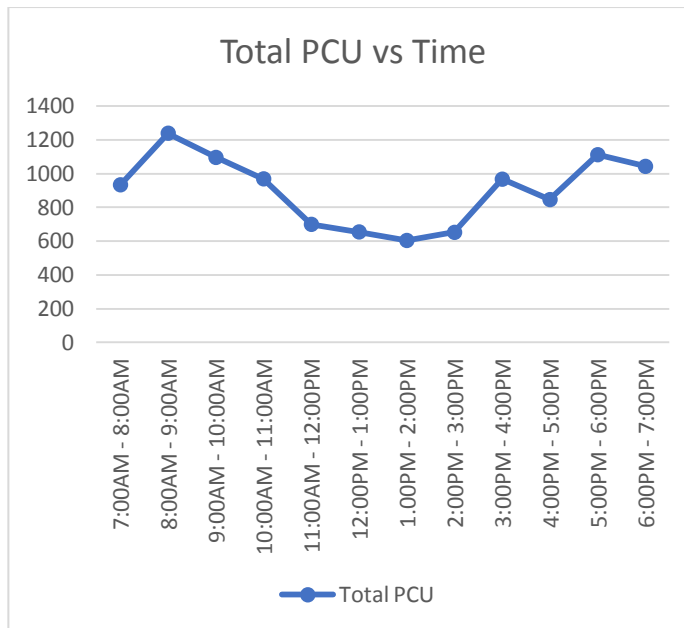


Figure 7 variation of total PCU with respect to time from Victory tunnel to Auckland tunnel Shimla

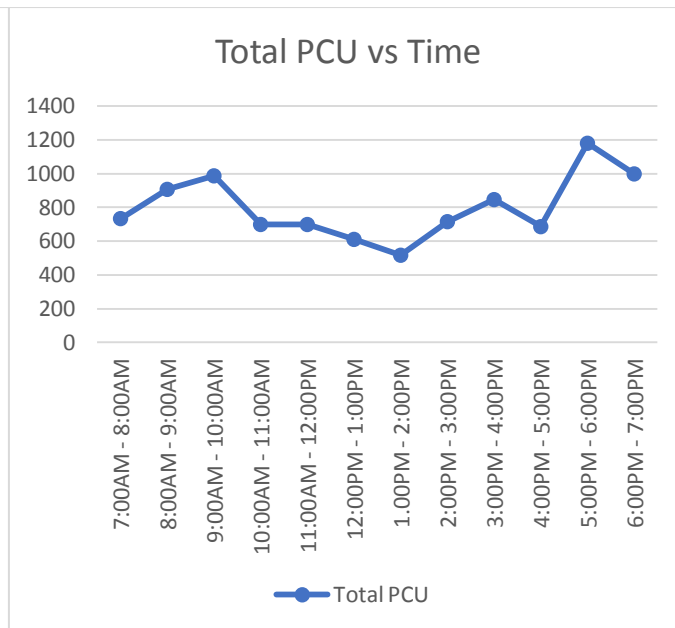


Figure 8 variation of total PCU with respect to time from Auckland tunnel to Victory tunnel Shimla

From figure 7, the observed peak hour from victory tunnel to Auckland tunnel Shimla is 8:00 AM – 9:00 AM whereas, from figure 8 the observed peak hour from Auckland tunnel to victory tunnel is 5:00 PM – 6:00 PM.

Table 2 calculation of V/C ratio and LOS from both sides of traffic

Time interval	PCU/Hour	No. of lanes	Design service volume (PCU/Hour)	V/C per ratio	LOS (level of service)
7:00AM - 8:00AM	1666.85	2	1500	1.11	F
8:00AM - 9:00AM	2145.26	2	1500	1.43	F
9:00AM - 10:00AM	2082.05	2	1500	1.38	F
10:00AM - 11:00AM	1667.34	2	1500	1.11	F
11:00AM - 12:00PM	1397.76	2	1500	0.93	E

12:00PM -	1264.69	2	1500	0.84	C
1:00PM					
1:00PM -	1120.48	2	1500	0.74	B
2:00PM					
2:00PM -	1367.12	2	1500	0.91	E
3:00PM					
3:00PM -	1812.55	2	1500	1.20	F
4:00PM					
4:00PM -	1531.54	2	1500	1.02	F
5:00PM					
5:00PM -	2290.63	2	1500	1.52	F
6:00PM					
6:00PM -	2040.41	2	1500	1.36	F
7:00PM					

From the above table it is observed that the level of service (LOS) during morning peak hours and evening peak hours approaches to “F”, which means the vehicular flow is congested.

Whereas during day time the level of service approaches to “C”, which means the vehicular flow is nearly free.

B) Road safety awareness survey.

Table 3 Awareness of drivers regarding different regulations mentioned in the questionnaire (values are in numbers/percentage)

S.No.	Survey Questions	Drivers were aware	Drivers were not aware
1	Awareness about documents that should be carried while driving a vehicle.	89	11
2	Awareness about drunk driving.	100	0
3	Awareness about Seat belt/helmet usage.	100	0
4	Awareness about right of way of the vehicle while driving on hill roads.	82	18
5	Awareness about White continuous or Broken lines.	25	75
6	Awareness about use of vehicle lights during rain and fog.	61	39
7	Awareness about right way of Using Horn.	88	12
8	Awareness about right way of Emergency stopping.	56	44
9	Awareness about controlling speed while descending or going downhill.	80	20

10	Awareness about use of Hazard Lights.	34	66
11	Awareness about use of mobile phone while driving.	100	0
12	Awareness about pedestrian crossing.	93	7
13	Awareness about right way of driving on curves.	84	16
14	Awareness about proper way of overtaking any vehicle ahead.	86	14
15	Awareness about proper use of high beam and low beam lights.	74	26

From the study it is found that the drivers are aware of seat belt/helmet usage, drunk driving, use and use of mobile phone while driving. However maximum no. of drivers was not aware of white continuous and broken lines on road and many drivers were unaware of proper way of emergency stopping and use of hazard lights.

Age wise sample distribution.

Age is distributed in three age groups.

1. 18-30 years.
2. >30-45 years
3. >45 years

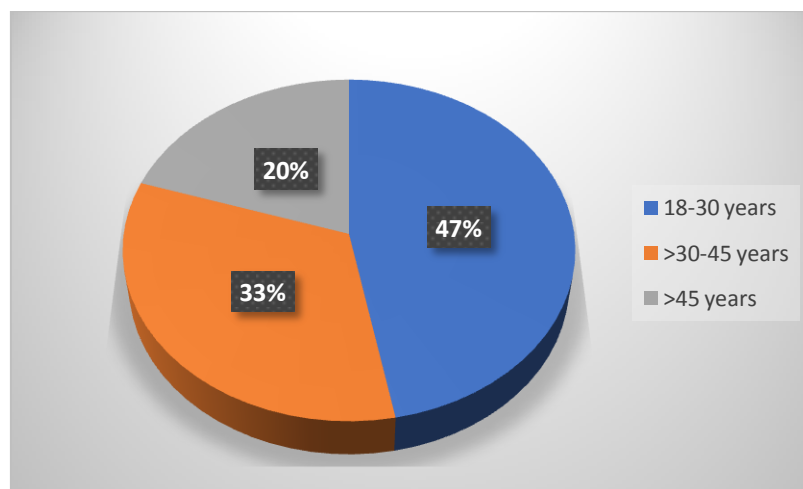


Figure 9 Age wise sample distribution

Maximum numbers of drivers are in the young and energetic phase (18-30 years) i.e., 47%. 33% of drivers were falling in the age group of 30-45 years and only 20% of drivers were above 45 years of age.

Education wise sample distribution

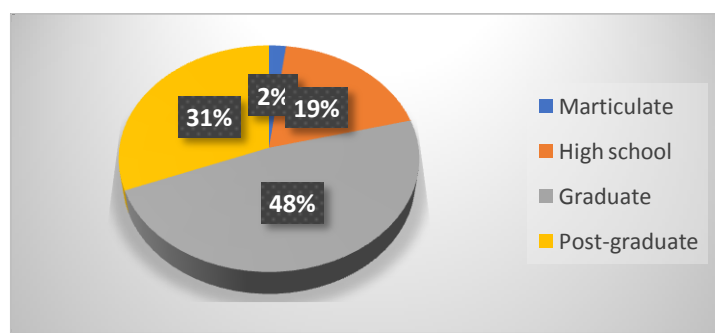


Figure 10 Level of education wise sample distribution

According to level of education 2% of drivers were matriculate, 19% of drivers were high school pass out, while 48% and 31% drivers were graduates and post graduates. This highlights that maximum no. of drivers are graduates and post graduates.

Road safety awareness among drivers of different educational levels

S. No.	Different education levels of drivers.	Percentage of awareness.
1	Matriculate	80
2	High school	76.84
3	Graduate	79.16
4	Post graduate	71.61

CONCLUSIONS

1. Traffic volume is very high at the observed road stretch. If, necessary actions to control traffic is not taken immediately, then after 4-5 years, serious traffic congestion will take place. Which will affect the commuters, pedestrians, and tourism.
2. During morning and evening peak hours we observed LOS F which means the vehicular flow is congested. It is increasing travel time for commuters.
3. Widening of roads and construction of shoulders should be done for solving the problem of traffic congestion.
4. Public transport should be increased to reduce traffic congestion caused by huge no. of personal vehicles used by commuters.
5. To increase road safety awareness, local licensing bodies along with traffic officials should educate people about the rules and regulations. It can be done by spreading awareness through road side informative boards and social media handles.

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