International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Traffic Volume of Kangra - Shimla National Highway (NH 103) in Himachal Pradesh - A Case Study

Gaurav[1], Moti Ram Sharma[2]

[1]PG Student, Career Point University Hamirpur, 176041, India
Email: *gk1200047[at]gmail.com*

[2]Professor, Career Point University Hamirpur, 176041, India
E.mail: *mrsharma.cpuh[at]gmail.com*

Abstract: ***Traffic engineering uses engineering methods and techniques to achieve the safe and time efficient movement of people and goods on roadways. The safe and time efficient movement of the people and goods is dependent on Traffic flow, which is directly connected to the traffic characteristics. The three main parameters of a traffic flow are volume, speed and density. In the absence of effective planning and traffic management of the city, the current road infrastructure cannot cater the future needs of the city. Pedestrian and vehicle volumes have increased significantly in the last decade due to change in the economics of the middle-class families. The current work investigated traffic characteristics in the Kangra-Shimla National Highway at one selected priority points. In this work emphasis was given on traffic volume and the analysis was carried out through primary traffic flow surveys of Kangra-Shimla National Highway for better understanding of the present status of traffic flow at the junction. Calculation of Passenger Car Units (PCU's) for different vehicle types was provided in the book. With the help of the data collection, an attempt had been made to understand the traffic patterns during different time periods. Traffic control at that junction is also dependent on the traffic flow characteristics. Hence the results from the present study are helpful in controlling the traffic at the intersection and also in suggesting some measures to improve the traffic safety in the region. Remedial measures such as widening the road, changing 2-lane to 4-lane or by providing more public transport can be recommended based on the outcomes of the work.***

Keywords: Passenger car equivalents, National Highway 103, Mixed traffic

1. Introduction

In present study the measure of traffic volumes and reported other related traffic characteristics (e.g. flow Composition, flow fluctuations etc.) of NH -103 (India). Moreover, authors also determine the hourly volume in terms passenger car equivalents (PCE) to determine vehicle composition in traffic stream. In addition, the compare of results with standard design service volumes and identify remedies. **Van Aerde (1995) [1]** presented a generic speed-flow-density relationship, which was successfully applied and calibrated for both freeways and arterials in both the micro and the macro domains. The model is a single regime model, but appears to be able to describe both congested and un-Congested traffic conditions. **Satyanarayana (2012)** [2] studied the effect of traffic volume, its composition and stream speed on passenger car equivalents. Method proposed by Chandra is used for developing the PCUf actors and found that For two axle trucks PCU values are found to increase with an increase in compositional share of respective vehicle types in the traffic stream. The PCU of two wheelers practically remains unaffected by its compositional share in the traffic stream. Compositional share of 2W at different locations were observed in the range of 31.69% to 34.23% whereas increase in PCU values are 1.1% only and it may be attributed due to high manoeuvrability. In slow moving traffic PCU values of bullock carts are increasing with the decreasing in the compositional share in the stream. **V.T HamizhArasan and Krishnamurthy (2008) [3]** provided an insight into the complexity of the vehicular interaction in heterogeneous traffic. The PCU estimates, made through microscopic of simulation, for the different types of vehicles of heterogeneous traffic, for a wide range traffic volume and roadway conditions indicate that the PCU value of a vehicle significantly changes with change in traffic volume and width of roadway.**Ahmed Al-Kaisy, A Jung Y and Rakha, H. (2005) [4]** Found that the HCM suggested PCU factors for heavy vehicles is applicable only under free-flow conditions and hence, attempted to derive passenger car equivalents for heavy vehicles during congestion. It is found from the review of the literature that several studies on estimation of PCU values of vehicles in heterogeneous traffic have been conducted. **Lum K.M, Fan H.S.L, Lam (1998) [5]** observed traffic volume and travel time data at a number of arterial roads in Singapore to analyse the speed-flow relationships for radial and ring arterial roads. The general speed-flow model incorporating "minimum delay perintersection" and "frequency of intersections per kilometer", as model parameters, reflects better speed-flow characteristics of traffic on arterial roads.**Maitra (1999) [6]** proposed 10 levels of services with 9 in a stable flow zone (conventional LOS A to E region) and one representing the unstable flow (presently LOS F), as a means of quantifying congestion on urban roads. They estimated capacity values of study locations on urban roads as 3,500 and 4,500 PCU per hour for road widths of 7.0 and 10.3 m respectively in one direction. Marwah and Bhuvanesh (2000) suggested level of service classification for urban heterogeneous traffic. They considered journey speed of cars, journey speed of motorised two wheelers, concentration, and road occupancy to define LOS

Vehicle Characteristics

PCU stands for passenger car unit. It is the conversion factor which is used in order to convert the different vehicle classes into one class such as PCU. In mixed traffic flow, traffic volume and capacity are generally expressed as PCU/lane/hour. As per IRC PCU for different vehicles are given as Car, jeep, and van is 1; Bus and Truck is 3; For both two wheeler and Auto Rickshaw is 0.5

2. Methodology

As per IRC the present study adopted the manual method for counting of traffic volume of NH-103 (India). The field data sheets prescribed by the IRCS are depicted. The form is intended to last for 4 hours, but if the hourly flow is large, one form may be needed for one hour.The data can be summarized for each hour of the day in a form prescribed by the IRCS. This form itself can be used for transferring the totals from multibank hand tallies, if these are used instead of the five-dash system.

3. Result and Discussion

The study reveals various results as given below:

Details of vehicle on weekday

The Fig.1 shows the week day traffic volume from 6:00 am to 10:00 pm. Also, Fig.2 shows the hourly variation in traffic (weekday)

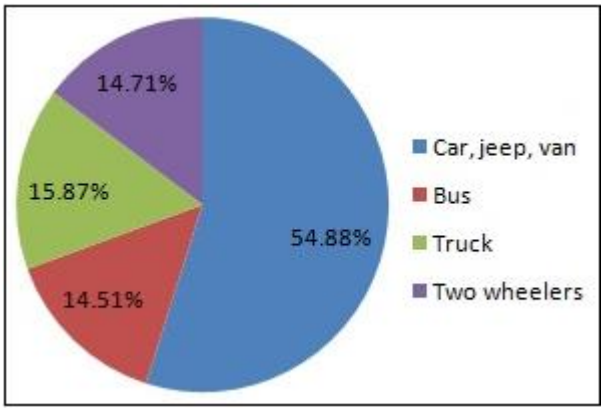

Figure 1: Variation of Traffic volume in week day

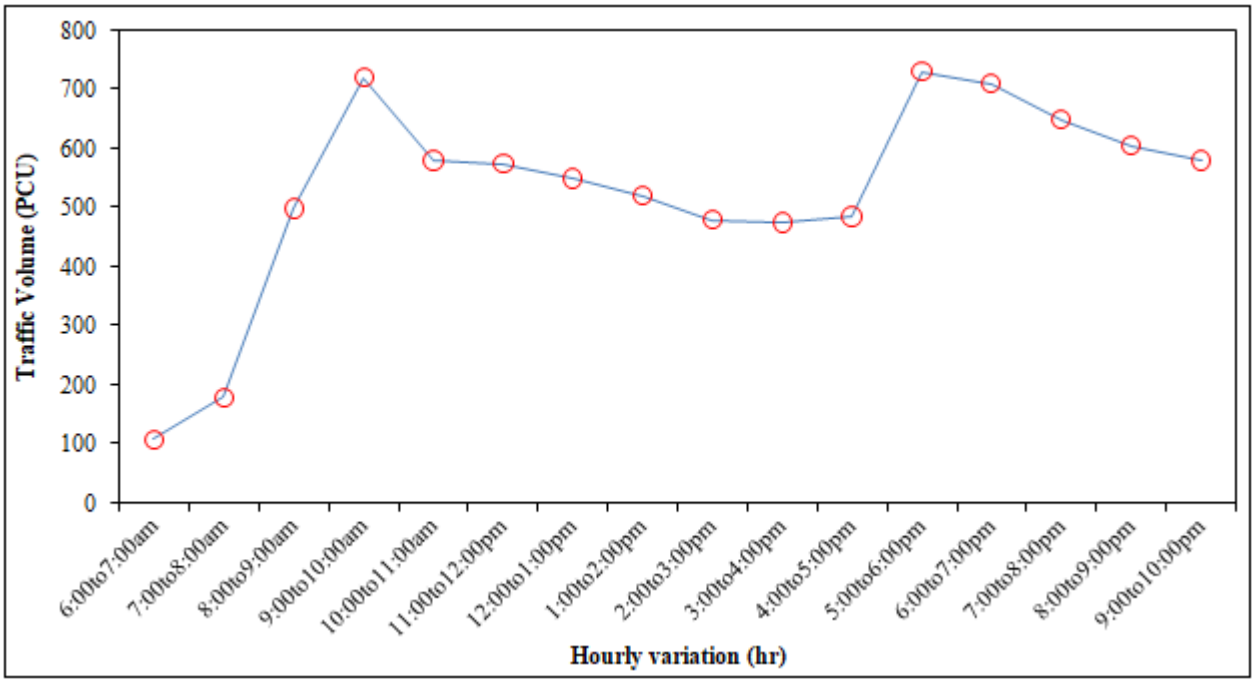

Figure 2: Hourly variation in traffic on week days

Details of vehicle on weekend day

The Fig.3 showing the details of flow of vehicles that has observed on Kangra – Shimla National Highway in weekend from 6:00 am to 10:00 pm showing the traffic volume of National Highway-103 (India). Also, Fig.4 shows the hourly variation in traffic in weekend day.

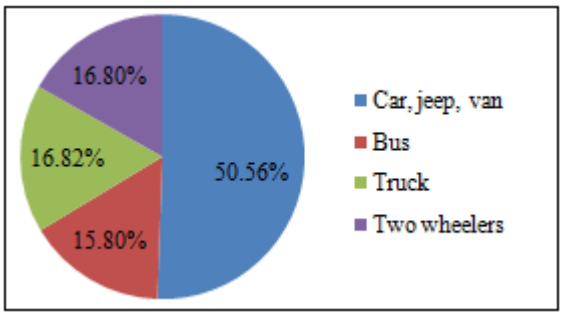

Figure 3: Hourly variation of traffic on weekend day

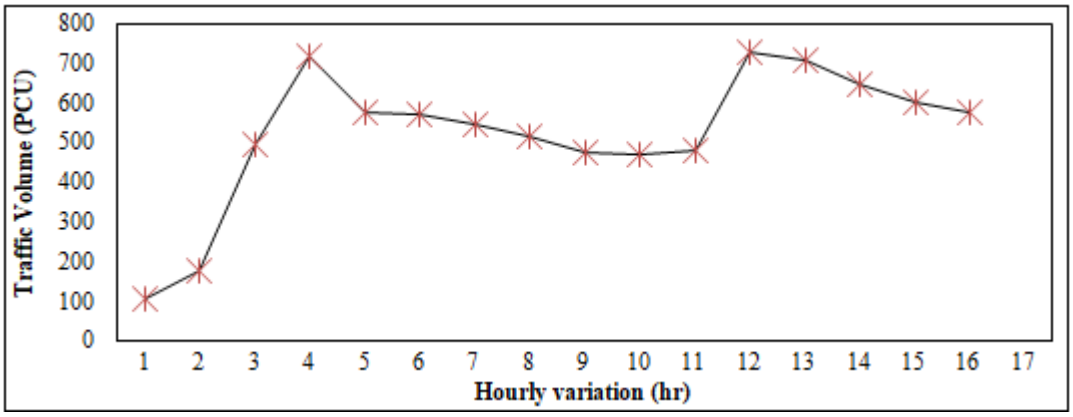

Figure 4: Hourly variation of traffic on weekend day

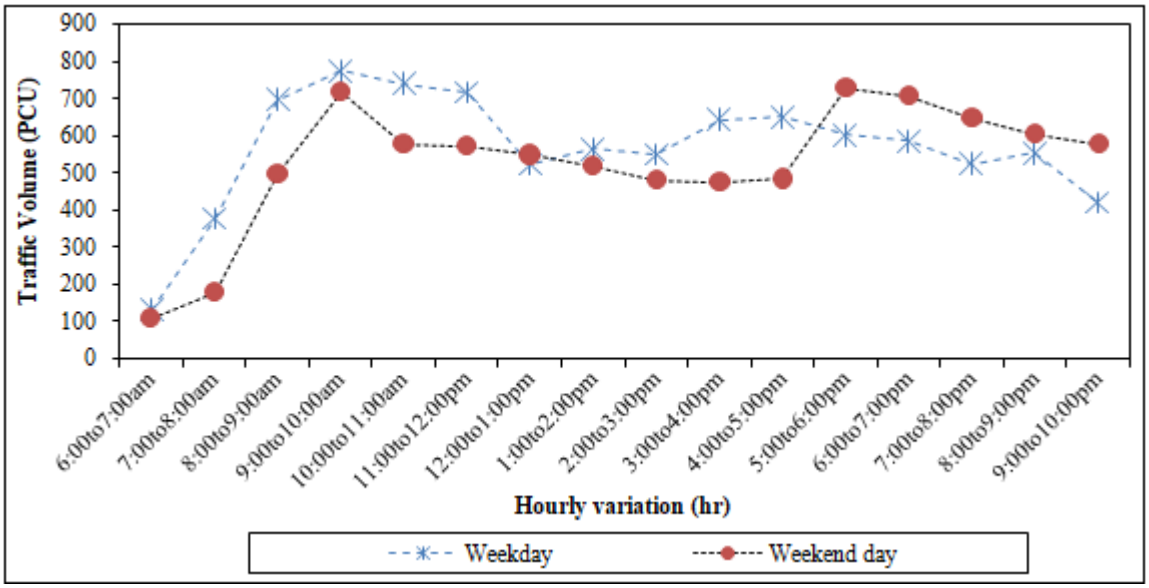

Figure 5: Comparison between weekday and weekend day traffic

The Fig.5 showing the comparison of traffic volume between weekday and weekend day of kangra – shimla National Highway. On the weekday and weekend there were two peak hours in day, morning peak hour and evening peak hour. On weekday the morning peak hour was 9:00 am – 10:00 am and traffic volume was 775 PCU. The evening peak hour was 4:00 pm – 5:00 pm and traffic volume was 651 PCU. On the weekend the morning peak hour was 9:00 am – 10:00 am and traffic volume was 720 PCU. The evening peak hour was 5:00 pm – 6:00 pm and traffic volume was 730 PCU. The study reported that there was huge rush in traffic on weekday in morning peak hour 9:00 am – 10:00 am and on weekend in evening peak hours 5:00 pm – 6:00 pm.

Expected Future Traffic Volume on NH 103

$$N = \frac{365 \times [(1+r)^n - 1]}{r} \times A \times D \times F$$

N is the cumulative number of standard axle to be catered for the design in terms of million standard axles (msa)
A is the initial traffic in the year of completion of construction in terms of number of commercial vehicle per day
D is the lane distribution factors (0.75)
F is the vehicle damage factor (2.5)
n is the design life in years
r is the annual growth rate (r = 0.075 if growth rate is 7.5% per annum as per IRC)

The traffic in the year of completion is estimated using the following formula **A = P(1+ r)^x**

Expected traffic volume in 5, 10, 15, and 20 year in cumulative number of standard axle to be catered in terms of million standard axles is 54, 189, 502, and 1196 respectively as shown in Fig.6.

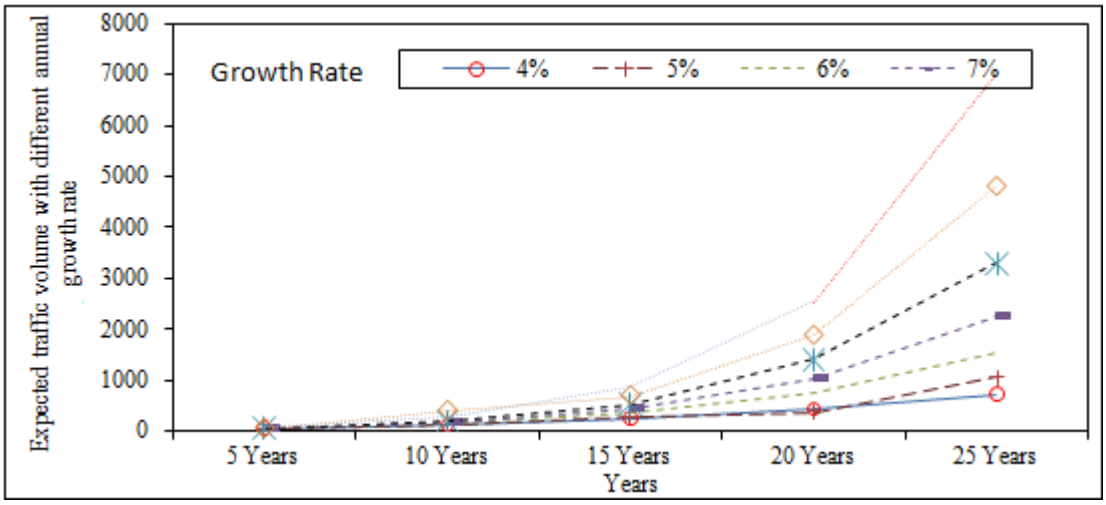

Figure 6: Expected traffic volume with different annual growth rate

4. Conclusions

1) From this study it can be concluded that major share of traffic on **NH Shimla – Kangra** 103 is of Cars, Jeeps and two wheelers, which is 69.59% of the total volume of traffic in a day .Buses and Trucks constitute about 30% of the total traffic. The number of buses (14.51%) and trucks (15.87%) on the road are almost equal. The number of tractor trolleys and JCB etc. was found very low. The peak hours of traffic were found 9:00am to 10:00 and 5:00pm to 6:00pm.On week days that is Monday to Friday the number of vehicles playing on road were more towards Shimla and on weekend day more vehicle were playing towards Kangra.
2) The conditions of road are not very good. There is need to improve the quality of road. Due to the rapid increase in the traffic, the NH remains blocked at one point or the other. It needs to be four-lined to avoid traffic congestion. The buses we observed on the road were very old that could not manoeuvre easily although the manoeuvrability of buses is originally low. There is need to replace the old buses by new buses. Pedestrians and Bicycle should have specific lanes of their own which should be placed beside the footpath/shoulder but there was no such lane on the road we studied. So it is recommended that a lane system should be introduced to increase efficiency of the road. There were some large container trucks observed on the road. Congestion can be slightly avoided if these vehicles are allowed only at off peak hours.

5. Limitations

The major limitation of this volume study was the survey was conducted for only three months for proper results the survey should be conducted for six months,

References

[1] Van Aerde, M., 1995, “Single regime speed-flow-density relationship for congested and uncongested highways”, 74th Transportation Research Board Annual Conference, Washington, D.C., Paper No. 95080.
[2] Satyanarayana, P.V.H., Durga, R. K., Gopala Raju, S. S. S. V. 2012 “Development of PCU factors and capacity norms at mid blocks of rural highways in Visakhapatnam”. Indian J. Edu. Inf. Manage., vol. 1 No.5
[3] Arasan, V.T. and Krishnamurthy, K., 2008. “Effect of Traffic Volume on PCU of Vehicles under Heterogeneous Traffic Conditions.” Road & Transport Research Journal, ARRB, Vol-17, No. 1, 32-49.
[4] Al-Kaisy, A., Jung, Y., and Rakha, H. (2005) “Developing Passenger Car Equivalency Factors for Heavy Vehicles during Congestion” Journal of Transportation Engineering, American Society of Civil Engineers (ASCE), Vol. 131, issue 7, pp 514-524.
[5] Lum, K. M., Fan, H. S. L., Lam, S. H., and Olszewski, P. (1998). “Speed-Flow Modeling of Arterial Roads in Singapore.” Journal of Transportation Engineering, ASCE, 124(3), pp. 213-222.
[6] Modeling congestion on urban roads and assessing level of service B Maitra, PK Sikdar, SL Dhingra - Journal of Transportation Engineering, 1999.
[7] Chandra, S. and Prasad, N.V. (2004), "Capacity of Multilane Urban Roads under Mixed Traffic Conditions", Highway Research Bulletin, Indian Roads Congress, No. 75, New Delhi, pp. 97-103.
[8] Central Road Research Institute (CRRI), (1988) New Delhi .
[9] Ramanayya, T.V. (1988). Highway Capacity under Mixed Traffic Conditions. Traffic Engineering and Control, 284-287. Wu, N. (1999). Capacity at All–Way Stop–Controlled (AWSC) and First–In–First– Out (FIFO) Intersections, Arbeitsblätter, Lehrstuhl für Verkehrswesen, Ruhr–Universität Bochum.
[10] Tanaboriboon and Aryal (1990) journal of Transportation Engineering Volume 116 issue -5 , September 1990 .
[11] Chandra S, Kumar V and Sikdar (1995) Indian Highways Volume: 23 Issue Number: 4 Publisher: Indian Roads Congress ISSN: 0376-7256
[12] M. Parker, “The effect of heavy goods vehicles and following behaviour on capacity at motorway roadwork sites,” Traffic Engineering & Control, vol. 37, pp. 524–531, 1996.

[13] Chandra, S., and Sikdar, P. K. (2000). "Factors affecting PCU in mixed traffic situations on urban roads." Road Transp. Res., 9(3), 40–50.
[14] Golias, C. J. (2003). "Examining sensitivity of impact of taxi traffic on capacity and delays at urban road sections." J. Transp. Eng., 129(3), 286–291.
[15] Basu, D., Maitra, R. S., and Maitra, B. (2006). "Modelling passenger car equivalency at an urban mid-block using stream speed as a measure of equivalence." J. Eur. Transp., 34, 75–87.
[16] V Thamizh Arasana , Shriniwas S. Arkatkarb , Derivation of Capacity Standards for Intercity Roads Carrying Heterogeneous Traffic using Computer Simulation 1877-0428 © 2011 Published by Elsevier Ltd. doi:10.1016/j.sbspro.2011.04.444