International Journal For Technological Research In Engineering
Volume 6, Issue 7, March-2019 *ISSN (Online): 2347 - 4718*

IMPACT OF ROAD SIDE FRICTIONAL ELEMENTS ON AVERAGE TRAVEL SPEED AND LEVEL OF SERVICE FOR AN URBAN TWO LANE STREET

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ABSTRACT: ***Every year our Government spends substantial amount of money to improve the level of service of the roads in the country, may they be National Highways, State Highways, Urban Roads or any road other category. Widening and strengthening of the roads is the most common approach as seen from decades. Even then the Level of Service has not been improved as expected because of many other socio economic factors influencing it of which the impact of Roadside Friction Elements on the through movement of the traffic is the one. Presence of on street parked and stopping vehicles, haphazard movement of pedestrians along the sides and mid sections of the roads , existence of roadside vendors are some of the most common events. Side friction on a roadway not only restricts the continuous or smooth vehicular flow movement but also affects maximum flow and level of service. It includes but not limited to pedestrians, slow moving vehicles (SMV), on road parked vehicles, roadside vendors, on road stopping vehicles. These factors are frequent in developing countries but they are sparse and random so making it of less interest for the researchers for their studies. But in day to day life everyone is interacting with these factors. An attempt has been made in the present work to quantify the impact of roadside friction on average travel speed and LOS of Indian rural highways. Based on data collected from three study sections at different periods of the day and at different friction levels, a detailed procedure has been followed to calculate the Average Travel Speeds, Flow, Level of Service and Roadside Friction Index (RSFI) for each run made. Speed-flow curves and speed-density curves for different friction levels have been generated and the impact of the roadside friction has been analyzed. In the later stages of the work Regression modelling has been done in SPSS statistical software to derive the relationships between the average travel speed as dependent variable and flow and roadside friction as independent variables. A comparison has been made at both disaggregate and aggregate levels between the impact of friction on average travel speed at low friction affected segments and higher friction affected segments. T tests have been performed to check the significance in the difference in average speeds at lower friction levels and higher friction levels. A significant difference was observed in the average travel speeds when speeds at lower friction levels were compared with the speeds at higher friction levels. Regression Models with both Flow and RSFI as independent variables and only Flow as an independent variable have been compared based upon the R square values obtained. A significant difference in the R square values has been observed indicating a significant impact of Roadside Friction on Average Travel Speed.***

KEYWORDS: ***Level of service (LOS), Average Travel Speed, Flow, Roadside friction index(RSFI), Slow moving vehicles (SMV), On road parked vehicles. Roadside vendors and on road stopping vehicles***

I. INTRODUCTION

With the increase in the trends of urbanisation the trends in the everyday traffic volumes on the urban streets of the country are also increasing. As seen from the past few decades the socioeconomic component of the society has take too many turns . As seen in today's scenario almost every second person in the urban society in India is owning a vehicle adding one more number to the traffic volume on the urban city roads. Keeping with the global trends economic growth has guided the country to a tremendous growth in urbanization in the last few decades. As far as the magnitude is concerned, as per 1901 census only 25 million people constituting almost 11.4 percent of the total population then lived in urban areas of India. In the 100 years since then, the urban population has grown 12 times and it is now around 286 million people constituting 28.53 percent of the total population. In the following 20 years, the urban population will nearly double itself to reach about 550 million. According to World Urbanization Prospects, the urban population in the year 2025 will rise to 42.5 percent which is 566 million (UN Department of Economic and Social Affairs, 1996). In terms of Urban transport systems the Urban areas in India are lagging behind from most other countries on the globe. Transport in this context has been a victim of ignorance, neglect and confusion all these at once. In 2002 almost 60 million vehicles were rolling the Indian Roads. According to the statistics provided by the Ministry of Road Transport & Highways, Government of India, the annual rate of motor vehicle population in India has been about 10 percent during the last decade.

II. METHODOLOGY

The methodology opted for this study involves identification of sites for the study, collection of required study data from these study sections, calculation of Average Travel Speed for each run at each study site, determination of Flow and Level of Service of the respective road sections, calculation of RSFI with a comprehensive method, disaggregated and aggregated analysis of the data collected, performing Multiple Linear Regression Analysis at both aggregate and disaggregate level.

III. LITERATURE REVIEW

In this section of the thesis the works and studies previously done on this topic have been discussed. In rapidly developing, densely populated countries in Asia and elsewhere considerable resources are invested in road transport which is seen as a sector which is crucial to the development effort. In designing new roads and when maintaining and upgrading existing ones, procedures are needed for the estimation of traffic performance if best use is to be made of the resources spent for construction and maintenance. Two different tools have been developed internationally over the years to meet these demands:

a) Highway capacity manual (HCM), which emanate from the traffic engineering profession and are used for prediction of traffic performance measures (speed, delay etc) as a function of traffic interaction, geometric design and traffic control features.

b) Highway design and maintenance models (HDM) , which originate from the highway engineering profession and are primarily used for selection of pavement management strategy by means of comparisons of road user costs and highway costs for different pavement types and treatments. Free-flow speed is predicted as a basis for these calculations, which normally do not include "congestion effects".

It is recommended to further analyse the impact of individual friction causing element on the travel speeds using the prescribed procedures. It is thus recommended to conduct this study on a much larger scale including a wider range of all frictional components in order to account for much of the variation in the criterion variable. Similarly, larger scale-study would imply to include wider spectrum of facilities such as intersections, roundabouts, ramps and different terrains. It is likely that the effect of different friction factors would vary for different facilities and different terrains.

IV. SITE SELECTION AND DATA COLLECTION

4.1 Site Selection

This Chapter gives an overview of the sites selected for the study and the methods opted for the collection of field data. In chapter detailed procedures have been shown that aid us to evaluate Travel Speeds, Free Flow Speeds, LOS and Road Side Friction Index. Study sections were selected in such a way that there was no major intersection within the stretch. There were a numerous variations of road side activities within the study stretch. Traffic Flow was heterogeneous in nature. Three study stretches were selected such a manner so that speed, volume and side friction data could be obtained with a wide range of variation.

S.No Name of Road Study Segment Type of Road Length of study segment

1. Boulevard Road Ghat 1 - Ghat 21 Two Lane - Two way Road 3.2 k.m
2. Boulevard Road Ghat 21 – Nishat Two Lane - Two way Road 5.4 k.m
3. Residency Road Ghantaghar – R.D 0.5 Two Lane- Two way Road 0.5 k.m

V. DATA COLLECTION

5.1 Traffic Data

Traffic data was collected from the study sites at five different time periods of the day viz. Early Morning, Peak Morning, Mid-Day, Peak Evening and Late Evening, Video graphic Method was used to count the traffic data after making numerous runs on the study sections at different time periods of the day.

5.2 Friction Data

During market hours and non market hours number of pedestrians, slow moving vehicles (SMV), on road parked vehicles, roadside vendors, on road stopping vehicles were counted at five different time periods of the day.

5.3 Speed Data

To study the impact of Friction on Travel Speeds at different Friction Levels, the speed for each individual run was calculated by floating car technique, for the first two segments that were continuous segments twenty runs were made for each segment and for the third segment where the directional analysis was carried out a total of forty runs were made making a total of [(20 x 2) + 40] i.e. 80 data points for Speed, Flow and RSFI.

VI. FUTURE SCOPE

It can be concluded that the lesser concerned factors in the traffic which are the side friction causing elements have greatest impacts on the quality of travel. However, in many developing Asian countries including India, the range and intensity of such side friction is so great that these activities need to be incorporated explicitly into procedures for calculation of speed and capacity of road links. Itis therefore evident that the impacts of side friction need to be taken into account in geometric design analysis as well as in pavement management analysis for many countries in Asia and especially in India.

It has been shown that side friction can have effects on travel speeds in India especially in Srinagar city, which indicated considerable effects like other commonly used factors in capacity analysis. This leads to the recommendation that highway capacity studies, particularly in the developing world, should include this variable, though in a form suited to their own particular circumstances.

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