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Capacity Expansion of two-lane Rural Road : A Case Study of Padra-Jambusar Road Vadodara

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ABSTRACT

The decision of widening of highway is always a complex matter involving consideration of traffic flow, environment impact, land use and costs. The traffic conditions are examined by using different surveys like traffic volume count, spot speed and feasibility study of existing road with the help of HCM-2000(Highway Capacity Manual).Roadway factors including the lane width, lateral clearance, width of shoulders etc. Also have impact on traffic which may affect the speed of the vehicle, level of service and safety.
Keywords : Widening, Lane Width, Traffic Study, Congestion

I. INTRODUCTION

India has the second largest road network in (3.3 million km) in the world. The main roads in India are under huge pressure and in great need of addition to maintenance; the expansion of the network and widening of existing roads is becoming increasingly important. This would then enable the roads to handle increased traffic, and also allow for a corresponding increase in the average movement speed on India's roads.

In 2009, lane capacity was low and only about 16% of India's roads were four lanes or above congestion on India's highways reduced average truck and bus speeds to 30–40 km/h (19–25 mph) Because of the congestion, the fuel efficiency of the vehicles in India is very low.

India's recent efforts to build modern highways and improve its road network have made a significant difference in trucking logistics shown in fig 1.

The average road speed in India has increased to 30–40 kilometers per hour. The worldwide average road speed, which includes China, ranges between 60–80 kilometers per hour.

Four lane road networks in India have increased to 7,000 kilometers. China in comparison 34,000 kilometers of equivalent quality four lane roads.

The traffic volume on road increases at 13% rate per annum. The population in towns is regularly increasing but the road area especially in the existing part of the cities and in city cores remains the same and congestion continues. And for congestion the conventional approach is “building new roads “Road traffic congestion poses a challenge for all large and growing urban areas. To reduce congestion additional lanes are provided.

Figure 1

II. METHODS AND MATERIAL

A. Objectives

(1) Effectiveness at reducing congestion;

(2) Economic efficiency;
(3) Income-distribution effects; and
(4) Flexibility of access for urgent travel needs.

B. Literature Review

Rahane and Saharkar (13) focused on traffic congestion due to on street parking, narrow width of road, paratransit. Focuses on reasons behind the congestion like Inadequacy of traffic police, Narrow roads, Illegal Parking, Increasing number of population, Higher Purchasing power of the public, Improper planning of city development, Improper lane management. An effective management is suggested as a remedy for the control over the congestion. Which includes factors like Strict lane management, restriction routes for rickshaw, financial penalty, supply and demand, road widening.

Mogridge (10) argues that the effect of roadway pricing on roadway use is determined largely by the character of alternative modes (transit). He argues that pricing freeways would not speed up auto travel in London very much, because riders who preferred the higher road speeds would shift from rail to auto until a new equilibrium was reached. Many writers observe that for pricing to work. there must be convenient HOY or bus lanes or rail transit available with enough capacity to handle the travelers who switch from autos (Dawson 1986).

Giuliano (4) argues that it is not enough to propose to spend the revenues in a way to benefit all user groups, because the public will not trust the officials to do the right thing. This distrust would be widespread, in part because of the huge sums of money that would be raised by market-clearing levels of tolls in very congested urban regions. Also, the public would look back at the recent inefficient and regressive spending on rail transit systems, which benefitted middle-class and not poor households in most regions. She suggests that building new toll roads will probably be more politically acceptable than tolling existing roads, as the funds would be seen as resulting in new capacity. May (1992), however, cites a study showing that 62% of London respondents favoured pricing of existing roadways if the revenues were spent on transportation improvements. A U.K. nationwide survey showed that 57% supported road pricing if the revenues were to be spent for improving transportation, including bicycling and walking facilities, and for increasing roadway safety (May 1992).

Satish Chandra and Upendra kumar (11) studied that the Lane and shoulder widths can have a substantial impact on traffic flow. As the capacity increases the traffic flow will also increases. Capacity of carriageway width also depends on speed-volume relationship. It is found that the PCU for a vehicle type increases with increasing lane width. The effect of lane width on the PCU is apparently linear; the slope of linearity depends on type of vehicle. The capacity of a 7.2 m wide road is estimated to be 2818 PCU/h which is slightly larger than the value specified in HCM -1994 but much lower than the value of 3,200 PCU/h suggested in HCM -2000.

The first 0.3 m of lane widening lanes from 3.0 to 3.3 m, for example! Corresponds to an increase in capacity of about 14% while 0.6 m of lane widening from 3.0 to 3.6 m results in a 24% increase in capacity.

Kononoy et al. (9) explains as the number of lanes increases the opportunities for conflicts related to lane changes also go up further more the increased maneuverability associated with the availability of more lanes tends to increase the average speed of traffic and the speed differential. Comparison of SPF'S multilane freeways suggests that adding lanes may initially results in a temporary safety improvement that disappears as congestion increases as shown in fig 2.

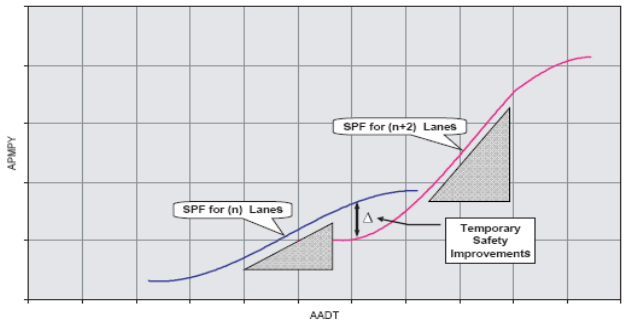

Figure 2

Carlos alba and edward Beimborn (2) described that many factors affect the widening decision like environment impact, costs, potential disruption of homes and businesses and traffic growth.

Threshold volume defined between level of service (table -1) D and E on a two lane highway. Because of number of access points and also shoulder width have major influence on LOS.

Table -1 **LOS** Criteria for Two-Lane Highways in Class I

Source: HCM-2000

LOS	Percent Time-Spent Following	Average Travel Speed (mi/h)
A	≤ 35	>55
B	> 35-50	>50-55
C	>50-65	>45-50
D	>65-80	>40-45
E	>80	≤ 40

Nikiforos Stamatiadis et al. Studied system-based evaluation of practical design is examined and the safety, operational performance of various cross-section alternatives, based on highway capacity and highway safety manual procedures. The various alternative cross sections ranged from an improved two-lane section representing a practical solution approach to a four-lane-divided highway.

III. DISCUSSION

A number of concepts regarding mobility and safety were presented and discussed within the application of practical solutions. Each of these concepts has an impact on the final solution to be selected and requires special attention. The choice of the desired and acceptable LOS becomes important since it will have a significant influence on the size of the facility.

IV. CONCLUSION

Traffic congestion is very common problem now days. Identification of congestion cause is very important. It can be sorted out by various ways like proper management of traffic, geometric improvements, and capacity expansion. Capacity expansion is not always a solution of congestion. Sometimes it worsens the situation.

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