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Feasibility Study on Motor Cycle Lanes in Visakhapatnam City

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Abstract-The present study addresses a comprehensive analysis and feasibility of motor cycle lanes in two important city roads, "CMR central to Thatichetlapalem via., Gurudwara junction", and "Jagadamba junction to old post office via., Poorna market in Greater Visakhapatnam Municipal Corporation[GVMC]" which are carrying 52% and 55% of motor cycles in total traffic. The paper discusses the basic understanding of travel time benefits and travel comfort by separating two wheeler motor cycle traffic from mixed traffic.

Index Terms- Exclusive motor cycle lanes, Inclusive motor cycle lanes, Motor cycle traffic, Mixed traffic.

I. Introduction

The city of Visakhapatnam is being administrated by Greater Vishakapatnam Municipal Corporation (GVMC) with a jurisdiction of 540sq.km. Visakhapatnam is rated as the fastest growing city in the country and this growth intern influencing the growth of various modes of transport. Out of all modes of vehicles registered, the motorized two wheelers occupied 73% (RTA, Visakhapatnam) in the city. It clearly shows that the motor cycle is the best mode choice due to its advantages such as low price, less parking space, accessibility and comfort etc.,

In the present work, two roads have been considered to study the feasibility of constructing exclusive motor cycle lanes. From the literature, it has been observed that the road accidents were reduced to a great extent by providing exclusive motor cycles lanes. Two major roads which are being carried the most of the two wheeler traffic are considered in the study. Road 1: CMR central to Thatichetlapalem via., Gurudwara" and Road 2: Jagadamba junction to Post office via., Poorna Market. These two roads are carrying 52% and 55% of two wheelers in total traffic respectively. Due to its major share, two wheelers are creating most of the traffic related problems. Keeping in view of this, an exclusive lane is proposed for motor cycles to reduce the congestion and travel time delays.

II. Objectives

- To analyze the travel time in mixed traffic and (Exclusive Motorcycle Lane)EML
- To study the travel time savings in terms of fuel cost benefit and value of time.
- To study the reduction in accidents

III. Data Collection & Observations

The classified traffic volumes in mixed traffic were collected in different reaches of two proposed corridors. Traffic volumes were collected in morning peak time, evening peak and off peak hours. The spot speeds of motorcycles were observed in mixed traffic at different locations of two roads. Road characteristics such as existing lane width, road lengths of two roads were collected. Travel time of motorcycles in two roads was taken along with signal interval timings at junctions.

It was found that, most of the Motorcycles have smaller and medium sized engine capacity with 150cc or below. Very few (less than 1%) is larger in engine capacity. The length and widths of Motorcycles were physically measured. The average length is about 2.00 m and width is 0.8 m measured between either ends of two mirrors. The time headway of two wheelers in mixed traffic has been collected at several locations of these two study roads. Typical motor cycle lane in Malaysia is shown in Fig.1.

Fig.1 Typical Motorcycle Lane

Width of motor cycle lane:

The width of the lane is influenced by the average width of the motor cycles, volume of motor cycles, minimum lateral spacing between two motorcycles during over taking and crossing maneuvers, operational speeds etc, The minimum width of motorcycle lane is 3.5 m (Ministry of transport, Malaysia). This study found that an exclusive motorcycle lane needs a control width of 3.8 meters (inclusive of marginal stripe 0.38 meter at both edge of road) for a design speed of 70 Kmph.

Headway

In mixed traffic, the average time headway is observed to be 4.2 sec between heavy vehicles (Bus/Truck) and motor cycles.

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On the other hand, the average time headway is observed to be 1.8 sec between two motor cycles. From the headway timings, it has been observed that the two wheelers are maintaining low speeds since they are following buses/trucks. This shows the importance of exclusive motor cycles lanes to improve the time headway and reduce the travel time.

Corridor 1: CMR Central to Thatichetlapalem via, satyam, Gurudawra, Akkayyapalem

- Length of the corridor : 4.2 Km
- Number of signalized intersections: 4
- Approximate waiting time (red) at each intersection : 5 min
- Space mean speed of motor cycles: 31.2 Kmph
- Peak Volume of motor cycles: 1820 motor cycles/hour.

Corridor 2: Jagadhamaba junction to old post office junction via, Poorna market

- Length of the corridor : 2.25 Km
- One way traffic
- Space mean speed of motor cycles: 38.4 Kmph
- Peak Volume of motor cycles: 1550 motor cycles/hour.

The volume share of two wheelers in these two study corridors is shown in Fig.2 and Fig.3. In both corridors, motorcycles are occupying more than 50 % of model share.

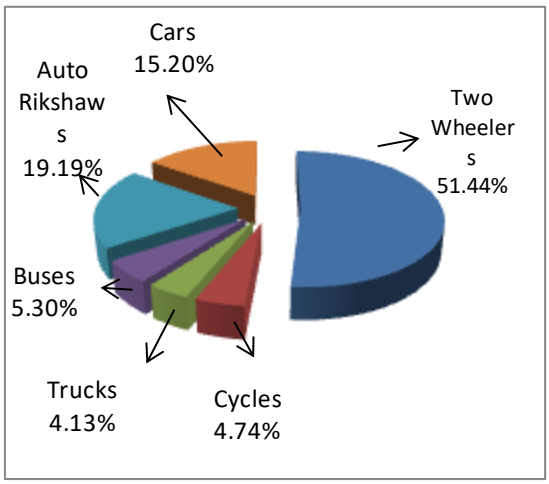

Fig.2 Model split in Corridor 1

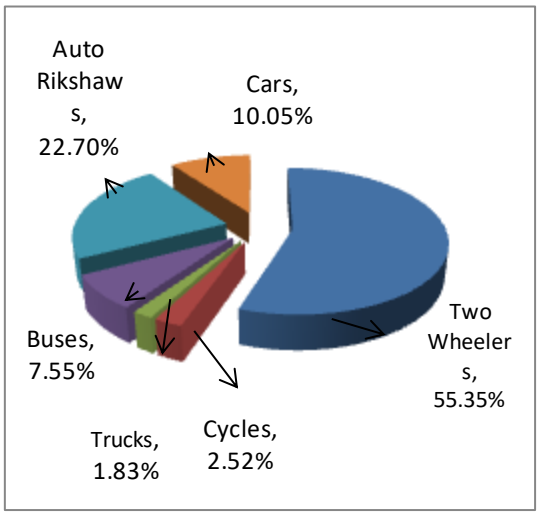

Fig.3 Model split in Corridor 2

IV. RESULTS AND DISCUSSION

The proposed motorcycle lanes result in the following advantages.

- Savings in fuel consumption
- Value of time.
- Reduction in vehicle operation cost
- Reduction in accident rate especially fatal accidents
- Reduction in vehicular pollution

The capacity of corridors in terms of motorcycles in mixed traffic and exclusive lanes is given in Table 1. The existing and improvement in travel times due to proposed motorcycle lane are given Table 2.

Table 1: Capacity of corridors in terms of motorcycles

	Mixed Traffic (Motorcycles /hr)	As per local city traffic condition (Motorcycles/hr)	As per Design (Motorcycles /hr)
Corridor1	1820	2150	3000
Corridor2	1550	1950	2900

Table 2: Travel time in mixed traffic and Motorcycle lanes

	Mixed Traffic (Minutes)	Motor cycle lane (Minutes)	Net savings in travel time (minutes)
Corridor1	13.7	5.60	8.10
Corridor2	7.67	3.85	3.90

From the above table, it has been observed that there is a great saving in travel times (above 50%) in separate motorcycle lanes compared with mixed traffic.

Value of Time (VOT):

Value of time has been considered based on the values generated for the similar township in the country. VOT is arrived based on occupancy rates of various vehicle types and hourly rates (Rs/hr) of passengers traveling in respective vehicles types. Benefits from Value of Time in both the corridors are shown in Table 3.

Table 3. Benefits from value of time per annum

	Savings in time in Hours	Time value Rs. Per Hour	Saving per Year (Rs.)
Corridor1	437416	14.80	64.74 Lakhs
Corridor2	256230	14.80	37.92 Lakhs

Cost of fuel:

As the vehicles running with relatively high speeds and reducing delays, the consumption of fuel is reduced.

Idle Fuel Consumption (IFC)

Savings due the fuel consumed by a vehicle during the stopped delay time (Idle fuel Consumption savings) will be reduced and the same has been assessed based on the IFC rates suggested by CRRI.

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Financial benefits from both the corridors in terms of fuel consumption are given Table 4. Total benefits from value of time and fuel consumption savings are given in Table 5. The construction cost of the project for corridor 1 and corridor 2 has been estimated to Rs. 890 Lakhs and Rs. 167 lakhs respectively.

Table 4. Benefit from fuel consumption per annum

	Total savings in Hours / Year	Avg. Cost of fuel (Rs)	Cost benefit in lakhs (Rs.)
Corridor 1 A. Fuel saving while the vehicle is in running	183558	69.00	126.65
B. Idle fuel consumption	52490	69.00	36.21
		Total	**162.86**
Corridor 2	256230	69.00	**176.79**

Table 5. Total financial benefits per annum

	Benefit from value of time in lakhs (Rs)	Benefit from fuel savings in lakhs (Rs.)	Total benefit in lakhs (Rs.)
Corridor 1	64.74	162.86	227.60
Corridor 2	37.92	176.79	214.71

Viability

The results of the economic analysis indicate that the project has good economic returns considering various benefits as discussed above. Considering the benefits due to savings in travel time delay and operating cost together. The RBI interest rate is varying 6% to 11% and the project returns are more than that of bank rates even considering the savings in travel time alone. The project is considered as highly viable.

V. CONCLUSIONS

- For corridor 1, the required width of motorcycle lane is 3.80 m which may be achieved by widening the existing road, as sufficient land is available.
- Necessary under passes are proposed at intersections to avoid waiting time at four junctions namely Satyam junction, Gurudwara junction, Sankaramatam junction and Akkayyapalem junction for corridor 1.
- To get a least possible benefit traffic volume of lean time is considered for calculating travel time benefit for both the roads.
- A physical barrier with proper markings to separate motor cycles from mixed traffic is recommended for corridor 2 without under passes as it is one-way traffic road.
- Level of service for four wheelers and other mixed traffic shall be improved due to separations of two wheelers from mixed traffic.
- The proposed corridors reduce noise and air pollutions to a great extent.

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