Comprehensive Transport Planning for Belgaum Central Bus Stand Area

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Abstract-- Belgaum has developed very quickly in recent times, especially since 2000. As the city economy has grown, many new buildings and factories have been constructed, and working and living conditions for people in the city have gradually improved. However, the growth of Belgaum's population is now causing a number of serious problems, including traffic congestion, Accident rate. The study area which has been chosen is Central Bus stand Belgaum which acts as Central Business District (CBD) for Belgaum city that is totally congested due to various factors and traffic. There is no easy movement for buses and pedestrians. Because of the heavy congestion on roads approaching bus stand, the pedestrians are facing problems to cross the road. Also due to improper road conditions, a leading to accidents. This study focuses on reducing these problems and to continue the Improvements in Belgaum’s living and working condition.

Keywords: Central Business District (CBD), Pedestrian survey, Traffic surveys and Improvement strategies and suggestions.

I. INTRODUCTION

Present study towards the comprehensive transport planning for a central business district (CBD) area has been chosen in and around Belgaum KSRTC bus stand and City bus stand. It is observed from the visual observations, that there are problems associated with smooth traffic operation due to various reasons.

The pedestrian movement for crossing the road connecting Market circle to Khadebazar circle and commute between KSRTC and City bus stand is concentrated at the main entrance of KSRTC bus stand. This pedestrian volume and higher vehicular volume has lead to conflict between pedestrian and vehicles which have resulted in terms of accidents. In view of this, it is necessary to remove the conflict and stream line the flow of traffic along the bus stand road and also ease out congestion and conflicts at KSRTC bus stand entrance location.

II. OBJECTIVES

- Identification of study area location in terms of network of roads and past study details
- Conducting necessary field studies such as Road inventory, Area inventory, and Traffic studies along the study area.
- Collection of relevant secondary data required for estimation and projection of traffic.
- Analysis of data to ascertain traffic characteristics and roadway details.
- Development of strategies to minimize the conflicts and reduce accidents.

III. LIMITATIONS

A detailed pedestrian surveys and vehicle surveys are carried out at the location only on the working day in the middle of the week. Most of the available footpaths are fully occupied by the small merchants and shop keepers. In this survey the count is taken manually, during morning and evening peak hours especially when traffic moment is too high.

IV. SCOPE

To conduct comprehensive study for the surrounding area and to develop complete transport demand model for the area. This could be a major study that can be carried out by local government.

V. STUDY OF PRESENT CONDITIONS IN BELGAUM CITY

A General

Belgaum (also known as Belagavi) is the headquarters city of Belgaum district and is one of the oldest urban centers of Karnataka, lying at a distance of around 502 km from Bangalore and around 500 km from Mumbai. The city area is planned and regulated by the Belgaum Urban Development Authority (BUDA). The Belgaum Municipal Corporation (BMC) is the city administrator, which comprises 58 wards under its jurisdiction with an urban population of about 488,292 (Census 2011).

B Growth Rate of Vehicles

The study area lies within the Belgaum City and also central business district place for Belgaum which is greatly influenced by City traffic. Belgaum city has a large number of two wheelers among the fast moving vehicles and Bicycles account the major share of slow moving vehicles. The figure 1 below represents the growth rate for vehicles registration for Belgaum City in last 5 years (Fig.1).
C Existing Condition of Location

The pedestrian movement for crossing the road is concentrated at the main entrance of KSRTC bus stand. This pedestrian volume and higher vehicular volume has lead to conflict between pedestrian and vehicles which have resulted in terms of accidents. The figure 2 and 3 indicates some following points:

- High traffic flow
- Considerable pedestrian delay
- Pedestrian facing problems to cross the road
- Formation of conflicts due to restricted access to roadway
- Due to improper road conditions, Entry and Exit of Buses have leading to accidents

VI. DATA COLLECTION:

For the purpose of preparing a comprehensive transport planning, detailed data collection are required to analyze the traffic characteristics at the study area, for this survey data has been collected by conducting various surveys like Inventory survey, Traffic surveys, Pedestrian surveys for 12 hours and Bus entry and exit surveys at KSRTC and City bus stands for 24 hours.

The relevant secondary data like accident data, growth rate of Belgaum city are collected. Summary of Present traffic volume at intersections, Mid block, Pedestrian volume, KSRTC bus entry in 15 min and in one hour and for 24 hour. The table 1 gives details of survey conducted.

TABLE I. LIST OF TRAFFIC SURVEYS

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Survey</th>
<th>No. Of Locations</th>
<th>Location details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classified traffic volume counts at mid blocks</td>
<td>1 (12 Hours)</td>
<td>1. Bus Stand Road</td>
</tr>
<tr>
<td>2</td>
<td>Classified turning movement counts at junctions</td>
<td>2 (12 Hours)</td>
<td>1. Market Circle 2. Khadebazar Circle</td>
</tr>
<tr>
<td>3</td>
<td>Pedestrian counts</td>
<td>3 (12 Hours)</td>
<td>1. Main Gate of KSRTC Bus stand 2. Back Gate of KSRTC Bus stand 3. alternate ways</td>
</tr>
</tbody>
</table>

A Mid Block Count Details

The average daily traffic volumes observed on the Bus stand road is 12,379 PCU (13744 vehicles). Details are presented in Table 2.

TABLE II.DETAILS OF MID BLOCK COUNT SURVEY

<table>
<thead>
<tr>
<th>Category</th>
<th>Vehicle type</th>
<th>Vehicle count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Vehicles</td>
<td>KSRTC Bus</td>
<td>1208</td>
</tr>
<tr>
<td></td>
<td>CITY Bus</td>
<td>965</td>
</tr>
<tr>
<td></td>
<td>Mini Bus</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Pvt. Bus</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Car/ Jeep/ Van</td>
<td>503</td>
</tr>
<tr>
<td></td>
<td>Two Wheelers</td>
<td>7704</td>
</tr>
<tr>
<td></td>
<td>Auto Rickshaws</td>
<td>2037</td>
</tr>
<tr>
<td></td>
<td>Auto Rickshaws (goods)</td>
<td>162</td>
</tr>
<tr>
<td>Commercial Vehicles</td>
<td>LCV (4-Tyres)</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Tractors</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Two Axle Truck</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Three Axle Truck</td>
<td>0</td>
</tr>
<tr>
<td>Slow moving Vehicles</td>
<td>Cycles</td>
<td>1051</td>
</tr>
<tr>
<td></td>
<td>Carts</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Total Vehicles</td>
<td>13,744</td>
</tr>
<tr>
<td></td>
<td>Total PCU’s</td>
<td>12,379</td>
</tr>
</tbody>
</table>

B Traffic Composition

Composition of daily traffic is presented in Figure 4. Out of the total traffic, 97% of traffic consists of passenger
vehicles. Share of two wheelers is the highest followed by auto rickshaws and cars.

![Traffic Composition – Bus Stand Road](image)

Fig 4. Traffic Composition – Bus Stand Road

**C Pedestrian Count Details**

There are three entries where the pedestrians are entering into the KSRTC Bus stand. Pedestrian counts were carried out at all three locations to access the requirement of pedestrian facilities near KSRTC Bus stand. Peak Hour Summary is presented in Table 3.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Location name</th>
<th>Peak hour</th>
<th>No. Of pedestrians movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>KSRTC Entrance</td>
<td>11.00-12.00</td>
<td>970</td>
</tr>
<tr>
<td>2</td>
<td>KSRTC Back Gate</td>
<td>1.00-2.00</td>
<td>775</td>
</tr>
<tr>
<td>3</td>
<td>Alternate way</td>
<td>1.00-2.00</td>
<td>670</td>
</tr>
</tbody>
</table>

**D Traffic Projection**

Based on the growth rates, the anticipated future traffic at the Intersection is estimated for next 15 years with the compound growth rate of 7.08% for Belgaum city traffic and given below in Table 4.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Traffic movement</th>
<th>Year/PCU</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2014 (Present)</td>
</tr>
<tr>
<td>1</td>
<td>Market circle to Khadebazar circle</td>
<td>1162</td>
</tr>
<tr>
<td>2</td>
<td>Khadebazar circle to Market circle</td>
<td>1278</td>
</tr>
<tr>
<td>3</td>
<td>KSRTC Entry from Market circle</td>
<td>305</td>
</tr>
<tr>
<td>4</td>
<td>KSRTC Entry from Khadebazar circle</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>KSRTC Exit to Market circle</td>
<td></td>
</tr>
</tbody>
</table>

**VII. DATA ANALYSIS STUDIES:**

The preliminary analysis of all the data collected has been further analyzed to ascertain the characteristics and to arrive at the decision regarding existence of the traffic operations at the location. The analysis has been carried out considering the variables such as vehicle arrival pattern, headways, gaps, speed, delay and volume. These data have been analysed using statistical techniques to check the goodness of fit.

**VIII. IMPROVEMENT STRATEGIES:**

**A Junction Improvements**

With reference to figure 5 and 6 the improvements suggested are:
- Providing road dividers along Market road and KSRTC bus stand road
- Providing a central island with properly designed geometric elements
- Providing zebra crossings with appropriate markings
Pedestrian Facilities

With reference to the figure 7, the pedestrian subway is proposed to achieve the pedestrian safety across the road linking between KSRTC and City Bus stands with consideration of IRC guidelines for controlled crossing.

Adding lane on each side of KSRTC and City bus stand gives the average V/C value of 0.43 which reduces the traffic by 62% with Level of Service B.

IX. CONCLUSIONS:

- The prevailing chaos around KSRTC and City bus stand area Belgaum has been scientifically investigated for proper local area management for decongestion and proper movements of pedestrian.
- The improvements suggested are junction improvement, proper pedestrian crossing, exit ramp at KSRTC bus stand and providing additional lanes though length of road.

REFERENCES

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