ROAD SAFETY AUDIT FOR NIGADI-DAPODI BRTS ROAD

Mr. Vijay D. Bhojane [1], Dr. N.S Jain [2]
[1] PG Student, Department of Civil Engineering, D. Y. Patil College of Engineering, Akurdi, Pune-44, Maharashtra, India.
[2] Asst.Prof., Department of Civil Engineering, D. Y. Patil College of Engineering, Akurdi, Pune-44, Maharashtra, India.

ABSTRACT

Rapid increase in number of vehicles in cities leads to various traffic problems. Out of which road accidents are major aspect. Mixed traffic condition and variable profile user's create situation of accidents in the cities. Apart from this several other reasons like over speeding, drink and drive, blip road design etc. are also responsible for the fatalities. As a Planner or Civil engineer one has only a few interventions like Road and vehicle design to reduce the road fatalities, because none of them can regulate the travel behavior of drivers and pedestrians. Pimpri-Chinchwad Bus Rapid Transit System is a proposed bus rapid transit project for the city of Pimpri-Chinchwad. The system has wider roads (61m) and grade separators, underpasses merge in and merge out, BRTS bus stops and foot over bridges. The system comprises eight lanes with a total length of 112 km. The Nigdi-Dapodi stretch is the PCMC's first BRTS project. Construction work on a 12 km pilot route between Nigdi and Dapodi had been completed. At this stage, PCMC has decided to study the safety aspects of proposed BRTS system before starting the operation of BRTS. In this regard, one has to undertake a Road safety audit Study for proposed BRTS pilot study stretch between Nigadi and Dapodi. The BRT system generally has specialized design, services and infrastructure to improve system quality and remove the typical causes of bus delay. The system consists of total 8 lanes. The four lanes in the centre are to cater to the normal traffic of the region. The two lanes adjacent on either side are the lanes for the bus rapid transit. Buses should be flow without hindrance in this lane. Service roads (where the traffic is minimal) make the boundary lane of the system.

Keyword: - *Road Safety Audit, Lane, Road Fatalities, National Highway.*

1. INTRODUCTION

The Traffic fatalities including injuries and death are happening almost every day not only in Indian cities but in other developing countries as well. Several studies reveals that alone 238,562 person died in 2013 (India) due to road accidents.

Unplanned Urbanization, rapid increase in vehicles, limited road space, and lack of Traffic Management plan in the cities are responsible factors for the Road fatalities. These facts compel the policy makers and planners to create a sustainable safe road system in the city. Road safety Audit is one of the tool which is a cost and time effective solution for road safety concerns. As per American Association of State Highway and Transportation Officials (AASTHO) guideline, A Road Safety Audit (RSA) is the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on the potential road safety issues and identifies opportunities for improvements in safety for all road users.

Road Safety Audit (RSA) was originated in UK and now spread across the globe. Countries like USA, UK, Canada, Japan Singapore etc. are using this tool to lower down the road fatalities.

To Promote the Sustainable mode of transportation in the city, Pimpri Chinchwad Municipal Corporation has constructed a network of 112 km BRTS System. Out of which 12km stretch constructed along old NH-4 Pune Mumbai Highway (Nigadi to Dapodi). This stretch consists of 8 lanes, due to its complicated road layout as shown in fig 1 and substantial flow of traffic, it is mandatory to have an appropriate road safety measures to reduce the future road accidents along this stretch.

Figure 1: The old NH-4 Pune Mumbai Highway (Nigadi to Dapodi) 8 lanes plan

Road safety audit is proactive approaches were safety performance of existing or future road is done. Before commencing BRTS on old National highway, it is essential to have RSA this will help Local bodies to prevent the future road fatalities.

2. OBJECTIVE OF STUDY

The main objective of the study is to examine the existing road's safety performance and suggest various suitable traffic control and management measures to enhance safety and mobility of proposed BRTS corridor.

3. STUDY AREA

The stretch of 12 km old NH-4 Nigadi to Dapodiis selected for the study. The system consists of total 8 lanes. The four lanes in the centre are to cater to the normal traffic of the region. The two lanes adjacent on either side are the lanes for the Bus Rapid Transit System. Buses should be able to flow without hindrance in this lane services road (where the traffic is minimal) makes the boundary lane of the system. The complete stretch of 12 km has 9 intersections, 14 bus stations, 4 Foot over bridges, 5 underpasses, 11 Diverging and Merging spots and 1 T junction.

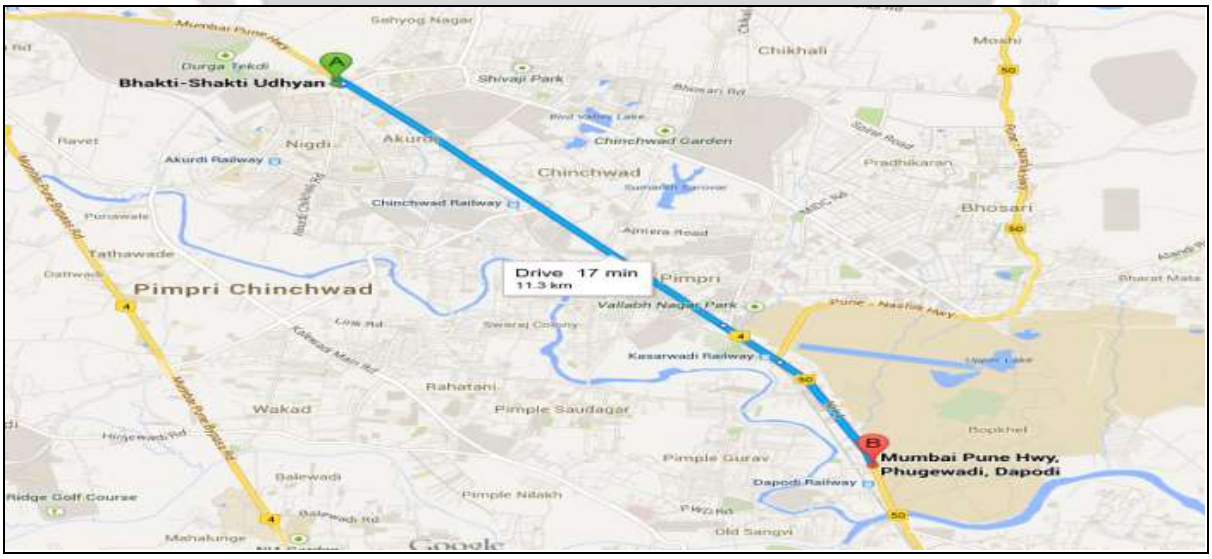

Figure 2: The stretch of 12 km old NH-4 Nigadi to Dapodiis

4. PROBLEM STATEMENT

During road inventory survey the following major safety concerned elements were observed and studied in detail:-

- **A.** Merging and Diverging sections: Vehicles from concrete lanes try to enter in the service road and vehicles from service road try to enter concrete road by crossing BRTS lane can cause merging and diverging respectively. This may cause conflicts with BRTS buses.
- **B.** Underpasses: Vehicles from one side of the highway have to cross BRTS lane twice to reach other side which increases the chances of conflict.
- **C.** BRTS Bus stations: Improper crossing facilities for passenger to access bus stations from road side.
- **D.** Intersections: Maneuverability of BRTS bus and other vehicles at intersections can cause conflict.

5. APPROACH AND METHODOLOGY

The Primary objective of this research is to use Road Safety Audit tool for assessing road safety along old NH-4 Pune Mumbai Highway (Nigdi to Dapodi). To carry out the research various primary and secondary data were collected.

The foremost Tasks involved in this study is listed below and the flow chart of the activities is also mentioned below:

5.1 Collection of Primary and Secondary Data

a) Classified volume counts were taken at Major Junction and Nodes of the stretch. These counts were taken through the manual counts.
b) Both day and night time inspections have been conducted at the site to ensure the site is looked at in all road and light conditions.
c) Field surveys were executed, to identify critical nodes and links.
d) Segregation of the BRT lanes and other issues related to BRTS operations
e) Safety analysis of critical sections: All the merging and diverging sections, Bus stations, intersections and underpasses.
f) Walk route analysis for safe movement of BRTS passengers 'to and from' bus stations.
g) Evaluation of existing and proposed pedestrian facility design.
h) Maneuverability analysis of BRTS buses at bus stations areas.
i) Maneuverability analysis of buses and other vehicles near elevated and underpass facilities.
j) Maneuverability analysis of non-motorized modes and pedestrians.

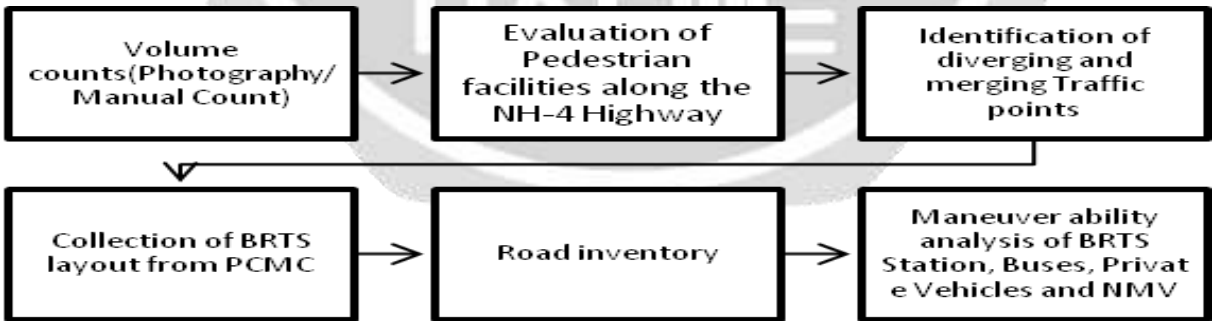

Figure 3: Collection of Primary and Secondary Data

5.2 Observation/Analysis

Following results have derived from the collection of data

a) Merging and Diverging spots

Total 10 spots were identified, were normal private traffic is merge and diverge. Merging and diverging of traffic will hinder the speed of BRTS Buses in coming future and also prone to road accident also. Statistics of merging and diverging traffic is shown below:

Bajaj auto, Greeves Cotton and Big Bazaar have substantial amount of merging and diverging traffic

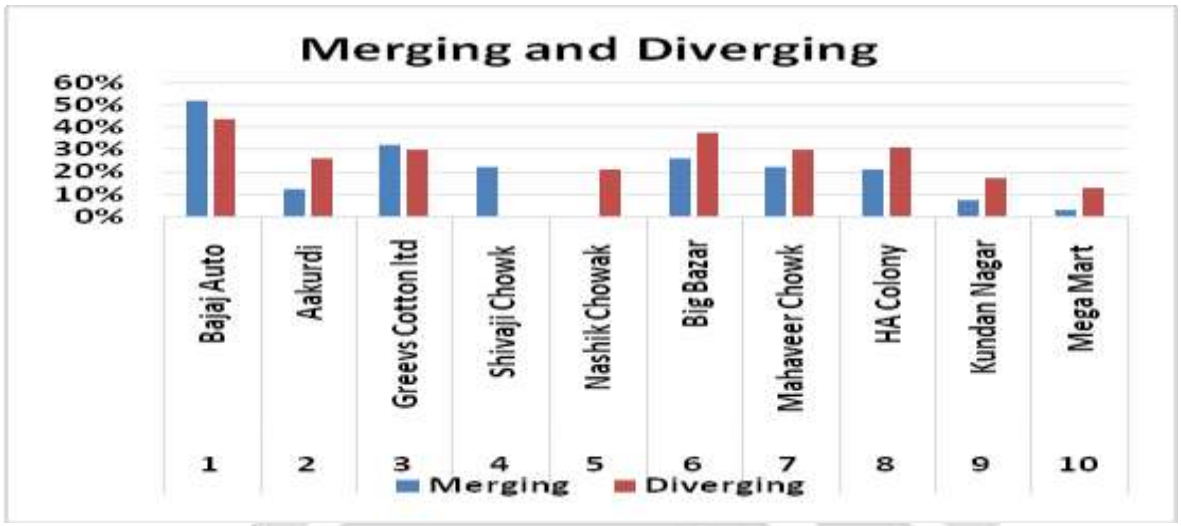

Chart 1: Comparative Statement of Statistics merging and diverging traffic

b) Under Pass

Total 5 under pass were surveyed

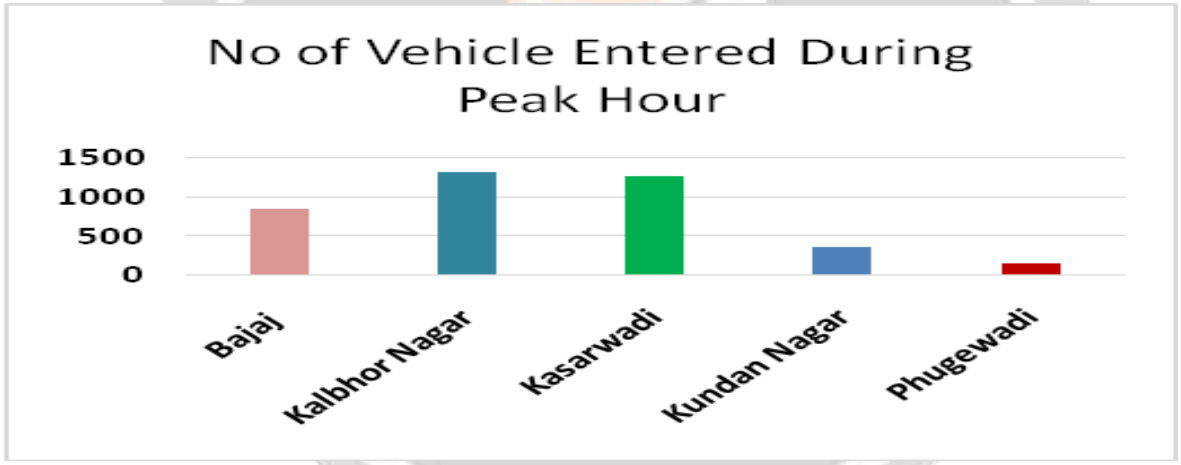

Chart 2: Comparative Statement of Underpass survey

KalbhorNagar and Kasarwadi bridges have the highest count of vehicles. At underpass, the entry of vehicles from side roads onto the main road would mandate the crossing of the vehicle through the BRT lane. This will result in a conflict zone near the underpasses and hence compromises either on the safety of the road user or the efficiency of the BRTS will take place.

c) Intersections

Traffic volume counts of 7 intersections were premeditated through video graphic survey conducted at peak hours. Vehicle crossing at these intersections has created following problems

- Delay
- Accidents
- Pedestrians Conflicts

6. OVERALL RESEARCH FINDINGS

1. Merging/ Diverging: Lack of segregation in the form of markings/signs for vehicles coming or going from concrete lane to the service road, may cause conflicts with BRTS
2. Underpasses: The entry of vehicles from side roads to underpass with the BRT lane in between can result in a conflict zone at and hence compromises either the safety of the road user or the efficiency of the BRTS.
3. BRTS Bus Stations: No proper pedestrian crossing facilities to access the BRTS bus stations making it unsafe for pedestrians to cross the service lane.
4. Intersections: Vehicle movement at intersections can cause conflicts when BRTS operations are active.

7. Recommendation/Solutions

1. MERGING/DIVERGING TRAFFIC

White strips have to be placed in the conflict area.

- Three set of rumble strips should be fixed in the merging/ diverging areas.
- Give way sign board and road markings installation is recommended.

2. UNDERPASSES

Design a Traffic signal with minimum Red time to BRTS.

Proper marking and proper storage lane should be provided, for vehicles which move towards the underpass.

- Three sets of rumble strips will help to reduce the speed of the vehicles from the service lane.
- The length of the ramp from the Bus Station needs to be extended up to the underpass.
- Pedestrian crossing signs will enable pedestrians to easily access the Bus station & underpass.

3. INTERSECTION

BRT in different cities have adopted various measures to counter this safety risk. One alternative is to terminate the segregation of the BRT lane a few meters before the intersection, and allow right-turning vehicles to merge into the BRT lane, so that they make the right turn form the same lane that the BRT bus continues straight. This can be a safe solution if the merging of the right-turning traffic into the BRT lane is signalized, or if there is adequate merging length and sight distance. However, if none of these features are present, then it may simply result in creating the collision risk from the intersection to the point before the intersection, where the merging happens.

• Another design alternative is to continue the segregation of the BRT lane till the intersection, but have separate signal phases for mixed traffic right turns, and BRT straight movement

• By using proper signal systems, signboards, pedestrian crossing platform and markings at intersection can be made safer.

4. OTHERS

- The BRTS bus doors have to be designed matching the level of the bus station floor.
- The ramp of the bus station should be designed with well gripped floor tiles and guard rails.
- Speed tables can be put up for crossing the road side to safely access the bus station.
- Good lighting facilities need to be installed inside the bus station as well as throughout the corridor.
- Speed table is most effective method for reducing speed of the other vehicles and also, to access the bus station by the physically challenged people.
- Proper markings like Bus Station and Pedestrian Crossing markings need to be placed nearby BRTS bus stations.
- In-pavement cross walk lights and reflecting LED lights on road will rectify the pedestrian safety issues at night time.
- Futurlux Cross-Walk lights should be installed.

7. CONCLUSION

Road Safety Audit is emerging as an important tool to create safe and sustainable environment for road safety. Due to Cost effective and Proactive nature it can be easily adopted by any urban local bodies for their road safety issues. One of the peculiar features of RSA is, it can be introduced at any phase of the project.

This Research recommends, conducting similar kind of safety audits at different stages of BRTS projects like (i) during planning and design stage (ii) during construction stage (iii) pre-opening stage for the remaining BRT corridors proposed by PCMC. This kind of three stage auditing will enhance quality and planning and operation of BRTS as well as study area.

There should be an involvement of Multilevel Planning authorities for e.g. Traffic Police, Transportation Department of Urban Local Body in all road safety audits. Targeted public education campaigns should be conducted to involve the user community. Road users are expected to incur maximum use of this facility by following the laws and rules appropriately.

8. REFERENCES

[1]. Transport Association of Canada. Canadian guide to Road Safety: TAC 2001.
[2]. Institution of Highways and Transportation. Guidelines for the Safety Audit of Highway, London: IHT, London, 1996.
[3]. Ministry of Transport Manual of Safety Audit, Road Directorate. Copenhagen, Denmark:1997.
[4]. Guideline for Road Safety Design and Practice by NSW Transport Road and Traffic Authority,
[5]. AASHTO, Highway Safety Design and Operation Guide 1997, Washington DC
[6]. IRC: SP: 88-2010 Manual on "Road Safety Audit" Indian Road Congress, New Delhi, India
[7]. IRC: Road development Plan "VISISON: 2021" Ministry of Road Transport and Highways, Government of India, 2001