© May 2016 | IJIRT | Volume 2 Issue 12 | ISSN: 2349-6002

COST ANALYSIS OF INTELLIGENT TRANSPORTATION SYSTEM (ITS) FOR REDUCING ROAD ACCIDENTS – A CASE STUDY OF S. G. HIGHWAY OF AHMEDABAD CITY

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***Abstract*- Road Traffic accidents and injuries are a major problem globally. In India, a fast growing economy, the problem is acutely felt in almost all major cities including Ahmedabad. This is primarily because infrastructure growth is slow compared to growth in number of vehicles, due to space and cost constraints. The problem can be solved through new and updated method of transportation management i.e Intelligent Transportation System (ITS). This research represent the economic analysis of ITS to show that this system is more economical and less time consuming for establishment at a site as compare to major infrastructure projects like flyover and underpass.**

***Index Terms*- Road accident, Intelligent Transportation system(ITS), ITS devices, Economic analysis.**

I. INTRODUCTION

The growth of the Indian economy has spawned an urban population with a high income level. This has led to increased motorization on Indian roads. The increasing number of vehicles coupled with a high population fabric that has contributed to severe congestion and accidents problems throughout the country.

India's road infrastructures are often not equipped to deal with the heavy traffic flow, which in turn creates unsafe road conditions and leads to road accidents causing physical, social and economic loss.

To control and regulate the movement of traffic safely, heavy infrastructure is needed which segregate the movement of traffic and reduces conflict points**.** But this project are costly and time consuming, even its construction period causes lots of trouble to the road user. Alternative methods which not only reduces the risk of accidents but also economical and take very less time for installation, is Intelligent Transportation System. Over the past decade advances in computer systems and communication technology have given an opportunity to ameliorate the negative externalities of motor vehicle transport. Intelligent Transportation Systems (ITS) encompass a very wide range of technologies to deal with accidents and safety issues. It is expected that when integrated into the transportation system's infrastructure, and in vehicles themselves, these technologies will help in increasing safety. As a result, the Intelligent Transportation system can be introduced in India

II. PROBLEM DEFINITION

Traffic accidents are considered modern problems which are causing enormous human and material losses to many people and resulting of them many temporary and permanent injuries and they cause enormous damages to the public and private properties. According to the World Health Organization (WHO), 10 percent of the world's road fatalities (130,000) occur in India alone. Traffic crashes occur every minute, and a life is lost every 3.7 minutes. Crashes have a significant negative impact on the nation's economy, costing the country the equivalent of 3 percent of its GDP in almost every year. Safety and accessibility are key components of ensuring that cities become secure, sustainable places to live. The loss includes loss of man, materials including social, economic and physical losses.

III. OBJECTIVE OF STUDY

To evaluate and understand the above project, following objectives related to the study is listed as below.

1) To find out the accidents and its causes in study area
2) To carry out feasibility study for implementing intelligent transportation system to reduce the risk of road accidents in the study area
4) To justify the recommended its devise and its location in the study area.

5) To compare the cost of ITS is implemented in the study area.

IV. SELECTION OF THE STUDY AREA

Ahmedabad city is well connected by an expressway, several national and state highways, the broad-gauge and meter-gauge railways and an international airport. The city transportation system is predominantly dependent on roadway systems. Vehicular growth has been rapid. The network is experiencing heavy congestion. Consequently air pollution has become severe. The information below provides an overview of the existing transportation system in terms of road network, vehicular growth and composition, performance of the system and its impact.

In Ahmedabad, SG Highway is an important corridor and the study area covers most of the part of SG Highway. Specifically the study area is Sanathal Circle to Vaishnodevi Circle on SG highway. This is connecting two junctions of Sardar Patel Ring Road in Ahmedabad. The important intersections in the corridor are Ujala Crossroad, Sanand Circle, Iskcon Crossroad, Bodakdev Crossroad, Gurudwara Crossroad, Thaltej Crossroad, Ananta Circle, Sola Crossroad and Gota Crossroad. There are Three Flyover constructed on this corridor at Iskcon Crossroad, Sola Crossroad and Gota crossroad. One Underpass is also constructed from Gurudwara Crossroad to Thaltej Crossroad.

V. DATA COLLECTION AND ANALYSIS

Year-wise accidents data for the year 2005 to 2015(till June) are collected and compiled as shown in Table 1. The accident data has been collected from police stations and traffic police stations of various region of Ahmedabad city.

Table No. 1 Road Accident Statistic of Ahmedabad City

Year	Minor	Major	Fatal	Total
2005	1987	156	168	2460
2006	2136	225	238	2601
2007	2092	265	248	2605
2008	1978	297	244	2519
2009	1725	266	188	2179
2010	1610	299	226	2135
2011	1436	362	222	2020
2012	1307	298	245	1850
2013	1522	333	230	2085
2014	1299	298	262	1859
2015(Till June)	750	202	170	1122

Analysis of data :

Table No.2 Road Accident Statistics of Study Area Year-wise

Sr. No.	Year	Minor	Major	Fatal	Total
1	2010	27	23	12	62
2	2011	43	24	12	79
3	2012	46	17	13	76
4	2013	42	18	2	62
5	2014	43	37	8	88
6	2015	31	30	9	70
Total		232	149	56	437

Table No. 3 Accidents cost analysis

Sr. No.	Type of Accident	Accident Costs (Rs.)	No of Accidents	Monetary Loss (Rs.)
1	Fatal	8,64,350	56	4,84,03,600
2	Major	1,72,650	149	2,57,24,850
3	Minor	30,450	232	70,64,400
Total				8,11,92,850

Table 4 Quantum of Vehicle Damage due to Accidents

Sr. No.	Type of Accident	Accident Costs (Rs.)	No of Accidents	Monetary Loss (Rs.)
1	Car	26,150	154	40,27,100
2	2W	6,650	79	5,25,350
3	3W	7,600	15	1,14,000
4	Buses	76,050	5	3,80,250
5	HCV	8,600	8	68,800
Total				51,15,500
Grand Total Amount				8,63,08,350

This is the Accidents cost for 6 years of 21 km stretch of Arterial road of Ahmedabad city. The accidents cost is analyzed as per guidelines of IRC SP 30: 2009.

VI. INTELLIGENT TRANSPORTATION SYSTEM DEVICES

The ITS devices used as per Indian conditions are as follows

1) Radar and acoustic sensors to detect speed.
2) Inductive loop detection.
3) Video Vehicle Detection and CCTV Monitoring.
4) Variable Message Sign.
5) Automatic Number Plate Recognition
6) Variable speed limit sign post.
7) Mobile Application.

Estimation of ITS devices :

ITS system will reduce transportation risks, traffic accidents and enhance communication and response during emergencies. Estimation of installation of ITS project costing Rs 5 crore for including cost of devices, installation charges, equipment, operation and maintenance cost for 1 year.

As many as 34 CCTV cameras, 30 ANPR cameras, 6 Variable Messages Signs, 28 Variable speed display sign boards, 32 speed detector sensors with speed display screen, 32 monitor screens at control room, 16 Traffic Inductive Loop Vehicle Detector, coil wire cables, optic fibers and anti-collision devices can be used.

ITS also aims to reduce travel time and cost, reduce damage to environment, reduce air pollution, carbon dioxide emissions, energy consumption and cost of road management.

VII. COMPARISION OF ACCIDENT COST AND INTELLIGENT TRANSPORTATION COST

1) Cost of Accidents for 6 years is 8.3 crores as per 2009.
2) Cost of ITS is 5 crore including operation and maintenance cost for 1 year as per 2016.
3) The use of ITS will reduce accidents fatality thus reducing the cost of accidents.
4) ITS cost can be recovered by advertising on variable message sign display board.
5) ITS system is more efficient than traffic police so more fine will be collected for violation of the traffic rules.
6) As the time pass the traffic violating will reduce which will increase the safety and reduce the fatality of the accidents. This reduction in accidents will reduce the economic loss and increase the social and economic wealth of the nation.

VIII. CONCLUSION

Traffic accidents are affecting to the national economy and social condition. The root causes of the accidents are rash driving in the study area. There is scope for evaluating existing ideas in different and challenging traffic scenarios, innovate new solutions and empirically evaluate ideas in collaboration with public and private sectors. In this paper, the small effort is made to put together the different ideas and economic analysis of Indian ITS, so that it gives an overview of the problem and the available solutions and approximate estimation of the ITS projects. It is concluded that due to implementation of ITS in the study area will reduce the accidents. The cost of suggested ITS devices are very less than the accident costs. It is advisable to implement ITS applications in the study area.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to Prof. N.G. Raval for initial spark and subsequent valuable guidance in my research work. His teaching has helped me in formatting the strategy and methodology for my research paper work. His prolonged contact with me during the research works formulation and helped a lot in fruitful completion of research work.

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