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A Review of Environmental Impact of ITS (Intelligent Transportation System) to Reduce CO_2 Emission at Toll Plaza

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ABSTRACT

ITS is an integrated system that implements a broad range of communication, control, vehicle sensing and electronics technologies to help in monitoring and managing traffic flow, reducing congestion, providing optimum routes to travelers, enhancing productivity of the system, and saving lives, time and money. ITS relies on wide range of technologies and functions such as Communications (Microwave, internet, Bluetooth), Geographical Locations, System, Data acquisition and exchange, Camera system and Artificial vision, Detection and classification, In-vehicle systems and Digital Mapping. Thinking of the Japanese and European thought leaders about- how ITS can contribute toward meeting environment goals - is very helpful to improve the environmental performance of ITS. Indian traffic can benefit from several possible ITS applications. One set of applications is for traffic management at toll plaza. ITS is not only helpful at toll plaza but also helpful at traffic signals, emergency management system in India. At toll plaza, deciding factor is the how much time a vehicle is going to be in the line of toll. More the time, more will be fuel consumption and waste of fuel. Knowing what kind of vehicles, and in what proportions, play main role in application of ITS at toll. ITS helps to reduce this Time factor. Also ITS clears the traffic at toll in less time. Long term data helps ITS to reduce traffic congestion at toll and reduce waste of fuel at toll efficiently.
Keywords: ITS, Microwave, Internet, Geographical Locations, Toll Plaza

I. INTRODUCTION

Intelligent Transportation System technology can be defined as the application of information technology to surface transportation in order to achieve enhanced safety and mobility while reducing the environmental impact of transportation. ITS aims to facilitate a national multi-modal surface transportation system that features a connected transportation environment around vehicles of all types, the infrastructure, and carry-in passenger devices to serve the public good by leveraging technology to maximize safety, mobility, and environmental performance. ITS covers all modes of transport and considers all elements of the transportation system- the vehicle, the infrastructure, and the driver or user, interacting together dynamically. The overall function of ITS is to improve decision making, often in real time, by transport network controllers and other users, thereby improving the operation of the entire transport system. The definition encompasses a broad array of techniques and approaches that may be achieved through standalone technological applications or enhancements to ether transportation strategies. ITS will achieve its full impact. ITS includes array of information data depending upon the requirement of the implementation theme, and simultaneously integrating these components together to get a good "Info structure" environment for the traffic.

Planning, control, management and boosting the system effectiveness are the objectives of ITS. Application of ITS at toll plaza help to control and monitor the traffic. Assume the waste of fuel at a single toll plaza every day then think of the toll plazas all over the India and all over the world, it will explain the necessity of ITS. Thinking of the waste of fuel at toll plazas on larger scale such as India or world, itself explains the depth of problem. To minimize this problem, smart tool like ITS is very helpful.

World population increasing at a greater pace and it crossed the digit of 7billion; simultaneously the world economy is also growing. People are used to the greater mobility and hence when it comes to mobility Transportation especially road transportation is the one which is easily accessible to everyone. There is no doubt in higher the people using the transportation system more will be the conflicts, and hence there comes the demand of proper systematic demand for transportation system which is capable of handling large mass of people on wheels safely and it is made sure that it is environment friendly as well. Worldwide various societies and associations have been setup for the development of intelligent transportation system, first was setup in 1991 by US Department of Transportation: along with this several prototypes have been proposed in context for the same, only few implemented. [7] Vehicle to vehicle communication, vehicle to infrastructure communication, electronic fees collection are some of the very popular projects undergoing worldwide. When it comes to the developing countries like India, Intelligent Transportation System is in primary stage of development. Each nation whether developed or developing, when implement the intelligent technologies the surface transportation system will be safest, economical and last but not the least Environment friendly.

ITS consists of different techniques, out of which ETC (Electronic Toll Collection) System is very efficient. ETC aims to eliminate the delay on toll roads by collecting tolls electronically. ETC determines whether the cars passing are enrolled in the program, alerts enforcers for those that are not, and electronically debits the accounts of registered car owners without requiring them to stop.

Figure 1: ETC at Kini toll plaza (Maharashtra, India)

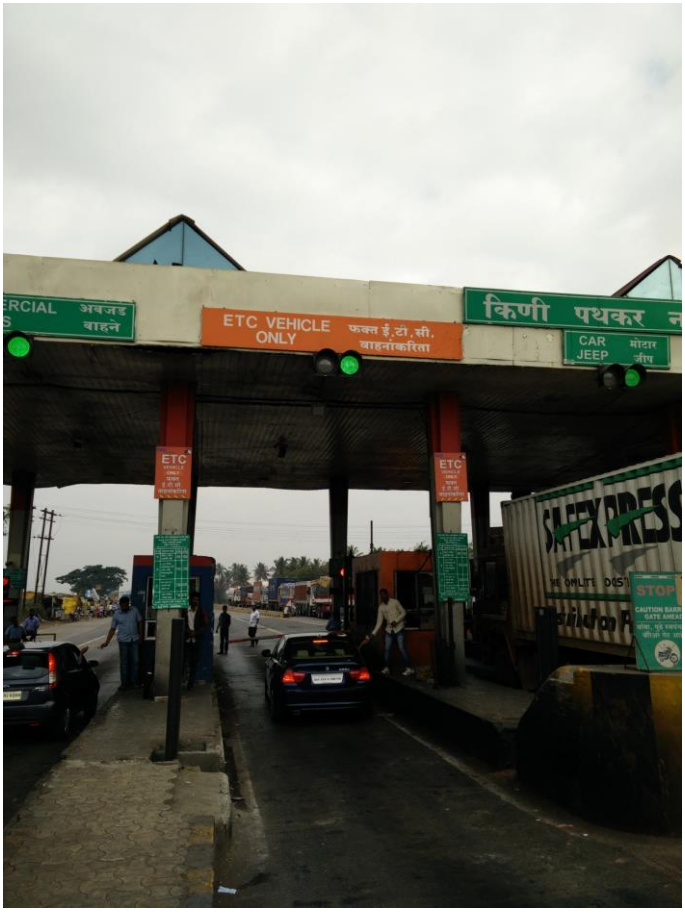

Figure 2: Separate lane is provided for ETC at Kini toll plaza.

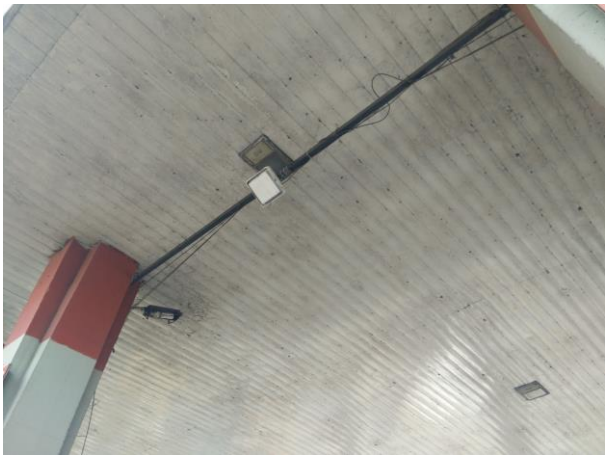

Figure 3: Sensors for ETC at Kini toll plaza

II. METHODS AND MATERIAL

Literature Review

B Singh and A Gupta, (2015) carried out recent trends in Intelligent Transportation System. Author explained 4 modules of ITS i.e. Advance Traveler Information System (ATIS), Advance Traffic Management System (ATMS), Advance Public Transportation System (APTS) and Emergency Management System (EMS). All four modules are explained in detail. Objective of the paper is to study various ITS architecture and model and review such models to get in-depth of their architecture

C S Rao et al., (2011) carried out survey of ITS in Delhi. Authors collected data related to current scenario of vehicle users in Delhi. Authors highlighted parking problem in Delhi. Authors collected data information and age of user and divided the data into groups according to age to solve the problem. Authors succeeded to find the solution.

Dr. P Kumar et al., carried out utilization of ITS using Geographical Information System (GIS) in Hydrabad. Module used by Authors is ATIS(Advance Traveller Information System). They applied ITS for giving bus routes, bus number and important places in Hydrabad which is used by public as user. Software used by authors is Geographical Information System (GIS).

P Chakroborty (2011), carried out roll of ITS in sustainable transportation system for Indian cities. Author focused on need of sustainable transportation system in India. Author also highlighted sustainability and efficiency of ITS in Indian cities. Author included the challenges in application of ITS.

R Sen and B Raman, carried out research on ITS for Indian Cities. They gave different ideas that give overview of problem and available solution. It helps to outline a set of questions to answer. Research includes major Indian cities having ITS.

Sathya V and Abdul S J (2013) carried out survey on vehicles and toll plaza for National Highways(NH) in India. They covered all toll techniques used for NH in India. This data is very useful for application of ITS on NH. Authors considered all types of vehicles. Data includes all the NHs in states of India

S Malik, 2014 carried out application of ITS for bus system. ITS used here is designed for urban/state/private road transport organization. Author gave all information about technology used in ITS (including GPS, Wi-Fi). Ultimate aim of author was to improve the bus transportation system using ITS.

S Mulay et al., carried out use of ITS to control traffic congestion and regulating traffic flow. Android application and SMS service are main components used here in ITS. The application created is user friendly and easy to understand by person of any age group. SMS service is also provided.

V E Nethaji Mariappan et al., 2013 carried out GIS enabled traffic assessment system for social service planning for Porur Municipality. System is based on use of GIS(Geographical Information System)-GPS(Global Positioning System) software. The system helps to improve emergency management system.

V Kumar, et al., carried out wireless sensor network based ITS application. Author focused on requirement challenges and issues in the system. Weight in motion is the highlight of the system. The system helps to give the information about overloading of trucks. Author explained every detail about wireless sensor network based ITS.

III. CONCLUSION

India is the second highest populous country in the world. For a country of 1.2 billion people, providing facilities is a tough job which is achieved by means of transportation. India is having large network of roads all over the country. For construction of infrastructures, roads are provided with toll collecting booth to collect the tax. During the peak hours at these toll plazas, traffic congestion is more due to which vehicles remain in the queue for a long period of time leading to more consumption of fuel. To minimize this waste of fuel, we should use ITS at toll plaza. India is a developing country, it is having projects like smart cities. And ITS as name suggests is a smart and intelligent system and help to reduce the traffic congestion at toll plaza as well as traffic signals so as to reduce the fuel consumption of vehicle. Data collected is also helpful to improve emergency management system as well traffic signals in India. Therefore scope of ITS is not limited only for toll plazas in India.

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