Integration of Intelligent Transport Systems in Indian Cities

Panchagnula Krishna Dutt[1] and Alok Tripathi[2]

[1,2]*Maulana Azad National Institute of Technology, Bhopal, 462051*
E-mail: [1]krishnadutt123@gmail.com, [2]aloktripathi.nit@gmail.com

Abstract—*Cities play a vital role in promoting economic growth and prosperity. The development of cities largely depends upon their physical, social, and institutional infrastructure. Since the economic liberalization of the 1990s, infrastructure development has progressed rapidly, and today there is a variety of modes of transport by land, water and air.*

With the introduction of concept of smart cities in India, the words such as ITS, sustainability have become most common words. But is India really capable to do so? If yes, then how? These are the questions of public and must be answered with some strong policies and programmes.

The concept of intelligent transport systems is expected to become critical in addressing the challenges posed by an increasing number of mega cities in both developed and developing regions in maintaining safety, smooth traffic flow, and increasing the levels of comfort in the road.

This paper talks about the intelligent Transport systems that can be incorporated in a comprehensive development agenda for building a sustainable and smart transport system in the upcoming 100+ smart cities announced by the Government of India

1. INTRODUCTION

These Urbanization accompanies economic development. As countries move from being primarily agrarian economies to industrial and service sectors, they also urbanize. This is because urban areas provide the agglomerations that the industrial and service sectors need. This trend of urbanization continues to take place as seen in the Fig 1.
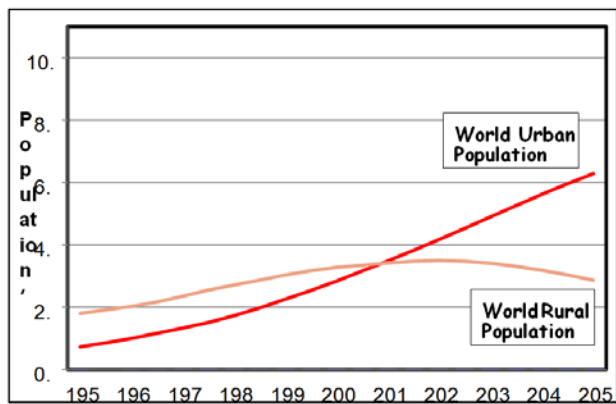

Fig. 1: Urbanization Trends

In fact, 90% of the world's urban population growth will take place in developing countries, with India taking a significant share of that. Urban areas also contribute a higher share of the GDP. The share of the GDP from urban areas in India has been growing, as seen from the Fig 2. [1]
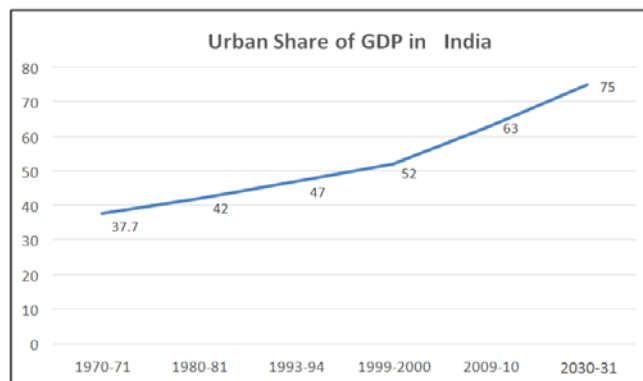

Fig. 2: Urban Share of GDP in India

Our national agenda "Smart City" is beginning to be established. However, our development model is still unemployed and strategies not entirely clear. By following a few ready-made models of developed countries, we should not forgetting that our local conditions separate us from the recombination system. In other words, the city's development by adopting a holistic bottom-top approach will pave the way for the development of the smart transport infrastructure enhanced with ITS systems.

In the context of existing cities in the country, for the development efficient transport systems that incorporates smart travel patterns there are two approaches i.e. a top-down approach and a bottom-up approach. Given the current level of the typical Indian cities, which would suggest, the road construction, traffic improvement, waste disposal, pollution control, power and water supply, etc., must be related to things. This is because we are still battling for infrastructure.

If we look a little more closely, it can be observed that these activities primarily relate to the development of important

features rather than building the smart transport. If we think of the top-down approach by experts, the Smart transport defines the vision that can be made a high-level perspective, which is a comprehensive and will pave the way for the creation of the System enhancement

2. METHODOLOGY

To put it simply, the methodology is the path leading from the problem to the potential answers conclusions in the end. It is the technique and process by which the problem is addressed in all stages of the research:

-gathering of information

-analysis and explanation of information

-interpretation of the analytical results

- Evaluation of the interpretation

The methodology used will be based on thorough literature studies within the area in order to gather the information necessary for analysis, interpretation and evaluation

3. INTELLEGENT TRANSPORT SYSTEMS AND ITS NEED IN SMART CITIES:

Intelligent transportation systems (**ITS**) are advanced applications of information and communication technologies which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks[2]

Transport is a backbone, responsible for the type of development and the pace of the development in the city. With the introduction of smart cities, there is need for an efficient and smart transport for the transport of people as well as the freight. If we could introduce the intelligent transport systems, there can an efficient way of transit of people and freight, which could increase the pace of development of our cities and ultimately the country.

4. INTELLIGENT TRANSPORT SYSTEMS FOR INDIAN CITIES

4.1. Junction Management

Signal retiming: In the present day Indian scenario, the cycle time of the green light is same through the day. People have to wait for a long time even though there is no rush on the road. Due to this, people neglect the traffic signals, and jump the signals by which they create chaos on the road instead of the order.

In order to prevent it, there must be a sensors/cameras which help to count the number of vehicles on the road and decide the cycle time of the signals accordingly.

4.2. Traffic Management

Basically we can divide the traffic on the road into 3 main categories, namely

  1. Private Transport
  2. Public Transport
  3. Freight Vehicles
  Let's discuss in detail, how ITS can be integrated in 3 kinds.

4.2.1. Private Transport:

4.2.1.1. Dynamic toll charges: We see many examples where, people still tend to use the road even though there is pricing on the usage of the road. Due to this, there is no effect of the tolling on the people. If we could introduce the dynamic toll pricing, where pricing depends upon the number of people using that road infrastructure during that period of time.

By this we can reduce the total number of vehicles during peak hours and preventing the congestion problems.

4.2.1.2. Real time display of availability of Parking in and around CBD/Major areas: In urban areas, as much as there is problem of vehicles on road, equally there is problem of parking. Most common problem with parking is non availability of parking spaces and even if there is availability of parking in an area, we cannot know it unless we drive all the way round to that place, during which we have to endure the traffic problems while travelling.

In order to prevent that, we can provide the LED display boards in and around the major junctions, which can be used to guide the rider of the vehicle to the areas which have availability of parking spaces.

4.2.1.3. Communication between vehicles and surroundings: If we can provide communication systems which can communicate among the vehicles and also with surrounding, we can save large amount of time and can also prevent accidents from happening.

When there is emergency situation over certain stretch, we can warn the drivers beforehand and help them take a diverted route. With this we can know the vehicles which are near us, and their proximity from the vehicle which can help us prevent the accidents to an extent. As every vehicle has its path defined in the GPS, we can see the number of vehicles conflicting the path, which reduces the chance of accidents on the road.

4.2.2. Public Transport

4.2.2.1. Provision of single card (Smart Card) for several modes of transport: Instead of providing a separate card for BRTS and metro and other modes of transport present in the city, there must be single card system, i.e. a single card can used to travel among different type of transport without any problem. This single card can be integrated with a personal identification card such as aadhar card, pan card etc., to

identify the person and levy the taxes or bills directly to the persons account.

4.2.2.2. Smart bikes: As the smart cities are going to be walkable and bicycle friendly (as mentioned in Draft Bench mark of smart cities by GOI), we can propose a smart bicycle sharing system or simply smart bikes. In this aspect, we can take an example of Next bike- a firm which provides smart cycle solutions. These cycles can also be accessed by mobile app, by pre-booking online or by using the smart card.

There may be possibility that these cycles may be stolen. As these cards are directly linked with personal cards like aadhar cards etc., it is very easy to track that person down. And moreover as these cycles are fitted with Smart boxes which contains GPS, GSM, WLAN (offline and online modules) for communication. For this system to work efficiently, the project can be under PPP or BOT. [5]

4.2.2.3. Real time tracking

A system of GPS cam be installed in the city buses, which can be used to trace/track the buses. By this there is less chances for the person to slack off during his work hours, thereby helping the system to work more effectively.

Using this data, we can generate a **mobile app** which can track and locate the series of buses travelling in the location, just like the railway system. Just a touch on Ur phone would reveal the information of the buses, whether there is delay in the buses etc.

4.2.2.4. Dynamic Occupancy Reporting System

This system can work only if there is there is real time monitoring of the smart Cards or the tickets issued in a bus. With this system we can know the current status of occupancy of the bus, where it is filling up, where it is being emptied.

With the implementation of this system, there is large scope of data availability which can be put several uses. Firstly, this can used to display the occupancy of the approaching buses in the led boards fitted in the stations. Also along with this, we can also know the stations where there is large pooling of the crowd, the stretch over which there is large crowding and also the time and day of the rush. Using this data, we can remodel the public transport systems to the areas where there is dire need of the system from less priority areas.

4.2.3. Freight Transport:

4.2.3.1 Dynamic ticketing: Each and every vehicle is fitted with a special tag which is unique to that vehicle, which can be read by RF-id reader. When a certain vehicle enters a city, it is noted down. And using this RF-id reader, the path of the vehicle is noted down along with the timings along with the time of halt. Based on this data, the vehicle is levied money.

We can have different pricing for different roads based upon its flow and time and period of the usage of road. By this, we can reduce the congestion of the freight on the main arterial and sub arterial on the peak hours.

4.2.3.2 Pricing of vehicles based on weight:

Rather than pricing all the heavy freight with same fee, they must be priced based on the load they carry i.e. the weight of the vehicle and the road they opt for transport of those freight.

5.   ISSUES AND CHALLENGES OF ITS IN INDIA

Some of the main issues facing the deployment of ITS in developing countries like India, reported by a World Bank study are: an underdeveloped road network, severe budget restrictions, explosive urbanization and growth, lack of resources for maintenance and operation, less demand for automation, lack of interest among government decision makers, and lack of user awareness.

In order to overcome these shortcomings, these are some of specific actions required to meet the challenges to ITS:

1.   Strengthening the infrastructure
2.   Evolving a national ITS standard for different ITS applications and their components
3.   Setting up a national ITS clearinghouse that documents all ITS projects with details on the design, implementation, lessons learned/best practices, and cost-benefit details
4.   Setting up fully functional Traffic Management Centers for coordinating the urban and regional ITS activities,
5.   Developing and implementing automated traffic data collection methodologies,
6.   developing a national ITS data archive,
7.   Developing models and algorithms suitable for ITS implementations
8.   Fostering more interaction between academia, industries and governmental agencies to generate more interest and in turn projects in the ITS area. [3]
9.   Creating awareness among different sections of people about the systems and its benefits

6.   CONCLUSION

It is true that only 31 per cent of our total population lives in cities, but about 65 per cent of India's GDP comes from the cities. Considering the next 15 years, nearly 75 per cent of GDP will come from cities. This shows how the future of our cities is important for economic development.

There is a rough road ahead for the development of the smart cities, but we pass though that phase with proper framework and vision to achieve good results.

With the integration of ITS into Smart Transportation, we can increase the pace of development, accessibility to different corners of city to public which in turn enhances quality of living of the people residing in urban areas.

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