IV. Intelligent Transport System [i]

Introduction

Intelligent Transport System (ITS) basically refers to the application of information and communication technologies to vehicles and to transport infrastructure. Some examples of transport management systems include GPS based optimization of public transport, computerized traffic signaling, information systems such as e-ticketing, e-information etc. Such systems increase the reliability, safety, efficiency and quality of transport systems. An increase in the efficiency of the transport system also leads to a reduction in associated GHG emissions.

The UK Department for Transport strategy includes the following objectives for ITS (DfT, 2005)[13]:

Improving road network management, including road pricing.

Improving road safety, by reducing collisions, casualties and deaths.

Better travel and traveller information, helping to match supply and demand by providing better information so that travellers can make informed choices on when and how to travel.

Better public transport on the roads, supporting more reliable, more accessible, safer and more efficient services.

Supporting the efficiency of the road freight industry.

Reducing negative environmental impacts.

Supporting security, crime reduction and emergency planning measures

The components of ITS systems generally include[14]:

- Data Acquisition Systems
- Data Communication Systems
- Data Management Systems
- Display Systems

Data Acquisition Systems: This includes sensors, automatic vehicle identifiers (AVI) and GPS. Sensors are used to obtain traffic parameters such as vehicles count, occupancy and speed. AVI systems are used to specifically identify a vehicle and its speed on road. GPS systems are used to identify the vehicle location and velocity in real time. Travel time, speed, distance and delay are estimated with help of GPS systems.

Data Communication Systems: Data captured using data acquisition systems needs to be effectively communicated to its intended users such as control centres and public display systems. Wireless technology is normally used for data communication systems.

Data Management Systems: for generating short and long term trends, data gathered through acquisition systems must be clean and removed from garbage values. Once the data is clean, data can be aggregated or disaggregated and subsequent analysis is done to generate effective traffic management policies and forecast traffic status. Based on forecast status real time decisions could be taken to prevent congestion etc.

Display Systems: These display systems are used to convey information to travellers using Message Signs, Radio, SMS, etc. ITS can provide information on travel times, travel speed, delay or accidents etc.

Intelligent Transport System could be applied to various areas as highlighted below[15]:

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[13] DfT (UK Department for Transport, 2005). Intelligent Transport Systems (ITS). The policy framework for the roads sector. http://www.solihull.gov.uk/planappdocs/msadocuments/CD253.pdf taken from http://climatetechwiki.org/technology/transport-management

[14] Vanajakshi L, 2010, Synthesis Report on ITS including issues and challenges in India , Centre of Excellence in Urban Transport , IIT Madras, http://coeut.iitm.ac.in/ITS_synthesis.pdf

[15] *ibid*

1) **Advanced traffic management systems:** These systems integrate various sub components such as CCTV, sensors for vehicle detection, communication and messaging into a single system for real time traffic monitoring so that traffic management is efficient, real time information to users about traffic conditions, incident detection, signal control, predict traffic trends in real time to avoid congestion.
2) **Advanced traveller information systems:** It provides travel related information to users such as estimated travel times of buses on bus stops, route selection, parking availability, so that users can take intelligent decisions as per their convenience.
3) **Advanced public transport systems** – It includes passing of real time information of public transport to passengers such as real time passenger information systems, prioritization of public transport, estimated time for bus arrival at bus stops, transit priority of public transport etc.
4) **Advanced Rural Transport Systems** – These systems provide information about remote road and weather conditions. This type of systems can be valuable for implementation in rural areas of the country to provide information for users travelling in those areas.
5) **Advanced Vehicle Control systems** – These systems enhances the driver control on the vehicles by alerting the driver of possible collision due to vehicle speed or location.
6) **Commercial Vehicles Operations** – These systems are implemented to track commercial vehicles such as trucks and taxis for enhanced safety and

Technology Characteristics

Some characteristics of a successful transport management system are:

Creation of a sound hierarchy of roads and streets that ensure particular street use, and so vehicles tend to be restricted to the most suitable thoroughfares to minimize traffic impacts

Designing roadways to maximize connectivity, with least possible number of dead-ends, especially for walkways and cycling routes

Encouraging private and public vehicles to use GPS systems that provide information about traffic and destination

Using design features and road laws to 'calm' or slow down traffic to avoid accidents that result in long duration congestions and bottle necks

Installing automated traffic controls at intersections, in the interests of safety, fair access for all traffic modes, and smooth flow of traffic

Installing electronic tolling systems at tolls that experience heavy traffic

On the demand side management including pricing mechanisms and restrictions on road space and parking, to ensure that more smoothly flowing traffic does not have the adverse effect of encouraging large numbers of extra motorized vehicles onto the roads

Educating drivers and the proper enforcement of road laws, doing away with corrupt unlawful practices.

Country specific applicability and potential

Establishing a proper traffic management system will go a long way in solving Bhutan's transport woes and help it achieve its target of reducing carbon emissions from its transport sector and move towards a low carbon economy. It is certainly possible to set up such a system in Bhutan and would be especially useful in managing the nation's public transport. The city of Thimphu has planned implementation of Bus Rapid Transit System in which application of ITS can enhance the effectiveness of the proposed mass transit system. The inter-city bus transport systems can also be benefited by implementing ITS technologies such as smart displays and vehicle information systems for commuters.

Status of technology in the country

Although there is still plenty of room for improvement in Bhutan's transport management system, there is no doubt in Bhutan's willingness to upgrade its existing transport system which is more intelligent, efficient and environmentally friendly. This has been made clear in Bhutan's National Transport Policy to "provide and develop safe, reliable, efficient, cost- effective and environment friendly transport services in support of strategies for socio-economic development of

the country. Further, ITS has been included in Bhutan's Surface Transport Master Plan, 2007. However, till date the technology has not yet been implemented in the country.

Benefits to economic / social and environmental development

Economic benefits

A better transport management system directly results in fuel savings thereby reducing dependence on import of fuel

There are fewer costs to health from pollution and accidents

The cost of additional transport infrastructure (e.g. new roads, flyovers) could be avoided

Social benefits

An efficiently managed transport system makes urban areas safer, healthier, increasing the quality of living.

It provides for a more balanced and sociable use of public spaces.

Environmental benefits

A good transport management system reduces air pollution and GHG emissions by reducing traffic congestions.

Calming motorized traffic helps control noise pollution.

Climate change mitigation benefits

Intelligent Transport Systems (ITS) apply information and communication technologies to vehicles and to transport infrastructure. This increases the efficiency of the transport systems leading to a reduction in associated GHG emissions. ITS also has a supporting role for the successful implementation of transport emission reduction strategies such as low-carbon fuels, energy efficient vehicles, public and non-motorised transport, mostly by supporting a more efficient organization of the transport system.

In Santiago de Chile, a project consisting electronic communications-based train control in one metro line, which allows for determining the exact position and speed of the metro trains was implemented. This increased the efficiency of train operations, resulting in 16 ktCO_2-eq/yr emission reductions[16].

Financial Requirements and Costs

Cost of setting up an effective traffic management system varies greatly. It depends on what is infrastructural developments need to be made, over what area or length of road or pathway as well as the degree and type of changes necessary. Some of the major costs incurred are for alterations to roads for traffic calming, creation of dedicated, lanes for buses and bikes, better controls and safety at intersections, driver education, and stronger enforcement. A part of the cost could be partly funded out of taxes, elevated parking charges, higher interests on inefficient private vehicles.

The Surface Transport Master Plan of Bhutan (2007) identifies installation of communication systems integrated with tracking components for public transport as an important measure for managing the transport systems in the country. Such a system would be play an important role in improved traveler advisory services, schedule adherence and could be archived to support future planning efforts that minimize GHG emissions. For such a system, the communication network available in Bhutan would have to be considerably upgraded to ensure coverage of all

areas on the road corridor. It is estimated that the cost of setting up the infrastructure would be to the tune of USD 400,000[17]. The GPS unit mounted on each vehicle would cost approximately USD 500[18].

[16] UNFCCC, 2011 in http://climatetechwiki.org/technology/transport-management, accessed on 1 August 2012

[17] Assuming 1 USD = Nu. 50

[18] Assuming 1 USD = Nu. 50

[i] **This fact sheet has been extracted from TNA Report – Technology Needs Assessment and Technology Action Plans For Climate Change Mitigation– Bhutan. You can access the complete report from the TNA project website http://tech-action.org/**