

## 2.26 Intelligent Transport System: Improving urban public transport in Mysore

*Launched in 2012, the Intelligent Transport System (ITS) in Mysore has involved Information and Communication Technologies (ICTs) to enable smarter transport networks that help traffic management, ensure real-time control and safety besides curtailing the growth of private vehicles. In doing so, it has resulted in several benefits to the people, such as improvements in safety, increased commuter satisfaction, reduction in traffic congestion and pollution levels, reduction in travel time delays and related uncertainties. It has provided an alternative to India's inefficient urban public transportation through the provision of dynamic and real time information of bus routes to the passengers. This has been achieved without putting the government or citizens through the inconvenience of construction and widening of roads, or cutting of trees.*

### Rationale

Mysore city faced severe problems of road congestion and associated issues of commuters, which include delays in the arrival of buses at bus stops, lack of information about different bus routes and stops, time, frequency etc. Considering the wide range of problems related to mismanagement of traffic, high pollution levels and the high growth rate in traffic density in the recent past in Mysore dynamic solution capable of contributing to the creation of an efficient and sustainable public transport system was required in the city.

In its effort to support the overall public transport system, Karnataka State Road Transport Corporation (KSRTC) introduced the ITS to deliver high quality services and make the system more passenger friendly through the appropriate use of ICTs. This approach was the result of lessons learnt from the conventional response of constructing flyovers or widening roads, which have not proved to be highly effective or sustainable solutions to the challenges posed by increasing traffic and population.

Recognising the shortcomings in the urban public transport systems, ITS aims to improve the transport system in Mysore, taking into account the operational costs of traffic congestion, maintaining environment quality and promoting traffic efficiency by reducing passenger waiting time, improving the frequency of buses, and ensuring the safety of passengers.

### Objectives

The Mysore ITS was conceptualised with the objective of managing the entire public transport system in the city to make it safe, more efficient and environment friendly. By

introducing real time data and facilitating commuters with accurate information on bus schedules, estimated timings of arrival and departure, announcing bus stops (by their names) and fare details at bus stops, bus terminals and inside the buses using SMS, internet and an interactive voice response system (IVRS), the project aims to reduce the commuter's dependence on personal automobiles. The initiative also promotes state-wide use of sustainable urban public transport by monitoring accidents and traffic congestion through effective diversion of traffic in case of emergency.

### Key Stakeholders

The ITS initiative benefits from the involvement of multiple stakeholders at various levels. Key stakeholders of this initiative are based in Mysore. *Figure 1* provides a clearer picture of the involvement and the role played by each stakeholder in the formulation and implementation of the initiative.

Implemented by the Government of India in partnership with the Global Environment Facility (GEF) - Sustainable Urban Transport Programme (SUTP), Intelligent Transport System involves multiple stakeholders at various tiers. The Mysore ITS was conceptualised to manage the entire public transport system in the city and for this it roped in the KSRTC. Two key ministries of the Government of India involved in this initiative were the Ministry of Urban Development which was involved in formulating policies and coordinating activities and programmes with the State governments and other central ministries; and the Ministry of Environment which acted as the nodal agency in the administrative structure for the planning and implementation from the perspective of the environmental issues involved.

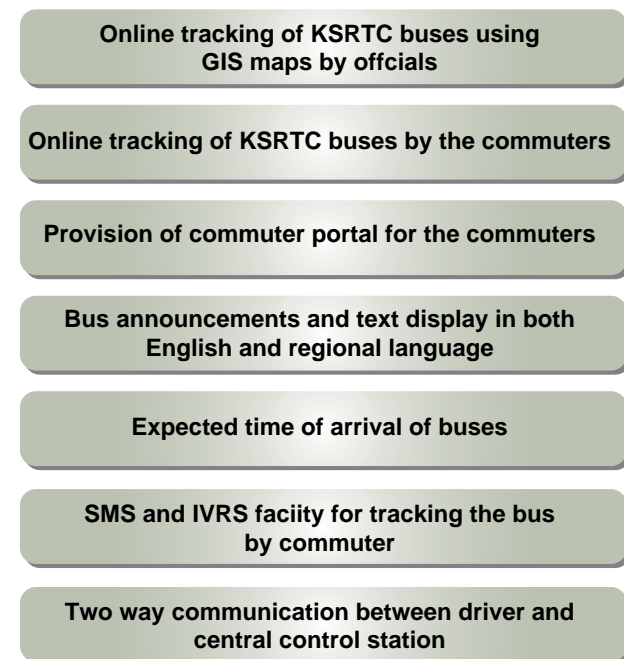
**Figure 1: Key stakeholders**

Besides the stakeholders described above, the World Bank was also an important stakeholder since it supports the SUTP. Also, the United Nations Development Programme (UNDP) provided expertise and training for the officials involved in the ITS. The IBI group which focusses on the physical development of cities, including planning, design, implementation, analysis of operations in various areas of development including transportation networks and intelligent systems, also played an important role in the ITS along with Computer Maintenance Corporation (CMC) Limited which was involved in the design and development of the ITS.

## Implementation Strategy

In Mysore, the implementation of ITS is overseen by the KSRTC. The Mysore City Transport Division (MCTD), a division of KSRTC, operates a fleet of about 400 buses from three depots in Mysore. The initiative was introduced in 2012 with the selection of a total number of 105 bus stops across Mysore, which gradually extended to all the bus stops in the city. It plans to cover 500 buses, 105 bus stops, 6 bus terminals and 45 platforms.

The Mysore ITS includes core systems like the Vehicle Tracking System, Real Time Passenger Information System and Central Control Station and technologies including Global Positioning System (GPS), Electronic Display Systems and other ICT tools. A digital display unit is used for displaying details of arrival and departure of buses, in both Kannada and English. Location information is

**Figure 2: Implementation strategy**

Source: OneWorld Foundation India, 2014

updated by the Vehicle Mounted Unit (VMU) to the central server via General Packet Radio Service (GPRS), which is a wireless data connection. In this manner, the ITS has provided a sustainable solution to the problem of traffic congestion.

Further, based on the information collected through the VMU, bus stop information on current and forthcoming arrivals is displayed inside buses for the benefit of passengers. In addition to the display of information, details of the approaching bus stops are also announced inside the bus. There is also a provision of displaying the information about expected time of arrival of the bus at the bus stops.

For better operationalisation and monitoring of the bus transport system in Mysore, ITS is supported by a two-way communication voice facility for the driver and the Central Control Station to contact each other in the case of emergencies or accidents. Bus drivers are provided with communication headsets to interact with the Central Control Centre and are given a keypad interface for voice communication. At the end, daily reports about the number of bus stops skipped, delays in the arrival of buses, performance of the drivers etc are generated through this system.

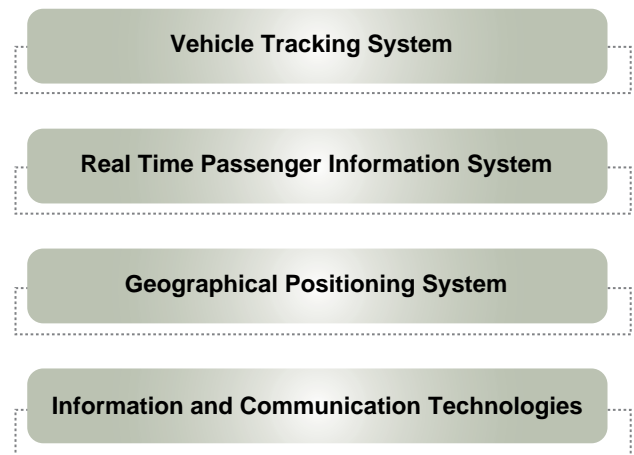
Building such intelligence into the transport system has many benefits, such as reducing the waiting period and uncertainty, increasing accessibility of the system, reducing fuel consumption, reducing traffic congestion and increasing the management's ability to track the bus fleet. KSRTC's integrated approach effectively leverages ICT tools and services based on GPS-enabled navigation systems. The Mysore ITS offers a sustainable solution to the ever growing demands of urban transport by way of providing information on bus location, number of passengers in the bus, estimated time to reach the bus stop or the destination through various channels such as IVRS, SMS or online, at the bus stop itself.

## Components of Mysore ITS

The digital display unit is one of the crucial components of the ITS. This is installed at the bus stops for displaying the details of arrival and departure information of the buses in both Kannada and English. It displays information about the Route Number, Bus Number, Terminal, Platform, Bay, Origin, Destination and Estimated Time of Arrival (ETA) & Estimated Time of Departure (ETD). This information gets updated by the central server through GPRS.

Another important component is the in-bus display system that displays information on the forthcoming (arrival) bus stop and the current stop information for commuters inside the bus. This information is sourced from the central control stations and is updated by GPRS.

**Figure 3: Components of ITS Mysore**



Source: OneWorld Foundation India, 2014

Audio announcements of the upcoming bus stops are made inside the bus to help commuters keep track of the routes and travel safely. Through access to Geographic Information System (GIS) maps, commuters can easily track information on the status of a bus through this website - [http://mitra.ksrtc.in/Mysore\\_commuter\\_3/](http://mitra.ksrtc.in/Mysore_commuter_3/). The expected time of arrival of the buses is also visible through the GIS mapping.

The SMS system in the ITS provides real-time bus arrival information and scheduled bus availability. This helps the commuters to plan their trips according to real-time information.

Responses to commuters' telephonic queries are provided through an IVRS facility under the Mysore ITS initiative. The system aims to provide information in Kannada and English. An online portal has been set up to help commuters in online tracking of the KSRTC vehicles and for access integrated to GIS map. The portal provides information in both Kannada and English.

## Resources Utilised

The Mysore ITS initiative is funded by the Global Environment Facility (GEF)-Sustainable Urban Transport Project (SUTP), KSRTC and other international bodies such as the World Bank and UNDP. The Ministry of Urban Development (MoUD), being the nodal agency, is responsible for implementing the ITS initiative.

The infrastructure related investment is partly financed with the support of the World Bank-GEF grant assistance and consultancy studies are financed partly through GEF grants. The estimated cost for the deployment of the ITS in KSRTC city services in Mysore is about Rs. 19.13 crore.



**Image 1: Electronic display board for bus travel timing**

Source: ITS, KSRTC Mysore

The Mysore ITS technology framework comprises wireless communication, sensing technologies, inductive loop detection, video vehicle detection, electronic toll collection, and convergence of different technologies, GPS, display systems and other information systems. The technology deployed in the implementation of ITS is helpful in providing real-time passenger information to commuters while in buses and also at bus stops and bus terminals. The information displays inform passengers about the details of the arriving bus stop, the route number, the expected time of arrival and departure etc.

Technology infrastructure comprises a data centre which includes different types of servers like communication, database and application. Other technical components comprise a Central Control Station including a video wall in the control room, dispatcher workstations and access control. Core applications include GIS and ITS and commuter friendly applications including SMS, IVRS and a commuter portal in Kannada and English.

About 1,439 crew members have been trained as part of this initiative. The training, which includes class room training, in-bus-demonstration and a visit to the control room, was also provided to depot managers and traffic inspectors.

Selected users of KSRTC services were also trained in the use of various devices and technologies deployed in the implementation of the ITS. As a part of implementation strategy, a team of training instructors from the three training institutes of the KSRTC was put together to help the on-going training on ITS, especially for drivers, conductors and other users within the KSRTC.

## Impact

**Greater safety, convenience and commuter satisfaction:** The introduction of ITS in Mysore has resulted in several benefits to people, such as safer travel, lesser traffic congestion and delays leading to greater commuter satisfaction. The display of ETA and ETD helps commuters to calculate the total time that will be taken to travel to any destination and accordingly help them



**Image 2: Commuter portal in regional as well as in English language**



plan their journey. The idea behind the introduction of this intelligence-based-system in public transportation is to increase mobility and provide wide range of services to passengers.

**Positive environmental impact:** As the initiative does not demand any widening of roads, construction work, or cutting of trees, it has not inconvenienced residents of the city, and not had an adverse impact on the environment in terms of air/water/noise pollution or vegetation or land degradation. In fact, ITS has resulted in a favourable impact on the city's environment by way of ensuring efficient flow of traffic and reducing pollution.

**Increased use of public transport, lesser traffic and pollution:** The introduction of ITS has led to increased use of public transport as it has become more convenient and reliable. The reduction in use of personal vehicles has also contributed to reduced traffic and pollution.

## Key Challenges

The integration of VMU and weak connectivity of GPRS posed a challenge to the technical team at KSRTC during the implementation of the ITS initiative in Mysore. Moreover, since the system works to provide time-bound and real time delivery of services, it faces challenges in the prediction of expected time of arrival for all the bus stops with accuracy. As getting real time information from buses was central to ITS, making GPRS signals available throughout the city proved crucial for the successful implementation of the ITS in Mysore.

As such an initiative has not been implemented anywhere in the country before, there was lack of in-house domain knowledge and the consequent dependence on consultants in addition to multi-level monitoring and coordination posed its own set of challenges.

Since financial management plays a pivotal role in the long-term effectiveness and sustainability of any initiative,



**Image 3: Classroom training of bus drivers**

Source: ITS, KSRTC, Mysore

ITS Mysore has ensured the involvement of many different funding agencies. While this has resulted in a basket of funding sources, which has its own advantages, it has also brought along its share of complexities in the system. Astute financial management was required in the light of the multi-funding relationships as the varying formats and different norms and financial flows made this even more challenging.

Another major obstacle related to taking the drivers into confidence as most of them feel this system puts them under scrutiny. This has meant that access to the infrastructure inside the bus has been a formidable challenge.

The large scale of operations and consolidation of information networks was also found to be challenging. For instance, synchronising massive daily operational changes to system requirements was difficult. The other key challenge was to address the customer service through this unique technology.

Post-deployment, KSRTC faces the challenge to ensure security and maintenance of in-bus equipment and display boards and ensure uninterrupted power supply at bus shelters, which are not owned by KSRTC.

## Replicability and Sustainability

By mobilising community support and demonstrating the sustainability of its approach, KSRTC has been able to expand the ITS initiative and its services all over Mysore. KSRTC is also planning to introduce a similar system for another 2,000 buses within Karnataka state in a sustainable manner. Other road transport corporations that have shown an interest in replicating this initiative include the Andhra Pradesh State Road Transport Corporation and the Bangalore Metropolitan Transport Corporation.

The strength of the Mysore ITS initiative lies in its ability to undertake successful integration of the bus equipment and display boards at terminals with real time passenger information for commuters. The use of such environment friendly and user friendly approach provides the initiative with vast potential for replication not just in Mysore, but in the entire country.

Financial soundness, which is a crucial factor in the sustained continuance of an initiative like this one, required due diligence in the administering of contracts for products and services. The preparation of a detailed tender process and financial plan was a crucial precondition to be met, especially given the involvement of high-end technologies and other equipment to be installed inside the buses. Replication of this initiative, therefore, has to take into account the cost of technology

## Highlights of Bus Rapid Transit System (BRTS)

### Ahmedabad Bus Rapid Transit System (BRTS)

Based on the concept of redesigning the city's infrastructure and making the existing transport system accessible, efficient and environment friendly, Ahmedabad's BRTS has deployed the intelligent transport system since 2009. The project, officially known as 'Janmarg', and managed by the Ahmedabad Janmarg Limited, aims to dedicate separate lanes to buses, pedestrians and non-motorised vehicles. The project started with a 12.5 km long corridor and 20 stations with corridors stretching to nearly 89 km across the city, thereby connecting less accessible areas of city and an external ticketing system.

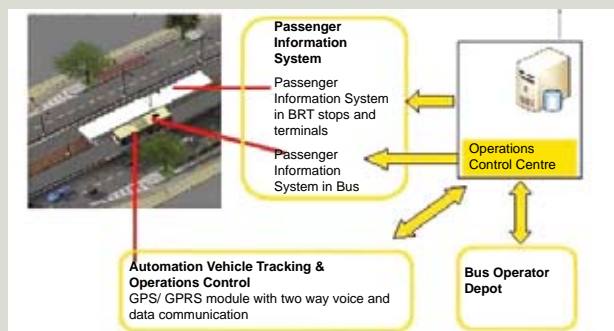
The project was implemented by Ahmedabad Municipal Corporation (AMC). The Centre for Environmental Planning and Technology (CEPT) University is involved in planning and designing the project which is funded by the Ministry of Urban Development, Government of India and Janmarg Limited. GMV intelligent transportation Pvt.Ltd. provides the required technological support for the working of this system.

The Ahmedabad BRTS is another successful example showcasing how, through the use of intelligent transport system technologies, public transport can help reduce traffic congestion, reduce distance and duration of travel and reduce air pollution. The Ahmedabad BRTS has created a positive impact and has been regarded as the best practice in urban transport management.

The major components of BRTS Ahmedabad are its running ways, Bus Rapid Transit (BRT) stations, customised buses and the intelligent transport system. The ITS applications used to make BRTS system efficient and effective in Ahmedabad was achieved by the means of an automatic vehicle tracking system, electronic fare collection, real time passenger information and its traffic management. These features are explained below:

**Automatic Vehicle Tracking System** - The Automated Vehicle Locator Tracking System uses GPS devices mounted on the vehicle as the primary source of data for tracking purposes. It also facilitates Central Computing System (CCS) to enable public information system to act as a source of information that is displayed on the public display screens and through voice-based information. This includes tracking of vehicles through the use of automatic vehicle location installed in individual vehicles that collect fleet data for these vehicle locations. The location of the vehicle is tracked through the use of GPS technology and can be viewed on GIS maps.

**Electronic Fare Collection** - The primary sources for fare collection on BRT stations are station ticket terminals, ticket validator and access control systems whereas the source for ticket dispensing and validations



on city bus service are barcode/smartcard-based hand held ticket terminal. This results in increased transparency and eases the process of ticketing. The automated fare collection is operated through the use of smart card and coin tokens.

**Real-time Passenger Information System** - Passenger information consists of services providing commuters with the real time information and schedule regarding the bus service and expected time of arrival and departure. The information is provided through display screens on bus stations, display screens on buses, voice announcement systems on buses and through the Ahmedabad Janmarg Limited portal for bus schedule to assist the passengers.

With the introduction of ITS in Ahmedabad BRTS, the city has hassle free travel, smart cards for ticketing to avoid congestion, reduced pollution, separate corridors for bus stations and people have been encouraged to use more of public transport by providing high quality service. The BRTS network has resulted in increased mobility and accessibility to less well connected places and low income areas. This project has also been awarded as the Best Sustainable Transport Award, 2010 and was adjudged the Best Mass Rapid Transit System by the Government of India, 2009. The figures below will provide a glimpse of the impact of BRTS:

Number of buses covered	139
Number of routes covered	8
Number of bus stops covered	118
Total number of passengers	1,50,000 (approx.)
Total number of smart card holders	7,20,000 (approx.)
Total number of student card users	5,000 (approx.)

(Data: 2009 - 2014)

While the BRTS' objective is to improve the exiting public transport system, it has its own set of challenges, such as narrow carriageway, high instances of encroachment and requirement of additional land acquisition for construction of corridors, stations etc. Thus, the Ahmedabad BRTS represents a model that is both technically and financially sound and holds immense potential for replication.

## Highlights of Mysore ITS

- ❖ 28 crew members and seven buses saved from auto scheduling. Auto scheduling is a system based on dynamic vehicle routing and scheduling feature, which helps in optimising the usage against manual scheduling of buses.
- ❖ Vehicle utilisation (buses) increased from 247.5 km to 251.7 km.
- ❖ Crew utilisation of ITS employees increased from 66.3 km/ employee to 68.2 km/ employee.
- ❖ Total savings of 55 operational hours and 26.55 Operational Time (OT) hours.
- ❖ A total of 1,555 non-earning km of the running time of buses cut down.
- ❖ 2000 km augmented daily which fetches Rs. 30 average earning per km (EPKM) and daily increased revenue of Rs. 6,000.
- ❖ In-bus equipment installation completed in 420 buses.
- ❖ Among 2 line & 4 line display boards, 157 out of 161 installations are completed.
- ❖ Among 10 line & 16 line Display Boards, 24 out of 26 installations are completed.
- ❖ 1493 crew members have been trained and geo-fencing, field survey and validation completed for all 342 routes.

development, deployment and maintenance involved in the working of the system.

For any initiative to be replicable, it should keep in mind the end-users of the system. The Mysore ITS has proved to be a feasible tool in improving the access and efficiency of public transport for the citizens.

## Conclusion

The Mysore-ITS initiative envisions building citizen-centric urban transport solutions instead of focussing on improving the conditions for private vehicles. Real time information is the most important application of its implementation in Mysore.

The initiative aims to reduce traffic congestion by helping people to plan their travel in a better way, suggesting alternate routes and keeping passengers informed about different timings, buses and routes, thus making public transport user friendly.

A well designed and planned ITS system in buses will make a significant improvement in the urban transport scenario in Indian cities, especially as it puts the needs of the majority who use public transport at the forefront.

## Fact Sheet

Theme	Infrastructure and Development
<b>Nodal Implementing Agency</b>	<b>Karnataka State Road Transport Corporation (KSRTC)</b>
<b>Geographical Coverage</b>	<b>Mysore City, in Mysore district of Karnataka State</b>
<b>Target Groups</b>	<b>Citizens of Mysore</b>
<b>Years of Implementation</b>	<b>2012 - Present</b>