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Mass Transportation System For Indian Cities

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Abstract

Developing sustainable transportation strategies has become a major focus of many cities around the world. Such strategies can range from improved pedestrian and bicycle infrastructure to investing in metropolitan rail systems. In major cities, where longer distance, high capacity services are necessary, city officials often debate the merits and costs of rail systems versus bus services. Each has its own advantages given specific context, with rail systems usually providing higher capacity, higher speed service, but often at much higher costs. Over the past two decades, bus rapid transit (BRT) has emerged as a major alternative to a rail versus bus debate. Although BRT systems are found in cities throughout the world, their greatest success has occurred in developing countries, where people demand a high quality transit system without having to pay the high price of heavy rail, a lifelong dream for many developing countries unable to afford large scale infrastructure development.

For these urban centers, BRT has become, in roughly 10 years, the alternative choice for mass, yet affordable and quick-to-implement, transit. It portrays a different picture of the role that buses can play in public transportation, an echelon above what regular bus service offers, entering a realm traditionally reserved for rail-based transit. The objective of this study is to examine the success and failure of BRT systems around the India, to identify what is necessary to make BRT systems an important component of an urban area's multimodal transportation system.

Introduction

Most literature addressing India's state of transportation refers to it, in one way or another, as a crisis (Pucher, Korattyswaropam, Mittal, & Ittyerah, 2005; Kim & Nangia, 2010; Hossain, 2006). Inadequate infrastructure, rising motorization, unsafe travel behavior, and lack of law enforcement are a threat to not only public health (Pucher et al., 2005), but also to the national economy and the social welfare of residents (Kim et al., 2010). Pucher, Korattyswaropam, Mittal, and Ittyerah (2005) present an overview of India's culture of transportation, outlining problematical trends that also pertain to Indore, namely: rise in congestion and vehicle ownership, inadequate accommodations for buses and non motorized transport (NMT) users, crumbling road infrastructure, poor traffic control/signals/signage, rising fatalities among pedestrians and motorcyclists, poor public transit, rising air pollution, lack of enforcement and lack of adherence to road rules. The authors claim that increased vehicle

ownership is the main reason for the rise in road fatalities, more than half of which are among pedestrians and cyclists.

BRTS

Bus Rapid Transit System (BRTS) takes part of its name from "Rapid Transit", which describes a high-capacity transport system with its own right-of-way, implemented using buses through infrastructural and scheduling improvements, to provide a high level of service. Complicated as it sounds, this is nothing but high-capacity articulated buses operating in lanes reserved for their exclusive use. The Bus Rapid Transit system is expected to revolutionize public transport with new buses, special lanes and new routes, all at a low cost. Bus Rapid Transit System, or 'High Capacity Bus System' as it is commonly referred to, is a flexible mass-transit mode that has the advantage of being the most economical amongst the mass-transit options. BRTS flexibility is both in terms of routes and areas of coverage as well as in terms of its amenability to features-up-gradation over time. BRTS, as a system, includes a number of broad elements such as running way, stations (or stops), vehicles, service and operating plans, fare collection, ITS (intelligent transportation system) etc., under which the different features of BRT are subsumed.

India, roads are often designed to take a particular number of users, say 30,000 persons per hour per direction. But the demand for use of any one road tells us only part of the story; looking at corridor volumes using a travel demand model is a flawed approach. A service which delivers passengers from their desired origins to their desired destinations should be conceived while designing roadways. A single dedicated lane BRTS is known to carry 20,000 passengers per hour per direction. The Bus Rapid Transit System (BRTS) system project is intended to reduce traffic on roads while improving service - at no extra cost to commuters. The new 160-seater buses will be operated by metro bus and other contracted operators. The system helped to reduce traffic, air and noise pollution and lengthy commuting times. Segregation by vehicle type or travel mode is the key to improving traffic flow. In a BRTS system the median and the inner most lane or the left most lane can be dedicated to the bus. In case of median lanes bus stops or stations can be built in the median to further improve the flow. Passengers are allowed to cross at the nearest signal or intersections. A well implemented efficiently-run BRTS will also cause citizens to switch travel modes from car to bus, which will further alleviate the traffic situation.BRT has gained considerable respect around the world as a practical and affordable choice for mass urban transport. It is similar to a mass bus network on the road surface on the lines of a local rail network, where pre-ticketing, wider and lower floors, high frequency and efficiency cut precious commuting time and give breathing space to the roads and parking areas which become bereft of private vehicular congestion. It is also a comprehensive system wherein cycling and pedestrian paths make the roads more peopleoriented. As many as 35

cities in the world have successful BRTS, including five in China, besides North and Latin America and Europe.

Elements of BRTS

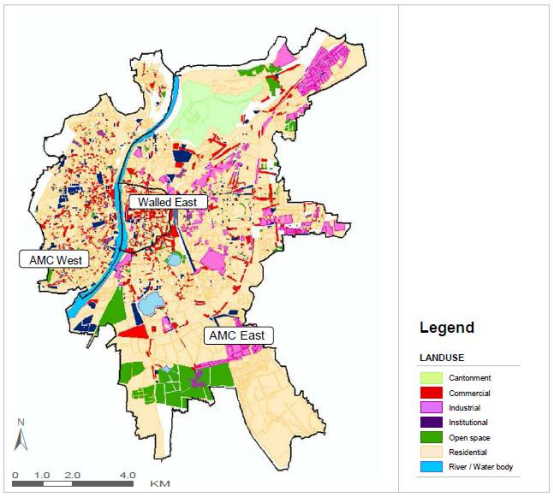
The major elements of bus rapid transit are described below.

- Running ways-running ways drive travel speeds, reliability and identity. Options range from general traffic lanes to fully grade separated BRT transit ways
- Stations –Stations, as the entry point to the system, are the single most important customer interface, affecting accessibility, reliability, comfort, safety and security, as well as dwell times, and system image. BRT station options vary from simple stops with basic shelter to complex intermodal terminals with many amenities.
- Vehicle-BRTS system can utilized a wide range of vehicles, from standard buses to specialized vehicles. Options vary in term of size, propulsion system, design, internal configuration, and horizontal/longitudinal control, all of which impact system performance, capacity and service quality. Aesthetics, both internal and external are also important for establishing and reinforcing the brand identity of the system.
- Off-bus fare collection: Conventional on board fare collection slows the boarding process, particularly when a variety of fares are collected for different destinations and/or classes of passengers. An alternative would be the collection of fares upon entering an enclosed bus station or shelter area prior to bus arrivals (similar to fare collection at a kiosk prior to entering a subway system). This system would allow passengers to board through all doors of a stopped bus. This also includes smart cards and payment through credit cards.
- Intelligent transportation System (ITS): A wide variety of ITS technologies can be integrated into BRT System to improve BRT System performances in terms of travel times, reliability, convenience, operational efficiency, safety and security. ITS options include vehicle priority, operations and maintenance management, operator communications, real time passenger's information, and safety and security systems
- Service and operation plan-designing a service plan that meets the needs of the population and employment centers in the area and matches the demand for service is a key step in defining a BRT system. How it is designed can impact system capacity, service reliability, and travels times, including wait and transfer times.

BRTS in India

With the unprecedented and rapid pace of urbanization, The BRTS is successfully running in a number of cities the majority of the million plus cities in India are facing across the world like, Curitiba, Bogotá, Sao

Paulo, Mexico serious problems of traffic congestion and pollution. The City, LA, Beijing, Taipei, Seoul, Beijing, Johannesburg and solution to these twin problems is being increasingly seen Lagos. In India the BRT System is being implemented in Delhi, Ahmedabad and Pune while, Jaipur, Bhopal, Hyderabad, Indore and few other cities will be following soon.



Conclusions

BRTS can be regarded as a step towards a sustainable transport system in terms of cost-effective mass transit solutions with less environmental impact. The BRT system that is proposed in Ahmedabad city is expected to improve the quality of the urban transport system improving the urban mobility and the quality of environment with less fuel consumption and emissions. Buses generally take less road space, helping to reduce congestion and with its high occupancy, it has far lower footprint per passenger kilometre as compared to other modes. With its good service in terms of timely service, reasonable fare and good comfort level, as compared to the existing bus service, more people are expected to use the newly proposed system, once the service is in operation.

Although, from the modal shift analysis towards the BRTS, the estimated footprint reduction is seen only as a marginal figure, nevertheless, the BRTS shows a promising public transport option for cities looking to reduce their transport-related GHG emissions. An implementation of BRTS should be encouraged in other cities as well, which will have significant contribution to the overall reduction of the GHG emissions from the urban transport sector. Stated Choice techniques provide a means to study choice making behaviour for hypothetical (not yet existing) mode alternatives. The stated choice survey has helped to understand perception of the people towards the BRTS, which is stated as a hypothetical alternative to them. The analysis of the choice made by the people helps to estimate the potential share of the total trips for the BRTS and it provides important information for transport planners to know the potential market share of the BRTS, even before its implementation. In terms of attributes, most people, in their selection of a travel mode, seem to opt for the travel time and travel cost, as a prime factor. This provides a basis for aspects to be focussed more in the BRTS implementation that will help to attract more people towards it, once it is in operation.

As per the technical aspect, the combination of stated choice estimation techniques (logit model estimation in Biogeme), transport models (OmniTRANS)

and GIS (ArcGIS) provides a powerful platform for advanced transport analysis. Use of appropriate modelling techniques and software technologies makes it possible for planners and policy makers to have a vision on the present and the future scenarios. This provides important information in formulating planning measures, policies and goals for the different development programs related to transport sector.

Ecological footprint is a resource accounting tool that provides a measure of sustainability of a human activity. Ecological footprint serves as an appropriate indicator to measure the environmental cost of transport, that helps to elucidate the impact of urban form and the mobility pattern on CO2 emissions and the consumption of resources associated to the transport sector. Although, footprint indicator has some limitations (in its methodology), nevertheless, ecological footprint analysis for scenario evaluation provides useful information in formulating appropriate development strategies for sustainable urban transport development.

Observing the footprint at disaggregate level (TAZ, routes) provides information about the spatial variation of the footprint over the city and accordingly, the areas having a high transport ecological footprint can be identified. Footprint based on the origin zone (source) is explaining how the travel pattern of the commuters from that zone has an effect on their footprint. The route based (system) theme explains how the traffic flow in each road segment is contributing to the footprint. Footprint can also be derived based on the destination zone (sink), as per trip the trip attraction (which is not covered in the research). Each theme presents different picture of the city and all the results are to be incorporated properly, to have a better insight on overall footprint reduction strategy.

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