ADB Urban Innovations and Best Practices

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Urban Development Policy of India (Part 1)

Mobility of People by Bus Rapid Transit

Cities in India have been the "engine of economic growth." But realizing future economic growth hinges on whether or not Indian cities can be made more efficient, livable, inclusive, and competitive. To achieve this, it is essential to strengthen urban governance and management through greater decentralization and enhanced accountability, and establish appropriate delivery mechanisms and regulatory frameworks for various urban infrastructure and services. In the urban transport sector, continuing urbanization and surging economic growth have led to an inevitable rise in ownership and use of private motorized vehicles across cities, placing heavy pressures on the available transport infrastructure and on the institutions responsible for road construction and maintenance, traffic management, traffic safety, and providing public transport services. Congestion and over-stretched urban transport systems are making commuting increasingly more time-consuming and often unsafe and, as a result, negatively impacting the urban efficiency. Air pollution is increasing. Fuel wasted due to this inefficiency also results in more greenhouse gas (GHG) emission that contributes to global warming/climate change.

The Ministry of Urban Development (MOUD) has proposed a policy that puts forward a vision for urban development by focusing on the mobility of people rather than on the movement of vehicles in handling urban transport;[1] and catalyzing more orderly and efficient spatial development toward "compact city" through "densification" along public transport corridors—a fundamental departure from the current inefficient retrofitting approach of merely trying to catch up with uncontrolled urban sprawl. In the long run, people's behaviors are expected to change toward more environmentally-sustainable lifestyles, such as shifting from heavy dependence on private vehicles to greater use of public transport services and walking/bicycling. Successful policy implementation would have a significant impact on the overall sustainable economic development by establishing a robust and replicable model. The Bus Rapid Transit (BRT) and the land use control and infrastructure financing mechanism linked to Floor Space Index (FSI, also known as Floor Area Ratio or FAR) are appropriate tools to implement this policy. A promising actual case is presented in this first part of a series, wherein the first direction of the MOUD's policy (i.e., focus on mobility of people) is successfully achieved by the introduction of the BRT.

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Aerial View of Janmarg BRT in Ahmedabad

Unlike conventional bus services that operate on streets with the rest of vehicular traffic, the BRT system is a bus-based transport system with much of the same benefits (e.g., efficiency, speed, capacity, and convenience) as a rail-based transport system. The advantages of BRT systems include

[1] The following statement eloquently explains what public transport systems are all about: "Traffic jams without public transport are relatively useless; so is public transport without traffic jams or some other form of automobile use restriction." (Enrique Peñalosa, Former Mayor, Bogotá, Colombia and now President of Board, Institute for Transportation & Development Policy)

- lower capital, and operation and management costs compared with rail-based light rail transit (LRT) (i.e., tram) and mass rapid transit (MRT) (i.e., metro) systems, which medium-sized cities in developing countries usually cannot afford in the first place;
- higher capacity compared with conventional bus services;
- more flexibility compared with LRT and MRT systems;
- easier integration with feeder systems; and
- relatively simpler technology.

Typical BRT systems cost in terms of unit cost per kilometer (km) between one-twentieth and one-quarter of LRT systems, and between one-fiftieth and one-twentieth of MRT systems. Also, BRT systems can be implemented in a relatively short period of time (typically 1–3 years after conception) and can be easily augmented and/or adjusted in phases.

Throughout the world, more than 35 cities already have BRT systems, including successful model cases in developing countries such as Curitiba (Brazil), Bogotá (Colombia), and Jakarta (Indonesia). This is a crucial period for India, which only recently started focusing on BRT systems, to earnestly develop and implement well-designed and financially-sustainable BRT systems so that a good, replicable public transport system model can be established for its many growing cities to address their traffic congestion and safety (or, more generally, overall urban mobility) problems. After a few less-than-satisfactory early attempts, including those in Delhi and Pune, one BRT (brand-named *Janmarg*)[2] emerged in Ahmedabad, Gujarat that could live up to the expectations of those who know well-functioning public transport systems.

With regular operations started on 14 October 2009, the first 12.5-km completed segment of the *Janmarg* BRT's planned corridor network occupies the middle of the right of way of the western part of Ahmedabad's primary middle ring road (called "132 Ft. Ring Road") with a total of 20 stations.[3] The two dedicated BRT lanes (one lane per direction with no median) are segregated from the rest of the traffic by railings except at intersections/roundabouts. Except for the northernmost station (called "RTO Circle"), all the other 19 stations[4] have common median platforms (serving both directions) at the height of about 0.9 meter (m) from the road surface for quick and safe "level boarding (and alighting)" when buses are properly "docked."[5] Stations situated near intersections are deliberately set back slightly to avoid "bunching."[6]

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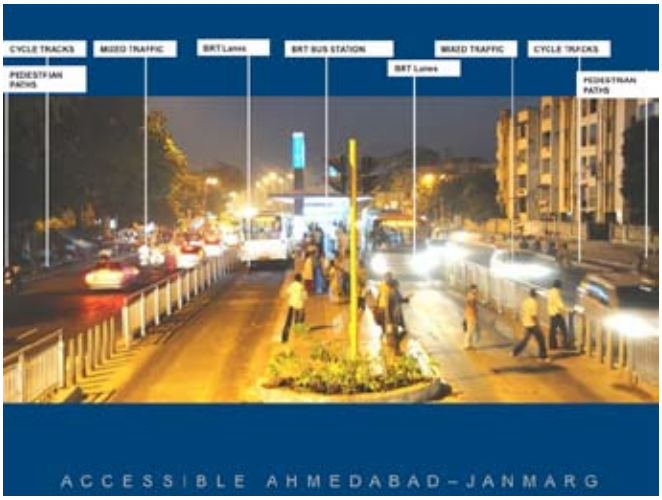
BRT Station in Ahmedabad during Daytime



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BRT Station in Ahmedabad during Evening

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2 *Janmarg* means "people's way." It was awarded as the Best Mass Transit Project 2009 by the Government of India. The award was presented by the Prime Minister to the Mayor, Mr. Kanaji Takore, and the Municipal Commissioner, Mr. I.P. Gautam, IAS. Janmarg aslo received the 2010 Sustainable Transport Award. The award was presented to the Municipal Commissioner and the Chairman, Standing Committee, Ahmedabad Municipal Corporation, Mr. Hasit Vora. CEPT University worked as its planning and design team (principal consultant) with technical assistance provided by the Institute for Transportation & Development Policy while Lea Associates worked as its project management consultant.

3 The segment is now extended to 18 km, connecting to Kankaria Lake, which is a recently-redeveloped major public space, with a total of 26 stations.

4 and the 6 additional stations on the extended segment.

5 There are signs in the bus for passengers to exit at the left half of the doorway (seen from inside the bus). Although passengers do not necessarily follow this instruction, the speed and safety during boarding and alighting do not appear to be compromised because of the close, level docking and wide doorway, as seen in a video clip. (See http://mms.adb.org/media/video/CorporateVideos/Janmarg-Boarding.wmv) Boarding by wheelchair is also easy, which can be seen in another video clip. (See http://mms.adb.org/media/video/CorporateVideos/Janmarg-Wheelchair-Access.wmv). Video clips courtesy of CEPT University.

6 As can be seen in an animation. (See www.adb.org/Documents/Urban-Development/bus-station-location.pps)

The buses used for the BRT operations are custom-configured with right-hand-side level-boarding doors and left-hand-side step-boarding doors.[7] Four-panel 2 m-wide folding doors are located in the middle of both sides of each bus. With the floor height at about 0.9 m, the interior floor is almost entirely flat, except for one modest step toward the front part, which ensures easy and smooth mobility of passengers (including those in wheelchair) within the bus.[8] Nominal seating capacity is 36 with a total passenger capacity (including standing passengers) of about 80. Powered by a cleaner diesel engine[9] and easily distinguished by its unique body painting, there are 23 BRT buses in the initial fleet with more expected shortly.

Current operating hours are from 6:00 am to 11:00 pm with peak-hour[10] headway (i.e., frequency) of 4 minutes. This translates into a maximum number of passengers per hour per direction (PPHPD) of about 1,200 (=80*15).[11] With the second docking bay already available per direction at each station, the maximum number of passenger carrying capacity could be easily increased to about 4,800 PPHPD without any modification to the physical infrastructure, if necessary in the future. The fare is from 2 rupees (Rs) to Rs11,[12] depending on the distance traveled. Before starting regular service operations, trial runs were carried out for 3 months to let the people experience the convenience and safety of this new urban transport mode free of charge and weed out any teething problems.[13]

One of the beauties of BRT comes through the use of custom-configured buses with dual-side-access. These buses can go out of BRT corridors (just as they already do when they approach the northernmost "RTO Circle" station) to reach

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Level Boarding and Alighting (video clip is available at www.adb.org/urbandev)

Step-access Side (at the "RTO Circle" station)

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Inside BRT Bus (seen from front to rear: Note the different heights of the doors)

7 Three steps from the road surface.

8 Smooth mobility of passengers within the bus is unachievable for low-floor (e.g., 0.38 m floor height) buses because of the large engine space and wheel arches that inevitably "stick out" from the floor. It is also difficult (or very expensive) to manufacture articulated low-floor buses (for passenger capacity augmentation, which may become necessary in the future) because of the same reason. The choice of 0.9 m-height-floor buses is, therefore, logical and prudent.

9 Compliant with Bharat Stage III Indian emission standard, which is equivalent to Euro 3.

10 Peak hours are from 8:30 am to 11:30 am and from 5:00 pm to 8:00 pm. Off-peak-hour headway is 10 minutes. The average speed of the BRT buses is about 26–29 kph with vehicle utilization of about 207 km per day.

11 During special events, it is operated at 2-minutes headway, bringing the capacity up to 2,400 PPHPD.

12 With the total segment now extended to 18 km, the fare for the whole length became Rs14.

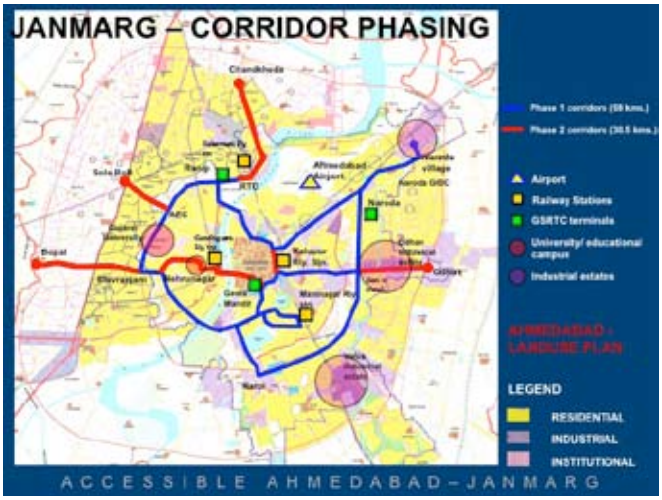
13 The total number of passengers per day ranges between 32,000 and 37,000 with corresponding daily fare collection ranging between Rs160,000 and Rs175,000.

various places with high passenger demand (e.g., train station, airport, shopping center, etc.) even before the full development of the BRT corridor network.

The stations are well lit in the evening and equipped with synchronized automatic sliding doors. Each station is fitted with digital displays that are fed by centrally-controlled Intelligent Transport System (ITS) linked to Global Positioning System (GPS) on board each BRT bus to tell waiting passengers when the next and second-next buses are expected to arrive, respectively. Pre-board ticketing and fare collection are carried out mainly at ticket counters at both ends of each station. (At the "RTO Circle" station where there was no ticket counter, a ticketing officer with wireless hand-held ticketing device was doing this job.)[14] Smart card system units are installed at each turnstile after the ticket counter at the stations and on BRT buses near the left-hand-side step-boarding doorway. The smart card system is currently under scrutiny for its consistency. Sidewalks (and bicycle lanes in some segments) are constructed along the BRT corridor, and pedestrian crossings and/or walkways are also constructed for passengers to access the stations safely.

Uniformed staff and drivers work at the stations and drive the BRT buses, respectively. Uniformed on-board attendants were placed on some BRT buses initially but have now been withdrawn. Initially, traffic control at intersections/roundabouts is carried out manually by traffic controlling officers with the traffic signals turned off (i.e., blinking red/yellow signals), but this appeared to impede the operating speed of the BRT buses that needed to push though the mixed traffic. Now the signal systems are operated at the intersections during peak hours.

The operations of the BRT buses are carried out by a private operator who was selected through competitive tendering. The contract is a gross-cost km-based contract for a period of 7 years and includes incentives and penalties to encourage proper fleet maintenance, create a clean traveling environment for passengers, and avoid vehicle breakdowns.



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Janmarg BRT Corridor Construction Phasing

Successful implementation of the MOUD's policy direction (i.e., focus on mobility of people) by the introduction of BRT would firmly establish a sound, comprehensive model (in terms of technical, institutional, and financial aspects) that could be replicated widely. The FSI-linked land use control and infrastructure financing mechanism for "corridor densification," which is presented in the second part of this series, and the introduction of BRT would complement each other very nicely. The new development paradigm presented is likely to have a significant pump-priming effect and far-reaching impact on similar medium-sized cities across India, and in other developing member countries in their pursuit of a sustainable solution to the pervasive urban transport problem.

[14] Now, a ticketing system has been put in place at the "RTO Circle" station.