

AHMEDABAD BUS RAPID TRANSIT SYSTEM



2.0 Ahmedabad Bus Rapid Transit System

2.1 Context

The city of Ahmedabad, founded in 1411 AD as a walled city on the eastern bank of the river Sabarmati, the commercial capital of Gujarat is now the seventh largest metropolis in India and the largest in the state. With a population of 6 million (2001) within an area of 466 sq. kms, the city is preparing for the emerging challenges, more importantly in terms of sustaining its contributions to the growth of Gujarat State. It accounts for 25% of the State's urban population; 20% of the State's GDP (2001), and also has one of the largest informal sectors. Ahmedabad with its strong industrial base continues to be an attractive destination for investments. Its population is likely to rise to 11 Million by 2035. While the area is likely to increase from the present 440 sq. kms 1000 sq. kms by 2035, sustenance of this growth is possible only with the development of an efficient rapid mass transit system

2.2 Situation before Implementation of the Project

2.2.1 Transport System before the Start of the Project

Ahmedabad is a compact city characterised by mixed land uses, high density development and balanced street network system with well developed 5 ring and 17 radials. Total road length is about 2400 kms. There are 7 bridges to connect the eastern part of the city with west. Sixteen rail-over/under bridges enable crossing the railway lines at appropriate places.

Two wheelers, both motorised and bicycles dominate the traffic on the streets of Ahmedabad. The city has 22 lakh registered vehicles of which two wheelers are about 73%. As per the household survey (CEPT, 2006), 8 lakh bicycles are in operation in the city accounting for 19% of the total trips. The share of four wheelers is still low. They constitute to about 12.5% of the total vehicles and 3% of total trips.

The culture of organised public transport operations dates back to pre-independence era. The Ahmedabad Municipal Corporation (AMC) has been running a well organised public transportation system known as Ahmedabad Municipal Transport Service (AMTS). However, due to resource crunch and operational inefficiencies of the system, the fleet size got reduced

to 450 in the year 2005. As a result, significant loss in patronage was experienced. Average daily ridership in 2005 was 3.5 lakh. While the share of public transport declined, the share of Auto rickshaw increased. In the city, there were about 35000 auto rickshaws operating catering to 10% of total trips. As most of these were using adulterated fuel, air quality was affected significantly. As a result the city of Ahmedabad figured as one of the top 3 cities in the list of 88 critically polluted cities of India.

AMTS with a fleet of about 1000 caters to about 8.29 lakh passengers every day. AMC undertook a restructuring exercise during 2006 and invited private operators to operate on gross contract basis leading to doubling of fleet size, with half owned by AMTS and the remaining half hired on gross contract basis. Through concerted efforts AMC undertook fuel switch operations. Today all buses and auto rickshaws in the city are operated on CNG, contributing to significant lowering of pollution load from transport sector.

The compactness of the city, mixed land use and balanced road network appear to have succeeded in keeping trip length short (average trip length in Ahmedabad is 5.5 kms). Further the balanced transport network and predominance of two wheelers limits excessive concentration at any one part making city relatively less congested. It is important to recognise that short trips and less congested streets appear to make city streets safe without compromising on mobility.

Average travel times are in the range of 15-20 minutes. The road fatalities, in the year 2009, are 202. This is comparable to those observed in the world cities of similar size. The city has also made significant gains in the air quality status. Being a part of 88 critically sensitive lists of cities as identified by the Central Pollution Control Board (CPCB), topping the list in 2003, today the city has managed to reach a position where it is reported that this year CPCB is considering taking the city out of the list.

While these initiatives have had slight dampening effect on the traffic, the rate of motorisation being rapid (every day 430 vehicles are added to the city vehicular register) and slow but steady increase in the share of cars will lead the city onto a grid lock unless persistent efforts to improve public transport, promotion of non-motorised vehicles and introduction of demand management measures are made. These are essential for achieving the goal of sustainable city and good quality of life.

2.2.2 Problems and Needs Addressed by the Project

In a developing country like India, transport nuances-planning follow development. The various factors which lead to the selection of Bus Rapid transit system in the city of Ahmedabad are as follows:

- No strong CBD;
- Highly randomized development with localized trips;
- Urban pull – spreading out;
- Need for decongestion;
- Flexibility in routing;
- Easily expandable;
- Scope for both low density and high density passenger movement;
- Project implementation easier;
- Wider reach;
- Leverages the full scope for public space and accessibility improvement;
- Can be operated according to the city ethos; and
- Environment friendly.

2.2.3 Reason for Adoption of BRTS

The Government of Gujarat had declared 2005 the ‘Year of Urban Development’ (Shaheri Vikas Varsh). During this particular year, the urban development department undertook various initiatives to resolve urban issues such as traffic management, and the introduction and enhancement of a city transport system. The Gujarat Infrastructure Development Board (GIDB), AMC and Ahmedabad Urban Development Authority (AUDA) jointly drafted a comprehensive urban mobility plan keeping in mind the needs of Ahmedabad as a mega city, and included in it, the implementation of the Bus Rapid Transit System (BRTS) and the planning of the regional rail and metro for future years.

CEPT University was assigned the work of the preparing of a Detailed Project Report (DPR) for the implementation of the BRTS project in Ahmedabad. Meanwhile, the government of India announced the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) for urban development and the AMC submitted its proposal to the government of India for the BRTS project, which was the first of its kind in the country. As approved by the ministry of

urban development, the AMC is now implementing the BRTS project in a phased manner. The BRTS project was approved in November 2006 and work on the project commenced in 2007. The urban mobility plan provides choices to the people in the case of their mobility, in terms of different modes such as the AMTS, BRTS and the suburban rail or metro, all of which complement each other.

2.3 Description of the Project

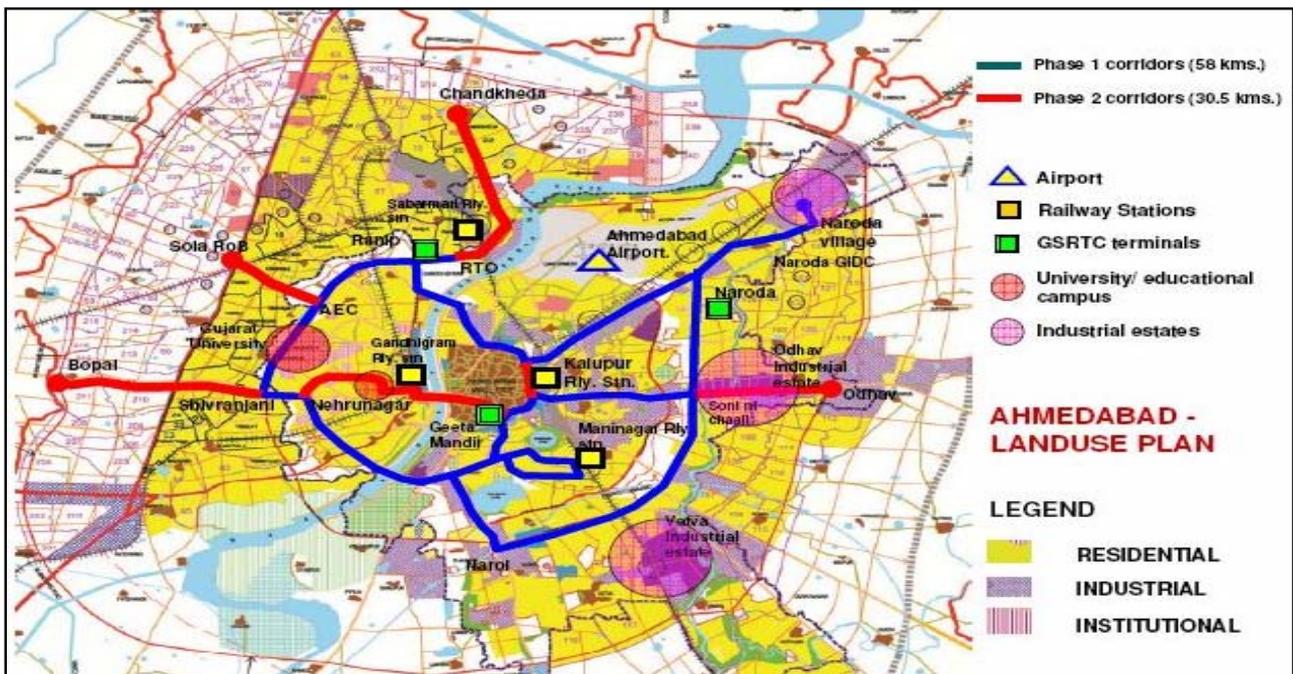
2.3.1 Project Description

The project is undertaken in 2 phases and the first stretch of the phase-1 between RTO-Pirana covering a distance of 12.5 kms which is open for public since 14th Oct, 2009. The system length will increase to 40 kms by December 2009 and to 84 kms by July 2010. A 3 km long elevated BRT will become operational by the end of 2011.

Components of a BRT System

Running Ways

BRTS Ahmedabad has 2 Median bus lanes of 3.65 to 3.75 m wide. Motorized Lanes, depending on ROW, vary between 10.75m in 60m RoW, 9.25m in 40m RoW and 7m in others in ROW <30mts. NMV and Pedestrian Lane are of 2 to 2.5 m and 2 m respectively.



Map 2.1: BRT Network-Accessibility to Important Origin and Destinations and Transit Points

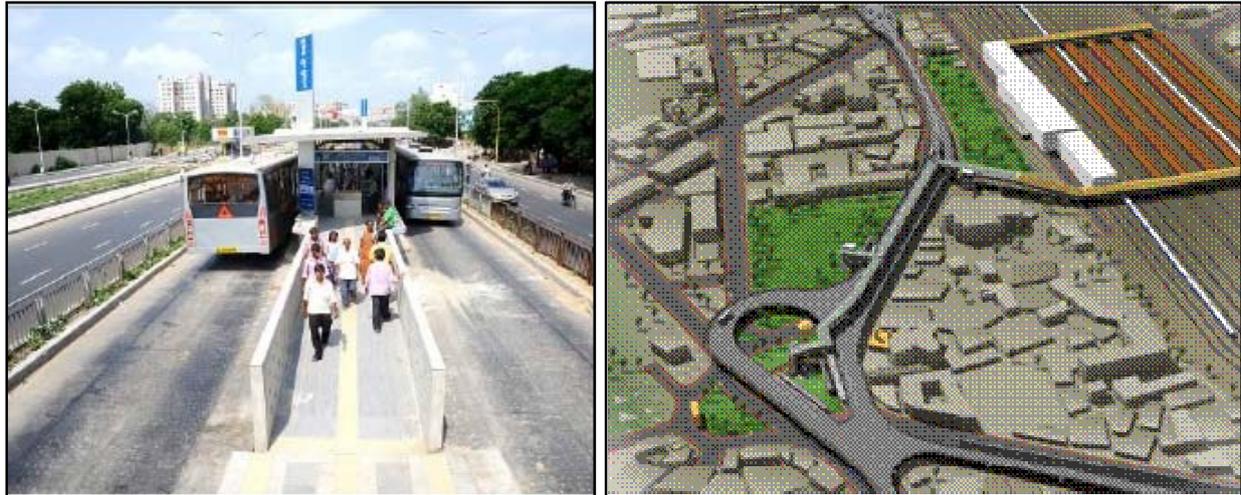


Figure 2.1: Ramp and Access to Bus Station and Elevated BRT at Kalupur

BRT Stations:

38m long 3m wide median bus stations, closed with necessary access controls, at level boarding-alighting, off-board ticketing system, IT enabled & Passenger Information System, security systems & pedestrian crossings & grade separated.

Bus Features:

Stylised buses designed for passenger comfort, wide central doors (1.2m+ 1.2m- entry and exit), (900+/- 40 mm floor height), 90 person-capacity and clean fuel Euro-III Diesel.



Figure 2.2: Side Elevation Showing Bus Graphics

Intelligent Transportation System (ITS)

- Operations Control

- Automatic Vehicle tracking system
- Electronic Fare Collection
- Real-time Passenger Information System
- Traffic Management (ATCS)

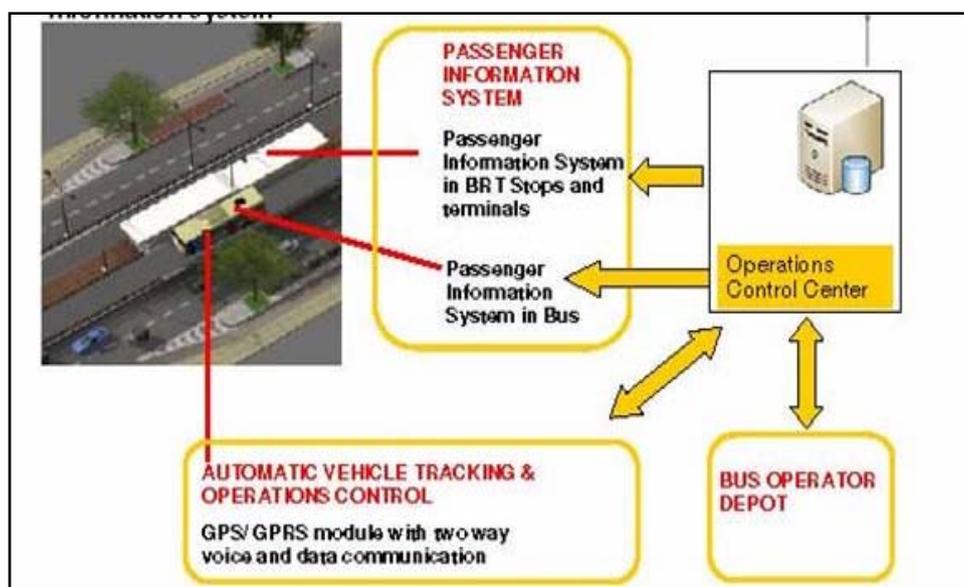


Figure 2.3: IT System in Ahmedabad BRTS

For detailed technological applications / innovations used in the BRTS, refer Annex VII.

2.3.2 Goals of the Project

The trans-vision of Ahmedabad captioned as ‘**Accessible Ahmedabad**’ is to **redesign the city structure and transport systems towards greater accessibility, efficient mobility and lower carbon future**. Main objective of project is to:

- Reducing need for travel;
- Reducing the length of travel; and
- Reducing automobile dependence.

2.3.3 Strategy Used to Achieve the Desired Goals

Ahmedabad transport strategy is focused on moving people and not on vehicles. The Urban Mobility strategy is based on the understanding that all people should be able to move around in Ahmedabad with comfort and efficiency. They must feel safe and secure. Travel must be

affordable. They must have choices for their mobility in terms of walking, bicycling, rickshaw, bus, BRT or any other form of transport depending on where they are going. To emphasize this, the system has been named as Janmarg, meaning peoples way.

The concept of BRTS is to encourage more people on the public transit system, which with high quality service is delivered. It is about equal access and equal sharing of road space for people. By providing a dedicated corridor within the street for BRTS vehicles, more people can travel to destination in a time that is comparable to single occupancy vehicles such as cars, two wheelers.

2.3.4 Activities Implemented to Achieve the Desired Goals

Several activities were undertaken and accomplished to implement BRTS –initial phase in Ahmedabad. BRTS phasing was done based on where right of way was available and where ridership could be achieved from early months. Brief study was done to look at travel time characteristics, demographics.

BRT corridor selected was done based on the set criteria. BRTS characteristic was adopted and a key decision to make the ‘closed’ system was taken early on.

Table 2.1: Travel Characteristics & Project Brief

Travel Characteristics	2006	Item	Phase-1	Phase-2
Gross Density (p/Ha.)	106	Number of corridors	5	6
% HHs with personal Vehicles	82	Length approved (Kms)	58	30.5 (4.5 kms elevated)
Avg. Monthly Income (Rs)	8728	Approved Cost (₹ Crores)	493	488
Trip Rate (Tot-> 1 km)	1.14	Cost per km	8.5	15
Avg. Trip Length	5.6	Date of Approval	11-08-2006	19-08-2008
		Exp. Year of Commissioning		
% Bus trips	15	October 24, 2009 – 12.5 kms December 25, 2009 – 05.5 Kms March 25, 2005 -08.0 kms Balance over the next 18 months		
% IPTS Trips	9	Road Width: < 24 m – 5.2 %, 24-30m – 22.4%, 30-45m – 28%, 45-60m – 47% Pavement Type: Bitumen, Mastic at some Bus Stations		
%Bicycle Trips	18			

Source: CEPT University, 2010

The city of Ahmedabad has a well organised road network with 5 rings and 17 radials. The BRT plan consisted of development of 217 km of BRT corridors in three phases. The corridors selected as part of phase 1 were mainly the rings in Ahmedabad. This included the 132 feet ring road on the western side and the Mani-Nagar railway station and Narol-Naroda highway on the eastern side. More difficult corridors for implementation, but having higher demand, were included in subsequent phases. The idea is to develop BRT on these critical links, in phase 2, so that optimal utilisation of the system is achieved. The attempt is to consolidate on the gains.

The project is to be undertaken in 3 phases. The first stretch of the phase-1 between RTO-Pirana covering a distance of 12.5 kms is open for public since 14th Oct, 2009. The second stretch was inaugurated on 25th Dec 2009 which got added to the existing corridor increasing the length to 18 kms.

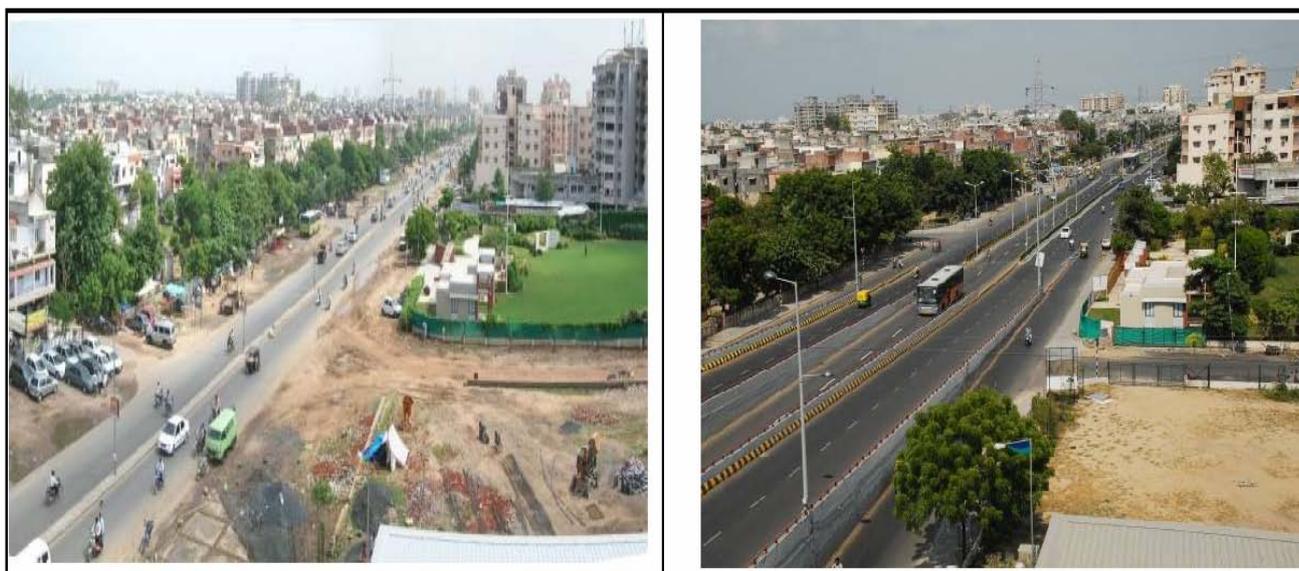


Figure 2.4: Building Split Flyovers (Before and After at AEC)

2.3.4 *Expected Outcome of the Initiatives*

Connectivity to important origins and destinations

The proposed BRT network connects the important origins and destinations and transit points like Railway stations, regional bus terminals, university areas, industrial areas, residential (LIG, MIG, EWS), commercial hubs of the city and recreational public spaces like Kankaria

lake front that is recently pedestrianised. The idea is to increase mobility and accessibility to these points through a well connected network of BRT.

Catalyst for Area Development

During phase-1, while existing and potential demand were prime considerations for selection of the corridors, BRT infrastructure with a projected future demand was considered as a critical part of the corridor selections. The corridor passes through areas having many vacant mill lands on the eastern part of city, with a scope for future development.

The transformations have begun to occur and the BRT acted as a catalyst for future development as shown in the images below. The open lands of university areas and major junctions on the 132 feet ring road have transformed into University convention hall, commercial malls and buildings. Hence, it can be said that supply creates its own demand. After four months of BRT operations, around 42, 500 passengers use BRT every day on this corridor from RTO to Kankaria (18 kms).

Low Income and Low Accessibility Zones

The corridor also provides connectivity to the lower income housing areas and increases accessibility for the lower and middle income groups. The system is for the poor as much as it is for the rich and the elite class of people. The stretch between Pirana to Shah-Alam that connects the western part to the eastern part of the city was recently opened up for operations and was well received by the citizens. People's acceptance and respect towards the high quality infrastructure gets reflected.

Availability of Right of Way

As the concept was being implemented for the first time, often the availability of RoW and ease of implementation took precedence over demand. The different right of ways available on BRT roads were 60 m, 45 m, 40 m, 36 m, 30m, 24 m and 18 m (in Kalupur area).

2.3.6 *Role and Activities of the Partner*

New Management Culture- Creation of Janmarg a company (SPV) to manage BRT

Board of SPV

1. Municipal Commissioner, AMC;
2. Hon. Mayor;
3. Chairman Standing Committee;
4. Leader of Opposition Party;
5. Dy. Commissioner BRTS;
6. Chairman, AMTS;
7. Additional Commissioner of Police (Traffic);
8. Chairman/CEO, AUDA;
9. Director, Urban Transport, MOUD, Government of India;
10. One Member of Legislative Assembly representing AMC area;
11. Principal Secretary or his representative, Urban Development Department;
12. Principal Secretary or his representative, Department of Finance;
13. Two urban Transport specialists; and
14. Two directors from private sector (With contribution to capital).

2.3.7 *Important Stakeholders Involved and Communication / Networking Procedure for the Project*

Ahmedabad Janmarg Limited (AJL), a SPV has been established under the Companies Act as a fully owned company of AMC. AJL is chaired by the Municipal Commissioner with representatives of political and administrative wings as board of directors. The board has provision for two experts and also 2 directors from private sector coming with equity.

Dedicated Urban Transport Fund has been set up. Parking Policy is in place and pay and park tender has been put in place for



Figure 2.6: Newspaper Articles on Ahmedabad BRTS

spaces along BRTS corridor. Advertisement policy is under finalisation. Formation of Urban Mass Transit Authority (UMTA) is under process.

Municipal area has been enlarged to include developing areas. Adopting consultative planning process, comprehensive plan has been out in place. Transit Oriented Development (TOD) is an integral part. Setting up of Urban Mass Transit Authority (UMTA) is under consideration. Dedicated Urban Transport Fund is being formalized. Parking Policy is in place. Advertisement policy is under preparation.

Role of Ahmedabad Janmarg LTD includes planning of services, selection of operators, monitoring of service quality, fare revisions, coordination with relevant departments and future BRTS expansion plan.

The private sector has been involved for Nine PPP Arrangements (Contracts):

- Bus Procurement, Operations and Maintenance;
- Integrated Information System including Automatic Ticketing and Vehicle Tracking System;
- Supply & Service Contracts for Bus Station Sliding Doors, Turnstiles;
- House Keeping & Cleaning of Bus Stations;
- Management of Pay & Park facilities;
- Lease of Advertisement Rights;
- Development of Foot Over Bridges on DBFOT;
- Development & Maintenance of Landscape;
- Maintenance Contracts for Bus Stations (Civil Works), Lighting of Bus Stations & Corridor; and
- Monitoring and Maintenance of BRTS Corridor (Civil works), Signage.

It is to be mentioned that private operators will be procuring buses as per the specifications decided by the authorities and operating services under the overall supervision and regulation of the SPV. A kilometer scheme is being contemplated for the system.

Janmarg Management

Janmarg will have various departments to manage its key responsibilities. The new proposed structure has all the departments placed under three clearly demarcated divisions (Operation,

Maintenance and Finance/Administration). Deputy General Manager, head of each division has to report the General Manager who will further report to the Executive Director.

Operations Division – Like arms and legs, this department will manage day to day management of bus operations. This department shall be the largest in terms of manpower. It will manage the Central Control Centre, perform quality control checks on bus fleet and infrastructure, and oversee fare collection activities at terminals and in the system in general. This department also advises the Administration and Finance department regarding payments to be made to bus operators and all other external contractors. They will liaise directly with the bus operators, fare collection agency, infrastructure maintenance agencies and all other groups involved with operations.

The Operations Division is charged with delivery of service to the community. Its function is to provide on time, dependable, transportation services to the citizens of this city. It is responsible for overall BRTS operations, safety & security and information technology and related work.

Planning - Planning department is akin to the heart of the system. It will work in the area of demand management. Its role will be to conduct passenger surveys, compile and analyse data pertaining to passenger demand, not just on the BRT system but in the whole city on other relevant modes. It will plan medium to long term changes in operations. It will assess possible extension to the system, when required, and take necessary approvals from relevant authorities. Fare structure, fare incentives, economic and business model are areas that it shall study and develop for the operations management group to implement.

Maintenance - The Maintenance division is responsible for maintenance of the vehicles and the facilities of AJL like BRTS stations, depots as well as feeder bus stops (in future) etc. The division will have a manager who will be stationed at a Depot. The division will work closely with the operations division in oversight, enforcement and management of system operator contract related to the maintenance of the vehicles.

Administration And Finance – It shall be responsible for making all payments based on the information it receives from the operations management cell. It will also be equally responsible for internal administration. The Finance and Administration Division is responsible for employment, employee services, employment and testing, training the

workforce, contracts and marketing & advertising of AJL services. The division has two departments. It is also responsible for revenue and general accounting, smart cards and fare media, organization budget, grants and financial reports.

2.3.8 Details of Public-Private Partnership*

There are a total of **nine PPP arrangements** which Ahmedabad Janmarg has entered into to ensure efficient operations of Janmarg BRTS. Depending on the elements each of these has been structured appropriately to reap the advantages of PPP. The responsibility matrix is presented below:

PPP Responsibility Matrix

Component	Solution/Design	Construction / Supply	Operations	Management	Maintenance
Bus Stations/ Corridor/ Flyovers	AJL/CEPT	Fixed Time / Fixed Rate Contractor	-	-	Presently under Defect Liability Period
Buses	AJL / CEPT	Buses hired for 7 years from Operator	Bus Operator	Janmarg / Operator	Bus Operator
Ticketing, CRM, IT Systems	AJL/CEPT	Service Provider	Service Provider through annuity	Service Provider through annuity	Service Provider through annuity
Sky Walks	Conceptual Design: CEPT / Detailed Design by Concessionaire	Concessionaire	Concessionaire	Concessionaire	Concessionaire
Component	Solution Design	Construction / Supply	Operations	Management	Maintenance
Parking	AJL / CEPT	Parking constructed as part of corridor	Pay and Park Operator	Operator overseen by Janmarg	Pay and Park Operator
Hardware elements: Sliding doors / turnstiles	AJL / CEPT	Supplier	Janmarg / Service Provider	Janmarg / Service Provider	Supplier through AMC
Advertisement Rights	AJL / CEPT	Licensee	Licensee	Janmarg	Licensee
House Keeping	AJL / CEPT		-	Janmarg	Service Provider
Landscaping	AJL / CEPT	Licensee	-	Janmarg	Licensee

Source: AMC, 2010

*All information (including tables) in the PPP section has been given by Ahmedabad Municipal Corporation (AMC), 2010.

The highlights of each of the above have been presented below:

Bus Procurement and Operation and Maintenance

- Fleet Strength of 250 buses envisaged to be provided during phase-1 and phase-2 of operations covering 90 kms through 3- 4 operators. At present 45 buses are operational and another 45 will come into operation during the next 4 weeks. Of these, 30 will be AC buses. Diesel Buses of Floor Height of 900 mm have been selected based on the technical and financial parameters. Regular Diesel Buses selected for operations owing to cost advantages over articulated / CNG Buses was designed for the BRTS and Specifications were detailed in the bid¹.
- Bus Service Providers to purchases, operate and maintain buses of given specifications on specified routes under AJL supervision for a per kilometer charge.
- Bus depot cum workshop is built by AMC and given to the operator for exclusive use during the contract period. All equipments are procured by the operator.

A) Key Terms and Conditions of Bus Contract

- Bus operator contract is for 7 years.
- Selection of Bus Provider through a two stage bidding process:
 - *Qualifying Criteria*
 - ✦ Had to visit and study Bogota system before bidding to visualise the expectations.
 - ✦ Ownership of 40 buses or 200 taxis.
 - ✦ Rs 300 lakh turnover.
- Bidding Criteria – Quoted Per kilometer charge.
- Traffic Risk retained with Municipal Body since the Bus Operators industry is yet to develop. Ticket revenues to be determined, charged and retained by AJL. Further it is necessary that services respond to the growing demand and keeping revenue risk through gross-cost contract ensures varying schedules during the day. Early morning

¹ Bus operator built the bus on a TATA chassis as this type of bus with 900mm and right side door with 180 hp was not readily available in the market. The bus operators have diversified into bus coach building activity.

headways are 15 min, which change to 10, 8 and 6 minutes during the day and come down to 2½ minutes during peak hour. Seasonal and weekly variations are also accommodated in designing the schedules.

- Bus advertisement revenues to be shared between operator and AJL in ratio of 20:80.
- No permanent route allocation. Only kilometer contract. This allows changing the number of buses allocated on each route on a regular basis based on change in passenger movement patterns.
- No minimum km guarantee per day. Guarantee of km only over a longer period of time (annual). This allows variation in allocated km from day to day to optimize operations. Minimum of 72000 km / bus promised to the operator in a year's time without any monthly/daily commitments. The kilometers operated are calculated on total fleet. In case excess kilometers are to be operated, rate reduction is done as adjustment against fixed costs sharing.
- Rate per kilometer is fixed based on formula which is adjustable on external factors like fuel cost, inflation indicators etc. Rate per kilometer would be sufficient for bus operator to provide good maintenance but not so high that the system has to be heavily subsidized (₹ 34/kms @ 2009 prices).
- Penalties are charged in **number of payable kilometers for the operator**. Money collected from fines would be redistributed amongst good performers as and when a second operator is put in place to bring competition among the operators.
- Penalties for non performance in terms of availability, punctuality, cleanliness of buses, maintenance, safety of operations etc.
- Contract awarded for 70 buses in first phase to local operator who has been trained exclusively for operations at the rate of Rs 34 per bus km.
- The operator is expected to train drivers from time to time.
- All drivers and other staff (depot manager, operations manager) have to be in uniform designed by Janmarg.

B) ITMS Contracts

- **Integrated Information Technology provision.**
 - ✦ Integrated Contract with Automated Fare Collection System, Passenger Information System and Central Control Centre.

- ✦ Payment per bus, per bus station and for Central Control Centre operations.
- ✦ Ticketing responsibility with service provider.
- **Challenges in terms of deciding whether to adopt BOT method for certain components**
 - ✦ The first bid issued followed a mix of Supply cum maintenance and BOT.
 - ✦ Second bid issued follows a pure Supply and Maintenance removing BOT part.
 - ✦ Other Challenge in terms of finding capability, termination payment, IPR, defining output.
- BRTS in Ahmedabad operates as a closed system. External ticketing is the key to reduce waiting time and over delay. The system serves about 90,000 passengers every day.

C) Turnstiles on Bus Stations – Key Terms of Procurement Contract

Purchase and Installation Procedure	Purchases could be made through orders placed anytime during a price validity period of 180 days. Delivery and installation to be made in 15 days from order. If the installation is delayed, damages payable @0.5% of value of delayed units per every week of delay capped to 5% of the value.
Warranty Period	Three years during which full repair and maintenance responsibility with Supplier including 99% uptime.
AMC Period	Four years after AMC period for which price pa would have to be quoted separately.
Payment Terms	90% on successful installation. 10% after 3 months of successful operation.
Insurance	Suppliers all risk insurance, comprehensive and third party insurance to be taken and maintained by the supplier at his own cost during warranty period.
Service Level Conditions	Damages payable for delay in repairs beyond 2 hours @0.02% to 0.04% of value of unit not repaired as per service level matrix. For overall performance levels below 99% uptime, proportionate deduction per unit per time lost would be made in the Performance Guarantee/Annual Maintenance Contract Fees.
Performance Guarantee	5% of tender value up-to end of Warranty Period. AMC payment being at the end of the year, acts as security during AMC period.
Status	Purchases and installation completed for 19 bus stations of Phase I. Purchases from German Brand Magnetic Auto

D) Sliding doors – Key Terms of Procurement Contract

Procurement for	Laminated Glass Automatic Sliding Doors
Purchase and Installation Procedure	Purchases can be made through orders placed anytime during a price validity period of 365 days. Delivery and installation to be made in 15 days from order. If the installation is delayed, damages payable @0.5% of value of delayed units per every week of delay capped to 10% of the value.
Warranty Period	Two years during which full repair and maintenance responsibility with Supplier including 99% uptime.
AMC Period	Five years after AMC period for which price pa would have to be quoted separately. (Rs 11250 pa per unit in previous tender)
Payment Terms	50% on successful installation & commissioning, 40% after 3 months of successful operation, 10% on 5 months of successful operation.
Insurance	Suppliers all risk insurance, comprehensive and third party insurance to be taken and maintained by the supplier at his own cost during warranty & AMC Period.
Service Level Conditions	Damages payable for delay in repairs beyond 4 hours @0.02% to 0.04% of value of unit not repaired as per service level matrix. For overall performance levels below 99% uptime, proportionate deduction per unit per time lost would be made in the Performance Guarantee/Annual Maintenance Contract Fees.
Performance Guarantee	5% of tender value up-to end of Warranty Period
Status	Each Door purchased and successfully installed at a price of around Rs 2 lakh approx inc alarm.

E) Pay and Park System

Procurement Arrangement	3 different bids invited for selection of Licensee for management of Pay and Park on Phase 1 route of BRTS: 1) 337 Auto rickshaws – to be allowed to park free of cost; 2) 2722 two wheelers; 3) 210 cars; and 4) About 400 bicycles.
Tenure of License	One year, extendable to two more years, separately for each year, at the sole discretion of the Authority.
Performance Guarantee	5% of the Total Bid Value of the successful bidder. In event of the contract being renewed for next year, same to be increased @ 7% pa.
Payment of License Fees	Upfront within seven (7) days of issuance of LoA. In case of extension of License period, same shall be paid in advance for each year, within 7 (seven) days of the start of the year.

Scope of Work	<ol style="list-style-type: none"> 1) Guiding the vehicle owners to park their vehicles systematically in the area demarcated for the same. 2) Collect Stipulated Parking Charges from the vehicle owner against issue of parking ticket/receipts and to retain this income. 3) Maintain the parking place infrastructure in clean and organized condition including housekeeping of the designated area and keeping it free from encroachments and obstructions. 4) To install proper signage, markings, additional lightings, demarcations, etc. as required and as guided or approved by the Authority.
Special Conditions of the License	<ol style="list-style-type: none"> 1) Ensure the complete safety and security of the vehicles in the parking area and protect the parked vehicles against damages/ theft 2) The delineation on the ground within the parking stretches for auto-rickshaws, 2-wheelers and 4-wheelers shall have to be done by the Licensee. 3) No other type of vehicle, except bicycles, shall be allowed by the Licensee to be parked in the area demarcated for specific other type of vehicle. 4) Licensee shall charge only such rates for parking as decided by the Authority.
Damages/ Fine	If the Licensee violates the material terms and conditions of the License, damages of ₹ 1000/- will be imposed for every instance of “repeated non-compliance or breach of terms and conditions of the License beyond a reasonable remedy period.”
Parking Charges	<p>For Bicycle- Minimum ₹ 1 up to 4 hrs and ₹ 2 for more than 4 hrs</p> <p>For 2 Wheelers- Minimum ₹ 2 for less than 4 hrs and up to ₹ 10 for 8 hrs or more</p> <p>For 4 Wheelers- Minimum ₹ 10 for less than 4 hrs and up to ₹ 20 for 8 hrs or more</p> <p>Free parking for Auto rickshaws</p>
Status	Bid out

F) Bus Station Housekeeping

Number of Bus Stations	54
Tenure of Service Contract	2 years
Performance Guarantee	5% of the Final Bid value
Payment Terms	Payment shall be made to the Service Provider on a monthly basis
Scope of Work	<ol style="list-style-type: none"> 1) Completely clean the Bus Stations including cleaning of all the electrical appliances and other components of bus stations using the materials and appliances as specified by the Authority 2) Cleaning of baskets, wastepaper baskets, cobwebs, etc 3) Waste Disposal 4) Making good the damages caused due to the performance of its services

Damages/ Fine	₹ 300/- for every instance of repeated non-compliance of scope of work livable at the discretion of the Authority
Qualification Criteria	1) Experience in housekeeping as demonstrated through aggregate contract value of ₹ 5 lakh 2) Bidder shall be registered in terms of being an incorporated company, partnership, proprietorship, and cooperative society, trust or society
Status	Rajdeep Enterprise was awarded the work at a price of ₹ 5000/- per month per Bus Station

G) Advertisement Rights – Key Terms of Contract

Tender For	Advertisement rights on 2 Main Locations: 1) BRTS corridor- 6 elements 2) 19 BRTS Bus Stations (16 elements for each Bus Station) The bidder could quote separately for corridor elements and each Bus station individually
Tenure of License	2 years
Performance Guarantee	5% of the Total Bid Value of the successful bidder.
Special conditions	1) Design for the Ads shall have to be approved by Authority 2) Licensee shall have freedom to changing ads 3) Adhere to design specifications 4) Ads shall Maintain standards of decency and uphold public moral
Damages/ Fine	Any violation from design will attract fine of ₹ 5000/- per location per day if not rectified on notice from Authority
Handing Over on termination of Contract	1) The Licensee shall keep all elements in original condition 2) Replace any damaged element 3) All non-display items shall be property of the Author
Status	Awarded

2.3 Factors of Success

The ultimate sustainability of the BRT system depends as much on its software (regulatory structure, management and business model) as on its hardware (infrastructure and rolling stock). A good institutional structure should.

- Maximise the quality of service to the end user and sustain it over the long term
- Minimise the cost of such service over a long term
- Maximise public benefit from public sector investment
- Maximise opportunities for private investment to cash in on private sector enterprise.

With these core objectives, the principal components of the institutional structure are:

- Regulatory environment in which private sector operates the system with strong public oversight in the interest of the citizens
- Cost sharing using a PPP model
- Multiple operators chosen through bidding process to encourage competition but limited to such numbers that provides low cost of operations
- Remove competition for passengers on street by making payments to operator based on kilometres operated and quality of service parameters. There should be no route contracts, exclusive or competing.

An Insight into the Two Months of BRT Experience

Route R.T.O. to Chandranagar (12.5 kms):

- Total 18 buses are running with total 132 round trips in a day.
- Operational Timings: Between 7:00 AM to 10:30 PM.
- Peak hours are: 8:30 AM – 11:30 AM and 5:00 PM – 8:00 PM
- Frequency of buses is 5 minutes during peak hours and rest 10 minutes
- Total Revenue in 1 month: ₹ 25,11,888 Avg. Revenue/day: ₹ 81,029
- Total passengers: 5,36,841 Avg. pax/day: 17,317
- Avg. pax./bus/day: 962, Avg. pax./round trip/day: 131
- Last week Avg. passengers/day: 19,593 and max. was 21400 pax./day
- Average speed of buses:
 - ✦ Overall: 26 – 29 km/hr
 - ✦ During peak hours: 25 – 27 km/hr
- Total km traveled by each bus:
 - ✦ 10 buses: each 200 km daily,
 - ✦ 8 buses: each 214 km daily



Figure 2.7: Total Boarding and Fare Collection for 1st and 2nd Months

Table 2.2: Comparative Indicators for 1st and 2nd months

	1st Month (15 Oct – 14 Nov '09)	2nd Month (15 Nov – 14 Dec '09)	Total (15 Oct – 14 Nov '09)
Total buses operate / day	18	18	18
Total Passengers	536749	715653	1252402
Total fare collection	₹ 2511888	₹ 3333705	₹ 5845593
Avg. pax/day	17315	23086	20531
Avg. collection /day	₹ 81029	₹ 107539	₹ 95829
Avg. pax. bus/day	962	1283	1141
Avg. collection / bus / day	₹ 4502	₹ 5974	₹ 5324

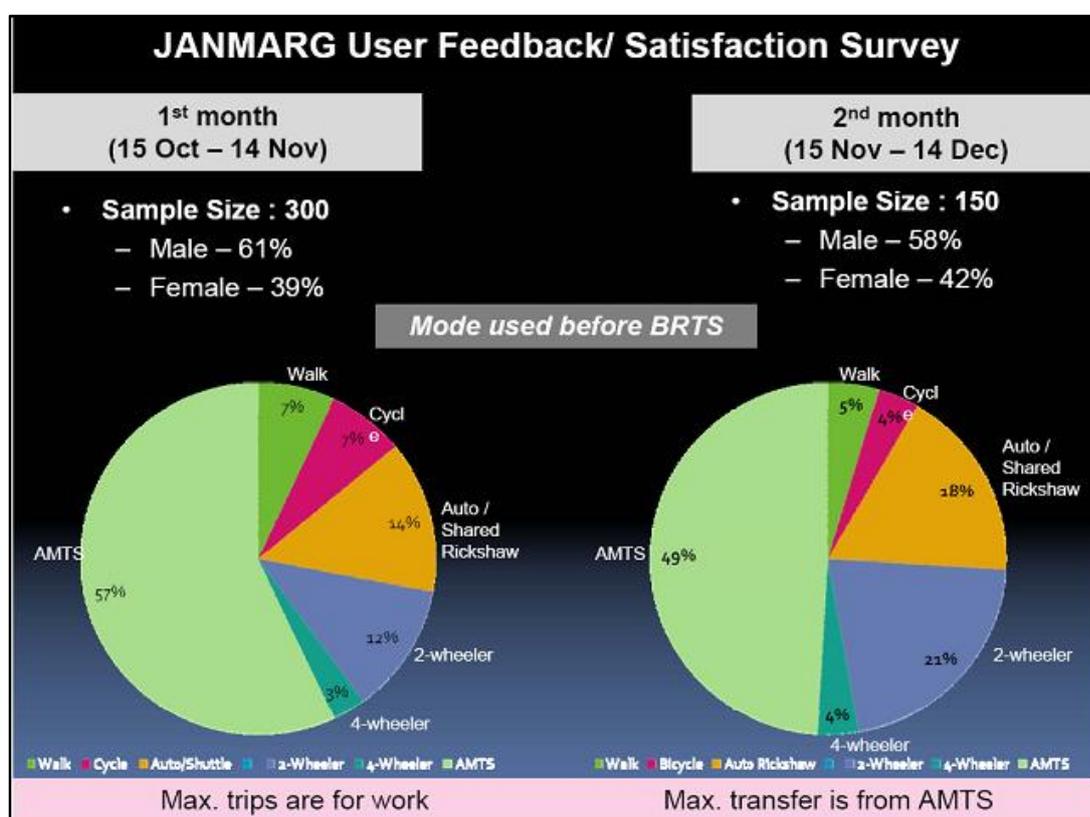


Figure 2.8: User Feedback / Satisfaction Survey

Rating for BRTS by Users

- Avg. Rating given to BRTS by users for 1st month: 8.34 out of 10
- Avg. Rating given to BRTS by users for 2nd month: 8.88 out of 10

Table 2.3: Operations of BRTS Users

	1 st Month		2 nd Month	
	Yes	No	Yes	No
Feel Safe to cross road	76%	24%	79%	21%
Good Frequency of buses	100%	0%	100%	0%
Buses are clean	100%	0%	95%	5%
Driven safely	97%	3%	96%	4%
Fare is consistent	82%	18%	90%	10%
Stops are Clean	96%	4%	99%	1%
Payment is easy	87%	13%	88%	12%
Breakdown of any Bus	0%	100%	0%	100%

Source: CEPT University, 2010

2.4 Budgetary Implications and Sustainability

2.5.1 Total Cost of the Project

The project has been sanctioned under the JnNURM project in 2 phases. In line with the scheme, 35% of the fund comes from the central government under JnNURM. Another 15% is shared by the state government and the balance 50% is borne by the local body.

Table 2.4: Project Cost in Phase-I

Project Phase	Date Of Sanction	Cost In ₹ Lakhs
Phase-1		
Stretch1 of First Phase Construction of 12 Km. long stretch	11 th Aug '06	8,760
Stretch2 of First Phase Construction of 46 Km. long network	6 th Oct '06	40,572
BRTS Phase II	19 th Aug '08	48,813
Construction of 30 Km. long network	19 th Aug '08	48,813
Total	₹ 98,145 lakh	

Source: CEPT University, 2010

2.5.2 Source of Finance for Sustainability of the Project

In addition to the above, there are several elements of the project which are undertaken on PPP mode. They include:

- Bus Procurement and Operations through gross cost contract;
- Integrated Automatic Fare collection and Passenger Information System;
- Landscape development and maintenance along the corridor against advertisement rights on railing;
- Foot Over Bridges to provide access to bus stations;
- Housekeeping of Bus stations through service contract;
- Operation and maintenance of Pay-and-Park system; and
- Advertisement Revenue to form part of Urban Transport Fund.

2.6 Impact of the Initiatives

Within four months of start of operations, positive impacts of the system have been visible.

Increase in Ridership: Ridership has increased consistently through eleventh month by 305%. Average daily passengers have increased from 17,315 (first month) to 69,759 (eleventh month). Frequency of service is at 2.5 and 4 minutes peak during weekdays at eleventh month, up from 5 minutes peak at first month. Ridership has gone upto 85-90,000/day.

Improvement in travel speed: Peak hour speed- 24kmph as opposed to 16-18 kmph of Ahmedabad Municipal Transport Service. Average speeds of mixed traffic same as BRTS on most stretches.

Dependable Service/Reliability: Over 95% of departures are on time (+/- 90 sec time). 65% of arrivals were on time. 22% arrived before time and 13% delayed.

Increase in Revenues: As a result of increased numbers, with 23 buses operating, revenue per bus increased from ₹ 4500 to ₹ 8700 per bus per day during the first four months. This covers the entire sum paid to bus operator and leaves a small surplus. However, the costs towards ticketing, administration etc. are yet to be recovered. These are expected to be

covered through revenues from advertisements and parking facility revenue. Shortfall, if any, will be met by AMC.

Modal shift: Every month about 300 passengers are interviewed to assess the satisfaction level. During the first month, of the total BRTS users, 57% were AMTS bus users. Now this has come down to 40%. Major shifts are from 3-wheelers (25%), 2wheelers (20%) and Cars (10%). Shifts from bicycles are not significant.

Environment: Due to expansion of bus system, both through AMTS and BRTS and conversion of AMTS and Auto Rickshaws to CNG, significant improvements in air quality have been observed. From a position 3rd most polluted among the 88 critically polluted cities monitored by CPCB, the city has come down to a level of 66th rank.

Economic Social Impacts: Two types of social impacts are visible. The routes of BRTS network went through the areas inhabited by the poor. Improved accessibility would not only contribute to widening of the employment market of the poor and also add to physical upgradation of the area. There are visible signs of these impacts in certain localities. System wide impacts, to become visible, will take some more time. Land value impacts are also visible. Several project schemes now advertise their location in the BRTS corridor as major marketing strategy.

User Satisfaction: BRTS User surveys are taken every month by distributing surveys at the station. Every month surveys are collected and user satisfaction rating is calculated. BRTS got average rating of 9.0 out of 10 in the eleventh month from its users, which is in tune with the past months of commercial operation. Survey asks for input on safety while crossing the streets, operator driving, frequency of service, ease of fare payment and cleanliness at stations.

Information Availability: Real Time passenger information is made available at the stations. Announcements are in English and Gujarati.

Other co-benefits: It has been observed that on the BRTS corridor, there has been only one fatal accident and significant reduction in serious accidents has been observed. There have been 6 incidents involving BRTS bus of which one was fatal. Other impacts such as supporting compact city, reduction in travel effort (trip length) etc., are yet to be measured.

Trial Runs

The system was on a trial mode running free of charge from 15TH of July to 14th October. About twenty thousand people per day used to take a ride on the system and during Navratri time the number of passengers had raised upto thirty five thousand per day. Experts, having seen the system and its plan have described it as: ‘already a BRT Best Practice (Dario Hidalgo: <http://www.embarq.org/en/node/1399>)’, ‘country's first bus rapid transit system and could draw high end crowd (S.K. Lohia: http://www.dnaindia.com/india/report_historic-brt-could-draw-high-endcrowd_1280826) and Ahmedabad on modernity bus, says BRTS pioneer (Enrique Penalosa: http://www.dnaindia.com/india/comment_ahmedabad-on-modernity-bus-says-brtspioneer_1280614).

- Series of Drivers’ training (practical and theoretical) program along with yoga programs for mental and physical health.
- Practical training of drivers for appropriate docking at bus stations and safe and comfortable driving.
- Allow people to understand the system and how to use it and helps improving the system based on their critical feedback
- Testing of scheduling and bus operations and signal interface

The system was named by Hon. Chief Minister of Gujarat Shri. Narendra Modi as ‘Janmarg’ which means people’s way, a system that would carry all the citizens of Ahmedabad, in safety, comfort and high speeds.

Sharing Documents, Presentations, News Letters

As a tool for branding Janmarg, a catalogue was prepared which briefs the project, its design principles and characteristics. Apart from this, brochures, illustrative cartoon strips, yearly newsletters etc were also prepared and distributed to help spread the idea of a dedicated bus transit system in the city. Bus stop models and Jana Marg branded pens were also specially made and gifted as souvenirs. A set of working papers were also prepared in the initial phase of the project on various topics related to the system like:

- Land-Use Restructuring;
- Vehicle technology;

- Roadway design;
- Bus stop design and location;
- Environment Impact Assessment;
- Road utilities;
- Pavement design;
- Fare collection;
- Traffic volume characteristics;
- Travel demand and route plan;
- Economic and financial analysis;
- Route rationalization;
- Institutional Aspects; and
- DPR, Presentations.

International Visits

Learning from visits to BRT cities worldwide - Delegates from AMC, Standing committee and members of Planning and Design and Municipal Councillors visited various cities around the world to know more about their inner workings. The various cities visited include Bogotá, Pereira, London, Beijing, Hongzhou, Jakarta, Singapore and Seoul.

Workshops, Seminars, Meetings

Various workshops and seminars were conducted

Stakeholders Consultations

- Bus manufacturers and experts consultations, 2006
- International workshop on BRT held in Ahmedabad, September 2007
- Directors Forum

Prototype & Trials

A prototype bus stop design was constructed to understand the implications and to gain public understanding and opinion.

Visits

- Bus rides for school children
- Visits by eminent citizens like doctors, industrialists, religious people etc.
- Visits by experts in the field helped in understanding and refining the system.

Media Response

News media as a publicity mode e-Interviews and articles on BRT were promptly encouraged and data provided for publicity.

MoUD Awards: The Best Mass Transit Project under JNNURM for the Year 2008-09 goes to Ahmedabad for “Janmarg – Ahmedabad BRTS Project”.

Implementation of any mass transit project, especially at the same grade as the existing roads, is an extremely challenging task. Ahmedabad Municipal Corporation as the lead agency for planning and implementation of “Janmarg - Ahmedabad BRTS project”, duly assisted by CEPT University, implemented the project with highest standards. The project has been designed with segregated bus ways, 900 mm floor height modern Intelligent Transport System enabled buses, level boarding and alighting, off board ticketing with Smart Card, accessible bus stops and audio visual Passenger Information System.

The roads have been completely re-engineered to provide for dedicated path for pedestrians and cyclists with adequate light on the footpath, street furniture and complete signage system with trees at every 8 meters. AMC and CEPT not only planned and implemented the project immaculately but also launched a very effective and noble awareness campaign for the project which has won it accolades from all sections of the society.

Sustainable Transport Award 2010

Within a span of one month of national recognition, the city got international recognition. On January 12, 2010, the city of Ahmedabad, India for the Janmarg Bus Rapid Transit (BRT) system was given 2010 Sustainable Transport Award for visionary achievements in sustainable transportation and urban livability in a function held at Washington.

Each year, the Sustainable Transport Award is given to a city or major jurisdiction that has a profound impact on lessening the impact of climate change and enhances the sustainability and livability of its community or region through innovative transportation strategies that increase mobility for all, while reducing transportation greenhouse and air pollution emissions, and improving safety and access for bicyclists and pedestrians. In the past, New York City and Paris have won this award.

The award selection process is organized by the Institute for Transportation and Development Policy (ITDP), Environmental Defense (ED), the US Transportation Research Board (TRB) Committee on Transportation in Developing Countries, the regional Clean Air Initiatives (CAIs) for Asia, Latin America, and Africa; Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), EMBARQ – the World Resources Institute Center for Sustainable Transport, ICLEI Local Governments for Sustainability, UITP – International Association for Public Transport and the United Nations’ Centre for Regional Development (UNCRD). All these organizations are members of the award selection committee.

2.7 Summing Up

Ahmedabad BRTS is a PPP based project. Public sector is represented by Ahmedabad Janmarg Limited (AJL), a Special Purpose Vehicle, chaired by the Municipal Commissioner along with the representatives of political and administrative wings as board of directors. Dedicated Urban Transport Fund has been set up. The role of AJL includes planning of services, selection of operators, monitoring of service quality, fare revisions, coordination with relevant departments and future BRTS expansion plan. CEPT University was assigned the work of preparing detailed project Report for the implementation of the project.

Private sector involvement is for nine PPP arrangements, viz. bus procurement; operations and maintenance; integrated information system including automatic ticketing and vehicle tracking system (BOT); supply and service contracts for bus station sliding doors, turnstiles; housekeeping and cleaning of bus stations; management of pay and park facilities; lease of advertisement rights; development of foot over bridges on DBFOT; Development & Maintenance of Landscape; Maintenance Contracts for Bus Stations (Civil Works), Lighting

of Bus Stations & Corridor, Monitoring and Maintenance of BRTS Corridor (Civil works), Signage etc.

The system with new technological applications / innovations has been in operation for the past one year. It carries about 90,000 passengers daily with deployment of 45 diesel buses (30 AC buses out of 45, 12 meter long, 900mm floor height), with commercial speeds greater than 24 Kms per hour. A review of the two months progress of the Ahmedabad BRTS project (in terms of various parameters) indicates that the system is running successfully. Average passengers per day, average collection per day, average passenger per bus per day, average collection per bus per day have increased considerably during two months period. During the period, average rating given to BRTS by users is 8.61 out of 10.

Besides the above, the operation of 23 buses during first four month reflects positive impacts, such as an increase in ridership (from 17, 315 in first month to 69, 759 passengers per day in eleventh month), increase in revenue (from ₹ 4,500 to ₹ 8,700 per bus per day), modal shift(shift of passengers from motor cycles, cars and 3-wheelers, which is about 50% of the total BRTS users), dependable service / reliability (95% departures are on time, 65% of arrivals were on time), improvement in travel speed (peak hour speed-24Kmph against 16-18 Kmph of AMTS), improvement in the level of air pollution due to CNG buses, decrease in accidents rates etc.

The reasons for the success (factors of success) of Ahmedabad BRT may be attributed mainly to its good institutional structure, which maximize the quality of service, minimize the cost of service, maximize public benefit from public sector investment and maximize opportunities for private investment to cash in on private sector enterprise. Moreover, the software (regulatory structure, management and business model) and hardware (infrastructure and rolling stock) used makes the project successful and sustainable.

The project was awarded by MoUD as the Best Mass Transit Project under JNNURM in the year 2008-2009. It was given 2010 Sustainable Transport Award for visionary achievements in sustainable transportation and urban livability in a function held at Washington.

Over all, the project may be treated as a success story in the field of public transport and it may be replicated in other cities also.