



CHAPTER 9.0

BUS RAPID TRANSIT SYSTEM

9.1 Concept of Bus Rapid Transit System

Bus Transport Systems in most of the world do not inspire a great deal of customer goodwill. Bus services are too often unreliable, inconvenient and unsafe. In response, transport planning agencies have some times turned to extremely costly mass transit alternatives such as rail based metros. However there is an alternative between poor service and high cost – “*Bus Rapid Transit*”. Bus Rapid Transit system can provide high quality, metro like transit service at a fraction of cost of other options. BRT is proved as high quality customer oriented transit that delivers fast comfortable and cost effective urban mobility. It incorporates most of the high quality aspects of underground metro system without the high costs. BRT systems are thus also known as “surface metro” systems in many parts of the world.



The benefits of BRT system identified are as under

- Attracts Higher Rider-ship and revenues
- The system is Cost Effective
- Increases Operating Efficiency in serving transit passengers.
- Transit-Supportive Land Development and increase in value of properties
- Results in Improved Environmental Quality
- The ability to attract riders from the automobile can help reduce or limit the growth in congestion.
- Improves economic productivity
- Providing mobility alternatives and improving transit-supportive development can improve the quality of life of a city.
- Providing additional mobility choices can enhance the pool of employment opportunities a regional population can pursue and reduce costs associated with more expensive modes. Retail establishments and other businesses benefit from increased sales and labor force availability.
- Transit investment has direct positive impacts on employment for the construction, planning, and design of the facilities.



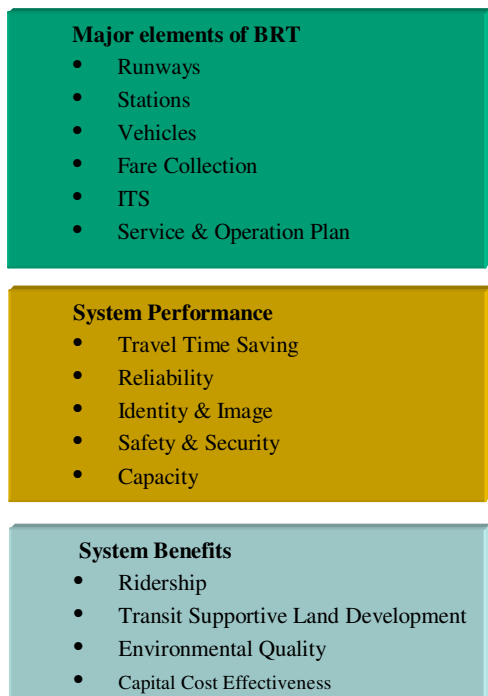
9.2 BRT System Characteristics

The main characteristics of BRT systems include:

- Segregated/prioritized busbays
- Rapid boarding and alighting
- Clean, secure and comfortable stations and terminals
- Efficient pre-board fare collection
- Effective licensing and regulatory regimes for bus operators
- Clear and prominent signage and real time information displays
- Transit priorities at intersections
- Modal integration at stations and terminals
- Clean bus technologies
- Sophisticated marketing
- Excellence in customer service.

The design of BRT elements is carried out to introduce the various system characteristics defined for proposed system. The efficient design of BRT elements would result in development of a cost effective system to derive desired benefits.

The choice of BRT element would determine the system performance and performance characteristics and decide the extent of benefits generated. **Figure 9.1** suggests relationship between BRT elements, system performance and system benefits. The major elements of BRT, which would guide the system performance, are defined 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 shelters to complex inter-modal terminals with many amenities.

Figure 9.1:Relation between BRT, System Performance and Benefits



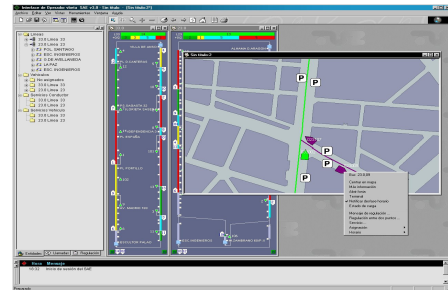
Vehicles - BRT systems can utilize a wide range of vehicles, from standard buses to specialized vehicles. Options vary in terms of size, propulsion system, design, internal configuration, and horizontal/longitudinal control, all of which impact system performance, capacity and service quality. Aesthetics, both internal and external, are also important for establishing and reinforcing the brand identity of the system.



Fare Collection - Fare collection affects customer convenience and accessibility, as well as dwell times, service reliability and passenger security. Options range from traditional pay-on-board methods to pre-payment with electronic fare media (e.g., smart cards).



Intelligent Transportation Systems (ITS) - A wide variety of ITS technologies can be integrated into BRT systems to improve BRT system performance 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 information, and safety and security systems.



Service and Operations 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 travel times, including wait and transfer times.

9.3 BRT System Design Philosophy

The design philosophy of BRT system for Vijayawada city would be governed by the requirement of the project, site conditions, expected passenger handling and requirement to adopt modern technologies such as ITS. There is a need to critically analyze each element of the system to achieve desired system performance on the basis of five key attributes - travel time, reliability, identity and image, safety and security, and capacity. Since each of the BRT system elements has different effects on system performance, a decision matrix would need to be prepared to finalize the requirements. A typical matrix indicating each attribute of system performance is presented below. The suggested engineering study would detail this matrix further for appropriate decision making.



	SYSTEM PERFORMANCE				
	Travel Time Savings	Reliability	Identity and Image	Safety and Security	Capacity
RUNNING WAY					
Running way Segregation	*	*	*	*	*
Running way Marking			*		
Running way Guidance	*		*	*	
STATIONS					
Station Type	*		*	*	*
Platform Height	*	*	*	*	*
Platform Layout	*	*			*
Passing Capability	*	*			*
Station Access			*	*	
VEHICLES					
Vehicle Configurations	*	*	*	*	*
Aesthetic Enhancement			*	*	
Passenger Circulation Enhancement	*	*	*	*	*
Propulsion Systems	*		*		
FARE COLLECTION					
Fare Collection Process	*	*	*		*
Fare Transaction Media	*	*	*	*	*
Fare Structure	*		*		*
INTELLIGENT TRANSPORTATION SYSTEMS					
Vehicle Prioritisation	*	*	*		*
Driver Assist and Automation Technology	*	*	*	*	*
Operations Management	*	*		*	*
Passenger Information	*	*	*	*	
Safety and Security Technology				*	
Support Technologies					*
SERVICE AND OPERATING PLANS					
Route Length		*			
Route Structure	*		*		
Span of Service		*			
Frequency of Service	*	*		*	*
Station Spacing	*	*			

9.4 Bus Rapid Transit System Development Process

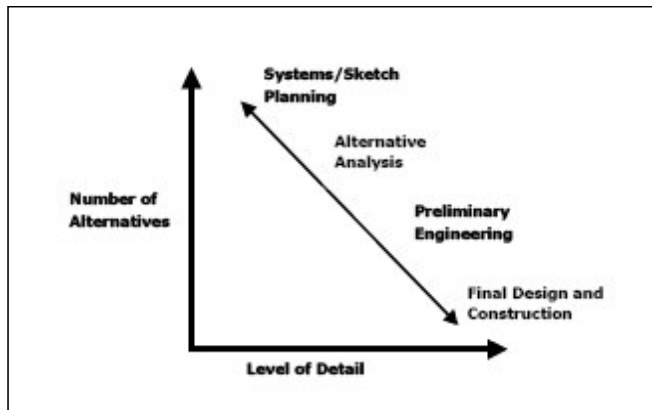
The Transit Development Process includes following stages

1. Pre Planning
2. Conceptualization, Feasibility and Preliminary Engineering
3. Detailed Engineering Design
4. Project structuring and Implementation

As a part of Transit Development Plan, several alternatives are tested to solve a specific transportation need. Initially, pre - planning techniques are used to establish the range of alternatives that meet screening criteria, ruling out those alternatives determined with significantly lower performance than others. Once the universes of potentially feasible options are narrowed down to a small number through planning process, a more detailed analysis is undertaken.



As per the JNNURM guidelines for project development, preliminary planning of transit system is undertaken as a part of City Development Plan (CDP) and Pre- Feasibility levels and subsequent stages include conceptualization, preparation of feasibility studies and Detailed Project Reports for selected options. At each stage, number of alternatives reduces and level of details increases (**Figure 9.2**).



The proposed BRT project for Vijayawada city has been conceptualized in line with the above principals and accordingly various stages involving system conceptualization, testing alternatives, carrying out detail design and developing implementation strategy have been proposed to be carried out.

Figure 9.2: Transit Development Process