Performance Index of Surat BRT System

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Abstract— BRT system is flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity. Objective of this study is analysis of existing performance of Surat BRT system and recommend measure for improvement and make BRT system sustainable. Surat BRT system is at its initial stage, so improvement its performance should encourage the people to use BRT system and make Surat BRT system efficient. For that international standards are taken as base to measure standard for Surat BRT system. These standards are tool for evaluation of BRT system practice. This is world level base to define BRT system and ensure quality of BRT system at world level.

Key words: BRT System, Surat, Service Quality, User Satisfaction, Performance Scoring

I. INTRODUCTION

BRT is becoming more popular as it improves the overall efficiency and reliability of public transportation. BRT system is defined as a corridor on which buses operate on a dedicated right-of-way such as a bus way or a bus lane reserved for buses on a major arterial road or freeway.

BRT has been defined as: a flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity. The components of BRT system, including: running ways, stations and bus stops, specialized vehicles, fare collection, route structure and servicing, Intelligent Transportation Systems (ITS), and marketing and branding. It combines quality of rail transit and flexibility of bus.

The first BRT system was the Rede Integrated Transportation Network in Curitiba, Brazil, which entered service in 1974. This inspired many similar systems around Brazil and the world, such as Trans Milenio in Bogotá, Colombia, which opened in 2000. BRT proposals, plans and studies were developed as early as the 1930s in a few U.S. cities. BRT has many benefit out of that major benefit of BRT are increased service speed and reliability, greater ridership, lower costs, high capacity, and operational flexibility. BRT system is a fully integrated system of facilities, services, and amenities that are designed to improve the speed, reliability, and identity of bus transit. Planning objectives for BRT systems include serving demonstrated current and forecasted future transit demand and needs, providing reserve capacity for future demand growth, attracting auto drivers to transit, relating to and reinforcing transit-and pedestrian oriented development plans, and offering affordable initial implementation and ongoing operating and maintenance costs. BRT is cost-effective and flexible than LRT. BRT is cost-effective means of archiving improve transit service and performance.

II. OBJECTIVES

The present study is carried out with following objectives:

To study performance of existing BRT system of study area. Based on existing study evaluate performance score of BRT system Surat. Based on performance score analyse finding out drawback of BRT Surat.

III. SURAT CITY PROFILE

Surat city; "The Silk City", "The Diamond City", "City of Flyovers". The city located at the River Tapi which swerves its course from the South- East to the South-West. It is having position at 9th largest city in the country. The city is known for textile trade, diamond cutting, and polishing industries. Area of Surat city is 326.51 km2 and population density is 136.80 ppha in 2011 as per S.M.C. Surat city is divided into 7 administrative zone such as North zone, South zone, West zone, East zone, Central zone, South-East zone and South-West zone.

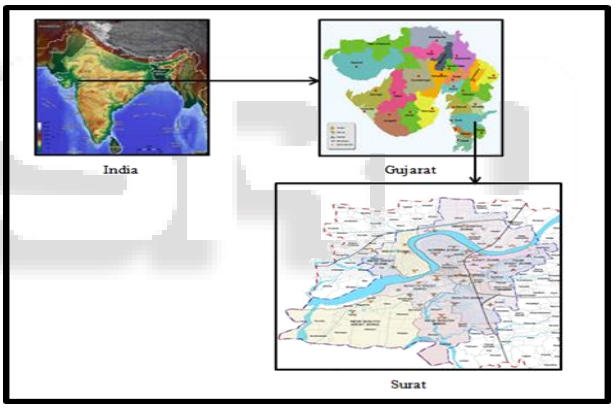

Fig. 1: Location of Surat city

IV. SURAT BRT SYSTEM

Surat BRT system intends to provide speedy, safe, pollution free, reliable and an efficient public transit to Surat. Specially designed BRT Buses shall ply on dedicated lanes along with special provision for other modes namely the cyclists, pedestrians and mixed traffic. The design and trending task is done by CEPT University. The BRT system is a high quality, ultra modern and passenger oriented rapid transit system to deliver fast, comfortable, economical and eco-friendly mobility to urban dwellers. BRT system arterial road network of about 125 kilometers in length has in Surat. There is 30 km of network implementation during the phase-1 of the project. There are 41 bus stations planned in phase 1. Three terminals have been proposed. There are 10 interchange stations proposed. The stations are located on the median. Stations will have provision for ticketing, display, audio systems and other support infrastructure. Off-board ticketing systems are proposed at all the stations on the corridor. Use of smart card is expected to be extensive.

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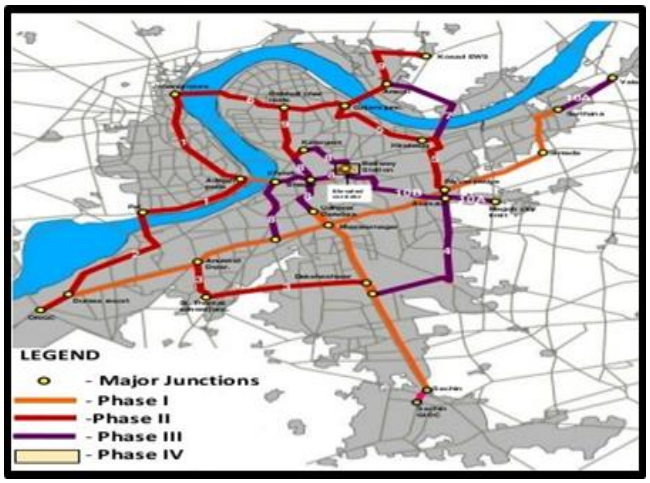

Fig. 2: Surat BRT system

More than 137 cities in the world operate BRTS corridors. There is number of software and tools exist for evaluation of performance of BRT system based on inputs provided and a feature or indicator based rating system. Measurable indicator-based system performance values and benchmarks allow evaluation of planning and design benefits. Weighting the performance of the system against different measures provides an overall rating. Each evaluation tool uses its own defined mixture of such indicators.

V. METHODOLOGY

For check performance of BRT system user satisfaction and level of service approach was taken. For that questioner survey was taken. In this questioner, travel time, reliability, comfortability, identity and image, safety and security, capacity and accessibility parameters are considered and compare this parameter with standard value to find the performance of BRT system. BRT standards are given by ITDP- Institute for Transportation and Development Policy. This standard consist basic, communication infrastructure, service, station, integration field. And points are allotted with them. Surat BRT system ranked based on this standard. Based on this standard loopholes are found out.

VI. BRT SYSTEM STANDARDS

Institute of transportation development policy give standard for BRT system. This standards are created to define common definition of BRT system and identify high quality BRT system at world level. It also function as tool to guide and encourage the municipality to consider as key component of the best BRT system. It reflect the quality of BRT system. As score high, quality of BRT system is high. They certified as gold, silver and bronze level.

Gold level	85 ponits above
Silver level	70 - 80 points
Bronze level	55 - 69 points

Table 1: Classification of BRT system as per standard
Source: The BRT system standard, ITDP)

This standard consist basic, communication infrastructure, service, station, integration field. And points are allotted with them. BRT standards applied to the corridor rather than whole BRT system because qualities of different corridors are different.

Basic standard for BRT system given in table 2

	Category	Max. Score
	BRT Basics	
1	Dedicated Right-of-Way	8
2	Bus-way Alignment	8
3	Off-board Fare Collection	8
4	Intersection Treatments	7
5	Platform-level Boarding	8
	Service planning	
6	Multiple Routes	4
7	Express, Limited, and Local Services	3
8	Control Center	3
9	Located in Top Ten Corridors	2
10	Demand Profile	3
11	Hours of Operations	2
12	Multi-corridor Network	2
	Infrastrcture	
13	Passing Lanes at Stations	4
14	Minimizing Bus Emissions	3
15	Stations Set Back from Intersections	3
16	Center Stations	2
17	Pavement Quality	2
	Stations	
18	Distances Between Stations	2
19	Safe and Comfortable Stations	3
20	Number of Doors on Bus	3
21	Docking Bays and Sub-stops	1
22	Sliding Doors in BRT Stations	1
	Commucation	
23	Branding	3
24	Passenger Information	2
	Acess and integration	
25	Universal Access	3
26	Integration with Other Public Transport	3
27	Pedestrian Access	3
28	Secure Bicycle Parking	2
29	Bicycle Lanes	2
30	Bicycle-sharing Integration	1
	Point of deduction	
31	Commercial Speeds	-10
32	Peak Passengers per Hour per Direction (pphpd) Below 1,000	-5
33	Lack of Enforcement of Right-of-Way	-5
34	Significant Gap Between Bus Floor and Station Platform	-5
35	Overcrowding	-5
36	Poorly Maintained Busway, Buses, Stations,and Technology Systems	-10
37	Low Peak Frequency	-3
38	Low Off-peak Frequency	-2

Table 2: BRT system standards
(Source: The BRT system standard, ITDP)

VII. SCORING OF SURAT BRT SYSTEM

Based on BRT standard scorecard shown in table 2, ranking of phase 1 of Surat BRT system is done, which shown in table 3. Surat BRT system has low ranking in integration system. There is poor integration system. There is poor feeder system. There is not facility of feeder system. There

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is not off-board ticketing facility, passing lane, express service. There is also field of point of deduction.

	Category	Surat Score
	BRT Basics	
1	Dedicated Right-of-Way	8
2	Busway Alignment	8
3	Off-board Fare Collection	1
4	Intersection Treatments	2
5	Platform-level Boarding	7
	Service planning	
6	Multiple Routes	4
7	Express, Limited, and Local Services	0
8	Control Center	3
9	Located in Top Ten Corridors	2
10	Demand Profile	3
11	Hours of Operations	1
12	Multi-corridor Network	1
	Infrastructure	
13	Passing Lanes at Stations	0
14	Minimizing Bus Emissions	3
15	Stations Set Back from Intersections	3
16	Centre Stations	1
17	Pavement Quality	2
	Stations	
18	Distances Between Stations	2
19	Safe and Comfortable Stations	3
20	Number of Doors on Bus	2
21	Docking Bays and Sub-stops	0
22	Sliding Doors in BRT Stations	1
	Commucation	
23	Branding	3
24	Passenger Information	1
	Acess and integration	
25	Universal Access	3
26	Integration with Other Public Transport	0
27	Pedestrian Access	1
28	Secure Bicycle Parking	0
29	Bicycle Lanes	1
30	Bicycle-sharing Integration	0
	Total sum	**65**
	Point of deduction	
31	Commercial Speeds	0
32	Peak Passengers per Hour per Direction (pphpd) Below 1,000	-5
33	Lack of Enforcement of Right-of-Way	-5
34	Significant Gap Between Bus Floor and Station Platform	0
35	Overcrowding	-5
36	Poorly Maintained Busway, Buses, Stations,and Technology Systems	0
37	Low Peak Frequency	-2
38	Low Off-peak Frequency	0
	Total deduction	**-17**
	Total	**48**

Table 3: Surat BRT system score card

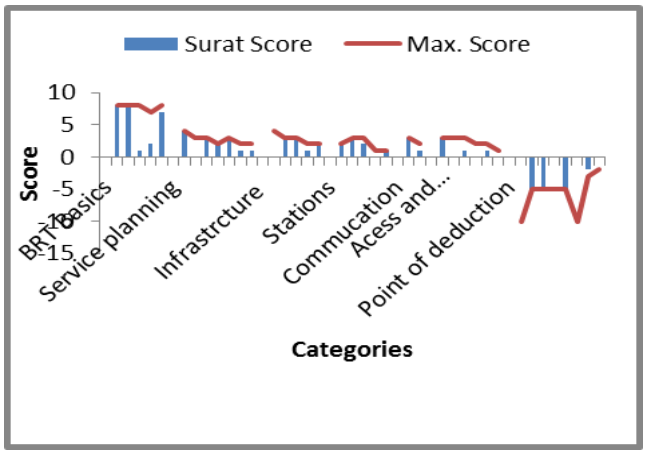

Fig. 3: Comparison of Suat BRT system with maximum score

Point is deduct due to overcrowding, less peak hour frequency, less passenger travel. Surat BRT system has score of 48 with less than bronze category. There is need to improvement in Surat BRT sysgtem to make it more efficient. . As per above graph there is a less standard score in access and integration and in point of deduction; overcrowding, less frequency, less peak hour frequency. This are the drawback of Surat BRT system. To improve the performance of BRT system Surat, need to improve in feeder system. As feeder system increase convenience to BRT system, it increases the use of BRT system. The feeder system should be well integrated so it decreases waiting time. As feeder system increase convenience to BRT system, it increases the use of BRT system. It increases overall performance score of BRT system.

VIII. Concluding Remark

BRT system is most efficient and popular mass transportation. BRT system define as dedicated lane for bus or reserved lane for bus on major artial road.BRT has flexibility of bus transit and quality of rail transit. Mass transportation is important for economy growth of city. For that BRT system should be sustainable. BRT system provides an opportunity to develop cities in a holistically manner and give fast and comfort transit. ITDP- Institute for Transportation and Development Policy gave standards for BRT performance evaluation. These standards are to define BRT system at world level and evaluate the quality of BRT system. It also function as tool to guide and encourage the municipality to consider as key component of the best BRT system and helps to make sustainable BRT system. Surat BRT system has score of 48 which is below bronze level. It has low ranking in integration with public transport, poor feeder system. Efficient feeder system is needed for successful implementation of BRT system. There is overcrowding and low frequency of bus during peak hour. It can be improve by large size bus in peak hour and providing express service. It should increase frequency of bus, reduce overcrowding problem and also provide fast transit and save time. Now a day time is money and it is impotent for all. It encourage people to use BRT system as it save time and money too.

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