

# Comparison of Prior Implementation Studies of BRT Systems of Various Cities in India

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## Abstract

While considering traffic management issues of Indian or any developing country's road situation Public transportation is most important factor. Traffic troubles in town areas increase due to rapid growth of population and with the rise in numbers of vehicles which result into excessive delays, travel times and reduction in speeds on urban road network. In order to reduce these problems there is a need for sustainable public transport system. Traffic quality parameters such as traffic flow, speed, travel time, delay time, stop time and fuel consumption need to analyze for the impact of BRT as compared to present day mixed traffic on traffic and commuter mobility. After many more researches experts make one and same conclusion that Bus rapid transit (BRT) is the most suitable, cheap and advance way of public transportation. But before implementation of any new system or making changes in existing system we have to analyze influence of pros and cons to existing system. In this particular study we consider the same for BRT system implementation. Authors studied previous research works for BRT system and made one standard conclusion for new BRT system. These judgments can be used to form the basis for developing public transport corridor in present Indian traffic conditions.

**Keywords:** Bus Rapid Transit (BRT), Public Transportation, Traffic speed, Traffic management, Urban traffic, Modelling, Simulation

## I. INTRODUCTION

Transportation is the spine to the improvement of urban areas. It permits functioning of urban areas efficiently by providing entree and motion of vehicles in populated area of city. According to latest census of government of India urban population of country rises with such a tremendous rate. As a result of this numbers of personal vehicle take a dangerous increase. On the other side, road network and width or area available in hand is very limited. This causes tedious traffic congestion and traffic jams. The only way to solve this particular problem is encourage people to use public transportation facilities available. If available public transportation is as good as for increased population then naturally there are very few loads on road traffic. Growth of a city and transportation facility of same city is equally depending on one another. If transportation facilities of a city changes to a standard mode then as effect of this many new industries are attracted towards this city and reversal of this if Industrialization of city needs a better transportation planning for growth of it. If we see growth of vehicle in Indian scenario we can easily understand need of superior transportation system. See figure

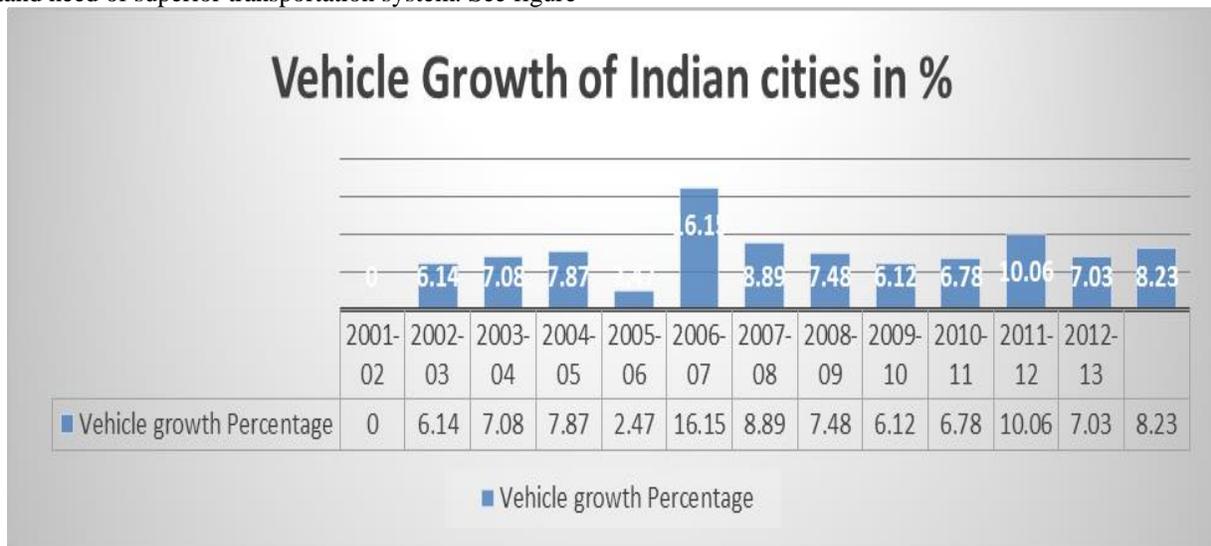


Fig. 1: Vehicle growth of Indian cities in percentage

Nowadays various effective public transportation modes are in use such as city buses, Light Rail Transit, Rapid rail transit, bus rapid transit, para transit modes. Out of all modes present in the world Bus rapid transit is found to be most effective and economical as well as it is very easy to implement provided road width available should be as per standards required for BRT. It is a high-capacity transport system with its own right-of-way, implemented using buses over infrastructural and scheduling modifications, to provide a high level of service during operation public transportation system. Here in this paper we have selected some papers who have studied specific city with respect to BRT as a concern.

## II. BUS RAPID TRANSIT (BRT) CHARACTERISTICS

### A. Exclusive Right of way and alignment for bus:

BRTs is consists of a separate road stretch for buses that is one lane of whole road width is reserved only for BRT buses. No other vehicle from mixed traffic flow is allowed to mix up with this lane of BRT. This system gives uninterrupted flow of buses results in high average speed of speed buses. Sometimes this separate lane is marked with different colors or in some cases bus lane is provided with separator at one end and divider at other end



Fig. 2: Exclusive right of way of BRT

### B. Modern boarding facilities:

Bus station are design in such a fashion that level of bus door and platform available for boarding at station should be at same level. This arrangement is for elder and physically handicap people. Because of this each and every user of system travels with no difficulties. Collection of fare is done off-board type or it can be done through internet also, it reduces time of journey of user



Fig. 3: Platform level boarding in BRT

### C. Traffic management strategies:

Traffic signals throughout the journey of bus are maintained to give priority to BRT buses to give nonstop travel of bus. If there is enough space for multilane system and multi network corridor is also implanted to avoid queuing. Bus operation management centers are also there to manage bus operation at one location to smooth functioning of whole BRT system. Distances between two adjacent station is decided in such a manner that neither a passenger suffers from walking too much distance nor the traffic flow is affected by bus queue at intersection. Engineer must have to think on safety reach of user from roadside to bus station that is options like pedestrian signal, subway underpass, overbridged crossing.



Fig. 4: Bus priority signal system for BRT



Fig. 5: Pedestrian priority signal system

### D. Passenger Oriented system:

Bus stations are safe and comfortable enough for traveler. Facilities like cctv camera, security persons are available at stations. Use of sliding door on station saves space for standing persons and naturally increases the capacity of station as well as bus. Present and true information of bus routes and buses should be displayed on bus stop with the help of digital information boards. Frequency of buses for low and high peak hour in such manner that neither shortage of buses at high peak hour nor excess of at high peak hour. Coordination with other modes of transportation such as rails, metros or cycling facilities is provided near each and every station of BRT system. Basic need of any public property like toilet drinking water is arranged at stations.

### E. Environment Friendly system:

Buses used in system are Euro-IV to Euro-VI. These buses produce less pollution of environment. In some systems buses run on CNG or electricity as fuel for operation results nearly zero impact on environment. Pavement quality of road in whole system is maintained so that vehicles pass very smoothly over it and cause less noise pollution. Buses are maintained after a specific period of time so that they run for longer time duration and produce less environmental impact.

### III. INDIAN APPROACH TOWARDS BRT

With the extraordinary and rapid pace of growth, The BRTS is magnificently running in a number of cities the majority of the million plus cities in India. Government of India planned to implement BRT for some cities. They have calculated cost of system in USD. From the figure shown we can get idea how less expensive the BRT system is! Pune was the first city in India to experimentation with a Bus Rapid Transit system. PMPML started spread over pilot tracks for new BRT in December 2006. It was little bit failure due to lack of proper application methods. But in next phase of implementation they were so good that everyone saw the BRT Pune as standard BRTs in India. Other than Pune Bhopal, Delhi, Ahmedabad, Bangalore these are the cities in India where BRT run as a successful mode public transportation.

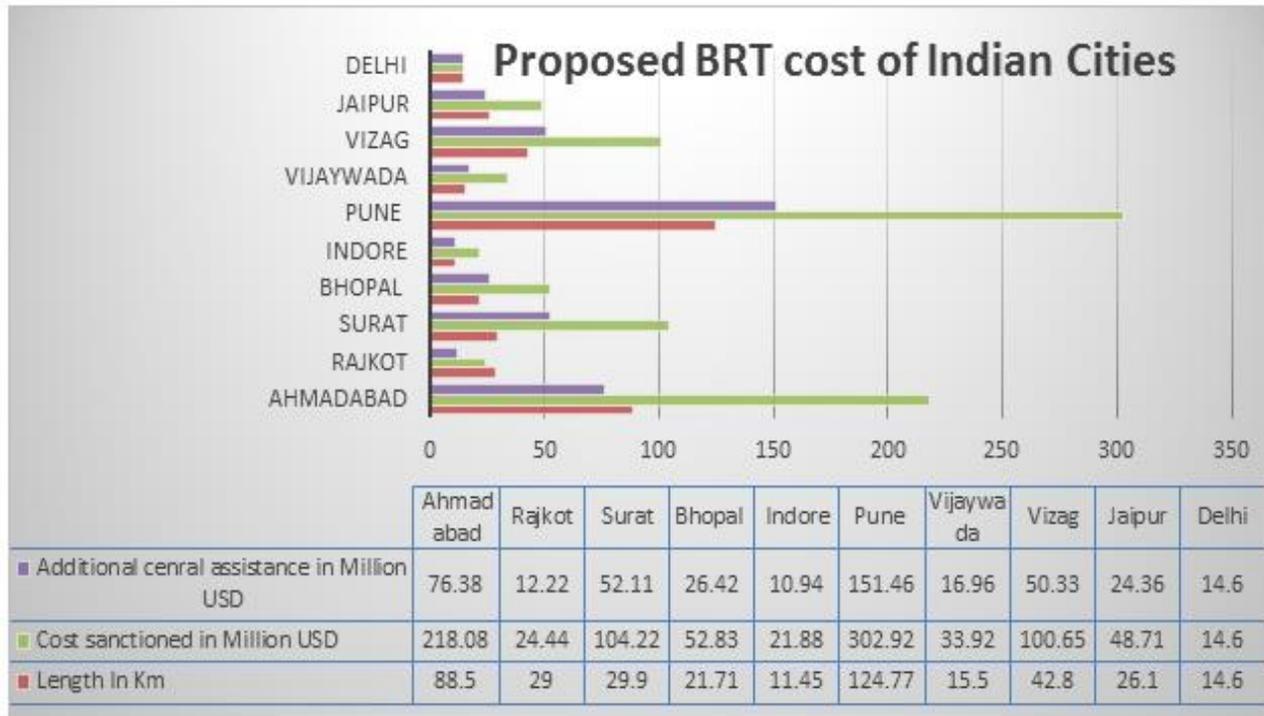


Fig. 6: Proposed BRT costs of some Indian Cities

### IV. LITERATURE SURVEY

Herein authors were selected researches on different cities in India to study impact of BRT after actual use of it. For this purpose study of different cities were made in parts to check feasibility, mobility and accessibility of new BRTS to present traffic scenario. Four most popular cities in India viz. Delhi -capital of India, Pune- I.T. hub of Maharashtra, Nagpur- Orange city, And Ahmadabad-a largest in Gujrat are taken for analysis of BRTS prior to implementation lessons.

#### A. Delhi

Vaishali M. Patankar et. al.(2012) made one investigation to study traffic quality parameters such as speed, traffic flow, travel time, delay time, stop time, and fuel consumption for betterment of future BRT system to be run on Delhi corridor. They had selected A 6.4 km long mixed traffic corridor from Ambedkar Nagar to Moolchand in Delhi to study the impact of dedicated lanes. This corridor is part of a 24 km long stretch, where dedicated lanes for public and nonmotorized vehicles would be constructed very soon as a BRTS. Authors made comparison on following basis by simulation and modelling of data with help of computer based softwares named TRANSYT-12, aaSIDRA2.1, AIMSUNv4.2. The comparison is shown in following table.

Table – 1  
Parameter comparison of existing and proposed bus system

Sr No.	Parameter	Existing Bus System	Proposed BRTS
1.	Public Transport Flow rate( buses/hr)	45-125	170-260
2.	Bus Speed (Km/hr)	5-32	10-72
3.	Bus travel time	Max 10 Mins	Max 3 Mins
4.	Bus Delay time	Max 10 Mins	Max 2 Mins
5.	Bus Stop Time	Max 9 Mins	Max 2 Mins
6.	Car Flow Rate (car/hr)	750-2400	950-2600
7.	Average Car Speed (km/hr)	10-48	45-72

After all above study authors made a conclusion that the percentage sharing of vehicles will be change very positively as shown in figures below. Because of which traffic management issue of Delhi got a valuable solution and problem air pollution also reduces to some extent. Overall BRT is good solution for traffic management difficulties.

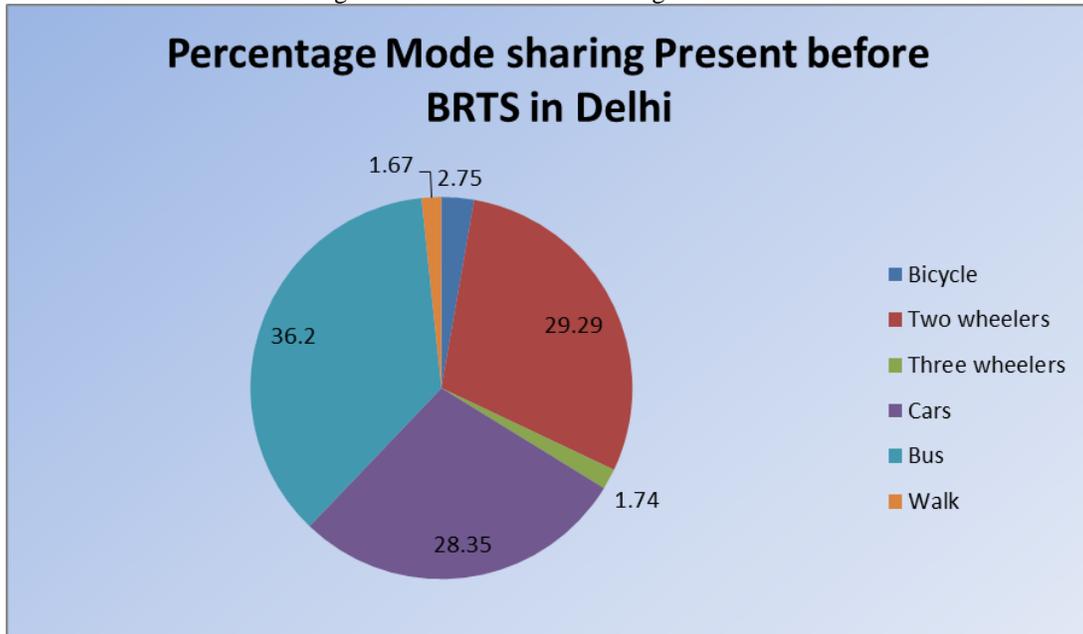


Fig. 7: Percentage Mode sharing Present before BRTS in Delhi

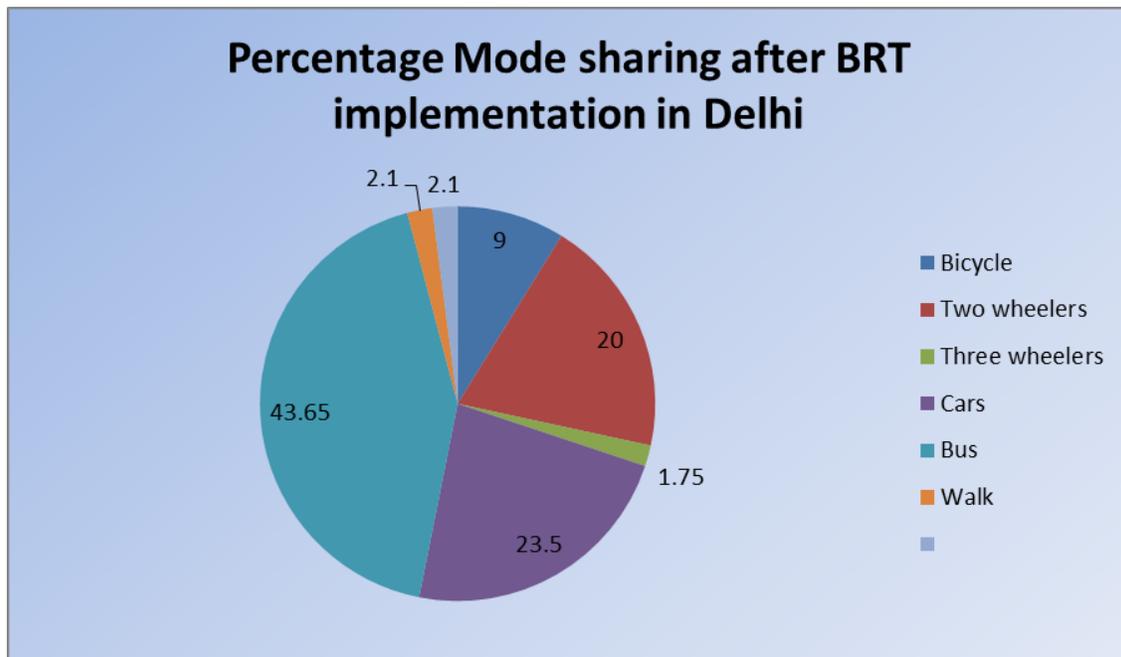


Fig. 8: Percentage Mode sharing Present after BRTS implementation in Delhi

### B. Pune

Ananth Rangarajan (2010) made analysis at Pune city where automotive sector is particularly prominent. A 13 Km road stretch in urban area where public transport is dominant. A microsimulation traffic model was developed for BRT and mixed traffic systems as well as the same are validated with field measured data using statistical methods. He also take review of Viva city and Dhaka city for elaborating his studies. Layoff time was calculated for bus system without BRT. By using these findings he made one comparison of travel time in both scenarios as shown in figure.

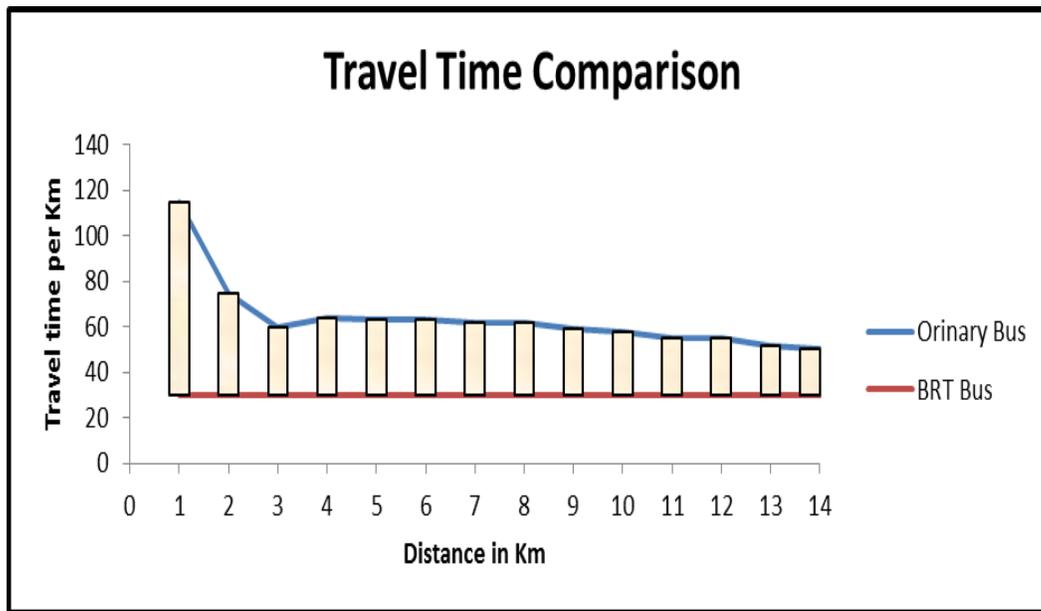


Fig. 9: Travel time comparison before and after BRTS

Above results clearly shows that how BRT system is beneficial as per as travel time is concern. It is the most suitable public transportation system for Pune traffic conditions.

### C. Nagpur

Safal A. Wankhade et. al,(2014) think thoroughly about traffic management strategies of Nagpur city. Transport in Nagpur is important due to Nagpur's purposeful central location in India. It is a fast growing metropolis and is the third most populous city in Maharashtra after Mumbai and Pune. Authors first concentrated on existing public transport system to get accident data analysis of same. Later they studied public review towards current public transport by man to man survey. Addition to this for deciding where there is need of BRT they have calculated capacity of road network available and Level of service (LOS) to compute degree of congestion in different areas of Nagpur city. For examining exact location of buses of each route Automatic vehicle location system (AVL) for public buses is suggested in this study. Finally by comparing existing public transport with BRT authors concluded that BRT is the beneficial solution for better future public transport of Nagpur City.

### D. Ahmedabad

The impact analysis of Keshavbaug To Anjali BRT Corridor in Ahmedabad done in this study tries to measure all benefits and costs by Darshit M. Shah et. al.(2014). In the beginning authors studied Traffic scenarios in Ahmedabad with data collected by them. Vehicle growth of city in previous some year is measured to identify the influence of BRT on traffic along implemented corridor as well as adjacent areas. Journey speed, Average running speed and queue lengths at intersection are calculated to find appropriateness of BRT system. As a final point in the research we can say that Journey speed and Running speed after implementation of BRT for different modes builds up to 4kms per hour.

## V. CONCLUSION

For modern public transportation of fast developing country like India Bus Rapid Transit (BRT) is the most suitable solution. Benefits of BRT system are reduction in queue length of buses, average speed rise, optimum travel time, drop down of travel time, delay time and stop times at stations , reduction in air pollution due to change of percentage of mode sharing of vehicles, flow rate and speed of car after implementation are increased effectively. Initial cost and time required for application is very less as compare to other system. Because of so many advantage of BRT it is accepted worldwide with open arms.

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