# A Feasibility Study for Bus Rapid Transit System in Hyderabad

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*Abstract*— Ever increasing traffic on our roads is one of the major problems being posed to the smooth running of our lifestyle in cities. Road network in urban areas is one of constitutes one of the essential infrastructures for the development of the city and also to meet the demands of the people. In the present world today the problem faced by citizens are mobility accessibility etc. As the population increasing day by day travelled demand is also increasing consequently the need for transportation facilities increases. But in current situation the facilities provided are not meeting the requirements. As the business activity centers are increasing rapidly road requirements are changing .It has become imperative that we should design more efficient systems to handle this problem with minimum expenditure. In the present work it is recommended to take Hyderabad as the study area, selecting corridor 'Mehdipatnam to HCU Depot'. The traffic volume studies at specified time at suitable spacing along the corridor between all the junctions are required to conduct. The data obtained will be useful to find out the peak hour volume of all vehicles. This enables to check the adequacy or deficiency of traffic along the corridor by taking V/C ratio at each Stretch. The Stretch with V/C ratio more than 1.0 are supposed to recommend for possible improvements either by providing better public transport facilities like Bus Rapid Transit System as compared all the public mode of transport; it is much cheaper and has better facilities.

***Key words:*** Bus Rapid Transit System, Economical Transit System, Traffic Congestion

## I. INTRODUCTION

Bus Rapid Transit System (BRTS) takes part of its name from "Rapid Transit", which describes a high-capacity transport system with its own right-of-way, implemented using buses through infrastructural and scheduling improvements, to provide a high level of service. Complicated as it sounds, this is nothing but high-capacity articulated buses operating in lanes reserved for their exclusive use. The Bus Rapid Transit system is expected to revolutionize public transport with new buses, special lanes and new routes, all at a low cost. Bus Rapid Transit System, or 'High Capacity Bus System' as it is commonly referred to, is a flexible mass-transit mode that has the advantage of being the most economical amongst the mass-transit options. BRTS flexibility is both in terms of routes and areas of coverage as well as in terms of its amenability to features-up-gradation over time. BRTS, as a system, includes a number of broad elements such as running way, stations (or stops), vehicles, service and operating plans, fare collection, ITS (intelligent transportation system) etc., under which the different features of BRT are subsumed.

## II. LITERATURE SURVEY

Talati and Talati (2014) reported that including private sector into urban transport projects allows the concerned authorities to spare funds for other institutional and development works. Two types of revenue models were followed for operation of BRT in India, these are the Gross Cost (GC) model and the Net Cost (NC) model. It illustrates the BRTS characteristics in terms of regulatory context. The GC model is either a route based or area based cost model.

In GC model the private partner states the unit cost of service on the following criteria: (1) Kilometres based (cost/km) e.g. Helsinki(Finland), Gote Borg(Sweden) Janmarg (Ahmedabad BRTS) and DIMTS New Delhi (2) Contract based (whole cost of operating) e.g. London (before 1993) (3) Passenger based (Cost/Passenger) e.g. Santiago NC model is also either a route based or area based model. In these models the operator states the minimum subsidy required. e.g. London (after 1993) and Rajkot.

Currie and Delbosc (2014) reported that BRT is an attractive public transit option because of its higher journey speed. Delay at signals and higher dwell times are a major cause of lower speeds. Average journey speed is one of the dominating operational measures to assess performance of BRTS. From the available data it can be concluded that the highest and the lowest journey speeds are observed in the case of Ahmedabad and Delhi BRTS respectively.

Ahmedabad BRTS has adopted a very different phasing plan for the signals installed at the intersections of BRT corridor, the cycle time of these signals are planned in a way that the BRT lane signal goes green two times in one cycle time, although there is no priority signal installed but still this helps in reducing the overall travel time on the BRT corridor. By the available data it will be quite reasonable to comment that BRT facilities with a larger and dedicated network will have high average operating speed than the smaller segregated network.

Deng and Nelson (2013) stated that Indian BRT systems majorly have median bus ways which separates the buses from the other mix traffic. Dedicated BRT is considered to be 90% on schedule this is reasonably higher than the conventional transit system. India majorly has composite or hybrid BRT which is partially dedicated up to a certain stretch and then changes into mix traffic transit service due to limitation of ROW or due to elevated stretch. This sudden change from segregated to mix traffic facility results in reduced reliability of the system. Of the aforementioned three types of reliabilities, TTR and

 

headway regularity can be estimated using the ITS data collected by the GPS fitted in the BRTS buses.

Mahadevia et al. (2012) reports that Jaipur and Indore started as open systems but now are in line to being converted into a closed system. India started implementing the concept of BRTS since 2005. The JNNURM scheme gave full support for its implementation. In corridor length terms Janmarg has almost increased its length from 12.5 km in 2009 to 82 km in 2014 but the corridor lengths of Delhi, Pune and Indore are at a standstill. Rajkot and Surat BRTS started their operation in 2012 and 2014 respectively, so not much increase in the length is observed. Similar is the case with Bhopal BRTS, but BCLL (Bhopal City Link Limited, 2015) is actively working on increasing the BRT route length. The average spacing for stations in case of Indian BRTS is observed between 525 and 710 m (www.brtdata. org). The total network length of Indian BRT system in operation is 167.7 km which is 3.4% of the total length of BRT worldwide (4,907 km).

Wöhrnschimmel et al. (2008) conducted a study, measuring commuters' exposure to air pollutants before and after the implementation of the Metro-bus BRT system in Mexico City. It was found that human exposure to traffic related air pollutants was effectively reduced after the implementation of the BRT system. The findings further suggested that the BRT system was a less hazardous transport alternative, and actually could improve the air quality for commuters.

TTR. Sekhar and Askura (2007) reviewed various reliability measures based on travel time, this study expressed that the reliability measures which exists in the literature are mainly based on central tendency and distribution of travel time. The Pune BRTS is reported to have reasonably good operating frequency i.e. to the range of 30 s in peak hour, on the other hand Bhopal is having the lowest frequency i.e. 10 min approximately during peak hour. One important thing to note here is that aforesaid frequencies might be different if route wise estimation is done.

Flyvbjerg et al. (2006) conducted a statistically significant study of traffic forecasts in transportation infrastructure projects. It was found that passenger forecasts in an overwhelming number of rail projects were overestimated due to the prevailing political bias in favor of rail transit investments. They concluded that passenger forecasts used in rail development were "highly, systematically and significantly misleading", while the potential large financial risks of such projects were normally ignored or underplayed in the decision-making process.

## III. Description of Hyderabad City

Hyderabad, Capital of the southern Indian state of Telangana and of Andhra Pradesh. In 2014, the newly formed state of Telangana split from Andhra Pradesh and the city became joint capital of the two states. Hyderabad city is one of the oldest cities in India. It is located at 17.366 0N 78.476 0E. This metro city occupies an area of 650 km2. Every government tried it's best to plan this great developing city in many ways. Introduction of the IT sector and boom in infrastructure has made Hyderabad one of the leading cities in India.

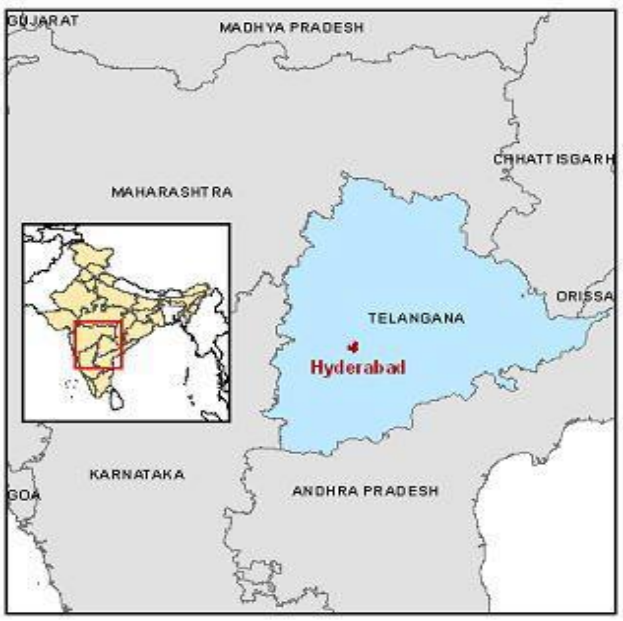


Fig. 1: Location of Hyderabad city in Telangana

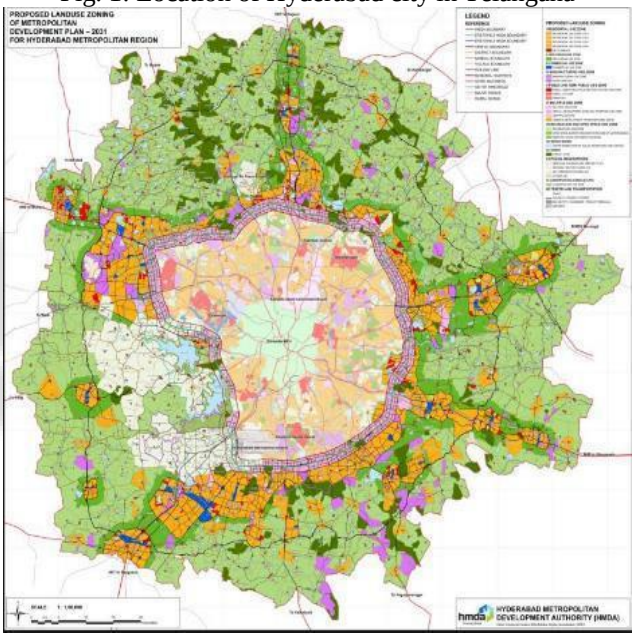

Fig. 2: Map showing land use details of Hyderabad city

## IV. Methodology

Initially the corridor has been selected from the Hyderabad city map. The selection was based on the Infrastructure, transit facilities and road geometrics available in different parts of the city. Reconnaissance survey had been conducted on the selected corridor. Finally the corridor from Mehdipatnam to HCU depot has been selected. The corridor is divided into 6 stretches considering the two way traffic flow. Traffic volume counts are conducted for each midblock between the intersections in both the directions. The volume data for two week days and two weekends at fifteen minutes interval are collected from 8am to 10pm in the night.

| S.No | Vehicle Type | Equivalency Factor |
|---|---|---|
| 1. | Passenger car, tempo , auto-richshaw, Jeep , van or Agricultural tractor | 1.0 |
| 2. | Truck , bus or agricultural tractor- trailer | 3.0 |
| 3. | Motor-cycle, scootor and cycle | 0.5 |
| 4. | Cycle – richsaw | 1.5 |
| 5. | Hourse - drawn vehicle | 4.0 |
| 6. | Bullock – cart | 8.0 |
| 7. | Head – cart | 6.0 |

Table.1 Passenger Car Equivalency Factors

| No of traffic lanes and Widths | Traffic Flows | Capacity in PCU'S per hour for various traffic conditions | | |
|---|---|---|---|---|
| | | Roads with no Frontage access, No standing vehicles, very little cross traffic | Road with frontage access but no stand-ing vehicle and high capacity intersections | Road with free frontage access, parked vehicles and heavy across traffic |
| 2- Lane | One way | 2400 | 1500 | 1200 |
| (7-7.5m) | Two way | 1500 | 1200 | 750 |
| 3-Lane (10.5m) | One way | 3600 | 2500 | 2000 |
| 4-Lane | One way | 4800 | 3000 | 2400 |
| (14m) | Two way | 4000 | 2500 | 2000 |
| 6-Lane | One way | 3600 | 2500 | 2200 |
| (21 m) | Two way | 6000 | 4200 | 3600 |

Table 2: Tentative Capacities of Urban Road between Intersections

## V. INTERPRETATION OF RESULTS

Level of service for weekday for the following stretches as follows in table 5.9

| NAME OF THE STRETCH | V/C RATIO | LEVEL OF SERVICE |
|---|---|---|
| MEHDIPATNAM – FILM NAGAR | 2.1 | F |
| FILM NAGAR – GACHIBOWLI | 1.2 | F |
| GACHIBOWLI – HCU DEPOT | 0.7 | D |
| HCU DEPOT – GACHIBOWLI | 0.9 | D |
| GACHIBOWLI – FILM NAGAR | 1.0 | E |
| FILM NAGAR – MEHDIPATNAM | 1.9 | F |

Table 3: Week Day LOS for each stretch

| NAME OF THE STRETCH | V/C RATIO | LEVEL OF SERVICE |
|---|---|---|
| MEHDIPATNAM – FILM NAGAR | 1.2 | F |
| FILM NAGAR – GACHIBOWLI | 0.6 | C |
| GACHIBOWLI – HCU DEPOT | 0.3 | B |
| HCU DEPOT – GACHIBOWLI | 0.5 | C |
| GACHIBOWLI – FILM NAGAR | 0.5 | C |
| FILM NAGAR – MEHDIPATNAM | 1.0 | F |

Table 4: Weekend LOS for each stretch

## VI. CONCLUSIONS

1) From the observations of level of service for stretches between Mehdipatnam to Film Nagar,Film Nagar to Gachibowli ,Film Nagar to Mehdipatnam for weekday,and for weekends between Mehdipatnam to Film Nagar, Film Nagar ; it is found out that level of service of F which indicates that road operations to be extremely low speeds caused by intersection congestion, high delay, and adverse signal progression.
2) From the observations of level of service for stretches between Gachibowli to Film Nagar for weekday; it is found out that level of service of E which indicates that road operations with significant intersection approach delays and low average speeds.
3) From the observations of level of service for stretches between Gachibowli to HCU Depot , HCU Depot to Gachibowli for weekday; it is found out that level of service of D which indicates that road situation with approaching unstable operations where increase in volume produce substantial increase in delay and decreases in speed.
4) From the observations of level of service for stretches between Film Nagar to Gachibowli, HCU Depot to Gachibowli, Gachibowli to Film Nagar for weekend; it is found out that level of service of C which indicates that road situation with stable operations with somewhat more restrictions in making mid-block lane changes LOS B. Motorists will experience appreciable tension while driving.
5) From the observations of level of service for stretches between Gachibowli to HCU depot for weekend, it is found out that level of service of B which indicates that road situation with reasonably unimpeded operations with slightly restricted maneuverability. Stopped delays are not bothersome.

## REFERENCES

[1] Bhanu Kireeti Chanda, Maddali Sai Satya Goutham(2014),Introduction to corridor selction & assessment for Bus Rapid Transit System(BRTS) in Hyderbad.American Journal of Engineering Research(AJER).
[2] Tuhin Subhra Maparu and Debapratim Pandit(2010),A Methodology for Selection of Bus Rapid Transit

 

Corridors:A Case Study of Kolkata.Institute of Town Planners.

[3] Caicedo, B., Ocampo, M., and Sanchez-Silva, M. (2012). An integrated method to optimise the infrastructure costs of bus rapid transit systems. Structure and Infrastructure Engineering, 8(11), 1017-1033.

[4] Delmelle, E. C. and Casas, I. (2012). Evaluating the spatial equity of bus rapid transit based accessibility patterns in a developing country: The case of Cali, Colombia. Transport Policy, 20(March), pp. 36-46.

[5] Deng, T. T. and Nelson, J. D. (2009). Analysis of an efficient urban transport system: lessons learned from Beijing Southern Axis Bus Rapid Transit Line 1, Proceedings of the 14th HKSTS International Conference, 2, pp. 719-727.

[6] Hensher, D. A. and Golob, T. F. (2008) .Bus Rapid Transit systems: A comparative assessment, Transportation, 34(4), pp. 501-518.

[7] Levinson, H. S., Zimmerman, S., Clinger, J. and Rutherford, S. (2002). Bus Rapid Transit: An Overview. Journal of Public Transportation, 5(2), pp. 1-30.

[8] Tirachini, A. and Hensher, D. A. (2011). Bus congestion, optimal infrastructure investment and the choice of a fare collection system in dedicated bus corridors. Transportation Research Part B: Methodological, 45(5), pp. 828-844.

[9] Rahman, M. M., Wirasinghe, S. C. and Kattan, L. (2012a). Users' Views on Current and Future Real-Time Bus Information Systems. Journal of Advanced Transportation. DOI: 10.1002/atr.1206.

[10] Rahman, M. M., Wirasinghe, S. C. and Kattan, L. (2012b). Optimal Busway Length in an Urban Corridor, working paper, Department of Civil Engineering, Schulich School of Engineering, University of Calgary, Canada.

[11] Patankar, V. M., Kumar, R. and Tiwari, G. (2007). Impacts of bus rapid transit lanes on traffic and commuter mobility. Journal of Urban Planning and Development, 133(2), pp. 99- 106.

 