Novelty Journals

ISSN 2394-7349

International Journal of Novel Research in Engineering and Science
Vol. 2, Issue 1, pp: (50-55), Month: March 2015 - August 2015, Available at: www.noveltyjournals.com

Analysis and Remedies of Bus Transit System for Pune City

Amruta A. Rukade[1], D. B. Desai[2], A.K.Gupta[3]

[1] PG Student, [2] Professors, Head of Dept., [3]Professor, Principal I/C
[1,2,3] Department of Civil Engg, Dr.J.J.Magdum College of Engg, Jaysingpur

Abstract: **For the last two decades Pune has registered a steep growth in number of public-private vehicles. But the road infrastructure and the utilities have not expanded in commensurate with increase in number of vehicles. The City manifests all the problems of a metropolis like increase in traffic congestion, speed reduction, environmental pollution and degradation quality of life. The problem of urban congestion has been brought out by an unprecedented growth in motorized vehicles which is further aggravated by the interstate truck movement that cuts through the Pune City. Existing public bus service falls short while catering to rising demand. This paper briefly explains to study the concept of BRT and to implement the BRT which factors are required to study the impact on city structure. In this paper, we study the existing city structure and transportation system of Pune city.**

Keywords: **BRT, Bus lanes, LRT, Curb lanes, PMC, PMR.**

1. INTRODUCTION

Pune city is an important urban center in Maharashtra. The city has started experiencing problems in safe and easy movement of people and goods. Traffic and transportation problems in Pune Metropolitan Region have aggravated very fast, firstly due to the population increase through migration and secondly phenomenal rise in vehicle population. The Metropolitan Region is a twin establishment where industrialization at present is concentrated in the Pimpri-Chinchwad Municipal Corporation area, while the Pune City has all the office establishments, state, central, semi-government offices and Commercial Centers with high-density residential habitat. Besides Pune Municipal Corporation Area (PMC), the Pimpiri-Chinchwad Municipal Corporation (PCMC), the Pune Metropolitan Area (PMA) also includes Cantonment Boards of Pune and Kirkee and some villages.

As per 2011 census population of the Pune City is a home to 32 lacs people and 26 lacs vehicles. The city has experienced steep enormous population growth due to inward migration of both skilled and unskilled labor for rising industrial base and service sector. For the last two decades Pune has registered a steep growth in number of public-private vehicles. But the road infrastructure and the utilities have not expanded in commensurate with increase in number of vehicles.

2. BRT: CONCEPT

BRT has been defined “a rapid mode of transportation that can provide the quality of rail transit and the flexibility of buses. BRT is a flexible, rubber-tired form of rapid transit that combines stations, vehicles, services, running ways, and ITS elements into an integrated system with a strong identity. BRT applications are designed to be appropriate to the market they serve and their physical surroundings, and they can be incrementally implemented in a variety of environments (from rights-of-way totally dedicated to transit—surface, elevated, underground—to mixed with traffic on streets and highways).

In many respects, BRT is rubber-tired light rail transit (LRT), but with greater operating flexibility and potentially lower costs. Often, a relatively small investment in dedicated guide ways can provide regional rapid transit.

Bus rapid Transit systems comprises of:

2.1 Bus lanes: A lane on an urban arterial or city street is reserved for the exclusive or near-exclusive use of buses.

Figure 1: Bus Lanes

2.2 Bus streets and bus ways: A bus street or transit mall can be created in an urban center by dedicating all lanes of a city street to the exclusive use of buses.

2.3 Bus signal preference and preemption: Preferential treatment of buses at intersections can involve the extension of green time or actuation of the green light at signalized intersections upon detection of an approaching bus. Intersection priority can be particularly helpful when implemented in conjunction with bus lanes or streets, because general-purpose traffic does not intervene between buses and traffic signals.

2.4 Traffic management improvements: Low-cost infrastructure elements that can increase the speed and reliability of bus service include bus turnouts, bus boarding islands, and curb realignments.

2.5 Faster boarding: Conventional on board collection of fares slows the boarding process, particularly when a variety of fares is collected for different destinations and/or classes of passengers. An alternative would be the collection of fares upon entering an enclosed bus station or shelter area prior to bus arrivals. This system would allow passengers to board through all doors of a stopped bus. A self-service or "proof-of-payment" system also would allow for boarding through all doors, but poses significant enforcement challenges. Prepaid "smart" cards providing for automated fare collection would speed fare transactions, but would require that boarding remain restricted to the front door of the bus. Changes in bus or platform design that could provide for level boarding through the use of low-floor buses, raised platforms or some combination thereof could make boarding both faster and easier for all passengers.

2.6 Integration of transit development with land use policy: Bus Rapid Transit and compact, pedestrian-oriented land use development are mutually supportive. The clustering of development has the additional benefit of conserving land and promoting the vitality of neighborhoods and urban commercial centers. Bus Rapid Transit can be most effective when integrated within a broader planning framework encompassing land use policies, zoning regulations, and economic and community development.

2.7 Improved facilities and amenities: The operational and travel time benefits resulting from the separation of buses from general-purpose traffic can be augmented with improved amenities such as bus shelters and stations.

3. IMPLEMENTATION OF BRT

3.1 Planning:

BRT should be developed as an outgrowth of a planning and development process that stresses problems and demonstrated needs rather than solution advocacy. BRT calls for early and continuous community and decision-maker support. State, regional, and town cooperation is essential; transit planners, traffic engineers, and urban planners must work together.

A key issue, unique to BRT planning, is dealing with modal biases in the system planning process and the perceived greater desirability of rail transit. Other issues, similar to planning for any rapid-transit mode, include finding suitable corridors for BRT, obtaining street space for buses and sidewalk space for stations, achieving effective enforcement, and overcoming fragmentation of responsibilities and conservative agency attitudes.

Planning BRT projects calls for a realistic assessment of demands, costs, benefits, and impacts. The objective is to develop a coordinated set of actions that achieves attractive and reliable BRT services, serves demonstrated demands, provides reserve capacity for the future, attracts automobile drivers, relates to long-range development plans, and has reasonable costs. Key factors include the following:

3.1.1 Land Use: *the intensity and growth prospects of activity centres, urban growth and expansion, development and growth patterns, and locations of major employment centres and residential developments in relation to potential BRT routes.*

3.1.2 Road Network: *street width continuity, capacity, congestion, and opportunities for off-street running ways.*

3.1.3 Bus Operations: *past and future projected transit use, operating speeds, and Reliability. Community willingness to support public transport, foster transit-oriented development, and enforce bus lanes is essential; therefore, extensive and effective public participation in the decision-making process can facilitate BRT implementation.*

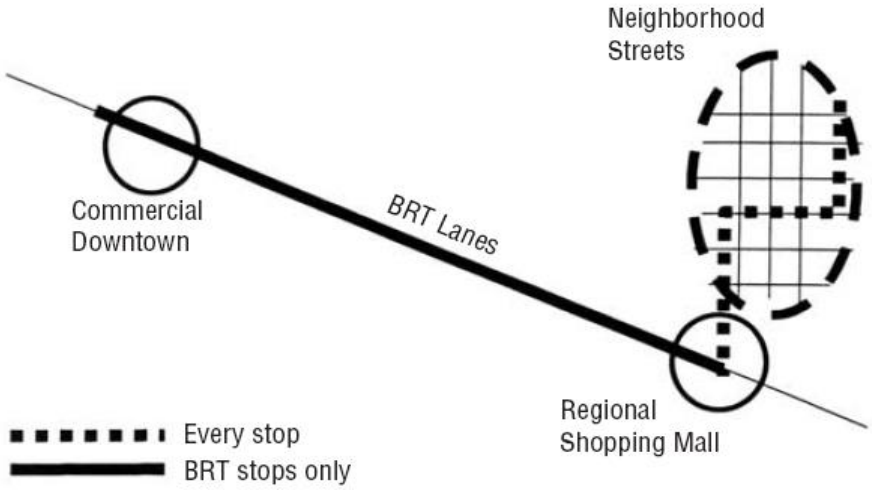

Figure 2. Bus operation system

A BRT plan should be developed as an integrated system that adapts attributes of rail transit, focuses on major markets, emphasizes speed and reliability, takes advantage of incremental development, and establishes complementary transit-first policies. Other system attributes that are equally important include the times during which service is available, frequency/headways, walking distances, waiting times, transfers, in-vehicle time, a clean and appealing image, and fare collection strategies. The elimination or reduction of system features to cut costs should be avoided. BRT is especially desirable in large cities and urbanized areas where passenger flows need frequent service, and there is a sufficient "presence" of buses. The following generalized standards should be applied as a starting point for BRT planning and design:

3.2 Running ways:

Running ways are the key element of BRT systems around which the other components revolve. Running ways should allow rapid and reliable movement of buses with minimum traffic interference and provide a clear sense of presence and permanence. Because buses have higher occupancies than private automobiles, economic benefits can result from increased ridership attraction, passenger time savings, and operating costs.

Novelty Journals

ISSN 2394-7349

International Journal of Novel Research in Engineering and Science
Vol. 2, Issue 1, pp: (1-5), Month: March 2015 - August 2015, Available at: www.noveltyjournals.com

3.2.1 General Guidelines:

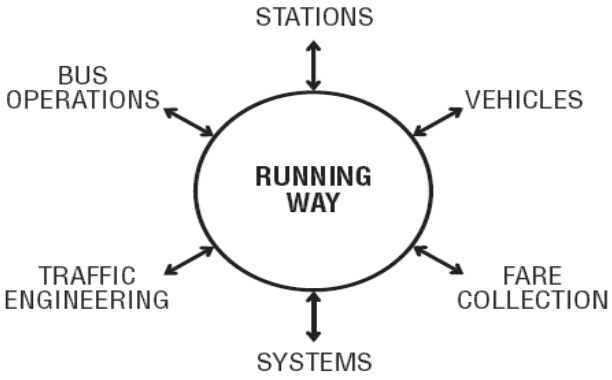

Figure3. Running Ways

BRT may run in dedicated bus ways, in freeway rights-of-way, or on city streets.

Some general guidelines are the following:

- Running ways should serve and penetrate major travel markets.
- BRT is best achieved by providing exclusive grade-separated right-of-way.
- BRT running ways should follow streets and roadways that are relatively free flowing wherever possible.
- Buses should be able to enter and leave running ways safely and conveniently.

3.3 On-Street Running Ways:

On-street BRT running ways provide downtown and residential distribution and serve corridors where market factors, costs, or right-of-way availability preclude providing bus ways (or reserved freeway lanes). On-street running ways also may be the first stage of future off-street BRT development and establish ridership during an interim stage. Each type of on-street running way has its strengths and weaknesses:

• *BRT operations in mixed traffic flow* can be implemented quickly at minimum cost, but can subject buses to general traffic delays, and there is little or no sense of BRT identity.

• *Concurrent flow curb bus lanes* are easy to install, their costs are low, and they minimize the street space devoted to BRT. However, they are usually difficult to enforce and are the least effective in BRT travel time saved. Conflicts between right-turning traffic and pedestrians may delay buses.

• *Contra flow curb lanes* enable two-way operation for buses on one-way streets, may increase the number of curb faces available for passenger stops, completely separate BRT from general traffic flow, and are generally self-enforcing. However, they may disperse BRT onto several streets, thereby reducing passenger convenience. Contra flow curb lanes require buses to run against the prevailing traffic signal progression, limit passing opportunities around stopped or disabled buses (unless multiple lanes are provided), conflict with opposing left turns, and may create safety problems for pedestrians.

• *Concurrent flow interior bus lanes* remove BRT from curbside frictions, allow curb parking to be retained, and provide far-side bus "bulbs" at stops for passenger convenience. However, they generally require curb-to-curb street widths of 60 to 70 feet, and curb parking maneuvers could delay buses.

• *Median arterial busways* physically separate the BRT running ways from general traffic, provide a strong sense of BRT identity, eliminate conflicts between buses and right-turning automobiles, and can enable the bus ways to be grade separated at major intersections. However, they require prohibiting left turns from the parallel roadways or providing

special lanes and signal phases for these turns. Median arterial busways also require wide streets—generally more than 80 feet curb to curb, and their costs can be high.

• *Bus-only streets* remove BRT from general traffic, increase walking space for pedestrians and waiting space at stations, improve BRT identity, and improve the ambience of the surrounding areas. However, they need nearby parallel streets for the displaced traffic and provisions for goods delivery and service access from cross streets or off-street facilities. They are generally limited to a few city blocks.

3.4 Off-Street Running Ways:

Off-street BRT running ways for line-haul BRT operations can permit high speeds and minimize traffic interferences. A desirable goal is to provide as much of the BRT route mileage in reserved freeway lanes or special bus ways as possible. The following considerations should underlie BRT development in special bus-only roads and in freeway corridors:

• Rapid and reliable BRT service is best achieved when buses operate in dedicated bus ways or reserved lanes in freeway rights-of-way. Bus ways have the advantages of better penetration of markets, closer relationship of stations to surrounding areas, better opportunities for transit-oriented development, and a stronger sense of identity.

• BRT access to freeways will benefit from bus-only ramps and/or metered ramps with bus bypass lanes. These ramps have the dual benefits of reducing bus delays and/or improving main-line flow.

• Ideally, bus ways should penetrate high-density residential and commercial areas, traverse the city center, and provide convenient distribution to major downtown activities. Bus ways should minimize branching to simplify route structure and station berthing.

• Bus ways should be located on their own rights-of-way whenever possible. Locations in order of desirability are (1) separate right-of-way, (2) one side of a freeway right-of-way, and (3) within freeway medians.

• Railroad and freeway rights-of-way offer opportunities for relatively easy land acquisitions and low development costs. However, the right-of-way availability should be balanced with its proximity and access to key transit markets. Such rights-of-way may generate little walk-on traffic, limit opportunities for land development, and require complex negotiations.

4. EXISTING CITY STRUCTURE & TRANSPORTATION SYSTEM

4.1 Pune Metropolitan Regions:

The Pune Metropolitan Region/Area encompasses the urban agglomeration of PMC, PCMC, Pune Cantonment, Khadki Cantonment and some surrounding towns and villages, and with Pune as the hub has exhibited considerable dynamism in urban industrial growth over last 3 decades. The Pune metropolitan area's main economic link is to the north-west via a road-rail corridor to the Mumbai region. Pune is well connected with Nashik in the north and Ahmednagar is the North-East. The Solapur and Satara road-rail links connect it to the south of India as well as the rich agricultural hinterlands of Western Maharashtra. It is along these regional Linkages that industries are established with various residential settlements having emerged in proximity. Among these the Pune- Mumbai corridor has emerged as the most rapidly growing zone. The PCMC, Cantonments and nearby towns have a degree of self-sufficiency in-terms of local needs and services

The population of PMR and the constituents, for which it is observed that in 2001 PMC accounts for 60.47 percentage of the total PMR population.

4.2 Population Structure:

Pune's growth and emergence as a metropolitan area has involved a great deal of change in its demographic structure, affecting the population size, its distribution as well as the occupation structure. Its population growth has accelerated along with the complexity and diversification of the economic base. In-migration has contributed to growth as a response to structural changes in the rural economy and the influx of industrial landless laborers has resulted in the densification and growth of slums in the city. While tertiary occupants grew during the fifties, secondary manufacturing occupants

have proliferated over last 4 decades. The service sector has contributed to the growth and accounts for large informal sector occupations, as well as sizable prospective of highly strolled professionals and technicians as shown in Table.

Table 1. Total Population and it's constitute

p Component	Yea Year r	
	19971997	***20012001***
Pune Metropolitan Region (PMR)	884377	1028886
Pune Municipal Corporation	538534	608071
Pune Cantonment	29342	30991
Khadki Cantonment	34542	36396
Pimpri-Chinchwad Municipal Corporation	264645	326767
Census Towns & Villages	17314	26661

5. CONCLUSION

Pune city is growing at a rate, which will set its berth as one of the developed cities, alongside Ahmadabad and Bangalore. This fast growth is fueled by the influx of people into the city for its better education opportunity and in recent past becoming an IT hub. For the last two decades Pune has registered a steep growth in number of public-private vehicles. But the road infrastructure and the utilities have not expanded in commensurate with increase in number of vehicles. The Central City is experiencing capacity gaps, parking problems, low-speed travel, congestion and urban decay. The acute shortage in supply of affordable housing within urban core has caused a construction boom in fringe areas, increase in slums putting load on existing traffic. Road safety problems are on the rise due to lack of footway and safe crossing facilities, encroachments, bottlenecks and stressful travel etc.

To control this sprawling, the planners must make a combine approach of solving it through measure which considers both development and transportation regulations. The smart growth principle suggesting mix land use development and better public transport is the proper way.

REFERENCES

[1] Benedetto Barabinoa, Eusebio Deianaa,* (2012): "On the attributes and influencing factors of end-users quality perceptions in urban transport: An exploratory analysis" SIDT Scientific Seminar.

[2] Electricwala Fatima, Rakesh Kumar (2014), "Introduction of public bus transit in Indian cities", Civil Engineering Department, S.V. National Institute of Technology, Surat 395007, India, Received 26 September 2013.

[3] Hsing-Chung Chu, M.ASCE1 (2014): "Modeling Variations in Bus Schedule Adherence at theStop Level on an Urban Arterial Road" Journal of transportatiom engineerimg, American Society of Civil Engineers.

[4] Hayati Sari Hasibuana*, Tresna P Soemardia, Raldi Koestoerb, Setyo Moersidikc (2013): "The Role of Transit Oriented Development in constructing urban environment sustainability, the case of Jabodetabek, Indonesia" 4th International Conference on Sustainable Future for Human Security, SustaiN.

[5] P. S. Kharola, Geetam Tiwari, and Dinesh Mohan Indian Institute of Technology, Delhi (2010), "Traffic Safety and City Public Transport System: Case Study of Bengaluru, India" Journal of Public Transportation, Vol. 13, No. 4.

[6] S.A.Mulay1, C.S.Dhekne2, R. M. Bapat3, T. U. Budukh4, S. D. Gadgil5 1(2013), "Intelligent City Traffic Management and Public Transportation System" Professor: Department of Computer, PVG's COET Pune, and Maharashtra, India.

[7] Yongjie Lina*, Xianfeng Yangb, Lei Jiaa, and Nan Zoua (2013): "Development of model-based transit signal priority control for local arterials" 13th COTA International Conference of Transportation Professionals.