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# Bus Rapid Transit : The Indian Experience

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## Prologue

With the economic growth and rapid urbanization there has been a sharp increase in urban transport requirements. The steep rise in personal vehicle ownership, coupled with a declining share of public transport, has led to severe problems of congestion, pollution, road accidents, etc. To deal with this challenge a number of transportation options are available; and funds availability has a major role in modal choice.

The Author, who has considerable experience in Transport Infrastructure, brings out that one of the options is optimisation of the right of way of roads

with the objective of maximizing the throughput of passenger trips instead of vehicle trips. A Bus Rapid Transit (BRT) System that creates space for pedestrians and cyclists and gives cars a separate corridor appears to be in the core of the solution. BRTs are successfully operating in many parts of the world. A pilot project in the capital city of India has been able to achieve its objectives to a very large extent. However, there is a lot of work ahead to make the BRT effective and attractive for personal vehicle users so as to enable them to make a modal shift.

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## Urban Transport Scenario

Owing to rapid urbanization coupled with economic growth, every city is experiencing corresponding increase in the travel demand. Due to lack of efficient, comfortable and reliable public transport, most of the cities are witnessing a swift growth of personal vehicles.

Population growth means more people to buy cars and motorcycles; economic growth means more people *can* buy; and urbanization means more people *will* buy vehicles. In short, a crisis is at hand. In the developing world, vehicle ownership is growing much faster than the population.

With the ever increasing number of private vehicles, the clamour to deal with congestion has become louder. The traditional response to congestion has been to

widen roads, build flyovers and elevated roads. Every Indian city is on a flyover building spree. Under the 9<sup>th</sup> & 10<sup>th</sup> Five Year Plans, over ten billion rupees were set aside for bridges and flyovers. It is now recognized world over that more roads and flyovers are not the solution. It leads to a vicious cycle; traffic increases leads to congestion, so roads are widened and that in turn encourages more vehicles to be introduced on the roads. Congestion is eased temporarily when roads are widened or flyovers built but as more vehicles are added every day, this space is quickly taken up and the situation is back to square one. In fact it gets worse.

With every additional vehicle, there is more congestion and emissions. Future problems associated with mass motorization include *reduced energy security and*, presumably, higher fuel prices. A 1997 study by Petroleum Conservation Research Association showed that idling vehicles in Delhi wasted more than 321,000 litres of petrol and 101,000 litres of diesel every day. Traffic jams cost time as well. Slow moving vehicles pollute more. The health cost – respiratory and cardiac problems – is immense. There is yet another cost. Road accidents in India cost the country one per cent of its Gross Domestic Product according to the Central Institute of Road Transport, Pune. These difficulties are likely to become serious in the perspective of urban sprawl and economic growth.

### **Delhi Scenario**

New Delhi, the capital city of India, is the second most populous city with 13.8 million inhabitants (2001 Census) and 1500 sq Km area. But in terms of vehicle population, *Delhi is not only the highest but exceeds by far the combined vehicle population of the other three metropolitan cities – Mumbai, Chennai and Kolkata.* Over the past few years, the economy of Delhi has been growing at about 10 percent per year, and vehicle ownership (cars and motorcycles) at about 15 percent. In Delhi, the rate of registration of vehicles per day has doubled between 2000 and 2006. According to the Economic survey of Delhi, the city had 1.60 million cars and 3.34 million two-wheelers in 2006-07. The number of city buses was only 8,000. Every day 1,000 vehicles are added to the city's roads. In 2001, the road length per vehicle in Delhi was 8.5 km. This has come down to 6 km per vehicle in 2007. So the driving space is *actually decreasing.* This leads to congestion, slow traffic movement and pollution. Delhi has already squandered its gain from switching to CNG. Air pollution level that had dropped from 140 microgram per cubic metre in 2002 to 100 microgram per cubic metre in 2005 due to introduction of CNG, is again on the rise. In 2007, the pollution level was up at 155 microgram per cubic metre.

The population in Delhi is heterogeneous in composition (socio-economic background and income), and this mix is reflected in the heterogeneous use of the street space. Delhi's roads have to cater to all the modes present in cities of developed countries plus hand carts, animal-drawn vehicles, a very high proportion of motorcycles and three-wheeled scooter taxis. In Delhi today, the most modern high-speed cars and motorcycles have to share the roads with slow vehicles and non-motorised modes. In 2004, New Delhi recorded 1,832 road traffic fatalities, i.e., a rate of 12 deaths per 100,000 persons.

## Public Transport

Accordingly, the consciousness about risks associated with chaotic urban transport is being recognised by the administration too. The National Urban Transport Policy states that, 'Travel in the city has become more risky .... This again has tended to impact the poor more severely as many of those killed or injured tend to be cyclists, pedestrians or pavement dwellers.'

Interestingly, roads account for 21 per cent of Delhi's total area, which is high by international standards. Therefore, the present crisis demands new solutions. And the solution is sustainable public transport since space to accommodate cars is limited and the impact of fuel-efficient technologies gets overtaken by the number of vehicles.

### Why BRT?

The success of policy initiatives aimed at public transport is palpable. Delhi Metro has proved to be a tremendous success story in Delhi. The idea was approved in 1998 with an aim to improve the traffic condition and mobility of commuters. Delhi Metro is operating around 90 trains and carrying approximately 800,000 passengers per day. The bus system, however, has its own importance. Delhi Metro can not completely replace the Bus-based system on all routes. Due to higher capital cost, low capital return and large gestation period, it is not feasible to build metro lines on all stretches. The logic of this argument is seen from the situation in other cities with well developed metro networks like London and Paris, where buses still cater to a much larger number of passenger trips than metro.

The BRT is a low-cost, flexible, mass transportation system that costs far less than a Metro system and can serve as much as 100 times the area of a rail-based system. The BRT project development and planning process is much quicker. Other considerations are: The Metro is rigid and has no flexibility while the BRT can be altered, added-to, subtracted from and redesigned at low-cost and at short notice; also, unlike the Metro, BRT can reach every part of every city and make itself accessible to other modes of feeder-transport like cycle rickshaws and three-wheeled scooters. There is a minimal need for staircases in some instances in the BRT System while it is essential in all cases for metro stations. The bus stop does not entail a long walk for the commuter unlike in the metro station; these factors make the BRT user-friendly.

An estimated 60 per cent of the motorized commuting trips are made by mass transit, the majority being by buses. But buses represent less than one per cent of the total motorized vehicles. Cars and two-wheelers represent 90 per cent of the motorized vehicles. As brought out above, several thousand people die or get injured in road accidents every year. They are mostly pedestrians or cyclists for whom there is no space on the roads, though an estimated 40 per cent of Delhi's citizen walk or cycle to work. A Bus Rapid Transit system (BRTS) / High Capacity Bus System (HCBS), that creates space for pedestrians and cyclists and gives cars a separate corridor, clearly seems to be more context relevant and in the core of the answer to Delhi's traffic problems.

We must realize that not only is urbanization here to stay, but that it seems to be the way of the future. Urbanization makes for diversity and heterogeneity in socio-economic conditions with multiple economies operating in close proximity to each other. The formal sector can keep on operating only as long as there is an *informal* sector for it to feed on. The latter is always larger because it serves both, the former and itself. If this is clearly recognized by our city-planners and policy-makers they would handle the challenge of urban travel and transportation with vision and empathy for all. The BRT is the most suitable system in promoting modal shifts to a more efficient and less polluting form of transportation.

Often, nearly fifty per cent of the inner city's population lives in low income houses (slums or shanty towns). The urban transport system must cater equally to all segments of society. If the transport infrastructure design ignores the needs of pedestrians, cyclists and public transport passengers, the latter will be forced to defy the law, exposing themselves to high risks on the road; motorized vehicles are then forced to operate at sub-optimal levels. To a large extent, from all the choices available to us, it would appear that the BRT is the one single operating mass transit system that comes close to best addressing all the relevant issues involved.

### **BRTs Across the World**

The city of Bogota in Colombia, is famous for its BRT project. This is one of the first successful BRT models. The BRT system, TransMilenio, in Bogota, carries over 1,050,000 passengers daily. The first phase of the system became operational in 2000 and is more than 60 kilometre long. TransMilenio is the first public transport system earning carbon credits. TransMilenio's estimated revenue from CDM (Clean Development Mechanism) between 2006 and 2012 is US \$20 million for reducing greenhouse gases by 1.7 million tonnes. TransMilenio was based on the BRT system in Curitiba, Brazil. Curitiba's BRT started in the 1960s. Of the 2.7 million people in Curitiba, 1.9 million use BRT. With 70 per cent of commuters using the system, Curitiba's use of the public transport system is the highest of all the Brazilian state capitals. As a result, the city's fuel consumption is 30 per cent lower than that in comparable Brazilian cities.

Today, BRTs are operating in a number of cities in different parts of the world. Further, Seoul, Tokyo, Jakarta, Lagos, Hanoi, Beijing and 20 cities in China have started work on BRTs.

### **Delhi Pilot Project**

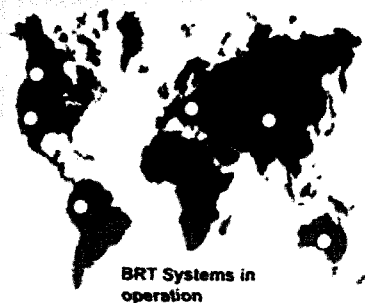
#### ***Inception and Approval***

The proposal of BRT / HCBS in Delhi was first mooted in 1996. The main motivation behind this proposal was to address the problem of growing accidents and pollution in the city. An international workshop was organized by the Delhi Transport

## BRTS ACROSS THE WORLD

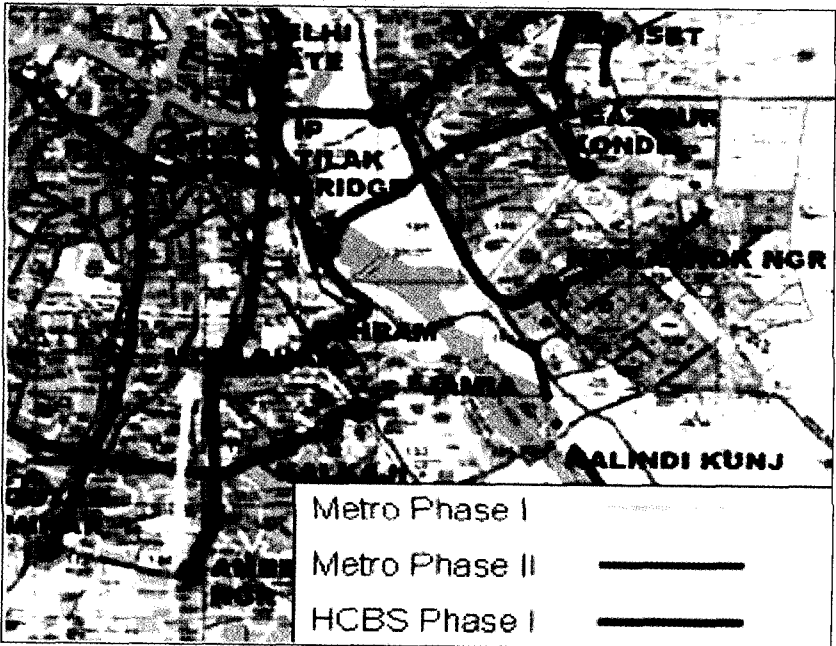
- Latin America
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  - Eindhoven
  - Essen
  - Ipswich
  - Leeds
  - Nancy
  - Rouen

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- Canada
  - Ottawa
  - Pittsburgh
  - Vancouver
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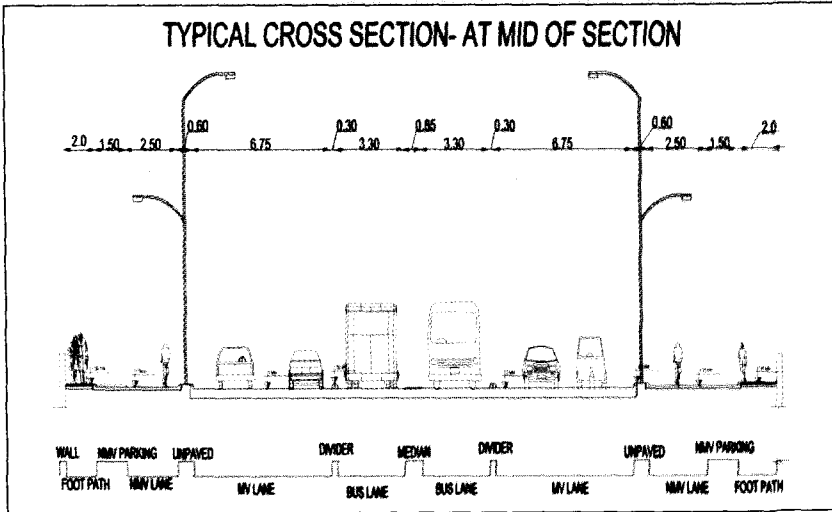
BRT Systems in operation

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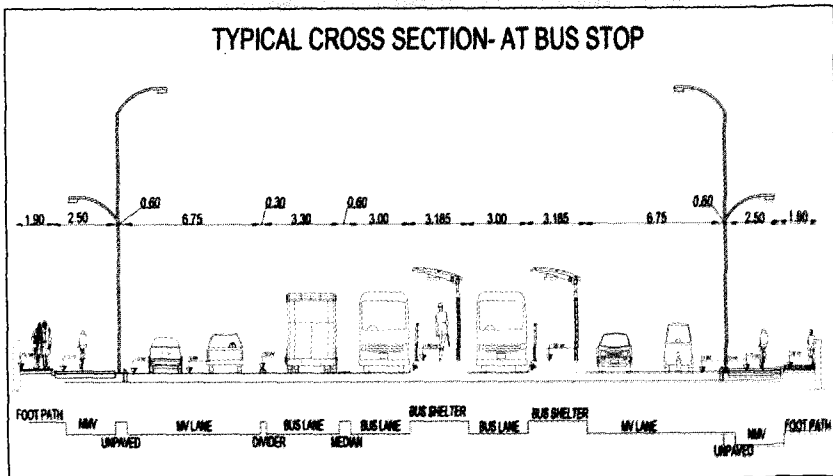


*Delhi Pilot Projects: Inception and Approval*

### TYPICAL CROSS SECTION- AT MID OF SECTION



### TYPICAL CROSS SECTION- AT BUS STOP



Corporation (DTC) and Infrastructure Development and Finance Company (IDFC) in 2001 to discuss the concept in the context of Delhi by several International experts. Following this, the Government of Delhi set up a Committee on Sustainable Transport chaired by the Chief Secretary in 2002, which recommended that BRT be implemented on all major arterial corridors of Delhi.

Extensive consultations were held with all stakeholders, which included all concerned departments, utility owners, Resident Welfare Associations along the proposed corridor. To address the issues and doubts raised by various quarters, the Government organized an international workshop in December 2005 where experts from all over the world and India were invited to examine the project. The experts observed that road based public transport provided the most effective connectivity for a majority of city residents. It did not matter how many vehicle lanes were there. What mattered was the effective width available for vehicles.

Convinced by the argument that BRT corridor is not merely road re-engineering but an overhaul of the road system, wherein the weakest and the most vulnerable are allocated road space and that it enabled the same right of way to move more people, the Government of Delhi approved the project. It also saw that many intelligent cities had adopted this system for the same reasons of efficiency, equity and environmental sustainability.

The concept, including detailed technical specifications and geometric design, was finalized by TRIPP (Transportation Research and Injury Prevention Programme), IIT Delhi. ITDP (Institute for Transportation and Development Policy), New York, was associated with TRIPP in the initial stages of conceptualization. The detailed profile design and project management was done by RITES, a Government of India Enterprise. DIMTS (Delhi Integrated Multimodal Transport Systems), a joint venture of the Government of Delhi and IDFC, was entrusted with the implementation and operation of the entire system. The progress of implementation of the project was regularly and closely monitored by the EPCA (Environmental Pollution Control Authority).

### ***Salient Features***

The first BRT corridor from Ambedkar Nagar to Delhi Gate is 14.5 km long. The first phase of the pilot Corridor (5.8 Km) became operational in April 2008. The facility stretches from Ambedkar Nagar to Moolchand Junction along JBT Marg in South Delhi. The corridor infrastructure consists of exclusive bus lanes on the right side of the carriageway, i.e., along the central median.

At each intersection there are two parallel bus platforms in addition to the bus lanes. The bus lanes flare at the intersection to accommodate these bus platforms. Bus platforms for buses travelling in opposite directions are staggered and located on either side of the intersection. Two lanes next to the bus lane are meant for other

motorised vehicles (MV). The motorised vehicle lanes flare at the intersection to provide an additional lane for turning vehicles. Bus and motorised vehicle lanes are physically segregated by concrete kerb. Running along the entire length of the corridor is a dedicated non-motorized vehicle (NMV) lane, which contributes to the safety of cyclists and reduction in ambient air pollution level. Footpaths located next to the bicycle lane are disabled-friendly with tactile and level crossing at openings. The corridor has special street lighting keeping in consideration the safety and security needs of pedestrian in particular, besides other road users. Two feet wide area between MV and NMV lanes is kept unpaved, which accommodates underground drainage, electric poles, electric and data cable, etc. Covered with greenery, this unpaved area also acts as barrier between MV and NMV lane providing enhanced psychological as well as proper safety to cyclists. Provision of parking for three-wheeled scooter taxis, which serve as feeder to buses, is kept alongside MV lane. Service lanes each way form part of the corridor wherever space is available within the Right of Way.

Bus operations include 57 different routes operated by Delhi Transport Corporation (DTC), a public company owned by the Delhi Government, and private operators (Blue Line Buses). Company and school buses are required to use the bus lanes. Emergency vehicles like ambulance, fire tender, police van are permitted to use the bus lane. The corridor can be described as an open system, i.e., bus routes enter and leave the corridor along its way. Operations do not have centralized control.

The segregated bus lanes make for faster travel of commuters in the corridor; it improves traffic management in general and as such, improves the driving conditions of all other vehicles on the road as well. The urban buses of the BRT are high speed vehicles, sometimes articulated and always very comfortable with wide doors and low floors, level with the platforms of the bus stops and with a carrying capacity of over a hundred passengers. This system, as a whole, produces a decreased load of pollution. Security, cleanliness, easy access, customer comfort, and minimal stoppage time, all combine to make for increased efficiency. Prominent and clear displays of arrival and departure timings at bus queue shelters create added value and minimize waiting anxiety. Such real-time information displays and clear signages generate a sense of customer security. The whole system with ramps and platforms is disabled-friendly and is a boon to the infirm and the old.

In the first phase, this BRT pilot corridor from Ambedkar Nagar to Moolchand junction (5.8 kilometres) has achieved three things, for the first time in India:

- It has presented the city with a public transport system that is disabled-friendly with tactile and wheelchair-friendly floorings, and low floor buses which are level with the platform.
- The entire corridor has special street lighting keeping in mind the safety and security needs of pedestrians in particular, not to mention those of the other road users.



- Running the entire length of the corridor is a dedicated bicycle lane which contributes to safety of the cyclists and reduction in ambient pollution levels.

### ***Achievements/ Effectiveness***

The corridor was opened for operation in April 2008. The corridor had teething troubles during the first two weeks as heavy traffic jams were observed. This was due to unfamiliarity with the new system which, required buses and cars to move in different lanes. Bus commuters were also not familiar with the central bus stops and most importantly there were problems in the hardware and software of the newly installed traffic signal system. After the hardware was fixed, signalization was fine-tuned and much of the problem faced by the road user was resolved. Other problems observed were lack of training of bus drivers, encroachment on the cycle track and footpath, vehicles straying into wrong lanes and cars piled up in long queues. The media unleashed relentless criticism calling the project, 'corridor of chaos', 'ill-conceived', 'a blunder', and demanding that it be scrapped. Car users and residents welfare associations of colonies along the stretch also criticized the new system – aimed at improving traffic flow. It did not ease traffic; instead it caused more traffic snarls, they said. People in cars and riding motorcycles felt that road space had been 'stolen' from them by creating a separate dedicated lane for buses.

In this outcry, fact was difficult to separate from fury. As a result, the initial public perception of the project was not good. To cut through the noise and confusion, one needs to understand that this is a system, which is specifically designed to allow public transport to carry a large number of people as conveniently and economically as possible. Hence, the media grouse that owners of private transport have been put to considerable inconvenience by the BRT serves to misrepresent the real intent of the system. The objective of the project is to give priority to sustainable modes, which include bicycles and buses and, therefore, car congestion cannot be the measure of success. To optimize the given right of way of roads, the system must **maximize the throughput of passenger trips and not vehicular trips.**

Buses stop regularly for passengers, while cars and motorcycles need to keep moving. So, in the pre-BRT scenario, a bus that halts, blocks the left lane and causes the vehicle behind it to try and merge with the right lane, thus, slowing down traffic. Also, non-motorised traffic, which prefers to hug the left lane, blocks buses from pulling into the bus stops, so buses just stop in the middle of the road. And amid all this, bus passengers must negotiate traffic to board buses. The result: underused or unused road space, slow traffic movement and increased risks to pedestrians and non-motorised traffic. The BRT aims at ensuring an equitable sharing of road space and safety by segregating traffic into different lanes depending on their speed and function. Creation of bus lane did not shrink road size; rather the usable road space by bicyclists, pedestrians, car and bus traffic increased.

In fact, the BRT system in Delhi goes several steps further than merely designing a dedicated corridor for buses. It also provides for pedestrian and cycle paths that are obstacle-free, well-illuminated, properly-serviced, and disabled-friendly, thus catering to the primary needs of over 80 per cent of the commuters on the road. Cyclists rarely figure in debates on traffic, but if one takes the BRT corridor early in the morning, it will be difficult to miss hundreds of commuters pedalling to work on the bicycle lane. On an average about 8,330 cycles and 1,020 rickshaws use the corridor. They are the biggest beneficiaries of BRT, for they are the most vulnerable on roads. Paved tracks also keep cycle lanes dirt-free.

BRT has given priority to emergency vehicles to use the bus corridors; and decreased the number of accidents on the road; Accident data indicates that since the corridor opened, there have been no fatal bicycle, motorcycle, and car crashes on this section, only pedestrians — and that is because many of them simply walk in the bus corridor. Significantly, no fatal accident on the corridor has taken place after the initial four months period of its operation. All these advantages are now being recognised by both commuters and authorities. NDTV carried out a user survey and found that 65% bus users, 88% bus drivers and the bicycle users were extremely happy and satisfied with the concept.

A May 2008 survey by volunteers from the Centre of Science and Environment and Indian Youth Climate Network recorded that while 83 per cent of all commuters supported the BRT, with major endorsement coming from bus commuters, pedestrians and cyclists, 73 per cent of car and two-wheeler drivers felt that the project should be continued. A subsequent survey in December 2008 by seven students of the Indian Institute of Technology, Delhi, has reinforced these findings by showing that 85 per cent of bus commuters felt that the BRT had been successful in promoting public transport, 88 percent claimed that bus travel was quicker and 90 per cent supported the idea of implementing it in other places. Monitoring studies undertaken during June-July 2008 (TRIPP, August, 2008) and latest evaluation by Washington based expert group EMBARQ (February, 2009) show how bus speeds have improved by 50%, car speed is same as in a parallel corridor (Khel Gaon Marg), and bus commuters and bicycle commuters find the system a huge improvement from the earlier left side bus lane in spite of encroachment, and frequent ingress of motorcyclists in violation of lane discipline. The concept is very popular with the majority users of the system, and, therefore, the pilot project has been successful in achieving the objectives.

### ***Response to Various Concerns***

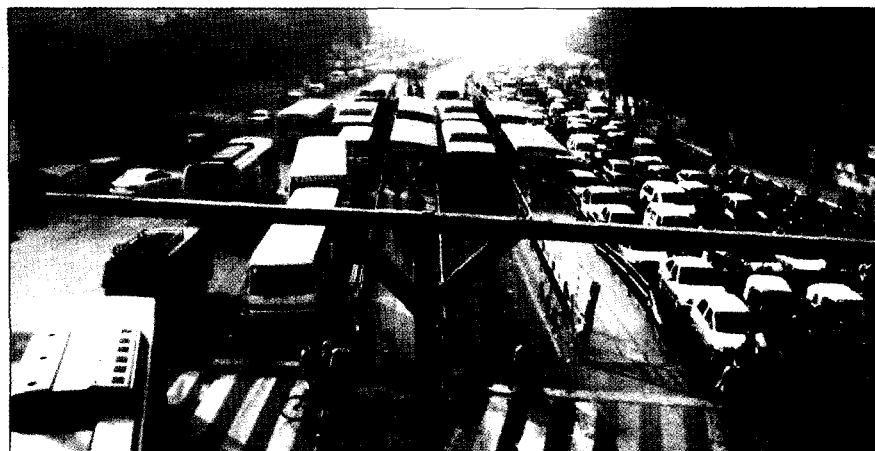
***Location of Bus Lanes and Bus Stops:*** Exclusive bus lanes on the left side are difficult to maintain because every 50-100 metres there is an opening to access various destinations like petrol pumps, offices, residential colonies, etc. The vehicles turning left, to access these destinations, would come in conflict with buses, thus, compromising safety as well as smooth flow of traffic. It is practicable to locate



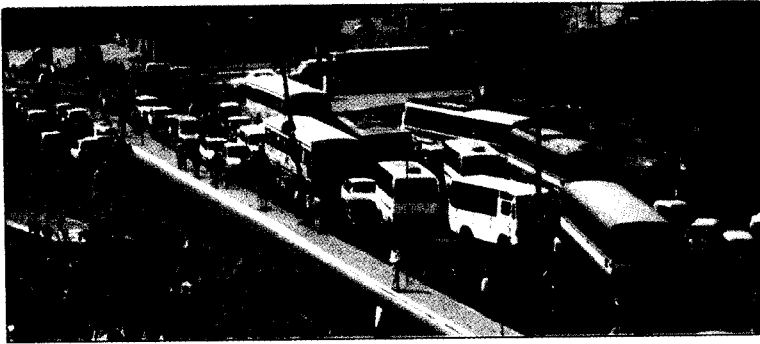
*Disabled-Friendly System*



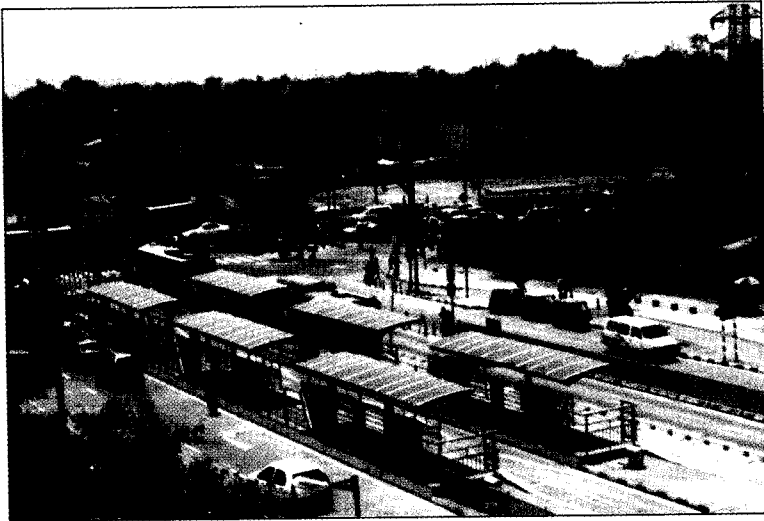
*Exclusive Cycle Track*



*Chirag Delhi: Post-BRT*

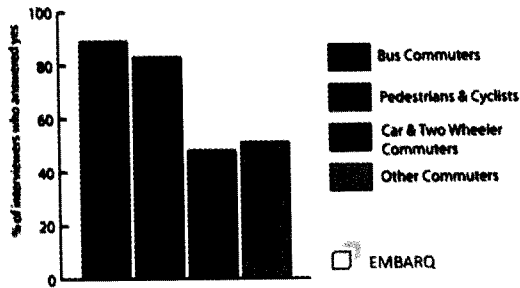


Ambedkar Nagar: Pre-BRT (Chaotic Mixed Traffic)



Ambedkar Nagar: Post-BRT (Segregated Traffic)

Are you happy with the BRT and dedicated bus lane system?



exclusive bus lane on the left side in BRT, only if continuous service lane is available to avoid this kind of conflict. Since in the pilot corridor availability of service lane was not continuous, the exclusive bus lanes were planned on the right side along with the bus stops on the near side of the junction. Detractors of this arrangement argue that pre-BRT situation was safe and convenient as the commuters were not required to move to centre of the road. Here, the moot point is that, even if the bus-stop is on this side of the road for the forward journey, it will be on the other side for the return journey, forcing the commuter to cross the whole width of the road, either before boarding the bus or after alighting from the bus. By locating the bus lane on the right (along the median) and providing bus stops right next to traffic lights and zebra crossings, it makes crossing the road as well as changing for other routes easier and safer for the commuter. In addition, this configuration has the advantage of having a separate traffic light cycle for buses so that they can pass through and turn right or left rapidly without disturbing other traffic — thus enhancing throughput and reducing risk. The bus stops along the right lane at nearside of the junctions are safe and convenient for pedestrians as well as cars because shorter duration red light is required to make the system pedestrian friendly. In fact, longer red lights are required when pedestrians have to cross the complete six lanes without any pedestrian island, which is not the case with right side lanes.

***Breakdown on a Dedicated Bus Lane:*** The divider separating the dedicated bus lanes of opposite directions are as per international standards and reflect sensitivity to local needs; the divider consists of a band of diagonally oriented rumble strips. Any unfortunate incident like a breakdown is addressed immediately and effectively without inconveniencing the others on the road because the median separating the two bus lanes is a mountable rumble strip.

***School Buses:*** Parents expressed concern regarding operation of school buses in the median lanes. According to the complaints, this resulted in unsafe travel conditions for children, as they need to cross traffic lanes to get to the curbside. The original provision that required all the buses to travel in the bus lanes was relaxed, as to allow school buses to operate in general traffic lanes and gain access to the curbside and the colonies. It is important to note that the school bus numbers are small. School buses are only 6.5% of the buses traveling on the bus lanes, and only 0.13% of the total number of vehicles crossing at Chirag Delhi Junction at the peak hour. Management of school buses can be specially targeted to provide special operations for them to address the parent's concerns, without compromising the overall performance of the bus corridor. This could be done by studying the specific bus routes and defining the points of departure from the bus lanes to gain access to the curbside and the colonies, in consultation with the parents and the schools. This should not be a major issue regarding the location of the bus lanes.

## **Work Ahead**

Interestingly, BRTs the world over ran into opposition at the project implementation stage. Getting a BRT going has initially been difficult and even painful.

The proponents of the system have had to face public anger. Few corridors have been implemented without initial difficulties, but most of them were solved gradually as projects progressed. A practical mechanism to assure gradual improvement is to establish a quality improvement program in which the performance is measured periodically, and specific actions are taken to address the identified concerns.

The initial implementation incorporates some elements of a “High End” Bus Rapid Transit paradigm, but other components can be incorporated gradually, such as improved vehicles, fleet management and user information systems, but particularly, enhanced service plans.

There are also some advances in performance, as the corridor greatly improved the travel experience for the bus commuters. Nevertheless, key elements of reliability, comfort and safety need to be addressed and adjusted.

A bus system is reliable if it provides consistent waiting and travel times. This is achieved through low variability of the bus intervals (consistent frequency) and low variability of the bus commercial speeds. Reliability is fundamental in attracting passengers to the bus system, and can be improved through the transit operations (consistent dwell times and driving practices, regular dispatch, control of the bus intervals along the route). Fleet management systems, using automatic vehicle location and online supervision, are desirable to monitor and help bus operations achieve reliability.

In transit systems, comfort refers to several attributes of passenger experience such as occupancy level in buses and station platforms, availability of user information, integration with other transport modes, and perception of safety and security, etc. Comfort is probably the most important factor in making a transit system attractive for motor vehicle users. Comfort can be improved by:

- increasing the capacity and reliability of the bus system (more frequent buses, consistent arriving times and speeds)
- the adequacy and quality of user information elements (fixed signs, maps, variable message signs)
- the connections and systems to integrate the bus corridor with other transport systems, including seamless pedestrian crossings, integrated fare collection systems preferably with the option of pre-payment, and
- the improvement of bus stops in terms of tidiness and presence of protection systems (security personnel, CCTV, alarm and communication elements).

It is necessary to address the outstanding traffic safety needs of the corridor through a combination of measures such as: safe crossings at the other end of the bus stations (preferably at grade), better management of the bus operations to reduce spill-over at the stations, review of the infrastructure devices that prevent jaywalking, and increased education and enforcement. Enforcement may require passing new legislation to be able to penalize users; similar to the Delhi Metro Railways – Operation and Maintenance Act 2002, which includes penalties for inadequate user behavior. The goal should be to reduce fatalities to zero.

Improving the supply and quality of public transportation is not enough to bring environmental sustainability to the rapidly growing cities in India. Only comprehensive policies that promote active transport – biking and walking – coupled with cars – use disincentives and restraint policies have proven effective in curbing motorization and pollution worldwide. Places like Singapore, Beijing, London, Paris, New York City, Bogotá, and Sao Paulo provide good examples of such effective and comprehensive approaches, while retaining economic vitality. Adaptation of the world class examples to the particular conditions and culture of Indian cities is possible and desirable.

### **BRTs in India**

Delhi Government plans to build 26 BRT corridors in Delhi, covering a total length of 310 km by 2020. Seven BRT corridors in phase I are planned to be built by 2010. The Techno Feasibility Study of the remaining six BRT Corridors of Phase I has been completed and Detailed Project Reports in respect of two of these corridors are under preparation. Besides, the BRT system is being implemented in some other cities of India under Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Construction work is in progress in Indore, Jaipur, Ahmedabad and Rajkot, whereas work in Bhopal, Surat and Visakhapatnam is in an advanced stage of planning. In Pune, the BRT is in operation, and modifications for improvements are also going on.

### **Conclusion**

Urban transport is an integral part of urban development and demands a conscious decision making. The technical aspects are simple. The difficult decisions relate to who is going to benefit from the models adopted. Do we dare create a transport model different from that in the so-called advanced world cities? Do we dare create a transport system giving priority to the needs of the poor majority rather than the automobile owning minority? Are we trying to find the most efficient, economical way to move a city's population, as cleanly and comfortably as possible? Or are we just trying to minimize upper classes' traffic jams?

The Clock is ticking fast. Roads in Indian cities are getting saturated by vehicles. There is no option but to build a public transport system efficient and attractive

enough to replace cars. Therefore, the BRT concept cannot be abandoned; it must be improved to make it work. The success of the Delhi BRT cannot be judged so early just by constructing a 5.8 kilometre pilot corridor. It will take time and discipline. One measure of success will be in reduction in the number of private vehicles on the road. And that won't happen until a full network of BRT corridors is developed, various public transit systems are interconnected and parking facilities created for car users, so that they can take the bus. Making public transport score over cars in terms of comfort, speed, accessibility, cost and convenience is a tall order, but is achievable. Giving buses a right of way is in everybody's interest; it frees space for cars, since in unsegregated traffic buses block more space.

Urban India can not now afford to miss the bus.

### References

1. Hidalgo, Dario & Pai, Madhav : 'Delhi Bus Corridor: An Evaluation', EMBARQ, February 2009.
2. Gupta, K K : 'New Delhi-Need for Integration and Proposed Structure for an Integrated Transport Authority', M Sc Dissertation ,2005.
3. Cover story: Down to Earth, 16-31 May, 2008.
4. Cover story: Civil Society Vol 5 No 7, May 2008.
5. Economic Survey of Delhi 99-2000,2001-02,2003-04,2005-06,2007-08  
[www.delhiplanning.nic.in/ecosurvey.htm](http://www.delhiplanning.nic.in/ecosurvey.htm)
6. Roy, Dunu : 'Left lane's not the right lane', Business standard, 5 April, 2009.  
[www.business-standard.com](http://www.business-standard.com)
7. [www.dimts.in](http://www.dimts.in)
8. [www.cseindia.org](http://www.cseindia.org)
9. [www.pcra.org](http://www.pcra.org)
10. [www.iitd.ac.in/~tripp](http://www.iitd.ac.in/~tripp)