

# Mass Rapid Transit

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## Abstract:

*Public transport system provision is viewed as an important component of the overall transportation planning and management process. Rapid Transit System thus plays a key role in the scenario of public transport considering viability particularly in urban areas. This paper deals with the trends in the provision and usage of Mass Rapid Transit System (MRTS), its policy goals and strategic approaches, supported by a case study of Delhi Metro. Statutes in consort with other legislations and acts enforced by Central, state government and local institutions must be followed in adherence with for effective functioning of MRTS. Strategic implementation of these policies alone can give an impetus to the use of mass transit which then could lead to higher*

*regional utilisation of this public transportation system.*

## Keywords:

Public transport; MRTS; policies; Delhi Metro

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## Introduction

With faster growing development and ever increasing GDP, India is rising in every term including population, economy, infrastructure and so forth. The population growth rate being more than 6% per year, there is a mass exodus observed from rural to urban area. This results into traffic congestion, poor transport systems, along with poor sanitation and lack of availability of living space. In such scenario mass rapid transit system plays a vital role in managing the city traffic and providing an economically viable alternative for the poor. Rapid Transit System thus plays a key role in the scenario of public transport considering viability particularly in urban areas.

Due to ever increasing rates of oil and inflation, it is very difficult for a common man to acquire his own private vehicle for transportation. Under such circumstances, mass transit system caters areas with augmented passenger carrying capacities for transport within cities & having higher service frequency.

Delhi Metro Project is the biggest urban intervention since independence. Unique feature of Delhi Metro is its integration with other modes of public transport, enabling the commuters to conveniently interchange from one mode to another. The Delhi Metro case study has specifically been taken up since its India's first modern public transportation system which can act as an ideal model for future public transport systems. To summarise, MRTS, if managed judiciously would rise to be the future of efficient public transport network, reducing

the travel time and improving the quality of journey.

## 1. Mass Rapid Transit System

### 1.1 Need of MRTS

Transport demand in most Indian cities has increased substantially, due to increase in population as a result of both natural growth & migration from rural areas & smaller towns. Availability of motorized transport increases in household income & increases in commercial & industrial activities have further added to transport demand. In many cases the demand has outstripped the road capacities. As the cities grow in size, the no. of circular trips on road system goes up. Individual cities cannot afford to cater only to private modes of transportation as cars & scooters or bikes. This necessitates a pragmatic policy to discourage private modes & encourage public or mass transit modes once the traffic along any travel corridor in one direction exceeds 20000 persons per hr. Thus the introduction of Mass Rapid Transit Systems is called for.

MRTS are capital intensive & have a long gestation period. It has been observed that in developed countries, planning for mass rapid transit system starts when the city population exceeds 1 million, the system is in position by the time the population reaches 2 to 3 million & once the population exceeds 4 million or so, planned extensions to the MRTS is vigorously taken up. But on the other hand, in developing countries including India, because of paucity of funds, planning & implementation MRTS has been lagging behind the requirement. As far as MRTS in

Indian cities is concerned, Rail Based Transit Systems in less than 10 cities out of all the cities with population in excess of 1 million.

Rail systems and bus ways operating 'trunk-and-feeder' services require more interchange.

### 1.2 Types of MRT

- Bus ways – these are generally segregated sections of roadway within major corridors, with horizontal protection from other traffic, and priority over other traffic at junctions, which are generally signalized.
- Light Rail Transit (LRT) – this is at-grade, with similar horizontal protection to bus ways.
- Metros – these are fully segregated, usually elevated or underground. It is the segregation that is critical to providing a rapid service, and the technology that allows a high mass ridership to be carried.
- Suburban rail – these services are usually physically part of a larger rail network, usually at-grade and fully segregated incorporating road-rail segregation or controlled level-crossings.

### 1.3 Comparison of criteria of MRT Options

- Use of space  
 Bus ways: It usually involves reallocation of existing road space.  
 LRT: It often does the same, but may also add new capacity, e.g., when using former rail alignment.  
 Metros: They add new capacity, typically increasing the passenger-carrying capacity of a major corridor by a factor of 3 (they may have no impact on road capacity, or if elevated lead to small reduction).
- Integration  
 All systems require interchange to provide an integrated public transport system.

- Capacity  
 Bus ways depending on specification, have a practical capacity of 10-20,000 passengers per hour per direction (pphpd), or occasionally higher.  
 Metros by comparison carry very large passenger volumes – 60,000 pphpd or higher; and high-specification suburban rail can typically carry 30,000 pphpd.
- Level of service  
 Bus systems perform less well in these respects.  
 Rail systems can generally provide a high quality ride, and when segregated, regularity.
- Ability to segment the market  
 Bus systems have this ability, by running basic and air conditioned/guaranteed seated/express buses.  
 Rail systems exceptionally provide women-only carriages, but otherwise do not segment the market.

## 2. MRTS POLICIES

### 2.1 Past:

Originally, state governments attempted to implement metro rail projects through various Tramways Act. However, the Commissioner of Railways Safety (CRS), who operates under the Ministry of Civil Aviation, is tasked with providing safety

certification for metro rail projects. The CRS refused safety certification unless the projects were implemented under a Metro Act enacted by the state government and published in The Gazette of India.

Research Design and Standards Organization (RDSO), another railway entity, also refuses certification to projects not implemented under the criteria. Subsequently, several state governments have enacted their own Metro Acts.

## 2.2 Current:

Construction of metros in India is governed by the centrally enacted "The Metro Railways (Construction of Works) Act, 1978" which provides for the construction of works relating to metro railways in the metropolitan cities and for matters connected therewith.

Operation and maintenance of metros is governed by "The Delhi Metro Railway (Operation and Maintenance) Act, 2002". Both laws were amended in 2009 with the passing of "The Metro Railways (Amendment) Act, 2009". The amendment expanded the coverage of both the acts to all metropolitan areas of India.

The ministry of urban development (MoUD) is the nodal agency to execute metro rail projects in the next 10 years in all Indian cities with a population of more than two million. However, The Metro Railways Amendment Act, 2009, empowers the ministry of railways to take the final call in respect of technical planning and safety issues concerning these projects.

## 2.3 Future:

As per statues mentioned in the National Urban Transport Policy, the Central Government would encourage the setting up of umbrella bodies that regulate the overall performance of the public transport system and ensure that the city has a comprehensive public transport system. Such bodies would design networks and routes, assess demand, contract services, monitor performance, manage common facilities like bus stations and terminals. They would have representation from all the major operators and stakeholders. Capacity building will have to be addressed at two levels – institutional and individual.

At the institutional level, capacity building would primarily involve creating a pool of knowledge and knowledge management centre that would sustain and enhance expertise as well as facilitate more informed planning. The Institute of Urban 16 Transport (India), an existing institute under the purview of the Ministry of Urban Development would be suitably strengthened to discharge this responsibility. It would be built up to serve as a national level facility to provide continuous advice and guidance on the principles of good urban transport planning as emerges from its research. Advice on new technologies would also be regularly available to implementing agencies from this institute. For this purpose, the institute would become a store house of information on the various public transport technologies being used in different parts of the world and would maintain the latest information and literature on the experience with such technologies.

At the individual level, training and skill development of the public officials and other public functionaries would be taken

up to make such officials aware of the nuances of urban transport planning and the specific issues involved in managing city transport. This would be targeted at personnel belonging to the State transport departments, municipal corporations, metropolitan development authorities, traffic police, environmental authorities, State Transport Corporations, Public Works Departments, etc. In order to build up the necessary capacity to adopt proven technologies for public within the country, the Central Government would facilitate joint ventures and collaboration agreements between such technology providers and suitable Indian companies by way of financing customized prototypes, development of designs to suit Indian conditions, trial operations and training of the technical personnel.

### **Policy and Institutional Reform**

- Infrastructure Pricing
- Service Provision & Pricing
- Urban Transport System Financing
- Strengthened Institutions
- Sound Political Framework

## **3. MRTS STRATEGIES**

### **3.1 Improving the Operational Efficiency of Mass Transit:**

- Investment decisions based on comparative analysis of strategic objectives, technological alternatives, and socio-economic and financial implications—not on short-term political or commercial opportunism.
- Rail-based mass transit systems have a role only in very large cities, as these are less

congesting and serve the peripherally located in work journeys.

- Plans for urban rail systems must be part of an overarching urban transport strategy—physical and fare integration between modes, especially to avoid the exclusion of the poor.
- Mass transit projects should be cautiously appraised vis-à-vis fiscal sustainability and affordability, given the very high costs of building and operating, and since these can prove expensive for passengers, especially the poor.
- Mass transit interventions appear to yield the greatest benefits when incorporated into citywide price-level, with an advance estimation of full cost of investment on municipal budgets, fares and impacts on the poor.
- In cases of very high demand for faster movement, private capital finance can be secured for investments in roads and metros. Examples include Bangkok, Buenos Aires and Kuala Lumpur.
- Public sector must maintain a strategic, planning and regulatory role in such scenarios – need very high quality public institutions to perform this role.

## **4. DELHI CASE STUDY**

### **4.1 Delhi Metro**

Delhi Metro is being built and operated by the Delhi Metro Rail Corporation Limited (DMRC). The Delhi Metro is a rapid transit system serving Delhi, Gurgaon, Noida and Ghaziabad in the National Capital Region of India. As of November 2010, DMRC operates around 2,700 trips daily between 6:00 and 23:00 running with an interval of 2.5 minutes between trains at peak frequency.

#### **4.1.1 Delhi Metro as world class Metro**

Delhi Metro, to ensure reliability and safety in train operations, is equipped with the most modern communication and train control system. It has state-of-art air-conditioned coaches. Ticketing and passenger control are through Automatic Fare Collection System, which is introduced in the country for the first time. Travelling in Delhi Metro is a pleasure with trains ultimately available at three minutes frequency. Entries and exits to metro stations are controlled by flap-doors operated by 'smart-cards' and contact less tokens. For convenience of commuters, adequate numbers of escalators are installed at metro stations.

To increase ridership of Delhi Metro, feeder buses for metro stations are Operating. In short, Delhi Metro is a trendsetter for such systems in other cities of the country and in the South Asian region.

The trains are mainly of four coaches, but due to increase in passengers' numbers, six-coach trains are also added on the network, with first coach reserved for ladies only.

#### **4.1.2 Metro Project**

As of 2011, the whole of Phase-I and parts of Phase-II are complete, with the network comprising six lines with 140 metro stations and a total length of 189.7 km.

#### **4.1.3 Ridership**

Delhi Metro recorded the highest ever ridership figure of 18, 30,944 in 2011. Currently, DMRC has a pool of 200 train sets with 69 of these being six coach formations. At present; the Delhi Metro is operational on six lines where more than 2500 train trips are made each day traversing over 69000 KMs in a day.

With Phase-III of the network expected to cover about 108 km, the Delhi Metro network will become 295 km by 2016 making it one of the fastest expanding Metro networks in the world carrying about 4 million passengers.

#### **4.1.4 Ticketing**

Delhi Metro commuters have three choices for ticket purchase.

RFID tokens are valid only for a single journey on the day of purchase and the value depends on the distance travelled. Travel cards, which are most convenient for frequent commuters, are valid for one year. Tourist cards can be used for unlimited travel on the Delhi Metro network over short periods of time. There are two kinds of tourist cards — with validities of one and three days respectively.

#### **4.2 Delhi Metro Policies**

Planning for the metro started in 1984, when Delhi Development Authority and the urban Arts Commission came up with the proposal for developing a multi-modal transport system for the city. For implementation and subsequent operation of Delhi MRTS, a company under the name Delhi Metro Rail Corporation was registered on 3<sup>rd</sup> May 1995 under the Companies Act, 1956. DMRC has equal equity participation from GOI and GNCTD.

#### **4.2.1 DMRC's Environment, Health & Safety Policy (Operations and Maintenance)**

Delhi Metro Rail Corporation accords high priority to Environment, Occupational Health and Safety (EHS) in maintenance of stations, structures and systems. In this endeavour, the DMRC has the following aims:

- To strive for continual improvement in its Environment, Health & Safety policies, processes and procedures.
- To comply with local and national Environment, Health & Safety Laws.
- To make efforts to create Environment, Health & Safety awareness amongst its employees, metro users and maintenance personnel.
- To maintain assets so as to enhance their aesthetic appeal, optimize the use of energy, because minimum negative impact to the environment and to ensure safety of the personnel.

#### **4.2.2 DMRC's Environment Policy**

Rehabilitation and Resettlement Statement –Green Park to Qutub  
To adopt environment-friendly construction methods and practices so as to cause minimum inconvenience to the public and prevent ecological degradation.  
To create assets that are aesthetically appealing, optimize the use of energy and cause minimum impact on the environment.

To conserve and enhance green cover through transplantation of trees and compensatory afforestation.  
To take all efforts to create environmental awareness among our employees, contractors and metro users.  
To strive for continual improvement in our environmental policies, processes and procedures.

To comply with applicable local and national environmental legislation.

#### **4.3 Delhi Metro Strategies**

The Metro master plan for 2021 envisages bringing the Metro within half a kilometre reach of every Delhiite. The next phase of construction, Phase III, will add another 69.57km of Metro through six new corridors. The corridors include:

- 25.66-km line from Anand Vihar to Dhaula Kuan of which 12.52km will run underground,
- 12.40-km line from Mukundpur to Rajouri Garden of which 6.58km will be underground,
- 9.64-km line from Ashok Park to Delhi Gate of which 5.28km will be underground,
- fully underground section from Central Secretariat to Red Fort (6.8km)
- elevated extension of the existing Line 2 from Jehangirpuri to Badli (3.43km)

- A sixth section (11.64km) is proposed from the existing Metro station at Noida Sector 18 to Malviya Nagar via Kalindi Kunj.

Delhi Metro Rail Corporation (DMRC), the principal Delhi Metro authority, is known for never collaborating with other public agencies. Whether it was with the DTC for feeder services, PWD or MCD for providing proper pedestrian facilities to its passengers, DMRC never worked in tandem with others. A classic case in point is the current road-widening work along the Mehrauli-Gurgaon road, which is right along the Yellow line, from a four lane to six-lane road to facilitate car users, irrespective of the mobility provided by the Metro. These factors result in no travel time savings for people shifting from cars or two-wheelers to Metro.

## Conclusion

India is well on its way to create a world-class MRT system as an integral part of community infrastructure development in the country. Growing cities, growing population and growing traffic has invariably called for a shift from private modes of conveyance to public transport.

A glance at the world's developing nations indicates that well planned Mass Rapid Transit Systems (MRTS) exist successfully. India, like many other developing countries, however has lagged behind. The reasons could be attributed to lack of funds planning as is known that such projects require huge capital investments, a long gestation period and complex technology. Other reasons could include the lack of integration between various systems of

mass transportation and the absence of comprehensive traffic and transportation planning.

A cheap mode of transport, the MRTS helps in low energy consumption, is eco-friendly; runs on electricity, thus minimising air and sound pollution, averts the number of accidents, is efficient in terms of space occupancy and provides comfort with ultra-modern coaches and modern systems like automatic ticketing, advanced signalling systems, automatic train protection system and integrated security systems. Services like ATMs, food outlets, cafés and convenience stores at these stations make the journey more fruitful. Also such stations lead to nearby economic development.

The international standard for MRTS with a maximum speed of 80kmph and average speed of around 34kmph helps in saving of time. With proper designing, the peak hour capacity could be rated at 3-4 lakhs passengers per hour. The only disadvantage of metros is the slight congestion on roads at the time of construction which has to be taken care of. Also, the cost factor is a disadvantage, the solution for which is to integrate metros with others systems considering the volume, structure, availability of space and resources for traffic and transportation.

MRTS is the best way to decongest traffic. However, a number of considerations should be kept in mind in order to run a successful MRTS. Viability of metro projects depend upon correct defining of traffic corridors, technology adapted, availability of land, volume of traffic carried, capacity utilisation and acceptance of the mode by the commuters.



Conclusively, transport needs to be made an integral part of urban design/master plan of the city as it cannot be delineated to a separate entity. A multi-modal transportation system would ensure the use of MRTS to its best potential.

The uncertainty about MRTS, which has plagued the importance of such systems in India, seems to be resolving. Though the Kolkata metro was designed without a rule book and the Delhi Metro was designed on international norms but now India has a set of rules being adopted for metro constructions.

A metro model for a country would have to depend on its logistics, financial resources and should avoid aping a western model blindly, rather should concentrate on learning from its shortcomings.

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