

**Nagarlok** Vol. XLII No. 1 January - March 2010**Multi Modal Transport System:  
Planning for Better Mobility in Delhi**

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**INTRODUCTION**

INDIA IS the 7th largest country in the world spread over 2.4 per cent of the world's area (330 million sq. km.) which consists of 16.7 per cent of the world population and sustains 1,027 million population (2001) in 28 States and seven Union Territories (UTs). There were 5161 towns/cities and 6, 07,491 villages. As per 2001 Census, the urban population of the country was 286.11 million, which constituted 27.8 per cent of the total population. The 35 million plus cities constituted more than a third of the total urban population (37.85%). During the last decade (1991-2000), the numbers of million plus cities increased from 23 to 35 and are likely to increase to 50 by 2011. These 35 cities belong to the large group of 206 million-plus cities of Asia.

UN Habitat published its report on the "State of the World Cities 2008-09". It covers growth and decay of cities, urban inequalities and growth of slums; urban environment risks, and energy consumption in cities; urban mobility; and also the current concern on climate change. The Report highlighted that Asia is urbanizing rapidly, with approximately 40 per cent of its inhabitants now living in cities. In China, cities like Chongqing, Xiamen and Shenzhen are growing at staggeringly high growth rates of more than 10 per cent per year. Dhaka, the capital of Bangladesh, is the fastest growing mega city (more than 10 million populations) in the world, with an annual growth rate of 4.4 per cent per year. In India, Mumbai and Delhi will improve their rank from 5<sup>th</sup> and 6<sup>th</sup> in 2007 to 2<sup>nd</sup> and 3<sup>rd</sup> in 2025. Chennai will grow to mega city status as a new entrant in the group on 26<sup>th</sup> rank<sup>1</sup>.

In this context of million plus and mega cities, urban transport infrastructures and services which are the most important factor in urban economy and mobility need to be addressed. In the present scenario, the road capacity has become saturated and is not able to cope with the increasing transportation demand. The single mode of transport is neither viable nor economical and efficient. Local rail services are underutilized. It is necessary to integrate various modes

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TABLE 1: MEGA CITIES OF INDIA IN THE WORLD SCENARIO

S.N.	Mega Cities	Population (value in thousand)	Rank as per 2007 Population	Mega Cities	Population (value in thousand)	Rank as per 2025 Population
1.	Tokyo	35,676	1st	Tokyo	36,400	1st
2.	Mexico city	19,028	2nd	MUMBAI	26,385	2nd
3.	New York-Newark	19,040	3rd	DELHI	22,498	3rd
4.	Sao Paulo	18,845	4th	Dhaka	22,015	4th
5.	MUMBAI	18,978	5th	Sao Paulo	21,428	5th
6.	DELHI	15,926	6th	Mexico City	21,009	6th
7.	Shanghai	14,987	7th	New York-Newark	20,628	7th
8.	KOLKATA	14,787	8th	KOLKATA	20,560	8th
9.	Buenos Aires	12,795	9th	Shanghai	19,412	9th
10.	Dhaka	13,485	10th	Karachi	19,095	10th

Source: UN Habitat (2009), State of the World's Cities Report 2008-09, Nairobi.

Note: Population figures are for urban agglomeration, not city proper. Megacities are cities with populations of more than 10 million.

of mass transport and evolve multi modal transport system for both harmonious growth and efficient mobility of the cities.

#### CONCEPT OF MULTI MODAL TRANSPORT SYSTEM

Multi Modal Transport System (MMTS) is an integrated approach to incorporate all components of urban transport into a single coordinated planning and operation system for efficient use of available transport resources and infrastructure to ensure better mobility within a wide range of modal options for the commuters. In urban areas, multiple agencies, multiple jurisdictions, multiple modes and multiple disciplines are responsible for planning, designing, construction, operations, administration and maintenance of transport. They are independent but are highly interdependent.<sup>2</sup> Hence, a well designed and coordinated multi modal transport system is required.

In metro cities, the urbanization and migration pattern have direct impact on intra-urban, sub-urban and inter-urban mode of transport and vice versa. Hence, MRT, sub urban rail, bus network, etc are required to be integrated with other modes. In multi modal transport system, the urban transit system should be complement and not compete with other components of the systems. An integrated approach for multi modal transport is win-win situation for commuters, transport operators, transport agencies, city authorities, etc.<sup>3</sup>

The Ministry of Urban Development, Government of India formulated National Urban Transport Policy, 2006 with the broad objective to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within cities. One of the methods to achieve such objectives is to "enabling the establishment of quality focused MULTI MODAL PUBLIC TRANSPORT SYSTEMS that are well integrated, providing seamless travel across modes". A coordinated integration of different modes brings about reduced congestion on the road, greater convenience for commuters, efficiency and cost effectiveness.<sup>4</sup>

#### INTEGRATED APPROACH OF MULTI MODAL TRANSPORT SYSTEM

Multi modal transport system is an integrated system of road based transport, rail based transport, air transport, water transport and other new transit systems. Roads and railways are two dominant modes of transport in the country. Water transport, i.e. navigable rivers, sea, etc. provide alternative means of urban transit access. In

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TABLE 2: CHARACTERISTICS OF INTEGRATION  
IN MULTI MODAL TRANSPORT SYSTEM

Sl.N.Integration	Characteristics
1. At Urban Local Bodies (ULBs) /City Authorities Level	Reduce unnecessary competition Enhance economic development Increase revenues Provide greater capacity and flexibility in emerging situations.Less congestion, accidents, etc on road. Protection and enhancement of environment
2. At Operators /Suppliers	Better services in terms of frequency, Level timing, etc. Comparatively cheaper /lower fare. Optimum utilization of fleets and infrastructures. Procure update technology, better facilities and skilled manpower.Better accessibility to borrowing fund/loans and their utilization. Increase corporate knowledge and wisdom.
3. At Users Level	Easy and better accessibility, mobility, safety, etc.Increase commuter's benefits and profits. Save cost and time. Less congestion, accidents on roads.

India, only limited river navigational services are available in Kolkata (Hoogly river), Mumbai (sea), Goa (sea) Kochi Back water transport and Andaman & Nicobar islands. In India, this system may not be attractive for urban public transport but in Venice (Italy), Gothenburg (Sweden) and Hamburg (Germany), inland navigation is an essential part of public transport system. In Paris, London, Cologne (Germany), navigable river exists but it is more popular for pleasure trips. Air transport, as a mode of urban (intracity) travel, is non-existent in India. Other transit systems such as LRT, Sky Bus, Advanced Light Rail Transit System (ALRTS), etc are likely to be used particularly in urban areas. Hence, integration of these modes as MMTS can provide efficient transport system.

MMTS is an integrated system of MRT, BRT, LRT, suburban rail, etc with Intermediate Para Transit (IPT) such as auto, rickshaw, tempo, etc. and personalized modes. IPT always play important role as access and egress mode to connect rapid transit system. Similarly, park and ride provides good facilities for personalized vehicles to access MRT/LRT.

MMTS is an integrated system to provide demand and supply side management measures. In Kolkata, a combination of bus services, tramways, suburban rails and metro services is used for mobility but still there is absence of planned integration of metro with other modes. Mumbai has a combination of bus services, ferry services and suburban rail network though railway stations are not integrated with other modes but the use of suburban railway is extensive due to the proximity of bus stops. In Chennai, bus services and suburban railway are used as major modes of public transport but common facilities are available to integrate different modes. In Delhi, operation of metro has given a strong image to public transport. Metro fails to have its full efficiency in absence of proper transport planning and synergy with other modes. Delhi ring rail (35 km. length having 23 stations) is still under utilization (less than 25 per cent of its designed capacity) due to most of the stations on this rail corridor have no travel demand. Therefore, there is a need for integrated development of road and rail based transport system to meet the requirement of transport demand. MMTS is a step forward to integrate and meet such demand and supply.<sup>3</sup>

MMTS is an integrated approach which connects education, health, real estate sector, etc to make a fairer, more inclusive society. MMTS not only provide accessibility to school going children, patients and disabled persons but also promotes development along the transit corridor. In fact, it enhances the socio-economic characteristics of the areas and residents.

#### MULTI MODAL TRANSPORT SYSTEM IN MILLION PLUS AND MEGA CITIES

Multi modal transport system relates to single trip consisting of combination of modes, i.e. vehicle modes (bus, metro, car, tram, etc.) or service modes (private/public) between which the traveller has to make a transfer. Transfer is an essential part of multi modal trip and traveler has to change modes at transfer nodes. Hence seamless travel is an important characteristic of the system.

There has been a rise in the number of middle class population having desire to own personalized mode. Further, automobile

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Sl.N. City	Category	Walk	Cycle	Two	Public wheelers	Car Transport	IPT	Total in Percentage
1. Delhi	Mega	20	12	5	43	14	6	100
2. Mumbai	Mega	27	6	7	45	8	7	100
3. Kolkata	Mega	19	11	4	54	8	4	100
4. Chennai	Million plus	22	9	20	31	10	8	100
5. Bangalore	Million plus	26	7	17	35	8	7	100
6. Hyderabad	Million plus	22	9	19	35	9	7	100

SOURCE: Wilbur Smith Associates & Ministry of Urban Development, Government of India (2007).

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companies are also coming up with new models of cars at reasonable cost. Thus personalized vehicles will increase which will further cause deterioration in traffic and environmental conditions. Hence it is necessary to shift mode of travel from car to walk/cycle for short journey and to public transport for long journey. The main aim of MMTS is to reduce personalized modes and promote public transport.

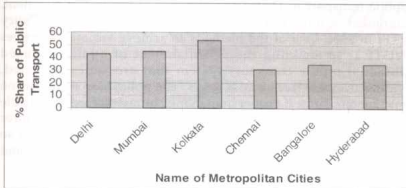


Fig. 1: Share of Public Transport in Mega Cities in India (2007)

In Master Plan for Delhi -2021, multimodal transportation system has been envisaged and future transport system shall consist of a mix of rail and road based system which may include metro rail, ring rail, dedicated rail corridors for daily commuters, BRTS, other mass transit modes as technologies become available and Intermediate Passenger Transport (IPT) and private modes on selected corridors are identified as per needs from time to time.<sup>6</sup> In Delhi, it is necessary to take appropriate steps for optimum use of carrying capacity of public modes and their proper integration with other modes such as monorail, LRT, etc.

The Government of NCT of Delhi has developed an Integrated Multimodal Transit Project using modes such as the Bus Rapid Transit (BRT), Light Rail and the Monorail in addition to the metro rail and the present DTC bus services duly integrated through multimodal interchange points. This project has been approved by the Cabinet of GNCTD for about phased implementation by 2020. The total length of the public transit network including 250 km of Metro will be 750 km. To implement this project, the Government of NCT Delhi has incorporated a 'Special Purpose Vehicle' under the name and style of Delhi Integrated Multi Modal Transit System (DIMMTS) Limited on April 19, 2006. DIMMTS Ltd. is responsible for all aspects of implementation, operation and maintenance of the proposed

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multimodal network, i.e. planning, design, financing, implementation, operation and maintenance of services and associated infrastructure.<sup>7</sup>

## LEARNING EXPERIENCE

Public transportation is gradually evolving in metropolitan cities in the country. Operation of Delhi metro has given a strong image to public transport in Delhi. The Ministry of Urban Development, Government of India formulated National Urban Transport Policy (NUTP) in 2006. One of the methods to achieve various objectives of NUTP is to enabling the establishment of quality focused multimodal public transport system that are well integrated, providing seamless track across roads. The policy lays emphasis on seamless interchange if proper interchange infrastructure is available and users are to use a single ticket overall system. It also requires that a single agency must take responsibility for coordination so that there is a common approach to public transport planning and management.

### Multi Modal Transport System in Hyderabad

Multi Modal Transport System (MMTS) is local train service in the city of Hyderabad. It is operational since 2003, an associate of the South Central Railway (SCR) and is presently running 84 services a day, covering 27 stations. The first phase covers a distance of 43 km of Secunderabad-Hyderabad-Lingampally (28km.) and Secunderabad-Falaknuma (15 km) at a cost of Rs 173 crore. Transport in Hyderabad is classified into two categories namely: (i) MMTS Stations in Hyderabad and (ii) Railway stations in Hyderabad. The Falaknuma – Hyderabad (FH) is a rapid transit service of the multi modal Transport system of Hyderabad. It covers 17 stations and runs between Falaknuma and Nampally (Hyderabad). It is operated by South Central Railway. There is a combined pass issued by the state-owned APSRTC and MMTS. Hence, purchasing a single pass allows to travel by bus as well as the train.<sup>8</sup>

### Singapore Integrated Multi Modal Public Transport System

Singapore Integrated Public Transport Service includes bus, Mass Rapid Transit (MRT), Light Rail Transit (LRT) and taxi. The amalgamation MRT of Singapore in the overall transportation system is a good example of multimodal transport system during 1990. On November 1, 2001, Singapore Bus Service (SBS) Transit came into existence which reflects the multi modal status, a move from being just a bus operator to provision of both bus and train services. Many

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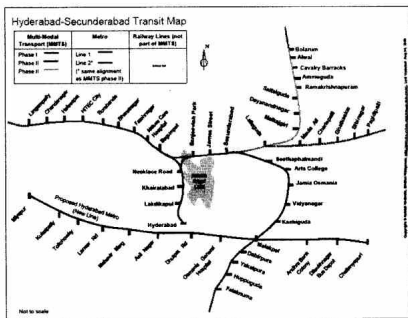


Fig. 2: Hyderabad-Secunderabad Transit Map (MMTS Hyderabad Route)

initiatives have been introduced to make travelling via bus, MRT, LRT and taxi more attractive and comfortable.

All LRT stations are located on arterial roads and integrated with feeder bus routes and covered walkways from station to adjacent HDB blocks. Similarly, MRT station and LRT stations are vertically integrated. Within the station, vertical transportation between LRT and MRT platforms is through escalators and lifts without having to exit the paid area of the station, using the same fare card. It is seamless transfer at its best. The same is linked with bus interchange via bridges and covered link ways. Similarly, planning of LRT stations has blended with surroundings commercial and residential development. In fact, integration of various modes and proper planning gives faster and more comfortable transportation services to the commuters.

PLANNING APPROACH

Urban transport is a state subject and responsibility for management of urban areas (and thus urban transport) rests with the state Governments. It is desirable that each Mega City should have its own MOBILITY PLAN particularly in the context of multi modal transport system for better survival of city. A comprehensive

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TABLE 4: INTEGRATED APPROACH FOR SINGAPORE  
MULTI MODAL PUBLIC TRANSPORT SYSTEM

SLN.	Integration Level	Integrated Approach
1.	Physical Integration	Existing MRT stations are upgraded to achieve better integration. These include: <ul style="list-style-type: none"><li>- Woodland MRT is upgraded to have bus interchange.</li><li>- Novena MRT station integrated with nearby commercial Development.</li><li>- Dover MRT station with roadside bus stop and</li><li>- Toa Payoh MRT station with a relocated bus interchange.</li></ul>
2.	Network Integration	Bus network and rail network are properly integrated. It is suggested to use bus (or LRT) network only as a feeder service to MRT so that there is less surface road congestion on arterial roads.
3.	Fare Integration	A single fare card usable on all public transport modes greatly facilitates integrated transport. Singapore introduced a magnetic stripe, stored-value Transit Link fare card in 1990 for bus/rail travel. A contact less smart card, called the EZ Card, was introduced in 2002 as a common fare card for all bus, MRT and LRT services.
4.	Information Integration	The Transit Link Guide provides coordinated and comprehensive information on all aspects of travelling on bus, MRT and LRT in a single book. It is updated every year and remains in use today. An electronic version is also available on the Internet.
5.	Institutional Integration	The formation of a service company such as Transit Link in 1989 was a first step towards institutional integration. In 1995 the Land Transport Authority was formed which combined the functions of a planning agency and regulatory body for both public and private transport. The rail networks are quite well segregated geographically. Each operator is in a good position to provide integrated services within its designated territory.

SOURCE: Ibrahim, Muhammad Faishal. 2003. Improvements and Integration of a Public Transport System: The Case of Singapore, Cities, Vol. 20, No.3, pp.205-216 and Luk, James and Olszewski, Piotr. Integrated Public Transport in Singapore and Hong Kong, Road & Transport Research, December, 2003.

MMTS should fulfill the following requirements:

<b>Connectivity:</b>	The two ways mass transfer of passengers from road based transit to rail based transit are possible only if the connections between bus stops and railway stations are available through feeder bus services.
<b>Network Integration:</b>	Restructuring of bus routes to reduce wasteful duplication of services between bus routes and MRT are essential at network level. The surplus can be utilized for feeder services to the MRT stations.
<b>Physical Integration:</b>	Adequate space needs to be provided at the ground for interchange facilities around bus stops and MRT stations for smooth transfer of commuters from bus route to MRT. Park-n-Ride facilities need to be provided at the MRT stations to promote the transit rider for parking of personalized vehicles to use MRT.
<b>Information Integration:</b>	A common bus-MRTS guide booklet with complete information regarding various services should be available to a passenger at every major transfer location. The information should be properly advertised through various information agencies, radio, TV, internet, etc.
<b>Unified Fare System :</b>	A single ticket system is necessary for a passenger to reach from origin to destination. It reduces the travel time from origin to destination. The single fare system attracts passengers to use buses and MRTS because of the comfort and also saving of time in buying separate tickets for travel at bus stops and MRT stations.

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The planning of multi modal transport involves the following stages:

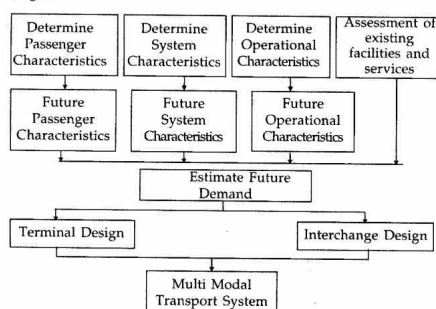


Fig. 4: Planning Methodology for Multi Modal Transport System

## POLICY APPROACH

Multi modal transport is a composite system. A policy oriented approach is required to associate its components with each other and deal with urban transport issues in general. The Ministry of Urban Development, Government of India launched Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in December 2005. The mission aims at creating economically productive, efficient, equitable and responsive cities in an integrated frame work with focus on economic and social infrastructure, basic services for the urban poor and implementing urban sector reforms for strengthening the urban local bodies. It has estimated provision of Rs 50,000.00 crores over seven years period starting from 2005-06, making it single largest Central Govt. initiative in the urban sector. It provides investment support for urban transport projects consistent with the NUTP 2006. Accordingly, the Ministry of Urban Development encourages cities to prepare "Comprehensive Mobility Plans" as part of long term urban transport strategy providing for a sustainable improvement of people's mobility in 63 mission cities.

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The Master Plan of Mega city should have provision for "Transit Oriented Development" and "Influence Zone" (500 mt both side) of the major transport corridor. Integration of the fragmented institutional structure may be done by setting up of a Unified Metropolitan Transport Authority in all mega cities to facilitate better coordination in the planning and implementation of urban transport systems. Such an authority should not be an operator but function as a coordinator.

The concept of integration in transport is defined as measures of improving the overall quality of services to the commuters and attracting more people to use public transport. Integration means that whatever modes or types of transport (rail, road, water, air) are involved, they all operate as one 'seamless' entity for the benefit of the commuters and the system as a whole. It can be achieved by proper planning and design of the services so that where a change of vehicle is required; passengers can enjoy easy to use, pleasant and sheltered interchange facilities along with shorter waiting time for the next service. Hence various aspects of transport in terms of :

- interface between two or more modes of mass transport,
- extend to all mass transit and intermediate para transit ,
- synergy among all modes (public and private ),
- land use and transport,
- land use along transit corridor,
- land use around transit node,
- surrounding environment,
- travel behaviors of commuters,
- travel information & guidance,
- inter -organization and co-ordination, etc

must be integrated. However, transport policy integration with other sectors such as education, health and wealth creation helps to make a fairer and more inclusive society.

#### CONCLUDING REMARKS

Multi Modal Transport System (MMTS) in Delhi explores the use of multiple modes of transport for safe, convenient and efficient movement of passengers. The presence of MMTS enhances accessibility, economic growth, public health, environmental protection, security and safety, social cohesion, etc. Further more, it

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may be considered as effective means of providing better, advanced, efficient and quality transit services in future.

Integrated approach of multi modal transport system requires systematic implementation of various measures and services amongst transport authorities, agencies, operators, etc for multi modal travel. Improvement in public transport system alone may not be an effective tool in reducing car travel but various other measures such as better coordination between bus and transit in terms of arrival and departure time, operation, scheduling, real time information, congestion pricing for personalized vehicles, park and ride facilities along the highly dense corridors, etc may be required.<sup>9</sup>

Non-Motorized Vehicles (NMVs) i.e. walk, cycle and rickshaw also known as Green Modes (GMs) have significant roles in Multi Modal Transport System (MMTS). NMVs are directly associated with space & time, capacity & cost, intermediate technology, etc.<sup>10</sup> However, flexibility and affordability of NMVs recognize their usefulness as mode in MMTS. Flexibility of NMVs is a multi purpose tool for door- to- terminal transport of persons and affordability is a function of purchase price in relation to income, availability on hire basis and sharing of their uses.

Walking is an access and egress mode to MMTS. Walk able areas must be planned properly and people must walk to good transit system/MMTS for 10-15 minutes in morning/evening. Cycles and rickshaws require sufficient road space and related amenities. However, legislation and traffic enforcement regulations are required to allow the operation of particular types of NMVs along specific routes along MMTS corridors in both peak and non peak hours.

Multi modal transport policy desires political and technical organization to co-ordinate all the individual elements of the transport system. The transport system is unbalanced because it largely depends on one mode: automobile. The improvement in transport policy therefore means shifting the balance from car to other modes. It can be done by putting more constraints on automobile use and by making public transport, cycling and walking more appealing to the urban population in Delhi.

#### Footnotes

<sup>9</sup>UN Habitat, state of the World's Cities, 2008-09, UN Publication, Nairobi, 2009.

<sup>10</sup>Kumar, Pawan, Kulkarni, S.Y. and M. Parida, Planning of Multi Modal

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<sup>3</sup>Kumar, Pawan; Kulkarni, S.Y. and M. Parida, Multi Modal Transport System in Metropolitan Region : Spatial Planning Approach, Proceedings of 57th National Town & Country Planners' Congress, January 23-25, 2009, Goa, India, 2009.

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<sup>6</sup>Delhi Development Authority, Master Plan of Delhi for 2021, Ministry of Urban Development (Delhi Division), New Delhi, 2007.

<sup>7</sup>DIMMTS Ltd., Integrated Multi Modal Public Transport Network for NCT of Delhi, New Delhi, 2008.

<sup>8</sup>Kumar, Pawan, Kulkarni, S.Y. and M. Parida, Multi Modal Transport System in Urban India, Proceedings of National Conference on "Developing Harmonious & Sustainable Cities in India for a Better Urban Future", March 20-21, 2009, New Delhi, India.

<sup>9</sup>Tong, C.Y, The Integration of Commuter Facilities at Mass Rapid Transit Stations, Proceedings of International Conference on "Seamless and Sustainable Transport", November 2002, Singapore, 2002.

<sup>10</sup>Singh, S.K. Review of Urban Transportation in India, *Journal of Public Transportation*, Vol 8, No.1, pp 79-87, 2005.