

Mass Rapid Transit System (MRTS)-A sustainable Transport System

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Abstract—Population is increasing with time geometrically which result the expansion of city as well as expansion in related infrastructure like traffic and transport. It is noticed that the mobility strength and mode is increased. So we felt need for a transport system which is able to transport maximum number of passengers in minimum duration of time.

Mass Rapid Transit System (MRTS) is the solution for this problem. MRTS which may base on rail or bus is appreciable among the world and must be a sustainable transport system. From 1863 to 2013 the MRTS is increasing with increase in tier of city in the hierarchy. Now 168 cities in 55 countries using this system.

In 1863 London use to serve first MRTS, which is rail based, serve between Paddington and Farringdon, which used by 80000 passengers in first two days.

This paper consists the history, features and successful life of MRTS such a sustainable transport system.

1.0 INTRODUCTION

Mass Rapid Transit is defined for the purposes of the review as public transportation services, which involve a substantial degree of collectivization, or combining individual trips into shared trunk linkages. It comprises those modes based on specific fixed track, or exclusive and separated usage of a potentially common user road track. It thus includes separated or largely separated busways, but excludes bus lanes and other forms of priority for buses in mixed traffic. The nature and significance of secondary modes of access and egress to the trunk facility are considered as part of the overall system. The review considers urban settlements of different sizes, and is not confined to the experience of megacities.

The core requirement of mass transit in developing cities is that it carries large numbers of passengers, rapidly. In the absence of large subsidies this requires both low cost (hence low fares) and speed in operation. The speed is critical to securing its impacts, hence the terms mass rapid transit are used in this review.

So, the MRTS is a sustainable transport system.

2.0 LITERATURE REVIEW

The literature is full of attempts to categorize these modes. They may be categorized in terms of:

- Their technology (bus or rail based), which influences aspects of service quality, capacity, the ability to segment the market, and cost.
- Right-of-way exclusivity, which determines speed and reliability.
- Grade separation, which allows new alignments, and strongly influences cost.
- Guidance which may offer new alignment possibilities, and other impacts.
- Operational possibilities, which may offer differing service qualities and flexibility.

I have reviewed the MRT systems actually operating in developing cities and have categorized them by technology and degree of segregation which broadly translate into level of service, capacity and cost. Four generic forms of mass transit currently exist. These are defined for use in this study as follows:

- **Busways**- These are unless otherwise stated at-grade with horizontal protection from other traffic, often with priority over other traffic at junctions, which are signalized.
- **Light Rail Transit (LRT)** – this is unless otherwise stated at-grade, with similar horizontal protection.
- **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 physically part of a larger rail network, usually at grade and fully-segregated by means of controlled level crossings.

I have limited the extent of my study to only two modes viz., Busways and Metros and have been discussed in the literature part .

3.0 NEED FOR MRTS

- Unprecedented Growth of personal vehicles-the urban area population of metropolitan city is increased by 1.9 times in India during 1981-2001 but the number of motor vehicles is increased by 7.75 times during this tenure.
 - Growing Traffic Congestion- The people of urban area felt various traffic problems like accident, congestion and crowding on the road, this is because of increasing population (traveller) and older transport which is not efficient.
 - Time saving-As we know that the rail metro having faster speed and dedicated corridor as well, so definitely it takes less travel time than that of others
 - It can be calculated from the formula using different parameters like daily run of vehicles, speed in congested traffic and speed in decongested traffic .As per thought, there are mainly two type of mass rapid transit system based on path, i.e. rail and bus. Bus rapid transit system is the bus based mass rapid transit system. Further rail based MRTS categorized in few types manually operated and fully automated, than manually operated is classified as Underground (Metro Rail), On Surface (Suburb Train) and Elevated (Monorail), Than Underground or metro rail which may be run on surface also can be divided into three types:-
1. High Capacity Rail Transit System
 2. Medium Capacity Rail Transit System
 3. Light Rail Transit System

4.0 HISTORY

London underground is the first metro rail or rail based rapid transit system which starts in January 1863 between Paddington to Farringdon. This system had steam engine and wooden carriage. Although its idea came in 1830 but granted permission to start the work in 1854. It had a great success

Declared in two days only because it carriage 38000 passengers on the opening.

Than in 1875 first British metro starts with the Company, "The metropolitan railway of Constantinople to the Galata Pera".

In USA, oldest subway tunnel is in Boston (1897). New York city has largest four track line of 14.5 km length in the world.

Madrid metro was opened on 17 Oct 1919, which is now one of the largest metro system in the world. In 1924, Barcelona metro starts.

Moscow credited for the first metro-rail in USSR, which opened in 1935. Moscow metro is now the busiest metro system in the world. After that automated (without ATO) metro rails were start.

In between Toronto, Montreal and Brazil starts the metro on 1954, 1966 and 1974 respectively.

In Asia, Tokyo is the first city for opening the metro (1927), Osaka is the second (1933). Later on Beijing (1969), Hongkong (1974), Singapore, famous for heavy rail system (1987), Taiwan(1996),Iran(1999),UAE(2009) and Saudi Arabia(2011) were noticed for using the metro rail.

5.0 MRTS IN INDIA

First metro rail in Kolkata metro(1984), than Delhi(2002) and Gurugram (2013). After success of these metro now many more cities starts work for built this MRTS system, like Mumbai , Hyderabad, Bangaluru, Chennai , Kochi and Jaipur.

Some facts about first metro rail in india i.e. Kolkata metro rail:-

- India's 1st and Asia's 5th metro rail was introduced in Kolkata.
- Over a length of 16.45 km and the work on this project was sanctioned on 1.6.1972
- The construction work started in 1973-74.
- Air-conditioning and ventilation system for environmental control of stations and tunnels.
- Automatic ticket vending and checking system.
- Automatic door opening /closing.
- A public address system is provided on the trains to announce approaching stations.
- System length -22.3km
- Number of lines-2
- Number of stations -21(15 underground, 1 on surface and 5 elevated).
- Track gauge –Broad gauge
- Coaches per train-8
- Maximum permissible speed-55km/h

- Voltage -750 V D.C.
- Travel time -41 minutes.
- Total estimated cost of the project-Rs. 1825 Crores(approx).

6.0 FINDINGS AND CONCLUSION

Metro systems are more reliable, comfortable and safer than road based systems and it reduces congestion on the roads. However systems planned in india shows that cost overrunning and under utilization of capacity. Methodology and arguments used to justify these systems needs careful analysis. High capacity system doesnot necessarily generate high demand. Estimation of passenger demand for transit services should consider complete journey of commuters including access time.

As we saw that mass rapid transit system from Parrington to Delhi continuously appreciated. Similarly BRTS in all over the world is appreciated. It minimizes the travel time ,GHG emission, traffic accidents, fuel consumption. The benefits of MRTS can be categorise like this:-

- Requires 1/5th energy per passenger km compared to road-based transport system.
- Causes less noise, no air pollution and eco friendly transport system.
- Occupies no road space if underground and only about 2.60 meters width of the road if elevated.
- Reduces journey time.
- Cost effective mass transport system.
- Reducing traffic transport problems.

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