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A review ON TRANSPORT planning strategies for Bangalore in order to obtain multimodal integrated transportation system

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ABSTRACT: *The present studies arrive to know the method for forecasting the vehicular and population growth and also other parameters which serve as the input for planning for present and future transportation system. The study carries the projection of population and vehicles for the future up to the year 2040, by using various available mathematical and statistical tools. The traffic projection out of various methods includes exponential, linear, logarithmic, polynomial, power, slope intercept and compound rate of growth based on IRC method. This paper summarizes basic principles for transportation planning. It describes conventional transport planning, which tends to focus on motor vehicle traffic conditions, and newer methods for more multi-modal planning and evaluation.*

Keywords: *Bangalore Metropalitan.Mono Rail. BMTC Commutor Rail*

I. INTRODUCTION

Bangalore's vehicular traffic has increased manifold, with 40.46 lakhs registered vehicles in the city continues to grow at an annual rate of between 7-10%. The maintenance and construction of roads to address the growing traffic in the city has been a challenge to the State's governing bodies. Development of the city road infrastructure has revolved around imposing one-way traffic in certain areas, improving traffic flow in junctions, constructing ring roads, bridges, flyovers and other grade separators. Everyday more than 30 accidents occur out of which 21 persons are injured and 2 to 3 persons killed. The economic loss caused due to traffic jams & accidents are unimaginable. This demands an effective multimodal integrated mass transportation network, which is cost effective, pollution free, covering large area & population. In the present work various options are investigated looking into the multifaceted traffic problems of Bangalore. This particular approach in the study is adoptable for cities facing similar problems. The experience of creating greater Bangalore has increased the number of trips to the city centre and work places in turn increasing the transportation needs. To have the optimal solution for resolving the problems, Metro Rail, Mono Rail, Commuter Rail system, High capacity buses with dedicated and exclusives lanes for operation, High speed rail link will have to be introduced in addition to development of road network by constructing number of ring roads, radial roads, and peripheral roads to mitigate the ever growing transportation needs. In the present study, was focused on various options and possibility of multi-modal integrated sustainable transport planning strategies for Bangalore public transport system.

Mass Transport System

Mass transportation system is designed to move large numbers of people in various types of vehicles in cities, suburbs, and large metropolitan areas. The systems offer considerable savings in labor, materials, and energy over private transit systems. Further, mass transit can help in the planning of future ground transportation systems, smaller rights of way will be possible, lessening the amount of landscape that must be paved over for highways and roads. Reduced congestion & travel time and Environmental benefits such as reduction in emission of air pollutants from individual vehicles & fewer emissions from public transport system. Fixed rail transit systems provide a moderate public health benefit to users by creating more opportunity for walking in one's daily commute.

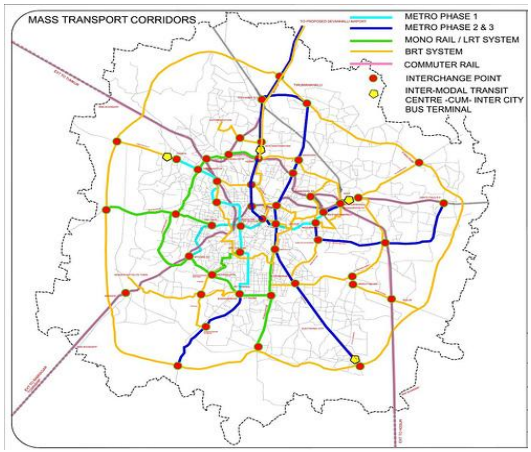

Fig. 1 Mass Transport Corridors

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Mass Rapid Transit System (MRTS)

A rapid transit, metro, subway, underground, or elevated railway system is an electric passenger railway in an urban area with high capacity and frequency, and which is grade separated from other traffic. Rapid transit systems are typically either in underground tunnels or elevated above street level. Outside urban centers, rapid transit lines sometimes run grade separated at ground level. Some systems use different types in different areas.

The MRTS project being an infrastructure project for Bangalore city designed to promote an efficient and commuter friendly transport sector for the benefit of the urban community is also expected to bring in a number of positive impacts on the environment and the general public. Depending upon their significance and magnitude, some of them could be considered as tangible while others could be viewed as intangible benefits.

The positive impacts would be steadily realized during sustained running operations of the MRTS. Some of these positive benefits are: 1) Quick service and safety, 2)Reduced traffic density on roads, 3) Reduced fuel consumption by automobile sector and accompanying import savings, 4) Reduction in road accidents, 5) Reduction in air pollution and noise levels, 6) Improvement in road conditions and extended life of roads, 7) Benefits of transfer of technology, 8)Employment opportunities, 9) Enhanced rural economy, 10) Saving in productive man-hours due to rapid mode of transport, 11) Reduction in green house gases emission, 12) Reduced need for expansion of roads, laying new roads, flyovers etc, 13) Better environmental landscape, aesthetics, 14) Boost to industry, trade, commerce, communication and culture

Metro Rail System (Namma Metro)

Although mass transit for Bangalore had been in consideration for over two decades, the final approval on a scheme that incorporated the expertise of Delhi Metro Rail Corporation (DMRC) and the Indian Government-owned RITES Limited infrastructure and transport consultancy did not come until April 2006. The rationale for the metro includes reduced journey times, cutting fuel use, accident reduction and lower pollution. The Bangalore metro will pass through most of the commercial and residential areas of the Bangalore city. There are mainly four phases in the construction of the metro. The first phase which is under construction will consist of two corridors- east west and north south- covering a total distance of 42.30 km through the double electrified lines.

The above corridors may be able to give relief to the immediate traffic problems within the core areas and its immediate neighborhood but by the time the Master Plan proposals get implemented and development of areas beyond the outer ring road takes place in right earnest, the above system will fall short and a more extensive system will become necessary. This is especially true because the Master Plan 2015 and its detailed Zonal plans propose the development of around 816.4 Sq. Kms. of area for various urban uses. This brings very large spread of area on which various urban activities will take place. They would now be located right up to the Peripheral Ring Road in practically all directions and at a few places even beyond it. These activities include some with huge employment potential areas like the Electronic City in the east and southern portions of the BMA. It is therefore necessary that the Metro gets ultimately extended to the most of the high density centers. Therefore the following additional corridors considering the projected travel demand are proposed to be taken up as extension of the Metro in Phase 2.

Phase II consists of extensions of all four reaches of the Metro and 2 new lines.

Extensions

Byappanahalli to International Technology Park Ltd -- Whitefield (extension of east-west line). This corridor has 14 stations -- Jyothipuram, KR Puram, Narayanapura, Mahadevapura, Garudacharpalya, Doddanakundi, Visvesvaraya Industrial Estate, Kundalahalli, Vaidehi Hospital, Satyasai Medical Institute, ITPL, Kadugodi, Ujwala Vidyalaya and Whitefield.

Mysore Road terminal to Kengeri (extension of east-west line). This corridor has five stations. Nayandahalli, Rajarajeshwari Nagar, Bangalore University Cross, RV College of Engineering and Kengeri

Hesaraghatta Cross to Bangalore International Exhibition Centre (BIEC) on Tumkur Road (extension of north-south line). This has three stations. Manjunathanagar, Jindal and BIEC terminal. The BMRC has asked BIEC to share the cost as it would be the main beneficiary of this extension

Puttenahalli Cross to Anjanapura Township, up to NICE crossing (extension of north-south line). This corridor has five stations. Anjanapura Road Cross, Krishnaleela Park (Iskcon), Vajarahalli, Talaghattapura and Anjana township.

New Line

The RV Road to Bommasandra line, on the outskirts of the city, will have 16 stations -- RV Road, Ragigudda temple, Jayadeva Hospital, BTM Layout, Silk Board Junction, HSR Layout, Oxford College,

Muneshwara Block, Chikkabegur, Basapura Road, Hosur Road, Electronic City-1, Electronic City-2, Huskur Road, Hebbagodi and Bommasandra.

The one between Gottigere-IIM-B and Nagavara will have 18 stations with six elevated and 12 underground stations. The elevated stations include Gottigere, Hulimavu, IIM-B, JP Nagar 4th Phase, Jayadeva Hospital and Swagath Road Cross. The 12 underground stations will be constructed near Dairy Circle, Mico Bosch, Langford Town, Vellara Junction, MG Road, Shivajinagar, and Cantonment railway station, Pottery Town, Tannery Road, Venkateshpura, Arabic College and Nagavara.

Without a feeder network the Metro ridership would be significantly lower than its potential. Hence, metro system definitely needs a feeder service so that it can increase its reach and maximum ridership.

Monorail /Light Rapid Tramsit System (LRT)

In addition to the metro, the corridors where the traffic volumes are upto 20,000 phpdt and the requirement is to cover a wide area with a large network and also to act as feeder to Metro, a medium capacity system is required. In fact up to about 15000 phpdt, a BRTS can also work reasonably well. However the limitation with it is that in order to make it really effective dedicated wide BUS Lanes (Bus ways) are necessary. However on roads where the right of way does not permit carving out the at-grade Bus way, an elevated mono rail / light rail is the preferred option, since it does not impinge upon the capacity of the at grade carriageways which continue handling the vehicular traffic. The Master Plan 2015, while pointing out the inadequacies of the present Public Transit system and emphasizing the need for a Multi-Modal Public Transport system, has referred to mono-rail as one of the modes. It has proposed a Mono–Rail along the western crescent of the ORR from Bellary Road to Kanakapura Road along with a couple of spurs along selected radials leading to the core area. In addition an independent corridor has been proposed from Hosur Road - Bannerghatta Road Junction to National park. Considering all the factors, while basically keeping the same configuration, the proposed radial corridors along Magadi Road and Bannerghatta Road need to be extended upto the PRR and along ORR, extended up to Bannerghatta Road. Accordingly the following corridors with a total length of 60 Km. have been identified for MonoRail / LRT system.

Commuter Rail System

Commuter rail, also known as suburban rail, is a type of public transport that is characterized by passenger trains operating on railroad tracks and providing regional service between the city and suburbs. This report about "NammaRailu" comprehensively covers all the aspects relevant to implementation of Bengaluru Commuter Rail Authority Limited (BCRAL) giving clear deadlines for the tasks to be undertaken by the Special Purpose Vehicle (SPV). Commuter rail can draw a large number of commuters - people who travel on a daily basis from cities like Tumkur, Yelahanka, Devanahalli, Hoskote, Whitefield, Hosur, Anekal, Kengeri, Ramanagar, Doddballapur and Chikkaballapura. Commuter rail provides a number of public benefits including reduced highway congestion, pollution and energy dependence and further, they serve lower density areas, and often share right-of-way with intercity or freight trains. They can also operate on existing rights-of-way and thus eliminates the time and significant costs of new infrastructure construction. Trains can operate following a schedule, at speeds of about 50 km/h and some services restricted to peak hours. When compared to rapid transit, commuter rail has lower frequency, following a schedule rather than fixed intervals, and fewer stations spaced further apart. No amount of connectivity within the city will be successful if that connectivity is not supplemented by mass transit to these growth centers. The key is frequent, low cost connectivity which can be achieved by utilizing and enhancing the existing train tracks between Bengaluru and these growth centers. Multiple reports over 27 years including RITES surveys have confirmed this fact.

The commuter rail service consists of train services connecting suburban growth centers within an approximate one hour travel distance to Bengaluru with environmental friendly electric trains which are bicycle & disabled friendly, operating on existing tracks, doubled or quadrupled as necessary, for operation at a high frequency of 20 or more trains per day between each origin-destination pair.

The growth centers indicated as green dots on the map are the towns which will be connected by the Commuter Rail. These growth centers are significant because they are currently not very heavily populated despite their close proximity to Bengaluru. They have sufficient headroom for growth and are approximately within one hours traveling distance from Bangalore, the catchment areas in between also having potential to grow with rail connections.

The Commuter Rail routes if implemented at a frequency of 20 trains per day for each route, can support lakhs of commuters per day. By adding rakes and using double decked carriages capacities can be scaled up many times this number.

It is obvious that the inventory of existing stations needs to be supplemented with many additional stations for commuter rail to be a convenient and popular mode of transport. For each segment, an attempt has

been made to identify localities where there is need for new stations to cover the one-third population that remains un served.

Complete Integration

The commuter rail complements the metro and other forms of city transport. If the commuter rail is seamlessly integrated with other modes of transport, it can feed the Metro /Mono /BMTC with a good number of commuters from the suburbs who can then reach the interior parts of the city with these systems. This integration will include facilities like disabled friendly ramps, walkways, escalators and subways directly to those terminals so that uninterrupted access between different modes is available.

Metro Connection : Fortunately, Namma Metro intersects the IR routes at many places in the city. Commuter Rail needs to be integrated with Namma Metro at these locations, i.e provides easy interchange facilities. Some of the locations that can provide easy transit include: Yeshwantpur, Benninganahalli, Kengeri & Whitefield.

HSRL Connection: Exclusive connectivity to the new airport via high speed rail when it becomes operational will also provide the opportunity for Commuter Rail to integrate with HSRL, thereby providing commuters from the nearby towns another PT connection to reach the new airport and vice versa. Interchanges with HSRL need to be provided at both, Yelahanka and Hebbal.

BMTC Connection

BMTC needs to support Commuter Rail by providing feeder services to all the Commuter Rail stops/stations in the BMTC operational area. The feeder service at bare minimum should connect Commuter Rail stations to the nearest BMTC transit center. BMTC's footprint being large, this should be an easy proposition. All it may need is some changes in the route or it could be an exclusive feeder loop connecting the station to the nearest transit center.

In order to make Commuter Rail useful and viable, it has to have tight integration with city's PT systems. Integration with other PT systems provides the commuter with point to point connectivity right from the town outside Bengaluru to the specific location in the city. The Integration could range from Commuter Rail station at the same physical location to Commuter Rail station being a short walking distance to other PT transit stations. Coaches having facilities to carry cycles will go a long way in helping promote green last mile options. It also benefits the economically weaker sections to save on the total cost of commuting.

Proposed Brt System

Assumptions: Buses have average constant speed of 40 kmph. which is not affected by external traffic due to Dedicated lane allocation, there is a prioritized signal system in place; the vehicular traffic follows the same speeds as the ordinary model, just that in this case the buses will not be affected by that traffic; the service would be direct. With same traffic trends as the one for present scenario; it is found that there is huge decrease in travel time, which came down by more than 50% in peak hour.

II. CONCLUSION

Road widening alone or expensive environment unfriendly flyovers and one way systems will not only push the problem to the next junction & do not suggest a long term solution for transportation. This research work comprises of transport planning strategies for Bangalore in order to obtain multimodal integrated transportation system such as metro, monorail, commuter rail and Bus Rapid Transit (BRT) along with Bangalore metropolitan transport corporation operations.

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