

EXECUTIVE SUMMARY

COMPREHENSIVE TRAFFIC AND TRANSPORTATION PLAN FOR BENGALURU

1. PROBLEMS AND ISSUES

- 1.1 Bengaluru population has been growing at a rate of 3.25% per year in the last decade. There has been a phenomenal growth in the population of vehicles as well especially the two and four wheelers in this period due to rising household incomes. The number of motor vehicles registered has already crossed 36 Lakhs. In the absence of adequate public transport system, people are using the personalized modes which is not only leading to congestion on limited road network but also increasing environmental pollution. An average citizen of Bengaluru spends more than 240 hours stuck in traffic every year. Such delays result in loss of productivity, reduced air quality, reduced quality of life, and increased costs for services and goods.
- 1.2 The analysis of collected data from primary and secondary sources has brought the following major issues regarding the transport system of Bengaluru.
- 1 Road network capacity is inadequate. Most of the major roads are with four lane or less with limited scope of their widening. This indicates the need for judicious use of available road space. The junctions are closely spaced on many roads. Many junctions in core area are with 5 legs. This makes traffic circulation difficult. There is need to optimise the available capacity by adopting transport system management measures and by making use of intelligent transportation systems.
 - 2 Traffic composition on roads indicates very high share of two wheelers. The share of cars is also growing. This indicates inadequate public transport system. V/C ratios on most of the roads are more than 1. Overall average traffic speed is about 13.5 Kmph in peak hour. This not only indicates the need of augmenting road capacity but the also to plan high capacity mass transport systems on many corridors.
 - 3 Outer cordon surveys indicate high through traffic to the city. This points to the need of road bypasses not only for Bengaluru Metropolitan Area (BMA) but also for Bengaluru Metropolitan Region (BMR). High goods traffic also indicates the need of freight terminals at the periphery of the city.
 - 4 The household travel surveys indicate high share of work trips. This segment of travel demand needs to be mostly satisfied by public transport system. Considering the large employment centres being planned in the BMA, the public/mass transport system needs to be upgraded/extended substantially.
 - 5 At present, modal split in favour of public transport is about 46% (exclusive of walk trips). The trends show a decline in this share over the last two decades. This is further expected to fall unless adequate and quality public transport system is

provided to the people of Bengaluru. Share of two wheelers and cars in travel demand is disturbingly high. This trend needs to be arrested.

- 6 There is high pedestrian traffic in core area and some other areas in Bengaluru. Footpath facilities are generally not adequate and their condition is deteriorating. Therefore up gradation of their facilities is very important. Share of cycle traffic has declined over the years. This mode of transport needs to be promoted by providing cycle tracks along the roads.
 - 7 Parking is assuming critical dimensions in Bengaluru. Parking facilities need to be augmented substantially. In the long run, city-wide public transport system needs to provide not only to reduce congestion on roads but also to reduce parking demand.
 - 8 Area of the BMA has been increased as per Revised Master Plan-2015. This plan has provided for densification of existing areas, Mutation corridors, hi-tech areas etc in various parts of the city. This likely to have a major impact on traffic demand. The transport network including mass transport system needs to be planned taking the proposed development in to consideration.
 - 9 Major developments have been proposed in the suburban towns of Bengaluru by BMRDA in the BMR. This is likely to increase interaction between Bengaluru and these suburban towns. There will be need to provide commuter rail services to these towns from Bengaluru.
- 1.3 Thus while planning for the transport system of Bengaluru, the above problems and issues need to be kept in consideration. The issues relating to traffic and transportation in a large and growing city like Bengaluru need to be viewed in the larger perspective of urban planning and development. Issues relating to land use planning and development control, public-private transportation policy and industrial location would need to be integrated at the perspective planning level. With Metro Rail under implementation there is the need to coordinate inter modal transport issues.

2. PREFERRED STRATEGY FOR TRANSPORT DEVELOPMENT

In order to prepare the Comprehensive Transport Plan the following policy measures have been considered.

- 1 Extension of mass transport system to provide wide coverage and transport integration with other modes of transport.
- 2 Provide substantially large network of medium level mass transport system such as BRT to cover the areas beyond the Metro network and on over loaded corridors.
- 3 Landuse adjustments and densification of corridors along mass transport corridors where possible.
- 4 Extension of commuter rail system upto the BMRDA's New Townships & beyond upto Tumkur, Hosur etc. to act as sub-urban services.

- 5 Rationalisation of local bus system and its augmentation.
- 6 Improvement in traffic management through TSM measures.
- 7 Special facilities for pedestrians within the entire network specially in the core areas; pedestrianisation of selected shopping streets in side the core area going to be served by Metro. Provision of pedestrian sky walks/subways, footpaths and road furniture along the roads where necessary.
- 8 Diverting through traffic on Peripheral Ring Road. Providing transport hubs at the junctions of Peripheral Ring Road with important radials such as; the National Highways and other heavily loaded roads.
- 9 Improving primary, arterial and other important roads (particularly radial and ring roads) by providing grade separation, junction improvements, adding missing links, widening and other road side facilities wherever necessary.
- 10 Institutional strengthening of Urban Transport organisations.

3. TRANSPORT DEMAND ANALYSIS

- 3.1 Population of the BMA is expected to increase from 61 lakh in 2001 to 88 lakh in 2015 and 122 lakh in 2025. In addition, BIAAPA area which has also been included in the study area, will have a population of 9 Lakhs by 2025. Considering proposed land use, transport sector requirements upto 2025 have been assessed using travel demand modeling. The transport sector recommendations contained in the Master Plan for BMA, city development plan proposed by Bruhat Bengaluru Mahanagara Palike (BBMP) under the auspices of Jawaharlal Nehru National Urban Renewal Mission (JNNURM), region development plan prepared by Bengaluru Metropolitan Regional Development Authority (BMRDA), development plans of Bengaluru International Airport Area Planning Authority (BIAAPA) and Bengaluru–Mysore Infrastructure Corridor Area Planning Authority (BMICAPA) have been examined.
- 3.2 For the purpose of transport demand analysis, various scenarios have been considered as follows.

Scenario 1: This scenario considers a ‘do minimum’ situation wherein Improvement & augmentation in existing system for the bus network and roads already proposed. The purpose of the scenario is to capture the intensity of the problem if no measures are taken to overhaul the transport system in the city.

Scenario 2: in addition to what has been considered in scenario 1, scenario 2 considers the implementation of metro project as planned in Phase-1 (42.9 Km).

Scenario 3: This scenario is developed on scenario 2 with additional lines of Mass Transport system to address the anticipated demand with extensive public transport system as the focus for development. It is developed upon scenario 2 with additional lines of mass transport systems (about 630 Km of Metro, Light Metro, BRT, Sub-Urban Commuter Rail and HSRL).

3.3 120 lakh person trips by mechanical modes are estimated to be generated in 2025. Present modal split of 54% in favour of public transport is estimated to fall to 49% by 2025 for scenario 1. Thus most of the trips would be undertaken by personalised modes and bus system creating unbearable congested conditions. For scenario 2, which includes Phase 1 metro network, modal split in favour of public transport is expected to improve to 54% by 2025. However, this is also not enough for the city of size of Bengaluru and many roads would still be overloaded. For scenario 3, the modal split in favour of public transport is estimated as 61%. In the scenario 3 with high parking charges and VOC, the modal split in favour of public transport is estimated as 70%. This modal split is in conformity with the desirable modal split for the city of size of Bengaluru as recommended by a Study Group of Government of India. The study, thus, recommends scenario 3 that would fulfill the objectives of the transport sector development integrated with the proposed land use and giving predominance to the public transport system.

4. PROPOSED TRAFFIC AND TRANSPORTATION PLAN

4.1 On the basis of projected traffic, an integrated multi-modal mass transport system plan on various corridors has been suggested in order to cater to traffic up to the year 2025. The mass transport systems have been proposed on various corridors considering expected traffic demand by 2025, available road right-of-ways and system capacity. The balance traffic should be carried by road system in order to satisfy the needs of normal bus system and other modes such as two wheelers, cars, bicycles, trucks, pedestrians etc. The proposed Traffic and Transportation Plan for Bengaluru contains the following types of proposals, which will cater to requirements of the projected travel demand up to the year 2025.

- Mass Transport System
 - *Metro System*
 - *Light Metro System*
 - *Bus Rapid Transport (BRT) System*
 - *Sub-Urban Commuter Rail System*
 - *High Speed Rail Link (HSRL)*
- City Bus System
 - *Augmentation of Bus Fleet*
 - *Grid Routes*
 - *Bus Terminal cum Traffic & Transit Management Centres (TTMC)*
 - *Multimodal Transit Centre*
 - *Volvo Depot cum Traffic & Transit centre*
 - *New Bus Stations/bus shelters*
 - *Additional Bus Depots*
 - *IT Infrastructure*
 - *HRD Infrastructure*
 - *Environmental Protect Projects*
- Integrated Multimodal Transit Centres cum Intercity Bus Terminals

- Transport System Management Measures
 - Pedestrian/NMT Facilities
 - *Footpaths*
 - *Skywalks/Subways*
 - *Pedestrian zones*
 - *Cycle Tracks*
 - Road Development Plan
 - *New Roads/Missing Links*
 - *Road Widening*
 - *Grade Separators*
 - *Re-alignment of ORR*
 - Parking Facilities
 - Integrated Freight Complexes
- 4.2 Integrated multi modal transport system has been recommended in order to ensure seamless travel. For the balance travel demand, road improvement proposals have been formulated. While making road proposals, entire corridor has been proposed to be improved instead of isolated improvements.
- 4.3 The proposed mass transport corridors are shown in **Table 0.1** and **Figure 0.1**. Proposals pertaining to city bus system (other than BRT), parking, pedestrian and road improvement proposals are shown in **Figures 0.2 –0.6**. Summary of proposals is given in **Table 0.2**.
- 4.4 Summary of the cost estimates for various projects is also given in **Table 0.2**. Overall cost of the entire plan is estimated as Rs 53367 Crore of which Rs 23987 Crore is proposed for Phase I (2011–15). Cost of the projects proposed in Phase II (2016–20) is Rs 26080 Crore.

Table 0.1 Proposed Mass Transport Corridors

Sl. No.	Corridor	Length (Km)
A	<i>Metro Corridors-Phase-I (under construction)</i>	
1	Hesarghatta – Puttenahalli Cross	24.2
2	Baiyyappanahalli – Mysore Road Terminal	18.7
	Total Length	42.9
B	<i>Extension of Metro Corridors</i>	
1	Extension of Puttenahalli Cross– Hesarghatta line to BIEC	2.7
2	Extension of Hesarghatta – Puttenahalli Cross line to PRR	7.4
3	Extension of Baiyyappanahalli – Mysore Road terminal line to Kengeri	5.9
4	Extension of Mysore Road terminal – Baiyyappanahalli line to Whitefield	12.4
	Total Length	28.4

Sl. No.	Corridor	Length (Km)
C	New Metro Corridors	
1	Electronic City to Srinivasapur	31.8
2	Yeshwantpur to BIA	37.8
	Total Length	69.6
D	HSRL	34.0
E	Light Metro Corridors	
1	Hebbal-JP Nagar (along Western ORR)	31.3
2	Toll Gate to PRR along Magadi Road	9.7
3	National College to Kathriguppe Junction	5.0
4	Hosur Road-BG Road Junction to PRR	13.8
5	Indira Nagar to White Field	17.2
	Total Length	77.0
F	Suburban Commuter Rail Service Corridors	
1	Kengeri - Ramanagaram	32.0
2	Baiyyappanahalli - Hosur	41.0
3	Yeshwantpur - Tumkur	64.0
4	Yelahanka - Doddaballapur	24.0
	Total Length	161.0
G	Bus Rapid Transit (BRT) Corridors	
1	JP Nagar-Hebbal (along Eastern ORR)	31.7
2	ORR to Hosur Road (upto PRR)	13.0
3	Hosur Road to Tumkur Road (Western PRR)	42.9
4	Tumkur Road to Hosur Road (Eastern PRR)	78.5
5	Along CRR	31.2
6	PRR to Kengeri to JP Nagar	15.9
7	Domlur Extn to Koramangala	5.6
8	Mulur to Maruthinagar	7.1
9	BIEC to PRR	2.1
10	Cricket Stadium to BIA via Hebbal	34.0
11	Yelahanka to PRR	9.9
12	KR Puram Metro station to PRR (Along Old Madras Road)	7.7
	Total BRT Length	279.6
	Grand Total Length (Km) (A+B+C+D+E+F+G)	692.5

Table 0.2 Summary of Cost Estimates for the Entire T&T Plan (2010 prices) (Rs. Crore)

ITEM	Length Kms/Nos.	Total Cost (Rs. Cr.)	Phase-I 2011-15	Phase-II 2016- 20	Phase-III 2021- 25
MASS TRANSPORT CORRIDORS					
Metro System	141.0	20882.0	0	20882.0	0
HSRL	33.0	3960.0	3960.0	0	0
Light Metro System	77.0	7700.0	4100.0	1380.0	2220.0
Sub Urban Commuter Rail System	161.0	2415.0	2415.0	0	0
BRT System	279.6	3914.4	2076.2	1838.2	0
IMPROVEMENT IN CITY BUS SYSTEM					
Improvement in City Bus System		5282.0	2372.0	1830.0	1080.0
Master Control facility for Public Transport Operational Integration		30.0	30.0	0	0
ROAD INFRASTRUCTURE					
New Roads	183.2	5403.9	5403.9	0	0
Outer Ring Road Realignment	16.6	346.1	346.1	0	0
Road Improvements (Inside ORR)	71.1	85.4	85.4	0	0
Road Improvements (Outside ORR)	469.1	422.2	422.2	0	0
GRADE SEPARATORS					
Grade Separators-Road (Nos.)	12	383.0	383.0	0.0	0.0
Rail Over Bridges / RUBs-Rail (Nos.)	32	864.0	864.0	0	0
PEDESTRIAN FACILITIES					
PARKING FACILITIES (No. of car spaces)	8500	420.0	420.0	0	0
INTEGRATED FREIGHT COMPLEXES (IFC)	6	300.0	150.0	150.0	0
TRANSPORT SYSTEM MANAGEMENT					
		590.0	590.0	0	0
GRAND TOTAL		53367.0	23986.8	26080.2	3300.0

5. INSTITUTIONAL STRENGTHENING

5.1 The current structure of governance for the transport sector is not adequately equipped to deal with the problems of urban transport. Multiplicity of organizations, independent legislations and inherent conflict in the roles and responsibilities of stakeholders actually impede in the process of planning and implementation of major schemes aimed at development. Government of Karnataka has recently accorded sanction for the creation of State Directorate of Urban Land Transport (DULT) under the Urban Development Department with the intended objective of ensuring integration of transport planning and development of transport infrastructure in urban areas. This DULT needs to be strengthened by any adequate technical staff such as Transport Planners, Traffic Engineers, Travel Demand Modelers, Civil Engineers etc. The government has also sanctioned setting up of Bengaluru Metropolitan Land Transport Authority (BMLTA) for BMR. BMLTA will function as an umbrella organization to coordinate planning and implementation of urban transport programmes and projects.

All land transport systems (excluding Railways) in the BMR will be brought under the purview of BMLTA. Therefore it is important that BMLTA is established at the earliest with statutory backing and adequate technical staff provided for this organization. It is also important that BMLTA is also given with the power to assign various projects to various organizations. All the finances to the concerned organizations should also be routed through BMLTA in order to make BMLTA effective and to ensure timely completion of projects.

- 5.2 Transport Planning is an essential component of town planning. Presently there is no proper technical body for required transport planning inputs. It is necessary that technical expertise is created within BDA and BMRDA to undertake this task. For the purpose, Transport Planning Unit (TPU) is proposed to be established in BDA and BMRDA.

A large number of agencies deal with road system such as BBMP, BDA, Traffic Police, PWD, NHAI, BMRDA, Transport Department, BMTC etc. There are numerous issues of proper road geometrics, traffic circulation, junction design, traffic signals, road signs/markings, street furniture etc which are not properly attended to by these agencies due to lack of traffic engineering expertise. Traffic planning is a continuous affair. It is therefore important that Traffic Engineering Cells are established in these organizations with qualified and adequate staff such as traffic engineers and transport planners. This will ensure that the traffic schemes are properly implemented with better results and fine-tuned later, if necessary. This will go a long way to improve traffic flow in Bengaluru. As bus system will continue to be an important sub-system in future also, it is also important that BMTC is adequately strengthened through its HRD initiatives.