CHAPTER – 7

THE TRAFFIC AND TRANSPORTATION PLAN

7.1 COMPONENTS OF THE TRAFFIC AND TRANSPORTATION PLAN

7.1.1 The previous chapter has dealt with the future travel demand analysis on various corridors. On the basis of projected traffic, an integrated multi-modal mass transport system plan indicating different mass transport systems on various corridors has been suggested in order to cater to traffic up to the year 2025. 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 Bangalore 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
  - Monorail/LRT System
  - Bus Rapid Transport (BRT) System
  - Commuter Rail Services
- City Bus System
  - Augmentation of Bus Fleet
  - Grid Routes
  - Bus Terminal cum Traffic & Transit Management Centres (TTMC)
  - Volvo Depot cum Traffic & Transit centre
  - New Bus Stations/bus shelters
  - Additional Depots
  - IT Infrastructure
  - HRD Infrastructure
  - Environmental Protect Projects
- Inter-city Bus Termini
- Transport Integration
- Transport System Management Measures
- Pedestrian/NMT Facilities
  - Footpaths
  - Skywalks/Subways
  - Pedestrian zones
  - Cycle Tracks
- Road Development Plan
  - New Roads/Missing Links
  - Road Widenings
  - Grade Separators
  - Re-alignment of ORR

- Parking Facilities
- Integrated Freight Complexes

7.1.2 While framing proposals priority has been given to public transport and non-motorized transport such as pedestrian facilities. For the balance travel demand, road improvement proposals have been formulated. The details of these proposals are given in the following paragraphs.

7.2 MASS TRANSPORT SYSTEM

Public/Mass Transport System will be the backbone of the city's transport system. The basic premise of the Transport Plan in terms of the National Urban Transport Policy is to create an efficient, cost effective and extensive network of public transport which could provide comfortable, convenient and affordable means of transport to the maximum number of commuters. In this direction a number of schemes are already under implementation and quite a few on the drawing board. Infact keeping in view the observations of the scenarios in Chapter-6 there exist a large requirement for additional facilities in respect of public/mass transport system for the large area proposed to be developed in the forthcoming two decades as per the Master Plan - 2015 proposals.

7.3 THE METRO NETWORK SYSTEM

7.3.1 Metro Corridors under Implementation:

Work on implementation of 36.8 km of metro, partly underground and partly elevated, has already been initiated by Bangalore Metro Rail Corporation (BMRC) along East-West & North-South corridors crossing at Majestic. These corridors will basically cover the most congested core areas of Banglore like Peenya, Gandhinagar, M.G. Road, Vijayanagar, Indiranagar, Majestic area, K.R.Market, Jayanagar, and Basavanagudi etc. **Tables 7.1** give these Phase I Metro corridors.

Table 7.1 Phase-1 Metro Corridors

S.No.	Corridor	Length km
1	Baiyyappanahalli to Mysore Road (East-West Corridor)	18.0
2	Peenya to R.V terminal (North-South Corridor)	18.8
	Total length	**36.8**

7.3.2 Extension of Metro Corridors:

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 as brought out in Chapter 6. This is especially true because the Master Plan 2015 and its detailed Zonal plans propose the development of around 814.4 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 upto 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.

7.3.2.1 **Extension of North –South corridor from R.V. Terminal upto Peripheral Ring Road**:
The area to the south of Jayanagar consisting of J.P.Nagar Banashankari, Kumaraswamy layout are fully developed and quite densely populated. Substantial commutation takes place between these areas and core areas of Bangalore. BMICAPA has plans to develop residential and commercial activities along the Bangalore Mysore Expressway corridor, the North –south commuter traffic is expected to increase substantially. It is therefore being proposed that the already approved North-South corridor between Peenya to R V Road Terminal may be extended upto the PRR along the Kanakapura Road. This extension of approximately 10 km should be taken up in the first phase itself.

7.3.2.2 **Baiyyappanahalli to Benniganahalli along Old Madras Road**
The first phase of the East West line has been proposed from Baiyyappanahalli to Mysore Road. How ever as would be seen from the plan and the subsequent proposals, Outer Ring Road (ORR) is one of the most important spines of Banglore on which large city traffic converges and keeping this in view mass transport in the form of BRT/ Mono-Rail/ LRT is proposed on it in addition to its improvement and smoothening. Benniganahalli located just on the ORR is also the Rail station for the proposed Commuter Rail Systems on the intersection of Bangalore City Station – Whitefield & Banaswadi – BMA Boundary rail corridors. Thus, since it is a very important transport node where a number of transport modes i.e. BRT, CRS etc., meet it, can act as an excellent inter-modal interchange. Therefore it is proposed the east west corridor is extended from Baiyyappanahalli to Benniganahalli through a distance of 1.5 km in the first phase itself.

7.3.2.3 **Yelahanka to Hi-tech corridor via Nagavara, Electronic City**
The singular North-South corridor planned so far will mostly be able to cater to the western part of the city between Peenya and Kanakapura Road. However the development coming up on the eastern side between Hosur Road and white field – the I.T. and the Electronic cities and in the Northern side near Thanisandra and Yelahanka need another north-south corridor. In order to meet the traffic demand of this area another 34 km long corridor from Yelahanka to PRR via Nagavara, Electronic City has been planned. This corridor will cover Nagavara, Veerannapalya, Frazer Town, the residential, commercial and industrial (IT Sector) areas along Hosur Road. This corridor will also have interchange with the airport expressway and airport metro to provide direct access from south and south east Bangalore to the airport. This will also at interchange with the East West metro corridor.

7.3.2.4 **Indira Nagar Metro Stn. to White field Railway Stn. via 100ft Indiranagar Road**

The up coming industrial areas, I.T hubs and commercial developments near the White Field area, C.V. Raman Nagar and the commercial development along most of the roads in the Indira Nagar area have totally chocked the Airport Road and the White Field Road and by the time the I.T. hub is fully functional the traffic demand will require a Metro connection of the White Field area with the heart of the City. Accordingly a 19.5 Km. Metro link between Indira Nagar Metro station and White field is proposed. This link when completed would have an inter face with the Mysore Road – Benniganahalli east west corridor at Indira Nagar.

7.3.2.5 **Proposed Devanahalli Airport to M.G.Road via Bellary Road**

A new International airport is coming up at Devanhalli about 33 Kms North of Banglore and is slated to be completed shotly. In order provide an unhindered direct approach to the Airport a Metro link between M.G. road and the new airport approximately 33 km long has proposed. In order to make the corridor truly functional, the following Terminal / checkin & pick stations have been suggested:

i. City Airport Terminal: In police grounds on M.G.Road the CAT is planned and the metro ramp structure from Mink underground section to M.G. Road elevated section will pass through the CAT structure, integrating both systems.

ii. Hebbal Check-in Station: The second check-in station has been planned at the end of the Hebbal fly-over towards left, with elevated cross-passage with escalator facility to cross-over from the bus-terminal being planned on the right side. The ease of access from the ORR will be able to attract large clientele to this Station.

iii. Yelahanka Pickup Station: It is located at the junction of the N.H. and the Yelahanka Town Road. At this station luggage checkin is not being provided but passengers with hand baggage only will be able to board and alight the train.

The above proposals of metro extensions have been consolidated and listed in the following table. These proposals would add up to about 100 Kms. of Metro to taken up in later phases.

Table 7.2 Extension of Metro Corridors

S.no.	Corridor	Length km
1	Extension of North –South corridor from R.V. Terminal upto PRR	10.2
2	Baiyyappanahalli to Benniganahalli along Old Madras Road.	1.5
3	Yelahanka R.S to PRR via Nagavara , Electronic City	36.0
4	Indira Nagar Metro Station to White field Railway Station via 100ft Indira Nagar Road	19.5
5	Proposed Devanhalli Airport to M.G.Road via Bellary Road	33.0
	Total length	**100.2**

Thus ultimately it is suggested that approx. 137 km of network of Metro will be required to effectively serve the major traffic corridors and high density use areas

to meet the travel demand up to 2025. This could be taken up in two phases. Corridors No 1 and 2 of the above **Table 7.2** may be taken up along with the corridors indicated in **Table 7.1** under implementation in Phase I, while the corridors Sr. No 3 &4 above may be taken up in the subsequent phase. In view of the pace at which the new Airport is constructed, it will be desirable to take up the Airport connection at S.No. 5 above in the first phase itself in order to make the same accessible as and when commissioned. These proposals are indicated in **Figure 7.1.**

7.4 MONO RAIL / LIGHT RAPID TRANSIT 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. Infact upto 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 10 meter wide BUS Lanes (Bus ways) are necessary at grade. However on roads where the right of way does not permit carving out the at-grade Busway, 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 as explained in Chapter 6. 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 Mono-Rail / LRT system.

Table 7.3 Mono-Rail/LRT Corridors

S.no.	Corridor	Length Km
1	Hebbal to J.P. Nagar (Bannerghatta Road) along the western portion of outer ring road	31.0
2	PRR to Toll Gate along Magadi Road	9.0
3	Kathriguppe Road / Ring Road Junction to National College	5.0
4	Hosur Road - Bannerghatta Road Junction to PRR along Bannerghatta Road	15.0
	Total	**60.0**

The option of system selection i.e. Light rail or Monorail will depend on the detailed feasibility for these corridors as and when taken up.

Figure 7.1

7.5 COMMUTER RAIL SYSTEM (CRS)

Within the BMA, approximately 120 km of rail system of the Indian Railways exists basically for long distance passengers and goods/ freight. This system currently is not being utilized for intra-urban movement with in the BMA. However RITES in its study has identified some of the Railway corridors along which it is possible to run commuter service with some additions and improvements. A similar proposal of utilizing approximately 62 km track and incurring an expenditure of Rs. 650 Crore on making the commuter service possible in two phases (2007 to 2012 & 2013 to 2018 each estimated to cost Rs. 325 Cr.) has been recommended in M.P.2015. The plan has also indicated a land requirement of 62 Ha. for this project. However it is found that the network proposed above will not be sufficient to meet requirements of the Development Area proposed in Master Plan 2015 upto the year 2025. Accordingly it has been considered necessary to extend the CRS network to approximately 119 Kms, using the existing at-grade railway system to serve intra-city needs, which is proposed along the corridors 1 to 7 in **Table 7.4**.

In addition, with the coming up of the BMRDA's planned new Town Ships at Bidadi, Ramanagaram, Solur, Sathanur & Nandagudi, high level of commutation between them and the Metropolis. Also, with the development of the huge Multiple Economic Activity Areas like Electronic City, I.T. Parks, Industrial & Commercial Areas with consequent job opportunities on the one hand and availability of comparatively cheaper accommodation in surrounding towns like Hosur, Ramanagaram and Tumkur etc. where a large number of working population is likely to live, substantial of commuter movement between these towns and the Metropolis will take place. In order to cater to this suburban commuter traffic, the CRS is proposed to be extended as corridors 8 to 10 in **Table 7.4** below.

Table 7.4 Commuter Rail Corridors

S No.	Corridor	Length Kms
1.	Kengeri – Banglore City Station	13.0
2.	Bangalore City Station – Whitefield	24.0
3.	Bangalore City Station – Baiyyappanahalli Via Lottegollahalli	23.0
4.	Lottegollahalli to Yelahanka	7.0
5.	Banaswadi upto BMA Boundary	29.0
6.	Kengeri- BMA Boundary	9.0
7.	Yeshwantpur to BMA Boundary	14.0
8.	BMA Boundary – Hosur	12.0
9.	BMA Boundary- Ramanagaram	23.0
10.	BMA Boundary to Tumkur	50.0
	Total	**204.0**

Corridors 1, 2, 6 and 9 are proposed to be taken up in the I Phase, while Sl No 3, 4, 5, 7 and 8 will be taken up in the II Phase. The Corridor at Sl No 10 upto Tumkur may be taken in III Phase.

7.6 BRT SYSTEM

BRT is one of the most cost effective public transport modes where the following two conditions can be met:

- Sufficient Right of way (30m or more) is available along the corridor to provide for exclusive carriage ways for BRT
- The peak hour commuter load is up to 20,000 phpdt.

The BRT has also the advantage of large coverage and ease of accessibility as well as simpler operational systems. Accordingly taking into consideration the Master Plan 2015 development proposals and the likely travel demand as explained in Chapter 6, BRT system along the following corridors is proposed:

Table 7.5 Bus Rapid Transit (BRT) Corridors

S.No.	Corridor	Length km
1	Hebbal to Bannerghatta Road along eastern crescent of outer ring road	33.0
2	Benniganahalli (ORR) to PRR along old Madras Road	7.0
3	From ORR to Hosur Rd along Hi-tech Corridor	8.0
4	Hosur Road to Tumkur Road along PRR (western part)	41.0
5	Tumkur Road-PRR Junction to Hosur Road along PRR via Tirumanahalli, Old Madras Road, Whitefield	76.0
6	Along Core Ring Road	30.0
7	Vidyaranyapura to Nagavarapalya via Hebbal, Jayamahal Road, Queens Road, M.G. Road, Ulsoor, Indranagar, CV Raman Nagar	29.0
8	Kengeri Sattelite Town to J.P. Nagar along Uttarahalli Road, Kodipur	13.0
9	Banashankari III stage to Banashankari VI stage Ext. along Ittumadu Road, Turahalli, Thalaghattapura	6.0
10	Domlur Ext. to Koramangala along inner ring road	5.0
11	PRR (Mulur) to Maruti Nagar (up to Hitech corridor) along Sarjapur Road	7.0
12	Peenya to PRR along Tumkur Road	6.0
13	Old Madras Road near Indiranagar to ORR near Banaswadi along Baiyyappanahalli Road -Banaswadi Road	5.5
14	Hebbal to Devanahalli Airport along Bellary Road	25
	Total	**291.5**

Thus it is proposed to have at least 569 km of mass transport system consisting of Metro, Mono Rail / LRT, BRT and CRS within the BMA supported by another 85 Kms of CRS out side BMA connecting the Metropolis to some of the BMRDA's new Townships and the Regional Towns of Tumkur and Hosur. All these proposals are shown in **Figure 7.1**. In addition to this network, the city bus system will cover a much larger area and will compliment the above systems.

7.7 AUGMENTATION AND IMPROVEMENT IN CITY BUS SYSTEM

While the high capacity BRT will be operational on selected routes where substantial right of way is available, the major areas specially the inner areas and the areas approached by the internal roads will in any case continue to be served by local bus system which will act as the most important feeder system to the Metro, Mono Rail/LRT and the CRS. For this purpose the BMTC has identified East-West, North-South & diagonal grid routes along 27 corridors as already indicated in **Figure 1.4**. In addition to improving the fleet capacity, rationalization of routes, improvement in traffic management at the junctions including priority signaling, provision of proper road side bus stops and integration points with the Metro, Mono Rail and CRS will provide effective use of the bus system. BMTC shall continue to play a vital and leading role in public transport in any scenario of the City's development. In order to meet the future challenge, BMTC has planned a number of initiatives as included in the following proposals:

Table 7.6 Proposed Improvements in the City Bus System

S. N.	Proposals	Description
1.	**Augmentation of Schedule and Fleet**	At present the BMTC is operating approximately 4500 buses at more than 1700 routes carrying approximately 35 Lakh passengers. By the year 2025, despite the fact that we are going to add Metro, Mono-rail /LRT, BRT and start CRS, still the feeder services as bus services on the other less dense corridors, will definitely be run through the city bus system only. It is expected that by 2025 at least 60 Lakh trips will be performed by buses only. For this volume of traffic at least 10000 buses will be required. However, this number may have to be increased substantially incase any of the MRT components lag behind in implementation. It is further pointed out that mere increase in fleet is not enough, its quality will also have to be of much higher standard if we want to achieve the NUTP policy of changing the passenger preference from personalized vehicles to Public Transport. Accordingly it is suggested that all the new buses to be added to fleet, either as addition or replacement should be low floor good quality buses fully considering the commuter comfort. The BMTC plans to add 2500 new vehicles and replace 1415 aged old vehicles, taking the Scheduled strength to 7000 by 2010. The financial implication towards these new vehicles is estimated as Rs 1000 Crore. In the later phases the balance 3000 buses are proposed to be added to meet the ultimate requirement of 10000 buses.

2.	**Grid Routes and Dedicated Bus Lanes**	The BMTC has at present identified 27 grid routes in the North South, East and West and diagonal direction, which will meet the requirement till about 2010. Most of these grid routes are confined upto the ORR, and only a few at present transcend beyond it. However, by 2025 when the complete Development Area of more than 814 Sq. Kms proposed in BDA Master Plan gets fully occupied, these grid routes will both have to be extended upto the PRR and new routes added to serve this area. These routes will complement the Metro and BRT already proposed between the ORR and PRR.		
3	**Bus Terminal cum Traffic & Transit Management Centres (TTMC)**	TTMC's are planned to have multi-level parking lot, public utilities like mini-shopping centres and food courts. These centers in addition to providing park & ride facilities are also proposed to act as hubs for Mini – Buses planned by BMTC to transport the commuters from every major residential area to the nearest TTMC, so that commuters can board a bus of their choice. BMTC has planned such TTMC's at the following 45 locations. Of these TTMCs at Bannerghatta, Kengeri, Domlur, Yeshwantpur, Koramangala, Vijayanagar, ITPL, Banashankari and Shantinagar are planned to be taken up very shortly. In fact quite of few these center will act as Intermodal transfer nodes and will provide logistic support to MRT modes like – METRO, Mono-rail/LRT, BRT & CRS etc. through Park & Ride as well as other facilities. In fact as the MRT network grows some additional TTMC's may be required and in some case a slight relocation of some of the following TTMC's may be required.		
	TRAFFIC & TRANSIT MANAGEMENT CENTERS (TTMC)			
	1. Yeshawantapur 2. Jayanagar Bus Stn. 3. Domlur 4. Kengeri 5. Bannerghatta 6. Shanthinagar 7. Koramangala 8. ITPL, Whitefield 9. Vijayanagara 10. Banashankari 11. Indiranagar 12. Kathriguppe 13. Hebbal. 14. Hennur 15. HSR layout	16. Kalyan Nagar 17. Nagarabhavi 18. Sriganda Kaval 19. Poorna Prajna 20. Jayanagar Depot-4 21. Peenya 22. Yelahanka 23. Rajarajeshwari Nagar 24. Hosakote 25. Bidadi 26. Vaddarahalli 27. Anjanapura 28. International Air Port 29. Venkatala 30. Bairathi	31.Avalahalli 32.Channasandra 33.Kodarhi 34.Dodda Tugur 35.Gollahalli 36.Kaggalipura 37.Challaghatta 38.Sulikere 39.Machohalli 40.Madapura 41.Harohalli 42.Soladevanahalli 43.Kambipura 44.Baiyyappanahalli KR Pura

4	**Multi-Modal Transit Center**	The MMTC at Subhash Nagar has been planned at a cost of Rs. 350 Crore
5	**Volvo Depot cum Traffic & Transit centre**	Banashankari
6	**New Bus Stations/Bus Shelters**	In addition to the 4 major Bus stations located at Subhashnagar, Shivajinagar, City Market and Shanthinagar & 27 sub-nodal bus-stations commissioned at various locations, BMTC has planned another 23 bus stations and about 300 bus shelters at a cost of Rs. 279 Crore
7	**Modern Bus Depots**	Nagarabhavi Sreegandhadakaval Vaddarahalli Kothnurdinne Poornaprajna Layout
8	**New Depots**	In addition to the existing 24 bus depots, BMTC intends adding another 27 depots at a cost of Rs. 161 Crore to make the total number to 51 by 2010. However in order to cater to the 2025 proposed fleet size of 8000 buses, we may need another 20 depots for the additional fleet.
9	**Improvement of IT Infrastructure**	BMTC is the first public transport undertaking in the country to use the sophisticated GPS technology for monitoring and tracking of vehicles. This is expected to cost Rs. 33 Crore. In order to provide commuter friendly information, the corporation proposes to transfer GPS generated positional details of the buses to commuters in the form of passenger information system (PIS) through display at bus stops/ bus stations also through interactive voice response system (IVRS). This is expected to cost Rs. 84 Crore. In addition introduction of Electronic Destination Boards on buses, introduction of Electronic Ticketing System, Expansion of Computerisation activity and establishment of surveillance system at a cost of Rs. 66 Crore has been proposed.
10	**Development of HRD Infrastructure**	Training of employees of a large staff organization such as bus system is very important. Therefore 2 hitech multi disciplinary centers (Rs. 50 crore), establishment of employee training modules (Rs. 20 crore) and establishment of employee development centers (Rs. 80 crore) have been proposed.
11	**Environment Protection Projects**	Various environment protection measures at bus depots are being proposed such as Rain water harvesting, Installation of solar lighting system and other environmental initiatives costing around Rs. 49 crore.

7.8 INTEGRATED MULTI MODAL TRANSIT CENTRES –CUM– INTERCITY BUS TERMINALS

At present all the buses whether inter-city, Inter-state or Intra-city originate and terminate at the Central station in Majestic area. These not only creates congestion and heavy traffic density on all radial routes coming into the core of Bangalore but also result in substantial delay to the passengers who have to take the buses from far flung area. Though another intercity bus terminal cum integrated multi modal transit center is being contemplated at Peenya, It will not be sufficient to meet the requirements of traffic from the other direction- especially North, East & South. It is, therefore proposed that there should be at least 3 more Intercity terminals. Accordingly it is suggested that ultimately 4 intercity terminals be located at the following places:

1. Peenya
2. Hosur Road
3. Old Madras Road near ORR
4. Bellary Road near Hebbal

The above terminals are proposed to be located at the Metro and the BRT terminals and will act as Inter Modal Interchanges between regional and local traffic.
Also these would be the center for Chartered and tourist buses, with adequate parking facilities and tourist bureaus / offices etc as well as other tourist infrastructure for operation of private tour operators who are at presently located mostly around the majestic Area.

These proposals have been indicated in **Figure 7.2**.

7.9 ROAD INFRASTRUCTURE

The present road network consists of the Ring Roads and major radial corridors. A number of proposals have already been very broadly included in the Master Plan 2015. In addition quite a few proposals are being implemented by Govt. agencies like NHAI, State PWD, BMC, BDA, BMRDA and BMICAPA along with the private sector through PPP model. It is necessary to integrate / superimpose all these proposals in the light of projected travel demand for road traffic and confirm that they are in conformity with each other and there is neither conflict nor duplication. As the radial road corridors are expected to have high traffic volume, these corridors have been proposed to be strengthened instead of isolated improvements. The road improvement proposals include road widening, new roads (bypasses and other roads), ORR realignment, grade separators (road flyovers, ROBs, RUBs), Integrated Freight Complexes etc. These proposals are explained below.

Figure 7.2

7.9.1 Functional Hierarchy

In the existing road network, except for defining National Highways no other road has been specifically defined according to its functions. The Master Plan 2015 has broadly defined them as under:

- Ring Roads – Core Ring Road (CRR), Outer Ring Road (ORR), Peripheral Ring Road (PRR), Intermediate Ring Road (IRR), Satellite Township Ring Road (STRR)
- Expressways– Airport Link Road
- Highways – National Highways, State Highways
- Arterial Roads
- Sub-arterial roads
- Other link roads

It is however suggested that for new roads, we may clearly define them as shown in the **Table 7.7** below and provide them with adequate protective green belt beyond their right of way in order control direct access and avoid ribbon development:

Table 7.7 Functional Hierarchy of Roads

Road Nomenclature	Functional Characteristics	Minimum Suggested Right of Way (ROW)	Restricted green belt beyond the ROW
R-1	Access controlled Expressway with proper service roads like Peripheral Ring Road, Expressway linking the Town with New airport, Other Regional Roads like the Intermediate Ring Road and the Satellite Towns Ring Road etc.	100 Mts	30 Mts.
R-2	Arterial Roads	80 Mts	15 Mts
R-3	Secondary Roads/ Sub-Arterial Road providing main internal access in functional areas- Industrial, residential, institutional and commercial areas.	45 Mts	
R-4	Access Roads providing access to individual properties. No kerb parking is to be provided	20 Mts.	

The suggested cross-sections for the above categories of roads are shown in **Figure 7.3**. It is suggested that in order to control the development along R-1 & R-2 roads, legislation similar to the 'the Punjab Scheduled Roads and Controlled Areas Restriction of Unregulated Development Act, 1963' may be enacted.

Figure 7.3

7.9.2 Major Road Proposals

7.9.2.1 Ring Roads

The City would be looking at significantly altering the radial, "through the core" traffic pattern by improving / developing key "rings," in the BBMP, BDA, and BMRDA jurisdictions:

- **Core Ring Road (CRR)**: Of about 30 km length, around the core area, this would form the primary "bypass" to the inner core BBMP area. This road may be constructed as an elevated corridor, to minimize land acquisition. The ground level carriageways may be reserved for public transport i.e. BRT, while the private vehicles and Para transit vehicles should use the elevated deck. However this proposal will also entail improvement to the radials meeting it and their junctions with the CRR.

- **Outer Ring Road (ORR)**: Is at a radius of 7 to 10 km from the city center. The outer ring road covers a total length of 62 km and connects all major roads and highways in and around Bangalore. However, by efflux of time, the ORR has almost become a city road, with local traffic and many signaled intersections, and development all around. At present this road has a number of bottlenecks and kinks. Infact near Pantarapalya on Mysore for about 6.5 Kms the ORR follows the Mysore Road radial corridor only. The proposals consist of realigning the ORR at a couple of points and providing 2 fly-overs where the ORR has some common portions with Sarjapur Road and Bannerghatta Road. These proposals are to be carried in small lengths totaling up to about 16.6 Kms and are indicated in the Table 7.8 below. On the eastern crescent of this road, BRT corridor with exclusive segregated lanes and allied facilities for operating high capacity buses has been proposed, while on its western crescent Monorail / LRT has been proposed.

Table 7.8 Outer Ring Road Re-alignment

S. No	Stretch	Length km
1	Elevated road along Bangalore University Road	2.5
2	Realigning ORR between Magadi Road and Pipe Line Road	1.9
3	Realigning ORR at Tumkur Road through CMTI	1.2
4	Realigning ORR from Kasturi Nagar to Mahadevapura along Selam railway line	5
5	Elevating ORR along common portion with Sarjapur Road	2
6	Elevating ORR along common portion with Bannerghatta Road	1
7	PESIT to Janabharti Enterance Banglore University	3
	Total	**16.6**

- **Peripheral Ring Road (PRR)**: The Master Plan 2015 has proposed a Peripheral Ring Road of around 114 km around Bangalore at a radial distance of 2.80 to 11.50 km from the existing outer ring road. On the western side of the city just about 1 to 5 Kms inside the PRR an access-controlled expressway is already being constructed under the auspices of the Bangalore Mysore Infrastructure Corridor Area Planning Authority (BMICAPA) through Private Sector. This Expressway connects NH-7 (Hosur Road) and NH-4 (Tumkur Road) covering approx. 41 Kms. The Eastern Portion of the PRR between NH-4 & NH-7 via Old Madras Road, Airport Road should be taken up immediately to be followed by implementation of the western portion. The entire PRR should have exclusive segregated lanes and allied facilities for operating high capacity buses as BRT system. Along this Ring Road at its Junctions with Hosur Road (NH-7), White Field Road, Old Madras Road (NH-4), Bellary Road, Tumkur Road and Mysore Road, six Integrated Freight Complexes (IFC) have been proposed for handling entire freight traffic. These IFCs are indicated in **Figure 7.4**. Since it is proposed not to allow the HCV's to enter the town inside the PRR, the junctions will have to be grade separated at these points. This road should be treated as R-1 and have the 30 meters restricted belt on either side beyond the ROW.

7.9.2.2 Air Port Link Road (Expressway)

An expressway has been proposed in the Mater Plan 2015 to connect the New International Airport at Devanhalli to the city. At the moment the International airport site is only approachable through the Bellary Road which being a National Highway (NH-7) carries large interstate traffic. In order to provide uninterrupted approach to the upcoming International Airport likely to be operational next year, it will be desirable that this expressway should come up early and be commissioned simultaneous with the opening of the International Airport.

7.9.2.3 Other New Roads / Missing Links

In addition to the above roads, a few small links are required to cater to the important activity areas from the major existing Network and under implementation.

Accordingly the new roads (including elevated CRR, PRR, A.P. Link Expressway and other new links proposed to be taken up are as listed in **Table 7.9** below.

Table 7.9 New Roads / Missing Links

SNo	Corridor	Length km
1	Core Ring Road (CRR) (elevated)	30
2	Arterial Roads crossing CRR	30
3	Peenya Industrial Area To Bangalore Mysore Expressway	2.2
4	Peripheral Ring Road (PRR)	114
5	Air Port Link Road (Expressway) Upto ORR	26

SNo	Corridor	Length km
6	Link from Tigalarapalaya Main Road to Nelagadaranahalli (included in Item 42 of Parallel Ring Road (Table 7.10)	1.23
7	Link from Hesargatta Main Road to Shettihelli and Madarahelli to Mohammed Sabi Palaya (included in Item 43 of parallel ring road (Table 7.10)	4.02 (1.38 + 2.64)
8	Link from Sampigehalli to CRPF parade ground (included in Item 25 of parallel ring road (Table 7.10)	1.72
	Total	**209.17**

7.9.2.4 **Road Improvements**

The entire traffic from the BMA, the Region and even beyond converges on to the Center of Bangalore and the work areas along the radial corridors and gets dispersed through the ring roads. Most of the radials roads suffer from congestion because of their over utilization of their limited capacity. In addition the limited carriageway, the inefficiency of the junctions and their incapability to handle the volumes of traffic further reduces the capacity of the road systems. Accordingly it has found necessary that quite a few roads listed in the **Table 7.10** below will require improvement through widening 4 – 6 lane carriageway in order to cater to projected road traffic up to the year 2025. In addition at some of the critical junctions where normal signaling cannot effectively manage the traffic volumes, grade separators & flyovers will be necessary. Also at road crossings with railway lines, at some places Road Over bridges & or Road Under Bridges will be necessary. Along a few of the roads where the traffic demand far exceeds the capacity and at grade expansion is not possible due to restriction of available carriageway, elevated roads e.g. along Mysore road and Hosur Road have been provided. Accordingly the roads, both inside the ORR and out side the ORR have been identified for their improvements in terms of widening of carriageway, provision of drainage, surface improvement, footh-path etc. are listed in **Table 7.10** below. The Junctions & Road stretches requiring grade separators, ROB's and RUBs are indicated in **Table 7.11** below.

Table 7.10 Road Improvements

SNo	Name of Road	Length km
Road Improvements (Inside ORR)		
1	Bellary Rd	7.60
2	Palace Road	1.75
3	Sheshadri Road	0.50
4	Nrupatunga Road	1.10
5	Vidhana Veedhi	0.20
6	Mission Road	1.00
7	Devanga Hostel Road	0.50
8	Sankey Road	3.40
9	Lalbagh Road	0.41

SNo	Name of Road	Length km
10	Jaymahal Road	2.80
11	Hosur Road	1.60
12	Hosur Laskar Road	4.30
13	Victoria Road	1.60
14	Lower Agaram Road	2.40
15	Sarjapur Road	3.35
16	Hosur Road	4.30
17	Bannerghatta Road	4.11
18	80' Koramangala	4.00
19	Dickenson Road	0.30
20	Ulsoor Road	0.60
21	Kensington Road	0.32
22	Murphy Road	1.70
23	Old Madras Road	1.70
24	Richmond Road	5.20
25	Airport Road	5.20
26	Goods shed Road	1.35
27	Cottonpet Main Road	1.20
28	17th Main J CNagar in ward13	1.50
29	5th cross Malleshwaram	1.00
30	Commissariat Road	0.74
31	A M Road	0.75
32	Lalbagh Fort Road	1.35
33	Race Course Road	1.66
34	Kasturba Road	0.77
35	A S char street & BVK Iyengar Road	1.21
36	Vanivilas Road	0.85
37	Suranjan Das Road	3.85
38	Mysore Road	3.90
39	Mt joy Road & Kattriguppe main Road via Vidyapeeta circle	3.00
40	Mahalakshmi Layout & Nandini Layout Road via Ayyappa Temple & Singapore Layout	2.70
41	Dinnur Main Road and Kavalbyrasandra Road (via Ganganagar Sulthan Palya)	4.50
42	Hoskerehalli main Road (via Girinagar)	2.05
43	Vasanth Nagar Main Road	0.62
44	K R Road	1.16
45	Sulthan Road	0.42
46	1st main Chamrajpet	0.15
47	3rd cross Chamrajpet & Bull temple Road	1.00
48	Link Road	0.63
49	Padarayanapura Main Road	1.86

SNo	Name of Road	Length km
50	Bull Temple Road via N R Colony, Chennamma Tank bed & 30th main BSK 3rd stage	1.10
51	Infantry Road	1.83
52	Park Road	0.50
53	Hospital Road	1.10
54	Dispensary Road	0.50
55	K Kamraj Road	1.25
56	Dharmaraj Road	0.40
57	Chandini chowk	0.45
58	Meenakshi Koil Street	0.60
59	Thimmaih Road	2.10
60	Old Poor House Road-Haine's Road	1.00
61	Millers Tank Bund Road	0.52
62	Station Road	1.30
63	Queen's Road	0.95
64	Millers Road	1.42
65	Cunningham Road	0.80
66	Road in front of Russel market	0.25
67	Dr. Ambedkar Road (Tannery Road)	4.43
68	Hennur Road	3.62
69	Banaswadi Road & Wheelers Road (via Banaswadi)	6.35
70	Hare Krishna Road	0.70
71	HMT main Road	2.10
72	Magadi Road	2.40
73	Baiyyappanahalli Main Road	3.35
74	Bapujinagar Cross Road	0.80
75	Kumaraswamy Layout Main Road	1.75
76	South Link Road	0.50
77	MTB Road	0.50
78	Kurubarahalli Main Road in ward 16	1.00
	Total	**141.73**
Road Improvements (Outside ORR)		
Radial Roads		
1	From Peenya II Stage to Andrahalli (via Peenya II Stage, Industrial area, Andrahalli)	4.00
2	Tumkur Road-NH4	8.80
3	New BEL Road	3.40
4	Jalahalli Main Road to Attur via Yelahanka	28.00
5	Yeshwantpur to Yelahanka	20.00
6	Doddaballapur Road.	6.00
7	Devanahalli – Hebbal Bellary Road	25.00
8	NH-7 Kogilu Junction to Nagavara Main Road	8.00
9	Dasarahalli Main Road	16.00

SNo	Name of Road	Length km
10	HBR Ring Road to Nagavara Main Road leading to Jakkur	20.00
11	HBR Ring Road to Hennur Main Road	16.00
12	Old Madras Road	5.25
13	ITPL Road from Ring Road to Hope farm	8.50
14	Varthur Road from Marathalli to Varthur Kodi	5.00
15	Varthur to Outer Ring Road via Belegere and Panathur	6.50
16	Kaigondanahalli to Sarjapur	10.00
17	Bannerghatta Road – ORR to National Park	8.60
18	Bannerghatta Road – National Park to PRR	2.40
19	Begur Road from Hosur Road to Begur	7.00
20	Kanakapura Road.	10.40
21	Ring Road to Kanakapura Road (via Ittumadu)	7.00
22	Rajarajeshwari Nagar Arch to PRR	10.00
Connector Roads		
23	From Magadi Road to NH 4(Via Sunkadakatte, Hegganahalli Main Road, Peenya II Stage, NTTF circle, KIADB Main Road)	6.00
24	Peenya II Stage to Ring Road (via Peeya II Stage Bus stop, Rajgopal Nagar Main Road, Peenya Industrial Area)	3.00
25	NH-7 to Nagavara Main Road through Jakkur	16.00
26	NH-7 to Nagavara Main Road	12.00
27	Hennur Main Road to Hoskote Ring Road	10.00
28	Horamavu-Agara to HBR Ring Road	4.00
29	Horamavu Road from Outer Ring Road to Kalkere	4.20
30	T C Palya main Road from ORR to Anandapura	5.50
31	Devasandra main road from NH 4 to Basavanapura Road	1.70
32	Kundalahalli Road from Devasandra main Road to Kundalahalli gate via Hoodi	7.00
33	ITPL Road to Varthur Road via Pattanadur Agrahara & Nellurahalli	4.00
34	Sarjapur Road to Ring Road(near Devarabisanahalli)	7.00
35	Nagarthapura to Matha Amruthamayee College	5.00
36	Hosur Road to Nagarthapura (Hosur Road)	4.00
37	Begur to Hosur Road (via Begur tank Bund, Chikkabegur and Manipal County)	7.00
38	Bannerghatta Road to Begur (via DoddaKammanahalli, Yelenahalli)	8.00
39	Kottur Dinne to Bannerghatta Road	5.00
40	Harinagar to Kottanur Dinne	4.00
41	Corporation Bank to Ring Road via Javaraiana doddi	4.00
Parallel Ring Road		
42	From Magadi Road to NH 4(Via Herohalli, karivobanahalli, Andrahalli, Tigalarapalya, Nelagadaranahalli, Nagasandra)	8.00

SNo	Name of Road	Length km
43	Hesaraghatta Main Road to SM Road (via Mallasandra, Shetty halli, Abbigere, Kammagondanahalli main Road, Gangammagudi Circle)	6.00
44	Vidyaranyapura Main Road to Hennur main Road	35.00
45	Nagavara Main Road to Kalkere Junction	8.00
46	Sarjapura Road to Kalkere via Chikkaballapur,Gujurpalya, Varthur, Hope farm, Kadugodi, Sadaramangala, Kodigehalli, Basavanapura, T.C.Palya	31.00
47	Matha Amruthamayee to Sarjapura Road(Kaigondanahalli)	5.00
48	Kanakapura Road-Amruthnagar to Harinagar	4.50
49	Kengeri to Konanakunte via Uttarahalli(end of Kanakapura Road)	13.50
50	Kengeri 80' Ring Road to Ullalu Main Road via Matha Mata	10.50
51	Begur Road to Hosur Road and Kudlu	6.00
52	B G Road to Begur Road(via BTM Layout, Kodichikkanahalli	5.00
53	Chunchaghatta Road to B G Road	6.00
54	GnanaBharati Circle to Magadi Road	11.00
	Total	**502.75**
	Grand Total	**644.48**

Table 7.11 List of Grade Separators

SNo	Location / Road
Grade Seperators-Roads	
1	Hudson Circle- N.R.Road Under pass
2	Cauvery Theatre Junction-Bellary Road Grade separator
3	Minerva circle-J.C.Road Fly over
4	Nagavara Junction Along ORR Flyover
5	Hennur Banasvadi along ORR underpass
6	Sarjapur Road & ORR Jn. Along ORR flyover near Ibbalur
7	On ORR Jn. Along ORR near Agara flyover
8	Flyover along Hosur Road near Check post
9	Hosur Road-Inner Ring Road along Hosur Road fly over
10	Additional slip road at CSB intersection
11	Hosur Road Grade separator @ Attibelle
12	Along 16 main BTM Layout underpass
13	Puttenahalli along ORR underpass
14	Kanakapura Road & ORR Jn. Along ORR flyover
15	Kadirenahalli Road & ORR Jn. along ORR flyover
16	Flyover on RV road near RV Teacher College

SNo	Location / Road
17	Tagore Circle underpass on Gandhi Bazaar Main Road
18	Tumkur Road & ORR Junction along ORR Grade separator
19	Flyover along NH 4 at Jalahalli Cross
20	Underpass along pipeline road near Ayyappa Temple
21	Grade separator along Guttahalli Main Road near Guttahalli Circle
22	Grade separator at Yeshwantpur Circle near Bus Station
23	Bridge at Gali Anjaneya Junction
24	Grade separator at Malleshwaram Circle
25	Underpass at Prof. CN Rao Circle
26	Underpass along Chord Road at Magadi Road & Chord Road Junction
27	Underpass along ORR at ORR and Banaswadi Ramamurthy Nagar Road Junction
28	Grade separator at ORR & Magadi Road Junction
Road Over Bridges / RUBs-Rail	
29	ROB along MES Road near Jalahalli
30	Underpass along Link Road Connecting D Rajagopal Road & Kodigehalli Road
31	Ashoka Theatre – Pottery Road
32	Nagavara–Arabic College Road
33	Kasturinagar–Chikka–Banaswadi Road
34	Baiyyappanahalli Road
35	Kadugondanahalli Railway line along Nagavara Main Road
36	Hudi Main Road near Whitefield Railway Station
37	Construction of ORR connecting Mysore Road to Magadi Road including underpass across Bangalore Mysore Rly Line
38	Along settihalli main Road
39	Along S M Road near Gurudwara
40	Along Koigehalli Main Road near Kodigehalli Rly Stn
41	Along Hesaraghatta Main Road
42	Near Tanisandra Rly Stn
43	Along Kundalahalli Road at Kundalahalli gate.
44	Along Varthur Road near Lakshmi Layout
45	Along Panathur Main Road near Bellandur Rly Stn
46	Along Sarjapur Road
Elevated Roads	
47	Elevated Road From Sirsi Circle to ORR on Mysore Road (6.0 Km)
48	Elevated Road on Hosur Road (10.5 Km)

The above proposals are shown in **Figure 7.4**

Figure 7.4

7.10 INTER-MODAL INTERCHANGES

7.10.1 Proper integration of modes

Integration between Bus, MRTS, and railway is a vital need for the future. The city is planning two such major inter-modal interchanges.

- The first such interchange is already under bid – the Kempegowda bus terminus at Subhashnagar is proposed to be converted into an interchange that accommodates the BMTC, KSRTC, BMRC, and a "city center" complex.
- The second interchange is proposed at Baiyyappanahalli, which will have the BMTC, KSRTC, Railways, BMRC, and the Airport Rail Link.

In addition to the above major 47 interchanges as indicated in Figure 7.1 are proposed at required intersections of mass transport corridors.

7.11 NON- MOTORISED MODES

7.11.1 Cycle Facilities

Their use in Bangalore is not significant but still this needs to be encouraged on environmental considerations. Provision for safer and better section of road or cycle track is the best way to keep them on roads. This is necessitates more on roads in the periphery of city and in many areas in BMA. In CBD some side roads and lanes can be exclusively reserved for cyclists and pedestrians in peak periods. In the new cross sections for major roads in **Figure 7.3**, reservation for cycle tracks has especially been incorporated.

7.11.2 Pedestrian Facilities

Pedestrians form a major proportion of commuters. Not only trips are conducted by walk in its entirety but every public transport trip will also have component of walk at its both ends. Though they are short distance travelers, they are spread all over the city. As facilities furnished for them are encroached upon by vendors or for road space, they have to spill on roads. These contribute to accidents also. One alternative for their facility and controlling their spill on roads is to provide good footpath with railings covering about one to one half meters width on either side of the road with openings at desired crossing points. Another alternative is to develop some narrow roads especially adjacent to major arterials as "pedestrians only" roads. Bus bays and foot paths at bus stops can also help in restraining their spill on to carriageways and reducing accidents. Pedestrian subways at important location on all 6 lane roads and at busy inter sections/junctions on 4 lane roads are to be planned on a programmed basis.

7.11.2.1 Pedestrian Cross-Over Walk-ways facilities

The proposed skywalks/pedestrian subways are given in **Table 7.12**.

Table 7.12 Sky Walks / Sub-Ways

S No.	Locations of Sky Walks / Sub-Ways
1.	Cauvery Bhavan to Education Department Building and to Law College to Mysore Bank crossing KG Road on State Bank Junction
2.	Opposite NTI connecting Guttahalli Road and Palace (opposite Bus Stop) on Sankey Road
3.	Arya Bhavan Sweets to Kanthi Sweet to Himalaya Theatre, crossing KG Road
4.	Lalbagh Main Gate (Javaraiah Circle)
5.	Bannerghatta Road near Jayadeva Hospital
6.	BMTC Main Bus Stand to Amar Lodge Building in Majestic Area
7.	KSRTC Kempegowda Bus Station to BMTC Main Bus Station
8.	At Kengeri Bus Stand, Mysore Road
9.	At Byatarayanapura on Bellary Road (near Junction of BBMP office complex)
10.	BMTC Main Bus Station to Railway Station Premises
11.	Shanthala Silk House to KSRTC Main Bus Station and to Good-Shed Road
12.	RNS Motors, Tumkur road
13.	Jalahalli Circle, Tumkur Road
14.	Near Webb junction
15.	Near Kamakhya, Kathriguppe Ring Road
16.	Gandhi Bazaar Main Road
17.	On Vittal Mallya Road near Mallya Hospital
18.	Sheshadri Road near Maharani College
19.	On JC Road near Ravindra Kala Kshetra
20.	On Hosur Main Road near Madivala Check post
21.	On Raja Ram Mohan Roy Road, near Pallavi theatre
22.	On Richmond Road near D'Souza Circle
23.	On Race Course Road near Chalukya Hotel
24.	On Commissariat Street near Garuda Mall
25.	On Residency Road near Mayo Hall
26.	On Kamaraj Road near Commercial Street
27.	Near Indira Nagar 100 feet Road & Water Tank junction on Airport Road
28.	On Hosur Road(Near Forum)
29.	On Tumkur Road, near SMS Railway Junction
30.	On Air Port Road, Marath Halli at Village Road.
31.	On Air Port Road, Marath Halli at Junction of Under Pass ORR
32.	K.R. Puram Bus Stand
33.	Bharatiya Vidya Bhavan, Devaraj Urs Road
34.	On Hosur Road "T" Junction with Tavarekere Main Road (Opposite Sai Sadan & Prestige Acropolis) (High Rise Apartments Condominium)
35.	Mission Road at the foot of Fly over
36.	Vidhana Veedhi near M S Building
37.	Tumkur Road near Yeshwantpur Circle
38.	At South End Circle
39.	Malleshwaram 5th cross

S No.	Locations of Sky Walks / Sub-Ways
40.	Double Road opposite Shanthi Nagar bus station
41.	City Market additional arm to be added to existing underpass
42.	30 no. Sky –walks / Sub-Ways along the eastern crescent of the ORR

The choice between lift/escalator operated skywalks and underpasses will depend upon the specific site conditions and the quantum of pedestrian traffic while undertaking the detailed feasibility studies. Location of these facilities is indicated in **Figure 7.5**.

7.11.2.2 **Foot paths**

It has been observed that most of the footpaths along the major arterial and sub arterial roads need extensive repairs and up gradations. The major problems observed are:

- Insufficient widths (< 1.5 mts.)
- Uneven surface because of settlement of base course, improper covering of service lines, manholes etc.
- Obstruction due to encroachments, unwanted garbage, unused building materials, fallen/ half cut trunks of trees and full grown trees, cable stays of electric poles etc.
- Level difference and steep risers with junctions of roads.

For this purpose tentatively it has been estimated that footpaths along 350 km of roads are required to be taken up. The basic principles for construction of new footpaths and improvement of existing ones are as under:

- Footpaths along existing roads should be widened and the minimum width be kept at least 2.0 mts.
- Proper leveling of footpath surface – with a stable base course fully compacted and safe guarded against any settlement before laying the top surface. In addition the cover for the underground services and man holes, if any, located below the footpaths or crossing should be properly designed to maintain a proper level with the surface of the footpath and no subsidence occurs.
- Continuity of footpaths
- Adequate ramp facilities for physically challenged people at junctions and cross overs.
- Proper merger of footpaths with skywalks/ underpasses/zebra crossings and junctions be provided with pedestrian priority signaling.

Figure 7.5

7.11.2.3 Pedestrian Zones

Substantial areas inside the core ring road has quite a few streets which are either fully commercial or majority of whose frontage is being used as shopping. The commercial activities on these roads can broadly be divided into the following two categories:

i. Retail and general Shopping like general merchandise, clothing garments and allied products, household white goods, consumer electronics, groceries & kitchen ware, Food & sweet shops etc., which are more or less regularly visited by shoppers.

ii. Wholesale and specialised shops dealing in machinery, building materials, Hardware etc. which are occasionally visited by customers with specific requirements and need bulk handling through Trucks and MCV's As far as these commercial activities are concerned attempt should be made to shift them out side the ORR along wide corridors where adequate loading / unloading facilities can be provided along with required parking facilities for visitors / shoppers. For shifting of these wholesale activities both strong measures against their functioning in their present locations in the core areas and incentives for shifting to the new locations will have to be provided.

The majority of the customers visit the core area to meet their retail needs through first type of establishments. As per the plan, this central area is going to be very well served by:

- 3 Metro Links namely
  i. Baiyyappanahalli to Mysore Road (East-West Corridor)
  ii. Peenya to Banashankari (North-South Corridor)
  iii. Yelahanka R.S to PRR via Nagavara and Electronic City

- An elevated core ring road surrounding this area with provision for BRT
- Adequate park & ride facilities out side the core area at Bus Terminal cum Traffic & Transit Management centres, Metro Termini & important metro Stations, BRT stations, along side Core Ring Road and Monorail Termini & Stations.

Thus the entire core area will be fully covered by elaborate public transport network and as such the entry of all private vehicles, especially during the shopping hours 10 A.M. to 9 P.M. should be minimised.

7.11.2.4 Proposed Pedestrian Zones

To start with following two areas are being suggested for pedestrianisation:

1. Gandhi Nagar & Chickpet Areas- The area surrounded by Seshadri Road, Kalidas Marg, K.G.Road, Distt. Offices Road, N.R.Road, Mysore Road and Bhashyam Road, Tank Bund Road & Dhanvantri Road can be converted into two pedestrian zones I & II on either side of K.G.Road. The two Zones can be inter connected through a semi depressed under pass near Alankar Plaza and Jantha Bazar. All the private vehicles will be required to move on Seshadri Road, Kasturba Road, NR Road and Bhashyam Road, while K.G.Road and District Offices Road be used by Public Transport –Busses & Trams. In the surrounding areas 5 mechanical parking spaces with a capacity of 500 vehicles each will be provided at;

- P13- Behind Sagar
- P14- Kanteerava Stadium
- P15-Near City Market
- P16-Near Bakshi Gardens
- P17 – KSRTC Bus Depot

2. Commercial Street – To be designated as 'CLOSED FOR VEHICLES FROM 10 A.M TO 9 P.M.' and supported by parking P-2 near Kamaraj Road
3. Brigade Road – To be designated as 'CLOSED FOR VEHICLES FROM 10 A.M TO 9 P.M.' and supported by parking P-1 near M.G.Road

These proposals are indicated in **Figure 7.6.**

7.12 PARKING

7.12.1 The parking demand is growing with growth of vehicles in the city. The multistoried buildings in busy/commercial areas are major attractors. Though the building regulations specify a minimum provision of parking area, there can be many defaulters and some who later convert the spaces for other purposes. This results in the vehicle parking spilling to streets (main road or side streets). A practical solution is to provide off street multistoried parking lots in this areas. As funds will be constraint consultants suggest a policy in this regard. The Owner who fails to provide required parking spaces as per the regulations should be charged an annual levy equivalent to market rental value for the short fall in parking area provided. Subsequently the market value will rise every year. Amount so collected plus parking charges collected will be substantially enough to meet the repayment installments of loans which were taken to construct multistoried parking lots. Once such facility is provided it is possible to prevent the on Street parking of vehicles or otherwise road space can be utilized for traffic. The development control regulations and TCP act may be suitably amended to provide for such levies.

Figure 7.6

7.12.2 Parking demand can also be controlled by implementing transport management measures like staggering office and school working hours and banning on-Street parking of private vehicles in CBD and on major arterials.

However it must be realized that mere regulatory measures are not enough and positive steps are required to meet the parking demand and provide safe parking outside the congested areas. It is suggested that for proper parking management and control, to start with we may divide the city into three zones.

7.12.2.1 Zone A – Central areas inside the core ring road where only short term parking on hourly basis should be provided between 9 AM to 9PM with high telescopic charges increasing with every hour of parking. These areas will invariably be provided with automatic mechanical parking (AMPs). Beyond 9PM and upto 9AM they can offer lower tariff rates for long term night parking.

7.12.2.2 Zone B – between the CRR and ORR – in these areas a combination of AMPs and Conventional Multi level Parking (CMPs) can be provided at selected interchanges, especially at the TTMCs and other identified locations closer to public transport corridors. Parking in these areas will also be short term time based but at a slightly lower tariff as compared to Zone A.

7.12.2.3 Zone C – outside the ORR – large CMPs may be provided at the TTMC s and other locations adjoining the public transport stations of Metro, Monorail/LRT, BRT etc. these will be long term parking lots of 8 to 12 hour duration at a nominal tariff to encourage the vehicle owners to park at these facilities and ride the public transport system to their destination and back.

7.12.3 To begin with parking for about 10000 vehicles has been suggested at the following sites in **Table 7.13**.

Table 7.13 Proposed Parking Sites

S. No.	Location	Phase	Type
1	M G Road	P-1	AMP
2	Near Kamraj Road	P-1	AMP
3	Gandhi Nagar	P-1	AMP
4	Jayanagar Shopping Complex	P-1	CMP
5	Koramangala near Raheja Tower	P-1	CMP
6	Rajajinagar BDA Complex	P-1	CMP
7	Banashankari BDA Complex	P-1	CMP
8	Gandhi Bazaar	P-1	CMP
9	Malleshwaram	P-1	AMP
10	Fire Station, Residency Road	P-1	AMP
11	Dhobi Ghat, Cunningham Road	P-1	AMP

S. No.	Location	Phase	Type
12	SP Office, Miller Road, Cunningham Road crossing	P-1	AMP
13	Near Sagar & States	P-1	AMP
14	Kanteerava Stadium	P-1	AMP
15	City Market	P-1	AMP
16	Bakshi Gardens	P-1	AMP
17	KSRTC Bus Depot	P-1	AMP

Of these sites, where the availability of land is limited and the land values very high, automatic mechanical parking (AMP) which can provide 500 parking lots in approx. 1000 sqm of space have been suggested. In the outer areas, conventional multistory parking (CMP) has been proposed.

In addition, since most of the TTMC's are proposed to be adequately served by Public Transport like Metro, Mono Rail/LRT, BRT etc, substantial Park and ride facilities should be provided from where the commuters can switch over from private to public transport. These proposals are indicated in **Figure 7.2**.

Similarly at all the termini of Metro, Mono rail/LRT, BRT,CRS and their major stations out side the Core Ring Road should be provided with adequate park and ride facilities are to be provided.

Within the core area where the land is scarce and very expensive, mechanical automatic & semi automatic parking may be provided with heavy time based parking Charges.

In the long run, when the mass transport system is city-wide and adequate, parking demand will stabilize. Therefore it is important that adequate and convenient mass transport system as recommended above is provided.

7.13 FREIGHT MOVEMENT

7.13.1 The freight movement through the city particularly on some of the arterials is already restricted in CBD area. Many orbital corridors cannot be easily restrained till such time the wholesale activities are concentrated in the CBD. The strategy already followed is to decongest the CBD by shifting the wholesale market to outer areas or proposed IFCs along the PRR. In order to facilitate the shifting of the wholesale activity from the core areas, both harsh measures in terms of restriction on the activities at their present location and incentives for relocation in the new areas will have to be followed. The restrictions in the central areas could be in the form of banning the entry of HCVs completely and permitting only LCVs between 10 PM and 9 AM; treating these properties as engaged in misuse activities and charge a very hefty misuse charge on a daily basis and a substantial increase in the property tax. All private vehicles should be banned from entering

these areas between 9 AM to 10PM. simultaneously well developed wholesale markets may be created along side the IFCs with modern transport, loading and unloading, parking and ancillary facilities. These sites can be allotted to the persons relocating their business on no profit no loss basis on priority.

The provision of PRR is itself going to help diversion of through freight traffic. Nearly 80% of the ORR has lost the sole identity of ring road, the PRR being thought of in this connection will be a boon to the city. Development of another orbital ring road as proposed by BMRDA would also help in diversion of the freight traffic. So far there is no though regarding the shifting of the goods shed. If a ring railway is formed over the outer ring road, shifting of the goods shed to the periphery of the city can also be thought of. But this will take longer time. However, future planning of the rail facilities in and around Bangalore will need to be kept this in mind. Such shifts will have some adverse effect i.e. HCV/LCV movement from the goods sheds on the periphery and any wholesale complexes, into the city will develop. By suitable management measures like restricting these movements during particular timings of the day, problem can be suitably managed.

7.13.2 Integrated Freight Complexes (IFC)

Near the junctions of the PRR with the following radial corridors, six IFC's are proposed as indicated in **Figure 7.4**:

1. Hosur Road
2. White Field Road
3. Old Madras Road
4. Bellary Road
5. Tumkur Road
6. Mysore Road

In addition to acting as nodes for handling the HCVs traffic and diverting it on the PRR they will also act as center for wholesale trade. Quite a few wholesale markets to be shifted outside the central area can be located as part of the IFC for efficient handling for bulk goods.

7.14 DEMAND CONTROL

7.14.1 Reducing Private Vehicle Use

There are two ways to restraint the growth of private vehicles on road to either by pricing policy or by providing better level of service on public transport. Road pricing is difficult to achieve in a city like Bangalore particularly since its enforcement would be very difficult. It should be possible to put constraints in some areas by restricting private vehicles entering into the congested roads particularly during the peak hours. Providing good public transport with feeder

IPT modes like Mini buses for facilitating the commuters to reach their destinations from Train/Bus stations would also induce many private vehicle users to shift from private vehicles. In fact with the coming up of the Core Ring Road, proposed improvements in the alignment of the ORR, Coming up of the various Mass Rapid Transit (MRT) Modes like Metro, Mono-Rail / LRT & BRT we can substantially achieve the objectives through the following measures:

- Enough parking lots be provided outside the ORR & CRR easily accessible from the radials reaching the ORR & CRR
- Proper park & ride facilities for long term parking at the stations / termini of the MRT modes out side the ORR.
- Providing comfortable, environmentally friendly transport (Electrically operated / CNG mini busses) between MRT stations and the core areas.
- The parking facilities provided / planned in side the CRR should only be for Short term parking with high hourly charges.
- Congestion Charges be imposed on slab-scale from private vehicles entering first the ORR and then the CRR.
- Private vehicles be completely banned from entering the pedestrian zones between the shopping hours i.e. 10 AM to 9 PM.

The above measures can help in reducing private vehicles in busy areas.

7.14.2 Land use for demand optimization

The land use and density component of the above strategy can be operationalized only through revisions in the Master Plan. High traffic generating activities and high density (high FSI) zones should be realigned around mass transport nodes and along major transportation corridors.

Such a reorganization of land use and density cannot be realized only through the modifications in the Master plan. In already developed areas, this needs to be translated into projects for planned redevelopment, ensuring that the high density and high intensity of activities are supported by appropriating land for improvements in the road network, street design and supporting infrastructure. The energy for redevelopment already exists in the real estate market in Bangalore, and will receive further impetus from the implementation of mass transport projects.

In new growth areas, a mechanism for micro-level planning (such as Town Planning Schemes in Gujarat) will need to be introduced to ensure that all new development is adequately served by primary, tertiary and secondary road network with provision for public transport facilities. These would also essentially have to be translated into land management projects.

7.14.3 Development of Integrated Facilities

As already pointed out, Bangalore has a good network of rail system, which can be converted by adding a few facilities like parallel lines, electrification, additional stations etc to serve as a commuter rail system also. Detailed studies have been completed already. CRS along with the Metro system under construction and the Bus transport can be integrated with good interchange and parking facilities at stations to form an Integrated Transport System.

7.15 TRANSPORT SYSTEM MANAGEMENT – B-TRAC 2010

7.15.1 Background

Bangalore City, has witnessed a phenomenal growth in vehicle population. As a result, many of the arterial roads and intersections are operation over the capacity (i.e., v/c is more than 1) and average Journey speeds on some of the key roads in the Central Area are lower than 10 Kmph in the peak hour. Therefore, it has become necessary to establish plans for efficient traffic management in Bangalore. In this regard, Bangalore City Police have envisaged the "Bangalore Traffic Improvement Project – B- TRAC 2010"

7.15.2 Goal and Objectives

The objectives of B-TRAC 2010 would be two-fold:

1. Operational Objectives: (a) Reduce traffic congestion by 30% in the Central Area of Bangalore City; (b) Reduce accidents by 30% in the city of Bangalore; (c) Achieve significant reduction in pollution; (d) Achieve substantial compliance of Traffic Laws and Rules; and (e) Set up an effective Trauma Care System.

2. Institutional Objectives: (a) Coordinated traffic management by developing mechanisms for the same, like institutionalizing Traffic Task Force, Road Safety Committee, Traffic Action Committee etc; (b) Robust Revenue Model (traffic funds to pay for traffic management infrastructure and maintenance); (c) Legal and Institutional reforms; (d) Capacity Building (Modernization and up gradation of Traffic Training Institute etc.); and (e) Strengthening of Traffic police by augmenting officers and staff; construction of buildings and provision of modern communication and mobility.

7.15.3 Approach

The city of Bangalore needs a traffic management that addresses not just supply aspects, but also demand and B-TRAC – 2010 adopts this very same approach.

7.15.4 Strategy

B-TRAC-2010 framework would be as follows: (a) Land use development controls; (b) Primacy to Public Transport; (c) Parking controls and management; (d) Automated Control and Enforcement (ITS/ATC); (e) Entry Restriction to the Central Area; and (F) Road safety plan for accident reduction. Specific components of the strategy are: (a) Central Area – Area Traffic Control System; One way systems; dedicated bys lance and signal priority for buses; Parking controls; creation of no-auto zones; restricted entry of traffic in to the core area

(b) Core ring road development for unhindered movement of traffic thereby avoiding the central area (c) Corridor Traffic Control System (as in ATC) for the several radial roads (d) up gradation of intermediate and outer ring roads and development of the peripheral ring road (e) Traffic police modernization with improved communication, computerization, mobility, capacity building and automated enforcement systems.

7.15.5 Components

The various components of B-TRAC are as under:

- Junction Improvements
- Street Furniture and Road Marking
- Intelligent Transport System including. ATC, VMS etc for 250 intersections
- Surveillance / monitoring and enforcement cameras etc
- Education and Training / Others

7.15.6 Benefits

(a) Traffic congestion will be reduced by 30% in the Central Area of Bangalore City
(b) Accidents will be reduced by 30% in the city of Bangalore
(c) There will be significant reduction in pollution
(d) Substantial compliance of Traffic Laws and Rules will be achieved
(e) Effective Trauma Care System will be set up
(f) Coordinated traffic management will be achieved
(g) Level of traffic and road safety awareness will be enhanced and
(h) State of the art traffic policing and regulation will lead to substantial compliance.

7.15.7 Summary

B-TRAC 2010 will be first of its kind project in the country to address the issues of traffic congestion, safety etc by utilizing the latest traffic management technology and techniques, which are appropriate to our context. This will give the much-needed scope for larger infrastructure projects to be planned and implemented for improving the transportation system in Bangalore city.