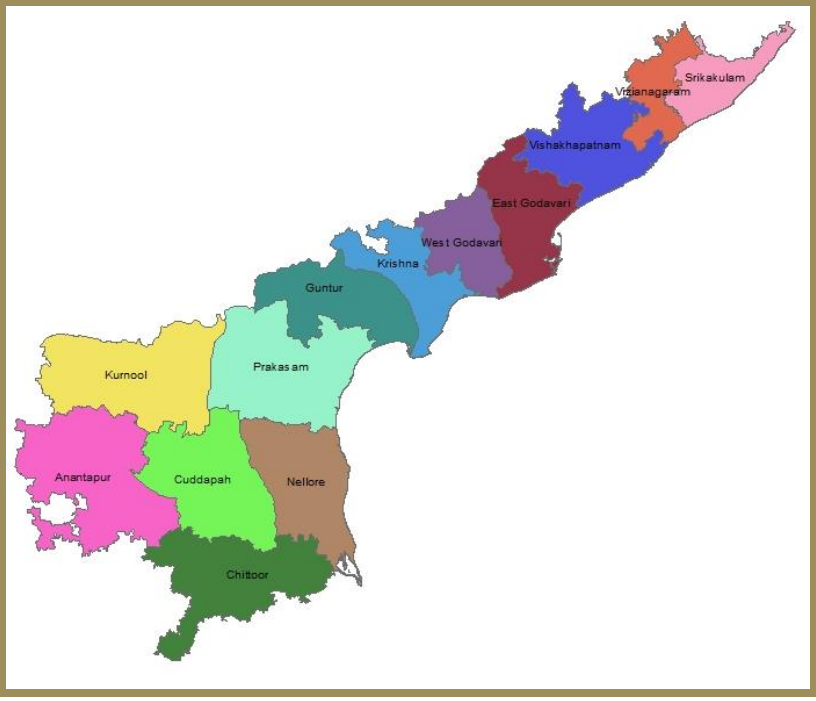
October, 2013

# *URBAN TRANSPORT REQUIREMENTS FOR ANDHRA PRADESH*

Report on Policy, Planning and Investment requirements




Innovative Transport Solutions Pvt. Ltd.

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# 1 Urban Transport

Cities are the centres for economic growth and for them to be able to support the required level of economic activity, they must provide for easy, sustainable flow of goods and people. However, such flow of goods and people has been facing several problems of congestion, pollution and accidents coupled with lack of coordination amongst various agencies. Unless these problems are remedied, poor mobility can become a major hurdle to economic growth and cause deterioration in the quality of life.

Our cities are increasingly faced with the twin challenges of providing adequate road space for future use and improving the poor condition of existing roads due to the neglect of maintenance over the years. Current road designs do not adequately serve the needs of all road users especially non-motorized transport users as well service providers such as hawkers/vendors are marginalized against motorized modes. The available road space gets encroached by commercial establishments, and on-street parking due to poor enforcement of the existing regulations.

A multipronged approach is needed to ensure that the economic growth and urbanization does not lead to deterioration in mobility and accessibility in urban areas. In this context, the current report is intended to seek attention to this important issue and also give a scientific basis for allocating funds required for the development of adequate infrastructure in the upcoming state.

## *Principles for Sustainable urban transport development*

**Increase access - integrate land-use with transportation planning**: People need to reach their destination with ease, but the degree of ease with which people gain access to different modes of transport to reach their destination with minimum environmental and health damages determine the sustainability of transportation regime in cities. If cities are compact with short travel trips and comfortable and dense network of walking, cycling and public transport, more people will chose to walk, bus or pedal. Most Indian cities are densely built with mixed land use that reduce journey distances, enable pedestrian traffic, and allow effective use of public transport. Studies show that more than 40 to 50 per cent of the daily trips in many of our cities have distances less than 5km – that are catered to by walking cycling, and low cost-high frequency Para-transit. But neglect of these modes and non-motorised network, poor quality public transport is limiting the sustainable options for the urban majority as well.

Sprawl oriented land-use policies, density control are encouraging longer travel distances and locking up more emissions and fuel use as a rebound effect. Road engineering interventions once made cannot be changed easily but it will permanently decide the design of the network and influence travel choices of people. Road design must not increase dependence on and usage of personal vehicles. That is possible only if cities are built on the basis of well integrated public transport, walking, cycling and clean and fuel efficient vehicle technology. Cities should increase densification along transport corridors to bring close largest possible number of destinations to work, residence, schools, public services, etc., to the public transport nodes and stations. But densification and mixed land use approaches will also require proper planning.

**Focus on people not vehicles:** Rapidly growing problem of mobility crisis can be solved only if cities are able to upscale the mobility solutions – extensive network of public transport, non-motorised transport and equally stringent measure to discourage personal vehicles. System design should focus on

carrying maximum people not vehicles. This will require significant shift in policy approach and implementation strategies and demand enormous regulatory capacity in all cities of India.

Cities already have advantages in the current commuting practices. Indian cities still have high share of commuting trips -- anywhere between 16-57 per cent – as walk trips. Similarly, public transport carries more than half of commuting trips in many cities; the immediate policy thrust should be to protect this ridership and reverse the steady decline in these sustainable modes already noticed in cities. Indian cities will have to set targets to reverse these trends and increase the public transport share to at least 80 per cent.

**Increase share of walking and cycling:** Pedestrian and cycling policies are even more important today when cities are planning massive augmentation of public transport. Metro, bus rapid transit system, buses cannot work optimally if these are not supported with a good pedestrian network. Any attempt to improve the share of public transport will lead to correspondent increase in walking and roads will have to be planned with more walking space. Yet walkways are most ill designed, encroached and least protected. Wilbur Smith study for the Ministry of Urban Development has found that the percentage of the road with pedestrian footpaths runs hardly in 30 per cent in most cities. The current engineering guidelines for pedestrian facilities are old and inadequate. Similar fate awaits the bicycles that despite being prominent in many cities.

**Increase public safety:** Road accidents in the country claim more than 160,000 lives every year, mostly pedestrians, cyclists or pavement dwellers. The pedestrian's right to safe and free passage has become a casualty. A recent joint study of University of Michigan and Indian Institute of Technology, Delhi, shows that road traffic fatalities have been increasing at about 8 per cent annually for the last ten years. The National Urban Transport Policy acknowledges that cycling and walking have to share the same right of way with motorized modes and it increases risks. But these concerns are still neglected in road designs in most cities.

**Prevent trade-offs between efficiency and toxic emissions:** Public health and energy security goals cannot be met in cities if vehicles continue to meet poor emissions standards and are not subject to any fuel economy standards. Five to ten year lag in emissions standards, uncontrolled dieselization (with cheap and unclean diesel) can further aggravate public health and energy impacts. To reduce exposure to vehicular pollution emissions will have to be cut at source. And to cut energy use per unit of vehicles, fuel economy standards should be set.

**Reduce dependence on personal vehicles and eliminate hidden subsidies:** Personal vehicles occupy more road space, carry fewer people, pollute more, and edge out pedestrians, cyclists, and public transport. But the current policies perpetrates hidden subsidy to car usage as the cost of using up scarce and valuable urban space for circulation and parking and their harmful effect on environment are not recovered through proper pricing and taxes. Cars of personal use are under-taxed in Indian cities that incite more shifts to personal modes. This trend will have to be reversed to promote usage of public transport and non-motorised transport.

**Protect urban commons, green areas and open spaces:** Transport infrastructure is devouring urban commons and green spaces affecting liveability of cities. For instance, in cities like Delhi road network has already used up 21 per cent of the urban space. The current demand for land for car parking is estimated to have locked up nearly 10 per cent of Delhi's urbanized area whereas forest area in Delhi is only 11 per cent. Erosion of urban commons and green lungs can seriously affect liveability of cities.

Thus the multi-dimensional policy goals can be addressed in cities only through a well-integrated strategy with clear milestones, more appropriately defined policy tools and indicators, and empowered and unified institutions. Cities need more appropriately defined policy tools and indicators, and empowered and unified institutions. This regulatory shift is absolutely essential as massive investments have begun in urban and road infrastructures. Road engineering interventions once made cannot be changed easily but it will permanently decide the design of the network and influence travel choices of people. Road design must not increase dependence on and usage of personal vehicles. That is possible only if cities are built on the basis of public transport, walking cycling and clean and fuel efficient vehicle technology.

This study looks at the current urban transport sector in India in general and the cities in Seemandhra districts of Andhra Pradesh in particular. The various policies being formulated at the National level to confront the future urban transport challenges are taken as the base for state-level assessments and recommendations. Based on observations and analysis on the existing data, the guidelines for formulating an urban transport policy at the state level are explained towards the end of the study. Based on these policies the infrastructure required, their cost estimates and financing options are discussed in the later sections.

## *Demand Assessment*

Reviewing the existing transport demand scenario in different cities gives an understanding of the existing mobility patterns. It needs to be understood that most of the cities in India have grown organically, without any proper urban strategy or enforcement in place. Therefore, these numbers give an idea of the natural trends in urban transport. Based on these numbers, interventions need to be planned for sustainable growth in the future.

The existing mobility patterns of the people in addition to the policy framework adopted by the state form the input to the kind of infrastructure required in different classes of cities.

For this demand assessment, Comprehensive Mobility Plan (CMP)s of 27 cities all across the country have been studied and their data is segregated into different city size classes and summary of their travel demand patterns is shown in the following table. Also shown in the table is the demand data of Visakhapatnam, for which a CMP is already being prepared. Apart from Visakhapatnam, only Vijayawada has a Comprehensive Traffic and Transportation Study (CTTS) for the city.

**Table 1 Summary of Travel Demand Patterns in India**

| City Size Class | Population | % Road area | Per Capita Trip Rate (including walk) | % Mode Share | | | Average Trip Length (in km) |
|---|---|---|---|---|---|---|---|
| | | | | Private | Public | Walk+ Cycle | |
| **Class IA** | >5 million | 11 | 1.54 | 22 | 38 | **40** | 7.8 |
| **Class IB** | 1-5 million | 11 | 1.27 | 31 | 21 | **48** | 5.3 |
| **Class IC** | 100,000-1,000,000 | 15 | 1.06 | 23 | 28 | **49** | 3.2 |
| **Visakhapatnam (Class-IB)** | | **17** | **1.60** | **17** | **28** | **55** | **4.2** |

Source: CMPs of 27 cities

- It can be observed that the Non-Motorised Transport (NMT) i.e. Walk trips, Bicycle trips and Cycle Rickshaw trips share in each class of cities is the highest among all modes and hence any new infrastructure needs to first cater to these modes of transport.

- The above data for Indian cities shows that the amount of area allocated to road space is mostly in the acceptable range of 10-15%.

- The per-capita trip rate increase with increase in city size, which can be attributed to the increased economic activity with city size.

- Also, the average trip length increases with increase in city size. If this is seen in correlation with the mode shares, it can be observed that Class IB cities with medium sized trip lengths have the maximum private mode share i.e. car and two-wheeler trips. Smaller cities (Class IC) have high NMT share while larger cities (Class IA) have higher public transport shares.

- The trip lengths in Class-IB cities are longer than general trip lengths for NMT and too small for public transport, as the access trip time's increase. The way forward is to organize Auto-rickshaws, which act as an Intermediate Public Transport (IPT), in these cities to shift people from private to public modes of transport.

## *National Policy Framework for Urban Transport*

The transport impacts of urbanization are of increasing concern at both the global and the national level. While motorization has traditionally been perceived as a symbol of economic development, the increasing congestion, pollution and road accidents in our cities are highlighting the negative impacts of this perception. Also, transport is increasingly becoming the major contributor to greenhouse gas emissions and global warming is a serious concern in the new policies and plans. The National Urban Transport Policy (2006) focuses on moving people not vehicles and stresses on the need for sustainable urban

mobility – public transport and non-motorized modes. In the forthcoming the National Transport Development Policy, the urban transport component clearly advocates reorganizing land-use to mixed uses with the objective of reducing need for motorized mobility and emphasises on investments in public transport infrastructure. The National Mission for Sustainable Habitat (2010), one of the 8 missions under the Prime Ministers National Action Plan for Climate Change, emphasises the use of NMT and public transport to combat the increasing CO2 emissions. The parameters being developed by MoUD of implementation of NMSH gives standards for walking, cycling, public transport, compact cities, transport impact assessment, and financing mechanisms that cities invest in sustainable transport options. The Planning commission Report by Kirit Parekh on Low Carbon Growth in India (2011) also advocates investments in public transport and non-motorized transport while de-incentivising use of private motorized vehicles. The Policy direction from the GOI is clearly pointing towards investments in Public Transport and NMT and the State transport policies need to conform to that vision.

In this section, various national level policies which affect the urban transport sector at the state level are reviewed and their salient features that affect the decision making at the state level are presented. The State urban transport policy framework should be consistent with the guidelines at the national level so that the project approvals and funding mechanisms are streamlined with the central government.

The following are the major policy initiatives at the National level and the infrastructure related approaches suggested for the country in each of those policies:

### *National Urban Transport Policy (NUTP), 2006*

The NUTP, developed by the Ministry of Urban Development, envisions a scenario where our cities are people centric, liveable and with ample scope for social and economic development. It suggests a multi-pronged approach to achieve its objectives:

- Integrating land use and transport planning
- Equitable allocation of road space i.e. infrastructure provided in proportion to the mode shares of person trips observed
- Priority to the use of public transport, maintaining high quality and pricing it optimally
- Encouraging Para-transit to fulfil gaps between public and private transport
- Priority to non-motorized transport
- Capacity Building at different levels of central, state and city levels
- Association of the private sector in providing public transport services, but under well-structured procurement contracts

### *High Powered Expert Committee (HPEC), 2011*

The HPEC, appointed by the Ministry of Urban Development, is a report on Indian Urban Infrastructure and Services and its purpose is to estimate the investment requirement for different urban infrastructure services like urban transport and roads, water supply, sewerage and sanitation, solid waste management. Its central message is that urbanization is not an option. It is an inevitable outcome of the faster rates of growth to which the economy has now transited. Indeed, urbanization is itself a process that will support growth. Following are the major observations from the report:

- Integrating governance is the weakest and most crucial link which needs to be repaired to bring about the urban transformation so urgently needed in India

- Housing for the poor to be planned within an integrated land use/transport plan with focus on public transportation

- Densification of existing cities linked to development of infrastructure facilities, especially public transport

- Smaller cities and towns should be treated differently from larger cities and metros for funding, capacity building and reform content and timelines

- Funding requirements for the transport in cities to be routed through the state governments

- Of the total NIJNNURM funds, 5 per cent needs to be spent on capacity building. state governments, ULBs, and the private sector will have to partner in building capacity

*National Transport Development Policy Committee (Working Group on Urban Transport) (NTDPC), 2011*

The NTDPC working group on urban transport is constituted by the planning commission to assess the transport requirements of the economy for the next two decades, to recommend a comprehensive and sustainable urban transport policy and to recommend various measures to realise these policies and investment requirements. The policy objectives and recommendations of this report are in line with the NUTP and the HPEC report. The key recommendations of the report are as follows:

- Policy interventions required for sustainable urban transport like comprehensive mobility planning, integrated land use- transport planning, travel demand management and transit oriented development
- Emphasis on maintaining a sustainable traffic modal mix i.e. investment in improving walking, cycling and public transport
- Minimizing the social and environmental externalities of transport i.e. the need to improve traffic safety, universal accessibility and minimizing the greenhouse gas emissions from transport
- The role of central, state and city level governments for sustainable urban transport is explained and the institutional framework required to perform these roles is proposed
- The capacity building initiatives required have also been detailed
- The investment requirements given in HPEC report are endorsed by this committee and the financing options to generate the funding requirements are also mentioned in the report

*Low Carbon Strategies for Inclusive Growth (Interim Report), Planning Commission of India, 2011*

The Planning commission constituted and expert group on Low Carbon Strategies for inclusive growth in India with a mandate of devising strategies to reduce carbon emissions in various sectors like Transport, Power, Industry, Buildings and Forestry. Out of the strategies proposed for the transport sector, the ones related to urban transport are presented in this section.

- *Avoid-Shift-Improve* strategy to be followed in urban areas i.e. Avoiding need for transport by designing systems so as to minimise movement of goods and length of commute for passengers, Shifting trips to more carbon efficient modes of transport and Improving technologies to make the existing modes more carbon efficient.

- Use policies such as National Urban Housing and Habitat Policy to ensure that cities remain dense and of mixed land-use with adequate provisions for housing for the poor to ensure that their travel distances remain small.

- Develop urban planning guidelines to encourage transit-oriented development, discourage sprawl, rationalize parking policies and charges, and mandate public transport accessibility indicators for large developments, institute intelligent transport systems to enable schemes such as congestion charging.

- Improve the National Urban Transport Policy (NUTP) by introducing elements such as demand management, rational transport pricing and clear definition of the role for Urban Mass Transport Authority.

- Improve the JNNURM scheme by improving its Monitoring & Verification mechanisms to ensure that projects are NUTP-compliant, modal shares of public and non-motorized transport are actually improving in cities and infrastructure is friendly for non-motorized transport.

- Incentivize bus operations in cities by providing capital subsidy and reimbursing taxes and duties paid on fuel.

These interventions will have to be implemented at the central, state and city levels given that various agencies are involved in governing the transport sector.

### *National Mission on Sustainable Habitat (NMSH) Report, 2011*

The national mission on Sustainable habitats is a sub-component of the National Action Plan on Climate Change formulated by the Prime Ministers Council on Climate change. It is being developed by the Ministry of Urban Development and it contains various strategies for mitigating and adapting to the ill effects of climate change. The report contains strategies in wide ranging areas which include Urban Transport, Urban Planning, Residential and Commercial Sectors, Water Supply and Waste Management. Out of these, the strategies proposed in Urban Transport sector are presented in this section.

- Greater Use of Non-Motorized Mode by investing in a segregated right of way for bicycles and pedestrians, launching a public cycle Programme on PPP; organising cycle rickshaws through PPP

- Improving Access and Reducing Passenger and Freight-Kilometres through focus on reducing the average trip length by densification of cities and controlling urban sprawl

- It is essential that the transport network guides the urban form, rather than the urban form guiding the transport system

- *Strengthening of Public Transport System through a Combination of Promotional, Regulatory and Fiscal Measures:* Encouraging PPP in bus operations for both revenue generating and non-revenue generating routes

- *Reducing the Fuel Consumed per Passenger Travel through Modal Shift*: all arterial roads more than 25 m right of way to have minimum of 2.5 m pedestrian path (with trees) and proper street furniture and 2.5 m bicycle path preferably in each direction as a mandatory measure.

- *Improving Access to Goods and Services through an Integrated Urban Plan*: minimizing the need to travel through charging the cost of externalities such as congestion, pollution, climate change, public infrastructure and reducing subsidies to private vehicles.

- *Service Level Benchmarks*: To standardize the infrastructure provided in different cities

- In the transport sector, capacity will have to be created for integrated land-use and transport planning, comprehensive mobility planning, optimization of various transport modes, improving efficiencies, route allocation, data collection and computer based data analysis, performance monitoring and development of monitoring frameworks including benchmarking, traffic management measures, transit planning etc.

- District /City Level Committee on Climate Change ULBs taking up transport management functions

# 2 As Is Assessment

The current chapter explains the existing scenario of urbanisation and infrastructure backlogs in the urban sector.

## *Urbanization in Seem Andhra Districts*

The 14 Seemandhra districts currently contain 2 Class-1B cities and 29 Class 1C cities as shown below.

**Table 2 List of cities and their population in Seemandhra Districts**

| S. No | District | Towns | 2011 Population |
|---|---|---|---|
| 1 | Visakhapatnam | Visakhapatnam | 1,730,320 |
| 2 | Krishna | Vijayawada | 1,491,202 |
| 3 | Guntur | Guntur | 673,952 |
| 4 | Sri Potti Sri Ramulu Nellore | Nellore | 564,148 |
| 5 | East Godavari | Rajahmundry | 478,199 |
| 6 | Kurnool | Kurnool | 478,124 |
| 7 | Chittoor | Tirupati | 459,985 |
| 8 | East Godavari | Kakinada | 442,936 |
| 9 | Kadapa | Kadapa | 344,078 |
| 10 | Anantapur | Anantapur | 341,895 |
| 11 | West Godavari | Eluru | 250,693 |
| 12 | Vizianagaram | Vizianagaram | 239,374 |
| 13 | Kadapa | Proddatur | 217,895 |
| 14 | Kurnool | Nandyal | 211,787 |
| 15 | Prakasam | Ongole | 206,419 |
| 16 | Kurnool | Adoni | 270,771 |
| 17 | Chittoor | Madanapalle | 179,267 |
| 18 | Chittoor | Chittoor | 175,640 |
| 19 | Krishna | Machilipatnam | 170,008 |
| 20 | Guntur | Tenali | 164,649 |
| 21 | Prakasam | Chirala | 162,725 |
| 22 | Anantapur | Hindupur | 151,835 |
| 23 | West Godavari | Bhimavaram | 147,056 |
| 24 | Srikakulam | Srikakulam | 146,988 |
| 25 | Anantapur | Guntakal | 126,479 |
| 26 | Anantapur | Dharmavaram | 121,992 |
| 27 | Krishna | Gudivada | 118,289 |
| 28 | Guntur | Narasaraopet | 117,568 |
| 29 | Anantapur | Tadpatri | 108,249 |

| | | | |
|---|---|---|---|
| **30** | West Godavari | Tadepalligudem | 103,703 |
| **31** | Guntur | Chilakaluripet | 101,550 |

It is to be noted that Anantapur district has the highest number of Class-I cities i.e. 5 followed by Guntur with 4 cities. Chittor, Krishna, Kurnool and West Godavari have three Class-I cities each.

## 2.1 As is assessment of Urban Transport Service Delivery

Only Vijayawada has a Comprehensive Traffic and Transportation Study (CTTS) in place, which contains urban transport data of the city. None of the other cities of Seemandhra region have studies in place to provide data regarding the existing service delivery. Hence the national level urban transport service delivery estimates have been considered to be applicable for the current study. These numbers have been used to calculate the existing service backlogs in these two cities and for the future infrastructure requirements. The urban transport service delivery estimates in cities across India are presented in the following section.

### 2.1.1 Urban Roads Service delivery-National level

The data collected from Andhra Pradesh shows data at the district level for most of the components. Hence existing service delivery data from similar sized cities from across the country have been studied to estimate the service backlogs at the city level. The service delivery backlogs and future norms set by the Ministry of Urban Development and the High Powered Expert Committee (HPEC) for estimating the investment requirements for Urban Infrastructure Services have been taken as the basis for calculating the backlog from the existing service delivery number. This report has the city classification and infrastructure components similar to what is required in the current study and also data from similar sized cities across the country. Also, the HPEC report forms the basis for the second phase of JNNURM and hence estimates based on this can help in case of any applications for funding from the ministry. Other infrastructure estimation reports like the NTDPC and the 12th five year plan consider all cities less than 5 lakhs as a single category which can lead to gross approximations while doing detailed city wise estimates like the current study.

The following table gives the urban road-service backlogs, in percentage terms, in different classes of cities.

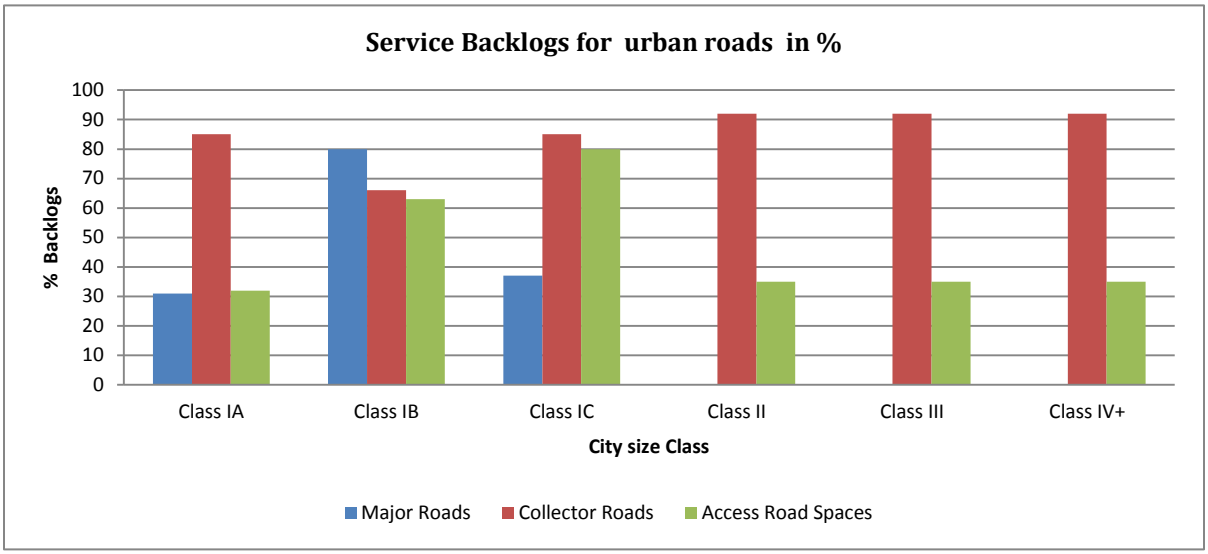
**Table 3 Service Backlogs in % urban roads not provided**

| City Size Class | Major Roads | Collector Roads | Access Road Spaces |
|---|---|---|---|
| **Class IA** | 31 | 85 | 32 |
| **Class IB** | 80 | 66 | 63 |
| **Class IC** | 37 | 85 | 80 |
| **Class II** | 0 | 92 | 35 |

| | | | |
|---|---|---|---|
| **Class III** | 0 | 92 | 35 |
| **Class IV+** | 0 | 92 | 35 |

Source: HPEC Report

**Figure 1: Service Backlog for urban roads in %**




It is apparent from the above table that the required road infrastructure in all classes of cities is lacking.

Even though the amount of road space is around 11% in most city classes, figure above indicate higher backlog numbers. This is due to the fact that these backlogs include footpaths, cycle tracks and parking space.

These numbers also indicate the type of road in need for investment in different classes of cities i.e. whether the infrastructure lacking is in terms of Major roads, collector roads or access road spaces

## *2.1.2 Traffic Support Infrastructure Service Backlogs*

The Traffic support infrastructure includes the various components of the transport system which enables the smooth operation of urban traffic. This includes the following items:

- Street Lighting
- Vehicular and pedestrian grade separated facilities if required
- Parking systems
- Bus terminals

- Bus Depots

It is known that almost no city in India (with an exception of some roads in Delhi) meets any international Urban Road Lighting Standards for pedestrian and barrier free mobility requirements. This can be considered the case in all cities in Haryana. Lighting standards such as those adopted by Delhi PWD, require white light for pedestrian and NMV areas (in contrast with yellow coloured lighting for vehicular traffic), with high standards of average 40 Lux and a uniformity ration of 40%. In addition, white lighting at junctions brighter by up to 50% than the regular street is mandated. These lighting requirements are considered essential to create safe streets for all.

Even for the remaining facilities like Bus terminals and Depots, the current city buses share the terminal facilities with intercity buses.

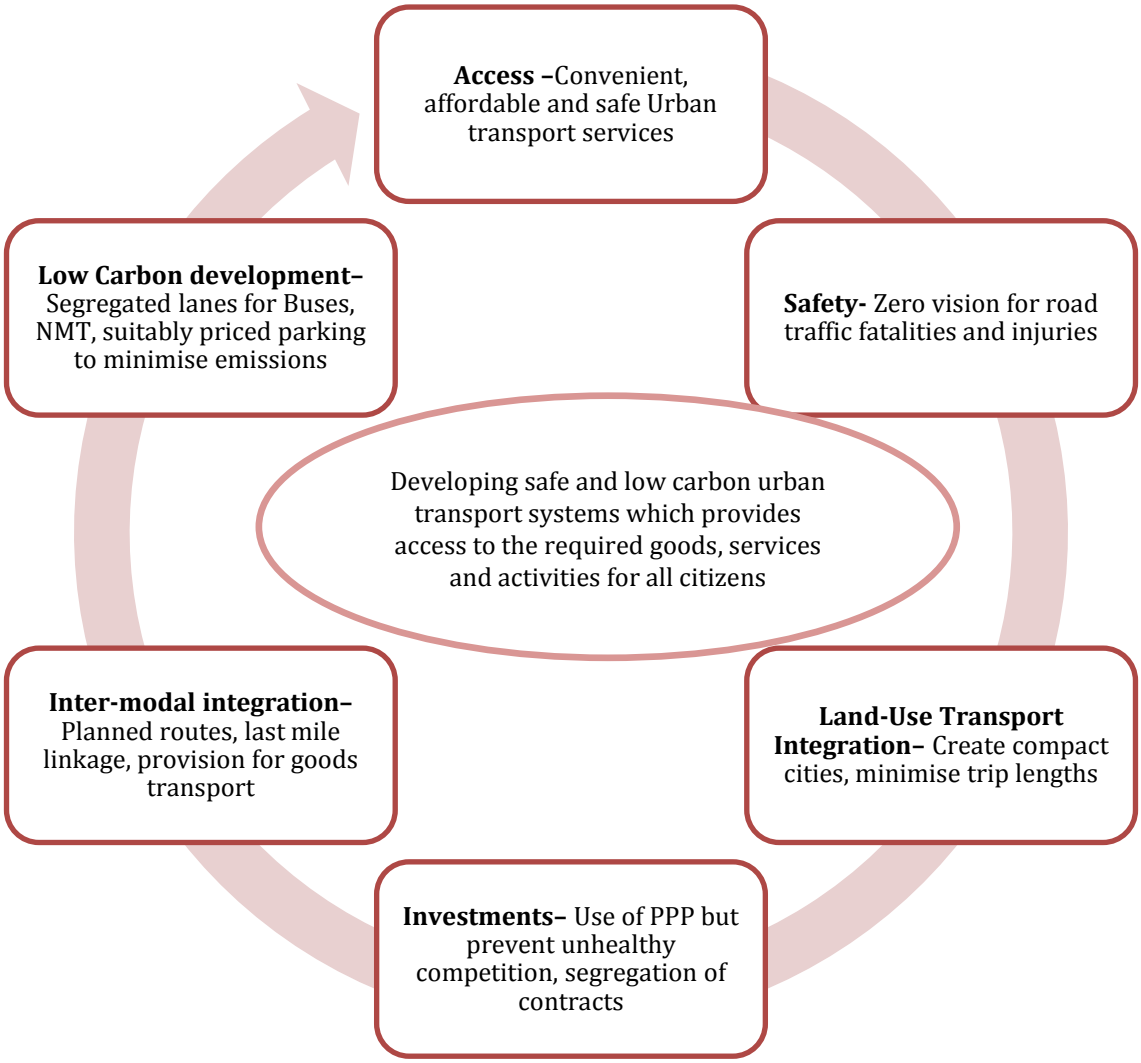
Considering these issues, the service backlogs in the area of traffic support infrastructure are assumed to be 100% in Haryana. Reports like the HPEC report and the NTDPC also consider the traffic support infrastructure existing in the country as sub optimal and hence consider 100% service backlog.

# 3 Envisioning the future

## 3.1 Vision for Urban Transport

The indicative vision for urban transport can be articulated as "Developing safe and low carbon urban transport systems which provides access to the required goods, services and activities for all citizens."

**Elements of the Vision for Urban Transport**



## 3.2 Targets to be achieved

- Trips made by PT and NMT should add up to 80% of the total non-walk trips in the cities.
- Reducing the road traffic fatalities by 50% by 2017 and to have a zero fatality vision for 2030
- Provide arterial roads >25 m to provide for pedestrian and cycle paths (2.5m each)
- Providing city bus services in all Class-I cities
- Implement a public cycle programme on PPP/central funding as envisioned by the MoUD
- Developing an Urban transport data base for all Class-I cities
- Introducing PPP in infrastructure and city bus services through well-structured contracts
- Innovative use of land for financing investments
- Dense and mixed land-use to improve use of public transport and non-motorised transport
- Formation of Urban Metropolitan Transit Authorities in Faridabad and Gurgaon,
- 25% reduction in carbon emission intensity by 2030
- Metropolitan/District planning committees combining a few smaller cities together

## 3.3 Public Transport Focus

Thus, the urban transport systems in the Indian cities have their own particular problems, which the current planning process is completely failing to address. There is a pressing need to understand the complexities of these systems so as to come up with innovative planning ideas that can provide efficient solutions to the problems plaguing Indian cities of today.

Over the last ten years, the cities of India – big and small – have experienced a rapid growth in the number of personal vehicles on the streets, a phenomenon more commonly referred to as motorization. Keeping in mind the problem of congestion faced by the cities, there is an immediate need to revamp the existing public transport systems in these cities. Almost all the existing public transportation systems in India are currently running into losses. Since the personal vehicles offer much more as far as the factors of, convenience and availability are concerned, and therefore most people choose them over the public transport system. The people that do choose the public transport are usually captive users whose financial limitations leave them no other choice.

In such a scenario, two classes of strategies can be employed to improve bus system capacities.

- Operational Strategies: Optimizing, routing, scheduling and synchronizing issues are the major components of activities related to the transportation of goods and persons traveling from a point of origin to a point of destination. The goal is to provide the best service to the customer at minimum cost to the producer. These two objectives are often contradictory, that is better service

is more costly therefore the transportation enterprise must optimize its resources to find an economical way to distribute its goods or services while maintaining the goals and constraints of its marketing strategy.

- Infrastructural modifications which are explained below in detail

## *3.4 Bus Rapid Transit Systems (BRT)*

Several cities have enhanced bus system capacity by changing the infrastructure design. "Bus systems, which have included operational and infrastructure modifications, are able to provide capacities ranging from 10,000 persons per hour in each direction to 35,000 persons per hour[1]. Bus Rapid Transit System (BRT) has become the most efficient, affordable and above all sustainable mass transport system. Because of its flexibility, ease of implementation and image of a modern information technology based system, several Latin American and Chinese cities are adopting this in favour capital intensive Metro systems. Since mid-seventies when the first system appeared in Curitiba, Brazil, the system design has been evolving as per the local needs- needs of road users, institutional mechanisms and financial structures.

The buses best serve the mobility demands of the residents of Indian cities. Keeping in mind the existing urban structure, the observed travel patterns and the fiscal strength of the Indian city governments, revamping the existing bus systems offers a viable solution to meet the mobility demand of the majority of the city residents. However, as the buses are forced to share the same right of way as the rest of the traffic, it suffers considerable delays due to congestion and the frequent traffic signals. This situation is worsened by the fact that the buses have to stop at regular intervals in order to pick up and/or drop off riders, thus making the travel times significantly higher when compared to personal modes like cars or two wheelers. Studies have proved that due to all these reasons the average speed of the buses is only about 60 per cent of the speeds obtained by other personal motorized vehicles.[2]

As long as the buses continue to share the same right of way as the rest of the traffic, they will continue to face delays and be regarded as the last option by the population. At the same time the new public

[1] Bus rapid transit planning guide 2007, Institute for Transportation & Development Policy, New York

[2] Salam, Harish, Urban Driving Cycles, M.Tech, thesis, IITD, 2010

transport system would have to be a road based system if the cost factor, presence of short trip lengths, and mixed land use patterns is kept in mind. The Bus Rapid Transit system is a road based system that allows the buses to move separately in their exclusive lanes independent of the rest of the traffic. In recent past more and more city planners have turned to this system as a solution to the public transportation problems being faced by the cities. These systems if planned correctly can provide the users with metro-like high quality transit service at a fraction of the cost.

### *3.4.1 What is a Bus Rapid Transit System?*

In simple terms, the BRT upgrades the performance of the bus systems by providing them with exclusive right of ways so they are no longer hampered by movement of other vehicles. A direct result of this is an increase in their operating speeds leading to greater reliability and dependability. This in turn greatly increases the convenience being provided to the users and more and more people get encouraged to use the new system. In this manner, a high-quality, car-competitive and affordable transit service can be provided to the users.

As of today, BRT is being universally accepted as one of the most cost-effective and efficient solution to the public transport problems being faced by cities. Table 2.1 compares the three most common mass transit options against various indicators. This clearly proves that BRT is one of the best options available to the cities of today.

**Table 2-4: Summary of alternate mass transport system**

| Characteristics | LRT | Metro | BRTS |
|---|---|---|---|
| Line capacity (passenger/h) | 20,000-25,000 | 40,000-70,000 | 20,000-35,000 |
| Journey speed (km/h[3] | 15-40 | 24-55 | 25-30 |

[3] Journey speed is the average speed of passengers travel along his/her path from origin to destination, including access, waiting, on-line travel, and transfers, if any

| | | | |
|---|---|---|---|
| Infrastructure cost (Rest. Core/km) | 100 | 150-300 | 10-20 |
| Average cost per trip (Rs.) | 30 | 45-50 | 10-15 |
| Required corridor density (persons/ha) | Medium (150-200) | High (250-300) | Medium (150-200) |
| Required minimum trip length (km) | 15 | 15 | 5 |
| Catchment area | Medium-low | Low | High |
| Segregation | At grade/ elevated | Elevated/ underground | At grade |
| Space required | 2-3 lanes from existing traffic | 2 lanes for elevated | 2-4 lanes |
| Impact on road traffic | Policy dependent | No impact | Reduced congestion for buses |
| Flexibility | Low | Very low | Very high |
| Integration | Required with buses and Para transit | Necessary with buses and Para transit | Desirable with buses and Para transit |
| Current applications | European cities | N. America, Europe and Asia | Latin America |

Source: ITDP BRT Planning Guide, and G. Tiwari Policy Brief for Urban Transport, ADB, 2006

Not only does the system maximize customer convenience, its concepts and principles can be modified according to specific city needs and requirements. As every city's conditions and demands are different, the solutions offered by the BRT are also completely different in each case, making every BRT project unique in its own way.

### *3.4.2 Features of a BRT System*

While each BRT project might be inherently different from the other, there are certain features that remain common in all the projects irrespective of the geographical location or the population it is expected to serve. For instance, a BRT system cannot be considered complete without a lane on a city street being reserved for the exclusive use of the buses. The exclusivity of this lane depends on the type of BRT system being used in the city. The two types of systems are: open systems and closed systems. In an open system, buses are allowed to move out of the exclusive corridors and mix with general traffic in order to increase the catchment area of the service. The closed systems, on the other hand, functions on the principle of allowing the buses to run only along the exclusive corridors without letting them being affected by the remaining traffic.

Another cause of the significant delays being faced by the bus systems is the number of stops it needs to make in order to pick up and drop off passengers. As the number of stops is quite high, the average speed of the buses is significantly lower than the rest of the motorized modes. The situation is further worsened by the fact that the design of the buses and the bus stops do not facilitate fast boarding and alighting. **Error! Reference source not found.** below shows a typical situation where people are boarding a bus. The height of the first step (400 mm) and number of steps (generally 3) of the bus is too high to allow everyone to board the bus quickly. In addition to that the buses stop at a considerable distance from the stop forcing people to cross the carriageway in order to reach the bus. This not only increases the boarding time but also creates extremely unsafe conditions for the users of this system.

However, as the basic purpose of any public transport system is to provide mobility and accessibility; the number of stops has to be planned carefully to meet the users' needs and needs of the bus operator. The other option is thus to reduce the boarding and alighting time of the passengers with the help of proper design and adopting other complementary technologies. This forms another characteristic feature of these systems. Some examples of such initiatives can be collecting the fares prior to boarding rather than on board thus allowing people to enter through all the doors, pre-paid smart cards can make the boarding faster but will restrict it to the front door, changes in platform design to provide for level boarding by either using low-floor buses or raised platforms and so on.

Most importantly, implementing a BRT system forces the authorities to realize that bus rapid transit is complemented by pedestrian-oriented transport infrastructure development. So another major feature of this system is the integration of transit planning with pedestrian infrastructure development. As the people using this system (public transport system) are pedestrians in access and egress trips, the urban structure needs to be developed so as to promote the pedestrian infrastructure. The efficiency of this system is further increased when planned in conjunction with supporting land use policies, zoning regulations and economic and community development.

**Figure 2** ***Height of the bus and distance increases the average boarding/alighting time***


## *3.4.3 Benefits of BRT Systems*

One of the most crucial advantages offered by BRT systems, especially in the context of Indian cities, is that it provides reliable and affordable mobility to the residents. This is extremely important in light of the fact that most of the people currently using the public transport are captive users. They are completely dependent on these systems for their daily commute to work and the undependable nature of these systems adversely affects their livelihoods. Providing this section of the society with a reliable transport system would go a long way in improving their quality of life. In addition, a well-planned BRT takes into account that a user of this system is also a pedestrian. The infrastructure and components of

the system are thus planned keeping in mind the behaviour of the pedestrians rather than the users of the motorized vehicles. This results in making the entire transportation network more accessible and safer for the most vulnerable users.

The bus rapid transit system is based on giving preference to walking, bicycling and public transport in that order. The public transit facilities should link all the important places within a city and the transit stops should be accessible to everybody. The term accessibility here takes into account the aspects of distance as well as safety. Not only should the transit stops be safe for people to use during day or night, the way to these stops should also provide a feeling of security. This would go a long way in making the entire experience of using public transit facilities much more pleasant and comfortable.

Unlike the metro systems, the BRT systems also provide the planners with the flexibility of altering or changing its route as and when required. While this might be a little difficult in the case of closed systems, it is easily managed in open BRT systems. By making the system flexible enough to let the buses move out of the BRT corridors provides a better chance of connecting all the important nodes of the city. While this might be achieved at the cost of increased travel times, the improved connectivity provided by such routes may make the higher travel times acceptable. In this manner the routes of the bus network can also be changed with the city size and structure. This is extremely desirable keeping in mind the dynamic nature of Indian cities.

Studies conducted in cities with functioning BRT have proved that the ridership numbers increased along almost all the corridors. As this system makes the public transport more available and reliable, the number of people depending on it increases. These studies have also shown that while some of this increase has been due to people shifting their patronage from other parallel services running along different corridors, a significant portion is also due to people preferring the improved bus services to their private motorized vehicles.

Another extremely important advantage that the BRT holds over any other public transport system is the relatively low capital needed for its planning and implementation. This is especially true when the capital costs required for a BRT is compared with that required for a metro system.

**Table 5 Comparative analysis of metro and BRT systems**

| | METRO | BRT |
|---|---|---|
| **Relative cost** | Metro cost is 10 to 10 times more than a BRT | BRT system cost 10 to 100 times less than a metro |
| **System cost** | Elevated Metro $40 to 100 millions<br>Underground Metro $45 to 350 millions | $500000 per KM to $15 million per Km |
| **In Delhi cost per Km** | 175 crores per Km | 10 to 15 crores per KM |

# 4 Investment Requirement

The investment projections for different sectors within urban transport and their likely funding sources are explained in this chapter.

## 4.1 Indicative service standards across sectors

Based on the existing service backlogs from the statistical abstract, data from similar sized cites in India and the guidelines for the State urban transport policy presented in the previous chapter, service standards have been adopted to decide upon the future urban transport infrastructure requirements of the state of Haryana. The service standards adopted in the HPEC report (2011), NMSH report (2011), the twelfth five year plan and the NTDPC (2011) have been taken as a reference for this study as they are all recent studies and are developed considering nationwide existing practices. These requirements are further divided into various sub-sectors within the urban transport sector. These standards have been presented in this section.

The service standards have been divided into three categories and their requirements for each class of city are presented:

- Urban roads which includes street infrastructure for all modes including passenger and goods transport
- Public transport requirements at the network level
- Traffic support infrastructure required for the smooth functioning of different modes

### Service Standards and Key Assumptions for Urban roads

The following service standards have been adopted for urban roads in Haryana:

**Table 6 Service standards and density considerations for urban roads**

| City Size Class | Population Size | Population Density* | Area under Roads (per cent)** | Road Density (km per sq. km)*** |
|---|---|---|---|---|
| **Class IA** | >5 million | 12500 | 11 | 12.25 |
| **Class IB** | 1-5 million | 12500 | 11 | 12.25 |
| **Class IC** | 100000-1000000 | 10000 | 11 | 12.25 |
| **Class II** | 50000-100000 | 10000 | 7 | 7 |

| | | | | |
|---|---|---|---|---|
| **Class III** | 20000-50000 | 7500 | 7 | 7 |
| **Class IV+** | <20000 | 7500 | 7 | 7 |

*-- Gross population density is considered at city level

**--100% of roads to be constructed with adequate pedestrian /NMT facilities

***--Out of the total road length it is recommended that 65% is allocated for access roads, 25% for collector streets and the rest of the 10% for Arterial roads.

These roads are assumed to be designed considering safety as a critical component in road design.

### Service Standards and Key Assumptions for Public Transport

- Rail-based and road-based Mass Rapid Transit Systems (MRTS) for Class IB cities, and city bus services for other city size classes
- MRT network (Rail and Road combined) service standards
    - Class IB cities: 0.3 km per sq. km area
- City Bus Service Standards
    - 40 per 1 lakh population for all Class- I cities

### Service Standards and Key Assumptions for Traffic Support Infrastructure

**Street Lighting**

Since street lighting forms an important component of the perception of safety on the roads during nights, the street lighting component has also been included in the traffic support infrastructure. The following are the assumptions used for street lighting.

- Luminescence of average 35-40Lux with 40% uniformity both for pedestrian and vehicular areas (however pedestrian and non-motorized vehicles may be lit under white light to ensure contrast as against yellow colored light for vehicular lanes) for all road categories for all city size classes;
- Spacing between street lights as required achieving the required lux levels, using combination of luminaire optics, bracket lengths and mounting heights. Care should be taken to avoid shadows such as those from trees.
- Lighting considered for two sides for arterial and sub-arterial roads, and one side for collector roads and access road spaces
- It is assumed that street lighting backlog is equivalent to backlog in road infrastructure

**Parking Facilities**

Formal public parking facilities in combination with a strong local parking policy need to be provided in Class IB and IC cities. It is recommended that formal parking facilities be provided for 20% of the vehicles owned in the city. Also, it is proposed that to discourage private vehicle use against public transport, and to avoid subsidizing private modes of transport, parking charges and space availability may be adequately addressed in the local parking policy. For cities less than 1 lakh population i.e. Class II and below, trip lengths are small and hence no. of private motorised trips will not be so high as to demand a structured parking facility. On-street parking would suffice for the requirements and a parking policy needs to be formulated as a part of the state urban transport policy as a TDM tool. (Refer Section 2.4.2, where policy guidelines are mentioned)

**Bus Terminals**

These are required in Class I and Class II cities**.** The service standard adopted is 1 terminal for every 1 million population i.e. in the above classed cities a depot is constructed for every increment of 1 million in population.

**Bus Depots**

These are required in Class I, II and Class III cities**.** The service standard adopted is 1 depot for every 70 buses i.e. in the above classed cities a depot is constructed for every increment of 70 buses.

**Intermediate Public Transport (IPT) Parking**

Since Intermediate Public Transport like auto rickshaws and cycle rickshaws form an important component of the feeder system to public transport and hence adequate parking needs to provide for IPT in the bus depots and terminals being proposed.

**Intelligent Transport System (ITS) Facilities**

ITS can be used in various forms i.e. in parking, bus terminals and depots, bus operations etc. Hence an indicative cost of 2% has been included in all the above systems for ITS facilities. Also, since this is a visioning exercise, the exact ITS system to be used cannot be specified at this stage as the rate of improvement in ITS facilities has been swift and the appropriate technology at the time of execution of project is proposed to be considered.

**Goods Transport**

Freight traffic and movement of goods within the city and 'passing through' intercity traffic affects overall city mobility. Passenger movements are concentrated in the morning and evening peak hours; freight movements are spread over a 24 hour period. At the same time goods vehicles are vital to the economy and well-being of society. Commerce is dominated by goods vehicles, and the logistics industry in particular is dependent on road transport for pickup and delivery. Hence adequate parking facilities and terminals for the goods traffic need to be provided on a case to case basis. As for the road requirements of goods transport, the traffic mix in various cities shows only a minor proportion of it as goods traffic. Hence, additional infrastructure requirements for goods transport can be minimised by adopting proper Travel Demand Management (TDM) tools which are applicable to the city size and type under consideration.

## *4.2 Cost benchmarking*

This section gives the unit costs adopted for different sub-sectors of Urban Transport. The average costs of different existing projects have been taken as the basis for these cost estimates.

## Unit costs for Urban Roads

- Construction cost (per lane km):
    - Major roads i.e. Arterial and sub-arterial roads – Rs 1.25 crores,
    - Collector roads – Rs 1.00 crores,
    - Access road spaces – Rs 60 lakhs;
- Additional cost of one lane km is considered for major and collector roads to cater to other road infrastructure like pathways, parking spaces, and medians;
    - Service life of five years has been assumed for major and collector roads due to increased activity on these roads. Hence the cost of overlaying the roads after every five years has also been included in the cost estimates;
    - 25 per cent of the unit cost is assumed to compute the replacement cost for major and collector roads;
- Service life of access road spaces is assumed to be 20 years, and hence no replacement costs are considered for these categories for the estimation period;
- Annual Operation and Maintenance (O&M) is assumed to be 2 per cent of the construction cost for all roads, covering both existing and new assets;
- Cost of drains, power cables, telecom conduits, lighting, etc. is not included in the costs. The unit cost for roads also does not include land acquisition costs for road construction; and estimate of the backlog is an area of limitation in the estimation exercise.

## Unit costs for Public Transport

**Costs for MRT Network**

- MRT networks have been proposed for Class-IA and IB cities. In Haryana, even in 2030, none of the cities is likely to be a Class IA city i.e. population greater than 5 million. Gurgaon and Faridabad are projected to be Class-IB cities. Since both these cities have access to Metro i.e. rail based MRT in place any additional MRT development is assumed to be road based i.e. BRT or segregated bus based systems shall be developed.
- Average construction cost per km for road-based MRTS i.e. BRTS: Rs 15 crores (two lane);
- Annual O&M for road-based MRTS: 3 per cent of construction cost, excluding rolling stock
- O&M costs cover both existing and new assets

**Costs for City Bus Services**

- A unit cost of Rs. 80 lakhs per bus i.e. the cost of an urban low floor bus is considered for the proposed city bus services in the cities
- The auxiliary infrastructure cost like terminals and depots' cost is included in the traffic support infrastructure section.

## Unit costs for Traffic support infrastructure

**Costs for Street Lighting**

- Light Emitting Diode (LED) lamps considered at Rs 5400 per lamp;
- Lamp post cost considered at Rs 10,000 per post;
- No replacement cost has been factored in; and
- Annual O&M is assumed to be 2.2 per cent of construction cost, covering both the existing and new assets.

**Costs for parking facilities** have been taken care of partially in the cost of urban roads as one extra lane-km is added for arterial and collector roads for facilities like road-side parking and walkways. Additional parking requirements throughout the city are computed art the cost of Rs. 50,000 per equivalent car space (ECS).

**Costs for Bus Terminals** is taken as Rs. 3 crores per terminal for construction and an O&M cost of 3 per cent of construction cost annually

**Costs for Bus Depots** is taken as Rs. 5 crores per depot i.e. 70 buses for construction and an O&M cost of 3 **per cent of construction cost annually**

**Cost for ITS facilities:** An indicative cost of 2% of the project cost is considered for ITS facilities wherever ITS can be used as support infrastructure i.e. in traffic management, parking, bus operations, bus terminals and depots

## *4.3 Investment projections for Seemandhra*

The investment projections in each category of urban transport infrastructure i.e. urban roads, public transport and traffic support infrastructure are explained separately and their summary is presented at the end of the section.

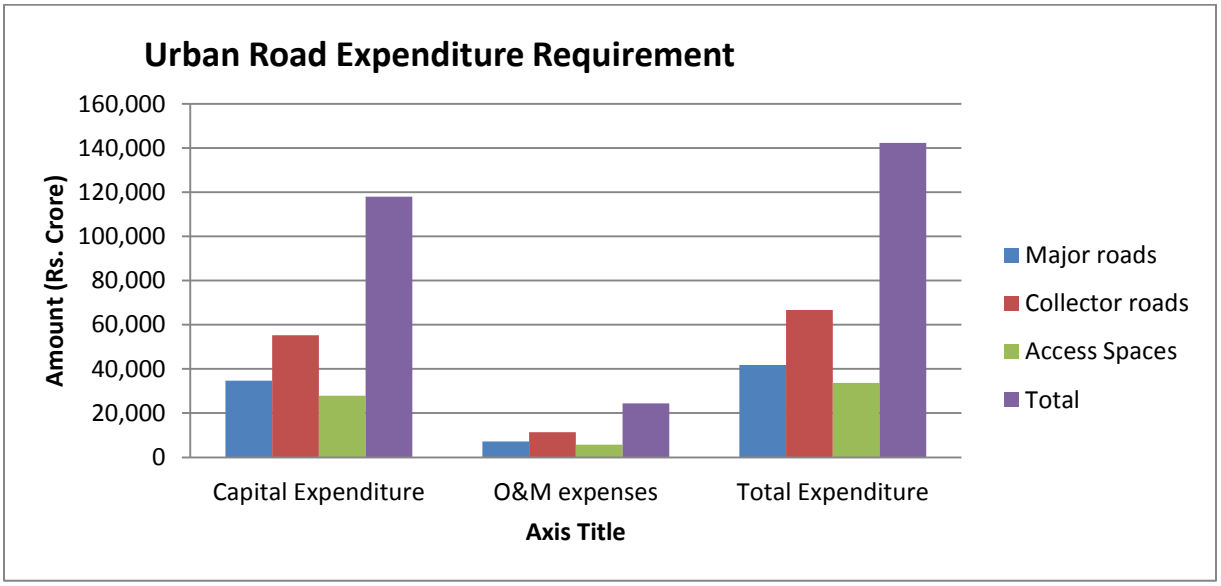
## Investment projections for Urban Roads

The following table shows the investment projections for urban roads for different classes of cities and also different categories of roads. The graphs following the table summarise the investment projections into city and road classes. These costs include the construction, operation and maintenance costs for urban roads. This also includes the cost for pedestrian and cycle pathways, on-street parking and ITS facilities required along the roads.

**Table 7 Investment projection for Urban Roads (at 2011-12 prices)**

| City Size Class (2001) | Cost Projection by Road Category (in Rs. Crores) | | | |
|---|---|---|---|---|
| | Major roads | Collector roads | Access Spaces | Total |
| **Capital Expenditure** | 34,692 | 55,315 | 27,953 | 1,17,961 |
| **O&M expenses** | 7,160 | 11,417 | 5,770 | 24,347 |
| **Total Urban Road costs** | 41,852 | 66,732 | 33,723 | 1,42,307 |
| **Total Urban Road costs** | **1,42,307 Crores** | | | |

Figure 3 Road category wise urban roads investment requirement




## Investment projections for Public Transport

Public transport is assumed to be provided in all Class-I cities as per the service standards explained in Chapter-3. Mass Rapid Transit facilities are assumed to be provided in Faridabad and Gurgaon i.e. Class-IB cities in Haryana in 2030. The existing service backlogs are also taken into consideration for these calculations. The unit costs include the construction, operation and maintenance costs for public transport are considered as explained above.

Table 8 Investment projections for Public Transport (at 2011-12 prices)

| Item | BRT Corridors | City Buses | Total |
|---|---|---|---|
| **Capital Expenditure** | 11,771 | 5,026 | 16,798 |
| **O&M expenses** | 334 | 151 | 485 |
| **Total PT cost** | 12,105 | 5,177 | 17,282 |

## Investment projections for Traffic Support Infrastructure

The traffic support infrastructure is further classified into street lighting, bus terminals and bus depots and the ITS facilities required for these support infrastructure. The investment projections for each of these categories are presented separately below.

**Street Lighting:**

The installation, operation and maintenance cost of street lighting to be provided in different categories of roads is calculated taking into account the existing service backlogs. The following table and the figure summarise the street lighting cost estimates in the state.

**Parking**

The cost of parking included in urban roads section, only includes the parking along roads. The remaining parking to be provided in Class I and Class II cities are considered in this section and the cost estimates are as follows.

**Bus Terminals**

The construction, operation and maintenance projections for bus terminals required in different classes of cities in Haryana are as shown in the following table.

**Bus Depots**

The construction, operation and maintenance projections for bus depots required in different classes of cities in Haryana are as shown in the following table.

**Summary of Traffic Support Infrastructure Cost**

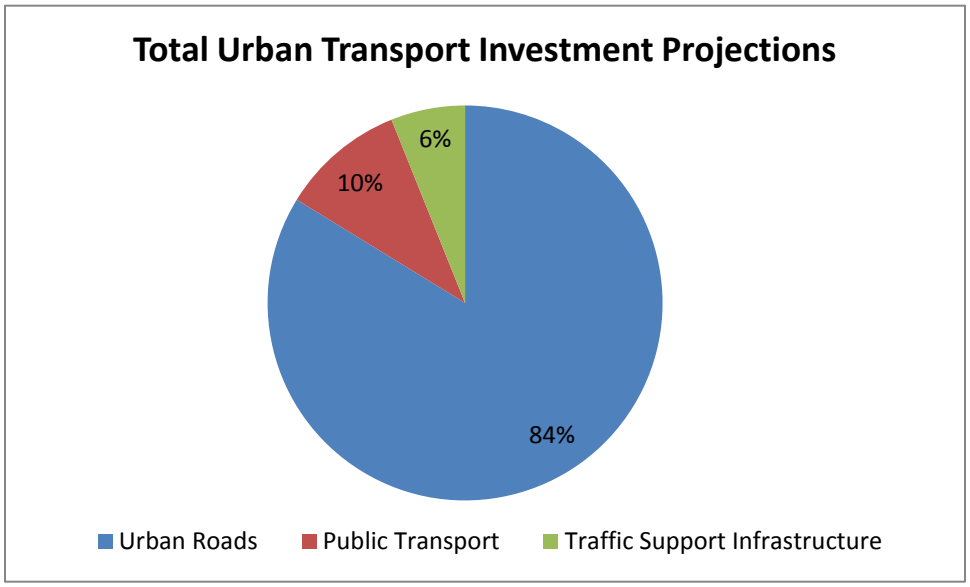
The three sub-sectors explained above are summarized in the following table.

**Table 9 Summary of Traffic Support Infrastructure costs (at 2011-12 prices)**

| Component of Support Infrastructure | Cost (in Rs. Crores) |
|---|---|
| Street Lighting | 884 |
| Parking | 8,203 |
| Bus Terminus | 179 |

| | |
|---|---|
| Bus Depots | 1,061 |
| **Total Support Infrastructure cost** | 10,327 |

**Figure 4: Summary of Traffic Support Infrastructure costs (at 2011-12 prices)**




## Total investment projections for urban transport

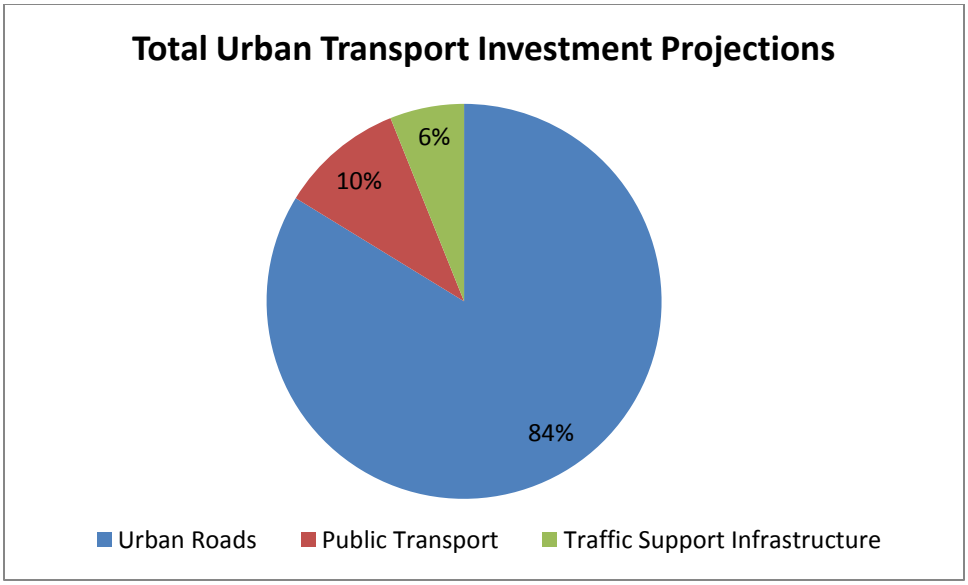
The total infrastructure cost estimates for urban transport derived from the above sub-components is explained in this section. The following table summarises the cost projections for the sector.

**Table 10 Summary of Urban Transport Infrastructure cost estimates up to 2030 (at 2011-12 prices)**

| Sub-Sector | Investment Projected (in Rs. Crores) | % of Total Investment |
|---|---|---|
| Urban Roads | 1,42,307 | 84% |
| Public Transport | 17,282 | 10% |
| Traffic Support Infrastructure | 10,327 | 6% |

| | | |
|---|---|---|
| **Total Urban Transport Investment** | 1,69,916 | 100% |

**Figure 5: Urban transport Investment Projections**




- The total investment required in urban transport is found to be Rs. 1, 70,000 crores over the next 20 year period.
- On an average this translated to around 8,500 crores for urban transport annually. It is observed that the investment requirements are the maximum in the area of urban roads followed by public transport and the traffic support infrastructure.
- The proportion of investment projections in urban roads seems heavily tilted in favour of roads. This is because; the cost includes the cost for both motorised and non-motorised infrastructure. Also, this includes the cost of roads in all classes of cities and even the cost of providing access spaces.
- Among the three sub sectors within Urban transport i.e. Urban Roads, Public Transport and Traffic Support Infrastructure, the service backlogs have been almost 100% in Public transport and Traffic support infrastructure. Hence this area should be the first priority for investment.
- The share of these two sub sectors is 23% out of the total investment required. Even though urban roads constitutes 77% of the total investment, it is spread over a period of 20 years while the other two sub-sectors are mostly one time investments with only the operation and maintenance costs, which are about 2-3% of construction cost, spread over twenty years.
- The urban roads' cost estimates include access spaces thereby increasing the cost projection as compared to other sub sectors like public transport and traffic support infrastructure like parking, bus depots and terminals, which are provided at limited locations or only along certain arterial roads.

# 5 Operationalizing the vision

## 5.1 Proposed Institutional Arrangement

Based on the observations made in the previous section, the following institutional mechanism is proposed for the state of Haryana. The various functions in urban transport, the sub-functions within them and the institutions responsible for those functions have been identified in the table.

**Table 11 Proposed Institutional Structures for Urban Transport**

| Function | Sub-functions | Agency Responsible |
|---|---|---|
| **Strategic and Policy Functions** | Strategic planning | MoUD |
| | Policy formulation | MoUD |
| | Capital financing | APUFIDC |
| **Regulation of commercial issues** | Fixation of fares/tariffs for Public Transport | Ministry of Railways/APSRTC |
| | Monitoring quality of services | RTO |
| **Health and safety regulation** | Setting standards | CPCB/SPCB/MoST |
| | Ensuring adherence to safety standards | MoST |
| | Ensuring adherence to environmental standards | CPCB/SPCB |
| **Procurement and provisioning of public transport** | Network and route design | ULB/SRTC /UMTA |
| | Identification of demand | APSRTC |
| | Franchising/route allocation | APSRTC |

| | | |
|---|---|---|
| | Planning and provisioning of services | ULB/R&B |
| | Contract monitoring | APSRTC |
| | Inter-sectorial coordination | MPC/ DPC |
| **Supply of common infrastructure and other services** | Inter-model coordination | UMTA |
| | Passenger information systems | APSRTC/MC |
| | Data collection and management | ULB/APSTRC |
| | Dispute resolution | Informally at Transport Department |
| | Management of common infrastructure | ULB/APSRTC |
| | Public relations | ULB/APSRTC |
| | Security services | Traffic Police |
| | Management of common ticketing facilities | ULB/APSRTC |
| | Management of revenue-sharing arrangement between operators | UMTA/ MPC/ DPC |
| **Operation of services** | Operation of publicly run bus services | ULB/APSRTC |
| | Operation of privately run buses | Private Operators |
| | Operation of the rail-based systems | Railways |
| MoUD - Ministry of Urban Development; UDA- Urban Development Authority; APSRTC – Andhra Pradesh State Road Transport Corporation; ULB- Urban Local Body; | | |
| RTO – Regional Transport Office; APPCB – Andhra Pradesh Pollution Control Board; CPCB – Central | | |

| |
|---|
| Pollution Control Board; |
| MoST – Ministry of Surface Transport; R&B—Roads and Buildings Department; |
| UMTA- Unified Metropolitan Transport Authorities (UMTA) ; MPC-Metropolitan planning committee; DPC-District planning committee; |

Most of these agencies/ organisations already exist and hence it's only a matter of assigning these agencies with the works specified here. The new set of agencies being proposed are the UMTA, MPC and DPC. These are explained in this section:

The centre and the state cannot be directly responsible for urban transport in each city. The primary responsibility for providing good mobility to the City and the surrounding area i.e. suburban/regional services has to lie with the city that is the prime beneficiary. The city has to be made to realize this because most actions to improve urban transport in the cities lie with the city. This is the international practice.

However, the city has to be empowered to take charge of its urban transport. The city has to be provided with a strong institutional framework, an effective organizational set up with a dedicated agency in the city to look after planning coordination and implementation of urban transport services, legislation, a resource generation policy and adequate skills. A three level organizational set up is proposed for the city.

- Metropolitan/District planning committee
- Dedicated authority for urban transport (UMTA)
- Other existing city agencies

**Metropolitan/ District Planning Committee**

The constitution of the 'Metropolitan/District planning committee' as envisaged in the 74th constitutional amendment for the metropolitan area will take care of the intersectional coordination needed particularly with urban growth policies. A Metropolitan planning committee is formed in the case of a large metro surrounded by a few smaller towns and all of them are to be integrated. A District planning committee is formed in case of a few smaller towns making up a district. All these towns together have a DPC which monitors their projects and helps in intersectional coordination in all these towns.

**Dedicated Authority for Urban Transport (UMTA)**

Large metropolitan cities say with population in excess of one million should set up the 'Unified Metropolitan Transport Authority' (UMTA) as envisaged in the National Urban Transport Policy 2006. Small cities should come together to form a DPC.

This authority should take care of the connectivity with the surrounding suburbs and region as well. UMTA should report to the proposed Secretary of urban transport in the State Government. Similar agency should be created to take care of a group of small cities.

NUTP 2006 envisages UMTA primarily as a coordinating body to bring about Policy, Planning and Service Co-ordination, to decide on capital financing and long term investments and to monitor implementation. The UMTA act enacted by Andhra Pradesh Government states that 'UMTA shall ensure effective implementation and coordination of traffic and transport measures undertaken by functional departments and public agencies in Hyderabad Metropolitan Region'.

The National Urban transport policy 2006 further requires UMTA to be supported by a professional body that will study and make recommendations on various issues for consideration and decision by UMTA. Rather than have two separate bodies it is now proposed that UMTA is a full time professional body working under a city council with representation from all city agencies and stakeholders including the surrounding region. It should undertake all work related to urban mobility in the city. This will include; Strategic and Policy Functions; Regulatory Functions; Integrated planning; Transport Demand Management; Organizing services; Providing Common Services; Resolution of day to day matters and Monitor the work assigned to implementing agencies both for the city and the surrounding region. For UMTA to be effective it should be backed by legislation and the entire funding for urban transport should be routed through UMTA.

**Other Existing Agencies**

Existing agencies managing various components of urban transport will continue to be a part of the institutional framework as the third level in the cities for executing works as per the prioritized program approved by UMTA. The professional skill with existing agencies in implementation and operation will be much needed. It is important that the large number of agencies presently involved do not feel left out. The respective city agency will be responsible for maintenance of assets as well.

## *5.2 Capacity Building Initiatives*

Capacity building is another one of the institutional reforms to be put in place. Urban transport is made up of several components such as several private and public modes of transport, roads network and all associated infrastructure and other related activities such as multi-modal integration. Unfortunately the capability for undertaking a coordinated approach and a complete understanding of issues involved is lacking at the State Government and City level. There is an urgent need for capacity building; both institutional and individual. For institutional strengthening NUTP has identified IUT at the Central Government level. Similar institutional strengthening should be undertaken by the Andhra Pradesh State Government under the Centre for Good Governance (CGG) or Andhra Pradesh Municipal Development Project (APMDP)

Individual capacity building should be in two parts; city officials and university educated professionals. The focus of training for existing city officials should be to develop awareness, skills and a deeper understanding of the requisite issues in urban transport. The focus of the education component should be to create a pool of skilled manpower to be available in the country for recruitment by various organizations engaged in urban transport. Alumni from such programs would be potential recruits for State Transport Corporations, State Transport Departments, Municipal bodies etc. Simultaneously State Governments should be encouraged to create jobs for such professionals. A compulsory system of certifying experts to handle specific tasks perhaps needs to be introduced. Capacity building is an on-going need and hence should be institutionalized.

## Recruitment and retention of professional staff

Recruitment and retention of trained urban planners and transport professionals in various cities is essential to promote good urban transport. It is proposed a new State cadre of urban transport professionals to be posted to various cities and managed by the Andhra Pradesh Municipal Development Project (APMDP)

# *5.3 Policy Reforms*

## *5.3.1 Policy Framework: State Urban Transport Policy*

Having a policy framework for Urban Transport in place at the state level is of utmost importance for the state government. A policy framework lists out the vision the state government has regarding its urban transport and the goals it sets to achieve. It is crucial that this state urban transport policy is complementary with the national level urban transport policies explained above. This helps in streamlining the decision making on different projects at the local level. When an individual project in a city or a city wide project is considered for approval of funding/financing, the state urban transport policy serves as the benchmark against which the project is compared. If the outcomes of the project help achieve the vision and goals of the state policy, the project can be approved. This results in consistent decision making across the state on different urban transport issues.

## Guiding principles for the State Urban Transport Policy

The following are the broad guidelines for formulating the State urban transport for Haryana.

*Urban Transport Vision guidelines*

- Providing access for all citizens to their amenities i.e. access to work, education, goods, health, recreation and any other requirement for travel.
- Minimising the greenhouse gas emissions and road traffic crashes while providing for this accessibility

*Urban Transport Policy guidelines*

Designing urban planning bye-laws so as to realise the following national goals:

- Carrying out well designed and regular surveys and data generation at the city level on key indicators of mobility to assess the travel behaviour of the cities on a timely basis.
- Equitable allocation of road space i.e. infrastructure provided in proportion to the mode shares of person trips observed
- Encouraging transit-oriented development,
- Mandating public transport accessibility indicators for large developments
- Installing intelligent transport systems to facilitate the above objectives.

Land- Use Transport Integration:

- Integrating land use and transport planning to be adopted in all urban areas so as to discourage urban sprawl thereby reducing trip lengths and hence providing an enabling environment for non-motorised transport use.

Public Transport and Para-Transit:

- Priority to the use of public transport, maintaining high quality and pricing it optimally. Incentivize bus operations in cities by providing capital subsidy and reimbursing taxes and duties paid on fuel.

- Encouraging Para-transit to fulfil gaps between public and private transport

Non-Motorised Transport:

- Prioritizing investments in infrastructure for sustainable modes of transport like Non-motorised transport (i.e. Walking, Bicycle and Cycle Rickshaw related infrastructure) and Public Transport

- Ensuring a barrier free street environment to ensure access to public spaces, pedestrian infrastructure, public transport etc. to all including those with special needs (physically challenged).

- Facilitating Bike sharing projects, currently being endorsed by the Ministry of Urban Development.

Parking Policy

- Rationalizing parking policies and charges to reflect the true price of land being allocated for parking

Safety

- Infrastructure and investments towards achieving the long-term vision of zero traffic fatalities in urban transport

Goods Transport

- Adequate terminals, parking facilities and road infrastructure required for the goods movement within the cities to be created

Reforms

- Smaller cities and towns should be treated differently from larger cities and metros for funding, capacity building and reform content and timelines

- Levying property taxes which consider the accessibility of a place i.e. places closer to stations or city centres to be valued more than interior areas

- Capacity Building initiatives at the state and city levels

- Achieving inter organisational coordination by constituting Unified Metropolitan Transport Authorities (UMTA) in Class IB cities and combining a few smaller cities together to form 'Metropolitan/District planning committee' as envisaged in the 74th constitutional amendment.

- Creating a separate State Urban Transport Fund which shall meet the capital requirements of various systems to be put in place and also for possible support to certain systems during the operations stage. Such a fund shall be formed by charging the private modes of transport their appropriate cost of operations and facilitating sustainable transport systems. Options like green cess on private vehicles, green cess on petrol and diesel, land value capture and congestion pricing can be explored to create the fund.

## *5.4 Financial Reforms*

In addition to the financial strategy proposed in Chapter 4 to meet the investment requirements projected for urban transport, certain financial reforms are recommended to be implemented to realise the objectives listed in the national urban transport policies and also the proposed state urban transport policy. The chief reform among these is to set up a dedicated Urban Transport Fund at the state and city levels. **Dedicated Urban Transport Fund**

The creation of a dedicated Urban Transport Fund (UTF) is an important reform proposed by the MoUD to make transport investments sustainable and use levies on private vehicles to subsidize public transport and non-motorised transport. The following issues should be kept in mind in the structuring of the UTF.

- Urban transport financial resources should be pooled within an urban transport fund administered by the strategic transport authority at the municipal or metropolitan level.

- Financing arrangements might be structured to secure more effective integration both within the sector and between sectors.

- Private sector financing for transport infrastructure should be raised through competitive tendering of concessions that may be supported by public contributions as long as these have been subject to proper cost benefit analysis.

- Intergovernmental transfers should normally be made to the fund and should be structured in such a way as to avoid distorting the efficient allocation of resources within the transport sector at the local level.

- When allocating funds to urban transport, the relationship between transport policy and other sector policies, in particular housing should be borne in mind.

**Fiscal measures and UTF**

Financing the proposed public transport in all Class-I cities remains a problem largely because cost recoveries are a challenge. A large part of the public transport is generally state funded though private investments in transport sector have also begun. But there is need for a strategic framework to enable the project to remain remunerative while meeting the social objectives. There is need for schemes that automatically earmarks tax proceeds for public transport. Otherwise, sustained predictable financing of public transport becomes difficult. Even if the city governments get into cost sharing arrangements with the private players, challenges remain. The subsidy burden to recover the cost of investments and operations has increased for the state governments.

It is important that the city governments actively find ways of forming public transport funds. But the fiscal measures will have to work on the principle of travel demand management principle that helps to reduce dependence on personal vehicles and also reduces vehicle kilometers traveled. Cities therefore, need a mix of fiscal measures to support public transport. There needs to be a clear policy to prioritize transportation investments into PT, IPT & NMT, and not in infrastructure for private modes.

- **Advertisement revenue for public transport:** It is now well accepted that advertising on street furniture, public transport infrastructure can be used to help meet the financial shortfalls and generate substantial revenue. Advertising can be promoted on street furniture -- devices placed on public service amenities of the city like railway carriages, buses, metro trains, commercial passenger vehicles, bus shelters, metro shelters, public toilets and public garbage facilities, to name a few. Advertisement policies would need some key guiding principles. They must not pose as safety hazards; must not be counter to city aesthetics and avoid visual clutter. For safety, allow large size billboards at a significant distance from the traffic junctions and intersections. Ban billboards on pedestrian walkways and in placing billboards at significant distance from the right of way of any road. Large size billboards should be completely banned on major city arterial roads etc. With all the safeguards and guidelines the cities can work to maximize the revenue gains, which can be used for city development.

- **Tap parking revenue**: Pricing of parking should be based on principle of 'user pay' reflecting the cost of the public good – precious urban space. Current parking rates in cities are low and act as a hidden subsidy to the car owners. Parking rates should be freed up and market driven. From periodic renewal of parking licenses parking revenue should be augmented and utilized to create a dedicated fund for public transport.

- **Fuel taxes: C**ities in Haryana need to explore this strategy of imposing cess on fuels to generate revenue for urban transport funds. Delhi is the only instance where cess on fuel is being charged to generate dedicated fund for pollution control. For instance, the Air Ambience fee per litre of diesel sale in Delhi to create the Air Ambience fund to meet the cost of Delhi's clean air action plan. Similar moves can be made to tax transport – diesel and petrol -- in other cities as well.

- **Urban Transport Tax on Purchase of New Cars and Two Wheelers:** at 7.5% of the total cost of the petrol vehicles and 20% in case personalised diesel cars. This is because diesel is more subsidised than petrol for the sake of agriculture. Delhi is already implementing this green fund to buy more city buses with the generated fund.

- **Land Value Capture in TOD zones to fund public transport through the UTF mechanism:** Indian cities have already begun to look at ways to generate revenue from land-use densification. The beneficiaries of transport development are asked to contribute towards the cost of developing transport infrastructure (e.g. metro or BRT corridors), often through enhanced property taxes, betterment levies or purchase of land development rights etc.

Capturing of land value gains for public investment is a new area of financing and is an opportunity for capital financing. It is important to include as a policy advisory both risks and regulatory safeguards for such approaches. Increased values and land speculation can potentially stifle development of affordable or mixed-income housing projects. This can result in a preference for developers to market projects in transit oriented developments to higher income households. This has the risk of urban transportation projects becoming heavily dependent on the real estate development. Therefore, regulations and safeguards must attach primacy to the urban transport component.

Cities should therefore frame inclusionary zoning regulations that will require that all new housing developments to include a portion of units as affordable housing. Also strong Travel Demand Management (TDM) measures should be in place before these strategies are enforced to increase public transport ridership. Zonal regulations and its stringent implementation should be made contingent to land based financing.

Also it is important to mention that the proposal to levy higher rate of property tax in designated areas close to the stations and corridor to capture the enhanced rental value will work only if the tax collection system is efficient, inventories are in place, and parcel by parcel valuation is possible. If property tax coverage is poor then the ability to generate more revenue through this will be poor. Inadequate valuation can also lead to other tensions etc. Therefore, it is important to include this in policy advisory so that appropriate regulations and charging methods can be evolved.

The advisory should also include the fact that higher floor Space index should not be indiscriminately used for revenue collection. A detailed analysis is needed to see if other infrastructural services such as water supply, sanitation facilities, etc., are available to cope with the increased demand. Also ensure TOD principles are adopted for densification. It is also important simultaneously to enforce travel demand management principles including parking caps etc. to ensure that the community in the TOD zone is transit oriented.

## 5.5 Implementation Roadmap for Urban Transport sector

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | Monitorable Indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Preparatory Activities** | | | | | | | | | | | | | | | | | | | | | |
| Comprehensive Mobility plans for cities and regions | | | | | | | | | | | | | | | | | | | | | Estimation of the existing service levels and infrastructure required. |
| **Institutional Reforms** | | | | | | | | | | | | | | | | | | | | | |
| Formation of UMTA/ MPC/ DPCs and framework for sharing of responsibilities | | | | | | | | | | | | | | | | | | | | | Redesign of accounting and staff structure and role definition for various agencies |
| Capacity building initiatives | | | | | | | | | | | | | | | | | | | | | Workshops should be held and courses for staff. |
| **Policy Reforms** | | | | | | | | | | | | | | | | | | | | | |
| Road map and policy framework for the urban transport sector is operationalized | | | | | | | | | | | | | | | | | | | | | State urban transport policy should be finalised and implemented. |
| **Financial Reforms** | | | | | | | | | | | | | | | | | | | | | |

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | Monitorable Indicator |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Backlog Demand is met | | | | | | | | | | | | | | | | | | | | | |
| Additional Demand is met | | | | | | | | | | | | | | | | | | | | | |
| Create an Urban Transport Fund and identify its revenue sources | | | | | | | | | | | | | | | | | | | | | |
| Implementing pilot projects under PPP | | | | | | | | | | | | | | | | | | | | | Collection efficiency reaches benchmark |