

Urban transportation plays a significant role in the economic, social, and physical life of urban areas. The urban transport planning in India today is falling short in nearly every score and needs attention. Traditional planning aims to improve mobility, especially for vehicles and is failing to adequately consider wider impacts. The Transport Planning Module thus introduces the reader to sustainable planning with a real purpose of access- while simultaneously reducing environmental and social impacts, and managing traffic congestion. The module follows the National Urban Transport Policy in presenting a good approach on Integrated Planning to the readers.



MINISTRY OF URBAN DEVELOPMENT
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Development of Training Material under “Sustainable Urban Transport Project”



Reference Guide

Volume 2

Urban Transport Planning

MINISTRY OF URBAN DEVELOPMENT



Acknowledgments



The Institute of Urban Transport (India) is a premier professional non-profit making organization under the purview of the Ministry of Urban Development, Government of India (MoUD). The National Urban Transport Policy (NUTP), 2006 has empowered IUT to serve as a National Level Facility for continuous advice and guidance on the principles of sustainable urban transport. The objective of the Institute is to promote, encourage and coordinate the state of the art of urban transport including planning, development, operation, education, research and management at the national level.

The Institute has been nominated as the project monitoring unit for Component 1A of the SUTP. IUT is responsible for overseeing the preparation of the training modules, subject toolkits and conduct of training of 1000 city officials in urban transport.



The Ministry of Urban Development (MoUD), Government of India (GoI) has initiated the Sustainable Urban Transport Project (SUTP) with support of Global Environment Facility (GEF) and the World Bank to foster a long-term partnership between GoI and state/local governments in the implementation of a greener environment under the ambit of the NUTP. The aim of the project is to achieve a paradigm shift in India's urban transport systems in favour of sustainable development. The MoUD is the nodal agency for the implementation of the project, to be implemented over a four-year period starting from May, 2010 to 30 November 2014. Project cost is Rs. 14,161.55 Million. The project's development objective (PDO) is to promote environmentally sustainable urban transport in India and to improve the usage of environment-friendly transport modes through demonstration projects in selected cities.



Urban Mass Transit Company Limited (UMTC) is a unique public-private venture promoted by the Government of India (Ministry of Urban Development), Govt. Of Andhra Pradesh, Andhra Pradesh State Road Transport Corporation and Infrastructure Leasing and Financial Services Limited. UMTC provides sustainable solutions for improving mobility in urban and suburban areas through an integrated and multimodal approach. The mobility solutions encompass the entire life cycle of the project i.e ideation, concept development, planning & design, implementation and operation. UMTC is providing its services across the urban-rural continuum covering various modes of transport.



EMBARQ is the WRI Center for Sustainable Transport. Its mission is to work with cities in the developing world to catalyze and help implement sustainable solutions to the problems of urban mobility. EMBARQ India provides advisory support to sustainable transport projects; designs, develops and delivers capacity building programs and develops research to influence policy development.



GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) purpose is to promote international cooperation for sustainable development and education work. As a 100% federally owned, public-benefit enterprise, we support the German Government in achieving its objectives in the field of international cooperation for sustainable development. GIZ operates in more than 130 countries and employs more than 17,000 staff members across the globe.

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The Government of India (GoI) has initiated the Sustainable Urban Transport Project (SUTP) with support from the Global Environment Facility (GEF), UNDP, and the World Bank. The objective of the project is to facilitate the provision of urban transport infrastructure and services in a manner that is consistent with sustainable environmental considerations and the National Urban Transport Policy (NUTP).

Component 1A of the GEF-SUTP project comprises tasks required for capacity building amongst practitioners in the field of sustainable urban transport. Such National Capacity Development Initiatives will help the Government at the Central, State and city levels to strengthen the core functions necessary for efficient administration of Urban Transport. It promotes building sustainable capacities in urban transport by enhancing the knowledge, skills, and productive aptitudes of the practitioners and organizations / employees involved in the field of urban transport in the context of reforms necessitated by globalization, democratization, the information revolution, and changing technologies.

In the last decade, there has been a realization among the States and Municipal bodies responsible for managing urban transport that adequate capacity does not exist to combat the growing transportation problems in their jurisdictions. The capacity building component of GEF-SUTP aims to establish the needed capacity for regular skill development of practitioners, public officials, other public functionaries, and urban professionals in the field of urban transport to be able to find solutions to these problems and apply the skills to planning.

Accordingly, a set of 10 subject modules, each for a group of topics on subjects associated with sustainable urban transport planning, have been developed. These 10 modules are structured in such a way so as to fulfill the end objective of creating the desired capacity amongst the practitioners, city officials, etc. These modules will make city officials competent to undertake, supervise, or evaluate the following activities:

1. Sensitization

- Understand the gamut of an urban transport scenario
- Understand the ill effects of neglected urban transport on the environment, energy, public health, and safety

2. Institutional Development

- Understand the functions that need to be performed for the planning, regulation, management, and delivery of urban transport systems
- Know the institutions involved in urban transport in India
- Know the problems due to institutional fragmentation
- Understand need for better integration/coordination
- Understand how the existing institutional set up can perform more efficiently
- Types of new institutions need to be set up and reasons for doing so
- Know the issues that need to be thought through in setting up a UMTA
- Know how the desired institutional framework be achieved

3. Financing, Fare Fixation and Cost Benefit Analysis

- Understand various phases of a project and the nature of funding required during each phase
- Understand the possible sources of funding for each phase
- Perform financial analysis, cost benefit, payback period, Net Present Value, and DSCR
- Perform economic analysis and calculate EIRR
- Perform financial analysis for both PPP and non-PPP projects – variations in perspectives for private partners and government partners
- Understand the criteria for fare fixation

4. Demand Assessment

- Understand the process of conducting demand assessment and the assumptions made

Subject Modules

- Sensitization
- Institutional Development
- Financing, Fare Fixation and Cost Benefit Analysis
- Demand Assessment
- Urban Transport Planning
- Integrated Planning of Infrastructure
- Public Transport
- Urban Transport and Environment
- Contracting
- Traffic Engineering and Management

- b. Know the factors that affect demand and the manner in which they affect
- c. Acceptance criteria – checklist for the demand assessment process

5. Urban Transport Planning

- a. Set up a vision, goals, and strategies for cities towards achieving a livable atmosphere
- b. Understand the nuances of comprehensive mobility planning studies; criteria for planning (service level benchmarks) and Transit Oriented Development (TOD) as a strategy for improved mobility in cities
- c. Develop a transport policy – issues to be considered and options

6. Integrated Planning of Infrastructure

- a. Teach city officials how to do an integrated planning of infrastructure for overall mobility (planning aspects of all infrastructure components)
- b. Create city-wide NMT facilities for pedestrians and cyclists and integrate them with other modes of transport
- c. Promote NMT

7. Public Transport

- a. Select the most appropriate mode of mass transit system for a city; understand the process of Alternative Analysis
- b. Understand how to develop a city wide bus system
- c. Assess need of modal integration and types of integration desired

8. Urban Transport and Environment

- a. Understand the causes and effects of air pollution, noise pollution, climate change, road safety, and public health
- b. Conduct environmental and social impact assessments
- c. Understand Environmental Mitigation Plans and Resettlement and Rehabilitation Plans

9. Contracting

- a. Prepare TORs and RFPs
- b. Evaluate feasibility reports and DPRs, procurement documents, and contract documents
- c. Be involved in bid process, evaluation, and award of contracts
- d. Supervise/monitor/manage projects

10. Traffic Engineering and Management

- a. Understand road markings, signage, road furniture, traffic signals, and phasing and junction design
- b. Understand traffic demand management measures in cities
- c. Understand parking management techniques

Each Subject Module is developed in two volumes:

Volume 1 : Training Manual

Volume 2 : Reference Guide

The Training Manual is designed as a 2-day complete course module containing the topics and lecture material (slides, hand-outs, etc) that a trainer would use for teaching.

The Reference Guide is a separate document for each subject that can be used as a reference book by anyone interested in Urban Transport. It is a detailed informative guide that will help practitioners in their professional work. This document is the **Reference Guide** on the subject “**Transport Planning**”

GENERAL GUIDELINES FOR READING THIS DOCUMENT

What does this module do?

- Explains the differences between Traditional and Contemporary (SUTP) Planning process approaches
- Tells how to integrate land use and transport
- Explains the process of preparing comprehensive mobility plans for cities and towns
- Explains how to estimate Service Level Benchmarks
- Explains the concepts of alternative analysis
- Stresses the importance of policies in Urban Transport; how to choose a set of policies for cities

What does this module not do?

- Provide the step-by-step details of building a transport model for the city
- Provide design details of the proposals emerging out of the planning process

Who are the intended users of this module?

- Planning Agencies
- Municipalities
- Development Authorities
- Transit Agencies

What are the outcomes/end objectives of the module?

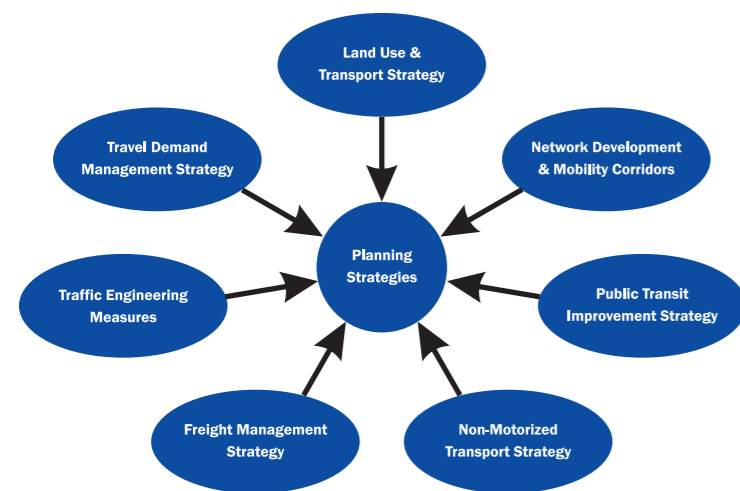
The Transport Planning module is developed with the main objective of making users understand the following:

- Need and objectives of urban transport planning
- Approach for transport planning (Traditional vs. contemporary planning)
- Importance of integrating land use and transport
- Preparing comprehensive mobility plans for cities and towns
- Estimating existing Service Level Benchmarks
- Concepts of alternative analysis
- Concept and importance of policies in Urban Transport; how to choose a set of policies for cities

Executive Summary

This module is a document that highlights the principles that need to be followed in the context of current urban transport planning in India. It is a guide for decision makers, planners, and technicians in planning bodies, city municipalities, development authorities, and also transit authorities involved in urban transport planning. It brings forth the needs and objectives of urban transport planning.

In the last few decades, increased urbanization, household incomes, industrial and commercial activities, and demographic changes (more women involved in the work force) have intensified the demand for transport in Indian cities. Cities have been unable to meet this demand, mainly due to inadequate and deteriorating public transport and transport infrastructure. These problems stem from underdeveloped institutions and human resources for planning, in general, and transportation planning, in particular. Infrastructure constraints, along with increased mobility demands that show increased dependence on low occupancy private vehicles and a decrease in non-motorized modes of transport, have led to deteriorating air quality and an increased incidence of accidents. Increasing trips, longer trips, increasing vehicles, fewer walking trips, reduced public transit usage, decreasing air quality, and increasing accidents represent the current urban scenario in India. In addition, the increased fuel consumption and high emissions have direct environmental impacts and also impact India's energy security. To address the mobility and accessibility challenges faced by Indian cities today, the National Urban Transport Policy (NUTP) 2006 lays down the guiding principles for ensuring safe and sustainable urban mobility. With the backdrop of the NUTP, the module emphasizes that the urban transport planning process in India needs to address the problem at its source, by decreasing the demands for vehicle usage, and by reducing number of motorized trips as well as the length of trips.



In this context, this guidebook highlights the need for a paradigm shift, from supply centric mobility solutions to adoption of the “Avoid, Shift, and Improve” strategy in transport planning in order to be sustainable. This strategy requires strong and effective leadership that prioritizes environmental concerns and social equity above short-term economic growth (rather than long-term losses). The NUTP guidelines/principles form the backbone of the approach to sustainable transport planning in India. However, the dilemma in making sustainable choices, both individual and society as a whole, remains a challenge for the urban transport planning process.

The module also describes the different strategic processes that are fundamental to the delivery of sustainable urban transport systems. These include an integrated urban land use and transport planning system, an urban bicycle

planning system, a public transport strategy, a demand management strategy and so on. The module also indicates that planning needs to be done at different levels - planning within modes and individual facilities along with their interactions with other modes and their impacts on the city. Urban transport planning is contextual and thus may vary depending on city size and understanding the socio-economic and geographic/spatial profile of the city (what and where the activities are, where people stay, what they can afford, what the city can afford, etc). The above sequence needs to be followed for all city types. Public participation is a necessary element in this planning process for cities of all sizes. Politics plays an integral role in the planning process.

At the backdrop of the NUTP, the Ministry of Urban Development (MoUD) encourages cities to prepare “Comprehensive Mobility Plans” (CMP) as part of a long-term urban transport strategy providing for the sustainable improvement of people’s mobility in metropolitan regions. This is considered as a prerequisite for the submission of a Detailed Project Report (DPR - Level 1) for JNNURM (Jawaharlal Nehru Urban Renewal Mission) funding. This module elucidates the methodology, the key inputs and outcomes and a checklist for appraising CMPs, and urban transport projects for funding under JNNURM based on the toolkit developed by MoUD for the preparation of a Comprehensive Mobility Plan.

One of the important strategies highlighted in the module is Transit-Oriented Development. This is an integral tool to support the principle of land and transport integration. This is essentially an urban design approach to connect and integrate activities, so that there is less need for car usage, shorter trips, less walk/bike time, and all of the above activities and alternative modes of transport are integrated into the transit network. This essentially supports last mile connectivity to public transit, thus making public transit more attractive and the mode of choice.

AVOID

Reducing the need to Travel

SHIFT

Changing mode choice

IMPROVE

Increasing the energy efficiency of vehicles, fuels and transport operations

Alternative Analysis follows comprehensive planning where a corridor has been identified as a top priority. The methodology described in the module is comprehensive and aimed at high investment projects with long locked-in periods (e.g. metros and bridges). For smaller projects, Alternative Analysis is necessary but at a less detailed level. For a given problem, a number of solutions might be feasible. Alternative Analysis ensures all transportation alternatives are considered and evaluated before the selection of the best alternative. This makes the case for a project much stronger and thus paves the way for better and faster access to Government and other funds.

This module identifies one of the major challenges in the context of urban transport in India as service delivery by government entities at various levels. There is a need for appropriate systems for information management, performance monitoring, and benchmarking in order to introduce accountability in service delivery. The Ministry of Urban Development (MoUD) has advised JNNURM mission cities to undertake the process of service-level benchmarking. The framework has been described in detail and includes service level (not quantity of assets) benchmarks that specify service delivery goals that should be achieved and standardized -indicators as per a uniform definitional framework.

The module highlights the need and functions of the central repository that range from data/information collection, providing a view of different sampling techniques, survey procedures, and analysis, including a review of the success and failures of projects, etc. The data collected by the central repository needs to be maintained and updated periodically for better data management. The module explains that data management may constitute many modules, namely: the information gathering module/library, data standards and types module, the data sharing interface module, and data storage and maintenance module.

Essentially, this module is a guide for Indian cities to direct transport planning activities that are sustainable and provide accessibility to all.

Data Collection

- Road network Inventory Survey
- Screenline/Outer Cordon Volume Count Survey
- Turning Volume Count Survey
- Speed & Delay Survey
- Household Interview Survey
- Roadside Interview Survey
- Pedestrian Count Survey
- Bus Passenger Count Survey
- Bus Occupancy Survey
- Terminal In and Out Survey
- On Street/Off Street Parking Survey
- Vehicle Operator Survey
- IPT Survey
- NMT Opinion Survey

Salient Features of the Module

This module helps in understanding the following....

- Need and objectives of urban transport planning
- Approach for transport planning (Traditional vs. contemporary planning)
- Importance of integrating land use and transport
- Preparing comprehensive mobility plans for cities and towns
- Estimating existing Service Level Benchmarks
- Concepts of alternative analysis
- Data Management
- Concept and importance of policies in Urban Transport; how to choose a set of policies for cities

Target Audience
Planning agencies
Municipalities
Development Authorities
Transit agencies

Acronyms

APMC	Agriculture Products Market Committee
CAGR	Compound Annual Growth Rate
CBD	Central Business District
CDP	City Development Plan
CMC	City Municipal Corporation
CMP	Comprehensive Mobility Plan
CV	Curriculum Vitae
DPR	Detailed Project Report
EIA	Environmental Impact Assessment
EOI	Expression of Interest
FOB	Foot Over Bridge
GC	Generalized Cost
HHI	House Hold Interview
IA	Implementing Agency
ICT	Information and Communication Technology
IRC	Indian Roads Congress
IVTT	In Vehicle Travel Time
JNNURM	Jawaharlal Nehru National Urban Renewal Mission
Kmph	Kilometres per hour
KSRTC	Karnataka State Road Transport Corporation
LCV	Light Commercial Vehicle
LOI	Letter of Invitation
LPA	Local Planning Area
M&E	Monitoring & Evaluation
MAV	Multi Axle Vehicle
MDR	Major District Roads
MoUD	Ministry of Urban Development
NH	National Highway
NMSH	National Mission on Habitat Mission
NMT	Non-motorized Transport
NUTP	National Urban Transport Policy
OD	Origin Destination
PCE	Passenger Car Equivalent
PCU	Passenger Car Unit
PPP	Public Private Partnerships
PT	Public Transport
RFP	Request for Proposal



ROB	Road Over Bridge
RSI	Road Side Interview
RSPM	Respirable Suspended Particulate Matter
RTO	Regional Transport Office
RTP	Request for Technical Proposal
SH	State Highway
SO2	Sulphur Dioxide
SPM	Suspended Particulate Matter
SUTP	Sustainable Urban Transport Project
TDM	Travel Demand Management
TOR	Terms of Reference
TT	Travel Time
TTMC	Traffic and Transit Management Centre
ULB	Urban Local Body
UMTA	Unified Metropolitan Transport Authority
UMTC	Urban Mass Transit Company Limited
UNDP	United Nations Development Programme
WB	World Bank
WPR	Workforce Participation Rate
WT	Waiting Time

Table of Contents

Acknowledgments	02				
Team	03				
Preface	04				
General Guidelines For Reading This Document	06				
Executive Summary	07				
Acronyms	09				
Table of Contents	11				
List of Figures	13				
List of Tables	14				
Chapter 1 Transportation Planning Process	15				
1.1 Introduction	15				
1.2 The Traditional Way and Contemporary Planning	15				
1.2.1 The Traditional Approach	15				
1.2.2 The Contemporary Approach	15				
1.3 The Gaps	18				
1.3.1 Lack of Vision	18				
1.3.2 Lack of public engagement	18				
1.3.3 Lack of Land use and transport integration	18				
1.3.4 Focus on project feasibility than best solution	19				
1.3.5 Inadequate Planning Capacity	19				
1.3.6 Institutional Challenges	20				
1.3.7 Urban transport: Funding	21				
1.4 The Urban Transport Planning Process	22				
1.5 The Process	23				
1.5.1 Vision	24				
1.5.2 Goals and objectives	25				
1.5.3 Strategies	26				
1.5.4 Evaluation of Alternative Strategies	32				
1.5.5 Development of Project Schemes	32				
1.5.6 Alternatives Analysis	33				
1.5.7 Institutional and capacity building measures	33				
1.5.8 Financing of Plans/projects	33				
1.5.9 Reviewing and updating the Plan	34				
1.5.10 Asset Management and Performance Monitoring	34				
1.6 Planning at different levels	34				
1.7 Planning for different sized cities	35				
1.8 Role of politics in planning process	38				
1.9 Conclusion	38				
Chapter 2 Comprehensive Mobility Plan	39				
2.1 The Need	39				
2.2 Objectives of CMPs	40				
2.3 Main Features of CMPs	40				
2.4 Key Outcomes of CMPs	40				
2.5 Brief Methodology	41				
2.5.1 Task 1: Data Collection and Analysis					
		of the Existing Urban Transport Environment	41		
	2.5.2	Task 2: Preparation and Evaluation of the Urban Transport Development Strategy: Development	42		
	2.5.3	Task 3: Development of Urban Mobility Plan	43		
	2.5.4	Task 4: Preparation of the Project Schemes	45		
	2.6	Gaps in Comprehensive Mobility Plans	45		
		Chapter 3 Transit Oriented Development	46		
	3.1	The Context	46		
	3.2	Transit Oriented Development (TOD)	46		
	3.3	Principles	46		
	3.3.1	Travel Connections	47		
	3.3.2	Building Scale and Orientation	49		
	3.3.3	Public Spaces	49		
	3.3.4	Parking	50		
	3.3.5	Land Use	50		
	3.4	Impacts of Transit Oriented Development	50		
	3.5	Challenges to Transit Oriented Development	51		
		Chapter 4 Alternative Analysis	52		
	4.1	What is Alternative Analysis?	52		
	4.2	Principles of Alternative Analysis	52		
	4.3	The Process	53		
	4.3.1	Set up Goals and Objectives	54		
	4.3.2	Set up Steering Committee	55		
	4.3.3	Review Technical Issues, Data, Models	56		
	4.3.4	Define Scope of Services/work	56		
	4.3.5	Framing the evaluation process	57		
	4.3.6	Identification of Alternatives (Conceptual)	59		
	4.3.7	Final Definition of Alternatives	61		
	4.3.8	Public Review Process	64		
	4.3.9	Evaluation	65		
	4.3.10	Selection of Preferred Alternative	66		
	4.4	Conclusion	66		
		Chapter 5 Service Level Benchmarks	67		
	5.1	What is Benchmarking?	67		
	5.2	The Need	67		
	5.3	The Benefits	67		
	5.4	Objectives	67		
	5.5	Performance Benchmarks for Urban Transport	68		
	5.5.1	Public Transport Facilities	70		
	5.5.2	Pedestrian Infrastructure Facilities	71		
	5.5.3	Non-Motorized Transport (NMT) Facilities	71		
	5.5.4	Level of Usage of Intelligent Transport System (ITS) facilities	72		
	5.5.5	Travel Speed (Motorized and Mass Transit) Along Major Corridors	72		
	5.5.6	Availability of Parking Spaces	73		
	5.5.7	Road Safety	73		
	5.5.8	Pollution Levels	74		
	5.5.9	Integrated Land-use-Transport System	74		
	5.5.10	Financial Sustainability of Public Transport By Bus	75		
	5.6	Performance Report Card	75		
	5.7	Performance Management System	76		
	5.8	Role of Stakeholders	77		
		Chapter 6 Conclusion	78		
		References	80		
		Appendix A The Policy Framework	81		
		A.1 Planning Process	81		
		A.2 Setting up UMTA	82		
		A.3 Acts Related to Mass Rapid Transport	82		
		A.4 Other Transport related Acts	82		
		A.5 Acts related to injury	83		
		Appendix B Survey Formats	85		

List of Figures

Figure 1.1: A city typology of transport development paths	16
Figure 1.2: Two Strategic Processes: An Integrated Urban Transport Planning System and Urban Transport Cycle (16)	23
Figure 1.3: Urban Transport Planning Process	23
Figure 1.4: Consistency in vision/goals statements in CDP and CMP (18)	25
Figure 1.5: Example of Vision, goals and objectives (18, 19)	26
Figure 1.6: Conceptual classification of urban transport planning (26)	34
Figure 1.7: Planning Sequence in urban transport (26)	35
Figure 2.1: Role of a CMP in the JNNURM Process (27)	39
Figure 3.1: TOD reduces vehicle usage and more use of alternative means of transport	46
Figure 3.2: Direct connections reduces walk time – enhances walkability	47
Figure 3.3: Short blocks encourage walking and cycling and reduced need for vehicle use	47
Figure 3.4: Interconnected street system ensures efficient transit system routing	48
Figure 3.5: Interconnected bike plan-signage and amenities'	48
Figure 3.6: Density and location of buildings, that is conducive to public transit	49
Figure 3.7: Safe Pedestrian paths with vending (Gariahat, Kolkata)	49
Figure 3.8: Comfortable pedestrian environment (Source: MARC Transit Supportive development-primer.pdf, www.polk.county.net)	49
Figure 3.9: Infill development is desirable (Source: MARC Transit Supportive development-primer.pdf, www.polk.county.net)	50
Figure 4.1: Alternative Analysis in the Project Development Process (28)	52
Figure 4.2: Alternative Analysis	53
Figure 4.3: The Process with Sub components	54
Figure 5.1: The process of urban transport benchmarking (32)	68
Figure 5.2: Performance Management System	76



List of Tables

Table 1.1: The Old and the New Paradigm (16)	17
Table 1.2: Organizations & Institutions concerned with Urban Transport	20
Table 1.3: Matrix showing visions, objectives and goals for different city sizes	36
Table 2.1: Example of Plan meeting NUTP objectives (18)	44
Table 3.1: Impact of TOD on Vehicle Travel	51
Table 5.1: Reliability Scale	69
Table 5.2: Indicators to calculate City-wide Level of Service (LoS) of Public Transport Facilities	70
Table 5.3: Indicators to calculate City-wide Level of Service (LoS) of Pedestrian facility	71
Table 5.4: Indicators to calculate City-wide Level of Service (LoS) of NMT facilities	71
Table 5.5: Indicators to calculate City-wide Level of Service (LoS) of Intelligent Transport System	72
Table 5.6: Indicators to calculate City-wide Level of Service (LoS) of Traffic Speed along major corridors	72
Table 5.7: Indicators to calculate City-wide Level of Service (LoS) of availability of parking spaces	73
Table 5.8: Indicators to calculate City-wide Level of Service (LoS) of Road Safety	73
Table 5.9: Indicators to calculate City-wide Level of Service (LoS) of Road Safety	74
Table 5.10: Indicators to calculate (LoS) of Integrated Land Use Transport Systems	74
Table 5.11: Indicators to calculate City-wide Level of Service (LoS) of Road Safety	75

By the end of this Chapter, the reader should be able to

- Understand the differences between Traditional way of transport planning and Contemporary way of planning
- Know the weaknesses and GAPS in the current planning process
- Understand the approach to Urban Transport Planning
- Distinguish the planning requirements for cities of different sizes

1.1 Introduction

Indian cities are engines of economic activity and have a major contribution to the development of the country. But they are currently overwhelmed by congestion and the associated costs to the all sections of the society. This, if left unchecked, will seriously hamper economic growth, travel time and costs impacting productive capacity of the city and the quality of life. As a result of increased motorization, local air quality gets deteriorated, resulting in serious health implications. The poor are often marginalized with transport policies focusing on congestion relief, the most urgent problem, which all too often results in more road space being made available for the low occupancy motorized travel.

There is an urgent need to change the approach with regards to how urban accessibility is addressed. The new paradigm for sustainable urban transport calls for a more participatory, people-centric approach that focuses on managing demand, management of plans, financial realism based on a sustainable policy for transport, promotes accessibility, proximity of services, over mobility. It aims at sustainable solutions that address the dynamic complexity of urban systems and calls for a multi-disciplinary approach in order to broaden the scope of the planning process. At the crux of the approach is understanding the travel needs for all socio-economic groups, urban design, managing demand, and promotion of non-motorized and public transport systems, coupled with pricing mechanisms that internalizes the full costs of the externalities due to low occupancy private vehicle usage.

1.2 The Traditional Way and Contemporary Planning

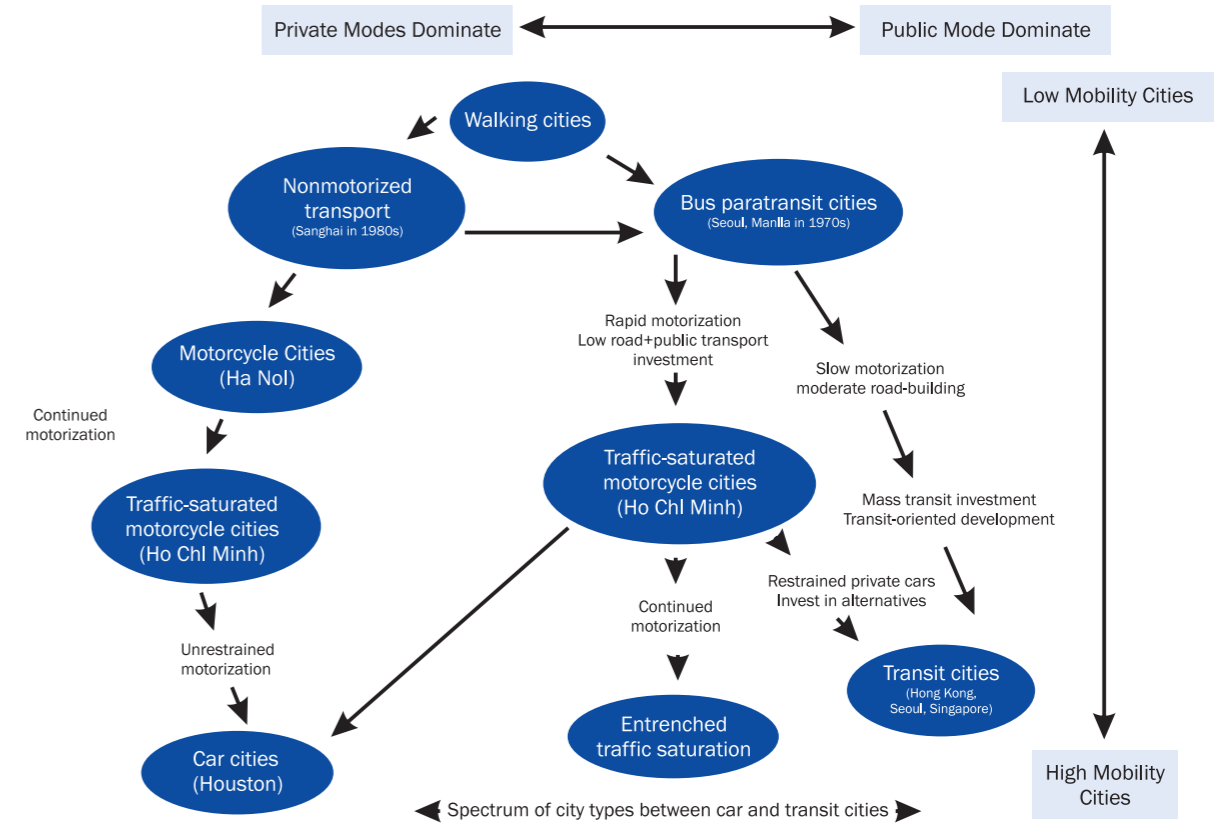
1.2.1 The Traditional Approach

The core hypothesis of traditional urban and transport planning 'growth of mobility', 'travel time saving by increasing speed' and 'freedom of modal choice' are myths and do not exist in the real urban and transport system (15). These traditional principles of transport planning have not solved the transport problems but have given way to more complex problems, environmental, economic and social, all over the world. For a long time, planning was an engineering exercise, involving a series of rigorous steps to predict future traffic flows and identify planning options. There were four major steps: Trip generation, trip distribution, modal split, and route selection. They involved the use of mathematical models, including regression analysis, entropy-maximizing models,

and critical path analysis. The common output of this exercise was to determine the supply gaps, and the tendency was solutions, that called for expansion of capacity. This approach has been referred to as "predict and accommodate". These models, still an important aspect of the transportation planning process, should be treated with caution. They are dependent on the quality of data, based on assumptions that the mathematical relationships between variables remain constant, rarely subjected to subsequent evaluation, and can be easily manipulated to suit the needs of the client. This approach has dominated since the 1940s to the 1980s, in the US, paving way to expansion of highways, car oriented society and sprawl. These predictions of future traffic levels are rarely evaluated, and the issue of induced demand has been totally neglected in these predications. They experience a decline in predictability and increase in uncertainty for longer planning timeframes.

1.2.2 The Contemporary Approach

The transport planning challenges are complex, and require a multi-faceted, multi-disciplinary approach and thus require professionals to think beyond traditional boundaries. Sustainable solutions may emerge from contemporary knowledge and international transport planning innovation tailored for local application. Cities such as Bogotá; Barcelona; Curitiba; Hong Kong, China; London; Seoul; Singapore; etc. have developed solutions, emerging from a sustainable transport strategy developed over time. According to analysis by Asian Development Bank (ADB), all of the successful policies and projects pursued by these cities addressed the following three issues: policy (what to do), management (how to do it), and financing (what to do it with) (16). There is no simple solution to this dynamic complex problem. Hard choices need to be made. City leadership is crucial in this aspect, to recognize the impending danger, and the power this position entails to steer the direction of future development. Stakeholders must understand enough of the fundamentals of sustainable land-use and transport policy engage in the strategic vision of the role of transport. Accountable in project delivery and evaluation w.r.t to the goals and objectives of the transport policy is crucial in understanding the impacts. Power to make transport-related decisions should be situated at the same level of government as the power to decide about funding. Stakeholders must be cognizant that improvements do not come cheap, and user fees may be necessary. Financial realism and prudence is important. Funding should not dictate strategies. Careful alternative analysis needs to be conducted before commitment is made for mega projects, such as metro rail.



Note: The model shows intended or potential transport development paths for developing cities.

Figure 1.1: A city typology of transport development paths
Source: Adapted from Paul Barter, 2004

The global policy agenda has changed in the recent years. Institutions around the world are investing huge resources in an attempt to achieve stability in the new areas of climate change and terrorism. At the same time, fluctuations in the oil prices and their impacts on energy prices, global credit crunch highlight the uncertainty in the future years. Transport planners have the daunting task of addressing the challenges of transport, in these new emerging areas of concern, as well as the persistent issues of congestion, accessibility and mobility. Uncertainty poses an immense challenge to city and transport system managers and planners as it requires them to design different projects and strategies robust enough to adapt to very uncertain tomorrow, in a globally connected world.

The highlights of the new paradigm are as follows (16):

- It is imperative to manage demand than supply. Minimizing travel demand by motorized modes (low occupancy) and trip length is crucial
- Importance to public transport; the up-gradation of public transport is vital
- Land-use planning as an important intervention that can both facilitate the provision of public transport and reduce the need to travel

- Soft measures such as telecommuting, teleconferencing, internet shopping, public transport marketing, and better information can be used as means to influence behavior.
- Proactive risk management produces transport strategies that face up to hard choices, give substance to the city vision, and create projects that are robust and adaptable.
- It also deploys performance/asset management and project development processes that deliver increasingly predictable success.

It is important to recognize that no single model, no single solution can address the issues related to transport. It is important to be cognizant of the inter-linkages of the different forces that determine travel behavior and vice-versa. This paradigm upholds participatory planning ensuring that all of those concerned participate in the design and implementation of relevant, sustainable urban transport policies, policies that will address the specific needs of the cities and its population. The old and the new paradigm planning approaches are compared in Table 1.1.

“This paradigm marks a transition from technical, model-based policymaking to evidence-based policymaking supported in some respects by models and influenced by the inputs of users and other stakeholders. Although the paradigm is based on empirical observation and robust technical analysis, it goes beyond technical considerations and puts the one-size-fits-all approach to urban transport to rest”

Changing Course, A New Paradigm for Sustainable Urban Transport, ADB, 2009

Table 1.1: The Old and the New Paradigm (16)

Aspect of Transportation Policies/Plans	Old Paradigm	New Paradigm
Goal	<ul style="list-style-type: none"> To provide mobility Road capacity is increased to meet forecasted increase in demand A traffic-centered approach 	<ul style="list-style-type: none"> To provide accessibility Demand is managed to road capacity and public transport is central A people-centred approach
Basis	<ul style="list-style-type: none"> Deterministic model forecasts by technical experts Lack of stakeholder engagement 	<ul style="list-style-type: none"> Plans are based on sustainable policies and strategic planning Robustness, technical soundness and stakeholder support are criteria for plan adoption
Preparation for an uncertain future	<ul style="list-style-type: none"> The future is largely ignored and sensitivity testing is trivial 	<ul style="list-style-type: none"> Preparation for the future is central; more relevant strategies and projects result
Content	<ul style="list-style-type: none"> Building projects, roads within the city Frequent megaprojects 	<ul style="list-style-type: none"> Management and integration of the existing transport system Focus on public transport New roads shape the city's expansion and secondary roads catalyze infill development Megaprojects are pursued only after careful study
Financing	<ul style="list-style-type: none"> Affordability is assumed and only limited attention is paid to whether the plan can be implemented 	<ul style="list-style-type: none"> Affordability is an input and financial and technical planning proceed together Focus on the possibility of implementation and on operations
Stakeholder involvement	<ul style="list-style-type: none"> Plans devised by technical experts using transport models; little stakeholder influence 	<ul style="list-style-type: none"> Strong stakeholder involvement and influence Technical inputs are fit for purpose Strong consensus is a requirement
Implementation	<ul style="list-style-type: none"> Implementation is a problem to be sorted out later 	<ul style="list-style-type: none"> Implementation processes are put in place and impediments are addressed early
Governance and institutions	<ul style="list-style-type: none"> The planning process is often politicized Technical analyses often provide justification for political decisions 	<ul style="list-style-type: none"> The planning process is technocratic and informs hard political decisions Improved governance is a prerequisite The focus is on creating an enabling environment

Source: Asian Development Bank

Following the contemporary planning process, the Ministry of Urban Development (MoUD), Government of India (GoI), encourages cities to prepare long-term vision and strategy documents-popularly known as “Comprehensive Mobility Plans” (CMP). An explanation of the CMP process is given in Chapter 2.

1.3 The Gaps

In India, with changing demographics, behaviors and lifestyles, substantial infrastructure improvement needs with limited financial resources and an absence in many cities of a knowledgeable institutional framework for the planning, the urban challenges are huge. Complicating all of this is the urgency for improvements. Current urban transport assets are marginal in many cities and the rapid pace of demand increases requires immediate attention. Unfortunately, this immediacy sometime leads to short term patches that are not consistent with long-term sustainable goals. The immediacy also argues for analytical nimbleness, which traditional demand modeling sometimes cannot support. Salient weaknesses in current planning generally include:

- Lack of vision and holistic approach;
- Lack of public participation and engagement
- Weak coordination between land use and transport planning;
- Focus on project feasibility rather than best solution;
 - Focus on private vehicle solutions, rather than multimodal and transit supportive solutions;
 - Tendency to overlook Intelligent Transport System (ITS) and other low cost operational improvements, that aid accessibility to public transport in terms of information, connectivity, comfort, convenience and safety
- Inadequate Planning capacity
- Data Challenges- data standards, data collection, repository
- Institutional Gaps
- Funding Gaps

1.3.1 Lack of Vision

By acts of both omission and commission, the emerging urban areas lack the vision and comprehensiveness in so far as mobility is concerned. The urban transport system needs to be planned with a vision for the future. In India, there are two scenarios:

- Many cities do not have vision statements
- A few cities have vision statements, but are vague and cannot be translated to measurable actions. Present examples of vision in some cities are as follows:
 - To make the city world class city
 - To make a fast track city
 - As tourism and heritage city
 - A commercial city and nodal center
 - Regionally important and nationally well recognized city

These vision statements merely serve as slogans. There are no goals or objectives, which are measurable and can be reviewed at regular intervals on a continual basis. It is an essential step in

building a political consensus on a development strategy, which encompasses, inter-alia, the roles and responsibilities of different agents in the economy, such as Central, State and local government, the private corporate sector, people's organizations etc. It has to be framed after intensive consultations with the stakeholders starting from municipal, corporations, NGOs, citizens, social workers, etc. Although some Indian cities have taken this initiative and framed vision statements through consultative process by means of discussions and workshops with the various stakeholders, the vision statements have often lacked measurable action plans or objectives. Moreover there is a knowledge gap on how to prepare vision statements, where the coordinating agency lacks resources such as trained professionals. There is also often a leadership gap to motivate for higher-level achievements.

It is therefore no surprise that urban public transport has congenital weakness in developing a new vision in keeping with the growth and quality of life of the emerging cities. Added to this, urban transport – unlike what obtains in most cities in the developed world – has not been in the agenda of political parties. The citizens who could influence the cause of better public transport have long ago opted out of it with their own official or private cars. After all, today's two-wheeler riders were once public transport passengers, who left either for status or for reasons of convenience. Perhaps more people are leaving public transport not for reasons of unaffordable fares but lack of adequacy and efficiency. Absence of a comprehensive vision that balances the needs of the population, environmental concerns as well as efficiency has led to myopic piece-meal solutions. The inter-linkages that exist between urban transport and other sectors such as economic activities, energy, environment and quality of life need to be assessed and a holistic systems view becomes important in this context. Therefore, the Indian cities which do have developed some vision statements; usually have a myopic view looking to mitigate perceivable current problems. A futuristic, long-term, comprehensive view is missing.

1.3.2 Lack of public engagement

The lack of public engagement persists although there are multiple laws which mandate that urban transportation planning must be decentralized with local civic groups in-charge of city based projects. The state and central governments continue to dominate while making a token effort to involve cities. Even when city authorities decide transportation projects, they seldom involve citizens in any kind of consultations. It is part of the larger culture of non-engagement that needs to be broken to be consistent with the reputation of the world's largest democracy.

1.3.3 Lack of Land use and transport integration

Most of the Indian cities have some sort of a Master Plan. The serious drawback is that, most of the transportation plans were prepared without a land use plan. The issue of land-use and transport integration has been grossly neglected in the Indian planning scenario. The earlier Master Plans did not estimate the

traffic flows since the modes available were only public transport modes (bus or rail); it did not pose serious threat to mobility. However, in the eighties and nineties, the production of the personalized modes increased manifold and the shortcomings of planning were exposed. The City Development Plan needs to be linked to the land use plan and the different sectoral plans, including transport. Thus the need for coordination from the beginning becomes critical. Pudong, Shanghai's hinterland, developed between 1987 and 1991 followed a strategy of having major infrastructure projects, including bridges, tunnels, a Metro, and a deep-water port. As a result, Shanghai grew at 8–10% per annum in the 1990s and Pudong at 16–18%. The \$40-billion investment in infrastructure changed the face of Shanghai. Entire blocks were rebuilt and its roads, buildings, transport, and telecommunications emerged as some of the best in the world. On the other hand, Bangalore grew from a small cantonment city to the Silicon City of India, where the information technology companies responsible for its economic success are now confronting the state Government over the poor state of infrastructure, which has affected the quality of life in the city, reducing its attractiveness as a primary global destination for investment (17).

1.3.4 Focus on project feasibility than best solution

With the dynamic growth of cities and traffic, the importance of travel demand estimates became critical. While huge transport studies can be made on longer time intervals, it is important to have studies that are made at frequent and regular intervals in order to keep the finger on transport pulse. The problem with major transport surveys is that they can only be undertaken once in five or ten years. The way, in which cities and urban centers are growing, travel demand estimates have become invariably conservative. The latest example is Delhi-Gurgaon super-highway, which is reported to have reached its maximum expected traffic on the day of its inauguration! On the other hand, ridership forecasts and fare revenues are mostly based on optimistic projections and in many cases support a particular transport mode rather than a transport mode resulting from it.

The issue of public transport has always been neglected in the urban planning process. Whatever little planning that may exist in urban public transport undertakings, it is to preserve basic minimum services, cutting costs on non-profitable but socially necessary services and operating a system reviled both by its own users and other road users. The classic case is of Calcutta Tramways that were slated for closure, because it obstructs the car. It is a measure of the prevailing myopia that a service that carries over hundred passengers in every tram car was billed as obstructing a passenger car that carried on an average 1.5 passengers! Moreover, there has been no effort in the development of plans to integrate the different modes of transport. The multimodal approach to the planning process has been neglected. As a result, different modes such as city buses and mini-buses run in competition to each other and often lead to the question of financial viability of the modes. Furthermore, there is lack of alternative analysis of the different transport options/a

package of options that may be applicable to an area. The consistent evaluation methodology is usually absent, since there is no in-house expertise to evaluate the systems.

1.3.5 Inadequate Planning Capacity

- Absence of transport planning departments: Due to shortage of skilled manpower and funds, the planning process in India cannot undertake planning studies in a very frequent manner. The in-house capacities of the agencies are very limited. Some of the Indian cities, such as Kolkata, started the preparation of Master Plans during the sixties or seventies. These Master Plans were usually development plans with projects identified, often a result of political decisions. Most of the cities in India do not have a traffic and transportation wing in their municipal corporation. In the absence of planning, the cities continue their growth in a haphazard manner. Urban infrastructure, including urban transport, could not keep up with the demands of the high rate of urbanization in the Indian cities. The few town planning engineers available to city authorities concentrate on activities such as building regulations, layout regulations, and zonal regulations. The main responsibilities of the Municipal Corporations are to provide basic amenities, including water supply, public health, road maintenance, street lighting etc. Most of them did not have urban transport planning as their basic responsibility. In some cities, organizations such as “State Transport Undertakings” assumed the responsibility for city transport, under pressure from political leadership. It has become an unwanted activity thrust on them. This has proved to be a serious gap for planning. Thus virtually there is no town planning aspects being practiced in most of our towns and cities, except for some metropolitan cities, which could find some financial resources for the planning process.
- Shortage of planning expertise: Until recently, the fact is that there are no urban transport undertakings in India that employ either a transport planner or a transport economist. There are administrators, managers and mechanical engineers who have little or no regard for either planning or economics. Cities lack professional skills and competent planners. Urban streets are designed by highway engineers, who lack the awareness about elements of urban street design. The shortage of the professional approach and the inadequate planning expertise has led to huge gaps in the planning process. The methodology of planning approach needs focus on public transport. New strategies for promoting public transport, including accessibility (economic, social and physical), to public transport should be the essence of the action plans. In this direction, capacity building of all partners i.e. planners, city authorities, public transport operators, funding agencies and all other stakeholders becomes a pre-requisite to make the efforts successful. The first step therefore is to create an institutional framework for establishing a transport planning and implementation division in each urban public transport

undertaking. New York City with a population of about 8.5 million has over 300 transport planners and professionals. In the Indian cities with population much higher than New York, there is a significant absence of required number of transportation professionals. This is a major gap that needs to be filled. Even the Korean Transport Institute (KOTI) has about 300 researchers.

1.3.6 Institutional Challenges

The current legal institutional arrangements in India for managing urban transport were developed at a time when urban transport was not a major problem. As a result, there is a high degree of fragmentation and separate enactments cover different modes of transport. Apart from this, the planning and implementation of urban infrastructure rests with multiple agencies, which do not necessarily work in a coordinated manner. In most states, the Transport Department carries out regulatory functions of setting the fares for public bus systems. Roads are built and managed by the local bodies or State PWD. A State Transport Corporations operates buses. The multiplicity of institutions has resulted in:

- Fragmentation of functional responsibilities;
- Lack of local resources;
- Paucity of financial resources; and
- Lack of privatization strategy for the sector, as a whole.

In fact, the responsibilities for policymaking, planning, investment, operations and management are divided in Central, State and local government organizations with the result, there is no unity of command and coherent approach to various issues confronted by this sector.

Table 1.2 Organizations & Institutions concerned with Urban Transport

Organizations	Function
a) Urban Transport Planning	
Ministry of Urban Development	Overall responsibility for urban transport policy and planning
Development Authority, State Govt. (State Development Act)	Land use allocation and planning
b) Road Transport:	
Transport Development, State Govt.	Licenses and controls all vehicles, inspection of vehicles, issue of permits, fixation of motor vehicle tax rates (Relevant Act: :Motor Vehicle Act 1988)
State Transport Undertakings	Operation of Bus Services (Relevant Act: :Road Transport Corporations Act of 1950)
Ministry of Road Transport Highways	Administer the M.V. Act 1988 and notify vehicle specifications & Emission Norms
C) Roads and traffic	
Public Works Department; State Govt. Ministry of Road Transport & Highways Municipality	Construction and repair of State roads. Construction and repair of National Highways. Construction and repair of smaller roads, road signage, traffic lights, licensing & control of non-motorized vehicles ; clearing of encroachments and land use planning.
e) Police	Enforcement of traffic laws and prosecuting violators.
f) Ministry of Petroleum and Natural gas	Regulation of prices and quality of transportation fuels
g) Department of Environment State Government	Monitoring air quality

It may be observed that Urban Transport is an activity that is controlled by multi institutions. The multiplicity of agencies providing various urban services got into a familiar bureaucratic jam. If we take the five major cities in India (Chennai, Delhi, Hyderabad, Kolkata and Mumbai), there is avoidable diversity. Chennai bus services are operated by a company formed under the Indian Companies Act; Delhi Transport Corporation and Calcutta State Transport Corporation are city-specific under the RTCs Act; Mumbai is a municipal undertaking and in Hyderabad bus services are part of state-wide operations by the Andhra Pradesh State Road Transport Corporation. As in the case of Hyderabad, where rural and urban services are under one organization, urban services are treated as an avoidable burden, often operated by depreciated, old buses. It is not only those cities are under different types of institutions, making it difficult to evolve a model which

enables common concepts of institution building; they are still not integrated with the overall governance of the city.

There is also a lack of Responsive Regulatory Regime for Public Transport. The Motor Vehicle Act 1988 contains provisions relating to the following aspects.

- Licensing of drives and conductors
- Registration of motor vehicles, including issue of fitness certificate
- Control of transport vehicles (Issue of permits)
- Construction, Equipment and Maintenance of Motor vehicles

The Motor Vehicle Department collects “Motor Vehicle Taxes” which has become a major and priority task over all other tasks, including “Enforcement” of various provisions. Our regulatory set up is age old, and conventional. With the policy of liberalization, private sector is playing a major role in public transport. Hence a new regulatory regime need be designed to respond to local realities;

In fact, the responsibilities for policy making, planning, investment, operations and management are divided in Central, State and local government organizations with the result, there is no unity of command and coherent approach to various issues confronted by this sector.

Detailed information on the Institutional Framework and case-studies around the globe is provided in the module Institutional Development – Volume 1 and Volume 2

1.3.7 Urban transport: Funding

Funding has been an issue for all city governments to finance their innumerable projects. Excepting for a few metropolitan cities, many look to the State Government for financing their transportation projects. There are no regular assured allocations from State Governments to local bodies for capital expenditure on transport projects, though there are some provisions in the legislation. For example, the Maharashtra Regional and Town Planning Act provides for a grant of 23.33% of project cost from the State Government, but many times the flow of funds is uncertain as the State's resources are not adequate enough to meet other commitments. The Municipal Corporations are not in good financial health; hence, they shy away from taking up transport projects of immediate nature. Most of the expenditure on transport relates to roads, and not to other areas such as public transport or traffic management. In the absence of long-term strategies, the token expenditure spent on road sector (road widening, flyovers etc.) does not offer any tangible results. All estimations of investment in urban transport are unanimous in pointing out that implementing the strategies for meeting the future urban travel demand by enhancing the capacities of urban transport infrastructure in general and public transport in specific will clearly require large capital investments.

Limited financial planning has been conducted by the authorities for assessing the financial viability of a particular initiative and its long term sustainability. Most of the planning authorities seem to have an idea of the various forms of revenues that could be possible for funding. However, there seems to be a gap in integrating it on a holistic perspective for assuring the incomes for sustainable urban transport. In almost all the case study cities, SPVs or special transport authorities have been formed and they have gone ahead procuring buses under the PPP route. However, not many evidences have been observed to support a detailed financial analysis. Most of the analysis assumes fare box revenues and advertisement rights. But no policy effort has been directed towards improving these revenues. Advertisement rights on the urban transport have not been accorded exclusivity to increase its earnings and it's a part of the general advertisement hoarding across the city. Exploitation of land as a source of revenue or increased FSI for funding transport system has been limited only to a few mega city transport project initiatives. Ridership forecasts and fare revenues are mostly based on optimistic projections ensuring feasibility of capital intensive transport modes, rather than looking at alternative options. Parking linkages with the urban transport system and subsequent parking revenues, betterment fees, increased property tax earnings, channelizing of development tax or cess, etc. have not been observed as part of financial planning. No multi modal transport linkages have been observed in the cases where rail and road based transport systems are operating. Resulting in duplication and unnecessary competition rather than solving the transport issues. Assessments on the expenditure side have been limited to estimating operating revenues of the rolling stock. Provisions for creation of reserves for capacity addition, maintenance of key transport infrastructure etc., have been lacking.

The above gaps in financial planning and sporadic initiatives result in sub optimal revenues. These usually burden the financials of a ULB thereby reducing the options in identification of a particular transport mode. And also casts doubt on the long term sustainability of the transport infrastructure and the rolling stock.

The Jawarharlal Nehru National Urban Renewal Mission (JNNURM), a seven-year US\$10 billion urban infrastructure is a GoI program that

cities are required to come up with Comprehensive Mobility Plan (CMP) for their city so that transport projects are strategized in a holistic manner in line with the policy guidelines made in the NUTP (principle of moving people not vehicles), in order to receive funding and grants for these projects. However, the capacity of the development authorities to understand the objectives of the CMP is limited, and so these studies are done within a short period of time, with very little funding available. The quality of these studies thus is compromised and it is just a compilation of local projects already identified, without a holistic and long term perspective. Thus the objectives of the CMP are yet to be accomplished, in most cases. Based on the critiques by TERI, the CMPs mostly lack a holistic approach, a vision, a focus on supply side infrastructure projects, neglect of pedestrian and accessibility issues to public transport, engagement of all stakeholders in the planning process, and lack of disaggregated data to address needs of various sections of the society, especially the urban poor (18). They also lacked implementation strategies, including communication strategies, identification of capacity constraints from planning to implementation. It is important to address these constraints and come up with a framework for these plans that are consistent across cities, so that these studies are aligned to the NUTP objectives.

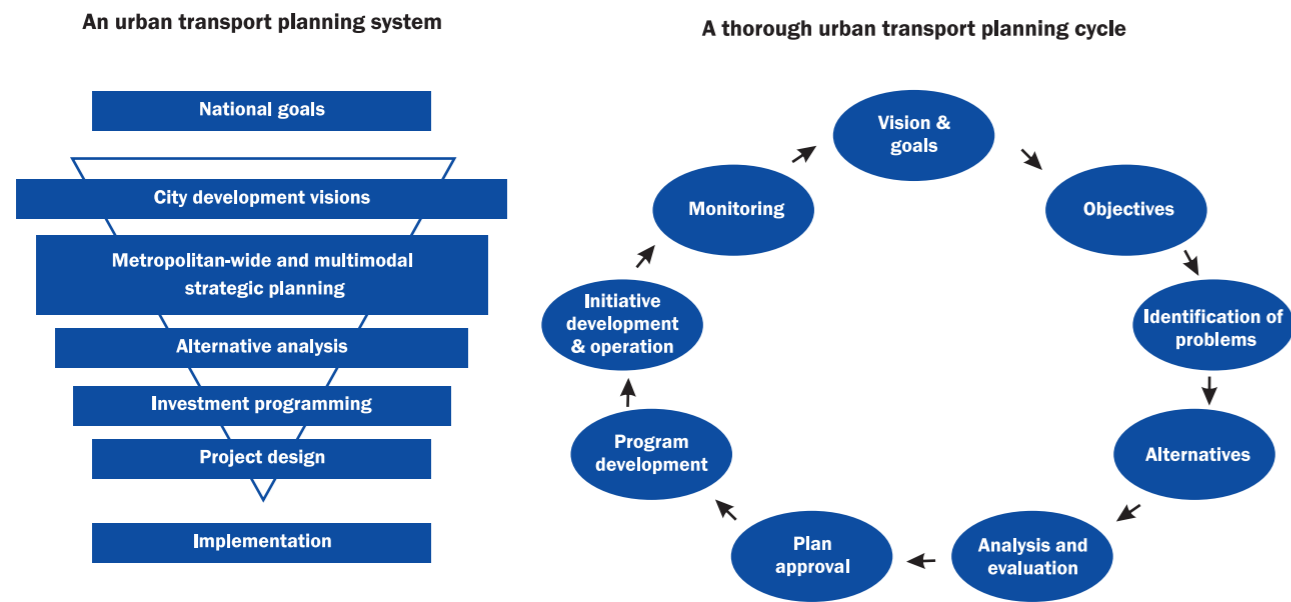
JNNURM funding for transport accounts for about 11% of the total allocation for urban infrastructure. It is to be noted that 86% of the vehicles on the road are cars and two-wheelers, although they account for 29% of the total trip (6). Looking at the distribution of JNNURM funded projects- roads and flyovers account for 57%, mass rapid transport systems 33%, parking 5% and the other urban transport 5%. Clearly, this pattern of JNNURM investment in transport where absence of funding for public transport and pedestrian and other non-motorized modes is noted- does not exactly align to the objectives of the NUTP.

1.4 The Urban Transport Planning Process

Detailed information on Urban Transport Funding is provided in the module on Financing titled 'Financing, Fare Fixation and Cost Benefit Analysis' – Volume 1 & Volume 2

There are four strategic processes that need to be adhered to in order to formulate plans, to identify and develop effective projects and policies, and to manage the transport system proactively (16). Together with champions and institutional capacity, these processes are fundamental to the delivery of sustainable urban transport systems.

- An integrated urban land-use and transport planning system – This system should be integrated spatially and transport, city development, and environment protection. A multi modal approach is important in this context.
- An urban transport planning cycle -This cycle entails a logical sequence of tasks start from setting the vision, goals and objectives and implementing projects and policies to monitoring the performance of the transport system, and feedback for further improvement.
- A mega project development process -The scale, cost, and impact of some megaprojects projects, such as metros (subways), expressways, are huge. The planning and project development of these projects need careful analysis, in the context of other alternatives.
- Asset Management and Performance Monitoring - The left diagram of Figure 1.2 depicts the urban transport planning system for India. In India, the national government took the lead in catalyzing urban transport planning in many cities. Its system places transport planning within the context of a city development strategy and demonstrates the value of integrating national and city development goals and making transport planning multimodal. The diagrams below (Figure 1.2) demonstrate the urban transport planning system (left diagram) recommended by the World Bank, and a strategic transport planning cycle (right diagram) that comprises the tasks necessary to ensure that policies and projects are relevant and effective.



Source: K. Fang. 2007. India: Sustainable Transport Program. Proposed GEF Project. World Bank Transport Forum. Washington, DC: World Bank.

Figure 1.2: Two Strategic Processes: An Integrated Urban Transport Planning System and Urban Transport Cycle (16)

1.5 The Process

The planning process needs to be comprehensive, scientifically sound and participatory. Transportation planning includes monitoring existing conditions; forecasting future population and employment growth, including assessing projected land uses in the region and identifying major growth corridors; identifying current and projected future transportation problems and needs and analyzing, through detailed planning studies, various transportation improvement strategies to address those needs; developing long-range plans and short-range programs of alternative capital improvement and operational strategies for moving people and goods; estimating the impact of recommended future improvements to the transportation system on environmental features, including air quality and developing a financial plan for securing sufficient revenues to cover the costs of implementing strategies and projects. Stakeholder participation is an important part of this process, during development of transport vision and strategy and after draft plans were made, for dissemination to citizen groups to solicit their concerns and suggestions

The planning process need to be followed in India is shown in Figure 1.3 and the cycle is explained in the subsequent sections.

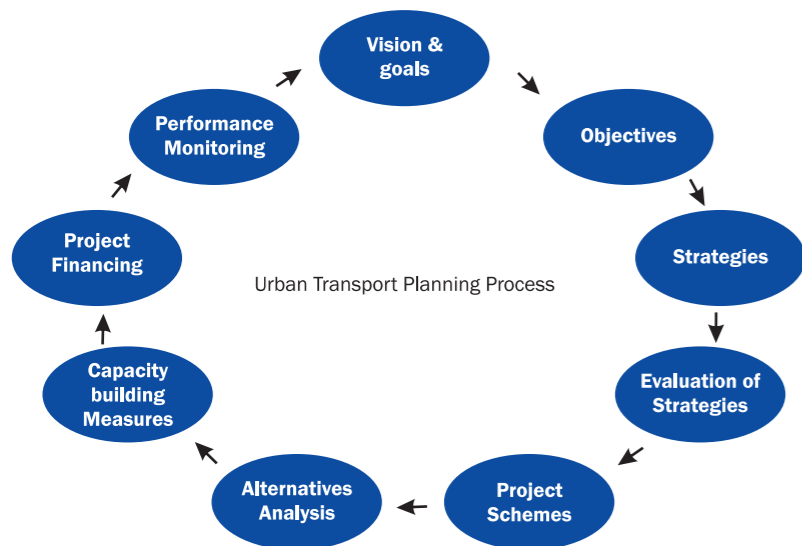


Figure 1.3 Urban Transport Planning Process

1.5.1 Vision

The statement

The vision statement is a guiding principle to develop strategies that are sustainable and adheres to the needs of the population. Successful implementation of the vision is dependent on how the vision is translated to strategies. The broad strategies derived from the vision should be able to capture the purpose of the vision and provide overall sustainability of the transport system in the city.

The transport vision of the city should encompass all elements of a sustainable transport system. It should align to the vision of overall city development. The vision for transport should include the three pillars of sustainability (social, economic, and environmental) to ensure sustainable growth of the city. The transport vision statement for transport sector should be in line with the following:

- Definition of sustainable transport system –'a transport system where every individual or traveler category in a city is able to fulfill his/her mobility needs in a quick, affordable, safe, reliable, comfortable, energy efficient and environmentally benign manner (18)
- The key focus area of NUTP- 'people should occupy center-stage in our cities and all plans would be for their common benefit and well being'; and
- The objectives of the National Mission on Sustainable Habitat of the NAPCC i.e. promote energy efficiency and reduce emissions from transport sector.

Kolkata CMP-Vision Statement

“Seamless inter-modal transfer and single travel experience to the commuter by connecting various transportation modes including non-motorized transport in a safe, comfortable, secure and timely manner. To evolve an integrated transportation system that contributes to the city's productivity and improves communities' quality of life with minimal environmental impact.”- Kolkata CMP

Kolkata CDP –Vision Statement

“The Vision is to provide sustained and improved quality of life through basic urban services in an inclusive manner and create enabling environment for attracting domestic and international investors to live, work and invest in Kolkata Metropolitan Area.”- Kolkata CDP

A critical analysis should be made to evaluate if the visions in CDP and the transport sector are align to each other. If not, the gaps need to be identified, and the visions need to be made consistent with each other.

The process

To determine this, planners must conduct strategic planning with rigorous stakeholder engagement to develop a vision that opens up and captures opportunities. Such planning must take place when formulating transport plans and deciding on projects. Participants should include city authorities, experts from multiple disciplines, local elected and appointed officials, business and development leaders, student leaders and administrators, NGOs, and human service providers, and all categories of transport users, including people with special needs. This engagement of the stakeholders will help in providing insight and ideas on local interests and issues and identify key concerns, ensuring participation in the planning process.

Participatory and inclusive planning process ensures inclusion of all perspectives, through engagement of a large number of people with diverse backgrounds. The visioning exercise needs to be done by the transport authority in conjunction with the technical team involved in the transportation planning process. This may be complicated, and time consuming process, but is rich and sustainable, as it engages the people, for whom the planning is being conducted. It is easier to design strategies, once the problems are identified in totality, with all stakeholders contributing to the design of the plan. Along with scientific analysis (surveys, studies, reports, etc) participatory visioning process is necessary in order to formulate the complete vision of the city. Only scientific analysis based vision statement makes the planning process inadequate and incomplete, as it is uncertain whether all stakeholder perspectives are in place for formulation of the problems. An example of the consistency of vision statements in CDP and CMP is shown below.

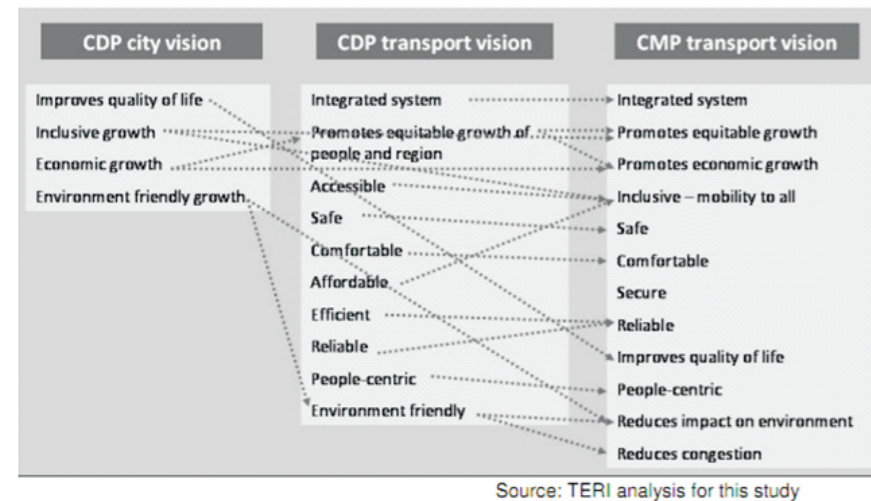


Figure 1.4: Consistency in vision/goals statements in CDP and CMP (18)

1.5.2 Goals and objectives

The context of contemporary urban planning is broader as transportation goals such as accessibility, mobility, etc., need to be considered in the context of other goals such as reducing emissions from vehicles, improving safety and health, improving equity, enhancing economic opportunities, improving community livability, etc. Defining goals becomes much more complicated in contemporary planning, as its goals and objectives focus more on managing demand, rather than trying to build capacity.

The goals and objectives of the planning process provide more granularity to the vision statement for devising implementable projects and measurable outcomes, in line with the vision statement. They provide the concepts of equity, safety, integrated planning, use of public transport, promotion of non-motorized modes, accessibility, travel demand reduction, reliability, clean energy usage, use of technology, and inclusiveness in accordance to sustainable transport planning.

Box 2.4 Vision, goals and objectives, Kolkata CMP

Vision for transport sector in Kolkata CMP:

Seamless inter-modal transfer and single travel experience to the commuter by connecting various transportation modes including non-motorized transport in a safe, comfortable, secure and timely manner.

To evolve an integrated transportation system that contributes to the city's productivity and improves the communities' quality of life with minimal environmental impact.'

Goals:

- A balanced, integrated and multi-modal transportation system, which provides equity, accessibility and mobility to all users thus serving the existing and future needs of the KMA.
- An environmentally sensitive transportation system that supports existing and future patterns of land development and enhances the quality of life in the KMA.

A transportation system that stimulates economic development, and establishes a spirit of commitment to interagency coordination.'

Specific goals:

- Congestion mitigation
- Safety and security
- Improved air quality
- Improved quality of life
- Improved opportunities for economic development'

Main objective of the study:

To study the existing traffic and travel characteristics of the study area

To forecast travel demand for the horizon year 2025

To identify short, medium and long term transport improvement plans

To encourage modal shift in favour of public transport and intermediate public transport

To encourage modal shift in favour of pedestrian movement and Non Motorized Vehicles (NMV) by providing proper facilities for them

To focus on economic, environmental and socially sustainable mobility

To analyze and recommend development of Integrated Mass Transport System

To recommend institutional changes and implementation mechanisms to enhance customer experience, reduce trip lengths and transportation modes'

Source: Kolkata CMP

Figure 1.5.: Example of Vision, goals and objectives (18, 19)

1.5.3 Strategies

The strategies should be driven by the following objectives:

- Providing improved access (motorized and non-motorized) to all individuals, businesses and traveler categories (including vulnerable groups, such as urban poor, physically challenged, women, children, elderly, etc.) to schools, health facilities, markets, recreation facilities and employment opportunities. The plan needs to target a transport system design that considers all traveler categories equitably and is not biased towards one specific traveler category such as car users. Access can be defined as physical as well as financial access, which includes availability, adequacy and quality of transport infrastructure, and also affordability of the transport services.
- Providing safe and secure mobility environment to all city residents. This implies that the transport system should reduce number of accidents, and increase safety, and also provide security to all transport users, especially the children, women, disadvantaged communities, disabled, and senior citizens.
- Have minimal impact of transport activities on environmental quality and local ecosystems and reducing its energy consumption levels. This implies that the transport system should reduce fossil fuel consumption, thereby reducing emissions, promote green initiatives, reduce other pollution such as noise, and also minimize local ecosystem destruction due to construction.

Transportation plans should incorporate mitigation and adaptation measures to shield cities from the consequences of climate change impacts.

Solutions for complex transport improvements cannot be achieved by a single strategy. The following strategies need to be adopted in tandem to meet the various goals. In addition, these plans need to be updated regularly/assessing the impacts of the plan, and monitoring the contribution of the different projects to the goals and objectives of the plan.

Based on the above objectives, certain strategies may be in order as follows:

(a) Integrated Land use and transport strategy

The structure and shape of the transport network is dependent on land use. Land use and the network strategy must go hand in hand, as land use cannot happen as planned, if there is no connectivity. This strategy should focus on accessibility, connectivity, mixed land use developments to minimize vehicle trips, transit oriented development, and the long term transport strategy be framed around the structural form of urban growth envisaged.

The objectives of an integrated land use and transport development strategy are to:

- Promote balanced spatial growth
- Minimize land requirements for transport
- Promote transit oriented growth
- Reduce the need to travel
- Encourage walkable/cyclable neighborhoods

The strategies may include:

- Preparation of a city spatial strategy to improve the quantity and quality of land development for the entire population
- Zoning restrictions reduced except in environmentally sensitive areas
- Introduction of more flexible regulations; legitimization, where possible, of existing settlements and upgrading them
- More land zoning and more regulation of land development

- Better coordination between transport planners and the developers of low-income housing, off-site infrastructure, and community facilities
- Focus on planning and implementing area road networks where and when land development is desirable
- Public transport services are integrated from the outset
- Diagnostic studies identify spatial trends, densities, and informal development processes
- Land demand projections inform the city development spatial strategy, which sends strong signals to private developers

Some of the strategies are illustrated below.

- Strategy for Mixed Use Development



High density, diversified businesses, and different types of land use maximize the use of urban space. We must focus on density, diversity, types of buildings, and mixed land use type to maximize the use of urban space. Closely knit mixed land uses (offices, residences, retail stores, tea shops, etc) make maximum utilization of urban space, and these are accessible to a more diversified group such as youth, senior citizens, high income as well as low income population. It also leads to reduced servicing costs, and reduced environmental footprints. Urban sprawl is extremely expensive to service and maintain – the amount of land, roads, pipes, and infrastructure required per capita is disproportionately large. A compact, mixed-use urban environment, by contrast, is far more efficient for municipal services and infrastructure requirements. Resilient cities will not subsidize inefficient forms of development (e.g. building roads and assuming operating costs) and instead prioritize city patterns and built forms that have a reduced footprint on the

environment and a reduced burden on municipal resources (e.g. directing growth to where services exist: infill).

- Strategy for Transit Oriented/Supportive Development

By designating certain roads as corridors to maximize passenger throughput, these corridors get priority planning for public transit systems. Mixed use development that is cognizant of the low income users of the transit system, is important. Land use planning can be used to create urban and suburban environments where walking and transit are viable transportation options (Transit Oriented Design/Transit Supportive Design, TOD) by making it easier to go from one transportation mode to another, the connection between community and development is enhanced ensuring that a community is accessible to all. Resilient neighborhoods will provide the needs of daily living, within walking distance (1/2 to 1 km radius). India has the potential to adopt these principles. The TOD planning process includes:

- Travel Connections- This would focus on convenient and direct pedestrian connections, pedestrian scale blocks, interconnected street network, including bicycle circulation and parking. Increased density in neighborhood centers would make transit service more effective.
- Building Scale and Orientation- Transit-supportive design assumes people are willing to walk a maximum of ¾ km for premium transit and rail service and ½ km for other bus services. Building placement is a powerful tool in reinforcing streets as public amenities. Sensitivity to the physical design and location of buildings is important in order for travel connections to be attractive. The quality of “out of vehicle” experiences is influenced by the placement of buildings in relation to the street and other buildings, as well as their height and scale.
- Public Spaces- This would include pedestrian-friendly streets, including adoption of traffic calming measures, parks, and plazas as community gathering spaces to enable social interaction, quality facilities for transit users (features such as benches, shelters, landscaping and adequate lighting make people feel comfortable while waiting for transit service). Additionally, services such as child care facilities, dry cleaners, postal facilities and health care offices can be included as part of bus transfer centers or rail stations.
- Parking - The proper location and size of parking facilities are essential if pathways, buildings and public spaces are to succeed in creating transit-supportive settings. Parking structures/shared parking lots are two ways to reduce the amount of space occupied by parking facilities.

Successful Transit Oriented Development can significantly reduce per capita motor vehicle travel, and reduced travel time. Reduced

travel time in turn leads to lower pollution including lower GHG and particle emissions. **This strategy is elaborated in Chapter 3.**

(b) Public Transit Strategy

This strategy should focus on increasing the public transit share, by making public transit user friendly. This strategy needs to be implemented along with the above strategy, and non-motorized transport strategy to be effective.

The objectives of this strategy would be the following:

- More space allocation for public transit on roads
- Public transit to serve the entire population
- Promoting public transit connectivity to the urban poor that is affordable
- Design of public transit infrastructure to cater to the needs of the vulnerable users such as women, children, senior citizens and the physically challenged
- Intermodal stations to facilitate seamless transfers
- Integration of IPT and NMT modes

For this purpose the following measures can implemented

- Introduction of Bus System in the cities that do not have one, with focus on an efficient bus route system.
- By designating certain roads as corridors to maximize passenger throughput, these corridors get priority planning for public transit systems.
- Augmentation and improvement of the bus system, including Route Rationalization, before embarking on capital intensive system, for cities that have a public bus system in place.
- Bus systems only may not be able to meet the desired goal and on key corridors. This would entail installing a higher order mass transit system namely BRT / Monorail / LRT/ Metro. The choice of the mass transit system can be strategically decided based on the following characteristics of the various mass transit options. However, the choice of a higher order mass transit system need to be decided after careful analysis of some alternative options, in the context of the city characteristics (Alternative Analysis), and not vendor driven.



Case Studies

BRT Operations have been initiated in some cities in India like Pune, New Delhi, Ahmedabad and other Tier II cities are following suit. There has been mixed reactions to the operations of the above various projects. Overall, it is meant to improve public transit ridership, but has faced some teething problems (New Delhi). Lessons have been learnt and also being learnt. Some issues that are critical to the success of the BRT operations in India would be:

- o Operations plan should be part of design process
- o Special Purpose Vehicle if developed need to have qualified, full time staff
- o Traffic Engineering need to be done by traffic engineers
- o Fare integration along with providing the “last mile” connectivity
- o Contracts need to be carefully formulated covering all risks with regard to performance (performance based contracts)
- o Assess the life-cycle implications of the financial contracts with respect to bus operations, and fare integration with vendors, contractors
- o Post implementation monitoring is essential

- Measures to ensure quality of public transport services in terms of reliability, travel time, comfort, safety and security.

(c) Intermodal Integration

Any public transit system is incomplete without intermodal integration. Intermodal integration is crucial for success of multi-modal transport system. Intermodal integration involves integrated public transit network planning, development of feeder networks; use of NMT



is these routes, etc.

Strategies include:

- Intermodal Stations to minimize delay/transfers. Big hubs/transfer stations may be integrated with commercial services such as groceries, laundry, city services, mobile re-charge kiosks, etc. for the convenience of users.
- Intelligent Transportation Systems (ITS) for user convenience and real-time information
- Access to the public transit network that includes integration with auto-rickshaws, taxis, and NMT modes such as cycle rickshaws, and inland water transport

Details of Intermodal Integration are presented in the Module on Public Transport

- Park and ride Facilities along transit corridors
- Integrated Fare policy and ticketing, to ensure a single travel experience

(d) Non-Motorized Transport Strategy

Every public transport user is a pedestrian/non-motorized transport user, for part of the journey. Thus, NMT strategies are an integral part of public transport strategies. A public transport strategy without a NMT strategy is incomplete and ineffective, as in most of the cities in India.

The NMT strategy should focus on the following:

- Establish connected walking networks.
- Provide adequate walkway widths. Prevent vendors, pavement dwellers, vehicle parking and other uses from blocking walkways.
- Maintain path surfaces. Establish a system to quickly identify and correct problems.
- Create bike lanes and bicycle boulevards (streets where bicycles have priority and motorists must drive at low speeds) where appropriate.
- Correct roadway hazards to non-motorized transport.
- Use street furniture (e.g. benches) and pedestrian friendly design features



- Provide bicycle parking/rickshaw stands.
- Address security concerns of pedestrians and cyclists.
- Develop /encourage bike rentals/sharing.

Source:

Better Streets, Better Cities: A manual for street design in urban India. Institute for Transportation and Development Policy



Details of Non-Motorised Transport Planning are presented in the module titled "Integrated Infrastructure Planning"

In Shanghai's bicycle revolution, lessons for India

Minhang, China has been encouraging residents to ditch gas-guzzling vehicles for bicycles. The bicycles are available 24 hours a day. Each resident is given an ID card, with which one can rent and return bicycles at any of the stations, usually located near metro-rail terminals. Private bicycle-renting companies have also been roped in. Part of the reason for the scheme's success has been the emphasis on connectivity. Xu Xuefeng, a transportation official, said he envisioned seamless connectivity between the metro network, the bicycle-renting programme and bus routes.

In Shanghai, another reason for the renewed appeal for bicycles is the city's unique licence-issuing system, which now caps the number of car-licences issued every month to ease pressure on traffic. At monthly auctions, car-owners now have to compete to get their hands on precious licence-plates. The lust for cars has grown so fast, that in June's auction the average price of a licence plate was a whopping 40,380 Yuan or Rs.2.75 lakh. In a city where a licence plate now costs as much as a car, it's no surprise that bicycles are back in favour. Free bicycle-renting programs are by no means unique to Shanghai — New Delhi, too, has recently launched a bike-sharing scheme. But the sheer scale of this effort, as well as the unprecedented public response, has attracted attention across China, making urban planners sit up and take notice.

(e) Transport for Special Groups

The disadvantaged sections of society continue to face a large number of constraints in urban travel, which need to be addressed. While problems of transport adversely impact all residents of the city, disadvantaged sections face particular constraints. The key issues are access, security and affordability. Specific studies need to be conducted in order to understand the needs in the spatial context, and also general constraints mentioned above.

(f) Freight Management Strategy

Unregulated loading and unloading of freight traffic in the central business areas add to the congestion on the roadways. Freight transport management includes various strategies of increasing the efficiency of freight and commercial transport.

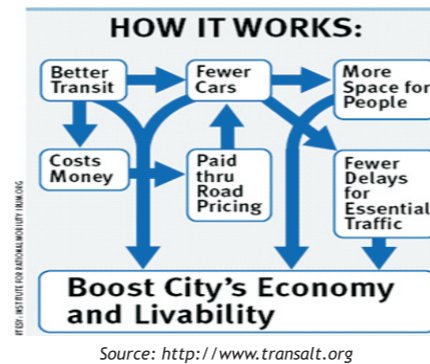
- Restricted delivery times in central business districts (Example: 8 AM-8 PM prohibition)
- Use of small and medium size vehicles with modern emission controls in the central city areas.
- Develop Freight Terminals/warehouses on the periphery of the city.
- Relocation of wholesale markets to the periphery
- Construction of bypasses (based on the nature of freight traffic)



(g) Traffic Engineering Strategy

It is imperative that Traffic Engineering and Traffic Management be given high priority. Simple junction design and optimization itself can alleviate difficult problems in the short run. Key traffic management measures are:

- Traffic engineering that includes junction improvements (geometrics and signage) and redesign
- Traffic control devices
- Area Traffic Control (ATC) and ITS
- Black Spot identification and elimination Traffic (One-way, tidal flow management, parking management)
- Encroachments/Hawker Management
- Road Maintenance and Management System supported by Road Information systems
- Establishment of Road Accident Analysis system



(h) Travel Demand Management Strategy

To further increase public transport modal shares additional demand management interventions can be implemented. The most common strategies widely used across the globe, and are potential candidates to be used in India are described briefly. They are:

- Congestion Pricing- refers to road pricing used as a mobility management strategy to reduce traffic congestion. Congestion pricing requires time-variable tolls, with higher charges during peak periods and lower or non-existent when roads are uncongested. Cordon pricing, area-wide licensing policy, and parking charges are means by which congestion pricing can be enforced. Road pricing should be implemented in conjunction with improved transportation options, so consumers have viable alternatives. Congestion pricing needs to be used strategically in the core business zones in urban areas.
- Parking Control and Management - Demand Management through restricted parking supply or imposing restriction of vehicles in core using methods such as odd or even number plate entries on certain days will discourage use of private vehicles and increase public transit share.

Case Study - Demand Management Strategies in Singapore (22)

- o Tax on vehicle ownership (import tax and registration) in 1989 amounted to 10,000 pounds (£) (\$18,000) on a typical 1,500 cc car with a market value of £7,000, plus £300 per annum road tax.
- o Area licensing scheme (ALS) enforced cordon pricing program with licenses displayed on windscreens to eliminate traffic congestion in the restricted zone. Extended to the major expressways under the road pricing scheme.
- o In 1998, electronic road pricing (ERP) replaced the manual, paper system, and in 1999 this was extended to arterial roads beyond the restricted zone. All vehicles are required to have an electronic in-vehicle unit that accepts credit in the form of a smart card.
- o Vehicle Quota System (VQS), a system which allows the government to control the amount of cars on the road. The quota is reviewed on a regular basis and is set per month, based on the road conditions and amount of cars permanently taken off the road in that month (by scrapping, exporting or otherwise). The VQS is controlled by the Certificate of Entitlement, or COE. This is sold through open bidding and on the average amounts to \$35,000 for 1600 cc car.
- o Total cost of your vehicle in Singapore= Cost price + Import duty + Registration Fee + Additional Registration Fee + COE + Road Tax + ERP + Maintenance Costs (Insurance, petrol, others)

The charges and quota system have been effective in constraining the growth of vehicle ownership. The total fleet was projected to reach 1 million in 1990 but had only grown to 711,000 (including 380,000 cars) in 2003.

Several Traffic Engineering and TDM strategies are explained in detail in the module “TRAFFIC ENGINEERING AND MANAGEMENT” – Volume 1 & Volume 2.

(i) Fuel Use Monitoring

This would aim at reducing pollution levels, and support alternative fuel initiative. Strategies may include:

- Strict enforcement of comprehensive inspection and certification system for on-road vehicles.
- Fuel quality improvement (e.g., benzene and aromatics in petrol, reduction of sulphur in diesel).
- Tightening and enforcement of emission norms (e.g., EURO-IV).
- Checking fuel adulteration.
- Checking evaporative emissions from storage tanks and fuel distribution system.

The success story of Delhi is a proof of success of CNG in itself. The year 1998, Delhi was one of 10 most polluted cities in the world. Pollution level exceeded the WHO (World Health Organization) standards by five times. Then the Supreme Court stepped in. In the Year 2003, Delhi won the US Department of Energy's first 'Clean Cities International Partner of the Year' award for "bold efforts to curb air pollution and support alternative fuel initiatives". Today, Delhi's entire public transport fleet is converted to Compressed Natural Gas (CNG) on a scale unparalleled anywhere else—80,000 CNG vehicles, including 9,000 buses. Similarly, mandatory use of less polluting vehicles or change in engines e.g., from gasoline to CNG was done in Kathmandu. However, in Bangalore the CNG infrastructure (adequate CNG filling stations) was not in place, and use of CNG was not mandatory and thus not enforced. Enforcement/development of infrastructure for alternative fuel use remains a critical issue in many cities in India. However, the Government of India will make fuel efficiency standards mandatory for the transport sector from 2011 as part of its mission to combat climate change (23).

1.5.4 Evaluation of Alternative Strategies

Given the possible range of goals, a set of possible options needs to be considered. Several objectives may be desirable, and thus it is important to consider what they imply in the short and the long run. Scenario building is important in this context to predict plausible future outcomes by changing an array of parameters, with each change part of a specific scenario. A common strategy is to present the future within the realm of low-, medium- and high-growth scenarios, or different paradigms (demand control or supply centric), and apply these scenarios to forecasting. Scenario building does not remove uncertainty, but may improve predictability by considering a set of possibilities. The stage of predicting the outcomes for each of the options is a critical step in the process. Models continue to play an important role, but whereas the traditional models were based on the number of trips, increasingly modeling is becoming more activity based. Nevertheless there are roles for other types of analyses, including non-objective forecasts. The predicted outcomes must then be assessed as to their benefits and costs. These may be expressed in monetary terms, but many transport planning situations call for measurement in other terms, such as visual impacts, environmental dislocations, and employment impacts. Evaluation of the scenarios has to consider the costs and benefits from the frequently conflicting perspectives of the stakeholders and actors. Extensive public consultation may be required. The information has to be disseminated and explained so that an informed public can participate in the debate.

1.5.5 Development of Project Schemes

A clear implementation strategy for the Plan needs to be in place along with clear phasing of schemes, and initiatives. They may be classified by long term, medium term and short term projects. Long term schemes may include projects that require high investment such as the following:

- Mass Transit Systems
 - o MRTS
 - o Metro
 - o Mono Rail / LRT
 - o Suburban Rail
 - o BRT
- Intermodal Stations
- Truck Terminals and Intercity Bus Terminals
- Freight Corridors

- Missing Roadway Links

The medium term proposals are those whose effectiveness last up to 10 years. The schemes proposed under medium term complement the long term strategies of Bangalore. They include:

- Off-street Parking Facilities
- Flyovers
- Pedestrian Subways
- ROBs/ RUBs
- Intelligent Transport Systems (Traffic Management Centers and ATC)

The short-term proposals include those schemes whose usefulness might last up to a maximum of 5 years. They need to be reviewed before that period and suitably revised as per the then requirements. The short-term proposals may include:

- Pedestrian infrastructure such as footpaths, bus stops that are user friendly
- Bicycle network and infrastructure
- Pedestrian Zones
- Demand management strategies
- Parking management and control measures
- Junction improvements

1.5.6 Alternatives Analysis

The role of alternatives analyses, especially for mega projects, such as high-order transit systems, bridges, new highways, is extremely crucial. The Comprehensive Mobility Plan identifies the high transit corridors that have potential for high order transit systems. These are high investment projects, with a long lock-in period, and thus needs in-depth review. Alternatives analyses, explores the different alternatives, for this corridor, and outlines them in terms of an emphasis on some key indices, highlighting of trade-offs between direct and indirect impacts. It aids the decision maker, in identifying tangible and intangible costs and benefits. Financial cash-flow analysis, as related to implementation staging, and the well-organized management of overall evaluation results are important planning outputs, in bringing out objectivity in decision making, as opposed to vendor driven decision making. An important aspect of this process is public engagement and participation.

A detailed process of conducting Alternative Analysis is given in Chapter 4.

1.5.7 Institutional and capacity building measures

It should focus on establishing a central nodal authority (UMTA) responsible for all transport initiatives and planning for million plus cities, and modify the enabling legislations and establish fare policies and fare regulators. A capacity building program needs to be in order to make assessments of demand, route rationalization, contracting, performance monitoring of projects. Capacity building of urban development, urban design, transport planning, PPP procedures, demand management, traffic engineering, police training, road user education, etc. need to be conducted for planning bodies (institutional and individual capacity building) and citizens, as applicable.

Detailed information on institutional issues is provided in the module “Institutional Development”

1.5.8 Financing of Plans/projects

The cost estimates of the identified projects and potential funding resources need to be identified. The key sources of funds usually include the local government through user charges, central and state governments, private sector and multilateral funding. Other innovative mechanism can also be included. It can also include involvement of private sector in implementation and management. Financing high cost mass transit systems may need setting up Special Purpose Vehicles (SPV) such as Janmarg - where the government pays for infrastructure but users (direct and indirect beneficiaries) must pay for the rolling stock and operations

Detailed information on funding options and implementation process is provided in the module “Financing, Fare Fixation and Cost Benefit Analysis”.

1.5.9 Reviewing and updating the Plan

A framework for review of the plan needs to be in place to address the dynamic nature of urbanization. Periodic studies, surveys of travel patterns need to be planned periodically in order to update the relationships within the travel demand model, impact of new projects and socio-economic changes.

1.5.10 Asset Management and Performance Monitoring

“Transportation Asset Management is a strategic framework for making cost-effective decisions about allocating resources (funding and personnel) and managing infrastructure (physical assets such as roads, equipment, and buildings). It is based on a process of monitoring the physical condition of assets, predicting deterioration over time, and providing information on how to invest in order to maintain or enhance the performance of assets over their useful life. The goals of a transportation asset management program are to minimize the life-cycle costs for managing and maintaining transportation assets, including pavements, bridges, tunnels, rails, and roadside features” (25).

Benchmarking initiative is an important aspect for asset management as well as assessing project impacts. Developing, implementing and maintaining an urban transport benchmarking initiative provides consistent and comparable performance data, as well as fast-tracking the performance improvement process by learning from best practices, identifying these practices. The MoUD has introduced Service Level Benchmarks in the urban transport sector, to be monitored, for availability of funds from the Center. Details about service level benchmarking are covered in Chapter 5.

Transportation helps shape the city's productive capacity and quality of life. It provides for the mobility of people and goods, as well as determines patterns and directions of growth, by providing access to people, goods, and services. Transportation planning needs to address the crucial linkage between transportation and other long term societal goals. The process of planning recognizes the importance of stakeholder participation and engagement and the performance of the system affects public policy issues such as resource consumption, economic development, environment quality, equity, land use, urban growth, safety and security. The plan is not just a list of projects, but a package of strategies, for operating, managing, maintaining, and financing the city's transportation system to achieve the long term goals and objectives, consistent with the vision.

1.6 Planning at different levels

One of the important drawbacks in Indian cities, big or small is the approach towards urban transport solutions, they are adhoc, and lack understanding of urban transportation as a “system”, that interacts with the different activities in these cities. Planning takes place in layers, each element as part of the whole.

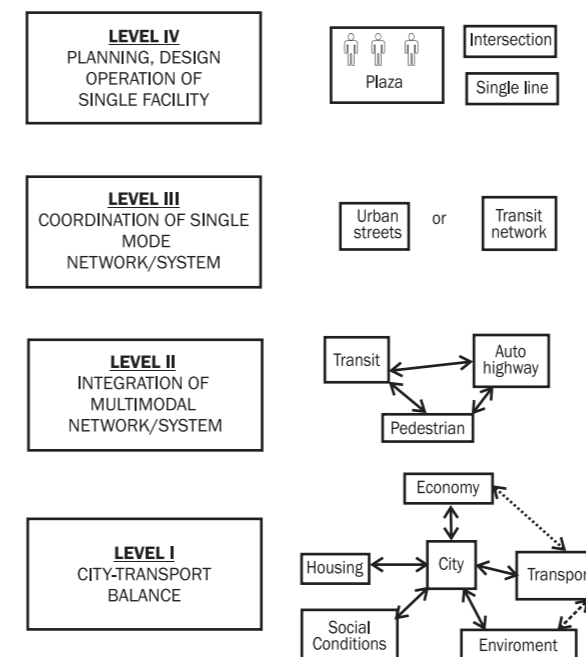


Figure 1.6: Conceptual classification of urban transport planning (26)

Urban transportation that includes planning, organization, and operation can be classified into four levels, from individual system elements to the overall city/urban area level. The four levels, shown schematically in Figure 1.6 are:

Level IV: Individual Facilities: This involves designing and operating a single facility such as an intersection, a flyover, and is the least complicated part of the planning process. It is usually performed by a single agency, the development authority, or the Public Works Department.

Level III: Single Mode Network or System. This requires more co-ordination than Level IV. This includes designing and operating a network of a single mode. For example, planning a network of bicycle lanes, or regional rail system would usually involve a single agency and jurisdiction, with unified control. However, inefficiencies may occur, if the network is shared by more than one planning agencies.

Level II: Multimodal Coordinated System: This includes integration of many modes that involve intermodal planning for a multi-modal coordinated system. This may involve different classes of streets, different transit and para-transit modes, pedestrian access, non-motorized modes, etc. It thus involves a higher-level organization, usually a city level or a regional/state level agency. Much more complex, technical, and operational considerations in coordinating different modes are required than for single modes, and they involve separate jurisdictions for different modes, and this is a challenge that all Indian cities are facing.

Level I: City-Transport Relationship: This is the level of planning that involves coordination among the transportation system and the city, its physical components and all other socio-economic functions, etc. This is the highest level of planning and operational integration. This is the most complex, but, in the long run, it is the most important for an urban area. This level of planning need special arrangements for organizing, financing, planning, and implementing transportation systems, and for their coordination with other activities. Level I planning links the cities to their vision and objectives, and target of sustainability and livability. With Level I planning cities can seldom achieve satisfactory levels of efficiency and livability. Sustainable forms of urban development will further increase the need for such planning.

Projects at Levels IV and III are within modes, Level II planning is intermodal and encompasses, for example, pedestrians, transit, and streets,; and finally, Level I planning relates the entire transportation system, consisting of all modes, to all other activities and socio-economic, and geographic profile of the city.

The classification of the levels of planning gives proper perspective on the overall handling of urban transportation and its role in cities. If planning is only focused on individual facilities (Level IV) while their interactions with other modes and their impacts on the city (Levels III, II, and I) are not considered, such a transportation system may stimulate urban development that is not sustainable. This sequence of planning, based on Level IV, has been the cause of many problems and conflicts between transportation and cities (26). The theoretically correct sequence of planning is shown in Figure 1.7.

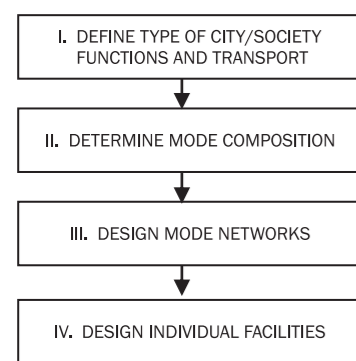


Figure 1.7: Planning Sequence in urban transport (26)

1.7 Planning for different sized cities

The context of urban transport planning may vary depending on city size. As mentioned in the earlier section, it is imperative to understand the socio-economic and geographic/spatial profile of the city (what and where are the activities, where do people stay, what can they afford, what the city can afford, etc). The above sequence needs to be followed for all city types. Public participation is a necessary element in this planning process for all sized cities.

Small cities (less than 10 lakh population): They constitute nearly 60% of the urban population. These cities have no city level development plans. Roads are maintained either by PWD or local municipality and police is responsible for traffic management and law enforcement. Transport office is responsible for vehicle registration and licensing. Para-transit vehicles (cycle rickshaws, three wheeled taxis, small vans) are operated by private operators after obtaining permit from the transport department. It is important to note that due to the size (geographic) of the city, the trip lengths are small, and these cities have high non-motorized modal share. Since public transport in

these cities is limited, longer trips are shared by public buses (limited in these cities) and para-transit modes. Thus in these cities, it is important to improve the non-motorized facilities and public and para-transit facilities, with a concerted effort at land use policies that are consistent in this direction. “Retain, develop and improve (NMT and public transit)”, may be the paradigm for these cities. The city development plans and the transport/mobility plans should resonate this vision and formulate objectives, plans and schemes that reflect and adhere to this. Capacity building becomes important in this case.

Medium size cities (10-40 lakhs): Nearly 15% of the urban population resides in this category cities. Comprehensive development plans may or may not be available for these size cities. Transport operations are similar to small cities except some cities have skeletal bus services operated by state transport undertakings, which primarily provide services for intercity operations. Majority trips are dependent on para-transit vehicles operated by private operators. However, in these cities due to inefficient and inadequate bus systems, there has been a rise in the use of two-wheelers in these cities. Incentivizing bus operations and accelerating introduction of modern safe buses would help in making these organizations viable and help achieve a modal share in favor of public transport in future also despite increase in incomes and vehicle ownership. Intermediate public transport (taxi, auto-rickshaws) operating in small and medium cities pays an important role in providing mobility at very low cost to a large section of the population. They have a potential of providing clean mobility, low emissions and improved safety. Investment to encourage manufacturers to invest in improving the technology of these vehicles, along with setting up emission and safety standards for these vehicles under the Motor Vehicles Act, etc. Incentives for industry for producing these vehicles, easy and efficient replacement schemes need to be given. Also with this accessibility issues to public transit need to be considered, at all levels of planning. Capacity building for city managers, and city planning agencies and the citizens are also necessary.

Large cities (Greater than 40 lakhs): Nearly 25% of the urban population lives in these cities, 15% in three mega cities (Delhi, Kolkata and Mumbai) and the remaining 10% in 4 other cities. City authorities (municipalities or development authorities) have prepared comprehensive mobility plans, and master plan for the city to plan for the estimated population growth. Public transport systems have been provided by city municipalities or city corporations. All of them have extensive bus network. Indian railways have been running suburban rail operations in Mumbai and Kolkata and Delhi Metro Rail Corporation (DMRC) has been responsible for the construction and operation of metro services in Delhi. The three megacities also have city traffic police responsible for traffic management, signal control and traffic law enforcement in the city.

The comprehensive mobility plans developed still lack some focus and integration with the vision, objectives and the plans itself. Often goals listed in master plans are not linked with traffic improvement plans. Master plans mention desirable modal shares, however, road development plans, traffic management, are not linked with the stated goals. Higher order transit systems may be needed, but sometimes, vendor-driven modes figure into the mobility plans, without any alternative analysis conducted for choice of transit systems (See Chapter 4). Public transit strategies are not linked to non-motorized plans, and thus accessibility to public transit remains an issue in these big cities, impacting the public transit share. Level I planning/strategic planning is lacking in these cities, and the inter-linkages of the other levels of planning is also missing. Adhoc knee-jerk solutions is the order of the day as most efforts are aimed at resolving daily crisis, without looking at the long term impacts. Also inter-linkages to other sectors such as housing, slum development, urban development policies, building/site plans etc., need to be considered.

Overall, a holistic approach to planning is necessary for all cities, based on its vision and goals, followed by effective monitoring of the impacts of the plans on the goals, feeding back into improvement of the plans, and/or learning from mistakes.

A matrix for different sized cities with regard to transportation vision and goals is presented in Table 1.3.

Visions	Objectives	Goals
Less than 10 lakh		
Connected and accessible transport network for all	Connected mixed use neighborhoods	Reduction of motorized trips
		Low usage of private vehicles
	Intra and inter city connectivity	Improved connectivity
	Accessible ped and NMT network	High walkability & NMT index
	Accessible ped and NMT network connected to the PT routes	High PT Index
	Focus on black spots	Improved safety of travel
	Planned shared and improved fuel usage for IPT	Reduction in pollution
	Containment of urban sprawl - focus on infill	Retain short trip lengths
	Capacity Building	NMT cell
		Bus Planning Authority (coordinated with NMT cell)

Visions	Objectives	Goals
10 -40 lakhs		
Integrated and accessible transport network for all	Connected mixed use neighbourhoods	Reduction of motorized trips
	New developments connected to transit network	Low usage of pvt vehicles
	Intra and intercity connectivity	Improved connectivity
		Intercity transit and freight hubs
	Accessible ped and NMT network	High walkability & NMT index
	Accessible ped and NMT network connected to the PT routes	High PT Index
	Focus on black spots	Improved safety of travel
	Planned shared and improved fuel usage for IPT	Reduction in pollution
	Containment of urban sprawl - focus on infill	Retain short trip lengths
	Traffic impact of developments to be minimized	Private developers to participate in transport solutions for the city, that adhere to city's vision and goals
	Traffic Management /Control	ITS usage (Signal control, synchronization of signals, incident management)
	Capacity Building	NMT cell
		Bus Planning Authority (coordinated with NMT cell)
40-80 lakhs		
Ensure transport options that serve all OR Sustainable mobility options that serve all Sustainable mobility options that serve all	Containment of urban sprawl - focus on infill	Retain short trip lengths
	Connected mixed use neighborhoods	Reduction of motorized trips
		Low usage of private vehicles
	Traffic impact of developments to be minimized	Private developers to participate in transport solutions for the city, that adhere to city's vision and goals
	Accessible ped and NMT network	High walkability & NMT index
	Accessible ped and NMT network connected to the PT routes	High PT Index
	PT dedicated lanes	High PT service
	Efficient PT route system, frequency	
	Feeder network (IPT, NMT and others)	High IPT Index
	Intermodal integration	
	Traffic Management /Control	High ITS usage (information, traffic management , dissemination, safety)
	Transit Oriented Development	
	Focus on black spots	Improved safety of travel
	Planned shared and improved fuel usage for IPT	Reduction in pollution
	Intra and inter city connectivity	Improved connectivity within activity centers
	Institutional Integration	NMT cell
		Public transit authority
	Sustainable financing	Transport Fund (focusing on PT and NMT)
	Capacity Building	Continual training

Visions	Objectives	Goals
80 lakhs +		
A world class transport system	Containment of urban sprawl - focus on infill	Retain short trip lengths
	Connected mixed use neighborhoods	Reduction of motorized trips
		Low usage of pvt vehicles
	Traffic impact of developments to be minimized	Private developers to participate in transport solutions for the city, that adhere to city's vision and goals
	Accessible ped and NMT network	High walkability & NMT index
	Accessible ped and NMT network connected to the PT routes	High PT Index
	PT dedicated lanes	High PT service
	Higher order transit systems	
	Efficient PT route system, frequency	
	Feeder network (IPT, NMT and others)	High IPT Index
	Intermodal integration	Integration Index high (physical, economic and information)
	Traffic Management /Control	High ITS usage (information, traffic management, safety)
	Transit Oriented Development	Higher density along transit corridors
	Focus on black spots	Improved safety of travel
	Planned shared and improved fuel usage for IPT and PT	Reduction in pollution
	Work trip reduction	Peak hour motorized travel reduction
	Intra and inter city connectivity	Improved connectivity within activity centers

1.8 Role of politics in planning process

Planning is a political process. The art of planning is about policy making, politics and power. Planners are not trained to play politics, yet political astuteness is imperative to achieve the desired objectives and achieving change. Thus there is always an uncomfortable relationship between politics and planning in the choice of policies and investments that shape urban planning and urban transport planning. Planners attempt to rationalize decisions through analytical methods, while competing interest groups, shape decisions through the political process. Thus it becomes important for planners to be pragmatic and know and understand the rules of the game, identify champions for the cause, use strategy to “influence” elected officials, citizens, and interest groups towards the goals that need to be achieved by the planning process. Thus broader understanding of institutional mechanism of the government agencies and special interest organizations become very important. Dialogue and collaboration with the decision makers and stakeholders creates good public policy. Identification of both the visible and the invisible movers and shakers is important. It is also pragmatic to let those with the political power think that your great idea is their great idea.

1.9 Conclusion

The new paradigm of urban transport planning calls for an integrated approach to urban transport. The process of planning involving stakeholders should take center-stage. Urban transport strategies need to be implemented in tandem, and should not be mode-specific. No one solution/mode can solve India's urban transport woes. A concerted attempt addressing different modes that are integrated, along with relevant policies in the urban transport sector as well as other sectors that are consistent, is vital to successful urban transport planning.

By the end of this Chapter, the reader should be able to

- Understand the need for conducting Comprehensive Mobility Plans (CMP) for cities
- Understand the objectives of CMP
- Know the outcomes of CMP
- Understand the approach in conducting a CMP and the data requirements

2.1 The Need

The current rapid urban development in India has exacerbated the mobility conditions of cities in India. There is need for a multi-pronged approach to handle the situation. Strategizing transport solutions, focusing on mobility of people as a basis for developing cost-effective and equitable urban transport measures in the context of the dynamic land use changes becomes important in this context. The existing local government capacity for urban transport planning is inadequate to address this.

Accordingly, the Ministry of Urban Development (MoUD) encourages cities to prepare “Comprehensive Mobility Plans” (CMP) as part of long-term urban transport strategy providing for a sustainable improvement of people’s mobility in metropolitan regions. The NUTP’s focus on comprehensive mobility planning is aimed at developing a strategy that is built around improved mobility. It recognizes pedestrianization, non-motorized modes, intermediate para-transit, and urban mass/ public transport system. The CMP aims to integrate activities, including strategic planning, city transportation and land use planning, project evaluation, prioritization, and coordination among modes. It is important to prepare long-term strategic plans focused on mobility of people as a basis for developing cost-effective and equitable urban transport measures with an appropriate and consistent methodology in line with NUTP.

The CMP is a key document providing the rationale for transport proposals. Therefore, within the overall planning hierarchy, the CMP can be considered as a prerequisite for the submission of a Detailed Project Report (DPR - Level 1) for JNNURM funding. Although it is not mandatory, all cities considering a funding application to central government have been recommended to submit the CMP and to obtain approval from MoUD. The plan also would help in assessing the fund requirements for urban transport for a city.

A toolkit for preparation of Comprehensive Mobility Plan has been prepared by the MOUD with the assistance of ADB (27). The toolkit provides the methodology, the key inputs and outcomes and a checklist for appraising CMPs and urban transport projects for funding

- The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) makes it conditional upon the cities to take up transport projects in line with the NUTP (which is driven by the principle of moving people not vehicles), in order to receive funding and grants.
- Every city is required to prepare a Comprehensive Mobility Plan(CMP) for the city before proposing individual projects

under JNNURM. This chapter describes the approach a CMP should have in order to achieve the objectives laid out by NUTP.

The role of CMP in the JNNURM process is shown in Figure 2.1.

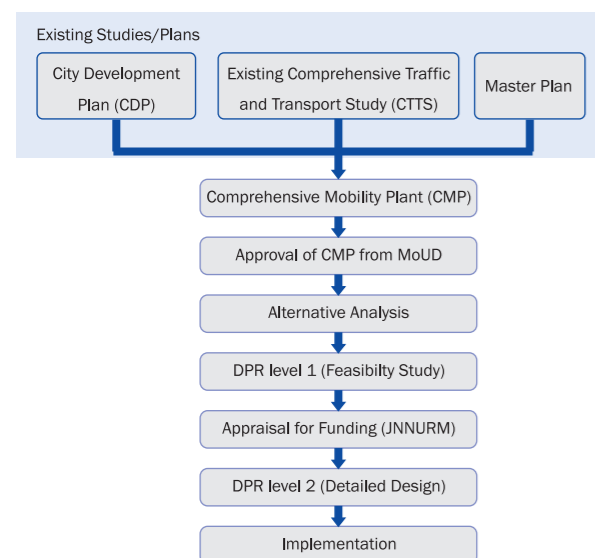


Figure 2.1: Role of a CMP in the JNNURM Process (27)

Source: CMP Preparation Toolkit - Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in

³Adapted from the Guidelines and Tool kits for “Module1-Comprehensive Mobility Plan: Urban Transport Development Preparation Tool kit”

2.2 Objectives of CMPs

The ultimate objective of a CMP is to provide a long-term strategy for the desirable mobility pattern of a city's addressing the dynamics of the land use changes, and economic development plans. It is the crucial link between the vision of the city with respect to their goals, and the projects that need to be implemented.

1. To provide a long-term vision(s) linked to goals and objectives for desirable urban development in each city;
2. Engaging the citizens in this process;
3. To develop strategies that integrate land use and mobility options, that are cost effective, equitable and also environment friendly to be implemented within a time span of 20 years or more; and
4. To ensure that the most appropriate, sustainable and cost-effective implementation program is undertaken in the urban transport sector

2.3 Main Features of CMPs

The main features of CMPs are the following:

1. To optimize the “mobility pattern of people and goods” rather than of vehicles: Recent approaches to urban transport plans focus on supply side addressing issues relating to vehicles and often recommended extensive infrastructure development such as road networks and flyovers. The improvement of vehicle flows in this approach, however, is often achieved through decreased mobility of pedestrians, NMV and public transport users. The urban poor and their mobility needs do not figure in these plans, and the impacts are often detrimental to their needs. The CMP, on the other hand, focuses on mobility of people to address more equitable allocation of road space in addressing urban transport problems, to promote better use of existing infrastructure, improvement of public transport, pedestrian and NMV facilities. It also emphasizes integration of land use and transport development.
2. To focus on the improvement and promotion of public transport, NMVs and pedestrians, as important transport modes in Indian cities: NMVs and pedestrian facilities provide accessibility to people of all ages, all income groups and capabilities and is vital to increase public transport usage. This is also an environmentally friendly transport means and need be promoted to reduce the rate of increase in the number of vehicles.
3. To provide a recognized and effective platform for integrating land use and transport planning: Since land use patterns directly influence travel patterns, it is essential to examine desirable land use patterns in cities from the viewpoint of urban transport development. For instance, commercial and residential area development should be integrated with mass transit development, in pursuit of transit oriented development, reducing dependence on private vehicles.

Such integration of land use planning and urban transport planning is urgently required in Indian cities. Mixed land use is inherent in many Indian cities, and there is need to retain and improve the integration between land use and transport

4. To focus on the optimization of goods movement: Freight movements need to be regulated and enforced, such that they do not hinder the peak hour traffic , as well as serve the activity center.
5. NUTP as the guiding light: The NUTP provides the direction in which the strategies need be developed and projects packaged so that the objectives and visions of the city can be realized.

2.4 Key Outcomes of CMPs

In accordance with the objectives set out above, a CMP includes the following major outcomes:

- Long-term visions and goals,
- A preferred form of urban growth
- List of proposed urban transport measures and
- Priority projects, based on Alternative Analysis
- Project sheets
- Indicative costing
- Service Level Benchmarks
- Implementation schedules (short, medium and long term)

It is a long-term strategy document recommending measures to improve the mobility of people in the short, medium and long term.

There are a few important plans and studies that need to be referred to when a CMP is prepared: City Development Plans (CDPs) and Master Plans and Comprehensive Traffic and Transportation Studies (CTTS).

The CDP addresses various urban development sectors, including urban transport. Usually, CDPs include project proposals for both infrastructure and regulatory measures, but the development of urban transport measures is not comprehensive and do not include a clear strategy regarding long-term urban transport development and the 'mobility' concept.

A Master Plan (or Development Plan) is a statutory document for guiding and regulating urban development. It is prepared by urban development authorities in each metropolitan area, defines the future area for urbanization, and addresses planning issues for various sectors. The transport sector plan, however, is one of the most important sectors, and contains development measures such as road network (arterials, collectors, and distributors etc.), parking facilities and MRT systems. In preparing a CMP in target cities, where a Master Plan is available, it should serve as an input to the CMP. In this process, the CMP reviews the future land use patterns in the Master Plan from the mobility optimization point of view and selects a preferred pattern of land use/transport integration if

necessary. If the recommendation by the CMP on urban growth pattern differs from the one in the Master Plan, the CMP recommendation may be reflected in a future version of the Master Plan. For cities where a Master Plan is not available, a CMP must be prepared first and used as an input for the preparation of the Master Plan.

Existing CTTS documents typically focus on mobility needs of car users, while CMPs are to address the mobility needs of all people and the infrastructure requirement for all modes, as well as to integrate both the land use (i.e., the spatial distribution of activities) and transport systems. The “comprehensive” in CMP conveys this all-encompassing scope. Existing CTTS documents allocate the majority of resources to “solving” vehicle congestion, while CMPs will focus on providing “mobility” for all people, the most important issue to be addressed for effective and sustainable urban development.

City authorities should be responsible for the preparation CMPs. During the process of the CMP preparation, it is recommended to establish an advisory committee consisting of key stakeholders and to organize seminars and workshops to obtain feedback from a wider audience. Preparation of a CMP should involve not only the engineering division, which is responsible for building roads, but also the municipal/state passenger transport authority, as well as the city development authority. In addition, other relevant agencies and stakeholders should be consulted throughout the planning process. Citizen participation and engagement is vital in this process.

Although a CMP serves as a visionary document, it should provide a clear and logical methodology. As such, any project recommended in a CMP should be broadly defined in its characteristics, such as basic concepts, form, area covered, components, and preliminary estimation of costs, financing options, implementation organization and social/environmental implications. A further level of detail required for feasibility assessment and detailed design should be performed after the CMP is approved.

Stakeholder Consultation

Since the CMP is a vision document providing a long-term strategy for urban land use and transport development, it needs to have active public engagement. The process on developing the CMP is as important as the Plan itself. If the Plan connects with the needs and desires of the city, it will be sustainable, and implementation may be easier. It is to be expected that each stakeholder will have different perspectives, opinions and preferences on urban transport development. Therefore, it is essential to coordinate among stakeholders to prepare an effective CMP through engagement and dissemination.

The next section describes the contents of the toolkit, which essentially are in 4 parts;

1. Introductory section; city profile, land use, transport system etc.
2. Preparation and Evaluation of the Urban Transport Development Strategy: Development of urban land use and

transport strategy, including vision, goals and future urban growth and transport scenario

3. Development of Urban Mobility Plan: Public transport, road network and NMT facility improvement plan, regulatory and institutional measures and fiscal measures.
4. Preparation of the Implementation Program

2.5 Brief Methodology

The tasks mentioned above are detailed in the Toolkit. A synopsis of it is elaborated below.

• Clarification of Study Area

The target area should be clearly described at the beginning of the CMP. The planning area of a CMP should cover the “Agglomerated Area,” rather than the area within the municipal boundary. The planning area for CMP can be adopted from the Master Plan.

A CMP must be prepared not only catering for city transportation needs, but also to the need for connectivity with satellite towns and Special Economic Zones (SEZs). Since the future limits of the city will be influenced by the development of transport corridors, CMPs must take into consideration the entire planning area in relation to major activity areas outside the planning area. If implemented in isolation, it will be difficult to optimize mobility patterns as addressed in the vision and goals statements.

• Planning Horizon

The CMP planning horizon is to be 20 years from the base year. In addition, 5 years and 10 years should be defined in between as the short-term and medium-term target years, respectively. Since the social and economic situation in Indian cities is rapidly changing, a CMP should be updated at least every five years.

2.5.1 Task 1: Data Collection and Analysis of the Existing Urban Transport Environment

To better understand the existing urban transport system, data collection and analysis is required. Necessary data and information can be obtained through a literature review (secondary data collection) of previous studies or field surveys (primary data collection). In particular, the following categories of data/information should be collected and analyzed, in addition to more conventional highway and automobile related information: (i) land use planning, (ii) NMVs; and (iii) public transport.

For the analysis of urban transport characteristics, transport indices such as those formulated by Traffic and Transportation Policies and Strategies in Urban Areas in India (MoUD, 2008) can be used to compare the subject city with other cities applying the same standards. As each city has its own characteristics, specific issues should be identified and presented based on the data/information obtained.

• Secondary Data Collection

A detailed review of existing development plans, including the Master Plan and/or the City Development Plan (CDP), gives information on existing land use patterns and planned growth scenarios, as well as the location and relationship between/among different land uses (e.g. residential, slum, commercial, industrial, utility, recreational, transportation, agricultural, wasteland, forest, and body of water). In particular, new development areas that will affect future transport demand should also be thoroughly reviewed. It is important to properly understand the existing transport situation in order to develop a rational land use and transport plan and mobility improvement measures in a CMP. Types of information required at this stage include the following:

- o City Development Plan
- o Master Plan
- o Comprehensive Transport and Traffic Studies
- o Industry Development Plan
- o Detailed Project Reports (DPRs) related to Transport Measures
- o Any other related plans/studies
- o Laws and regulations related to transport/traffic
- o Engineering design standards
- o Environmental standards
- o Regulations related to social issues such as involuntary resettlement
- o Inventory of projects proposed or planned in the existing reports or studies, or by relevant agencies

In addition, the following also need to be reviewed:

- Review of Existing Transport Infrastructure
- Review of Public Transport Systems
- Review of Urban Goods Distribution
- Review of Traffic Safety and Enforcement
- Review of Institutional and Financial Situation
- Review of Environmental and Social Conditions

• Primary Data Collection

The following primary surveys (traffic surveys) need to be conducted for analyzing the existing traffic scenario, as well as, for forecasting the future scenario:

- i. Road Network Inventory
- ii. Screenline and Cordon Count Survey
- iii. Turning Volume Count Survey

- iv. Speed and Delay Survey
- v. Household Interview Survey
- vi. Road Side Interview Survey
- vii. Pedestrian Count Survey
- viii. Bus Passenger Count Survey
- ix. Bus Occupancy Survey
- x. Terminal in and out Survey
- xi. On Street/ Off Street Parking Survey
- xii. Vehicle Operator Survey
- xiii. IPT Survey
- xiv. NMT Opinion Survey

It is to be noted that all the above mentioned surveys may not be need in all conditions and one need to choose as required. Typical Survey Formats for collecting the data are provided in Appendix B. It is to be noted that these formats are only for reference, and should not be used as such in the field. The formats need to be customized as per the actual need, issues and situation of the city.

• Development of Base-Year Transport Demand Model

In the CMP preparation process, transport demand modeling is used as a tool to analyze/evaluate urban land use and the transport system impacts. The modeling technique provides a quantitative and scientific approach to improving mobility and ascertaining impacts of various scenarios and strategies of land use and/or transport strategies

Detailed information on the data needs is provided in the module “DEMAND ASSESSMENT”.

2.5.2 Task 2: Preparation and Evaluation of the Urban Transport Development Strategy: Development

Every city has different characteristics, visions and goals specific to each city's issues, and challenges. The visions and goals could focus on the strategies, which aim to ensure multi-pronged approach rather than piecemeal measures; consider the movement of people rather than vehicles; ensuring public engagement, and dissemination of the process. Several strategic scenarios for urban growth and the trunk network should be developed. Through the evaluation of these scenarios, preferred future urban growth and transport networks should be identified. A strategic transport demand model may be the tool used in providing an overview of travel behaviour. It need not be as precise and detailed as will be required for the Detailed Project Report. The CMP could provide a preferred growth scenario from the viewpoint of an optimal urban land use and transport development pattern. If

the preferred urban growth pattern differs from that specified in the Master Plan, such changes may be reflected in future versions of the Master Plan.

EXAMPLE: The following scenarios are generally useful for analyzing future transport demand:

- **Do-Nothing Scenario:** In this scenario it is assumed that no new policy changes with regard to land use or transport is in place.
- **Moderate Public Transport Improvement Scenario:** This scenario involves implementation of public transport improvement measures and maybe changing density patterns of the city moderately.
- **Significant Land use and Public Transport Improvement Scenario:** Through implementation of compact land use policies, demand management measures, public transport improvement measures. Etc

Based on the above scenarios, road network scenarios may be developed, and transit corridors may be identified.

The following criteria may be used when evaluating the alternative development scenarios and for selecting a preferred scenario:

• **Potential for Developing Public Transport System**

A preferred pattern of land use and transport system should possess a high potential for developing public transport. If the city is large enough, the potential for MRT development can be measured by the demand density along major corridors. Physical characteristics of these corridors should be suitable for MRT. In general, where the land use pattern has high density development along corridors, it is recommended to provide other forms of public transport as well. Improvement to NMT facilities will be made cost effective under such a development pattern, which leads to improved mobility for all.

• **Total Travel Time and Average Travel Speed**

Total travel time and average travel speed are important indices for evaluating mobility. A preferred system would have a lower value for the total travel time and higher values for travel speeds on the network. The total travel time can be calculated on the basis of person trips as well as vehicle trips to better understand the mobility implications.

• **V/C Ratio**

This index is often used for the analysis of vehicle mobility. The V/C ratio is one of the most widely used indices for measuring the degree of congestion on the network. The V/C ratios on links can be compared and analyzed. Through an analysis of V/C ratios and traffic volumes, bottleneck sections and intersections should be identified. It is often found that the road network around new development areas is very congested, with bottlenecks caused by large increases in traffic volume.

• **Economic Indices**

An economic analysis of each development scenario may be performed to develop a preferred solution with the lowest net economic cost. If a detailed demand model is available, travel time savings, vehicle operating cost savings and required infrastructure may all be incorporated in this analysis.

2.5.3 Task 3: Development of Urban Mobility Plan

Based on the preferred land use and transport development scenario, a more detailed urban transport development plan will be prepared. The list of existing/ongoing transport projects, could serve as a starting point for project preparation. Some projects will be added and others may be deleted through this process. Throughout, the integration of land use and the transport network should always be taken into consideration.

Mass rapid transit can achieve reduced travel times through the provision of widely accessible networks, higher speed vehicles, exclusive right-of-way infrastructure, special limited-stop or express services, efficient fare collection systems, and/or faster boarding and alighting. Higher capacities may be achieved through larger vehicles, multiple sets of vehicles (e.g. a bus platoon or a train) and/or more frequent services (although there are limits on headways). Each major city has, according to its structure, one or more major corridor that can be developed to be suitable for a mass transit system. Selection of mass transit systems should be undertaken by considering corridor characteristics and the technical parameters of available mass transit systems.

For details on the selection criteria for Mass Transit Systems, refer to 'Public Transport' Module – Volume 1 and Volume 2

The Plan may include the following:

- **Corridor Plan-** By designating certain roads as corridors to maximize passenger throughput, these corridors get priority planning for public transit systems.
- **Public Transit Strategy –** This strategy should focus on increasing the public transit share through intermodal Integration (Development of Feeder Networks, use of NMT is these routes, Integrated Fare policy and ticketing, Intermodal Stations to minimize delay/transfers, Intelligent Transportation Systems (ITS), integration with auto-rickshaws, taxis, and NMT modes such as cycle rickshaws, and inland water transport, park and ride Facilities along transit corridors, etc)
- **Non- Motorized Transport Strategy-** The NMT strategies should focus on maintaining path surfaces, establish connected walking networks, safe accessibility to public transit stops, etc)
- **Freight Management Strategy-** Unregulated loading and

unloading of freight traffic in the central business areas add to the congestion on the roadways. Freight transport management includes various strategies of increasing the efficiency of freight and commercial transport.

- **Traffic Management-** It is imperative that Traffic Engineering and Traffic Management be given high priority.
- **Travel Demand Management Strategy -** To further increase public transport modal shares additional demand management interventions can be implemented.
- **Institutional Integration-** It should focus on establishing a central nodal authority responsible for all transport initiatives and planning, modify the enabling legislations and establish fare policies and fare regulators.
- **Fiscal Measures:** Fiscal measures such as fare policy for public transportation, parking; subsidy policy for public transport operators, and potential for road congestion charging, etc

An Alternatives Analysis needs to be done in case of selection of higher order mass transit. Alternative analysis may be done after the CMP. Details regarding choice of mass transit options, is included in the Alternative Analysis Toolkit (28), and described in Chapter 4. Every city is different and requires its own study of the potentially realistic options. The guidelines shown in Chapter 5 are to assist decision makers in narrowing down the applicable options.

• **Mobility Improvement Measures and NUTP Objectives**

The CMP preferred strategy and land use and transport measures proposed in the CMP will improve mobility in the metropolitan area and cover the critical issues addressed in the NUTP. A table can be prepared summarizing the relationship between the NUTP objectives and the measures proposed in the study, together with a classification of the measures according to their implementation time frame (short, medium and long term). Table 2.1 shows an example of such a summary in relation to NUTP objectives.

Table 2.1: Example of Plan meeting NUTP objectives (18)

NUTP Objectives	Proposed Mobility Improvement Measure
Priority for Pedestrians	<ul style="list-style-type: none"> • Pedestrian paths are recommended in all residential and commercial areas and on major corridors. • Pedestrian crossings are proposed in all commercial areas and school zones • Pedestrian underpasses are recommended at critical locations.
Priority for Non-motorized Vehicles	<ul style="list-style-type: none"> • Recommended bicycles tracks on major corridors and in school zones. • Requirement for bicycle parking is recommended for offices, railway stations, schools and all markets and shopping centres. • Rickshaw stands are proposed at critical locations
Priority for Public Transport	<ul style="list-style-type: none"> • Development of an MRT system is proposed. • Recommended improvements to existing bus services and necessary regulatory/institutional changes.
Parking	<ul style="list-style-type: none"> • On-street parking facilities are proposed for critical locations • Recommended regulatory changes in building permits to secure parking demand • Construction of off-street parking is proposed for several locations, and a funding mechanism is developed including the possibility of private sector participation • Changes in parking tariff policy are proposed to optimize the use of existing off-street parking facilities
Integration of Land Use and Transport Planning	<ul style="list-style-type: none"> • A preferred urban growth scenario is recommended in the CMP document and its compatibility with the Master Plan is analyzed. • Land use control principles to minimize the mobility requirement are presented. • Proposed MRT corridors with feeder modes of transport cover major residential, commercial and industrial areas in metropolitan areas. • High-density residential and commercial development around proposed MRT stations is recommended.
Equitable Allocation of Road Space	<ul style="list-style-type: none"> • MRT corridors and bus priority lanes are proposed. • Pedestrian and NMV lanes are recommended.
Integrated Public Transport Systems	<ul style="list-style-type: none"> • Recommended that inter-city bus terminals be moved to peripheral areas of the city and integrated with inner-city bus services. • Intermodal (taxi/rickshaw stands, vehicle, NMV parking, and bus-loading/unloading) facilities are proposed at MRT stations.
Introduction of Paratransit Services	<ul style="list-style-type: none"> • Recommended the introduction of paratransit services to supplement the existing/new public transport services.
Freight Traffic Improvement	<ul style="list-style-type: none"> • Truck terminals proposed • Entry restrictions for heavy vehicles during peak hours recommended

Source: based on Comprehensive Mobility Plan for Coimbatore, 2007.

2.5.4 Task 4: Preparation of the Project Schemes

The Implementation Program, which includes timeframe, financing options and implementation agencies/organizations for each project. General project information will be required at this stage, outline with project rationale and justification, along with conceptual drawings (if necessary) and estimated cost. Proposed projects will then be evaluated and prioritized based on pre-determined criteria (detailed in the Toolkit) and classified into short-term (high priority), medium-term, and long-term. Though it is not necessary to include Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) reports, very preliminary social and environmental impact assessments of each priority project may have to be performed and the results and implications be fully reflected in the recommended projects. Also, it would be beneficial to conduct a Strategic Environmental Impact Assessment (SEIA) in order to examine and evaluate the project justification within the national/regional and/or municipal planning framework.

The next stage of project implementation is Alternative Analysis for selection of high order transit options. Alternatives Analysis can be performed after the CMP to enable the commencement of DPR.

2.6 Gaps in Comprehensive Mobility Plans

Many of the JNNURM Mission cities have already prepared CMPs, but certain gaps in the methodology still remain in the planning process, based on review of 5 CMPs by TERI (18).

Gaps in CMPS in achieving sustainability objectives

Planning process/Plan

- Inadequate stakeholder engagement in plan preparation
- Lack of clarity in terms like vision, goal, objective, strategy, etc.
- Gaps in translation of plan recommendations into specific projects
- Lack of clarity on formal linkages of CMP with other city plans like Master Plan and CDP

NMT

- Lack of supporting facilities for NMT users
- Lack of integration of hawkers/informal sector in NMT/road proposals
- NMT cells to undertake planning/ management of NMT missing

Public transport

- Quality of public transit services accessibility of public transit terminals
- Integration of IPT with public transport

Security, Access and Environment

- Security of transport system users, especially that of the vulnerable traveller categories
- Universal accessibility Operating differential transit services in cities
- Environment quality improvement (clean fuels, maintenance regime for in-use vehicles, reducing air/noise/ water pollution)

ITS, Freight and TSM

- Use of ICT in mobility solutions like traffic management, accident analysis, road maintenance and monitoring, efficient delivery of public transit services, etc.
- Limited to construction of bypasses and shifting of economic activities to city peripheries

Traffic demand management

- Only a few plans give detailed parking policy/management plan
- Lack of innovative solutions to restrain transport demand by private vehicles

Implementation

- Lack of clear implementation strategy in many plans
- Lack of a well-defined framework of targets and performance indicators
- Lack of identification of capacity building requirements
- Lack of mechanism for periodic revision and updating Plan
- No proper communication strategy to build public support

Chapter 3

Transit Oriented Development

By the end of this Chapter, the reader should be able to

- Understand the need for TOD
- Understand the principles of TOD
- Learn the benefits of TOD

3.1 The Context

The impacts of increase in motorized travel, traffic congestion, deteriorating air quality and isolation from their neighborhoods, sets the need for transit oriented development. The opportunity now exists to promote new patterns of development that encourage vibrant, safe, human-scale communities that offer alternatives, that are supported by transit and facilitate transit usage

3.2 Transit Oriented Development (TOD)

Transit-supportive planning and development rethink land use and development patterns so that they will be effectively served by a balanced transportation system where walking, bicycling, and riding transit work in harmony with the private automobile. Transit oriented development enables citizens to choose an alternative to the automobile for at least one or more of their daily trips between home, work, shopping, school, or services. This is primarily accomplished by designing communities so that the physical facilities necessary to walk, cycle, ride transit and drive a car are convenient and attractive.

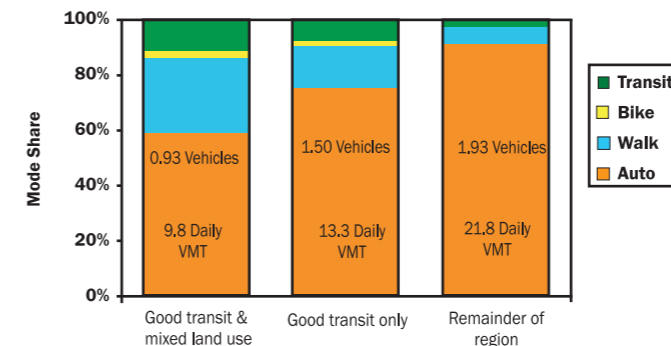


Figure 3.1 TOD reduces vehicle usage and more use of alternative means of transport

Source: Hank Dittmar and Gloria Ohland (2004), The New Transit Town: Best Practices in Transit-Oriented Development, Island Press

3.3 Principles

The principles support efforts to enhance mobility and quality of life by reinforcing the city/urban area's transit system and supporting ridership growth. It recommends, simply, that land use planning be used to create environments where walking and transit are viable transportation options. The basic thrust of TOD strategies is making it easier to go from one transportation mode to another, the connection between community and development is enhanced—ensuring that a community is accessible to all. Indian cities like Kolkata and Mumbai have traditionally been more transit-focused than cities like Bangalore, and the public transit mode shares validate that. Thus, if implemented, the transit-oriented development principles have the potential to reshape the manner in which development occurs within the cities of India.

The five principles of TOD planning process include:

- Travel Connections
- Building Scale and Orientation
- Public Spaces
- Parking
- Land use

These principles are intended to guide how development should take place, rather than what and where. The focus of the principles is to maximize transit usage and other non-motorized means of travel, through an integrated approach of urban design, and street design. In order to transform the transit-supportive development principles into physical land use patterns, continued action is necessary.

Identification is the first step. Policy obstacles still exist. This is why it is important that the public, community organizations, and urban local bodies gain a clear understanding of these principles, identify with the prototype applications and visualize the potential future of transit oriented development in their cities, and neighborhoods.

3.3.1 Travel Connections

Convenient and Direct Pedestrian Connections

Direct and multiple connections to activities, empower travelers with the ability to choose how to access development. Short, convenient connections and pathways located between and within developments make non-motorized alternative modes of travel more attractive. By integrating uses within a multiple-use activity center, enhances walkability by reduced travel time to activity centers.

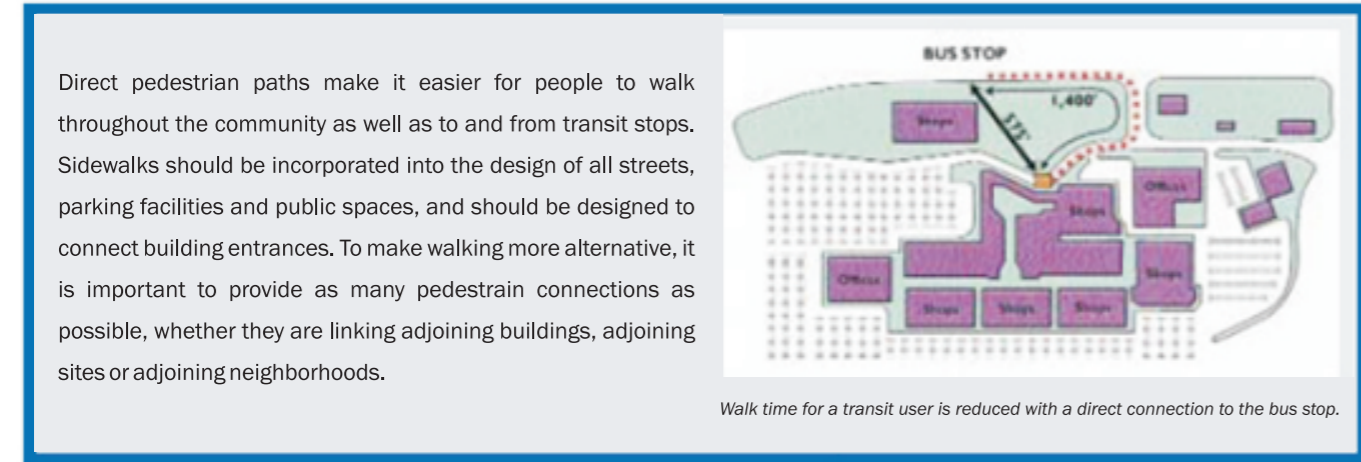


Figure 3.2 Direct connections reduces walk time – enhances walkability

(Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

Pedestrian-Scale Blocks

Short blocks are desirable as they improve the mobility of pedestrians. Block lengths of 300 to 500 feet are desirable as opposed to longer blocks, which discourage walking and result in longer routes. When this is integrated into an interconnected street network, reduces the need for vehicle use.



A system of pedestrian-scale blocks allows buildings to fill in an area over time

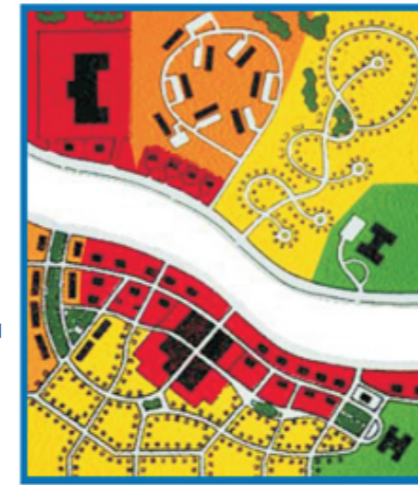
Figure 3.3 Short blocks encourage walking and cycling and reduced need for vehicle use

(Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

Interconnected Street Network

An interconnected street system distributes traffic among all roadways, rather than concentrating it on arterial roads. Such a system improves the mobility of pedestrians and bicyclists by providing multiple travel routes, in addition to allowing more efficient transit routing. For maximum efficiency, this system needs to also extend into neighbouring developments.

Conventional suburban development with limited connection



Interconnected street network

Conventional development use the street network to separate uses, while transit-supportive development brings different uses together through an interconnected street network.

Figure 3.4 Interconnected street system ensures efficient transit system routing

(Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

Bicycle Circulation and Parking

To ensure a safe and convenient bicycle network that is comparable to automobile network, bicycle lanes need to be incorporated, segregated or otherwise, depending on the traffic on the streets. Routes should be clearly marked and designed using standards. Bicycle accommodations should be provided along every street. In addition, secure facilities for bicycle parking should be available at common local destinations, and at bus stops. Bicycle renting may also be encouraged at major transit hubs, and high density commercial areas.

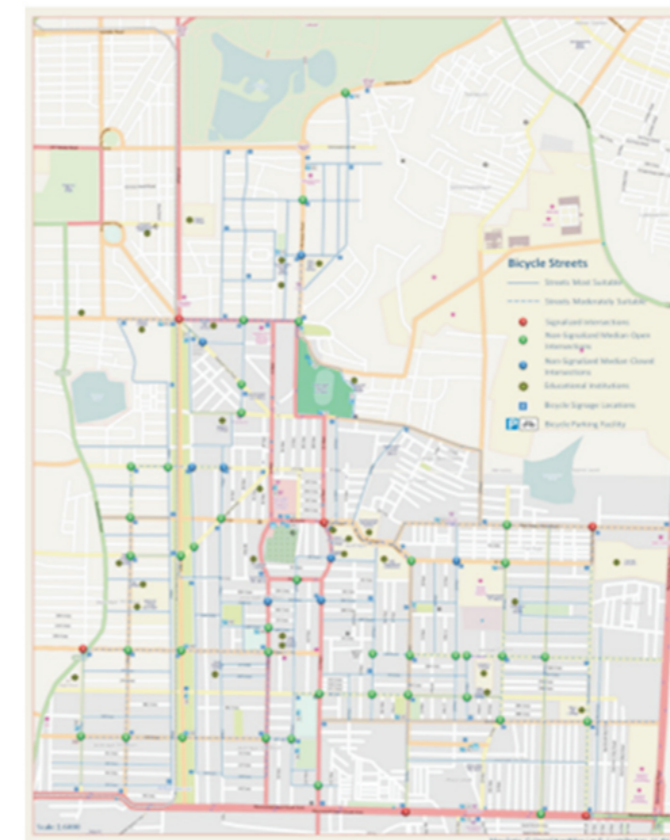


Figure 3.5 Interconnected bike plan-signage and amenities'

(Source: Bicycle Friendly Streets In Jayanagar, Bangalore, Gubbilabs); Bike stands at bus stops (Source: League of Michigan Bicyclists, Michigan, USA)

3.3.2 Building Scale and Orientation

It is assumed that people are willing to walk a maximum of ¼ km for premium transit and rail service and ½ km for other bus services. Transit-supportive design takes that into account. By placing buildings and their entrances along pedestrian walkways, walking distances are shortened. Building placement is a powerful tool in reinforcing streets as public amenities.

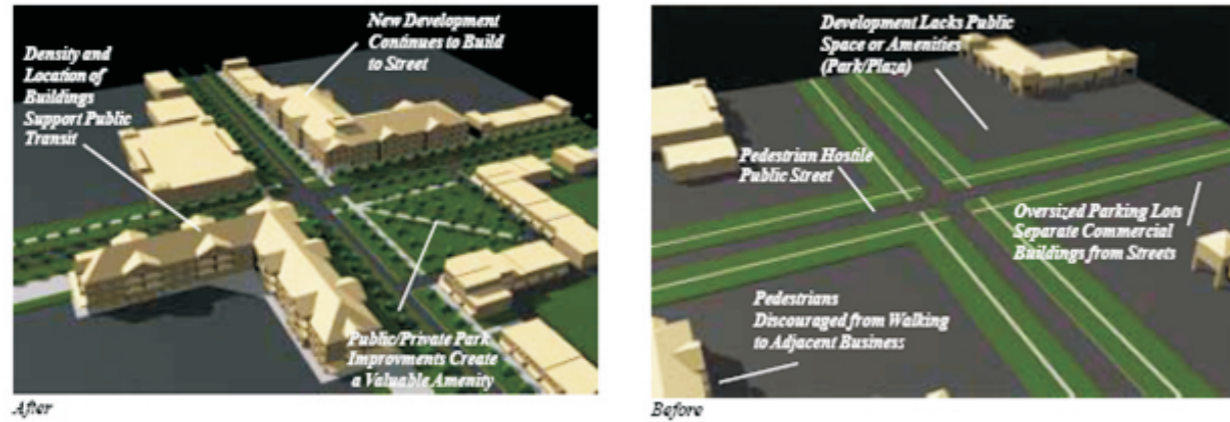


Figure 3.6 Density and location of buildings, that is conducive to public transit

(Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

The physical location of buildings can not only encourage pedestrian activity, but is also the most powerful tool for organizing public spaces for informal gatherings, vending activities, etc. Such public spaces also make very attractive transit facilities where the transit customer can wait in a safe, comfortable and aesthetic setting, as well as utilize the transit waiting time (quick snacks, small errands, etc). Sensitivity to the physical design and location of buildings is for travel connections to be attractive. Placement of buildings in relation to the street and other buildings, as well as their height and scale influence the quality of non-motorized experiences.

3.3.3 Public Spaces

Pedestrian-Friendly Streets

Streets are by far the most prevalent public spaces; as such, they should be designed to accommodate pedestrians comfortably. Speed of motorized vehicles is a safety risk to pedestrians. The speed of traffic can be managed through various traffic-calming measures and by using two-way streets instead of one-way pairs. Pedestrians may also be protected from moving traffic through features such as street trees, landscaped strips, bicycle lanes, or a row of parked cars. The sidewalk itself should also be wide enough to provide a buffer area, with a minimum width of five feet in less travelled areas and 10 to 15 feet in heavily travelled residential, commercial and office areas, to enable segregation of pedestrian traffic and for pedestrians to have an enhanced “feel safe” factor.



Figure 3.7 Safe Pedestrian paths with vending (Gariahat, Kolkata)

Parks and Plazas as Community Gathering Spaces



Public gathering spaces framed by buildings work to create a comfortable pedestrian environment.

Figure 3.8: Comfortable pedestrian environment (Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

In addition to streets, spaces such as parks and plazas can encourage social interaction and create an environment designed around people. In addition, these places often serve as community landmarks and focal points, making them ideal locations for transit stops.

Quality Facilities for Transit Users

Features such as benches, shelters, landscaping and adequate lighting make people feel comfortable while waiting for transit service. Additionally, services such as child care facilities, dry cleaners, postal facilities and health care offices can be included as part of bus transfer centers or rail stations. The quantity and quality of these features is an important part of establishing transit as a respectable and convenient travel option and creating a dignified experience for the transit customer.

3.3.4 Parking

Pedestrian-Friendly Parking Facilities

Parking is a critical principle of transit oriented development. The proper location and size of parking facilities are essential if pathways, buildings and public spaces are to succeed in creating transit-supportive settings. The size and location of parking facilities should be sensitive to pedestrian and bicycle circulation. On-street parking is a pedestrian-friendly way to provide convenient access to street-front businesses, as the parked cars provide a buffer between pedestrians and moving traffic. Surface parking lots can be made more pedestrian-friendly by including walkways for pedestrian traffic. They should also be placed behind buildings to shorten walking distance. The proper location and size of parking facilities are essential if pathways, buildings and public spaces are to succeed in creating transit-supportive settings. Parking structures/shared parking lots are two ways to reduce the amount of space occupied by parking facilities.

Structured and Shared Parking

Parking structures and shared parking lots are two ways to reduce the amount of space occupied by parking facilities. Uses that operate during different times of the day can share parking facilities. Structured parking is useful in dense residential and commercial areas, because it allows more direct travel for pedestrians and bicyclists.

3.3.5 Land Use

The mix and density of land uses is a powerful tool in the creation of places where travel is best experienced without the aid of the automobile. Appropriate mixes of land uses must be complementary to one another to encourage trip interactions. A connected and integrated land use mix also encourages different activities throughout different times of day, enabling parking facilities to be sized in a manner that is not out of scale to the pedestrian or transit customer.

Increased Density in Neighbourhood Centers

Land uses such as office, commercial and medium/high-density residential are well suited for neighborhood centers and locations next to existing or proposed transit routes. By clustering these uses around community focal points and public spaces, more people benefit from access to transit service and other public amenities. Additionally, increased density makes transit service more cost effective, since each route is able to serve more people.



Before
Increased density in neighborhood centres can be accomplished through new infill development. Transformation from regional mall to mixed use centre- Eastgate Center, Chattanooga, TN.

Figure 3.9: Infill development is desirable (Source: MARC Transit Supportive development-primer.pdf, www.polk-county.net)

3.4 Impacts of Transit Oriented Development

Successful Transit Oriented Development can significantly reduce per capita motor vehicle travel.

A study conducted by Dill (2006) in Portland, USA, found that 30% or more of Portland area Transit Oriented Development residents commuted by MAX (the regional light rail system) at least once a week and 23-33% used transit as their primary commute mode. This compares to less than 10% of transit trips before the development of TOD area. Overall, transit commuting increased when people moved to TODs. Nearly 20% of the commuters switched from non-transit to transit modes and 4% did the opposite, for a net of about 16%.

Evans and Pratt (2007) summarize extensive research on the effects of TOD on travel. They found:

- In Portland, Oregon, as of 1995, the average central area TOD transit share for non-work travel was roughly four times that for outlying TODs, which in turn had over one-and-two-thirds times the corresponding transit share of mostly-suburban, non-TOD land development.
- In Washington DC, work-commute transit mode shares decline from 75% at downtown office buildings right at Metrorail stations to just over 10% on average at office buildings within roughly 1/2-mile of a station but located in the suburbs outside of the Capital Beltway. Transit mode shares along the Washington Metro system were found to decrease by 7 percentage points for every 1,000 feet of distance from a station in the case of housing and by 12 percentage points in the case of office worker commute trips.
- A 2003 California TOD travel characteristics study found TOD office workers within 1/2 mile of rail transit stations to have transit commute shares averaging 19% as compared to 5% region-wide. For residents, the statewide average transit share for TODs within 1/2 mile of the station was 27% compared to 7% for residences between 1/2 mile and 3 miles of the station.
- TOD residents are generally associated with lower automobile ownership rates. For example, auto ownership in three New Jersey "Transit Village Areas," for example, averaged 1.8 vehicles per household compared to 2.1 outside the transit villages.

Table 3.1: Impact of TOD on Vehicle Travel

Design Feature	Reduced Vehicle Travel
Residential development around transit centers.	10%
Commercial development around transit centers.	15%
Residential development along transit corridor.	5%
Commercial development along transit corridor.	7%
Residential mixed-use development around transit centers.	15%
Commercial mixed-use development around transit centers.	20%
Residential mixed-use development along transit corridors.	7%
Commercial mixed-use development along transit corridors.	10%

Source: Features of land use design by Dagang, 1995

The impact of TOD on vehicle travel is also summarized in Table 3.1 based on the research conducted by Dagang in 1995.

3.5 Challenges to Transit Oriented Development

Transit-oriented development has the potential to provide a wide range of mobility options, use land efficiently, conserve environmental resources and create affordable housing opportunities. Despite these benefits, there are regulatory, institutional, and financial and market based obstacles to achieving transit-oriented development patterns in cities. Some of the obstacles to TOD are listed below:

1. No Common Definition or Agreement on Goals and Outcomes
2. Tension between Place-Making and Transit System Needs
3. Uncertainty (i.e. Mismatch between potential demand for TOD and supply)
4. Transit alone does not Drive Real Estate Investments
5. Financing (i.e. Most Banks are structured to fund isolated single-use developments)
6. De-gentrification – The real estate value along the corridors and stations shoots up, making it impossible for the poor and middle class people (who are the real transit users) to live next to the corridor and use the system.

Chapter 4 Alternative Analysis²

By the end of this Chapter, the reader should be able to

- Know why is it important to conduct AA and which projects can go through the process of AA
- Understand principles of AA
- Know the detailed step by step process of conducting AA

4.1 What is Alternative Analysis?

Alternative Analysis is about finding the best alternative to solve transport and related problems in a particular corridor or sub-area. Alternative Analysis is NOT a "feasibility study" where the "feasibility" of a single solution is evaluated without looking at other, potentially more cost-effective and desirable options. It is a consensus (not unanimity) amongst various stakeholders after examining various options as pragmatically and honestly as possible in making the right choice.

Alternative Analysis will be done after a Comprehensive Mobility Plan has been finalized and before a project goes into the DPR-1 stage for project sanction as shown in Figure 4.1. The Comprehensive Mobility Plan (CMP) of a City will identify priority corridor (s) that need transportation improvements. It will also spell out transportation alternatives for the corridor (s) identified. Alternative Analysis will evaluate the alternatives for the identified corridor and select the best alternative suited to the City. For example, the CMP identifies Corridor X as a priority corridor for having mass transit. The alternatives spelled out maybe an enhanced existing bus system, transportation management alternatives, bus rapid transit system, a metro and a mono rail. Alternative Analysis will evaluate all these alternative based on certain criteria to select the best available alternative suited for the corridor. Alternative Analysis will not be as detailed as Detailed Project Report-1 (DPR), it will about 10% design for the corridor/area.

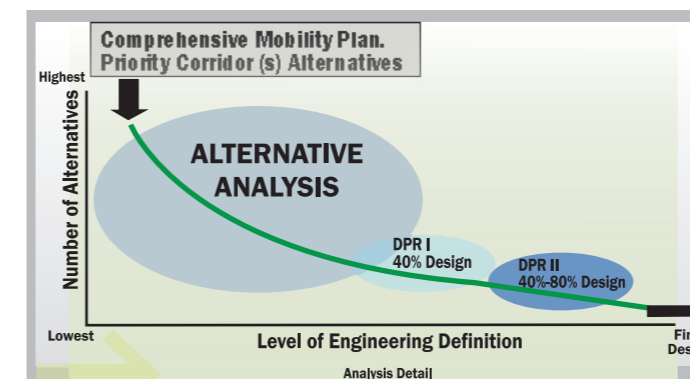


Figure 4.1: Alternative Analysis in the Project Development Process (28)

Source: Presentation from Sam Zimmerman, World Bank

4.2 Principles of Alternative Analysis

- Make sure that everyone understands the process from start: It is important to clarify the difference between alternative analyses and feasibility studies. The "big decision" that is to be made at the conclusion of the study, whether it selection of mode, management and operation options for the corridor/area, or both, need to be communicated to the stakeholders and the decision makers.
- Get the decision makers and the public at the table: It is important to define the public engagement process from the very beginning, by recognizing the stakeholders, the decision makers and establishing a communication plan between them.
- Understand the problems that are to be solved: It important to look beyond the symptoms, and find the source of the problem, asking questions as to why performance objectives not met, etc. It is important to analyze the present and future conditions, not only the traffic problems but future land use changes, changes in travel behavior etc.
- Identify the information needed for decision making: Evaluation framework and measures may be developed based on what information the stakeholders and the decision makers want and need to know. The data, analysis and tools used need to communicate this. It needs to be comprehensive enough to include, land use impacts, accessibility issues, network connectivity, system performance (transfer requirement, connectivity, frequency, speed, convenience, etc), environmental impacts, and costs, including life-cycle costs (implementation, operating and maintenance, recapitalization, emissions, etc)
- Consider the right alternatives: Identification of decision points for alternatives is important. There is need to establish constant

²Adapted from the Alternative Analysis Toolkit, Ministry of Urban Development, 2009

policy setting but identify policy options (e.g., tolls, traffic management, fares) to be tested, and find a range of reasonable alternatives. There is need to cognizant of the fact that there is more than one rapid transit mode and more than one type of road capacity addition. Also considering a Do-nothing and also a comprehensive package of improvements (integrated public transport priority/traffic management) as a distinct alternative is important to identify low cost improvements that work, especially for medium and small sized cities. Each alternative as need to be made as competitive as possible.

- Develop complete, objective and reliable information: All factors that are relevant to the decision need to be analyzed (capital and O&M costs of the alternatives, transportation, land use and other benefits, environmental and other impacts, etc) and sufficient detail to support the decision to be made. All quantitative and qualitative decision criteria consistent with goals and objectives need to be utilized, combining effectiveness, benefits and costs into "investment worthiness" criteria, sensitivity analyses (what happens if everything goes wrong) and independent "reasonability" assessment of costs and benefits can build credibility. All these need to be fully disclosed in an honest assessment of benefits, costs, impacts and risks analyses.
- Be prepared to make the case: All the analyses need to be developed into information that can tell a clear, coherent and concise story, addressing problem(s) at hand, and effectiveness of each alternative in addressing the problem (s) and why the locally preferred alternative has the best-justification of choosing the alternative.

4.3 The Process

This section describes the process by which Alternative Analysis is done. The process consists of mainly 10 steps. The steps are as follows:

1. Set Goals and Objectives
2. Set up Steering Committee
3. Review Technical Issues, Data, Models
4. Define Scope of Services
5. Framing the Analysis
6. Identification of Alternatives (Conceptual)
7. Final Definition of Alternatives
8. Public Review Process
9. Evaluation
10. Selection of Preferred Alternative

Alternative flow charts show the road map of the AA process and also show the sub-components of the entire Alternative Analysis process.

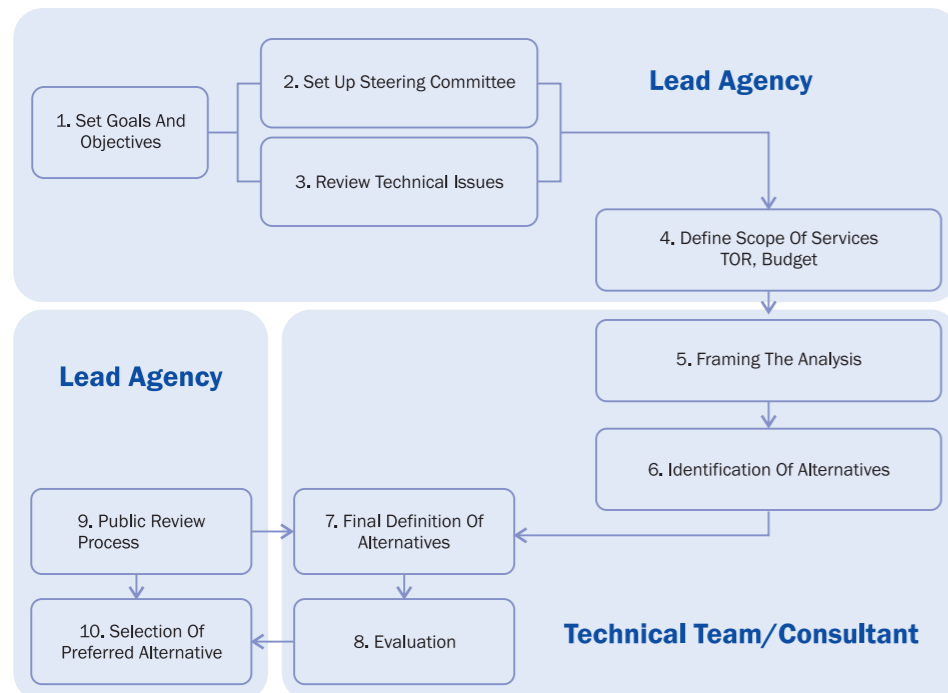


Figure 4.2 Alternative Analysis

Source: Toolkits and Guidelines -

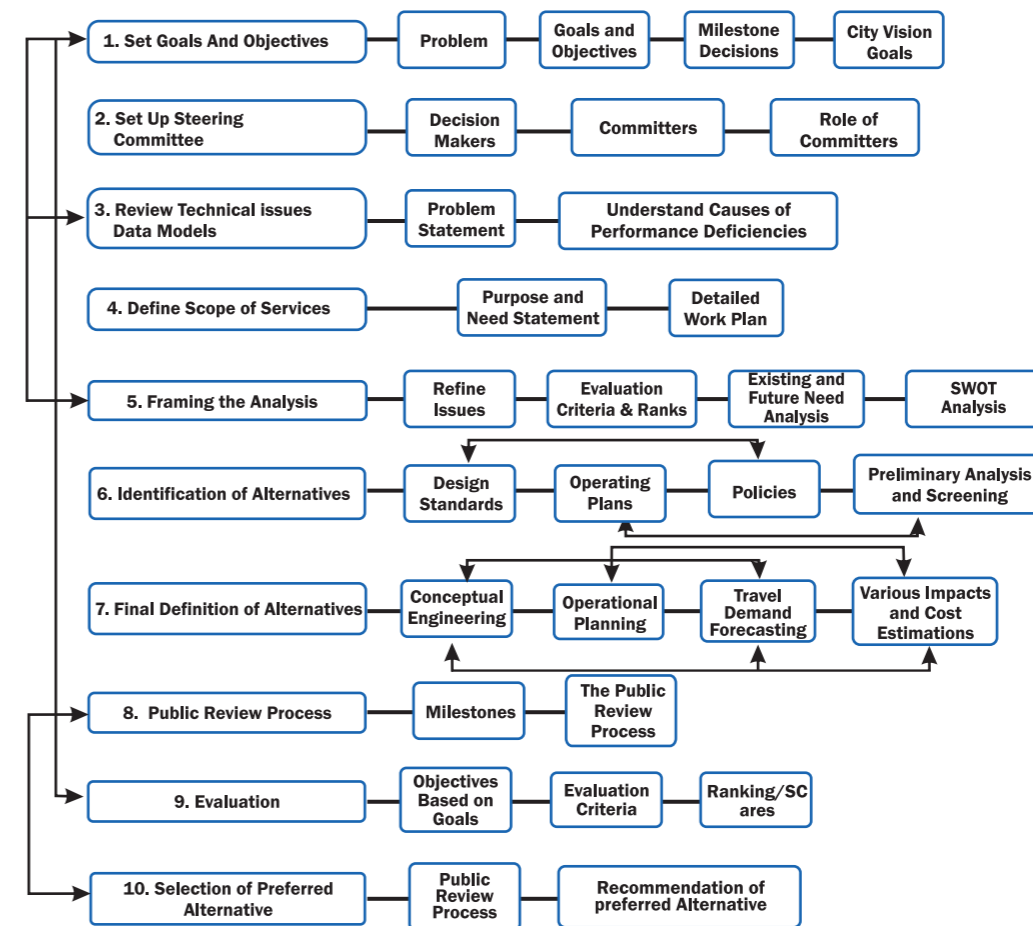


Figure 4.3: The Process with Sub components

Source: Toolkits and Guidelines – Alternative Analysis; MoUD

4.3.1 Set up Goals and Objectives

The perceived problem(s) faced by the corridor is identified here. The lead authority conducting the AA, which is the UMTA, will identify and clarify the problem(s) of the corridor. This will form the basis of the analysis to evaluate the mitigation measures and select the best option.

Clarify the problem: Why does the corridor need improvements? What is the problem? The problem needs to be pointed out at this stage. The clarification of the problem will eventually formulate the goals and objectives of the process and help evaluate the different alternatives.

Identify the "Goals and Objective" in specific terms: Once the problem has been identified, goals and objectives need to be identified. Goals and objectives identified here will be used later in the process for evaluation. These goals and objectives need to be related to the overall City Vision and Goals. Every City usually has a Vision statement, developed as part of the City Development Plan (CDP) and also the Comprehensive Mobility Plan (CMP). Goals and objectives are also identified in these studies. The goals and objectives developed for the AA process will be more corridor/sub-area specific than what identified in the CDP or CMP.

Clarify the "big decision" to be made in AA: Why are we considering alternatives for the corridor? What are we trying to achieve? What decision will the AA process help us make? What is the "big decision" that has to be made? These questions need to be answered at this stage. Big decisions could be choice of a transit system, or a highway alignment, or choice between different types of bus transit along the corridor. Once the "big decision" that has to be made is clarified, the milestones that will help arrive at the decision point need to be decided. These milestones will help make the decision in a scientific manner. The major milestone decision points are as follows:

- Context- This will give a system wide perspective of the project corridor

EXAMPLES OF PROBLEMS

- Congestion and decreasing general mobility
- Growth in vehicle miles traveled with the potential for environmental degradation
- Decreasing transit mode share
- Job shifts and decreasing mobility for transit dependent persons
- Reduced Safety

- Purpose and Need Statement- Answers why the process is being done
- Preliminary Definition of Alternatives- Alternatives identified
- Final Definition of Alternatives- Alternatives screened
- Evaluation Of Alternatives- Alternatives evaluated
- Selection of Alternative-Final milestone-alternative selected

EXAMPLE OF GOALS AND OBJECTIVES

GOAL: Mobility
Enhance mobility by providing transportation choices

Objective M1 - Facilitate connections between residential and business activity centers

Objective M2 - Facilitate ease of transfer between modes

Objective M3 - Provide convenient, multi-modal transportation options

Objective M4 - Enhance system reliability across travel modes

Objective M5 - Balance the transportation needs of local, regional, and national users

Check-list-Step1-Identification of goals and objectives

- Problem/s Identified?
- Goals and Objectives identified? Do the above goals and objectives align with the City's Transportation Plan?
- Are milestone decision points identified?

4.3.2 Set up Steering Committee

Committees that will be involved during the study process, need to be set up. It is very important to involve all decision makers for the process. The decision makers would mainly consist of representatives from the Government, stakeholders, champions and critics for the project. Participation of both the government the stakeholders, as well as understanding their priorities and concerns is extremely important. It would be important to involve key personnel of the agencies so that decisions can be made quickly avoiding bureaucratic log-jams. The representatives from these groups would form the different committees that would be involved during the course of the study. There is also need to have champions for the process, who are "unofficial" ambassadors and may provide access to hard-to-reach groups and increase credibility of the process and its findings. Last, but extremely crucial is include critics. They are potentially impacted by changes in the corridor, and there is need to have an agreement (at minimum), that the process is/was fair. During the AA process, documentation of all opinions is extremely important.

THE AA PROCESS –The main players

UMTA is the recommended agency to conduct the AA process.

The UMTA technical staff or consultants will perform the analysis.

Decision Makers

- Government
- Stakeholders
- Champions

There are three committees that need to be formed as part of the AA process: the policy committee, the citizen committee, and the technical committee. All three of these committees will be formed and coordinated by the UMTA. The recommended authority / lead agency in charge of coordinating the entire AA process is the UMTA. The AA staff are comprised of the UMTA technical team or consultants involved in conducting the analysis. They will be in constant coordination with the UMTA and the three committees.

Policy Committee: UMTA is the recommended lead agency to conduct and co-ordinate the AA process. It is the decision making body for all internal study milestones, including final project selection. It is the spokespeople/champions for the final decision. The UMTA will also act as liaison to other decision making bodies. The typical membership of this committee would be transit agency board members, local elected officials, State Transport Department officials and elected state officials. Other agencies that could be involved and also affected the corridor may include but not restricted to Public Works Department (PWD) officials, State Transport Undertakings (STUs) representatives, etc.

Technical Committee: The role of this committee is to advise policy committee on milestone decisions. It is responsible for scoping of the AA process. It would advise study staff on all technical issues, QA/QC for technical work. It would also represent, coordinate with other agency staff during the process. Typical membership would include but not restricted to Transit Agencies (e.g., service, operations), Local and State Traffic/Highway and land use planning departments, and also permitting agencies like Public works.

Citizen Committee: This committee provides two-way communications to stakeholders. It may advise, policy, technical committees. Typical

membership would include neighborhood associations, environmental groups, minorities, business associations, senior Citizen Groups, etc.

Checklist- Step 2- Set up Steering Committee

- Decision makers identified?
- Have all decision makers been contacted?
- Have the Committees been formed?
- Do the Committees understand their roles?
- Does the UMTA have technical expertise to do the AA or will it have to select a Consultant?

4.3.3 Review Technical Issues, Data, Models

Based on data available for the corridor/sub-area need to be gathered and evaluated by the lead agency.

Problem Statement: The problem statement needs to be identified. Problem statements are based on multi-layered analysis of performance deficiencies. It needs to be specific enough to be useful for defining and evaluating alternatives. It needs to be functional rather than facility based. Problem statements are NOT mode specific and is not defined as the "lack of" mode x, y, or z.

Identification of causes of performance deficiencies: After identifying and coming with the problem(s), the causes leading to the problem need to be identified. The problem is merely a symptom. The causes leading to this problem need to be identified in specific terms.

Why does the corridor/sub-area need improvements? What is the problem? The perceived problem(s) are identified in this step and also the causes for this problem is determined in specific terms. This will help evaluate the alternatives available to come to the best alternative that will best mitigate the identified causes to the problem(s).

Based on the above, The Authority (UMTA or the Planning Authority) need to spell out the context and also identify the different tasks for the

Checklist- Step 3- Review Technical Issues, data, models

- Problems identified?
- Causes for performance deficiencies?

Alternative Analysis- the Terms formulated, and the timeline for the completion of the AA process is also decided at this point. The Alternative Analysis time frame may vary project-wise. The average time-frame may vary from 6-12 months.

4.3.4 Define Scope of Services/work

This task will be initiated by the Authority (UMTA or the Planning Authority), where the purpose and the need statement are defined in specific terms. In other words, the Terms of Reference (TOR) need to be formulated at this stage. The budget and the timeline for the completion of the AA process are also decided at this point.

The detailed work plan for the Alternative Analysis needs to be formulated. The time-frame may vary project-wise. The average time-frame may vary from 8-12 months.

Example of problem statements

- Current transit travel times during the peak period 45-75 minutes vs 20-30 by car
- Corridor contains a significant percentage of transit dependents
- Significant percentage of corridor residents travel to CBD for jobs and services

Example of multi-layered problem analysis

1. Significant current congestion projected to worsen;
2. Significant corridor growth in population and employment;
3. Lack of continuous arterial highway grid;
4. Small and declining percentage of corridor trips with end in CBD/ more suburb to suburb travel pattern
5. Current transit system focused on CBD

Terms of Reference

- Establish Goals and Objectives
- Evaluate current problems, future challenges
- Evaluate Alternatives
- Decision of Mode and General Alignment

Checklist– Step 4– Define Scope of Services

- Terms of Reference
- Time frame/work plan for the study
- Budget
- Deliverables

4.3.5 Framing the evaluation process

The technical team forms the evaluation criteria which would include refining the issues suited to the corridor/area in context, setting up the evaluation criteria, setting up ranks based on the criteria, existing and future needs analyses, along with a Strength, Weakness, Opportunities and Threats (SWOT) analysis.

The technical team revisits the data, and information gathered, narrows into the study area/corridor and rechecks, the land use, travel demand models that are sensitive to the project issues. A reality check of the issues, models, and risks of the alternatives may be assessed at this point

(a) Set up Evaluation Criteria

To assess and compare alternatives, selection of evaluation criteria is very important. The key considerations for selection of evaluation include:

- Effectiveness and Comprehensiveness in Measuring Goal Attainment - Alternative strategies should contribute to the achievement of accepted transportation-related goals and objectives for the city.
- Conform to NUTP – The alternatives should conform to NUTP objectives and guidelines
- Ability to Reflect the Specific Nature of the Alternatives - The recommended screening and evaluation measures should be relevant to the need to evaluate alternative transportation strategies in isolation, as well as in combination. These measures need to be capable of reflecting interactions between transportation and other factors, such as land use and the environment, and among travel modes.
- Realistic in Terms of Technical and Resource Requirements - The computation of measures should allow for efficient use of available data and provide comparable levels of detail, both among different screening and evaluation categories and across alternative strategies.
- Relevance for Policy Evaluation - The total number of screening and evaluation measures is reasonable and allows for thorough coverage of key goals and issues. Where possible, quantitative as opposed to qualitative methods may be employed to depict potential effects in an objective manner

The different factors that are considered for evaluation of alternatives are:

- Mobility Effects– These criteria relate to travel demand and facility capacity, presence/absence of different modes, access, connectivity and circulation.
- Economic Effects-To identify and quantify the benefits and costs associated with the project to help in identification of the optimum solution along with the economic viability in terms of its likely investment return potential. Direct economic benefits such as road user benefits should give priority to people and not vehicles (as in NUTP). Indirect benefits such as improvements law and order, improvements in environmental standards, accessibility to opportunities for the urban poor, etc. also need to be assessed. As indirect benefits are difficult to be quantified, they are usually ignored in economic analysis and this should not be the case.

Possible Data Sources

- Comprehensive Development Plan
- Comprehensive Mobility Plan
- Master Plans
- Feasibility Studies
- Other Relevant Studies

- Environmental Effects (Land Use & Natural Environment) - Criteria assessing environmental impacts related to land-use and natural environment such as water, air etc. Land use alternatives may be evaluated based on their effects on land use patterns/land use compatibility. Also potential land development opportunities should be taken into account. Each of the alternatives' effects on air quality, noise, energy consumption, disturbances to floodplains, hydrology, water quality, and water resources. The effects on

disturbances to wetlands/jurisdictional waters, effects on/from potential hazardous materials sites, and on threatened & endangered species/wildlife habitat need to be evaluated.

- Social– The social impact of the alternatives is evaluated to see potential social costs and benefits, including impacts on livelihoods , and shelter and mobility of the urban poor. Effects on known historic, archaeological, and cultural resources, impacts of dislocation and rehabilitation –both residential and commercial, effects on major utilities, effects on neighborhood and business access and circulation.
- Cost Effectiveness & Affordability-The capital and annual costs associated with each of the alternatives are evaluated. It also assesses the cost-effectiveness and affordability of the alternatives.
- Construction Effects– Displacements and resettlements needed due to construction, other impacts to the area due to construction are assessed here. Impacts to the corridor/sub-area during the construction phase of the projects also need to be assessed. For example, short-term construction related disturbance to sites known to contain contaminated and/or hazardous materials, or other disruptions to existing traffic and services such as transit routes/rail services, etc.
- Other Factors and trade-offs– How each of the alternatives comply with local policies, priorities are assessed and trade-offs with other city priorities that are impacted as a result of this investment.

(a) Establish Ranks

After all the evaluation criteria have been established, each alternative needs to be ranked based on the values/performance of each of the criteria. As in a grading system, a scale of range 1-5 may be used, with the negative effects having the least ranking and the positive effects the maximum ranking.

(b) Existing and Future Needs Analysis

To build up on the existing information available (CTTS, CMP, and other studies) and also to do some reality checks, relevant surveys and ground counts may be relevant at this point. Identifying the data needs, for the corridor, to assess the existing condition is important. Also, to assess the future, a No-Build (if nothing is done to the corridor) scenario is set up in the travel demand modeling process, which basically updates the network to include all improvements to the network that are to be completed by the horizon time period (15 years) along with the forecasted traffic, but without any improvements to the project corridor.

(c) SWOT Analysis

A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis is a highly effective way of identifying Strengths and Weaknesses (existing conditions) and also your Opportunities and Threats (possible future conditions). Carrying out this type of analysis will assist an entity to focus on the areas where it is strong and where the greatest opportunities exist. SWOT Analysis when done in a realistic and candid way, it can be very informative – both in terms of pointing out what needs to be done, and in putting various issues into proper perspectives.

STRENGTHS	WEAKNESSES
Advantages of the project: <ul style="list-style-type: none"> • Carrying capacity • Cost • ROW availability • Constructability • Sustainability 	Drawbacks- <ul style="list-style-type: none"> • Too expensive- the tradeoffs • Too much ROW requirements • Adverse environmental impacts • Adverse social impacts
OPPORTUNITIES	THREATS
Areas of good opportunities <ul style="list-style-type: none"> • Mixed use planning • Property development • Piggy back projects 	Obstacles <ul style="list-style-type: none"> • Major policy challenges • Strong opposition to the project by NGO, neighborhoods associations

Checklist– Step 5– Identification of Alternatives

- Plan and Design Standards
- Operational Plans for each alternative all having same parameters
- Screening needed? Yes – for > 10 alternatives/No – for < 5 alternatives
- What are the criteria, depending on screening level
- Ranking Scale

4.3.6 Identification of Alternatives (Conceptual)

For evaluation the alternatives each of the alternatives need to be defined with sufficient details. The details of each alternative need to be spelled out w.r.t. operating plans and design standards. How each of the alternatives adhere to the existing transport policies also need to be assessed. Preliminary evaluation will be based on the conceptual design alternatives along with their operating plans. The conceptual plan with the operating plan parameters will help build up the travel demand forecasting model in order to assess the impacts of each of the alternatives.

(a) Design Standards

Each alternative needs to be designed for compliance with applicable design standards such as:

- IRC Design Standards, Guidelines and Codes, Non-Motorized & Pedestrian Guidelines, as available
- AASHTO-2003 – A Policy on Geometric Design of Highways and Streets
- Other Relevant Standards

Design standards followed for doing pre-feasibility/feasibility studies or DPR I may be followed.

(b) Operating Plans

Operating Plans need to be developed at level of detail necessary to develop rider ship projections in a Travel Demand Model. These projections will help evaluate impacts of each of the alternatives and how they compare against each other. Operating plan parameters may include fare assumptions (Highlight Fare increase/decrease), parking assumptions, approximate alignment, route network-feeder and trunk, station/stop locations and relocations, runtimes, headway and frequency (Peak and Off Peak).

(c) Policies

The alternatives need to be consistent with the National Urban Transport Policy (NUTP). The NUTP is a multi-prolonged approach that revolves around the following issues:

- Pedestrian Facilities and pathways
- Non-motorized Vehicles
- Priority to the use of public transport
- Integrating land-use and transport planning
- Integrated public transit system
- Parking
- Freight Traffic
- Capacity building
- Pollution Reduction

(d) Screening Process

All alternatives identified with operational plan parameters could go through a screening process based on the evaluation criteria created in the earlier step. (see Step 5. Evaluation Criteria). This screening process filters alternatives that are unreasonable, not related to the goals and objectives, or have apparent fatal flaws. This step is optional and is based on the total number of alternatives that are available. If the number of alternatives is greater than 10, the screening process is required. If the number of alternatives is less than 5, the screening process may not be required. However, the Do-Nothing and TSM Alternative need to make through for detailed analysis in all cases.

Good Practice

- As part of good practice, it is imperative that the following Alternatives be included as part of the detailed AA.
- Do Nothing Alternative -It provides a good baseline to compare the benefits of the project
- Transportation System Management (TSM) Alternative-It helps describe relative benefits of low cost alternatives. TSM measures include low cost up gradation to the existing system, travel demand management and also ITS Applications.

Preliminary Screening: Alternative development starts with defining alternative categories. From the master list of alternatives, alternatives can be grouped under categories such as TSM alternatives, land –use alternatives, transit alternatives (can be further grouped under alignment, technology), interchanges, corridor lane types, etc.

Preliminary analysis is a reality check that eliminates alternative elements that do not have a realistic chance of being designed and built. Yes-or-no questions can be used to evaluate alternatives during this step. Alternatives screened individually to see whether goals are achieved (e.g. mobility, safety, access, capacity, etc.). Elements not eliminated in initial screening are then refined and evaluated in comparative screening. Elements not eliminated in initial screening are then refined and evaluated in comparative screening.

Elements not eliminated in initial screening are then refined and evaluated in comparative screening.

Comparative screening: It looks in more detail at elements. It determines if some are clearly better than others. A qualitative (good/better/best) approach or some quantitative (preliminary) screening can be used to decide the elements within each category that are more effective at meeting purpose, need, or practicability.

Detailed Screening: It is a quantitative (measure-based) analysis. It identifies the strength of the various alternatives. The elements that remained after the second level of evaluation, comparative screening, can be combined to create several corridor-wide alternatives. The detailed analysis of the alternatives will be done in the next step where all impacts of each of the short-list alternatives will be evaluated as per the evaluation criteria (Step 5) and rating scale.

CASE STUDY: South Miami-Dade Corridor, Florida, USA (29)

Study Area

Corridor along U.S. 1 (South Dixie highway) from the Dadeland South Metrorail station south to its intersection with Florida's Turnpike in Florida City. It is one half mile in each direction from the center line of U.S. 1, a multilane highway in Miami Dade county, Florida. The total length is approximately 20 miles.

Goals

- Improve corridor mobility
- Improve citizen access to employment
- Improve corridor safety and improve operating efficiencies
- Reduce auto dependency
- High quality and cost-effective transit service
- Modify development patterns in the corridor to support transit
- Develop plans for incremental increase of transit infrastructure

Objective

To develop a staged program of transit improvements in the corridor that helps in mobility between residential areas and employment concentrations.

Alternatives

Alt 1: No build

Alt 2: Transportation system management

Alt 3: Light rail transit to Florida City

Alt 4: Metrorail to Southland mall/ BRT from Dadeland south to Florida City

Alt 5: Metrorail to Florida City

Alt 5A: Hybrid Metrorail to Florida City

Alt 6: Metrorail to SW 104th street / BRT form Dadeland south to Florida city

Alt 7: Diesel multiple unit (DMU) on CSX/ Kendall drive and maintain operation on existing busway

Evaluation Criteria

1. Comparative Screening: Ridership, Cost, and travel time
2. Detailed Screening
 - a. Travel time
 - b. Ridership Cost
 - c. Number of north/ south travel options
 - d. Travel time
 - e. Headways
 - f. Transit routes serving rail
 - g. Future employment and population near stations
 - h. Total capital cost
 - i. System operating cost
 - j. Car/ transit conflict points
 - k. System connectivity
 - l. Transit ridership or trips

- Alternatives 4 and 7 were eliminated by the comparative screening process.
- Alternatives 3, 5 and 6 were recommended for detailed further analysis.

(Source :www.miamidade.gov/mpo/docs/MPO_southlink_aa_200606_es.pdf)

Checklist– Step 6-Identification of Alternatives

- Plan and Design Standards
- Operational Plans for each alternatives all having same parameters
- Screening needed? Yes-for >10 alternatives/No – for < 5 alternatives
- The criteria, depending on screening level
- Public Meeting notification

4.3.7 Final Definition of Alternatives

In this step, detailed analysis of the short listed alternatives is conducted. The various aspects of the detailed analysis include conceptual engineering parameters, operational planning parameters, and travel demand forecasting. All these three components feed into each other in order to come up with relevant measures/evaluation measures against which all the alternatives might be compared.

Conceptual Engineering: During Conceptual Engineering (CE, 10% design level) the project definition is further refined. This involves additional study of the following project elements:

- Project alignment options and details
- Station locations, including design elements and configuration
- Demand for Park-and-Ride lots along the corridor
- Operating and transit service plan, including interface between bus and other rail services

Operational Planning: Operation Plan may include all the criteria included in the evaluation criteria, such as transportation impacts, land use impacts, environmental and social impacts, capital and operating costs, economic evaluation and financial planning.

Traffic engineering - Existing and future traffic conditions, including recommendations for grade separations and other modifications to the existing roadway network, right-of-way needs, Transportation System Management (TSM) alternative, existing and future transit ridership,

The above parameters are suggestive and there may be more parameters that need to be considered depending on the nature of the alternative.

It is prudent to assess the extent of the depth in analysis of the above parameters based on the project conditions. Suggestive approaches are indicated below.

(a) Transportation Impacts

The different performance measures are attributed under the following factors.

- Anticipated travel demand
- Transportation capacity
- Transportation performance measures
- Impacts to the road network
- Other impacts such as parking and freight delivery

(b) Land Use Impacts

Land use plays a critical role in transportation projects. Land use is a driving force for transportation and vice-versa. In assessing land use impacts of the transportation alternatives, the guidelines include the following.

- Assess secondary impacts of each alternative: The forecast of the extent of induced land development need to be estimated from each of the alternative. There is need to assess the environmental, traffic and other impacts of induced land use changes.
- Assess land use opportunities of each alternative: There is need to consider each alternative's potential to have positive land use impacts consistent with local comprehensive plans. Each alternative needs to be supportive market and policy setting. There is need to consider available land that is attractive to developers. Also any adverse effects (traffic, environment, opposition) need to be considered.
- Evaluate supporting policies: Local policies need to be influenced if an alternative has the potential to positively impact the corridor/sub area. For example, influencing local land use and other policies to encourage Transit Oriented Development (TOD) around stations have involves station area planning and change / develop policies and ordinances. This may help public transit ridership to increase along the corridor.

An evaluation matrix can be used to evaluate and compare land use impacts. It should reflect the city's/regional goals and objectives. Each alternative need to be rated to indicate how much it supports or contradicts each objective.

When conditions are simple, and time is a constraint, it might be useful not to go in-depth into the conceptual engineering parameters. However, it is important to select the parameter that will bring out the nature and the benefits of all the alternatives. In this case, for example no more detail than typical cross-sections and alignments may be shown. Block costs may be calculated based on unit costs.

In problem areas and hard spots, the analysis needs to be more detailed. Special studies need to be done. Sometimes small changes such as geometric uncertainties, potential disruptions, transitions, etc. may lead to large costs.

(c) Environmental Impacts

For the AA process a detailed Environmental Impact Assessment (EIA) is not necessary. An Initial Environmental Examination (IEE) is adequate for this purpose. The IEE process is detailed below.

- Screening / Scoping: Screening is done to see whether a project requires environmental clearance as per the statutory notifications (MOEF) and the scope of the assessment process. Scoping is a process of detailing the terms of reference for impact assessment. Various aspects of physical features, ecological resources, and economic development, including Land Use, Industry and Agriculture, Infrastructure, Transportation, Power Supply and socio cultural characteristics such as Demography, History, Culture, and Tourism are identified during this process. It is based on the secondary data collected; impacts and consequences on the various aspects mentioned above are studied and monitored in detail. It also evaluates the impacts due to the location, design, construction, operation and maintenance of the project.
- Environmental Management Plan: Various mitigation measures are devised to ease the negative impacts that have been encountered during the study. The EMP is prepared detailing out the institutional mechanisms, responsibilities, timelines and the costs and funding involved in the project.
- IEE Report: Contents of an IEE report is generally in accordance with terms of reference established during the scoping process.

Inputs of a multi-disciplinary team are required to prepare an IEE report (environmental planners, engineers, ecologists, social scientists, hydrologists, legal experts, etc.).

- The decision-making process involves consultation between the project proponent and the impact assessment authority. Monitoring should be done during both construction and operation phases of a project. This is not only to ensure that the commitments made are complied with but also to observe whether the predictions made in the IEE reports were correct or not.

(d) Social Impact Assessment

Preliminary social impact assessment (SIA) for each of the alternatives is adequate for the AA process. The steps are detailed below.

- Identification/study of project alternatives from social impact perspective, and identification of project influence area
- Secondary Data Collection – Demographic and socio-economic data.
- Transect Walk - A very small survey is done to assess the number of affected households and the types of losses.
- Development of a resettlement framework based on assessment of impacts and discussions with the affected community and project proponents.
- Development of a Short Resettlement Plan, with an implementation and monitoring program and a grievance redressal process.

(e) Economic Evaluation

Economic evaluation consists of economic costs and benefits. It involves estimation of the costs of each of the project alternatives, estimation of project benefits in monetary value, and deriving a relationship with respect to the costs involved. Economic analysis techniques include Benefit-Cost Ratio, Net Present Value, Cost-Effectiveness, Internal Rate of Return and Payback Period.

(f) Financial Planning

Financial planning is one of the major aspect of a project. Lack of financial planning can lead to the failure of a project with huge loss in resources. The financial analysis of each alternative determines whether each of the alternatives is affordable in the context of the system and the Region. It involves development of a Financial Plan, keeping in mind the risks, uncertainty and how to manage it. The financial analysis of each alternative consists of the cash flow analysis incorporating all sources of funds. The cash flow analysis shows annual cash flow and balances by combining Capital Finance Plan with Operating Finance Plan.

Development of Financial Plan: The contents of a Finance Plan may include:

- Capital Finance Plan- Project Development/Capital Costs and Capital Revenue
- Operating Finance Plan- O& M Costs and Revenue
- Cash Flow Evaluation
- Sensitivity Analysis

Capital Finance Plan	Operating Finance Plan
<ul style="list-style-type: none"> • Capital costs • Project Schedule • Capital Revenue • JnNURM Funds • State/Local Agencies • Debt Financing-interest rates, financing terms 	<ul style="list-style-type: none"> • O & M Costs • Operating and other revenues • Central Funds • State local sources • Fare revenues • Joint development/Advertising • Interest Income

O&M Cost models have the following tasks.

- Decide on key service variables
- Calculate unit cost factors for each service variables
- Calculate Annual O& M Costs = \sum (Unit Cost * Service Variable)

(a) Sensitivity Analysis

Sensitivity analysis needs to be examined under the following scenarios to assess the impacts of risks and uncertainties:

- Lower revenue growth
- Lower Central/State Funds
- Higher Capital and/or O& M Costs
- Inflation
- Interest Rates

(b) Travel Demand Forecasting

Travel Demand Forecasting is a simplified representation of real world systems. It allows projections of future traffic conditions. It determines expected demand and supply conditions that will help shape decisions on future infrastructure needs and policy measures. It helps project future transport growth. It is a useful tool that allows planners to run projections across many different scenarios. The evaluation criteria derived from the Travel Demand Forecasting process could be further used as input for deriving evaluation criteria for economic analysis, cost estimates, and also financial analysis.

(c) Supporting Documentation:

All assumptions that form the basis of the financial analysis, such as economic forecasts, historical revenue, and cost data need to be well documented. Funding sources or funding sources enabling legislation, other documentation on commitment of funds, etc. need to be attached along with the financial plan.

4.3.8 Public Review Process

An inherent part of the AA process is the involvement of the public. Public input into the selection of the most suitable alternative is vital to the success of the process.

All milestones require consensus and documentation

(a) Milestones

The public review process for the AA process may be conducted around two milestones.

1. Final Definition of Alternatives: After all the short-listed alternatives have been analyzed and evaluation criteria clearly defined, these need to be presented to the public in a public meeting. In the public meeting, all the short-listed alternatives need to be presented with the evaluation criteria clearly defined for each of the alternatives. Public input/feedback regarding the alternatives will be solicited within a certain time frame to be sent to the lead agency (UMTA). The UMTA will consider all the public preferences and concerns regarding each of the alternatives, before making a decision on the best or the preferred alternative.
2. Selection of Preferred Alternative: After public feedback has been incorporated by the UMTA and the preferred alternative has been selected, the second public meeting is convened to let the public and other stakeholders know the project that has been selected. This meeting entails that all documentation justifying the selection of the project be presented.

(b) The Process

The Public Review process can be conducted by the following means.

- Project Coordination with Citizen Committee may be done using email, letter ensuring adequate dissemination of information, so that work group members are better equipped to make informed.

Checklist- Step 7- Final Definition of Alternatives

- Conceptual Engineering Plans, Drawings
- Travel Demand Forecasting
 - Base Year Model
 - Forecast Model
- Operational Planning
 - Transportation Impacts
 - Land Use Impacts
 - Environmental Impacts
 - Social Impacts
 - Economic Impacts
 - Project Development
 - Costs/Capital Cots
 - O &M Costs

NUTP-Need for Public Awareness and Cooperation

“Urban Transport policies cannot succeed without the fullest co-operation of city residents. Such cooperation can be best secured if the objective of any initiative is made clearly known to them.”

- Public Meetings may be done at the milestones identified. A letter in advance of each public meeting notifying all persons on the mailing list. In addition to this, newspaper advertisements may be placed in the local newspapers a minimum of 30 days in advance of the scheduled meeting, followed by similar advertisements 10 days prior to the meeting. Feedback may be asked from the public within 2 weeks of the meetings.
- Newsletters: Project newsletters may be produced and distributed throughout the alternatives analysis. The newsletters will provide general project updates, including information such as the dates, times and locations of upcoming public meetings.
- Webpage: A project website need to be developed where all project information will be posted to include:
 - o Information on the alternatives analysis process,
 - o Upcoming meetings
 - o Contact information, and
 - o General information about the study area.

The major focus of this step is to keep the public informed during the study process. The whole process need to be well-documented and clearly presented to the public, along with incorporating their relevant feedback into the AA process to select the best /preferred alternative.

Checklist– Step 8– Public Review Process

- Have all the stakeholders been identified?
- Decide on mode of contact, meeting date
- Decide on public meeting dates
- Inform public about the feedback process-time frame, format etc

4.3.9 Evaluation

After all the short-listed alternatives have been analyzed, with the evaluation criteria defined, the stage is set for the process of evaluation of the alternatives. The inputs to the evaluation process include the following.

- Objectives based on Goals: Goals and objectives identified in Step 1 of the AA process, need to be aligned to the evaluation criteria.
- Evaluation Criteria: Evaluation Criteria identified in Step 5 and analysis of the results related to the evaluation in Step 7, the evaluation matrix is ready to compare alternatives.
- Ranking / Scores: Once the values of the performance measures of evaluation criteria have been established, the alternatives need to be ranked/scored based on the ranking scale (1– Poor to 5-Excellent).

The evaluation process is described below.

The Process

The process is suggestive and the evaluation process can be set up in a different way depending on the project alternatives. However, the following are the steps involved in the process.

Step 1-Performance measures' numeric values may be grouped into three ranges, corresponding to the rating scale 1-5, where 1-Excellent and 5-Unacceptable. The grouping may be done in a way that avoids overstating the difference between closely grouped alternatives.

Step 2- The scores (1-5) generated for each performance measure may be aggregated to create a single score for each evaluation criterion. The aggregate scores for each alternative may be then rated again using the same rating technique in step 1.

Step 3-A composite score for each evaluation criteria may be computed by adding the ratings for each performance measure, calculated in step 2. Each evaluation criteria may be rated again using the 1-5 scale.

Step 4-The composite ratings for each category may be then summed into an aggregate score for each alternative. This score may be the basis for comparing alternatives.

Checklist– Step 9– Evaluation

- Rating Scale
- Performance Measures to be evaluated
- Grouping of Performance measures
- Composite Score of each evaluation category by alternative
- Final Score – Sum of score of all evaluation categories by alternative

4.3.10 Selection of Preferred Alternative

After the evaluation matrix has been set up and scores given to each of the evaluation criteria and total scores for each of the alternatives calculated, the public review process sets in. The first public meeting needs to be convened at this stage. The first public meeting is where presentation of the short-listed alternatives with all the evaluation criteria and all performance measures under each criterion for all of the alternatives is done and public feedback/opinion on all alternatives is sought.

The public may be asked to send all their views, concerns etc. to UMTA within 2 weeks of the first public meeting. Once their feedback is received the UMTA along with the committees will make the decision of the preferred alternative. At this stage, when the final project has been selected out of the short-listed alternatives list, the second public meeting is held. Here the details regarding the process of the selection of the Preferred Alternative is presented, along with the selected Preferred Alternative, justifying the case. The detail of this Preferred Alternative is presented in this meeting.

Checklist– Step 10-Selection of the Preferred Alternative

- Evaluation Matrix with all supporting documents
- Public Feedback
- Decision on Preferred Alternative
- Public Meeting notification

4.4 Conclusion

Alternative Analysis is about informed decision making, when a “choice” needs to be made regarding transport alternatives, for a city or a corridor. It ensures that all feasible alternatives are considered and their impacts analyzed and stakeholders are involved in the “choice-making”, to select the locally preferred alternative. Alternative Analysis makes the case for a project much stronger and thus paves way for better and faster access to Government and other funds.



By the end of this Chapter, the reader should be able to

- Know what is bench marking and why is it needed?
- Understand the benefits and use of bench marking
- Prepare a 'Performance Report Card' for their projects in cities
- Data requirement and how to collect them

5.1 What is Benchmarking?

Benchmarking is a tool used by public entities to make more informed decisions regarding the performance, make comparisons internally and with other organizations/entities and continuously improve performance using the lessons learned through this comparison process. Benchmarking allows public entities to direct limited resources to the program (30). Benchmarking helps to establish baseline measures of performance, and helps monitor the entities' individual performance over time, and also how it compares with the other entities, and also improving performance by sharing of lessons learned from different entities.

In the context of urban transport in India, gaps in service delivery by government entities at various levels has been recognized as a major challenge. In order to introduce accountability in service delivery, there is need for appropriate systems for information management, performance monitoring, and benchmarking. Benchmarking is required to help Urban Local Bodies (ULBs) and other agencies in identifying performance gaps and effecting improvements through the sharing of information and best practices, ultimately resulting in better services to the people. The Ministry of Urban Development (MoUD) wants to address institutional and operational aspects for ensuring long term sustainability of the benchmarking activity. Accordingly all JNNURM mission cities are advised to undertake the process of service level benchmarking. The aim of this benchmarking process is to provide: Common minimum framework for monitoring and reporting on service level benchmarks.

- Guidelines on how to operationalize this framework in a phased manner.

This initiative will facilitate development of Performance Improvement Plans using information generated by the benchmarking exercise. It will address both, performance monitoring for internal decision making and reporting to higher levels of government and also external stakeholders.

5.2 The Need

NUTP 2006 highlights the crucial link between transport demand and land use planning and the need to develop an integrated mobility plan for each city. Accordingly, each city should develop comprehensive mobility plan during the 12th five year plan with focus on accessibility, mobility and traffic flow (in that order). Rather than the present approach of "predict and provide" it has to be "Planning for the desirables" (31). However, there need to be some yardstick to measure and compare the effectiveness of policies and urban projects across cities. Urban agencies in India currently do not have any system for measuring performance of urban transport activities, assessing impacts of projects and taking further action on them. The service level benchmarks issued by MOUD specify parameters to measure the effectiveness of land use-transport planning.

The needs of cities are different, and so depending on the specific needs of a city, performance parameters can be defined and used to improve the quality of urban transport.

5.3 The Benefits

Service level benchmarking for urban transport will help identify general short comings in infrastructure and service delivery and also assist State/City authorities to track their performance improvement, and help assess the impact of investment made in urban transport. It will also guide in formulating a general policy for future interventions and investment requirements in urban transport. It can also be used as a model that can be replicated in other cities across the country. Benchmarking will help the Government of India, in decision making ensuring optimum allocation of resources and their utilization by the cities.

5.4 Objectives

To facilitate comparison between cities and changes in performance over time, it is important that the performance levels are monitored against set benchmarks. It is in this context, that the MoUD has initiated an exercise to define Service Level Benchmarks (SLBs). Benchmarking is a long term continual process, the need to be at regular intervals. It involves a number of successive steps as shown in the benchmarking wheel below

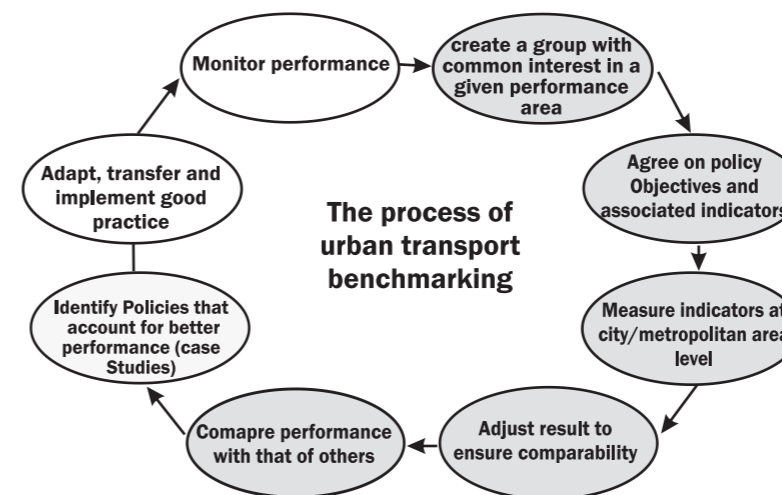


Figure 5.1: The process of urban transport benchmarking (32)

The Handbook on Service Level Benchmarks is a ready reckoner of sorts to enable ULBs and other city level parastatal agencies implement systems for measuring, reporting and monitoring the SLBs. For consistency and relevant comparison between cities, the handbook has standardized the definition and computation methodology of the selected SLBs. The details of the specific name, the unit of measurement in which the performance is to be measured, and definition for the benchmarks along with the specific surveys and area which need to be covered for each benchmark has been provided in the Handbook.

The Framework

- Service Level – Refers to level of service, not quantity of assets
- Benchmarks-Specifies service delivery goals that should be achieved
- Standardized-Indicators as per uniform definitional framework and Gol intends to integrate these with all future programs

5.5 Performance Benchmarks for Urban Transport

Service level performance benchmarks have been identified for the following areas of intervention:

1. Public transport facilities
2. Pedestrian infrastructure facilities
3. Non-motorized Transport (NMT) facilities
4. Level of usage of Intelligent Transport System (ITS) facilities
5. Travel speed (Motorized and Mass Transit) along major corridors
6. Availability of parking spaces
7. Road safety
8. Pollution levels
9. Integrated land use transport system
10. Financial sustainability of public transport

The parameters highlight the performance as would be monitored by the Urban Local Bodies/Development Authority/Parastatal Agency. These performance measurements will need to be carried out by the service delivery agencies themselves, reported to higher levels of management and also disseminated widely to the citizens. Standardized definitions and methodologies are expected to eliminate inconsistencies in measurement and reporting.

For establishment of a benchmark, the following process is followed:

- Collection of Primary Survey and Secondary data

³Abridged from Service Level Benchmarks for Urban Transport at a Glance, MoUD, GOI

- Detailed analysis of data
- Establishment of LOS for indicators under each benchmark
- Calculation of overall LOS
- Compilation of Report card
- Stakeholder Consultation

Typically, four levels of service (LoS) have been specified, viz. 1, 2, 3 and 4 with 1 being the highest and 4 being the lowest LoS to measure each identified performance benchmark. Therefore, the ideal service level is 1. A summary of the different benchmarks has been illustrated below. Details regarding the benchmarks may be found in the Handbook.

There is also a reliability scale of the information /data used to calculate the benchmarks. The highest reliability being a scale of A, the lowest being D is illustrated in table 5.1.

Table 5.1: Reliability Scale

Reliability of Data Measurement	
Reliability Scale	Description of method
Lowest level of reliability (D)	Based on some information collated from secondary sources.
Intermediate level(C)	Only information collected from city authorities / different agencies without any checks.
Intermediate level (B)	Only surveys are undertaken
Highest/preferred level of reliability (A)	All the data for above mentioned performance parameters is collected/measured as mentioned above. Field observers should be properly trained, data formats provided, and observations be properly tabulated. Actual surveys are undertaken which are either carried out by or verified by the independent agencies.

The data requirements for the above performance measures are:

Service level Benchmark (SLB)	Area to be covered	Primary Survey Required
1. Public Transport facilities	Key public transport corridors along the city	<ul style="list-style-type: none"> • Boarding Alighting at major bus stops of identified routes • Passenger count inside the bus on identified routes
2. Pedestrian Infrastructure facilities	Arterial roads* / sub arterial roads / Key Public transport corridors along the city	<ul style="list-style-type: none"> • Collect phasing plan of a Signalized intersections in a city • Measurement of intensity of street light by lux meter • Footpath length having minimum width of 1.2m or more
3. Non -Motorized Transport (NMT) facilities	Arterial roads / sub arterial roads / Key Public transport corridors along the city	<ul style="list-style-type: none"> • Dedicated NMV track having minimum width of 1.5m or more • Measurement of parking area on dedicated Cycle track • Signalized Intersection count
4. Level of Usage of Intelligent Transport System (ITS) facilities	City Municipal area / Planning boundary	<ul style="list-style-type: none"> • Count of Signalized intersections, bus stops, terminals, metro stations etc
5. Travel speed (motorized and mass transit) along major corridors	Arterial roads / sub arterial roads / Key Public transport corridors along the city	<ul style="list-style-type: none"> • Speed and delay • Journey time of bus at identified bus route
6. Availability of Parking spaces	Arterial roads / Sub arterial roads/ Key Public transport corridors along the city	<ul style="list-style-type: none"> • Parking survey
7. Road Safety	City Municipal area / Planning Boundary	Nil
8. Pollution levels	City Municipal area / Planning boundary	Nil
9. Integrated Land Use Transport System	City Municipal area / Planning boundary	<ul style="list-style-type: none"> • Land use observation survey along transit corridors • Total length of roads having ROW 9m and above • Total length of roads having exclusive BRT/Metro/LRT
10. Financial Sustainability of Public Transport by bus	ULB / Parastatal agency	Nil

The survey locations and detail data analysis of each survey should be captured in report so as to maintain consistency in measurement or survey locations over time.

All of the performance benchmarks have certain parameters articulating the need, reliability of data, the frequency of measurement and the jurisdiction for which it should be measured.

1. Rationale for the benchmark: For each performance benchmark, the overall significance and rationale for assessing and monitoring has been provided. The benchmark value has been specified in all cases.
2. Reliability of measurement: The performance assessment can be scaled on reliability wherein casually collected information from secondary sources would result in lowest level of reliability (D) and information collected by conducting detailed survey on the field would qualify as being the highest / preferred level of reliability (A).
3. Frequency of measurement: For each benchmark, the minimum frequency at which the performance should be measured is annually. Frequency of reporting would also be annually.
4. Jurisdiction of measurement: This refers to the geographic jurisdiction for which performance should be measured. The Jurisdiction area for measurement is as follows:
 - o Class 1 cities - Planning Boundary
 - o Class 2 and 3 cities - Municipal area boundary

The ten Service Level Benchmarks defined by the Ministry of Urban Development are summarized below. For detailed information, refer to the Handbook on Service Level Benchmarks from the Ministry of Urban Development, Government of India.

5.5.1 Public Transport Facilities

Table 5.2: Indicators to calculate City-wide Level of Service (LoS) of Public Transport Facilities

Level of Service	1. Presence of Organized Public Transport System in Urban Area (%)	2. Extent of Supply Availability of Public Transport	3. Service Coverage of Public Transport in the city	4. Average waiting time for Public Transport users	5. Level of Comfort in Public Transport	6. % of Fleet as per Urban Bus Specification
1	> = 60	> = 0.6	>= 1	< = 4	< = 1.5	75 - 100
2	40 - 60	0.4 - 0.6	0.7 - 1	4 - 6	1.5 - 2.0	50 - 75
3	20 - 40	0.2 - 0.4	0.3 - 0.7	6 - 10	2.0 - 2.5	25 - 50
4	< 20	< 0.2	< 0.3	> 10	> 2.5	< = 25
The calculated level of Service (LoS) of Public Transport facilities = (LoS1 + LoS2 + LoS3 + LoS4 + LoS5 + LoS6) and identify overall LoS as mentioned below						
Overall LoS	Calculated LoS	Comments				
1	< 12	The City has a good public transport system that is wide spread and easily available to the citizens. The system provided is comfortable.				
2	12 - 16	The City has public transport system that may need considerable improvements in terms of supply of buses/ coaches and coverage, as many parts of the city are not served by it. The frequency of the services available may need improvements. The system provided is comfortable.				
3	17 - 20	The City has a public transport system which may need considerable improvements in terms of supply of buses / coaches and coverage as most parts of the city are not served by it. The frequency of the services available needs improvements. The system provided is not comfortable as there is considerable over loading.				
4	21 - 24	The city has poor or no organized public transport system				

5.5.2 Pedestrian Infrastructure Facilities

Table 5.3: Indicators to calculate City-wide Level of Service (LoS) of Pedestrian facility

Level of Service	1) Signalized intersection delay (%)	2) Street Lighting (Lux)	3) % of City Covered
1	< 25	> = 8	> =75
2	25 - 50	6 - 8	50 - 75
3	50 - 75	4 - 6	25 - 50
4	> = 75	< 4	< 25
Overall Level of Service of Pedestrian Infrastructure facilities City wide			
The calculated Level of service (LoS) for pedestrian infrastructure facilities = (LoS1 + LoS2 + LoS3) and identify overall LoS as mentioned below:			
Overall LoS	Calculated LoS	Comments	
1	3 - 5	The City has adequate barrier free pedestrian facilities at overall road network.	
2	6 - 8	The City has pedestrian facilities, which may need some improvements in terms of improvements in intersections, footpaths, and street lighting, as some parts of the city are not served by it. The footpath available needs improvements. The system provided is comfortable and sustainable	
3	9-10	The City has pedestrian facilities that may need considerable improvements. The pedestrian facilities at intersection, availability of footpath etc. needs improvements as many parts of the city are not served by it.	
4	11 - 12	The city lacks adequate pedestrian facilities	

5.5.3 Non-Motorized Transport (NMT) Facilities

Table 5.4: Indicators to calculate City-wide Level of Service (LoS) of NMT facilities

Level of Service	1. % of network covered	2. Encroachment on NMV roads by Vehicle Parking (%)	3. NMT Parking facilities at Interchanges (%)
1	> =50	< =10	>=75
2	50 - 25	10 - 20	50 - 75
3	25- 15	20 - 30	25- 50
4	< 15	> 30	< 25
Overall Level of Service (LoS) of Non-motorized facilities (NMV) City-wide			
The calculated level of service (LoS) of Non-motorized facilities is = (LoS 1 + LoS 2 + LoS 3) and identify overall LoS			
Overall LoS	Calculated LoS	Comments	
1	3 - 5	The City has adequate barrier free pedestrian facilities at overall road network.	
2	6 - 8	The City has pedestrian facilities, which may need some improvements in terms of improvements in intersections, footpaths, and street lighting, as some parts of the city are not served by it. The footpath available needs improvements. The system provided is comfortable and sustainable	
3	9-10	The City has pedestrian facilities that may need considerable improvements. The pedestrian facilities at intersection, availability of footpath etc. needs improvements as many parts of the city are not served by it.	
4	11 - 12	The city lacks adequate pedestrian facilities	

5.5.4 Level of Usage of Intelligent Transport System (ITS) facilities

Table 5.5: Indicators to calculate City-wide Level of Service (LoS) of Intelligent Transport System

Level of Service	1. Availability of Traffic Surveillance (%)	2. Extent of Supply Availability of Public Transport	3. Global Positioning System / GPRS (%)	4. Signal Synchronization (%)	5. Integrated Ticketing System (%)
1	> =75	> = 0.6	> =75	> =75	> =75
2	50 - 75	0.4 - 0.6	50 - 75	50 - 75	50 - 75
3	25 - 50	0.2 - 0.4	25 - 50	25 - 50	25 - 50
4	< 25	< 0.2	< 25	< 25	< 25
Overall Level of Service (LoS) of usage of Intelligent Transport System (ITS) City-wide					
The calculated Level of Service (LoS) of Intelligent Transport system = (LoS1 + LoS2 + LoS3 + LoS4 + LoS5)and identify overall LoS as mentioned below					
Overall LoS	Calculated LoS	Comments			
1	5 - 7	The city has adequate ITS facilities			
2	8 - 10	The City has ITS facilities which may need some improvements in terms of integrated ticketing system, signal Synchronization, GPS/GPRS, PIS etc., as some parts of the city are nor served by it.			
3	11 - 15	The City has ITS facilities which may need considerable improvements terms of integrated ticketing system, signal Synchronization, GPS/GPRS, PIS etc., as many parts of the city are nor served by it.			
4	16 - 20	The city lacks adequate ITS facilities			

5.5.5 Travel Speed (Motorized and Mass Transit) Along Major Corridors

Table 5.6: Indicators to calculate City-wide Level of Service (LoS) of Traffic Speed along major

Level of Service	1. Average Travel speed of Personal vehicles (Kmph)	2. Average Travel speed of Public Transport (Kmph)
1	> =30	> =20
2	25 - 30	15 -20
3	15 - 25	10 - 15
4	< 15	< 10
Overall Level of Service of Travel speed along major corridors City wide		
The calculated LoS of Travel speed along major corridors = (LoS1 + LoS2) and identify overall LoS as mentioned below		
Overall LoS	Calculated LoS	Comments
1	2	Primarily free flow- operations at average travel speeds usually about 70% of the free flow speed for the key corridors
2	3 -4	Small increase in flow may cause substantial increases in approach delay and hence, decrease in arterial speed.
3	5 -6	Significant approach delays and average travel speed of 1/3 of free flow speed or lower. Such operations are caused by some combination or adverse progression, high signal density, extensive queuing at critical intersections and inappropriate signal timing.
4	7 -8	Key corridors at extremely low speeds below 1/3 to 1/4 of the free flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

5.5.6 Availability of Parking Spaces

Table 5.7: Indicators to calculate City-wide Level of Service (LoS) of availability of parking spaces

Level of Service	1. Availability of on street paid public parking spaces (%)	2. Ratio of Maximum and Minimum Parking Fee in the City
1	> =75	> 4
2	50 - 75	2 - 4
3	25 - 50	1 - 2
4	< 25	1

Overall Level of Service (LoS) for Parking Space City-wide

The calculated Level of Service (LoS) for parking space = (LoS1 + LoS2) and identify overall LoS as mentioned below.

Overall LoS	Calculated LoS	Comments
1	2	Paid parking spaces are available in the city and the demand is well managed by incorporating differential parking rates for the CBD.
2	3 - 4	Paid parking spaces are available in the city and the demand is well managed by incorporating differential parking rates for the CBD. However some improvements may be required
3	5 - 6	Paid parking spaces provided in the city need to be improved upon and to cater to the demand some differential parking rates for the CBD have been adopted. The city authorities need to initiate considerable improvements measures.
4	7 - 8	The city authorities need to initiate immediate actions with respect to providing paid parking spaces and demand management for parking.

5.5.7 Road Safety

Table 5.8: Indicators to calculate City-wide Level of Service (LoS) of Road Safety

Level of Service	1. Fatality rate per lakh population	2. Fatality rate for pedestrian and NMT (%)
1	< =2 persons	< =20
2	2 -4 persons	20 -40
3	4 - 6 persons	40 - 60
4	> 6 persons	> 60

Overall Level of Service (LoS) for Road Safety City-wide

The calculated level of service (LoS) for Road Safety = (LoS1 + LoS2) and identify overall LoS as mentioned below

Overall LoS	Calculated LoS	Comments
1	2	Level of Fatality rate in a city is very low.
2	3 - 4	Need some improvements in Road design and available road infrastructure, traffic management, and in other such reasons that significantly contribute to road safety.
3	5 - 6	Need considerable improvements in Road design and available road infrastructure, traffic management, and in other such reasons that significantly contribute to road safety.
4	7 - 8	Level of Fatality rate in a city is very high.

5.5.8 Pollution Levels

Table 5.9: Indicators to calculate City-wide Level of Service (LoS) of Road Safety

Level of Service*	1. SO ₂	2. Oxides of Nitrogen	3. SPM	4. RSPM (Size less than 10 microns)
1 (Low)	0 - 40	0 - 40	0 - 180	0 - 40
2 (Moderate)	40 - 80	40 ñ 80	180 - 360	40 - 80
3 (High)	80 - 120	80 ñ 120	360 - 540	80 - 120
4 (Critical)	> 120	> 120	> 540	> 120

* As per CPCB guidelines: Annual Arithmetic Mean of minimum 104 measurements in a year taken twice a week 24-hourly at uniform interval (Data from CPCB)

Overall Level of Service (LoS) for Pollution levels

The calculated Level of Service for Pollution level is LoS = (LoS1 + LoS2 + LoS3 + LoS4) and identify overall LoS as mentioned below

Overall LoS	Calculated LoS	Comments
1	<=5	Level of pollution in a city is very low.
2	6 - 9	Need some improvements in emission standards, checking pollution etc.
3	10 - 13	Need considerable improvements in emission standards, checking pollution etc.
4	14 - 16	Level of pollution in a city is very high.

5.5.9 Integrated Land-use-Transport System

Table 5.10: Indicators to calculate (LoS) of Integrated Land Use Transport Systems

Level of Service	1. Population Density - Gross (Persons/D developed area in hact.)	2. Mixed Land-use on Major Transit Corridors / Network (% area under non residential use)	3. Intensity of Development - City wide (FSI)	4. Intensity of development along transit corridor (FSI transit corridor/ FSI)	5. Clear Pattern and Completeness of the network	6. %age of area under Roads	7. %age network having exclusive ROW for Transit network
1	>=175	>=30	> =2	>=3	Clear pattern (ring-radial or grid-iron) and complete network	> = 15	> = 30
2	150-175	15-30	1.5-2.0	2-3	Somewhat clear pattern (ring- radial or grid- iron) but somewhat incomplete network	12 - 15	20-30
3	125-150	5-15	1.0 - 1.5	1.5-2	somewhat unclear pattern and incomplete network	10 -12	10-20
4	< 125	<5	<1	<1.5	no clear pattern incomplete / sparse network	< 10	<10

Overall LoS

Overall LoS	Calculated LOS		Comments
	> 1 million population	< 1 million population	
1	<8	< 9	City Structure is appropriately planned in a manner which patronizes public transport.
2	8 -15	9 -14	City structure is some what incoherence with the public transport system
3	16 - 22	15 - 20	Faint coherence between city structure and public transport system
4	22- 28	21 - 24	Inconsistency in the city structure and public transport system leading to lesser ridership and high dependence on personalized motor vehicles

5.5.10 Financial Sustainability of Public Transport By Bus

Table 5.11: Indicators to calculate City-wide Level of Service (LoS) of Road Safety

Level of Service	1. Extent of Non fare Revenue (%)	2. Staff /bus ratio	3. Operating Ratio
1	> 40	< = 5.5	< 0.7
2	40 - 20	5.5 - 8	0.7 ñ 1.0
3	20- 10	8 - 10	1.0 - 1.5
4	< =10	>10	> =1.5
The Overall LoS for Financial Sustainability of Public Transport city wide			
The calculated Level of Service LoS = (LoS1 + LoS2 + LoS3) and identify overall LoS as mentioned below			
Overall LoS	Calculated LoS	Comments	
1	< = 4	The public transport of a city is financial sustainable.	
2	5 - 7	The public transport of a city is financial sustainable but needs some improvements	
3	8- 9	The public transport of a city is financial sustainable but needs considerable improvements	
4	10 - 12	The public transport of a city is not financial sustainable.	

5.6 Performance Report Card

It provides the sample of performance reports of Service level benchmarks that each ULB / parastatal agencies / municipal development authority can use to set and track their performance improvement. The minimum frequency of computation of the performance indicators is annual and the geographic jurisdiction for which it should be measured is municipal limits or planning boundary. On the basis of the above framework, ULBs should prepare Performance Report Cards, which would form the basis for reporting and monitoring performance. The Report Cards should necessarily contain the following information:

- Municipal Areas / Development Authority
- The time period for which performance is being reported
- Current baseline and actual accomplishment of performance as time passes
- Targeted performance levels for subsequent time periods (annually).
- The Measure of reliability of the systems, on the basis of which the indicator has been measured (viz. either A or B or C or D)
- Brief plan of action for achieving the targeted performance level for each of the forthcoming time periods.

Illustrative Performance Report Card Submitted to State / Central Govt.

Demographic Details-

- Population:
- Population density:

Modal Share:

- Public Transport
- Intermediate Public Transport (IPT)
- Private vehicles

Total area in sq km:

Reporting Frequency: Annual

Time Period: FYI 09-10

Reporting Jurisdiction: Limits of Municipal Boundary or Planning Boundary

S.No	Service level Benchmark	LoS Actually achieved	LoS Targeted for next year Action	Plan to achieve the target
1	Public Transport facilities			
2	Pedestrian Infrastructure facilities			
3	Non- Motorized Transport (NMT)facilities			
4	Level of usage of Integrated Transport System (ITS) facilities			
5	Travel speed (Motorized and Mass Transit) along major corridors			
6	Road Safety			
7	Pollution levels			
8	Availability of Parking Spaces			
9	Integrated Land Use Transport System			
10	Financial Sustainability of Public Transport			

5.7 Performance Management System

The process of performance measurement has to be taken further into performance management system. Performance management data using SLBs should be included in the set of information disseminated under mandatory public disclosure, as required by the reforms mandate under JNNURM. The next key steps for ULBs are to generate performance reports on SLBs periodically. Data can be captured either through previous studies or through specific surveys carried out at defined intervals. In parallel, the ULBs will also need to institutionalize systems for the entire cycle of performance management, as depicted in Figure 5.2. This would imply the following:

Illustration A: Performance Management System

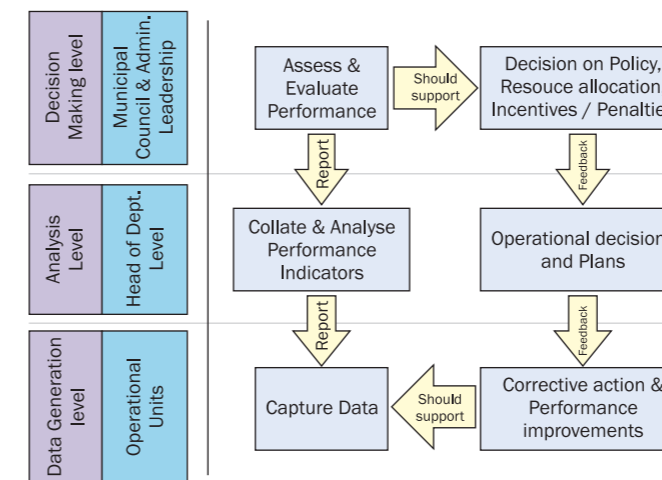


Figure 5.2 Performance Management System

- Systems for Capturing Data:** Design and implement data collection systems for data to be captured. Such data will typically be from field level staff such as traffic engineers, planners, accounts clerks, etc. Simple data formats should be designed and provided to them to capture the data and report the same upwards within the organization for collation and determination of the service level performance.
- Systems for collation and analysis of performance benchmarks:** Specific persons should be designated with the mandate to collate the data received from the field and generate the performance reports. They need to be working directly under supervision and guidance from officers at the Head of Department level.
- Systems for assessment and evaluation of performance:** In most cases, multiple indicators need to be examined to obtain a holistic picture of service levels in identified benchmarks. Performance benchmarks reported by department level should be closely examined at the management level of the ULB.
- Systems for decision making:** All ULBs do have systems for decision making; however, many decisions end up being considered in the absence of quality data. To address such gaps, systems such as periodically tabling the performance reports in the Council / to the Standing Committees should be instituted.

⁴Service Level Benchmarks for Urban Transport at a Glance, MoUD, GOI

- v. **Systems for operational decisions and plans:** Decisions and plans will need to be periodically reviewed in light of the performance achieved. Additional capital inflow and revenue expenditure may be required. A process of annual review and follow-up of decisions will need to be instituted.

5.8 Role of Stakeholders

The role of different stakeholders and the next steps they will need to pursue are briefly mentioned below.

- a) **Central Government:** The Ministry of Urban Development, Government of India will take the lead for disseminating these service level performance benchmarks. Further SLBs will also be institutionalized through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and other programs of this Ministry through more ways than one, viz.
- SLBs will be an integral part of City Development Planning processes, including development of Comprehensive Mobility Plan, both for assessment of current situation, and for setting targets under their plans.
 - Where ever appropriate, SLBs will be dovetailed with the commitment on reforms, and subsequent process of appraisal of reforms
 - The relevant SLBs should be part of Detailed Project Reports for related projects in urban transport. The DPR should indicate both the current situation and what change the project will bring about to increase the level of service (LoS). Subsequent process of monitoring the implementation of the project will examine this change in LoS.
 - Under the JNNURM or scheme for urban transport planning, support may be extended to enable ULBs to establish systems in their respective institutions for periodic measurement, reporting and analysis of SLBs.
- b) **State Governments and its agencies:** State Governments and its nodal agencies in the urban sector have a critical role in driving performance of ULBs. State Government will need to periodically examine the SLBs as an input for its decisions related to policy, resource allocations, providing incentives and penalties, channelizing technical and manpower support SLBs will also be an important input to State Finance Commissions in the course of their work.
- c) **Urban Local Bodies / Parastatal agencies:** ULBs / parastatal agencies are the most important stakeholders for institutionalization of SLBs. As service delivery institutions, ULBs will find it useful to institutionalize systems for performance management using SLBs. Benchmarking with other cities within the State or with similar cities would facilitate a healthy competitive environment for continuous improvement. The Directorate of Local Bodies / Department of Municipal Administration will need to play a key role in this process through constant inter-city comparisons.

Chapter 6

Conclusion

Rapid urbanization, increased industrial and commercial activities, household incomes, geographically expanding urban areas, increased trip lengths have intensified mobility needs in India. Most Indian cities are not prepared to meet this demand. Private vehicles offer unparalleled convenience, and with increased affordability of the middle-class, the private car and two-wheel (TW) vehicle population have sky rocketed to enable the urban population to meet its individual mobility needs. The failure of public transport to remain competitive has further encouraged people to purchase private vehicles. Public transport services have deteriorated and not kept up with the rate of mobility demand. The over-bearing vehicle population has overshadowed the non-motorized modes. Non-motorized trips have dropped drastically; not only due to longer trip lengths and increasing affordability of motorized personal vehicles, but also due to greater risk of accidents. Accidents are a result of excessive motorization coupled with lack of proper infrastructure for non-motorized travel. This has led to congestion, deteriorating air quality due to automobile exhausts, increased incidence of accidents, increased fuel consumption, high emissions, impacting the environment and India's energy security, in addition to the high costs to the economy in terms of travel delays and loss of productivity. The pedestrian and the cyclists do not have adequate infrastructure and are threatened by high level of motorization, public transit infrastructure and services are grossly inadequate, extenuating the vicious cycle of increased motorization. The urban poor is especially disadvantaged in this situation, due to lack of pedestrian and cycle facilities (their mode of choice for short trips), and affordable and reliable public transport services, resulting in long commutes, spending a huge part of their low-income on transport. The current state of urban transport in India is unsustainable.

There are substantial improvement needs, but limited financial resources and above all absence in many cities of a knowledgeable institutional framework for planning. The urgency for improvements complicates matters further, and unfortunately this immediacy sometime leads to short term patches that are not consistent with long-term visions.

The NUTP in 2006 was the guiding light aimed to direct the urban transport planning into one that is sustainable. NUTP 2006 focuses on "people and not vehicles". This was a paradigm shift from the "predict and accommodate" principle of the earlier years. The paradigm now is "Avoid, Shift and Improve", focusing on reducing demand, avoiding low occupancy motorized trips, shifting to public transit, and continuous improvement on vehicle and fuel technology and alternative fuel use. However, there is need for a comprehensive Urban Transport Act to address all issues and priorities, and all modes. Also, other Acts related to urban development need to be consistent and aligned to the NUTP principles of sustainability.

The Jawaharlal Nehru National Urban Renewal Mission (JNNURM), a seven-year US\$10 billion urban infrastructure is a GoI program that includes investment support for urban transport projects consistent with the National Urban Transport Policy (NUTP). Accordingly, the Ministry of Urban Development (MoUD) encourages cities to prepare "Comprehensive Mobility Plans" (CMP) as part of long-term urban transport strategy providing for a sustainable improvement of people's mobility in metropolitan regions. The NUTP's focus on comprehensive mobility planning is aimed at developing a strategy that is built around improved mobility. It is important to prepare long-term strategic plans focused on mobility of people as a basis for developing cost-effective and equitable urban transport measures with an appropriate and consistent methodology in line with NUTP.

The CMP is a key document providing the rationale for transport proposals. Therefore, within the overall planning hierarchy, the CMP can be considered as a prerequisite for the submission of a Detailed Project Report (DPR - Level 1) for JNNURM funding. Although it is not mandatory, all cities considering a funding application to central government have been recommended to submit the CMP and to obtain approval from MoUD. The plan also would help in assessing the fund requirements for urban transport for a city. Many CMPs have been prepared by the mission cities, and they are evolving, still far from perfect.

It is to be understood that the process of planning is very crucial, in fact, as important as the Plan itself. The process apart from scientific inputs, modeling, etc, need to have an active public engagement process. This will not only enhance understanding the needs of all the stakeholders, and identify the problems, from various perspectives, it will make the plan richer in content, and minimal resistance during implementation. The impact of climate change on the transport needs to be considered as part of the planning process, and not as an afterthought. The impacts can be minimized by approaching it from the following two aspects; firstly, planning and investing efficiently for sustainable transport, thereby reducing the impact of emissions, and addressing the case for energy security (Mitigation); and secondly, planning for disaster preparedness (Adaptation).

In the project development process, Alternative Analysis follows comprehensive planning. This is especially vital for evaluating high investment projects such as metros, bridges, etc. The transit corridor identified by the CMP, may have a number of transit solutions that may be feasible. Alternative Analysis ensures all transportation alternatives are considered, and evaluated before the selection of the best alternative. This makes the case for a project much stronger and thus paves way for better and faster access to Government and other funds. The United Metropolitan Transport Authority is likely to be the leading agency initiating this process urban transport planning is a continual process that evolves itself through feedback. Performance monitoring through benchmarks is important in this aspect. Service Level Benchmarks, introduced by the MoUD, need to be part of this process, to assess the impact of the strategies, and also learn from best practices and failures.

For any informed decision making, data plays a vital role. The data needs for the planning process, and also data needs to calculate the

SLBs, is huge. But there is no standardized centralized data clearing house, and/or data management center, in India. So there is a huge challenge in quantifying the issues, resulting from the paucity of reliable data with which analysis can be pursued.

An integrated, holistic approach to a transport planning would include reducing the number of vehicles on the road, enhancing the public transport system with more buses and mass transit systems, along with efficient traffic management measures, ensuring better traffic flow and maximizing throughput of people, not vehicles. In addition to these, improvement in vehicle technology, adoption of clean fuel technologies, strict enforcement in the maintenance of roads and vehicles would go a long way to reduce fuel consumption and air pollution in the transport sector. Core development needs that include access to food, water, public health and transport will face the adverse effects of climate change impacts. Adaptation techniques in transport need to be addressed in conjunction with the overall development of the other sectors.



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The NUTP is the comprehensive urban transport policy that is directed towards sustainable urban planning, in the context of India. There are more than 25 documents and legal enactments that may have a direct or indirect impact on urban transport.

The acts related to urban transport planning are noted below.

A.1 Planning Process

Allocation of Business Rules: This was an Act of Central Government that was amended in 1986. The function of planning urban transport systems (including Rail based systems) was transferred from Ministry of Railways to Ministry of Urban Development.

The Institutional arrangement for municipal governance and urban service delivery, including transport mainly comprises the Constitutional provisions, State Municipal Laws, and status of ULBs and parastatals.

74th Constitutional Amendment Act: According to the Constitution local self-government in urban area was not a clear-cut constitutional obligation. As a consequence of inadequate Constitutional provision many urban local bodies remained ineffective. In this context, the 74th CAA came into force in June, 1993, which aimed at the devolution of power. The main provisions include constitution and composition; constitution of wards committees; reservation of seats; duration of municipalities; powers and functions; finances; finance commission; elections; district and metropolitan planning committees, etc.

The 74th CAA, expects that ULBs will assume responsibilities for urban planning, water supply, social and economic planning, slum upgradation, public health, etc. However, the CAA did not lay down revenue base for ULBs and the power to determine the revenue base continues to remain with state governments. An important observation is that while there has been full compliance in respect of provisions, such as constitution of three types of ULBs, reservation of seats, and constitution of SFC, the same cannot be said for other provisions, namely constitution of Wards Committees, District Planning Committees and Metropolitan Planning Committees. Some states have performed better than others. Many states have not transferred functions, funds and functionaries. Revenue powers of ULBs are often not in consonance. There is also no consistency about term, powers and method of election of Mayors. In most states, Mayors do not have executive powers as they are vested with the Commissioners.

Some of the progress in the implementation of 74th constitutional amendment is reported as follows:

DPC has been constituted in 20 states: Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Goa, Gujarat, Haryana,

- Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal
- MPC has been constituted in 6 states: Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Tamil Nadu, West Bengal
- Planning function has been transferred in 14 states: Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Tripura, West Bengal, Haryana

State Acts: Town and Country Planning Acts: The 'Town and Country Planning acts' enacted by various States, directly affect planning for urban transport. The 'Town and Country planning acts' enacted by Maharashtra and Tamil Nadu are required to prepare regional plans, including transport requirements. Karnataka Town Planning Act- 1961 specifies planned growth of land use and development and for the making and executing of town planning schemes in the State only. There is no mention of including transport planning in it.

Local Urban Bodies Acts: Urban Development Authority Acts And Municipal Acts: Urban Authorities such as the Lucknow Development Authority, Indore Development Authority and Bangalore Development Authority and the Karnataka Municipal Act mentions specifically both land use planning and transport as its functions. The main function of Indore Development Authority (IDA) stated in the act is to implement the master plan made by Town and Country Planning Office, Bhopal. Bangalore Development Authority is constituted as Planning Authority under the Karnataka Town and Country Planning Act. It is the agency for drawing up development plan and Town Planning schemes in Bangalore Metropolitan Area. The Karnataka Municipal act states 'town planning and improvement' as one of its functions. The Delhi Development Authority Act however requires preparation of land use plan based upon such survey of the present use of land as may be necessary for estimated future needs and consisting of comprehensive proposals for the most desirable utilization of land such as agricultural, governmental, commercial, industrial, residential, commercial, industrial, residential, cultural, educational, recreational, transportation, and other activities.

Industrial Areas Outside Urban Governance: The 74th CAA under article 243(Q) "provided that a municipality under this clause may not be constituted in such urban area or part thereof as the Governor may, having regard to the size of the area and the municipal services being provided or proposed to be provided by an industrial establishment in that area and such other factor as may deem fit, by public notification specify to be an industrial township."

Special Economic Zones: In a large-scale effort transforming India's competitiveness in the global market, the Government of India enacted the Special Economic Zones (SEZ) Act in 2005. About 50 to 70 new cities or satellite cities will come up in and around the

medium and large size SEZs and the population of these new cities will range between 5-10 lakhs. It has raised issues regarding urban management and regional impact of SEZs in India.

In fact, the 74th CAA under article 243(Q) "provided that a municipality under this clause may not be constituted in such urban area or part thereof having regard to the size of the area and the municipal services being provided or proposed to be provided by an industrial establishment in that area to be an industrial township." SEZs management is delegated to the Development Commissioners and the participation of local as well as State Government will be marginal. This implies the population of these towns will be deprived of participating in urban governance.

A.2 Setting up UMTA

The National Urban Transport Policy lays emphasis on integration of the fragmented institutional structure by setting up of a Unified Metropolitan Transport Authority (UMTA) in all cities with a population of one million plus to facilitate better coordination in the planning and implementation of urban transport systems. Such an authority should not be an operator of any transport facility, but should function as a coordinator amongst various operators. It could perform a regulatory function and also provide common facilities that would benefit all operators. It should play an important role in creating a future vision for improved mobility and ensuring that the required investments take place. So far, only some cities, namely Jaipur, Mumbai, Hyderabad, Indore, Kochi, and Bangalore, have set up/in the process of setting a unified authority.

All the other UMTAs, except the Hyderabad UMTA has been set up based on administrative decision. The Government of Andhra Pradesh has enacted a law to provide for the establishment of Metropolitan Development authority for the purpose of planning, coordination, supervising, promoting and securing the planned development of Hyderabad Metropolitan Region and also a Unified Metropolitan Transport authority for Hyderabad Metropolitan Region under the Chairmanship of the Chief Secretary.

A.3 Acts Related to Mass Rapid Transport

There are today only 3 acts that are specific to mass rapid transport, in the urban transport context.

- Tramways Act
- The Delhi Metro Railway (Operation And Maintenance) Act, 2002
- The Metro Railways (Construction Of Works) Act, 1978

The tramways act is for operation of trams in the road surface within the Municipal limits that permits free access across the tracks. The Delhi Metro Railway operation and maintenance act provides for the operation and maintenance and to regulate the working of the metro railway in the metropolitan city of Delhi. Earlier Kolkata Metro had enacted a similar act for operation and maintenance of Kolkata Metro as an adjunct to the Indian Railway Act.

The Metro railway construction act covers the needs of construction of metro railways in the metropolitan cities and for matters connected therewith.

A.4 Other Transport related Acts

There are 8 acts that deal with other transport matters.

- The Railways Act, 1989
- The Hackney-Carriage Act, 1879
- The carriers act 1865
- Motor Vehicles Act 1988
- Central Motor vehicle rules 1989
- Road Transport Act, 1956.
- The Motor Transport Workers Act, 1961
- The Road Transport Corporations Act, 1950

The Railways Act, 1989 is for operation and management of Indian: Railways: Indian Railways operate suburban rail services under the Indian Railways act. These provide substantial urban transport services today. The technical clearance of Rail based systems, however, remained the function of Ministry of Railways. Section 196 of the IR Act, authorizes the Central Govt. to exempt a Railway from any or all provision of the Act. It is as follows:

- The Central govt. may by notification exempt any railway from all or any of the provisions of the Act.
- Every notification issued under Sub Section (i) shall be laid as soon as possible, may be after it is issued, before each house of

⁵Source: Ministry of Urban Development, Government of India (as on 1st December, 2010)

Parliament.”

Hackney carriages act 1879 is for animal driven vehicles: The "hackney-carriage" means any wheeled vehicle drawn by animals and used for the conveyance of passengers that is kept or offered or plies for hire.

The Carriers Act, 1865: It is expedient not only to enable common carriers to limit their liability for loss of or damage to property delivered to them to be carried but also to declare their liability for loss of or damage to such property occasioned by the negligence or criminal acts of themselves, their servants or agents;

Motor Vehicles Act 1988 and Central Motor Vehicle Rules 1989: Mainly relates to licensing issues and management of traffic.

Road Transport Act, 1956: An act to amend the Road Transport Act, 1933, in relation to the carriage of merchandise in hire vehicles

The Motor Transport Workers Act, 1961: An Act to provide for the welfare of motor transport workers and to regulate the conditions of their work.

The Road Transport Corporations Act, 1950: An Act to provide for the incorporation and regulation of Road Transport Corporations.

A.5 Acts related to injury

The following 4 Acts relate to compensation related to injury:

Fatal Accidents Act 1855: 1A. Suit for compensation to the family of a person for loss occasioned to it by his death by actionable wrong

The Personal Injuries (Emergency Provisions) Act, 1962: An Act to make provision for the grant of relief in respect of certain personal injuries sustained during the period of the emergency.

The Personal Injuries (Compensation Insurance) Act, 1963: An Act to impose on employers a liability to pay compensation to workmen sustaining personal injuries and to provide for the insurance of employers against such liability.

The Public Liability Insurance Act, 1991: An Act to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any hazardous substance and for matters connected therewith or incidental thereto.

Karnataka Town Planning Act- 1961

Act 11 of 1963.- With the formation of the New state of Mysore it has become necessary to have a uniform law for the regulation of planned growth of land use and development and for the making and executing of town planning schemes in the State. Physical Planning has to precede economic planning as otherwise cities, towns and villages of our country will grow to unmanageable sizes without proper planning resulting in unhealthy surroundings. Physical planning with co-ordinated effort on a large scale is necessary if the people are to live in a better, healthier and happier environment. The proposed measure is expected to solve the Town Planning problems.

The essential requirement of integrated land use transport planning is not stated in any of the State 'Town and Country planning Acts' and the Urban Development acts. The Acts related to mass rapid transport are grossly inadequate for today's requirement. Coordination of transport planning and services, multi-modal integration, safety, pricing, and financing are not covered in any act. A need for a comprehensive Urban Transport Act to cover all aspects of urban transport is imperative. The UMTA as envisaged by the NUTP 2006, needs legislative support, administrative support will not suffice.

Maharashtra Regional and Town Planning Act, 1966

Subject to the provisions of this Act and any rules made thereunder for regulating the form of a Regional plan and the manner in which it may be published, any such Regional plan shall indicate the manner in which the Regional Board propose that land in the Region should be used, whether by carrying out there on development or otherwise, the stages by which any such development is to be carried out, the net-work of communications and transport, the proposals for conservation and development of natural resources, and such other matters as are likely to have an important influence on the development of the Region; and any such plan in particular, may provide for all or any of the following matters, or for such matters thereof as the State Government may direct.

Delhi Development Authority Act

Master Plan And Zonal Development Plans - Civic Surveys

There cannot be proper planning unless proper survey is done pre hand. What is civic survey has to be understood in the socioeconomic need of the citizen, which broadly speaking , includes land use survey, traffic and transportation survey, physical services survey industrial

planning survey, residential area survey, community facility survey Survey, fiscal planning survey, etc and analysis thereof, with reference to the natural resources, density of population, etc. A land use plan based upon such survey of the present use of land as may be necessary for estimated future needs and consisting of comprehensive proposals for the most desirable utilization of land such as agricultural, governmental, commercial, industrial, residential, commercial, industrial, residential, cultural, educational, recreational, transportation, and other activities.

“A transportation and transit plan based upon reports of survey and inventory of volume of traffic and capacity of existing roads, highways and consisting of proposals for a system of street roads highways and parking , loading and terminal facilities.”

Bangalore Development Authority

The salient provisions of Bangalore Development Authority Act, which ensures plannin implementation as well as co-ordination are mentioned below:

- Bangalore Development Authority as Planning Authority under the Karnataka Town and Country Planning Act is the agency for drawing up development plan and Town Planning schemes in the Bangalore Metropolitan Area.
- The Authority can take up land acquisition and developmental schemes, housing schemes etc.
- Bangalore Development Authority has power for controlling the developments and enforcement of the plan and has also powers to implement developmental schemes.
- The Act empowers Bangalore Development Authority to issue directions to other Authorities.

Bus Occupancy Survey Format

Bus Occupancy Survey Format									
Road Name:		Bus Stop/Land mark:					Direction:		
Road Name	Bus stop Name	Direction	Bus Type	Total no of seats available per bus type	Route Number	Sitting	Standees		Crush Capacity ()
							If Under Capacity		

Bus Type: M- Moffusil Bus, C- City Bus

Bus Stop Waiting Time Survey Format					
Bus Stop Name	Route No	Direction	Bus Type	Arrival Time	Departure Time

Street Light Intensity Survey – LUX METER			
Road Name :		Arterial/Sub arterial:	Date:
No of Lanes :		Divided/Undivided:	Day :
Direction:			Time :

Distance - m

Distance - m

Distance - m

Pedestrian Intersection Delay Survey									
Junction Name				Date:					
Junction type	3 Arm/ 4 Arm/ 5 Arm								
Availability of Cycle Track	Yes/No			Availability of Footpath	Yes/No				
Approach Arm	Phasing Plan								
	Green Time (Sec)		Red Time (Sec)		Pedestrian Time (Sec)		Total cycle Time (Sec)		Whether Free Left Turn Available
Arm 1									
Arm 2									
Arm 3									
Arm 4									
Arm 5									

Parking Duration Survey - On Street Parking

Road name											
Parking starting From:											
Parking ending at:											
Parking type:	Authorised/Unauthorised	Lenght Of Parking:	Code	Registration Number	Code	Registration Number	Code	Registration Number	Code	Registration Number	Code
	Paid/Free										
Time											
Code											
No. Of Cycles/Cycle rickshaws:		No. Of Cycles/Cycle rickshaws:		No. Of Cycles/Cycle rickshaws:							
No. Of Carts:		No. Of Carts:		No. Of Carts:							
Codes		Codes		Codes							
CB- Car Big		V- Van/Maxicab/Minibus		T- Trucks							
CS- Car Small		B-Bus		TM-MAV							
TW- Two Wheeler		A-Auto Rickshaw		L-LCV							

COMPREHENSIVE MOBILITY PLAN																
CLASSIFIED TRAFFIC VOLUME COUNT																
Location: Road Name:	Time	Date:						Day				Enumerator				
		Direction:						Weather				Goods Vehicles				
		Buses		Private Vehicles & IPT		Slow Moving Vehicles		Trucks/2 Axle		MAV		Cycle rickshaw		Carts		
City Bus	Long Distance Bus	Institutional Bus/Company Bus	Mini Bus	Van/Maxi Cab	Car	Taxi	Two Wheeler	shared Auto rickshaw	Auto Rickshaw	LCV	Tractor	MAV	Tractor	Cycle rickshaw	Carts	
	:00 to:15															
	:15 to :30															
	:30 to :45															
	:45 to :00															

COMPREHENSIVE MOBILITY PLAN FOR TUMKUR ROAD NETWORK INVENTORY FORMAT

Road Name	Node Number From node To node	Length (in Kms)	Pavement Type Flexible/Rigid/Un-repaired	No of Lanes	Divide/Un-divided	One way/two way	Carrage Way Width (m) (Curb to Median)		Shoulder		Footpath				Drainage				Right Of Way Width (m)	Posted Speed Limit (Kmph)	Any Auto Stand (Onstreet /Offstreet)	In it a bus route? (Yes/No)	No. of Designated Bus stops	Any Buses? (mention the width and length)	On-street Parking Present / Absent	On-street Parking Approximate Length (m)	Land Use (LHS)	Land Use (RHS)	Encroachments on footpaths / Heavy / Moderate / Nil	Sign Boards (Fly/Cover /Pos/N/A)	Road Markings (Fly/Cover /Pos/N/A)	Remarks (If Cycle track, Pillion mention)			
							LHS Width (m)	RHS Width (m)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Width (m)	RHS Width (m)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Width (m)	RHS Width (m)															LHS Type (P/U/P)	RHS Type (P/U/P)	
							LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)															LHS Width (m)	RHS Width (m)	

Land Use- R/C/I/A/O/W R-Residential, C-Commercial, I-Institutional, A-Agricultural, O-Others, W- Waste Land

COMPREHENSIVE MOBILITY PLAN FOR TUMKUR ROAD NETWORK INVENTORY FORMAT

Road Name	Node Number From node To node	Length (in Kms)	Pavement Type Flexible/Rigid/Un-repaired	No of Lanes	Divide/Un-divided	One way/two way	Carrage Way Width (m) (Curb to Median)		Shoulder		Footpath				Drainage				Right Of Way Width (m)	Posted Speed Limit (Kmph)	Any Auto Stand (Onstreet /Offstreet)	In it a bus route? (Yes/No)	No. of Designated Bus stops	Any Buses? (mention the width and length)	On-street Parking Present / Absent	On-street Parking Approximate Length (m)	Land Use (LHS)	Land Use (RHS)	Encroachments on footpaths / Heavy / Moderate / Nil	Sign Boards (Fly/Cover /Pos/N/A)	Road Markings (Fly/Cover /Pos/N/A)	Remarks (If Cycle track, Pillion mention)			
							LHS Width (m)	RHS Width (m)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Width (m)	RHS Width (m)	LHS Type (P/U/P)	RHS Type (P/U/P)	LHS Width (m)	RHS Width (m)															LHS Type (P/U/P)	RHS Type (P/U/P)	
							LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)	LHS Width (m)	RHS Width (m)															LHS Width (m)	RHS Width (m)	

Land Use- R/C/I/A/O/W R-Residential, C-Commercial, I-Institutional, A-Agricultural, O-Others, W- Waste Land

COMPREHENSIVE MOBILITY PLAN

HOUSEHOLD INTERVIEW SURVEY

Form No.

Part I- Household Information

Zone No

Division/ Village No.

Address

Land use
 1. Residential
 2. Commercial
 3. Institutional
 4. Others

Travel Day
 Monday 1
 Tuesday 2
 Wednesday 3
 Thursday 4
 Friday 5

Travel Date.....

PRODUCTIVITY (HOUSEHOLD)

Whether the form is fully productive (Tick) Yes/No

If No, tick the appropriate reason

Vacant demolished premises
 No trace
 No contact
 Business, Institutional premises
 Absent during survey period
 Sickness/Language problems
 Total refusal
 Partially interviewed household

Interviewer Number.....

Interviewer Name.....

Coded by.....

Checked by.....

1. Name of Head Household

2. (a) Type of Dwelling Unit: Apartment/Flat-1 Independent House-
 2. Rented,
 3. Employer provided

3 (a) Total No of member of household (Excluding guests & servants)

(b) No of member of household aged less than 5 years

(c) No of members of household who make regular trips per

4. Employed person in HH

5. No of Earners in Residence

6. No of Vehicles Owned
 Cycles No
 Scooter/MCs/Mopeds
 Cars/Vans/Jeeps
 Autorickshaws (owned)
 Other vehicles (PL Specify)

7. Availability of parking space in dwelling premises
 Yes 1 No 2

8. Distance to public Transport Facilities
 a. Nearest Bus Stop from houses (meters)
 <250 1
 251to500 2
 501to750 3
 751to1000 4
 1001to1500 5
 >1500 6

9. Number of Telephones in dwelling units

10. Average Household monthly income (of all members) (IN Rs)

11. Average Monthly Expenditure on transport (In Rs)

Part 2-Person Information										
Form No.	Person Number	Sex Male 1 Female 2	Completed Age 1 5-17 2 18-24 3 25-34 4 35-44 5 45-58 6 59-64 7 65-74 8 >75	Working Status Full time Full Employee 1 2 (30+hrs per week) 3 Part Time Employee 4 (1-29 hrs per wee) 5 Self Employed 6 Student 7 Retired 8 Housewife Unemployed Others (PI Specify)	Address and Location of place of employment /Education: 2 3 4 5 6 7 8	Mode of travel (Walk-1, Cycle-2, Two wheeler-3, Car/van/jeep-4, Taxi-5, Public transport (KSRTC)-6, Public transport (PVT bus)- 7, Public transport (Rail)-8, Public transport (Ferry)-9, Auto Rickshaw-10)	Distance to the work place/Education	Gross Income Per month A- upto 1500 B- 1501-3000 C- 3001-5000 D- 5001-10000 E- 10001-20000 F- 20001-30000 G-30001-40000 H- 40001-50000 I-above 50000	Expenditure on transport monthly (in Rs)	
1										
2										
3										
4										
5										
6										
7										

Part 3- Travel Day Trips

Note: Please provide information of travel you made on the previous day

Form No.

Person No	Trip No	Stage	Trip Purpose	Starting Address	Finishing Address	Starting Time	Finishing time	Mode of Travel	Stage Distance (Kms)	Travel Fare (Rs)	Parking Fee (Rs)

Trip Purpose	
Work	1
Education	2
Self business	3
Shopping	4
Social and Recreation	5
Others (Please Specify)	6

Mode of travel	
Walk	1
Cycle	2
Two wheeler	3
Car/Van/Jeep	4
Taxi	5
Public transport (KSRTC)	6
Public transport (PVT Bus)	7
Public transport (Rail)	8
Public transport (Ferry)	9
Auto Rickshaw	10

COMPREHENSIVE MOBILITY PLAN

Road Side Interview Survey Format-Goods Vehicles

Name of the Road:

Direction:

Interviewer:

Locations:

Day:

Date:

Time (very Important)	Vehicle Type	Origin of the Trip	Destination of the Trip	Purpose of Journey	Trip Distance (Kms)	Goods Type	Loading in Tonnes	Trip Frequency	Market Value (Rs)
	1. LCV 2. Truck/ 2 Axle 3. MAV			1. Loading 2. Unloading 3. Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others	
	1. Truck/2 Axle 2. MAV 3. LCV			1. Loading 2. Unloading 3. Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others	
	1. Truck/2 Axle 2. MAV 3. LCV			1. Loading 2. Unloading 3. Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others	

COMPREHENSIVE MOBILITY PLAN
Road Side Interview Survey Format-Passenger Vehicles

Name of the Road: _____								Day: _____		
Interviewer: _____								Date: _____		
Locations: _____								Direction: _____		
Time (very important)	Vehicle Type	Occupancy	Origin of the Trip	Destination of the Trip	Purpose of Journey	Trip Distance (Kms)	Trip Frequency			
	1.Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1.Work 2.Business 3.Education 4.Social & Recreation 5.Tourism 6.Others		1.Daily 2.Alternate Day 3.Weekly 4.Monthly 5.Others			
	1.Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1.Work 2.Business 3.Education 4.Social & Recreation 5.Tourism 6.Others		1.Daily 2.Alternate Day 3.Weekly 4.Monthly 5.Others			
	1.Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1.Work 2.Business 3.Education 4.Social & Recreation 5.Tourism 6.Others		1.Daily 2.Alternate Day 3.Weekly 4.Monthly 5.Others			

COMPREHENSIVE MOBILITY PLAN
BUS STOP PASSENGER COUNT SURVEY

Name of the Bus stop: _____									
Road Name: _____									
Date: _____									
Direction: _____									
Time (Hrs)	Route No/Name	Origin	Destination	Terminal	Alighting	Total			

**COMPREHENSIVE MOBILITY PLAN
BUS PASSENGER INTERVIEW SURVEY**

Name of the Road: _____ Location: _____ Time: _____
 Date: _____ Direction: _____

Boarding Passengers

Sr no	Origin	Mode of Travel to the Bus Stop	Purpose of journey	Distance travelled to arrive at the stop (Km)	Fare for the trip (Rs)	Waiting time at the Bus stop (min.)	Where are you going (designation)	Approximate		Average Waiting time at the Bus stop (min)	Approximate		Fare (Rs)
								Distance (Km)	Time (Min)		Distance (Km)	Time (Min)	
1													
2													
3													
4													
5													
6													
7													

Alighting Passengers

Sr no	Origin	Approximate		Fare (Rs)	Waiting time at the Bus stop (min.)	Destination	Mode of travel from the Bus Stop	Approximate		Approximate Waiting time at the Bus Stop (min)	If the destination is not near the bus stop, Which mode do you take to go from there	Approximate		Fare (Rs)	Purpose of journey
		Distance (Km)	Time Taken (Min)					Distance (Km)	Time (Min)			Distance (Km)	Time (Min)		
1															
2															
3															
4															
5															
6															
7															

(Walk-1, Cycle-2,Cycle rickshaw-3, Motorcycle-4,Auto Rickshaw-5, Pvt Car-6,Taxi-7, Bus-8,Other-9) Trip Purpose: Work=1, Business=2, Education=3,Social &Recreation=4, Tourism=5, Others=6

**COMPREHENSIVE MOBILITY PLAN
BUS PASSENGER INTERVIEW SURVEY**

Name of the Road: _____ Location: _____ Time: _____
 Date: _____ Direction: _____

Boarding Passengers

Sr no	Origin	Mode of Travel to the Bus Stop	Purpose of journey	Distance travelled to arrive at the stop (Km)	Fare for the trip (Rs)	Waiting time at the Bus stop (min.)	Where are you going (designation)	Approximate		Average Waiting time at the Bus stop (min)	Approximate		Fare (Rs)
								Distance (Km)	Time (Min)		Distance (Km)	Time (Min)	
1													
2													
3													
4													
5													
6													
7													

Alighting Passengers

Sr no	Origin	Approximate		Fare (Rs)	Waiting time at the Bus stop (min.)	Destination	Mode of travel from the Bus Stop	Approximate		Approximate Waiting time at the Bus Stop (min)	If the destination is not near the bus stop, Which mode do you take to go from there	Approximate		Fare (Rs)	Purpose of journey
		Distance (Km)	Time Taken (Min)					Distance (Km)	Time (Min)			Distance (Km)	Time (Min)		
1															
2															
3															
4															
5															
6															
7															

(Walk-1, Cycle-2,Cycle rickshaw-3, Motorcycle-4,Auto Rickshaw-5, Pvt Car-6,Taxi-7, Bus-8,Other-9) Trip Purpose: Work=1, Business=2, Education=3,Social &Recreation=4, Tourism=5, Others=6

COMPREHENSIVE MOBILITY PLAN
RAIL PASSENGER INTERVIEW SURVEY

Name of the Station: _____ Location: _____ Time: _____
 Date: _____ Direction: _____

Boarding Passengers

Sr. no	Origin	Mode of Travel to the Bus Stop	Purpose of journey	Distance travelled to arrive at the stop (Km)	Fare for the trip (Rs)	Waiting time at the Bus stop (min.)	Where are you going (designation)	Approximate		If the destination is not near the bus stop, Which mode do you take to go from there	Average Waiting time at the Bus stop (min)	Approximate		Fare (Rs)
								Distance (Km)	Time (Min)			Distance (Km)	Time (Min)	
1														
2														
3														
4														
5														
6														
7														

Alighting Passengers

Sr. no	Origin	Purpose of journey	Approximate		Fare (Rs)	Waiting time at the Bus stop (min.)	Destination	Mode of travel from the Bus Stop	Approximate		Fare (Rs)	Approximate Waiting time at the Bus Stop (min)	If the destination is not near the	Approximate		Fare (Rs)
			Distance (Km)	Time Taken (Min)					Distance (Km)	Time (Min)				Distance (km)	Time (Min)	
1																
2																
3																
4																
5																
6																
7																

(Walk-1, Cycle-2, Cycle rickshaw-3, Motorcycle-4, Auto Rickshaw-5, Pvt Car-6, Taxi-7, Bus-8, Other-9) Trip Purpose: Work=1, Business=2, Education=3, Social & Recreation=4, Tourism=5, Others=6

COMPREHENSIVE MOBILITY PLAN

Bus Occupancy Survey Format

Road Name: _____ Bus Stop/Land mark: _____
 Direction: _____

Road Name	Bus stop Name	Direction	Bus Type	Total no of seats available per bus type	Route Number	Sitting		Standees		Crush Capacity (✓)
						Empty	Full	None	Full	
						Empty	Full	None	Full	
						Empty	Full	None	Full	
						Empty	Full	None	Full	
						Empty	Full	None	Full	
						Empty	Full	None	Full	
						Empty	Full	None	Full	

Bus Type: M- Moffusil Bus, C City Bus

COMPREHENSIVE MOBILITY PLAN				
OTHER VEHICLES AVERAGE OCCUPANCY SURVEY				
Location:		Date:		
Direction of count:		Name of the enumerator:		
Time	Two wheeler passengers	Car/Van/Jeep passengers	Auto rickshaw passengers	Mini tempo passengers
:00 - :15				
:15- :30				
:30 - :45				
:45- :00				
:00 - :15				
:15- :30				
:30 - :45				
:45- :00				

COMPREHENSIVE MOBILITY PLAN				
BUS TERMINAL PASSENGER IN & OUT COUNT SURVEY				
Location:				
Date:				
Direction:				
Time(Hrs)	Passengers In	Passengers Out	Total	

COMPREHENSIVE MOBILITY PLAN				
RAIL TERMINAL PASSENGER IN & OUT COUNT SURVEY				
Location: Date: Direction:				
	Time(Hrs)	Passengers In	Passengers Out	Total

COMPREHENSIVE MOBILITY PLAN					
PEDESTRAIN COUNT SURVEY (Junction)					
Location:			Date:		
Road Name:			Day:		
Direction:			To:		
	Please draw the St road & Crossing Road				
Time	Crossing the road			Along the road/Foothpath	
	Towards: -----	Towards: -----	LHS	RHS	
:00 to:15					
:15 to :30					
:30 to :45					
:45 to :00					
:00 to:15					
:15 to :30					
:30 to :45					
:45 to :00					

Comprehensive Mobility Plan							
Pedestrian Count Survey-Mid Block							
Location:	Shift Day/Night Weather: Sunny/Cloudy/Rainy	Date: Enumerator:	Day: Sheet No:	Along the Road (LHS)			Along the Road (RHS)
				Direction 1:	Direction 2:	Direction 1:	Direction 2:
Time							
Hourly Total							

COMPREHENSIVE MOBILITY PLAN	
NON-MOTORIZED TRANSPORT- OPINION SURVEY	
Date:	Location:
Day: Cycle <input type="text"/>	Interviewer: Cycle Rickshaw <input type="text"/>
1. Age:	<input type="text"/>
2. Sex: (Male: M, Female: F)	<input type="text"/>
3. Trip Origin:	<input type="text"/>
4. Trip Destination:	<input type="text"/>
5. Distance of the trip in Km:	<input type="text"/>
6. Time taken for the trip :	<input type="text"/>
7. Trip Purpose: a)Work/Business b)Education c)Social d)Others	<input type="text"/>
8. Trip Frequency : a)Daily b)Weekly c)Monthly d)Rarely	<input type="text"/>
9. Travel & Maintenance cost per month :	<input type="text"/>
10. Problems while riding your vehicle:	<input type="text"/>
(Please rank as per your observation as 1,2,3,4,5,6 etc)	
a) High Volume of Traffic	<input type="text"/>
b) High Speed of Vehicles	<input type="text"/>
c) Interference due to parking/pedestrians/bus stops	<input type="text"/>
d) Bad condition of road/shoulders	<input type="text"/>
e) Absence of proper lighting	<input type="text"/>
f) Difficulty in crossing junctions	<input type="text"/>
11. Your opinion on the necessity of separate track	
a) Very essential	<input type="text"/>
b) Desirable	<input type="text"/>
c) Not required	<input type="text"/>
g) No idea	<input type="text"/>
12. Do you prefer exclusive track : Yes / No	<input type="text"/>

COMPREHENSIVE MOBILITY PLAN										
IPT SURVEY FORMAT										
Part I Para transit Vehicle Information										
1. Name of the Operator 2. Garaging Address 3. Vehicle Ownership Details										
Vehicle Type	No of Vehicle owned	Vehicle Registration No	Year	Make & Model	No of crew per trip (Driver/Cleaner)	Monthly Salary (in Rs for Driver & Cleaner)	Passenger Capacity	Frequency of Trips per day	Average Annual Maintenance Cost (Rs/year)	Average service Life (in years)
Auto Rickshaw										
Share Auto										
Taxi										
Maxi cab/Pick up van										
Frequency of Trips: 1. Daily 2. Alternate Days 3. Weekly 4. Monthly 5. Quarterly										
4. For Share Auto / Pick up van please mention the route of Trip:										
1	_____									
2	_____									
3	_____									
4	_____									

Part II Trip Information								
Date of Travel:			Day of Travel:			Total Number of Trips per day:		
Approximate Distance Traveled (in Kms) on a travel day:								
Trip No	Trip Origin Address	Trip Destination Address	Time to start (Hrs:Min)	Time to finish (Hrs:Min)	Trip Distance (in Kms)	Trip Purpose 1.Work 2.Business 3.Social 4.Education 5.Others	Number of passengers carried per trip	Remarks

COMPREHENSIVE MOBILITY PLAN

TRUCK OPERATORS INTERVIEW SURVEY FORMAT

1. Name of the Operator
2. Garage Address
3. Number of vehicles owned: LCV MAV TRUCK
4. What is the route of operation?
 1. _____
 2. _____
5. Frequency of Trips: 1. Daily 2. Alternate Days 3. Weekly 4. Monthly 5. Quarterly
6. Average trip distanc:
7. Do you have any parking facilities/Garages? (Yes/No)
8. If yes what is the size of parking facility?
9. If No, where do you park your vehicles?
10. What is the designated time duration for loading and unloading inside the city?
11. What are the truck operating routes in the city?
 1. _____
 2. _____
12. Do you have any truck Laybys inside the city?
13. Please tick ü if any Operational diffculties given below are there.
 1. No Parking facility
 2. Ban on some roads or time
 3. Poor quality of roads
 4. Narrow roads
 5. No terminal facilities
 6. Lack of general facilities
 7. No weighing facilities
 8. Others

Detailed Trip Information: (Last day/Last week)												
Date of Travel:	Number of Trips per month:	Day of Travel:					Total					
		Trip No (1)	Origin Address (2)	Destination Address (3)	Time of start (Hrs:Min) (4)	Time of finish (hrs:Min) (5)	Trip Distance (6)	Trip Purpose (7)	Commodity type (8)	Load Carried (in Tonnes) (9)	Market Value of Commodity (in Rs)	Remarks (10)

Trip Purpose: 1-Loading, 2-Unloading, 3. Others
 Commodity Type:1.Foodgrains, Vegetable, Cereals, 2.Wood, 3. Fisheries, 4.Stone, Coals, 5.Industrial Materials, 6.Petroleum Products, 7.Building Materials, 8.Consumer items, 9.Empty, 10.Rubber Related Products, 11.Others

Street Light Intensity Survey – LUX METER

Road Name : _____
 No of Lanes : _____ Arterial/Sub arterial: _____ Date: _____
 Direction: _____ Divided/Undivided: _____ Day : _____
 Time : _____

