

## TOD Guidance Document



**CONSULTANCY SERVICES FOR DEVELOPING GUIDANCE DOCUMENTS FOR TRANSIT ORIENTED DEVELOPMENT (TOD), NON-MOTORISED TRANSPORT (NMT) AND PUBLIC BICYCLE SHARING (PBS)**







**Transit Oriented Development  
Guidance Document**

**Cover Page:**

An example of Town Centre along a BRT stop with active street edges, sidewalk activity, slow vehicular traffic and continuous building edges | Source: Adapted from Town Centre Master Plan, Bhubaneswar, prepared for BDA, by IBI Group



Prepared for Ministry of Urban Development, Government of India  
By IBI Group

## Foreword

Prior to the launch of the National Urban Renewal Mission (2005) and the National Urban Transport Policy (2006), investments in public transportation systems to meet the mobility needs of the current and future population were limited in Indian cities. Planning for essential city systems — environmental, land, mobility, economic and social — has largely been attempted in piecemeal. The need to induce a paradigm shift, putting people first in planning our regions, cities and neighbourhoods, implies providing for increased mobility choices from dependence on private vehicles to the availability of good public transportation and safe non-motorised transport. With increased investment in mass rapid transit systems, time is opportune to structure an approach to address how integrated land use and transit may serve as a tool to bring about the paradigm shift and assist in transforming the future of Indian cities.

Transit Oriented Development (TOD) is a foundational planning concept that integrates the potential of coordinating land use planning, transportation system design and infrastructure investments, as an integrated process with people and public transit. This TOD Guidance Document presents a compendium of strategies and recommendations for integrated land use, transportation and infrastructure planning in shaping urban growth patterns. It also identifies a five-step planning process for local authorities, central government agencies and development professionals to follow in implementing transit oriented development projects. It is one of the first comprehensive attempts in India to provide a step-by-step guide for cities to plan and implement successful TODs.

This Guidance Document brings out clarity in the discourse around transit-oriented development of Indian cities by analyzing challenges encountered in attempting transit-oriented development around the country. The purpose seeks first to document the state of the practice and finally to assemble the resources necessary to assist cities, transit agencies and professionals who wish to embrace TOD as a planning concept.

It is of utmost importance that the knowledge contained in this document is transferred to on-the-ground practices to bring about sustainable changes in urban development in India's cities.

## Preface

The Guidance Documents for preparing Non-motorised Transport (NMT) plans, Transit Oriented Development (TOD) plans and Public Bicycle Sharing Schemes (PBS) have been undertaken by the Sustainable Urban Transport Project, Ministry of Urban Development (MoUD), Government of India (GOI) with support from Global Environment Facility (GEF), UNDP and World Bank. The primary objective of GEF-SUTP is to apply National Urban Transport Policy principles to achieve a paradigm shift in India's urban transport system for more favourable sustained developments and alternatives.

Under the guidance of MoUD, these documents are envisioned to assist various government organizations, public authorities and development professionals in India, embarking on the process of integrating sustainable transport planning principles in diverse urban contexts. In addition, central government officials and representatives may refer to these documents when evaluating the implementation of the Smart City Mission in selected cities and future policy formulation initiatives by think tanks such as NITI Aayog.

A state of the art review was conducted as a first step to highlight successes and failures in application of NMT, TOD and PBS globally and in Indian cities. Building on the lessons learned from these experiences, the focus of the Guidance Documents was directed to establish a systematic process for plan preparation, serving more as an implementation manual with checklists of potential alternatives, rather than providing technical standards for development of detailed specifications. Based on local conditions, it is expected that state, city and special authorities will adapt the steps presented in the Guidance Documents to each city's own individual situations.

This Guidance Document on preparing TOD Plans goes beyond discussing the principles and includes a step-by-step planning process, supported with tools for quick reference and application of standards in Indian cities. To test the practical value of the guidance document in Indian cities, TOD city specific plans were also prepared for Mumbai and Bhopal. This document will serve as a handbook of ideas and strategies for making transit oriented development as the focus of future development in Indian cities and show how all forms of urban development and redevelopment can be made more accessible by public transit.



## Acknowledgment

The TOD Guidance Document was prepared under the direction of Shri. Rajiv Gauba (Secretary, MoUD), Shri. Durga Shanker Mishra (Additional Secretary, UD), Shri. M.K.Sinha (OSD, UT), Shri. R.K.Singh (Director, UT-I), Shri. I. C. Sharma (National Project Manager, PMU, SUTP), Shri. Sudesh Kumar (Team Leader, Project Management Consultant, SUTP) and Ms. Nupur Gupta (Team Leader, World Bank).

The team would like to make special mention of Shri Dinesh Naik (Dy. Chief Planner. Town Planning Officer, Municipal Corporation of Greater Mumbai), Shri Kamal Nagar (Joint Director cum OSD-Transport, Directorate Urban Administration and Development, State of Madhya Pradesh), Ms. Paromita Roy (Deputy Director, UTTIPEC, Delhi Development Authority) for their valuable inputs. In addition, special thanks to Ms. Sonal Shah, Urban Planner & Designer and Ms. Sradha Marathe, LEED AP and GRIHA trainer for assisting during the document conceptualisation phase.

We are thankful to all stakeholders for participating in various workshops and sharing their feedback during the TOD city specific workshops.

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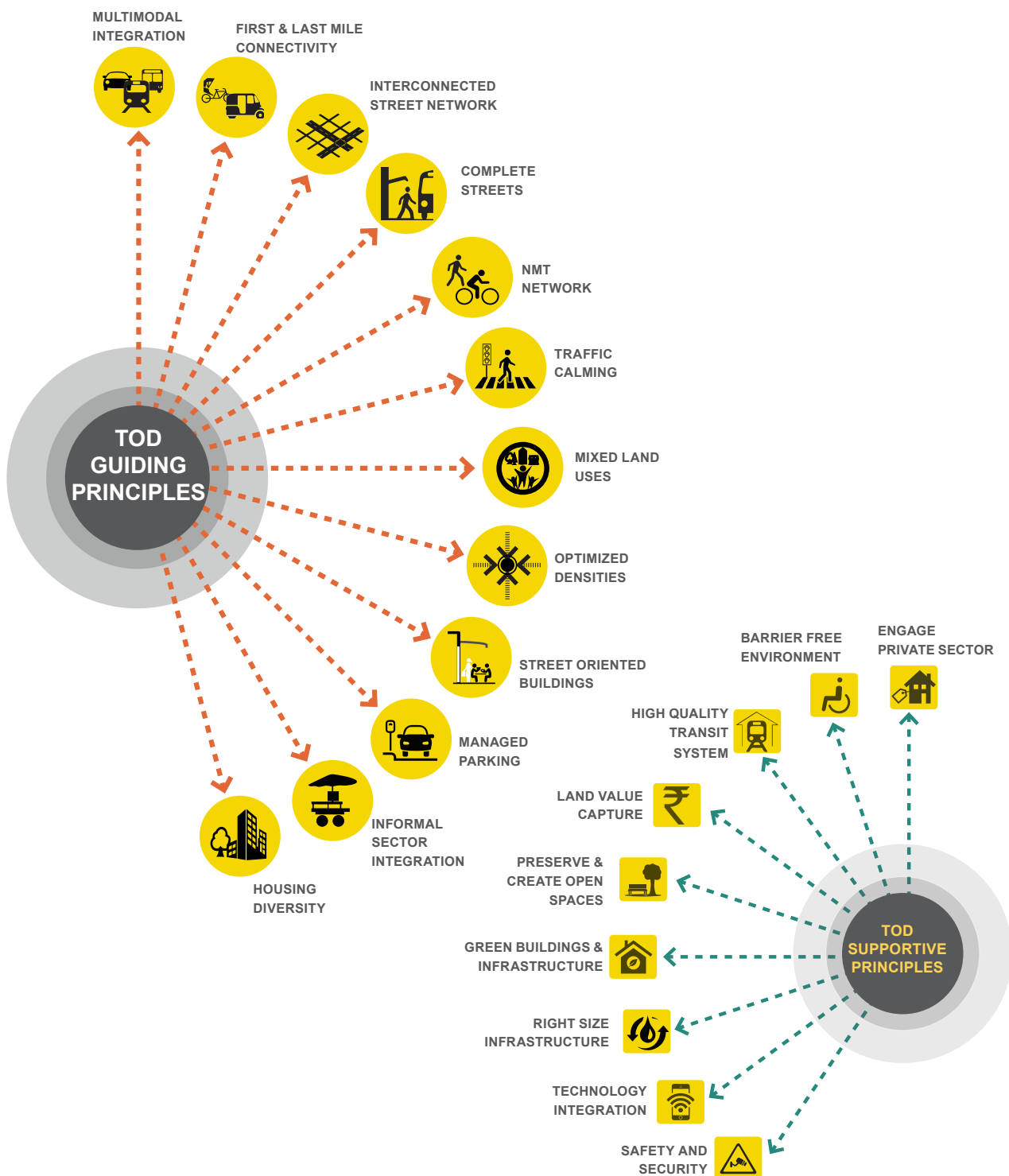
# EXECUTIVE SUMMARY

## DEFINING TRANSIT ORIENTED DEVELOPMENT

Transit Oriented Development, better known by its acronym TOD, involves creating concentrated nodes of moderate-to-high density developments supporting a balanced mix of land uses around transit stations. TODs encourage compact growth all within a 5-10 minute walk from quick and efficient public transit and promote 'live, work, play, shop and learn' in a pedestrian-friendly environment – without the need of a car.

## Principles of TOD

The document identifies 12 TOD Guiding Principles and 9 TOD Supportive Principles derived from a study of Indian urban conditions and best practices of TOD design and planning from around the world.





The purpose of developing a step-by-step approach for successful implementation of TOD projects is to ensure a robust process for initiation, design and evaluation of TODs at multiple scales- city, corridor, station area, site. The entire TOD process from inception to implementation is captured in the following five key steps. Each step is further guided by a series of task-based actions that will assist cities in making informed decisions to promote TODs.



## STEP-1

### ASSESS

1 Review nature of transit and station areas

2 Conduct a review of current institutional support, plans, policies and programs

3 Define scale and scope of TOD planning area

4 Identify funding opportunities to undertake TOD related studies

5 Gauge in-house technical capacity

6 Identify stakeholders early-on in the decision making process



## STEP-2

### ENABLE

1 Establish leadership support and project champions

2 Develop Transit-First goals in promoting integrated land use and transportation

3 Establish partnerships at state and regional levels to empower local governments

4 Identify and address policy level and regulatory barriers

5 Define TOD project methodology and delivery tools

6 Undertake capacity building







### STEP-3

## PLAN+DESIGN

- 1 Prepare data inventory
- 2 Delineate boundaries for TOD study area
- 3 Conduct stakeholder workshop/meeting(s) to revalidate vision, issues and opportunities
- 4 Formulate context-specific plan and strategic priorities
- 5 Identify a pilot/demonstration project
- 6 Identify a phasing and implementation strategy including catalyst projects



### STEP-4

## INVEST

- 1 Identify capital costs for critical improvements
- 2 Introduce innovative funding tools
- 3 Enhance development potential and attract investors through appropriate incentives



### STEP-5

## IMPLEMENT

- 1 Formulate a phasing strategy
- 2 Establish clear roles and responsibilities to empower key players for implementation
- 3 Establish statutory relevance
- 4 Adopt a flexible planning approach to accommodate growth and change
- 5 Develop a communications, outreach and marketing strategy
- 6 Develop monitoring and evaluation benchmarks to measure success of TOD



# FREQUENTLY ASKED QUESTIONS (FAQs)

## 1. What is Transit Oriented Development?

Transit Oriented Development, commonly known as TOD, is a planning concept that focuses on creating development patterns which facilitate use of public transit, walking and cycling as primary modes of transport. This is achieved by providing convenient and efficient access to a **diverse mix of land uses** (supported with increased densities, where appropriate) located within a **5-10 minute walking distance** from mass rapid transit stations (both bus and rail based).

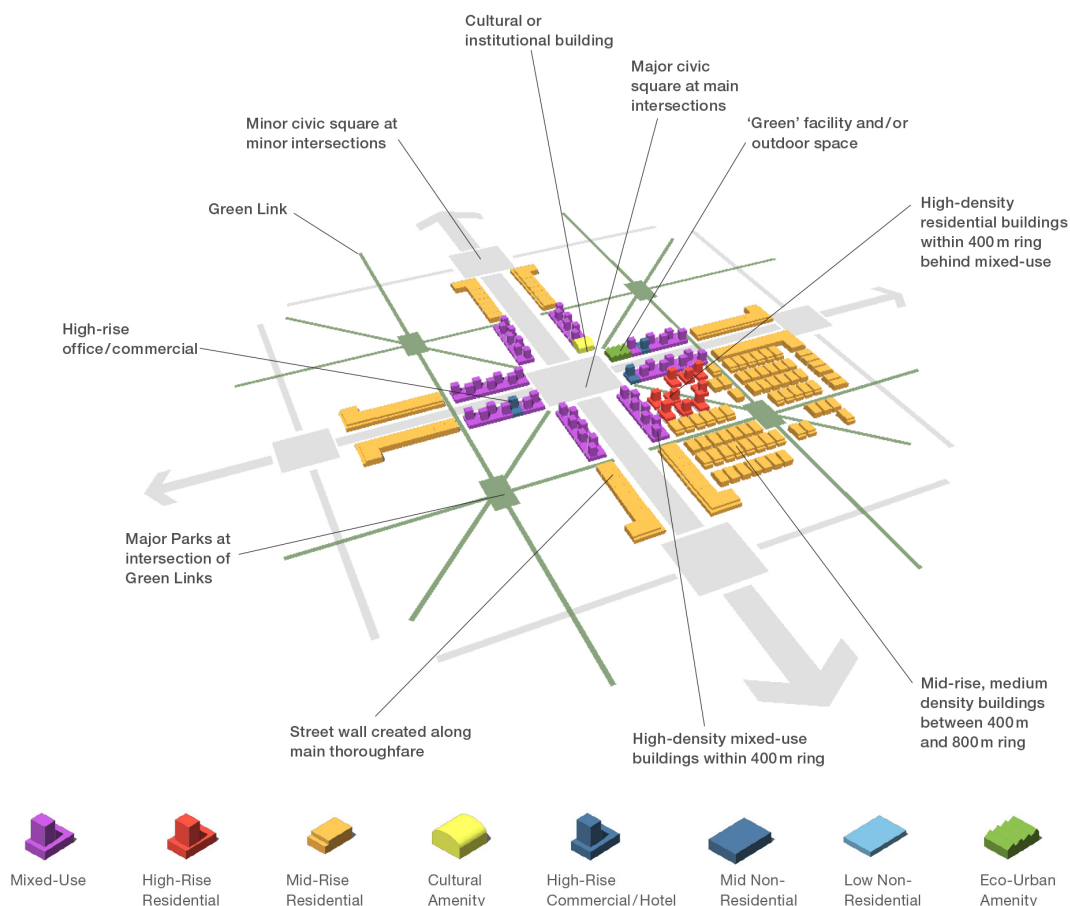
TODs involve following a planning process that integrates a city's physical features (land use, built form, transportation, and infrastructure systems) with **real estate market dynamics** by **bringing multiple stakeholders together**.

## 2. Are TODs relevant to the Indian context?

Yes. In most cases, planning in Indian cities continues to be automobile-centric with wide roadways, minimal pedestrian and cycling infrastructure, and segregated singular use areas. TOD hinges on the principle of bringing together people, jobs, and services connected with each other primarily by walking, cycle or transit. Indian cities are in urgent need for such an intervention that promotes a shift from personal vehicle ownership to increased public transportation and non-motorized transportation (NMT) usage.

Recent investments in mass rapid transit systems such as the Janmarg BRT in Ahmedabad and Metro Rail in Delhi and Bengaluru, have brought to surface the current lack of connectivity to transit stations and BRT stops. TOD offers alternatives to resolve these conflicts through careful planning and design of public spaces (streets and open spaces).

As TODs are centered on the transit facility as the origin and destination, the concept promotes micro-level planning and urban design interventions as opposed to the current **top-down "one-size fits all"** policy-driven approach followed in most Indian cities.



Elements of TOD to promote compact development with combination of mixed use and high density | Source: IBI Group

### 3. Is mass rapid transit a pre-requisite for creating successful TODs?

Not necessarily. Evidence from transit-rich cities such as Curitiba, Singapore, Hong Kong, Arlington (Virginia, U.S.A.) or New York confirm that rapid transit (BRT or Metro rail) has a significant impact on attracting TODs, however, transit quality alone does not drive real estate investment in these cases. Real estate market dynamics are influenced by several factors such as land availability, ownership, infrastructure quality, or market demand.

A high-capacity mass rapid transit system with frequent and reliable service plays a critical role in encouraging efficient mobility patterns for residents and workers living in close proximity to the transit corridors. Local busways, if designed to function as high quality transit systems, may attract successful TOD projects at strategic locations such as multimodal interchanges.

### 4. What is the purpose of this Guidance Document and how is it different from ongoing TOD initiatives in India?

Presently, there is no detailed policy directive from the central government to the state or urban local bodies in promoting TODs as a planning tool. The National Transport Policy 2014 and URDPFI Guidelines, formulated by the Ministry of Urban Development, GoI, discuss the concept of TOD generically.

This Guidance Document is the first attempt in India to provide a step-by-step guide for cities to plan and implement successful TODs, applicable at varying contexts such as scale (City, Corridor, Station Area, Site), development type (Greenfield, Redevelopment, or Infill), and transit mode (BRT or Metro Rail).

To date, ongoing initiatives in India have been limited to local level interventions in the form of citywide policies (TOD chapter in Delhi Master Plan), modifications to the Development Control Regulations (Ahmedabad DCR Update 2014) or preparation of Station Accessibility Plans (DULT, State of Karnataka). The Guidance Document draws from the learnings of these cities to create a set of generic TOD principles that could be applied (per local context) in other Indian cities.

This document intentionally goes beyond discussing the theory of TOD and includes a detailed planning process, tools for implementation, and references for accessing standards, case studies and templates for implementing agencies.

### 5. Who will be responsible for preparing and implementing TOD plans?

The complex nature of TODs where transit, land use, transportation and infrastructure meet requires multiple stakeholder coordination. However, there are two primary agencies that will have a pivotal role in creating successful TODs. These include:

#### a. **Development or Planning Authority/ Municipal Corporation: Planning, Implementation, and Enforcement**

Lead agency responsible for TOD policy formulation, local area planning near stations, infrastructure improvements including streetscape design and utility upgrades, land assemblage, and stakeholder coordination.

#### b. **Transit Agency: Planning and Implementation**

Transit systems planning, area planning near stations, land assemblage, infrastructure improvements such as station accessibility, facility design, financing development and joint development of stations with private sector.

## 6. What is the ideal scale for planning TODs?

As mentioned before, there is no “one size fits all” approach to TOD planning. TOD plans are prepared primarily at four scales: 1) Region or City; 2) Corridor; 3) Station Area; 4) Project Site. Tool 1 illustrates a potential methodology to determine the appropriate scale of TOD planning.

The recommended scale for TOD planning is the **corridor scale**. Corridor level TOD plans offer the advantage of integrating citywide transportation systems with local level land use patterns. Planning at the transit corridor scale also helps in identifying the development potential of stations as origins and/or destinations and the role of different transit nodes along one corridor. Success at the station area or project site scale is more likely when there is an understanding of the market dynamics and street connectivity at the corridor level.

Detailed planning for identifying infrastructure improvements and DCR changes should be undertaken at the **station area level**. Station Area boundaries are defined based on the transit mode and walking/ cycling distances from the station node.

## 7. Can TOD policies be incorporated into statutory documents such as the Comprehensive Development Plan/ Master Plan/ Development Control Regulations?

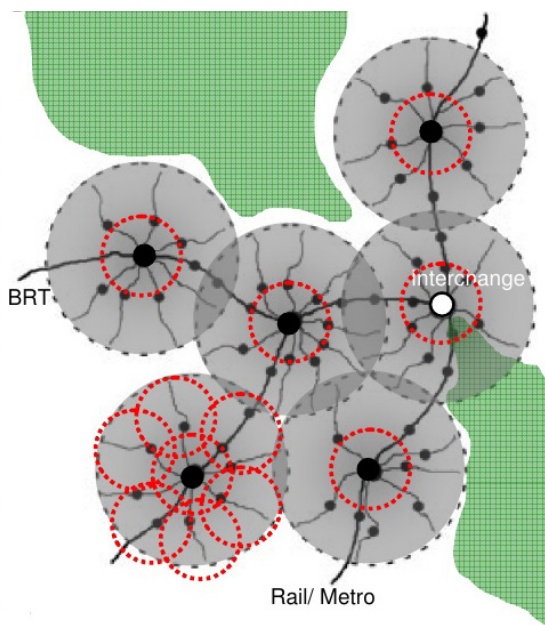
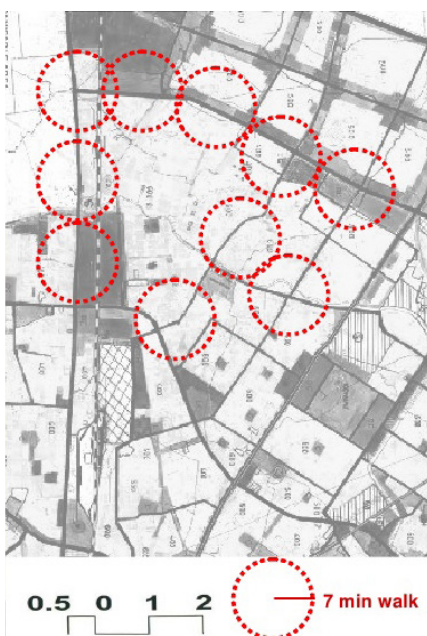
Yes. However, there is no one solution for incorporating TODs in statutory documents that will fit all cities. Depending on the planning and regulatory context of the City and the respective State Town and Country Planning Acts, incorporating TOD policies may take alternative forms, including, but not limited to:

- As part of the **Master Plan Update** process which happens typically every ten years;
- As a **separate TOD chapter** inserted as an amendment to the existing Master Plan;
- As **modifications to specific elements of DCRs** such as parking requirements, building heights, FARs, setbacks, public realm improvements along priority transit corridors; or
- As **urban design guidelines** supporting Development Control Regulations.

## 8. Are there any “quick-wins” that can be achieved through TOD planning?

Yes. While a fundamental rule for TOD is to plan for long-term spanning a horizon of 10-20 years, interventions related to improving accessibility to transit stops and stations offer ‘quick-wins’( time frame of 2-3 years). These interventions are generally identified in the plan as incremental additions for creating complete TOD projects. Some of these immediate projects may include:

- Multimodal integration for various modes including direct access between feeder buses, auto-rickshaws, cycle rickshaws and transit stations;
- Upgraded pedestrian infrastructure including footpaths, street furniture, designated waiting areas;
- Improved station facilities including passenger amenities;
- Bicycle rental or public bicycle sharing systems near transit stations;
- Park-and-ride lots at strategic transit locations; or
- Identify staff resources for managing TOD projects.



Shift from Auto Oriented City to Transit Oriented City | Source: UTTIPEC



**9. In the western context, TODs are often used as a planning tool to increase population densities and transit ridership. Will increased FARs in TOD areas be relevant in dense Indian cities?**

Rather than focusing on increasing development density or FARs as the primary goal of TODs, priority in the Indian context should be placed on issues of pedestrian and cycling infrastructure, mixed land uses, first and last mile connectivity, street oriented buildings, and parking management.

While it is true that Indian cities are densely populated, these densities are not always concentrated in close proximity to transit corridors or stations. This has resulted in sprawled automobile dependent development with **limited accessibility to transit facilities for pedestrians and cyclists**. In addition, the high density areas in Indian cities are characterized by **singular uses instead of mixed land uses** including a **mismatch between jobs and housing development** density near transit stops and stations.

Another issue related to building densities is the application of **blanket or uniform Floor Area Ratios (FARs)** or Floor Space Index (FSI) to land uses at the city level, irrespective of the existing infrastructure capacities or local context. A fundamental premise of TOD is the application of context sensitive design standards, including building densities, based on variables surrounding the station **area such as transit capacity, plot sizes, street widths, or infrastructure capacities**.

**10. Will TOD as a concept be effective in built-up urban areas?**

Yes. On the contrary, TOD will be most effective in urban areas (infill development, redevelopment sites, and brownfield sites in particular) where transit investments are generally initiated to alleviate issues of traffic congestion. Indian cities may be dense, but safe, secure and efficient pedestrian connections within developments and to adjacent development and Public Transport are not always there. As cities continue to experience rapid population growth, urban areas expand outwards to greenfield lands requiring investment in new infrastructure rather than better utilization of existing infrastructure.

TODs promote compact development with intentional mixing of land uses such as residential, commercial, educational, recreational amongst other services. These land uses are in close proximity to each other and can be easily accessed by public transit and non-motorized transportation modes of walking, cycling, and cycle-rickshaws.

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## ACRONYMS

AUDA	:	Ahmedabad Urban Development Authority
AJL	:	Ahmedabad Janmarg Ltd.
BDA	:	Bhubaneswar Development Authority
CBD	:	Central Business District
CDP	:	City Development Plan
CPTED	:	Crime Prevention Through Environmental Design
CREDAI	:	Confederation of Real Estate Developers' Associations of India
CTOD	:	Center for Transit Oriented Development
DBF	:	Design Build Finance
DBFM	:	Design Build Finance Maintain
DBFOM	:	Design Build Finance Operate Maintain
DCR	:	Development Control Regulation
DPR	:	Detailed Project Report
DULT	:	Directorate of Urban Land Transport
ECS	:	Equivalent Car Space
EPA	:	Environmental Protection Agency
EWS	:	Economically Weaker Section
FAQ	:	Frequently Asked Question
FAR	:	Floor Area Ratio
FSI	:	Floor Space Index
GDCR	:	General Development Control Regulations
GEF	:	Global Environment Facility
GHG	:	Green House Gases
GIS	:	Geographic Information System
GLS	:	Government Land Sales
HDB	:	Housing Development Board
HUD	:	Department of Housing and Urban Development
IDA	:	International Development Association
IIA	:	Indian Institute of Architects
IIM	:	Indian Institute of Management
IIT	:	Indian Institute of Technology
IPPUC	:	Institute for Research and Urban Planning of Curitiba
IPT	:	Intermediate Public Transport
IRC	:	Indian Roads Congress
ITDP	:	Institute for Transportation and Development Policy
ITPI	:	Institute of Town Planners of India
IUT	:	Institute of Urban Transport
LRT	:	Light Rail Transport
LTA	:	Land Transport Authority



MND	:	Ministry of National Development
MoUD	:	Ministry of Urban Development
MRTC	:	Metro Rail Transit Corporation
MRTS	:	Mass Rapid Transport System
MTR	:	Mass Transit Railway
MTRC	:	Mass Transit Railway Corporation
NBC	:	National Building Code
NIUA	:	National Institute of Urban Affairs
NMT	:	Non-Motorised Transport
PBS	:	Public Bike Sharing
PCMC	:	Pimpri- Chinchwad Municipal Corporation
POD	:	Pedestrian Oriented Development
PPP	:	Public Private Partnership
RAH	:	Residential Affordable Housing
REIT	:	Real Estate Investment Trust
RFP	:	Request For Proposal
SAHPD	:	Special Affordable Housing Protection District
SAP	:	Station Accessibility Plan
SP	:	Strategic Planning
SPA	:	School of Planning and Architecture
SPV	:	Special Purpose Vehicle
SUTP	:	Sustainable Urban Transport Project
TAD	:	Transit Adjacent Development
TCPO	:	Town and Country Planning Organization
TDM	:	Transportation Demand Management
TDR	:	Transfer of Development Rights
TIF	:	Tax Increment Financing
TOD	:	Transit Oriented Development
TOZ	:	Transit Oriented Zones
TPS	:	Town Planning Schemes
ULB	:	Urban Local Body
UMTA	:	Unified Metropolitan Transportation Authority
UNDP	:	United Nations Development Programme
URA	:	Urban Redevelopment Authority
URBS	:	Urbanização de Curitiba
URDPFI	:	Urban and Regional Development Policy Formulation and Implementation
UTF	:	Urban Transport Fund
UTTIPEC	:	Unified Traffic and Transportation Infrastructure Planning & Engineering Centre
VKT	:	Vehicle Kilometres Travelled

## DOCUMENT ORGANIZATION

1	<b>INTRODUCTION</b>	The Introduction chapter sets the stage for the creation of TODs through a general discussion of the concept's planning context, myths, and lessons learned from global practices and Indian experiences.	
2	<b>TOD GUIDANCE DOCUMENT</b>	The need, objectives, target users and structure of the step-by-step process detailed in the TOD Guidance Document is explained in this chapter.	
	TOD FRAMEWORK	3 <b>ASSESS</b>	The Assess chapter provides an overview of the steps needed to examine a city's preparedness for undertaking TOD initiatives including defining the scale and scope of the planning area and identifying stakeholders for undertaking TOD projects.
	TOD FRAMEWORK	4 <b>ENABLE</b>	This chapter provides the steps necessary to create an enabling environment for creating successful TODs prior to embarking on detailed TOD planning initiatives
	TOD FRAMEWORK	5 <b>PLAN + DESIGN</b>	The Plan + Design chapter contains a series of detailed planning principles and design components to formulate TOD plans at various scales of intervention (city, corridor, station area, and site).
	TOD FRAMEWORK	6 <b>INVEST</b>	Invest provides an overview of the financing tools that can be used by a city to achieve the TOD planning policies, projects and initiatives identified in the previous steps.
	TOD FRAMEWORK	7 <b>IMPLEMENT</b>	Implementation provides an overview of tasks and sub-tasks to implement TOD plans including institutional framework and supportive public policies.

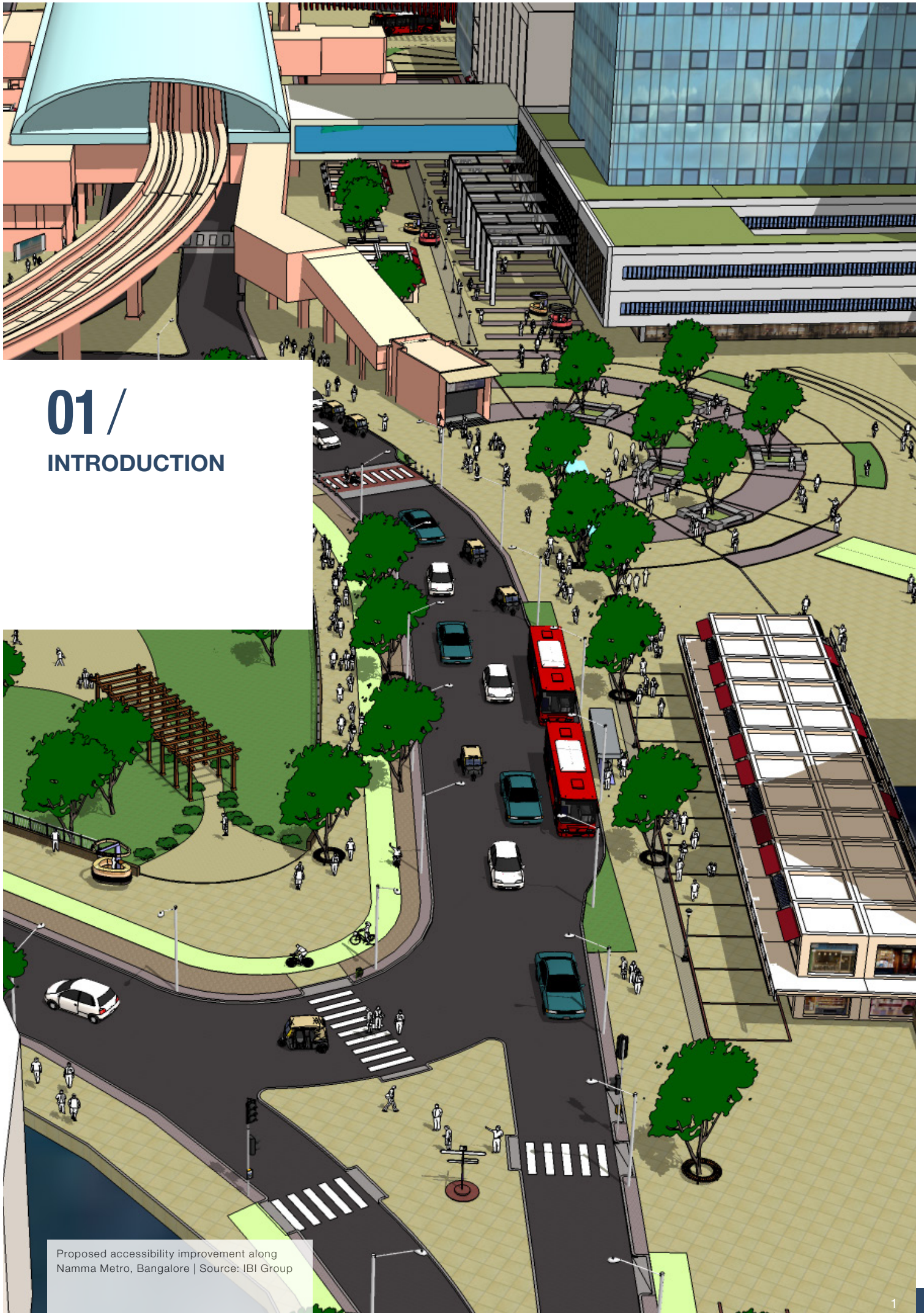
The document concludes (Appendix) with a compendium of best practice case studies, sample Terms of Reference for cities and a glossary of terms.

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# 01 / INTRODUCTION

Proposed accessibility improvement along  
Namma Metro, Bangalore | Source: IBI Group



## 1.1 Background

**Traditionally, integrated land and transportation development principles such as narrow walkable streets, 'human scaled' mixed use buildings, and active street frontages existed in different forms in Indian cities. With walking and cycling as the dominant modes and preferred choice of mobility, the issues of congestion, pollution, dominance of automobiles in the public space was non-existent. Public transportation modes (trams, buses, commuter rail systems) and intermediate public transport modes (cycle rickshaws) provided alternative mobility options, with development concentrated around public transport nodes.**

A radical change occurred following the post-Independence phase for larger Indian cities, as rising automobile ownership, cheap energy and lower property values fueled the rapid development of lands located farther away from established city centres linked with large expansive roadways- termed "urban sprawl". New planned cities such as Chandigarh and Bhubaneswar were planned for the automobile as a "symbol of development", while older city centres continued to unsuccessfully accommodate automobiles on streets designed for pedestrians and cycles. Even today, rapid population growth, migration, increased automobile ownership, and mobility challenges coupled with crumbling infrastructure systems continue to define the image and quality of life in India cities.



Figure 1: Traditional neighbourhood in Puducherry with human scale development and no boundary walls| Source: INTACH Puducherry



Figure 2: Expanding development on the existing plots at Rajajinagar, Bangalore leads to high on-street parking and reduced right of way.| Source: IBI Group

## INDIA'S URBAN GROWTH CHALLENGES

As a response to address the mobility related implications of the above mentioned broader urban growth challenges, Indian cities have been adopting automobile centric planning prioritising large single land uses and extra wide roads with minimal space for non-motorized travel modes. Prior to the launch of the National Urban Renewal Mission (2005) and the National Urban Transport Policy (2006), investments in mass rapid transportation systems (MRTS) to meet the mobility needs of the current and future population were limited in large and medium-sized Indian cities.

Since the launch of the National Urban Transport Policy (NUTP), many states and cities have placed public transportation systems as a high priority. Mass Rapid Transit Systems (MRTS) including Bus Rapid Transit (BRT) service and Metro Rail have gained popularity. Following the successful implementation of BRT in Ahmedabad and Metro rail in Delhi, 19 more cities are planning BRTs and 10 cities are planning new metro rail systems.

To implement the objectives of the National Urban Transport Policy and to better manage urban management practices, there are key overarching challenges that need to be addressed urgently, including:

**Uncoordinated Transportation and Land Use Planning:** Despite these recent investments cities continue to struggle with increasing the share of public transportation. Lack of multimodal integration, safe access to BRT/ metro stations, increasing distances between employment centres and residential areas, and increase in largely unorganized IPT modes have relegated transportation to the least preferred choice for commuters. These problems illustrate an unsustainable situation. If new growth continues to be accommodated as 'business as usual', and our automobile dependence intensifies, these problems will undoubtedly worsen.



Mumbai Suburban Rail



Hubli Dharwad BRTS



Bangalore Metro

Figure 3: Different Modes of Transit | Source: IBI Group

In Indian cities, the gap between private and formal public transport is filled by intermediate public transport (or paratransit) (IPT) modes. While substantial efforts have been made to provide and improve public transportation in India, the focus on last mile connectivity and linking IPT with mass transit into an integrated system to aid ease of access for users is lacking. In smaller and medium-sized cities, IPT plays a stronger role in the absence of adequate public transportation services as feeder services. IPT modes are considered an informal transport sector because of the unorganized operations, minimal governmental regulations for operators, and lack of proper infrastructure facilities. In TODs, informal transport, when upgraded, plays an important role in providing affordable accessibility options to better connect development with public transit.

**Multiplicity of Governmental Agencies:** Multiple agencies at different levels of government with overlapping roles often results in long plan implementation periods. For example, land use planning falls under the purview of a municipal body or development authority. Transportation, on the other hand, is controlled by different agencies at local, state and national levels.

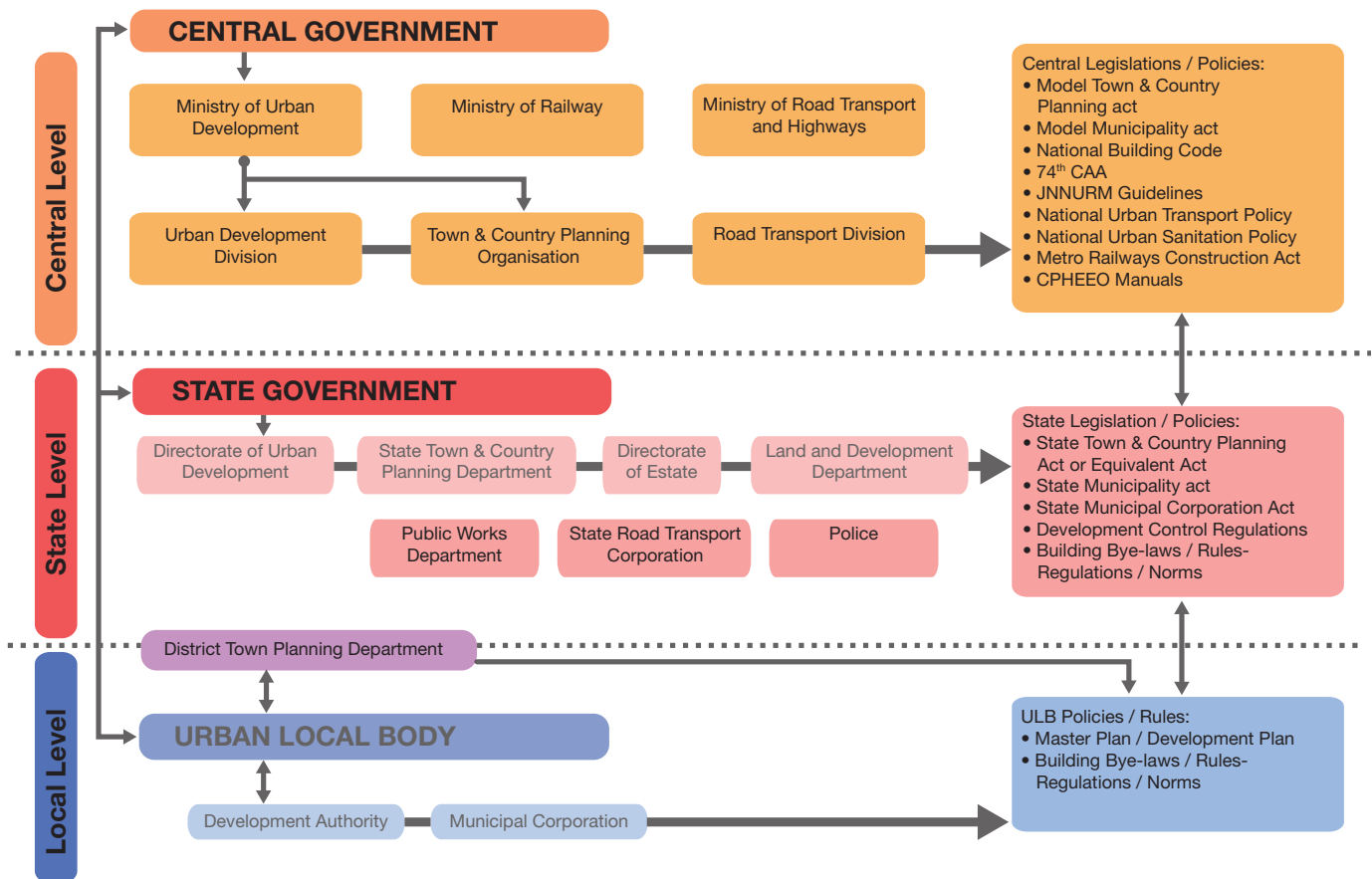


Figure 4: Agencies Involved in Land Use Planning and Transportation planning in India| Source: IBI Group

**Antiquated Planning Acts:** Planning laws in most Indian cities is determined by Town & Country Planning Acts drafted between 1960s and 1980s (Annual Survey of India's City- Systems, 2014). These Acts need to be reviewed and revised to respond to the challenges of the present days of urbanisation.

**Weak Plan Implementation:** Master Plans or Development Plans in India are considered statutory documents for guiding and regulating urban development with a 10-20 year time horizon. However, preparation of these plans typically takes up to 3-5 years, and is disconnected from on-ground realities by the time it is implemented. In most cases, cities have not embarked on preparation of micro-level plans such as Zonal Development Plans and Local Area Plans.

**Weak Institutional Capacities:** There is a significant shortfall in staffing of Urban Local Bodies to implement and enforce plans prepared by Development Authorities, especially compared to global cities. For example, Delhi and Mumbai were reported to have 1,260 and 895 employees per 100,000 population. In comparison, New York was reported to have 5,338 employees and London 2,961 employees per 100,000 population respectively. (Annual Survey of India's City- Systems, Urban Local Body Capacities and Resources, 2014)

**Financial Management:** Weak powers of taxation and low revenue generation potential has hindered the ability of Indian cities to make adequate capital investments in infrastructure and service delivery.

**Data Availability and Quality** to enable planners to make informed decisions in real time is one of the biggest hurdles for planning. The quality of data collected is also an issue as it is often not coordinated between different agencies resulting in inaccurate data and outdated information.





Figure 5: Lists of documents and legislation related to planning hierarchy in India, categorized by documents with statutory powers, documents without statutory powers, urban planning legislation in force, and urban planning support legislation literature in India. | Source: IBI Group

## WAY FORWARD: PARADIGM SHIFT IN PLANNING INDIAN CITIES

Until recently, planning for essential city systems — environmental, land, mobility, economic and social — has largely been attempted in isolated parts. What is emerging as a response is a strong philosophy of putting people first when designing city systems and processes.

The National Urban Transport Policy, 2006 has provided the unequivocal policy support needed to promote sustainable transport. The policy states that “attention should be paid to channel the future growth of a city around a pre-planned transport network rather than develop a transport system after uncontrolled sprawl has taken place” and promises to “promote the development of such integrated land use and transport plans for all cities.”

What is needed is a paradigm shift of putting people first in planning our regions, cities and neighbourhoods. This implies providing increased mobility choices from use of private vehicles to the use of public transportation and non-motorized transportation. Engaging the citizens and private sector to participate in city building is equally important to build long-term commitment.

Transit Oriented Development (TOD) is one such planning concept that presents the potential of coordinating land use planning, transportation system design and infrastructure investments, as an integrated process with people and public transit at its heart. It is important to ensure citywide initiatives are reflected at the scale of municipal policy, and more importantly, in the built form of individual neighbourhoods and individual developments.

Mutually supportive transit infrastructure, land use patterns and built form cannot be achieved without close cooperation between transportation engineers, planners and urban designers. These disciplines can no longer be carried out independently, otherwise sprawl development and automobile dependence will continue. The need of the hour is to design processes that ensure transit is in sync with land use, infrastructure capacities and responds to the needs of transit users.

***“If you plan cities for cars and traffic, you get cars and traffic.”***

***“If you plan for people and places, you get people and places.”***

***- Fred Kent, Project for Public Spaces***



Figure 6: A before (left) and after (right) aerial view of Multi-Modal Town Centre building at Bhubaneswar presents the site’s potential to promote transit and pedestrian oriented development along its proposed BRTS corridor. | Source: IBI Group

## 1.2 Defining TOD

**Transit Oriented Development**, better known by its acronym **TOD**, is one of the key planning tools to have recently gained momentum in urban development practice around the world. TOD involves creating concentrated nodes of moderate-to-high density developments supporting a balanced mix of land uses around transit stations. Transit-oriented developments are where all residents are within a 5-10 minute walk of quick, efficient public transit and can 'live, work, play, shop and learn' in a pedestrian-friendly environment – without the need of a car.

An integration of transportation and land use planning, as well as other elements – market demands, environmental systems, community input and technical efficiencies – are essential in a planning process centred on the principles of TOD.

The primary goals of TODs include:

- **Prioritizing public transit use and reduced use of private vehicles** for daily commuting through policy measures, design interventions, and enforcement.
- Providing convenient and efficient access to a **diverse mix of land uses** (supported with increased densities, where appropriate) located within a **5-10 minute walking distance** from mass rapid transit stations (both bus and rail based).
- **Reducing trip lengths and number of trips** for maximum number of people through **placement of employment and residential uses** in close proximity to each other.
- **Capitalizing upon the land value potential** near BRTS and Metro stations to attract **private sector investment** in joint development of transit stations and supporting infrastructure.

*“Now, I am able to combine and comprehend the meaning of “Bus do kadam”, “75 m” and “400-600m” which collectively signifies that Bus should be available within do kadam (two steps) i.e. within a walking distance.”*

*- L.K. Panigrahi, Chief Engineer (Projects), Naya Raipur Development Authority*

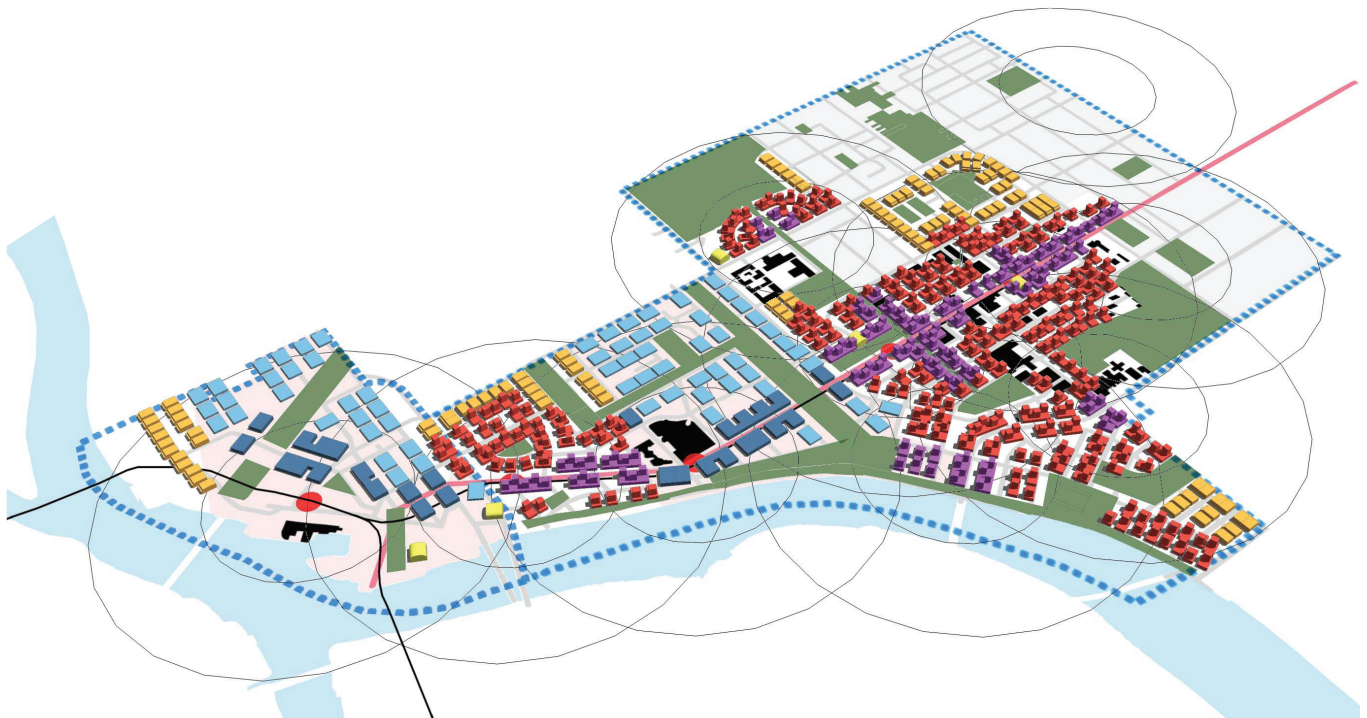
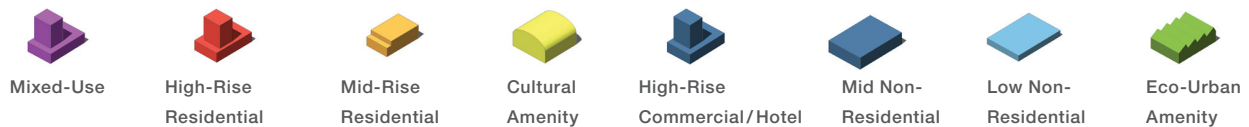
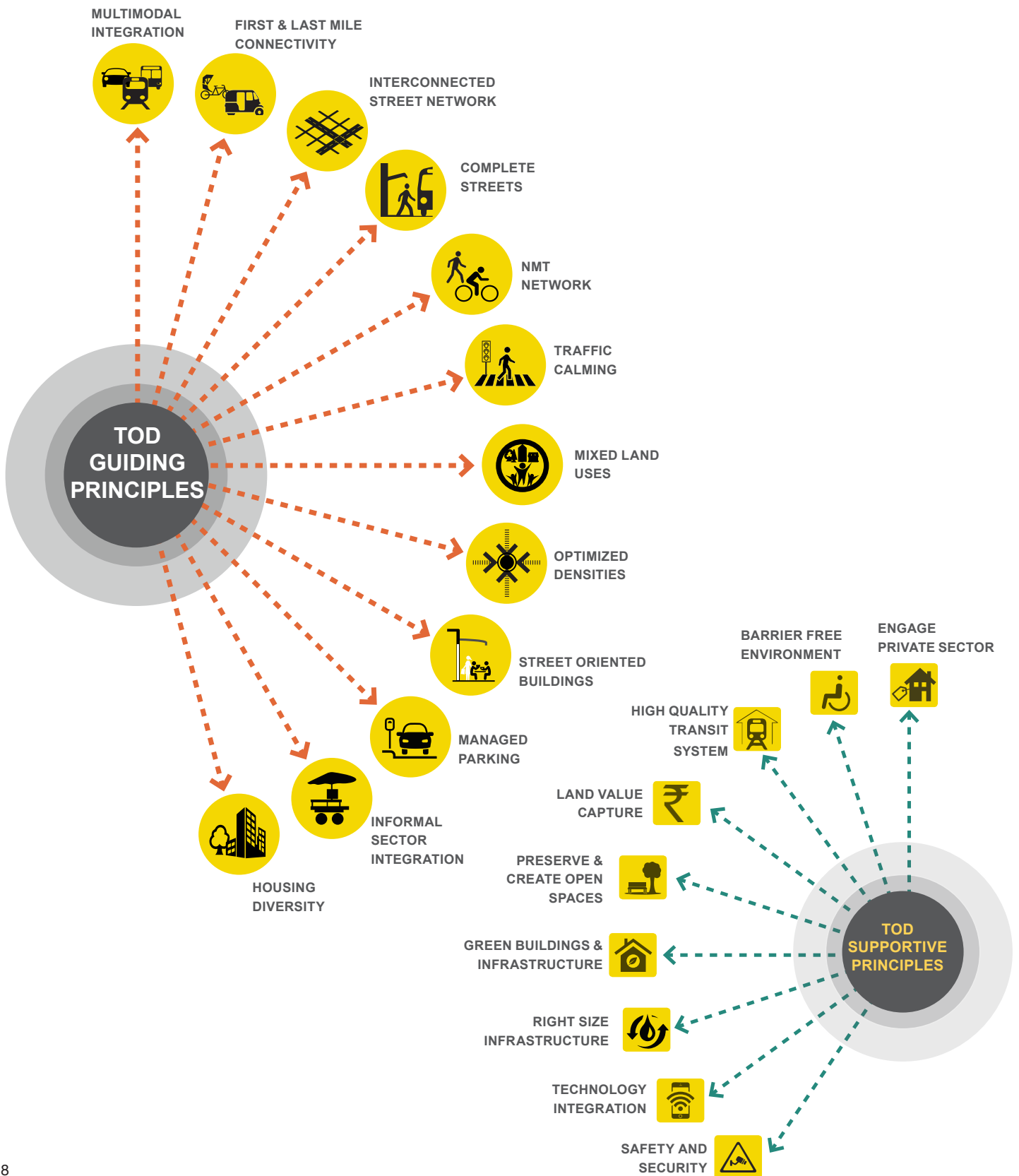


Figure 7: City Centre Area Plan Update, Richmond BC | Source: IBI Group

### 1.3 TOD Principles

The following section illustrates key TOD principles organized under two categories: 1) TOD Guiding Principles; 2) TOD Supportive Principles. These principles are derived from a study of global best practice examples of TOD design and planning fundamentals contextualized for application in Indian cities. Each principle is further elaborated in detail, complete with descriptive supporting strategies and relevant graphics.





# 1. MULTIMODAL INTEGRATION

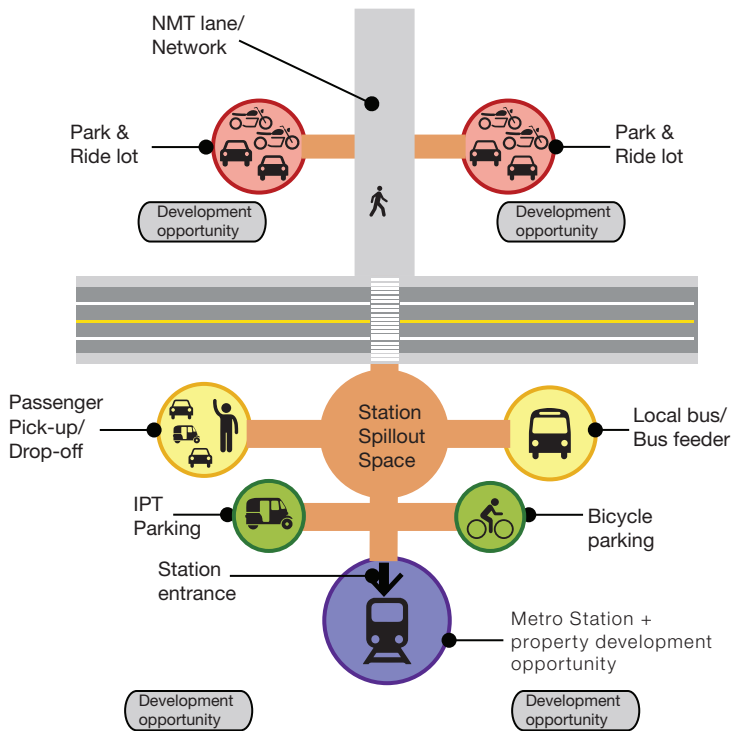


## Purpose

One of the essential functions of mobility hubs will be to foster **seamless integration between transit modes, systems, and routes, while accommodating efficient connections to all modes of access to and from the station.**

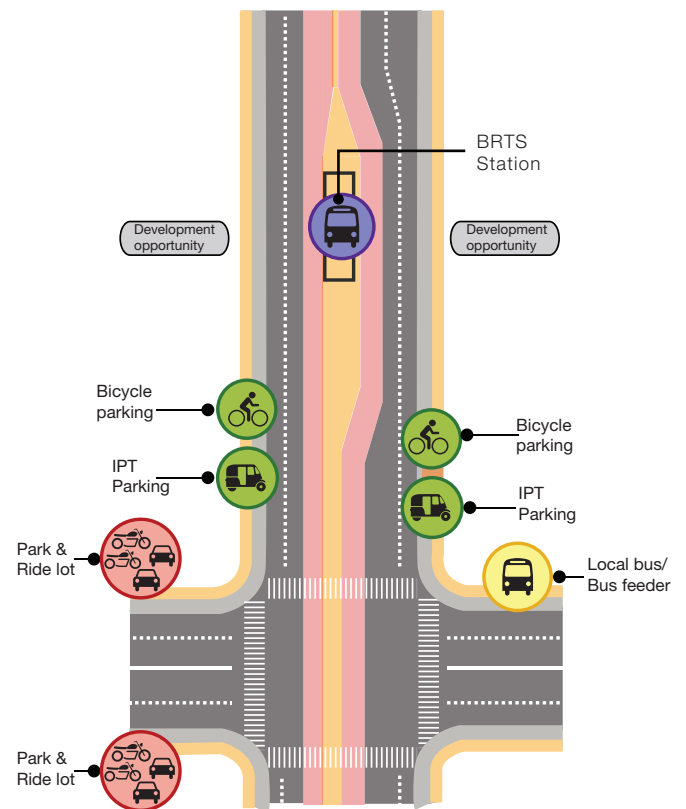
## Goals

- Create clear, **direct, and short transfers** between transit modes and routes.
- **Minimize travel time** and cost for maximum commuters.
- **Prioritize pedestrians, cycling, public transportation, and IPT** over other private modes in site planning of transit interchanges.



Multimodal Integration at MRTS: Passenger pick up and drop off areas, IPT parking, bicycle parking are integrated with the station entrance through station spill out place, like a central plaza.

Source: IBI Group



Multimodal Integration at BRTS: Feeder bus stops for perpendicular routes, IPT and park and ride lots are generally integrated with BRTS at the crossings to make the transfers as convenient as possible.

Source: IBI Group

Refer detailed components on page **82**

## Related TOD Principles:

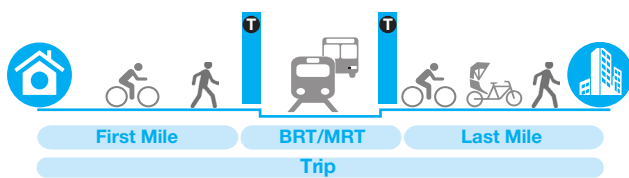
- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> Multimodal Integration         | <input checked="" type="checkbox"/> NMT Network     | <input type="checkbox"/> Street Oriented Buildings              |
| <input checked="" type="checkbox"/> First & Last Mile Connectivity | <input checked="" type="checkbox"/> Traffic Calming | <input checked="" type="checkbox"/> Managed Parking             |
| <input type="checkbox"/> Interconnected Street Network             | <input type="checkbox"/> Mixed Land Uses            | <input checked="" type="checkbox"/> Informal Sector Integration |
| <input checked="" type="checkbox"/> Complete Streets               | <input type="checkbox"/> Optimized Densities        | <input type="checkbox"/> Affordable Housing                     |



## 2. FIRST & LAST MILE CONNECTIVITY

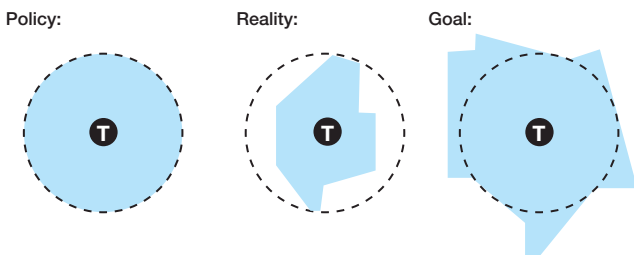
### Purpose

An individual's 'trip' is understood as the entire journey between origin to destination. Public transportation agencies typically provide bus and rail based services to facilitate such trips, but **users must complete the first and last portion on their own: either by walking, bicycling, feeder buses or other IPT modes including cycle-rickshaws, auto-rickshaws, or taxis.** This is referred to as the 'first-last mile' of the user's trip.



First and last mile options available along the transit corridor

Source: IBI Group

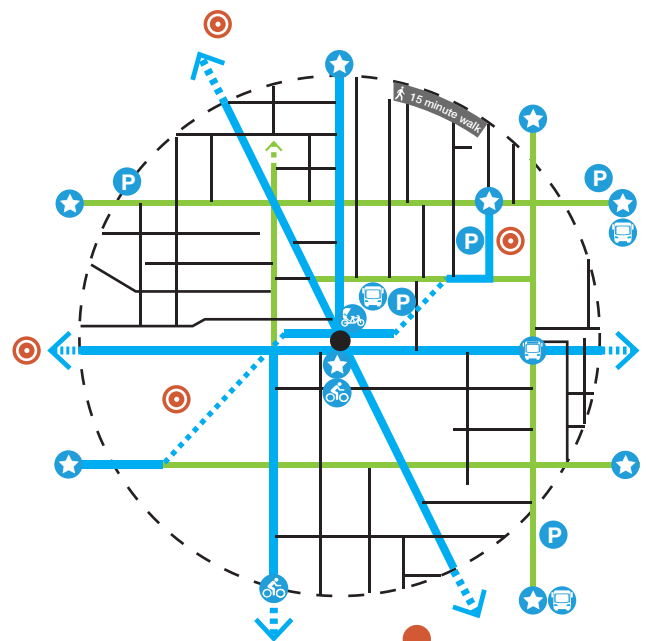


Policy: Access shed defined based on average walking distance  
 Reality: Access shed decreases due to break in the access network  
 Goal: Increase the access sheds around transit stations while improving first and last mile connectivity.

Source: Adapted from First Last Mile Strategic Plan, prepared for LA Metro by IBI Group

### Goals

- **Reduce the distance and time it takes people to travel** from their origins to stations and from stations to destinations.
- **Induce modal shift from personal vehicles** by providing viable mobility options and extending the reach of transit to maximum users.



**LEGEND**

- Destination
- Parking
- Way Finding Signages
- Cycle Stand
- IPT
- Bus Stop
- Arterial Road
- Collector Road
- Shortcuts
- Cycle Network
- Transit Station

Different access and mobility solutions bundled around transit station.

Source: IBI Group

Refer detailed components on page 84

### Related TOD Principles:

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Affordable Housing

### 3. INTERCONNECTED STREET NETWORK

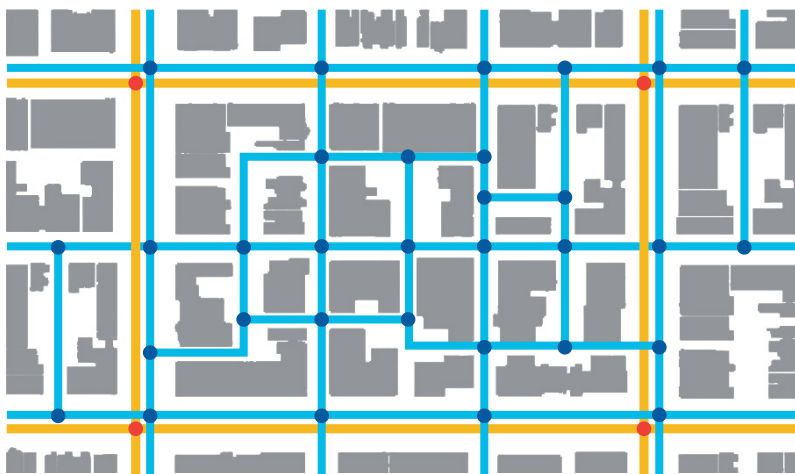


#### Purpose

An interconnected street pattern is a traditional urban design technique that **reduces congestion, encourages travel choice, and reduces distances between places as well as travel times.**

#### Goals

- Develop an interconnected streets and blocks system with routes **providing direct connections between transit station and other area destinations.**
- Identify a **clear hierarchy of streets** to accommodate a wide range of traffic patterns, including pedestrian, cycling and vehicular.
- **Disperse high traffic volumes over multiple parallel human-scale streets** rather than concentrating traffic on fewer major arterial streets. (NMSH Parameters, MoUD 2011)



■ Pedestrian and cycling network  
■ Vehicular roadway

Urban Infill Areas: Reconnect/ dedicate a comprehensive NMT network for the core where as plan vehicular movement just outside the core  
Source: Adapted from TOD- Standard, ITDP



Greenfield Areas: Establish and / or reconnect a comprehensive street grid of small blocks, accommodating pedestrian, vehicular and cycling connections  
Source: Adapted from Naya Raipur TOD Study, prepared for NRDA by IBI Group

Refer detailed components on page **86**

#### Related TOD Principles:

- |  |   |  |
|--|---|--|
| <input type="checkbox"/> Multimodal Integration                    | <input checked="" type="checkbox"/> NMT Network | <input type="checkbox"/> Street Oriented Buildings   |
| <input checked="" type="checkbox"/> First & Last Mile Connectivity | <input type="checkbox"/> Traffic Calming        | <input type="checkbox"/> Managed Parking             |
| <input checked="" type="checkbox"/> Interconnected Street Network  | <input type="checkbox"/> Mixed Land Uses        | <input type="checkbox"/> Informal Sector Integration |
| <input checked="" type="checkbox"/> Complete Streets               | <input type="checkbox"/> Optimized Densities    | <input type="checkbox"/> Housing Diversity           |



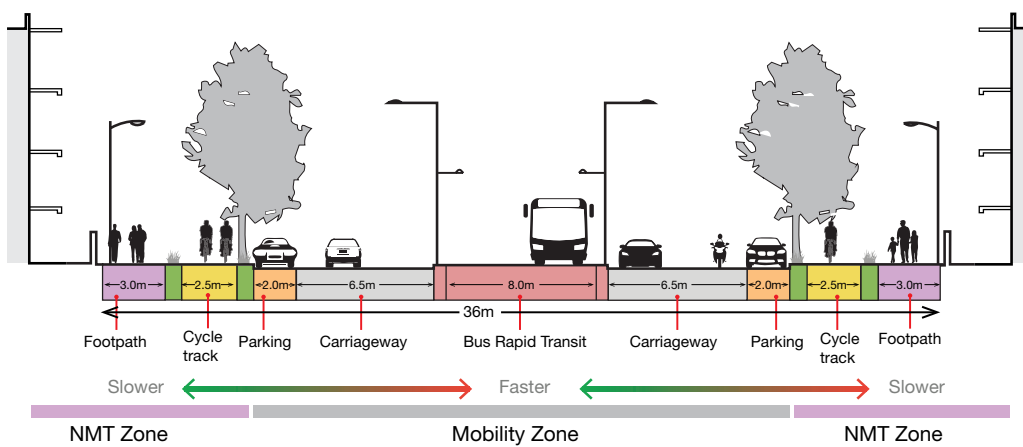
## 4. DESIGN COMPLETE STREETS

### Purpose

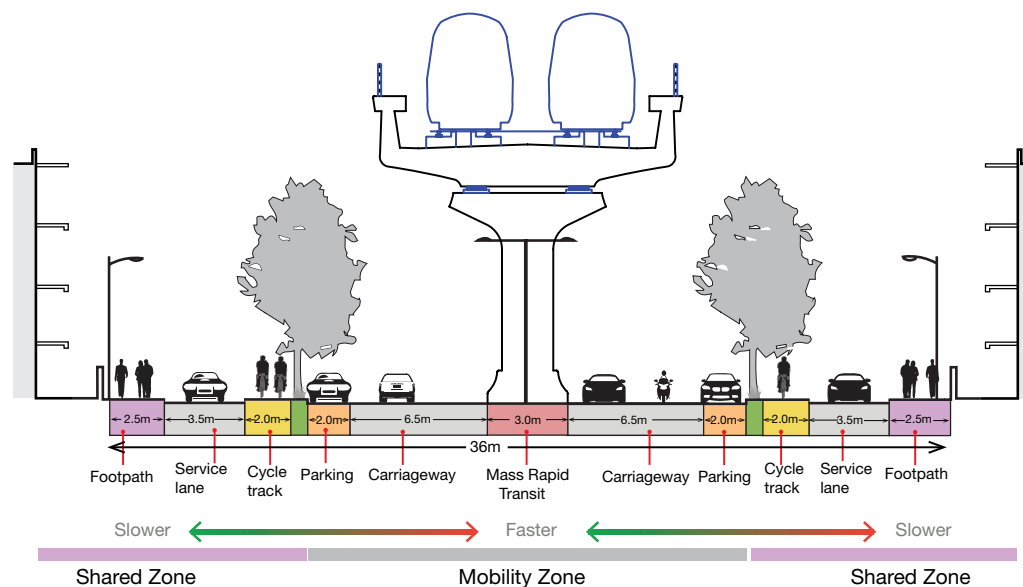
Complete Streets are streets for everyone. They are **designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.** (Smart Growth America, <http://www.smartgrowthamerica.org/complete-streets/>)

### Goals

- Create a **balance between the movement of pedestrians, cyclists, transit, and vehicles.**
- Promote **equitable allocation of RoW** for balanced allocation of space and modes.



Typical BRTS corridor section for 36m ROW with different street space allocations  
Source: Adapted from *Better street better cities*, ITDP, 2011



Typical metro rail corridor section for 36m ROW with different street space allocations,  
Source: IBI Group

Refer detailed components on page **88**

### Related TOD Principles:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Multimodal Integration         | <input checked="" type="checkbox"/> NMT Network     | <input type="checkbox"/> Street Oriented Buildings              |
| <input type="checkbox"/> First & Last Mile Connectivity | <input checked="" type="checkbox"/> Traffic Calming | <input checked="" type="checkbox"/> Managed Parking             |
| <input type="checkbox"/> Interconnected Street Network  | <input type="checkbox"/> Mixed Land Uses            | <input checked="" type="checkbox"/> Informal Sector Integration |
| <input checked="" type="checkbox"/> Complete Streets    | <input type="checkbox"/> Optimized Densities        | <input type="checkbox"/> Housing Diversity                      |





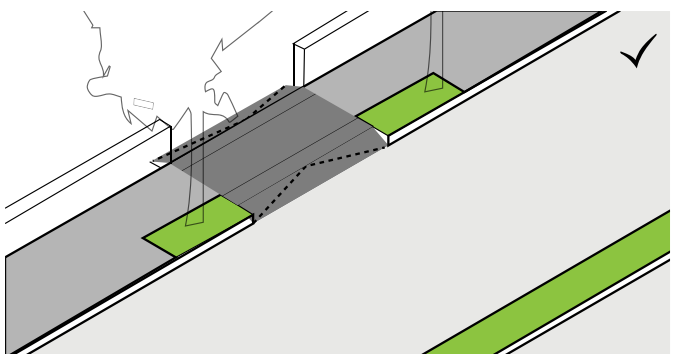
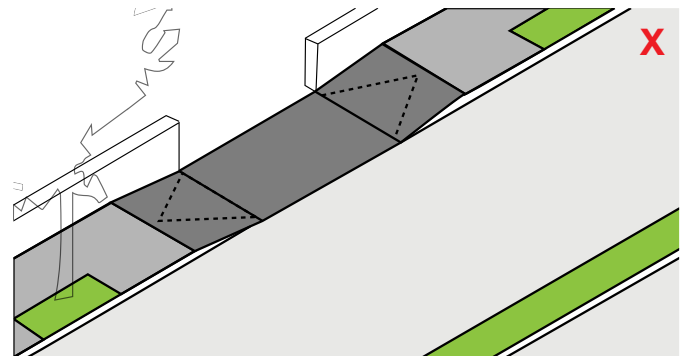
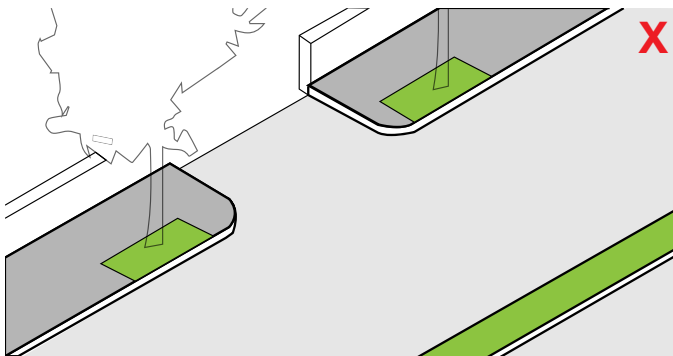
## Purpose

**A continuous sidewalk network is pivotal in serving as safe rights-of-way for pedestrians to travel between destinations.**

“If investments made in developing high quality public transport systems are to be efficiently utilized, pedestrian access to public transport has to be prioritized” (NMSH 2011, MoUD). A high quality public realm and walking environment encourages people to walk longer to reach public transport.

## Goals

- Shift the balance of the roadway so that it caters more to NMT users of all types within station areas and transit zones.
- Increase safety and comfort on the sidewalk for NMT users.
- Provide enough room on the sidewalk for NMT users of varying speeds, ages, and abilities.



For accessing private properties, vehicle ramps should be provided in the landscaping strip but not in the area of pedestrian through movement.

Source: Adapted from *Better Streets Better Cities*, ITDP

Refer detailed components on page **90**

## Related TOD Principles:

Multimodal Integration

First & Last Mile Connectivity

Interconnected Street Network

Complete Streets

NMT Network

Traffic Calming

Mixed Land Uses

Optimized Densities

Street Oriented Buildings

Managed Parking

Informal Sector Integration

Housing Diversity



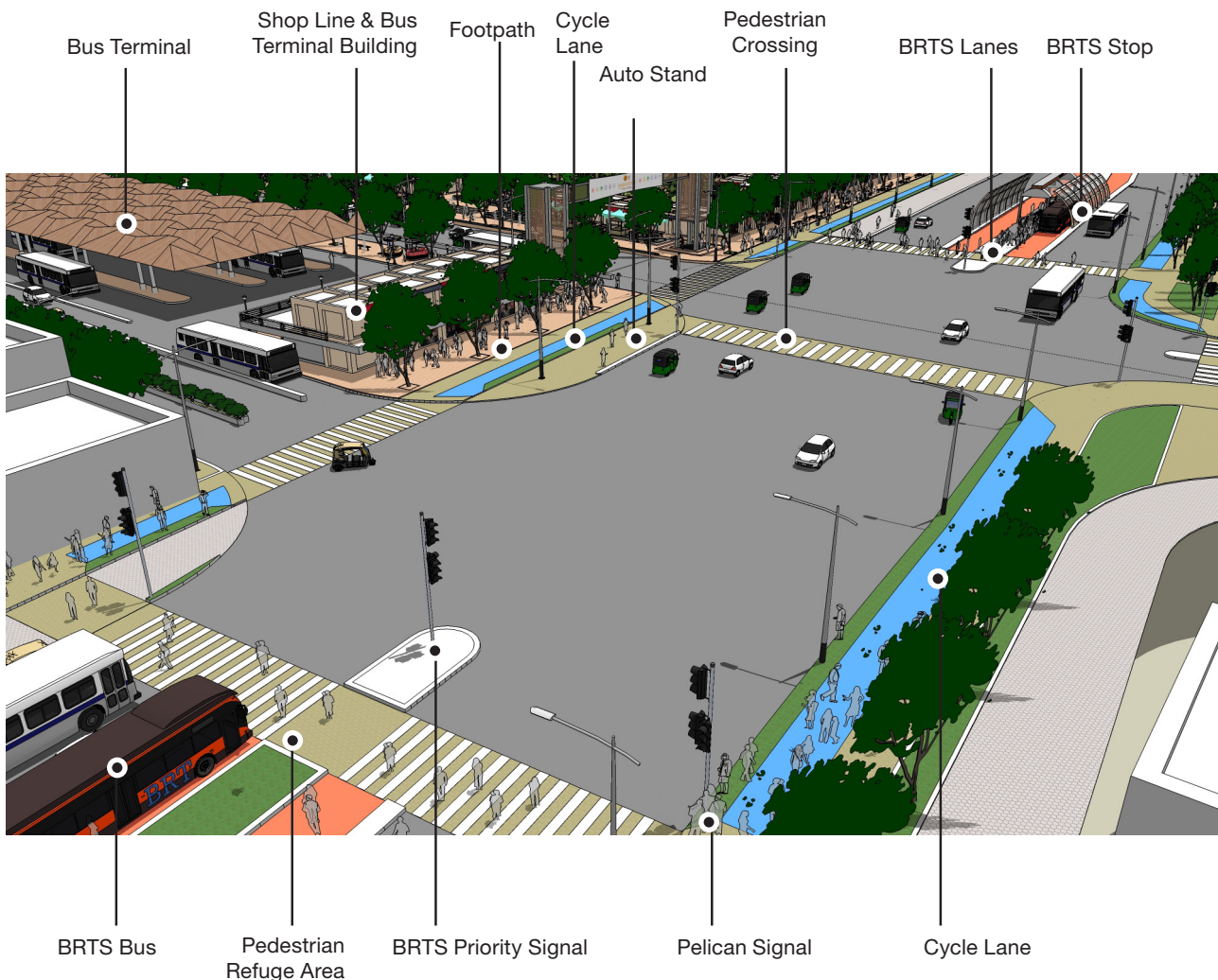
## 6. TRAFFIC CALMING

### Purpose

Traffic calming is intended to **slow or reduce motor-vehicle traffic in order to improve safety for pedestrians and bicyclists** and improve the environment for residents.

### Goals

- **Emphasize pedestrian and cyclist safety,** comfort and convenience to improve accessibility to transit stations.
- **Decrease speeds along heavily trafficked streets** to protect multi-modal users near transit stations.



Different forms of traffic calming- signal phasing, raised pedestrian crossings, refuge islands etc.  
 Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Refer detailed components on page **92**

### Related TOD Principles:

- |  |   |  |
|--|---|--|
| <input checked="" type="checkbox"/> Multimodal Integration | <input checked="" type="checkbox"/> NMT Network     | <input type="checkbox"/> Street Oriented Buildings   |
| <input type="checkbox"/> First & Last Mile Connectivity    | <input checked="" type="checkbox"/> Traffic Calming | <input type="checkbox"/> Managed Parking             |
| <input type="checkbox"/> Interconnected Street Network     | <input type="checkbox"/> Mixed Land Uses            | <input type="checkbox"/> Informal Sector Integration |
| <input checked="" type="checkbox"/> Complete Streets       | <input type="checkbox"/> Optimized Densities        | <input type="checkbox"/> Housing Diversity           |

7. MIXED LAND USES

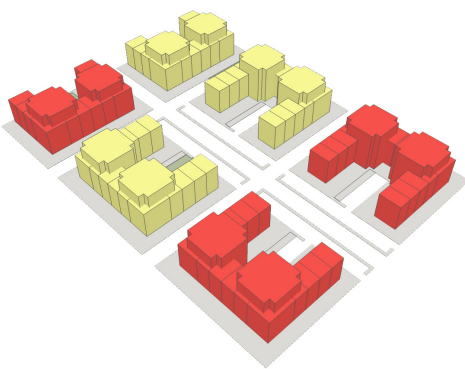


Purpose

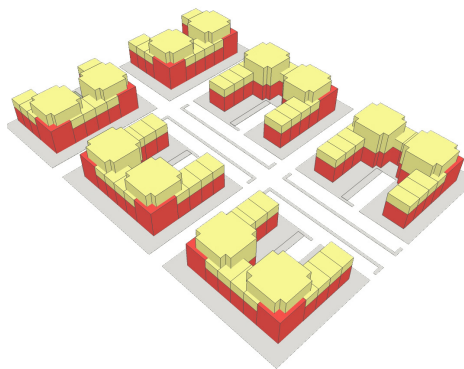
Placement of more people close to transit and providing **mixing of land uses- jobs and residential- justifies higher service frequencies and promotes high ridership levels**, enabling transit to be more competitive with the automobile by reducing trip generation and traffic congestion.

Goals

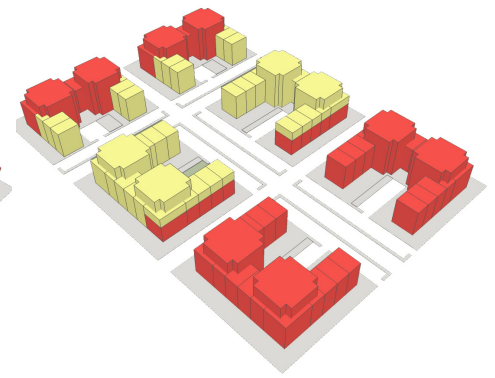
- Promote more efficient land use patterns at a city scale by providing residents access to retail, commercial and civic services, employment and recreational facilities without needing to travel by automobile.
- Large single land uses located along transit alignments, should be encouraged to redevelop into higher density, mixed-use forms.
- Encourage multiple functions in the same building and development to improve pedestrian activity, safety, and financial viability of overall development.



Horizontal Mixed Use: Combines single-use buildings on distinct parcels in a range of land uses within one block.  
Source: IBI Group



Vertical Mixed-Use: Combines different uses in the same building.  
Source: IBI Group



Mixed-Use Walkable Neighbourhoods: With vertical and horizontal use mixing in an area ideally within a 5 to 10 minute walking distance.  
Source: IBI Group

Refer detailed components on page 94

Related TOD Principles:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Multimodal Integration         | <input type="checkbox"/> NMT Network                    | <input checked="" type="checkbox"/> Street Oriented Buildings |
| <input type="checkbox"/> First & Last Mile Connectivity | <input type="checkbox"/> Traffic Calming                | <input checked="" type="checkbox"/> Managed Parking           |
| <input type="checkbox"/> Interconnected Street Network  | <input checked="" type="checkbox"/> Mixed Land Uses     | <input type="checkbox"/> Informal Sector Integration          |
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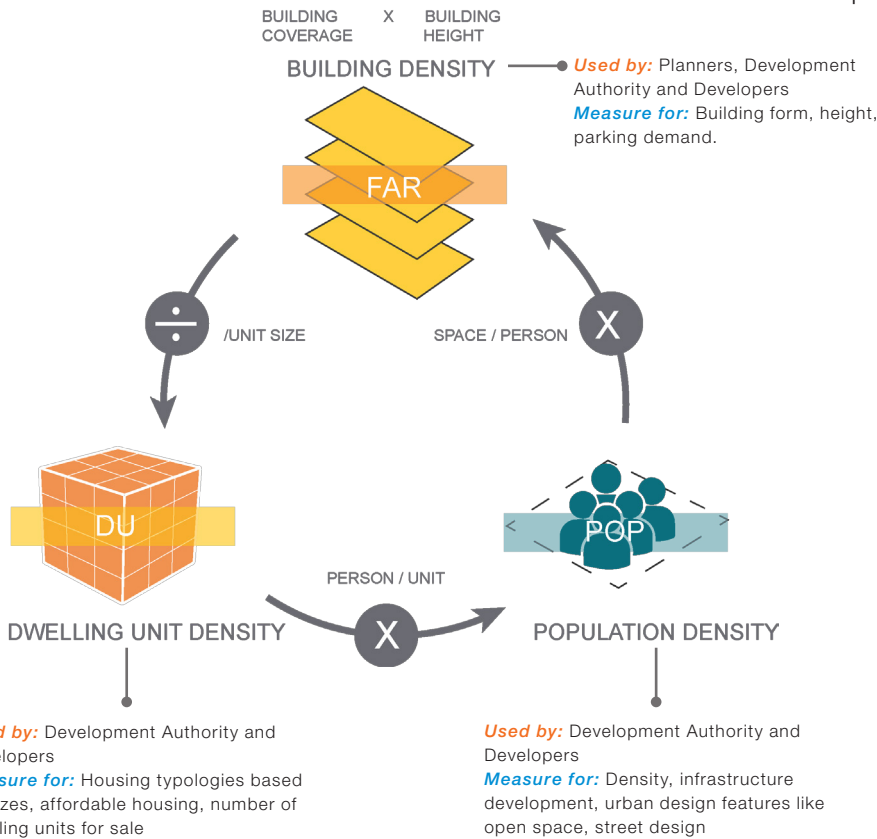
# 8. OPTIMIZED DENSITIES

## Purpose

To optimize employment and residential densities along a transit corridor or station area based on carrying capacities of transit and NMT infrastructure to promote walking and transit use.

## Goals

- Encourage enforcement of differential increase in density regulations (as opposed to uniform blanket citywide regulations) at transit stations based on existing capacities of land, NMT infrastructure, transit capacity, and utilities.
- Ensure densities are strategically distributed across the urban area as a means to create compact city forms.
- Utilize density bonusing or premium FARs as a tool to attract development while ensuring that increased infrastructure demand is provided by the development.



Refer detailed components on page 96

## Related TOD Principles:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Multimodal Integration         | <input checked="" type="checkbox"/> NMT Network         | <input type="checkbox"/> Street Oriented Buildings    |
| <input type="checkbox"/> First & Last Mile Connectivity | <input type="checkbox"/> Traffic Calming                | <input checked="" type="checkbox"/> Managed Parking   |
| <input type="checkbox"/> Interconnected Street Network  | <input checked="" type="checkbox"/> Mixed Land Uses     | <input type="checkbox"/> Informal Sector Integration  |
| <input type="checkbox"/> Complete Streets               | <input checked="" type="checkbox"/> Optimized Densities | <input checked="" type="checkbox"/> Housing Diversity |

## 9. STREET ORIENTED BUILDINGS

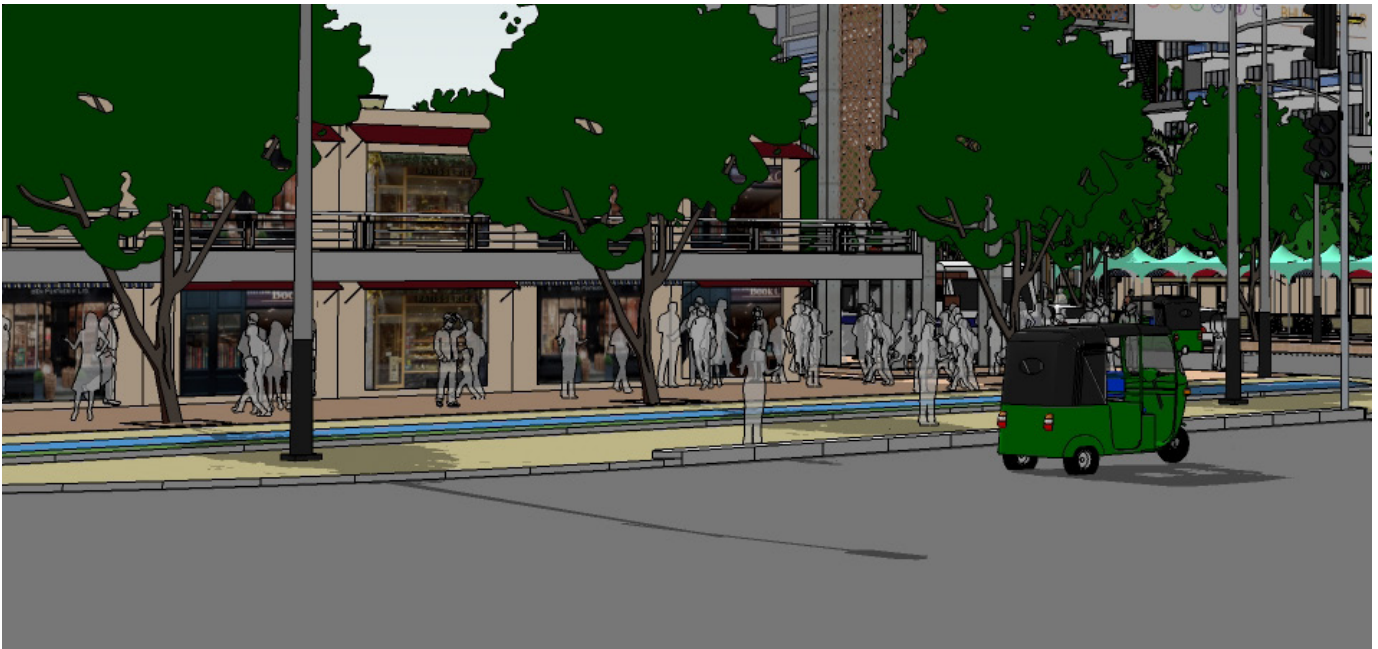


### Purpose

Encourage **ground-level activity and uses along main streets, key intersections, station areas and parking garages to accommodate retail and other 'active uses' with transparent facades** at the ground plane to ensure high-quality pedestrian environments.

### Goals

- Provide **natural surveillance and “eyes on the street” for pedestrian safety** by regulating street edge design and not limiting controls to RoW design.
- Develop regulations to **integrate the public realm street edge treatment** with private sector development.



Street Oriented Buildings in Bhubaneswar

Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Refer detailed components on page **98**

### Related TOD Principles:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Multimodal Integration         | <input type="checkbox"/> NMT Network                | <input checked="" type="checkbox"/> Street Oriented Buildings   |
| <input type="checkbox"/> First & Last Mile Connectivity | <input type="checkbox"/> Traffic Calming            | <input checked="" type="checkbox"/> Managed Parking             |
| <input type="checkbox"/> Interconnected Street Network  | <input checked="" type="checkbox"/> Mixed Land Uses | <input checked="" type="checkbox"/> Informal Sector Integration |
| <input type="checkbox"/> Complete Streets               | <input type="checkbox"/> Optimized Densities        | <input type="checkbox"/> Housing Diversity                      |





# 10. MANAGED PARKING

## Purpose

Utilize parking management strategies as a **travel demand management tool to discourage personal vehicle usage, reduce parking demand, and promote sustainable mobility opportunities** to build people-oriented neighbourhoods near transit stations.

## Goals

- Reduce vehicular trips within Station Area (800m from transit station).
- Maximize development opportunities on public lands surrounding the transit station for providing more equitable uses.
- Adopt an area based approach to parking management and reduction with a priority placed on NMT/ IPT/ feeder bus/ service vehicles.



- 1 Parking Infrastructure Improvements
- 2 Transportation Improvement Proposals

Area Management Plan For Bhopal's New Market Area  
Source: Adapted from Parking Master Plan prepared for UADD by IBI Group

Refer detailed components on page 100

## Related TOD Principles:

- |  |   |  |
|--|---|--|
| <input checked="" type="checkbox"/> Multimodal Integration | <input type="checkbox"/> NMT Network                | <input type="checkbox"/> Street Oriented Buildings   |
| <input type="checkbox"/> First & Last Mile Connectivity    | <input type="checkbox"/> Traffic Calming            | <input checked="" type="checkbox"/> Managed Parking  |
| <input type="checkbox"/> Interconnected Street Network     | <input checked="" type="checkbox"/> Mixed Land Uses | <input type="checkbox"/> Informal Sector Integration |
| <input type="checkbox"/> Complete Streets                  | <input type="checkbox"/> Optimized Densities        | <input type="checkbox"/> Housing Diversity           |

# 11. INFORMAL SECTOR INTEGRATION



## Purpose

To achieve the goal of **achieving inclusive development in TODs through integration of the informal sector** in planning and design of street vendors, settlements, and unorganized transportation services.

## Goals

- Ensure that TOD plans enable equitable distribution of benefits to all sections of the society.
- Provide and promote a supportive environment for earning livelihoods to the street vendors as well as ensure absence of congestion and in public spaces and streets. *(Source: National Street Vendors Policy, Protection of Livelihood and Regulation of Street Vending Act, 2014 )*
- Address integration of informal residential areas as part of TOD redevelopment projects.
- Upgrade informal intermediate paratransit (IPT) services (private mini-buses, cycle rickshaws and auto-rickshaws) through designating defined parking areas, improved fleet management, regulated operations and route rationalization to serve as effective feeder systems for public transit service.



Integration of street vendors at proposed Bhubaneswar Railway Station  
Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

Refer detailed components on page **102**

## Related TOD Principles:

- |  |   |   |
|--|---|---|
| <input checked="" type="checkbox"/> Multimodal Integration | <input checked="" type="checkbox"/> NMT Network | <input type="checkbox"/> Street Oriented Buildings              |
| <input type="checkbox"/> First & Last Mile Connectivity    | <input type="checkbox"/> Traffic Calming        | <input type="checkbox"/> Managed Parking                        |
| <input type="checkbox"/> Interconnected Street Network     | <input type="checkbox"/> Mixed Land Uses        | <input checked="" type="checkbox"/> Informal Sector Integration |
| <input checked="" type="checkbox"/> Complete Streets       | <input type="checkbox"/> Optimized Densities    | <input checked="" type="checkbox"/> Housing Diversity           |



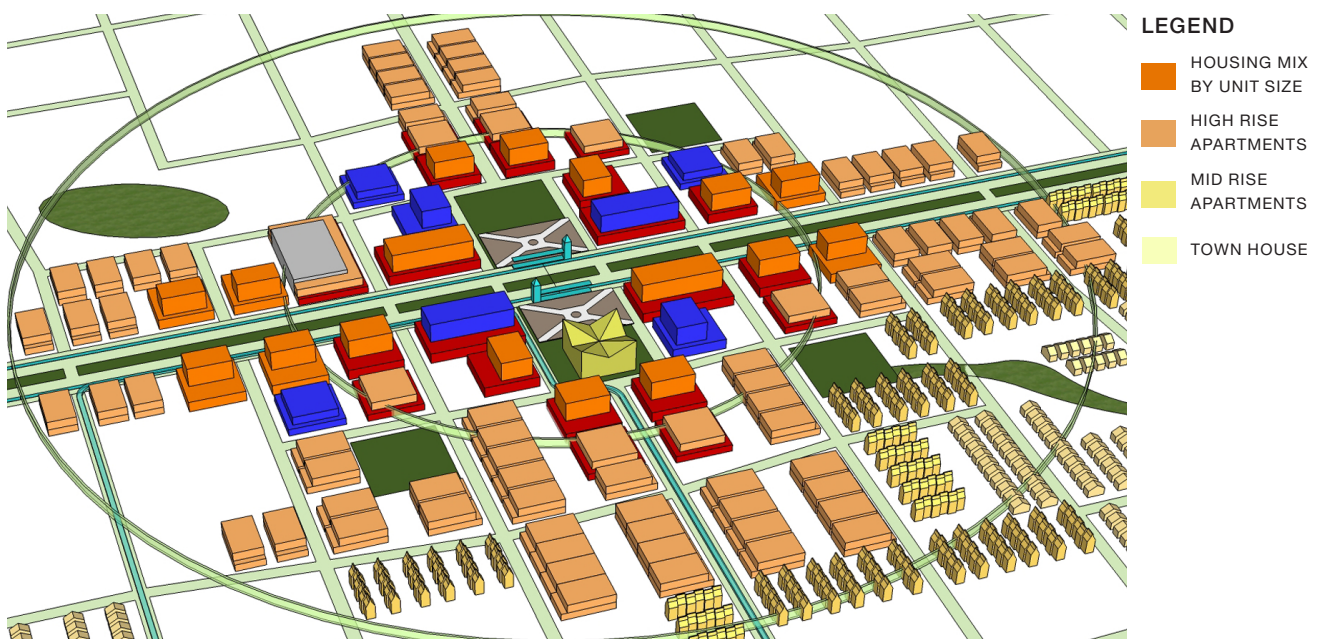
## 12. HOUSING DIVERSITY

### Purpose

Providing a **diversity of housing choices that includes a mixture of types, styles, price ranges and tenure within a 10-minute walking distance from a transit station** is essential to foster creation of equitable TODs.

### Goals

- Ensure that all residents of urban areas have **access to a range of housing options within their affordability limits** within a 10-minute walking/ cycling distance from a transit station.
- **Ensure a minimum supply of affordable housing options for low and medium income population within walking/ cycling distance of stations**, and in close proximity to sources of employment and recreation.



Balanced mix of housing choices along transit corridor  
Source: IBI Group

Refer detailed components on page **104**

### Related TOD Principles:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Multimodal Integration         | <input type="checkbox"/> NMT Network                    | <input type="checkbox"/> Street Oriented Buildings              |
| <input type="checkbox"/> First & Last Mile Connectivity | <input type="checkbox"/> Traffic Calming                | <input type="checkbox"/> Managed Parking                        |
| <input type="checkbox"/> Interconnected Street Network  | <input checked="" type="checkbox"/> Mixed Land Uses     | <input checked="" type="checkbox"/> Informal Sector Integration |
| <input type="checkbox"/> Complete Streets               | <input checked="" type="checkbox"/> Optimized Densities | <input checked="" type="checkbox"/> Housing Diversity           |



# TOD SUPPORTIVE PRINCIPLES



## 1. ENGAGE PRIVATE SECTOR



Fostering private sector participation in the TOD planning and implementation process including financing infrastructure upgrades related to real estate development.

Reference: *Toolkit for PPP in Urban Transport, 2008, IUT* (<http://www.iutindia.org/capacityBuilding/Toolkits.aspx>)

## 2. BARRIER FREE ENVIRONMENT



Build and retrofit the pedestrian environment to meet or exceed accessibility guidelines and standards.

Reference: *Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons, CPWD (1998)* (<http://cpwd.gov.in/Publication/aged&disabled.PDF>)

## 3. HIGH QUALITY TRANSIT SYSTEM



Encourage high-quality transit system design including station/ stop architecture and provide a minimum level of customer amenity to enhance customer comfort, safety, and information.

Reference: *BRT System Toolkits, IUT* (<http://www.iutindia.org/capacityBuilding/Toolkits.aspx>) | *BRT Planning Guide, ITDP* (<https://www.itdp.org/the-brt-planning-guide/>)

## 4. LAND VALUE CAPTURE



Use Development based Land Value Capture as a financing mechanism for upgrading infrastructure along TOD corridors and station areas.

Reference: *Financing Transit Oriented Development with Land Values, World Bank Group, 2015* (<https://openknowledge.worldbank.org/handle/10986/21286>)

## 5. PRESERVE & CREATE OPEN SPACES



Preserve open areas such as amenity spaces, green spaces, playgrounds, parks and natural areas as an integral component of TODs at all scales.

Reference: *Urban and Regional Development Policy Formulation and Implementation Guidelines.*

## 6. GREEN BUILDINGS & INFRASTRUCTURE



Prioritize and implement proven and innovative sustainable building, energy, water, landscape and waste management practices.

Reference: *LEED for Neighbourhood Development* ([https://www.nrdc.org/cities/smartgrowth/files/citizens\\_guide\\_LEED-ND.pdf](https://www.nrdc.org/cities/smartgrowth/files/citizens_guide_LEED-ND.pdf)) | *Energy Conservation Building Code* ([http://www.beeindia.in/schemes/documents/ecbc/ecoc3/ecbc/ECBC-User-Guide\(Public\).pdf](http://www.beeindia.in/schemes/documents/ecbc/ecoc3/ecbc/ECBC-User-Guide(Public).pdf))

## 7. RIGHT SIZE INFRASTRUCTURE



Gauge the carrying capacities of existing infrastructure and accordingly propose increased densities in station areas or upgrade infrastructure as part of TOD project.

Reference: *Developing Commercially Viable Infrastructure Projects* ([http://www.urbaninfrastructureindia.org/pdf/5-ProjDev\\_web.pdf](http://www.urbaninfrastructureindia.org/pdf/5-ProjDev_web.pdf))

## 8. TECHNOLOGY INTEGRATION



Integration of innovative technologies within TOD plans from the beginning will provide an edge for transit service to compete with automobiles. Smart Parking management, fare integration, information integration are few of the key project components.

Reference: *ITS Toolkit, IUT* (<http://www.iutindia.org/capacityBuilding/Toolkits.aspx>)

## 9. SAFETY AND SECURITY



Social safety and physical security are prime determinants for making conducive and safer for people.

- o Incorporate design principles that optimize natural surveillance with strategies such as adequate street lighting, street vendors, and active frontages to provide a secure environment for vulnerable pedestrians and cyclists, particularly women and children.
- o Enhance safety by creating safe refuge points for women and persons with disabilities by introducing 24X7 CCTV surveillance and panic button.

Reference: <http://www.wriroscities.org/sites/default/files/Safe-Access-Manual-EMBARQ-India.pdf>

## 1.4 Benefits of TOD

The social, environmental and economic benefits of TODs together contribute to enhance the overall quality of life in a city. TOD principles support development of properties that are located within a 5-10 minute walking distance of rapid transit corridors and/or high frequency intensive local bus services as those that exist in most major arterial roadways in Indian cities.



### SOCIAL BENEFITS

**Increased mobility choices for all:** Compact, walkable communities linked by transit. TOD provides much needed mobility options, including options for young people, the elderly and people who do not own cars or prefer not to use a car;

**Increased disposable household income:** TOD can effectively increase disposable income by reducing the need for one or more car and reducing commuting costs;

**Increased health benefits:** TOD promotes a healthy lifestyle by making it convenient to walk and by providing the infrastructure that supports walking and bicycling;

**Increased public safety and security:** TOD encourages “24-hour” activity in a mixed-use environment and provides “eyes-on-the-street” that increases one’s overall sense of security and safety in an area; and

**Increased housing choices for all:** Encouraging high quality diverse housing products (mixed income, owner occupied, rental and workforce housing) within TODs is an important goal. TOD can contribute to the affordable housing supply by offering incentives to the private sector such as density bonuses and location efficient loans in transit served sites in exchange for lower cost housing products.



### ECONOMIC AND FISCAL BENEFITS

**Increased land values and property tax revenues:** Access to transit results in a significant increase in the property values of nearby properties, provided the transit system has good regional connectivity and frequency of service;

**Increased transit ridership:** Placement of more people close to transit and providing mixed-use amenities justifies higher service frequencies and promotes high ridership levels (including attracting new riders that may otherwise choose to drive), enabling transit to be more competitive with the automobile; and

**Reduced road and infrastructure costs:** TOD can help reduce new infrastructure costs (such as water, sanitary, sewer and roads) for local governments and property owners through more compact and infill development. While initial infrastructure improvements may be necessary to support additional density in resource constrained locations, utilizing decentralized infrastructure services in higher density areas will lead to self-sufficiency in the long term.



### ENVIRONMENTAL BENEFITS

**Reduced rates of vehicle kilometers travelled (VKT):** Savings in travel times and unit vehicular operating and maintenance costs;

**Space efficiency:** Less land is required to move a small number of transit vehicles relative to a large number of automobiles carrying the same number of people;

**Energy efficiency:** Less energy is needed to move one person by transit than by automobile, assuming normal transit vehicle loading conditions;

**Better air quality:** Since less energy is required to move people, fossil fuel based transit vehicles emit smaller amounts of smog forming and climate change inducing pollutants thereby reducing air pollution rates; and

**Conservation of resource lands and reduced urban sprawl:** Provision of more compact patterns of growth at urban infill sites conserves agricultural and natural lands that would otherwise be consumed by sprawling development.

## 1.5 TOD Planning Context

Being a relatively new concept that is based on adaptation to contextual conditions and characteristics, there is no “one-size-fits-all” approach to creating successful TOD projects. Planning for TODs must take into consideration different aspects of the city and contextual variations. Key variables that influence TOD planning processes and projects include: **1) Scales of TOD; 2) Development Context; and 3) Nature of Transit Service**

### 1. Scales of TOD

While TOD projects are implemented on individual parcels within station areas, planning needs to be conceptualized at multiple interrelated scales – city-region, corridor, station and individual parcel level. A city-region includes many transit corridors, each corridor includes many neighbourhoods / station areas, and each neighbourhood / station area includes many parcels of land or sites. TOD planning can start at the smaller scale and move up the spectrum, or at the larger scale and move down.



Figure 8: An example of 4 levels of TOD planning from transit corridors at the regional level to promoting compact mixed use development at site level. | Source: IBI Group

Table 1: Scale and scope TOD planning area | Source: IBI Group

	City-Region	Corridor	Station Area	Site
<b>Purpose</b>	Involves integration of land uses with transit system planning. Used to support analysis and decision making related to citywide growth management. Provides a point of intervention for TOD as a policy in statutory documents (Master Plan/ Development Plan)	Ensures that development at one station complements development at other stations, resulting in a network of transit oriented places. Specific transit ridership goals can be evaluated at this scale against development potential around transit stations.	Focuses on areas surrounding transit stations within a 5-10 minute walking distance focusing on land use, transit station accessibility, multimodal integration and connectivity.	Focuses on individual developments within a station area. Includes targets for net intensity and density for development, internal circulation, building design, and parking.
<b>Boundary Definition</b>	Administrative Boundaries/ Transit Systems.	10-minute (800m-2km) walking/ cycling distance on both sides of existing/ planned transit corridor.	5- 10 minute (400m-1km) walking distance from station facilities.	Individual parcel within 5-10 minute (800m- 1km) walking distance from the station facility.
<b>Outcomes</b>	TOD Policies + Generic DCR Modifications + Institutional Framework for Implementation	Strategic Plan + Station Area Typologies + Investment Priorities + Phasing Strategy	Detailed Station Area Layout Plan + Urban Design Proposals: Built Form Guidelines + Accessibility/ Streetscape Proposals + Investment Strategy + Implementation Plan	Site Layout Plan + Detailed Development Program + Urban Design Plan + Accessibility/ Streetscape Detail Design + Financial Strategy + Implementation Plan

## 2. Development Context

Each Indian city is at a different stage of development. Some new cities like Naya Raipur and growing cities like Bhubaneswar offer significant greenfield opportunities for development. Metro cities such as Mumbai and Bangalore, which are already developed, offer mainly urban infill and redevelopment opportunities. Development context is categorized into three types: **1) Built-up Infill Areas; 2) Redevelopment Areas; 3) Greenfield Areas**

CONTEXT	ADVANTAGES	DISADVANTAGES
<b>Built-up areas</b> (Infill Development)	<ul style="list-style-type: none"> <li>Served by multiple transit options with inherently higher public transportation and pedestrian modal shares</li> <li>Higher residential and employment densities</li> <li>Opportunity for redeveloping aging building stock</li> </ul>	<ul style="list-style-type: none"> <li>Higher property values</li> <li>Multiple land ownership</li> <li>Smaller plot sizes not conducive to increased densities unless amalgamated</li> <li>Constrained right-of-ways</li> <li>Existing congestion issue</li> <li>Aging infrastructure</li> </ul>
<b>Redevelopment Areas</b> (slums, aging or vacant industrial lands, declining areas)	<ul style="list-style-type: none"> <li>Often located near major transportation corridors and established employment centres</li> <li>NMT modal share is higher, specifically in low-income areas</li> <li>Opportunity to improve transit accessibility</li> </ul>	<ul style="list-style-type: none"> <li>Multiple ownership requiring land assemblage</li> <li>Irregular property sizes and configurations</li> <li>Existing land uses typically not transit supportive</li> <li>Large block sizes inhibiting walkability</li> </ul>
<b>Greenfield Areas</b>	<ul style="list-style-type: none"> <li>Single ownership</li> <li>High percentage of government owned lands</li> <li>Opportunity to master plan new communities around transit</li> <li>Lower land costs</li> <li>More financial resources appropriated</li> <li>Opportunity for constructing higher capacity infrastructure systems</li> <li>Strong political support</li> <li>Minimal regulatory barriers</li> </ul>	<ul style="list-style-type: none"> <li>Time period for new cities to take shape is long-term</li> <li>Unknown population composition</li> <li>Limited employment opportunities initially to achieve jobs- housing balance</li> <li>Often sprawl inducing as public transport connectivity to city centres is not strong.</li> </ul>

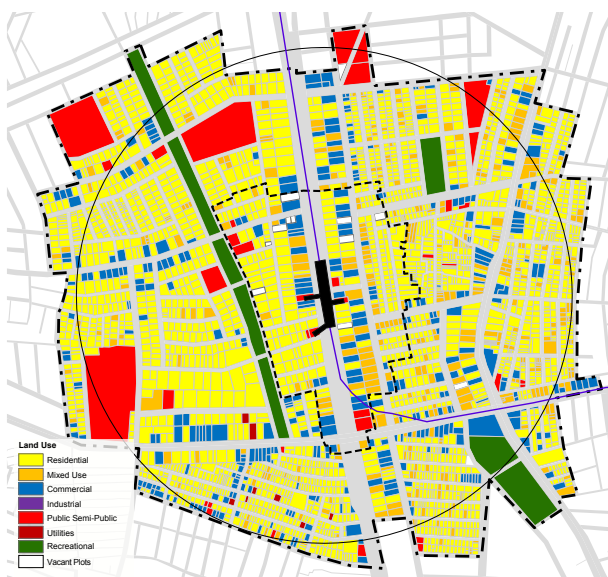


Figure 9: An example of Urban Infill along Namma Metro in Bangalore characterized by small land parcels. | Source: IBI Group

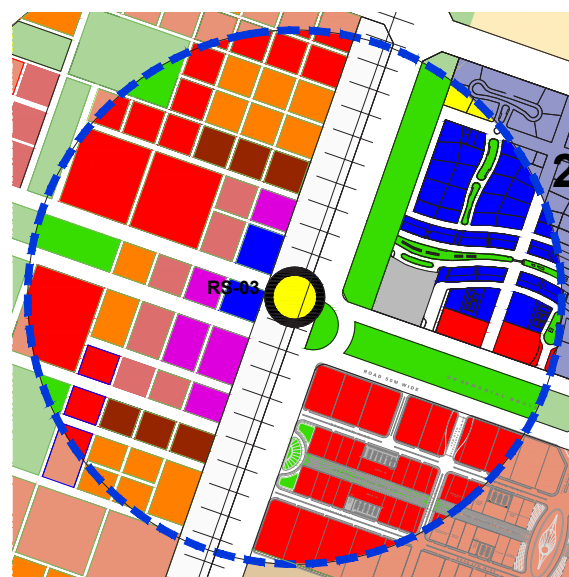


Figure 10: An example of Greenfield Area, Naya Raipur that has large land parcels owned by NRDA | Source: IBI Group

### **Station Area Typologies based on Development Context**

Station areas along corridors are set in different urban contexts, play different roles in the transportation network and present unique challenges and opportunities. Successful approaches to transit station design for a Station Area that acts as a main interface into the rapid transit network may not be appropriate for a station area that serves as a key transfer point between different modes. Similarly, appropriate intensification strategies at a very urbanized hub may be very different from a regional destination or a greenfield low-density area. Every station area, whether existing or proposed, faces unique challenges and will require specially tailored strategies to develop high-performing TOD projects at the site level.

With that being said, many different types of station areas share similar characteristics which can help planners quickly understand key planning considerations and what to expect in terms of the character, role and function of the places that will be created. Station Area Typologies also help in creation of future transit corridors and stations especially with the analysis of development priorities against transit service and station capacities. Station Area Typologies are typically established based on:

- Existing land use character
- Transport functions including right-of-way, availability of multiple modes, and connectivity to the citywide network
- Land availability for future development
- Susceptibility to change - for example age of buildings
- Mobility network (including block size and mobility barriers)
- Infrastructure carrying capacity

In the Indian context, typical station area typologies may include:

- Intermodal Gateways
- Employment Centres
- Destination Nodes
- Transit Neighbourhoods
- Urban Core(CBD)
- Infill Neighbourhoods
- New Residential Area



## STATION AREA TYPOLOGIES

	Intermodal Gateways	Employment Centres	Destination Nodes
	 <p>Anand Vihar, Delhi</p>	 <p>Barakhamba, Delhi</p>	 <p>Mahalaxmi, Bangalore</p>
<b>What are the characteristics of the Station Area?</b>	Significant hubs of transport activity with supporting commercial and informal activities	Significant centre of economic and community activity. Stations serve the main public / semi public-amenities & offices of the city.	Stations which provide access to unique destinations.
<b>What is the Character of Land Use Mix &amp; Density?</b>	Moderate- to high-density mix of industrial, commercial, employment, public - semi public / cultural and residential uses.	Moderate to high-density mix of employment, public-semi public / cultural uses. Some residential and local- retail also supported.	Moderate to low-density mix of public-semi public and cultural uses. Some residential and local-retail also supported.
<b>What are the major planning &amp; development challenges?</b>	Integrating dense mix of housing and employment uses while maintaining ease of access to transit stations.  Illegal parking and hawker encroachment can create a false sense of congestion.	Introducing housing into predominantly employment / public-semi-public uses and improving connections/ access to transit.	Creating sustainable off-peak uses and accommodating peak travel demand.
<b>What are land development opportunities?</b>	Moderate chance of land availability	Less possibility of land availability	Less possibility of land availability

### Transit Neighbourhoods



Azad Nagar, Mumbai

### Urban Core (CBD)



Church Gate, Mumbai

### Infill Neighbourhoods



Koh-e-fiza, Bhopal

### New Residential Areas



Misrod, Bhopal

<p>Predominantly residential district with good access to regional and subregional centres</p>	<p>Significant centre of economic, community and cultural activity with regional-scale retail destinations.</p>	<p>Predominantly residential districts located just outside the core/old city</p>	<p>Predominantly residential district outside the core/old city area with good access to the core city</p>
<p>Potential for community and regional-serving retail but need to balance demands and conflict with surrounding destination retail.</p>	<p>High density with commercial uses (&gt;75%) + a moderate mix of other uses such as institutions, and residential within a 5 min (400m) walking radius.</p>	<p>Moderate-to high density with predominantly residential and moderate mix of Commercial, public semi public &amp; community facilities</p>	<p>Moderate-to high density mix with predominantly residential supported with commercial &amp; community facilities</p>
<p>Integrating affordable housing in the product mix to increase transit ridership.  Provide greater opportunities for commercial activities and informal markets to support household needs.</p>	<p>Integrating high-density housing into existing mix of housing and employment to support local-serving retail and improving connections/ access to transit</p>	<p>Integrating new housing and supporting local-serving retail  Improving connections/ access to transit"</p>	<p>Expanding local-serving retail opportunities and high-density housing opportunities</p>
<p>Less possibility of land availability</p>	<p>Mostly infill developments &amp; retrofitting uses</p>	<p>Very less chance of land availability</p>	<p>Moderate chance of land availability</p>

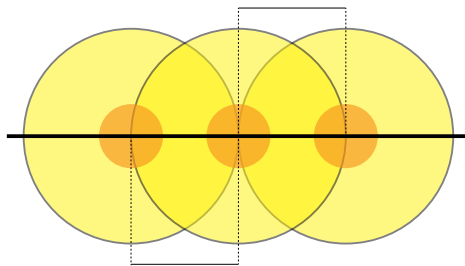
**Nature of Transit Service**

Bus Rapid Transit (BRT) and Metro rail are dominant types of mass transit systems being planned in Indian cities. There is a misconception that Metro rail systems are better positioned than BRTs to occupy low-to-moderate density TOD markets. Global experience in cities such as Cleveland (USA), Boston (USA), York Region (Canada) and Curitiba (Brazil) indicates that the ability for transit systems to attract development along well-designed BRT corridors is comparable to TOD near rail transit stations. (BRT TOD: Leveraging transit oriented development with bus rapid transit investments).

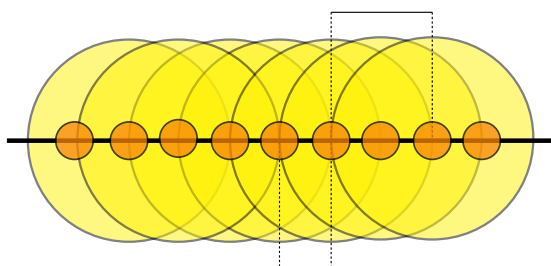
BRT systems in India, with the exception of Janmarg Ahmedabad, are still in their early stages of implementation to draw definitive conclusions. Similarly, with the exception of Delhi Metro, other metro rail systems are currently in the construction or partial implementation phase. However, there are some inherent differences between planning for TODs along Local Bus, BRT and Metro rail corridors that need to be proactively addressed to attract desired investments. These differences are primarily related to station design (spacing, placement and facility) illustrated below:

**STATION SPACING**

1



Metro Station Spacing



BRT Station Spacing

The optimal station spacing is determined based on the average transit speed and walking distance such that:

- Beyond this, more time is imposed on customers walking to stations than is saved by transit speeds.
- Below this distance, transit speeds will be reduced by more than the time saved with shorter walking distances. *(Adapted from ITDP)*

**BRTS**

- 300m-800m

**METRO RAIL**

- 800m-2000m

Source: (ITDP/ IUT)

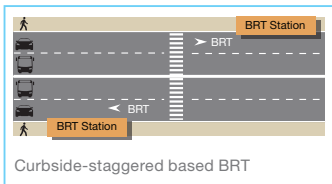
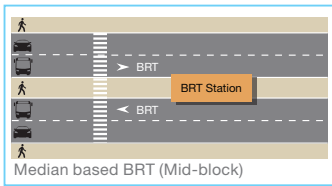
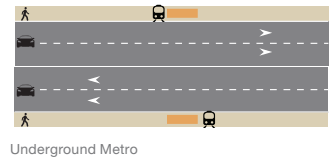
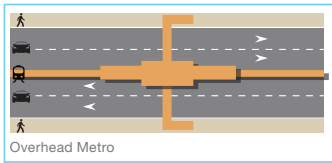
**Level of Interventions** that should be considered in the process of promoting TOD along different transit modes:

**Pedestrian crosswalks | Block sizes | Catchment area**



2

STATION PLACEMENT



**BRTS**

- Median busways
- Curbside

**METRO RAIL**

- Elevated
- Underground

**Level of Interventions** that should be considered in the process of promoting TOD along different transit modes:  
**Traffic calming | Pedestrian crosswalks vs. foot over bridges (FOBs) and underpass | Cycle Parking | IPT integration | Universal Access | Joint Development Opportunities**

3

STATION FACILITIES



**BRTS**

- Utilizes existing RoW- less land acquisition costs
- Typically restricted to passenger boarding and alighting
- Limited passenger amenities (retail spaces, public facilities)
- Minimal joint station and property development opportunities
- Park and ride facilities limited

**METRO RAIL**

- Higher land acquisition and construction costs
- High potential for joint development including high quality passenger amenities
- Opportunities to provide park and ride, passenger pick up and drop off facilities as part of station design

**Level of Interventions** that should be considered in the process of promoting TOD along different transit modes:  
**Multimodal Integration | NMT Accessibility| IPT integration | Joint Development Opportunities| Parking Facilities | Cycle Parking | Safety and Security**

## 1.6 Dispelling Myths about TOD

Transit Oriented Development is generally misunderstood as one single solution to the confounding crises that afflict modern cities. TOD can certainly lay the groundwork for long-term problem solving related to development and urbanism issues. However, contrary to the widely held belief that TOD is simply a justification used to build taller buildings, the concept in fact suggests planning appropriate densities that can take advantage of transit access while also providing easy and convenient mobility for NMT modes. The following section outlines the myths about TOD.

### MYTH:

**“TOD is a panacea for urban growth and liveability issues”**

### TRUTH:

*TOD is not a panacea for the world's urban problems. TOD does, however, have the capacity to play a primary role in alleviating a wealth of contemporary city problems. Incorporating flexible planning that involves bringing citizens closer to affordable transportation and resources has a huge potential for growth and, if designed and implemented correctly, for liveability and quality of life. These benefits will be also compounded if aided by further regulation and smart growth strategies, along with large scale economic development programs.*

### MYTH:

**“TOD is only about densification and capturing land values”**

### TRUTH:

*Densification and the capturing of land values do play a role in successful TODs, but they are by no means the only intended results or goals. These two elements are merely tools that can be implemented to make a TOD scheme work more efficiently and to its highest capacity. As a TOD element, however, density does play a large role in ensuring long-term ridership for the public transportation system that is housed near the densest areas. Densification also allows more people to live in urban centres in close proximity to many resources. Increasing the density can also limit the outward sprawl of suburban development.*

*Densification is not, however, the end goal. Densities must be mixed-use with a high focus on accessibility and liveability. Density is feasible only if walkability, the key requirement of TOD, is prioritized and emphasized. Density alone, without upgradation of pedestrian infrastructure, can increase congestion and worsen liveability. A highly walkable vibrant mixed used station area is likely to garner more value for land around transit stations, increasing the potential for land value capture. TOD also does not call for a uniform densification of all urban areas; rather it designates an outward, stratified gradation towards low density suburbs.*

### MYTH:

**“TOD creates more traffic congestion than low-density development”**

### TRUTH:

*Low density areas do, indeed, experience lower levels of traffic congestion intensity but only in the areas immediately surrounding the low density development. These areas rarely provide a sustainable amount of commercial and retail needs for their citizens. Nor do they encompass a large portion of the employment areas in cities. Inhabitants of these low density areas are then forced to commute into concentrated areas of employment and commercial activity, a migration that makes up the peak of congestion areas.*

**MYTH:**

**“TOD exerts increased pressure on city infrastructure services”**

**TRUTH:**

*This notion is in direct contradiction with the principles and logic that are inherent to a successful TOD plan. Agglomerating people and commercial development into dense areas, in close proximity to public transportation, will reduce a municipality's infrastructure needs. A main TOD tenet is to focus development in urban areas and establish spatial limits to outward, circular, sprawling growth.*

*However, limited infrastructure capacities are a reality in Indian cities. While these need to be acknowledged and used to inform TOD ideas, it is important to recognise that concentrated agglomerations are far more equipped to support sustainability measures like rainwater harvesting, grey water recycling, renewable energy, composting, etc. that can reduce the burden on municipal infrastructure systems.*

**MYTH:**

**“TOD is government driven with a minimal role for the private sector”**

**TRUTH:**

*To believe that the government is solely responsible for driving TOD is only partially true. It does aim to create a framework that encourages development, but it also allows private enterprise to capitalize within that environment. Because of this, the role of the private sector is not minimal but in fact the main development agent. The government is not equipped for creating an economically sustaining TOD on its own accord. Government facilitation is expressed through control measures such as zoning regulations and various incentive programs to control, direct and induce growth. Private entities such as financial institutions, developers, store owners, real estate professionals and, most importantly, customers will then sustain the economic growth.*

**MYTH:**

**“Transit service is secondary to development in TODs”**

**TRUTH:**

*Development and transit are not mutually exclusive elements of TOD. They contribute to each other and create a symbiosis that each allows the other to flourish. The transportation aspect is the cornerstone of TOD. Without an efficient and well used transit network the development can never materialize to its fullest potential.*

*Furthermore, development should not just be perceived at the station level. By connecting stations via mass transit, all TOD stations become within reach of a city's population mass. Encouraging the exchange of people in and out of the connecting station areas will benefit the commercial retail areas within the corridor. It will also provide the necessary human interest for these areas to succeed in the long term.*

**MYTH:**

**“Build a Metro Rail and development will follow”**

**TRUTH:**

*It is widely assumed that building metro rail will lead automatically to new real estate development along the transit system. Evidence from cities around the world shows that while metro rail is a catalyst for development, well-designed BRT systems have a similar impact in attracting transit supportive development. The potential of mass rapid transit modes to attract development is dependent on several other factors including land availability for development, local real estate market strength, and proactive land use zoning regulations. Global experience in cities such as Cleveland (USA), Boston (USA), York Region (Canada) and Curitiba (Brazil) indicates that the ability for transit systems to attract development along well-designed BRT corridors is comparable to TOD near rail transit stations. In the Indian context, both Metro and BRT systems are still in their early stages of implementation with minimal research conducted on the real estate potential of either mode to draw any definitive conclusions related to predictability of attracting development.*



## 1.7 Lessons from Global Practices for TODs

While each city and TOD project is unique, global best practices demonstrate some key lessons that are integral to successful TOD implementation.

### VISION BASED

One of the consistent lessons from all the global case studies was the regional or citywide vision-based planning adopted. Cities like Curitiba, Singapore, Hong Kong and Arlington (USA) attribute their TOD success to the **political leadership's vision and continuity through different administrations** while implementing the envisioned future for sustainable urban growth.

### TRANSIT-FIRST POLICIES

Cities have witnessed immense transformation from their 'transit-first' policies such as transportation demand management for site plan development (Arlington, USA), electronic road pricing (Hong Kong), vehicle quota systems (Singapore) combined with prioritized investment in NMT infrastructure, played a significant role in enabling TOD as a lifestyle choice.

### JOINT DEVELOPMENT

High-density, high-quality transit supportive cities such as Hong Kong, New York and Tokyo emphasized the potential of utilizing joint development of stations (Hong Kong's Rail + Property development model) as a viable financing tool to fund transit service while at the same time creating a transit-supportive built form.

### IMPACT OF TRANSIT SERVICE QUALITY

High quality, affordable and integrated public transit system. The significance of providing a high quality transit service in influencing a modal shift is nowhere more evident than in the case of Curitiba's BRT system. The system continues to be the inspiration for cities in the developing and developed countries as a low-cost flexible transit investment alternative to rail-based systems. Initial investments in creating high-performing busway systems is an absolute necessity for capitalizing on the benefits of transit oriented development.



Figure 11: Arlington, Virginia, U.S.A. is considered as one of the most comprehensive TOD programs implemented in North America. | Source: "Arlington County - Virginia" by Arlington County uploaded and derivative work: MrPanyGoff - <http://www.flickr.com/photos/>

## AFFORDABLE HOUSING

Provision of appropriate affordable housing policies was equally important in cities like Arlington (Virginia, U.S.A.) and Curitiba. Arlington created a special land use overlay, 'Special Affordable Housing Protection District (SAHPD)' along the transit corridor to offer preference to the affordable housing developments along the transit corridor. Curitiba's public housing programme (COHAB-CT) works in close co-operation with the Institute of Research and Urban Planning (IPPUC) to ensure a continuous supply of low-cost housing, especially along the transportation corridors, when it was found that people using BRT do not actually live along these corridors, but primarily in the densely occupied peripheral districts of the city and the immediate neighbouring areas of a much more populated metropolitan region.

## FINANCING TODS

Financing TOD infrastructure and attracting investors that are willing to implement the desired vision has been a challenge even for mature TOD experiments like Portland (Oregon, U.S.A.) or Arlington. **Incremental changes and experiments with regulatory mechanisms through creation of overlay districts, density bonuses, and land value capture mechanisms such as Tax Increment Financing (TIF)** were part of the success story in many of these cities, which spanned a time period of 15-20 years.

## PEDESTRIAN ACCESSIBILITY: FIRST AND LAST MILE CONNECTIVITY

Urban Design principles that prioritize pedestrian access to transit station and enforce parking demand management strategies form the backbone of successful TOD programmes. Arlington, Curitiba, Portland and Singapore reveal that **prioritizing urban form over densities near transit stations** has been a successful approach in increasing the property values of surrounding development.



An example of Singapore's public realm around its transit stop that supports a walkable urban neighbourhood, sidewalk activity, slow vehicular traffic and continuous building edges that combine to promote transit, walking, and cycling. | Source: IBI Group

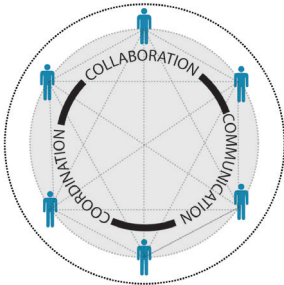
Figure 12: Public realm around transit stop in Singapore



## 1.8 Lessons from TOD initiatives in India

The following key components will be crucial in determining the future of TOD as a lifestyle choice in Indian cities:

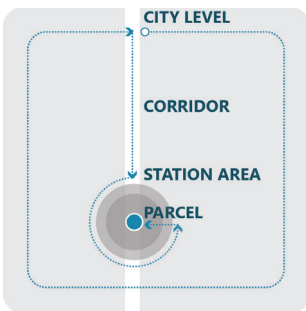
### CAPACITY BUILDING AND INTERGOVERNMENTAL COORDINATION



For successful implementation of TOD projects, it is imperative for all stakeholders to work collaboratively. Identifying the available technical capacity is essential in outlining the next steps and build upon synergies possible through an integrated approach.

Most governmental agencies in Indian cities have minimal planning and engineering resources available, especially when compared to the west. Often, the current resources are not well-equipped to understand the nuances and intricacies of TODs. Many local agencies require a lot of hand-holding in understanding, applying and finally implementing TOD concepts during the development phase. The other common issue faced by Indian cities is the buy-in for TOD from within governmental agencies itself. Traditionally, majority of the governmental agencies have operated individually without much coordination. Encouraging TOD forces different stakeholders to work collaboratively (often met with resistance). Where does TOD fall in terms of planning, implementation and monitoring is still a grey area because of the multiple agencies involved and requires interventions similar to UTTIPEC in Delhi's case.

### SCALE AND NATURE OF TODS



Delhi, Naya Raipur, Ahmedabad and Hyderabad have adopted TOD policies in their existing Master Plans as amendments at the citywide scale. Other cities investing in Metro rail or BRT systems have conducted isolated station area planning studies but the integration at city level especially changes in land uses still remains a challenge from a policy perspective.

In terms of development context, most professionals in cities strongly believe that TODs are better suited for Greenfield conditions as opposed to built-up urban conditions, which are already dense (as opposed to North American cities), with overburdened infrastructure. These arguments have merit and reinforce the need to develop a context-sensitive approach in establishing and enforcing appropriate regulations as well as planning for infrastructural upgrades to support higher densities.

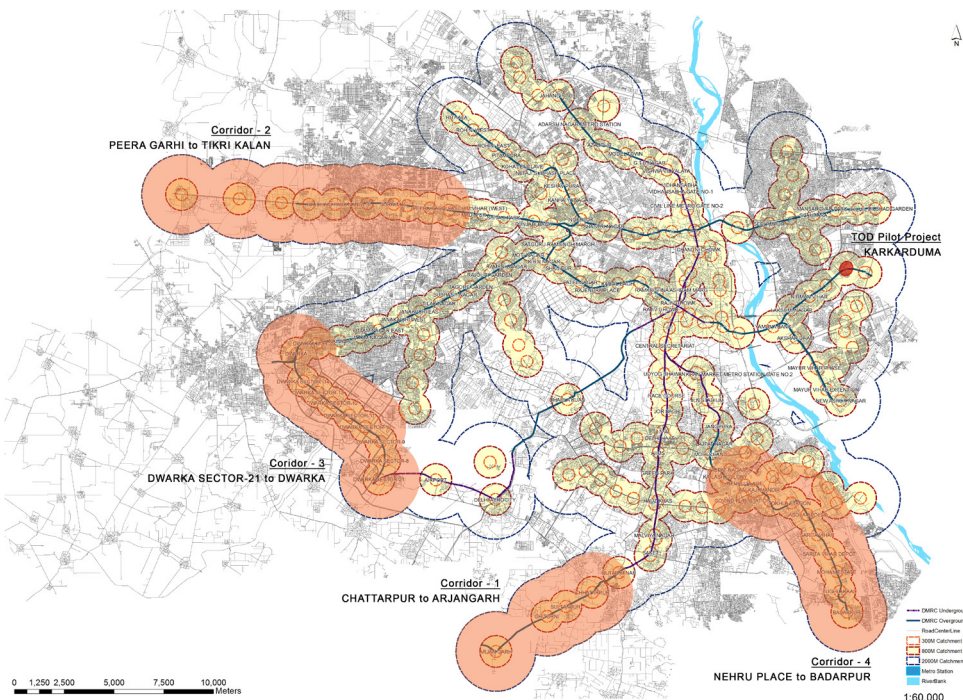


Figure 13: Example of TOD corridor planning along Delhi's Metro Rail system

Delhi's TOD Plan defines project boundaries under three types; greenfield, urban infill, and redevelopment. It also identifies four corridors to be implemented in the first phase, and the scale and nature of pilot project | Source: UTTIPEC, retrieved online from: [www.uttipeec.nic.in](http://www.uttipeec.nic.in)

## REGULATORY FRAMEWORK

Developing successful transit oriented communities requires employing a combination of regulatory tools such as parking policies, affordable housing mandates, pedestrian access with incentives such as density bonuses, expedited development review and land pooling.

While one of the biggest roadblocks is that the current land use regulations are not TOD supportive, there have been several attempts by various cities in eliminating these challenges. Presently, in India, cities have not invested in direct development of public facilities as TOD models. There are few instances where joint development at the Vashi Station in Mumbai and Nehru Place Station has elements of commercial development integrated with the station facility. However, these examples are focused more on facility development and not accessibility, as in the case of successful TOD projects.

In India, Tier 1 cities have some of the lowest development densities (measured in terms of FAR or FSI) when compared to similar sized global cities such as Hong Kong, Singapore, Tokyo or Chicago. In addition to the lower FARs, what has been observed is that most Indian cities are responding to this issue by increasing FARs as a blanket regulation in a 200-500 meter radius around the metro station, without understanding its consequences on the surrounding area's infrastructure carrying capacity.

Other issues such as parking standards near transit stations, provision of minimum affordable housing standards, segregated land uses and minimum front setbacks need to also be addressed at central and state levels in terms of modifications to the National Building Codes and Town & Country Planning Act.

### Regulatory precedents in Delhi, Naya Raipur, and Ahmedabad

*Though it is premature to draw conclusions from current TOD planning attempts in India have introduced regulations that could give some cues for TOD planning in other cities. These include:*

- **Special Overlay Zoning Districts (Delhi, Ahmedabad, Naya Raipur)** as supplemental provisions to existing regulations without disrupting the requirements of the base zoning designation;
- **Differential FARs (Ahmedabad, Mumbai)** to adjust for contextual variation according to on-ground conditions;
- **Density bonuses (Ahmedabad, Delhi, Mumbai)** Increased FARs in exchange of public infrastructure investments by private sector; and
- **Mixed-Use Development (Delhi, Ahmedabad, Mumbai, Naya Raipur, Hyderabad)** as a separate land use designation within 800 m walking distance from transit stations.

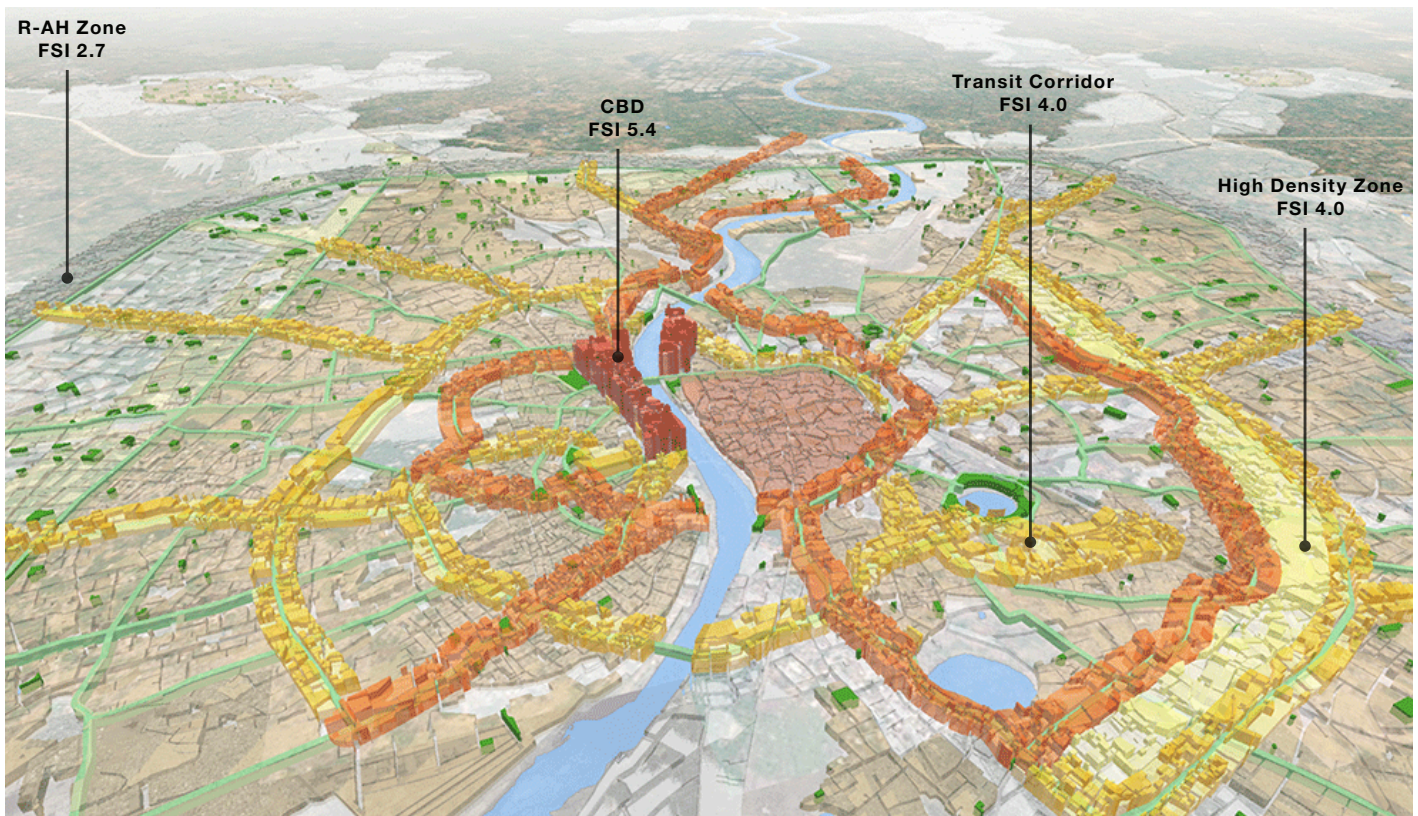
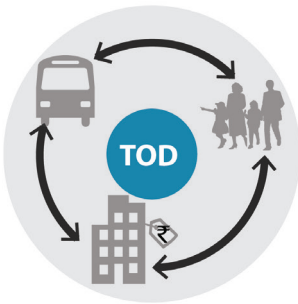


Figure 14: Special Overlay zones proposed in Ahmedabad

Special Overlay Zones are proposed in Ahmedabad to be taken up as a local area planning projects for easy implementation at the city scale | Source: Presentation on Draft Development Plan, 2021, AUDA, January 21, 2013



## REAL ESTATE MARKET RESPONSE



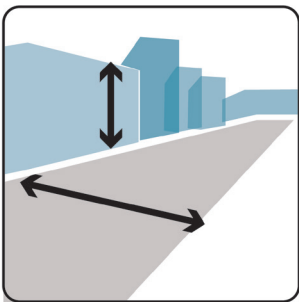
Understanding the perspective of developers and initiating a consultative process to introduce more transit joint development and pedestrian friendly opportunities along transit station will help bridge the current disconnect between theory and practice related to TOD.

While a majority of real estate developers in the country use transit service as a value addition to their properties for marketing purposes, the response from the development community in embracing TOD in established urban areas to-date has been indifferent.

One of the major issues cited by developers is the lack of large-sized land parcels near transit stops that will enable them to create viable development products. Buyers and developers alike want the comfort of having transit as an option available but not at the expense of negative impacts such as increased congestion, loss in safety and security onto the neighbourhood streets and aging infrastructure. Furthermore, the concept of promoting vertical mixed-uses with commercial and residential in the same building is yet to gain acceptance in the development community.

Embracing the concept of TOD for developers will require awareness building for developers and a paradigm shift in lifestyle choices for end users. Whether developers could be incentivized to invest in these areas and create a market for captive suburbia aspiring individuals is yet to be seen.

## URBAN DESIGN CONSIDERATIONS



Developing transit supportive design guidelines and integrating them with development review processes is one of the proactive approaches that communities need to take in order to encourage transit considerations in future development plans. With the exception of UTTIPEC Delhi's Street Design Guidelines, Ahmedabad's Draft Development Plan 2034 and Naya Raipur TOD Study, a majority of the studies have not yet incorporated urban design guidelines into their existing review process. IRC Codes, Urban Road Codes, NBC Codes and URDPFI Guidelines are default standards used by city engineers and planners. However, these standards have not been updated to take into consideration the changing landscape of Indian cities, specifically as it relates to integration of land use, development and mass rapid transit investments. Urban Design Guidelines typically cover street design standards, accessibility parameters, multimodal station design elements, prioritized pedestrian and bicycle access and built form regulations.



# 02 /

## TOD GUIDANCE DOCUMENT



Walkable pedestrian friendly Ballston station at Arlington | Image Courtesy: Thesmothete



## 2.1 Need for the TOD Guidance Document

This Guidance Document is the first comprehensive attempt in India to provide a step-by-step guide for cities to plan and implement successful TODs. With increased investment in mass rapid transit systems, the time is opportune to prepare a step-by-step approach to address how integrated land use and transit can serve as a tool to bring about a paradigm shift in transforming the future of Indian cities.

This effort was initiated by the Sustainable Urban Transportation Project (SUTP), Ministry of Urban Development and World Bank, as states and cities in India increasingly aspired to maximize benefits of mass rapid transit investments underway in their urban areas. Majority of the acts, regulations and statutory documents are based on automobile-oriented planning principles. This Guidance Document is intended to provide direction to cities in addressing barriers to TOD at local levels, create realistic financing plans, and direct investment to transit stations with the best development opportunities.

TOD as a planning concept is hinged upon the principle of developing context sensitive solutions to local issues. It is with this purpose in mind that the guidelines, norms and sample policies presented is designed to be applicable at varying contexts such as scale (City, Corridor, Station Area, Site), development type (Greenfield, Redevelopment, or Infill), and mass rapid transit modes (BRT or Metro Rail).

The TOD Guidance Document is meant to provide both Development Authorities and Transit Agencies with a common vocabulary when discussing transit investments in any city. In preparing this Guidance Document, TOD experiences of Indian cities and best practices of other successful TOD focused cities were taken into consideration. Finally, this Guidance Document reflects emerging central government policies including the National Urban Transport Policy, National Mission for Sustainable Habitats, and the Smart Cities Concept Paper prepared by the Ministry of Urban Development, Government of India.

The document intentionally goes beyond discussing the theory of TOD and includes a detailed planning process, tools for implementation, and references for relevant standards, case studies and templates for implementing agencies.

It is important not to perceive the Guidance Document as a ‘manual of standards’ for creating successful TODs. Based on local conditions, it is expected that state, city and special authorities will adapt the steps presented to their own individual situations to develop solutions and approaches beyond those contained in this document.

## 2.2 Objectives

The Guidance Document is an important resource guide to successful TOD implementation, achieving the following objectives:



### A. Communicate

Clearly communicate applicability of TOD principles in the Indian context for cities at various stages in planning and implementing mass rapid transit systems.



### B. Guide Creation of Successful TODs

One of the primary objectives of this Guidance Document is to expand the present TOD discourse beyond the planning and design aspects of the process. This document provides special emphasis on the financing and implementation steps required for creating successful TODs, including integration with statutory documents and existing institutional framework.



### C. One-stop TOD Resource

Serve as a one-stop resource on TOD for municipalities, transit agencies, developers, professionals, state governments, central government ministries and other public agencies interested in embarking on TOD planning and implementation;



### D. Capacity Building

Assist stakeholders in delivering TOD policies, programmes and projects by establishing the necessary foundation for the physical, regulatory, financial and political environments.



## 2.3 Target Users

As a step-by-step resource, this document is intended to facilitate the implementation of existing recommendations and projects identified in adopted development plans, transit system detailed project reports (DPRs), as well as creating strategic TOD plans.

### USING THE TOD GUIDANCE DOCUMENT



#### PLANNING AUTHORITY

***If you are a:***

- City Development Authority
- State Urban Development or Transport Department
- Municipal Corporations/ Urban Local Body
- Town And Country Planning Department
- Special Planning Authority

***And if you want to:***

- ASSESS** your city's readiness for implementing TOD
- ENABLE** capacity building in TOD
- PLAN+DESIGN** development along transit corridors
- INVEST** in improving infrastructure and development potential along transit corridors and/or station areas
- IMPLEMENT** TOD concepts when reviewing proposals for individual site developments near transit stations.

#### TRANSIT AGENCY

***If you are a:***

- Transit Agency or Special Purpose Vehicle (SPV) for BRTS/ Metro Rail
- Bus Transport Department
- Indian Railways Department
- Other Transportation Agency

***And if you want to:***

- ASSESS** the ideal scale of intervention for integrating TOD principles in transit systems planning
- ENABLE** transit agency to seek central government funding for improving accessibility to stations
- PLAN+DESIGN** accessibility to transit or station facility designs
- INVEST** in capturing the value around transit to fund transit system improvements
- IMPLEMENT** joint development projects with city agencies and private sector

#### PRIVATE STAKEHOLDERS / PROFESSIONALS

***If you want to:***

- Increased real estate development opportunities and property values along transit corridors and stations
- Joint development opportunities with government reducing risks related to land acquisitions
- Higher development potential for increased densities in strategic locations
- Improved quality of life conditions to attract future buyers
- Incentives may be available to provide affordable housing near transit stations

## 2.4 Step-by-Step Approach to TOD

The purpose of developing a step-by-step approach for successful implementation of TOD projects is to ensure a robust process for initiation, design and evaluation of TODs at multiple scales. This process focuses on providing decision-makers with the tools required to make informed decisions for developing a realistic plan that is implementable and flexible, depending on local conditions, capacities and resources available. The entire TOD process from inception to implementation is captured in the following “five key steps”:



TOD FRAMEWORK

### 1 ASSESS

**ASSESS:** TODs do not simply consist of one project or site located in close proximity to the transit station; they consist of a series of projects encompassing various scales of development. There is no single solution for TODs and not all sites that are accessible from a station will exhibit all factors necessary for creating successful TODs. Determining the appropriate scale and scope of work is one of the crucial steps in determining preparation of a realistic TOD Plan. **The ‘Assess’ step of the process is designed to assist authorities to determine how ready a city is for TOD.**



TOD FRAMEWORK

### 2 ENABLE

**ENABLE:** The TOD state-of-the-art review of global best practices, as well as examples from various Indian cities implementing TOD policies, draw attention to several barriers—legal, financial, political, institutional and economic— that could suppress the best of TOD planning efforts in any city. **The ‘Enable’ step highlights policy barriers and mechanisms that cities can use in enabling TOD planning processes in their jurisdiction.**



TOD FRAMEWORK

### 3 PLAN + DESIGN

**PLAN + DESIGN:** The ‘Plan + Design’ theme brings forth the fundamental steps in the development of transit and pedestrian friendly communities in Indian cities. Components that are considered the building blocks of transit supportive planning—such as walkability, mixed-uses, reduced parking and active streets with zero front setbacks—are also the challenges communities across the nation are currently facing with no direct solutions. This step presents action strategies and tools to create a more compact land development pattern hinged upon pedestrians and cyclists.



TOD FRAMEWORK

### 4 INVEST

**INVEST:** Aligning financing mechanisms to implement TODs is often cited as a challenge, both by the public and the private sectors. From a private sector perspective, fiscal barriers range from incurring higher construction costs for mixed-use developments and multi-level parking structures to obtaining loans from financial institutions for unconventional investments. The ‘Invest’ section highlights strategies to understand the dynamics of real estate financing, infrastructure investments and how private sector players can work in collaboration with governmental agencies to maximize their returns while at the same time equitably distribute the benefits of transit investments.

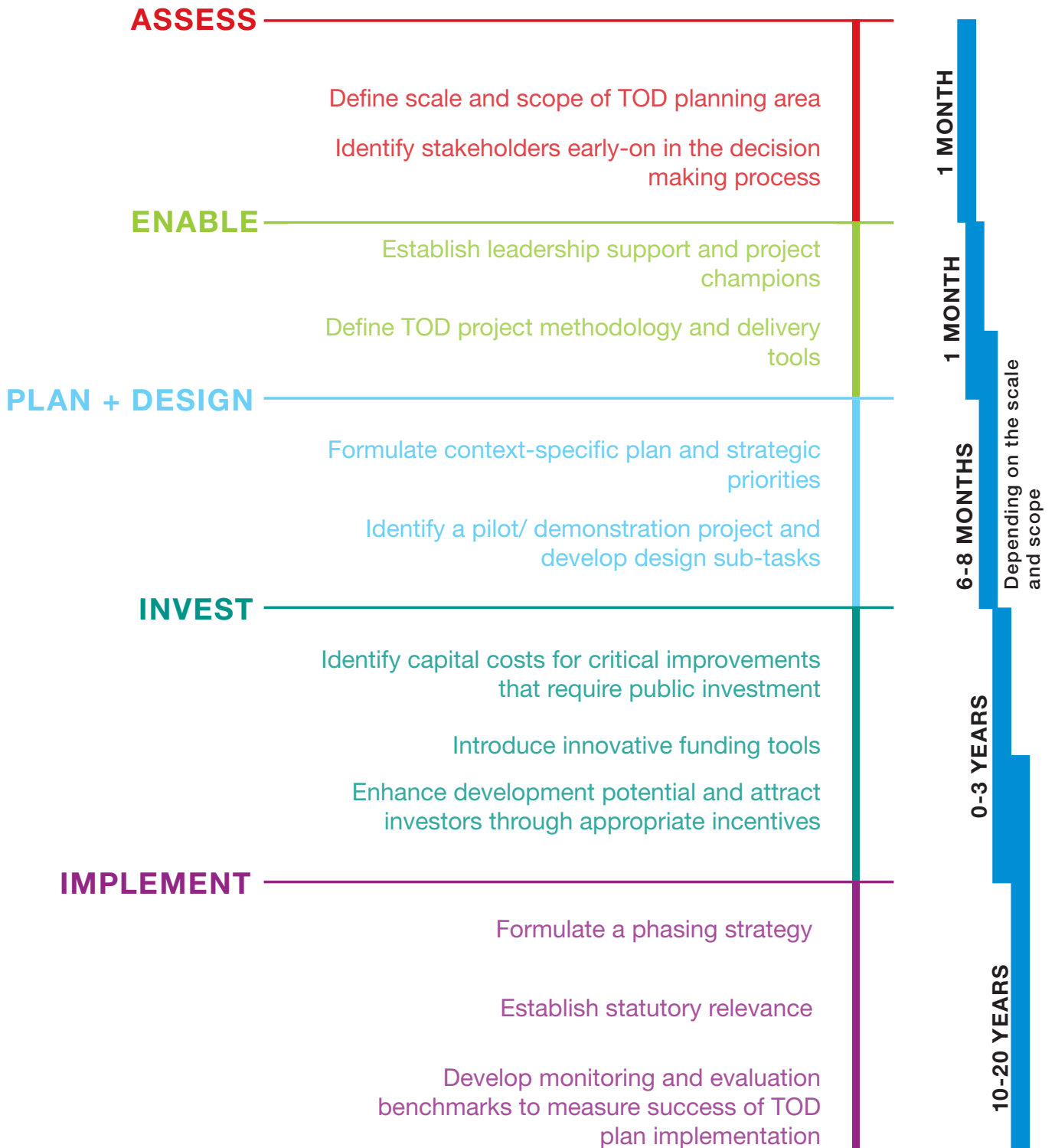


TOD FRAMEWORK

### 5 IMPLEMENT

**IMPLEMENT:** Similar to other planning initiatives TODs have a long gestation period and achieving success requires continuous support by the decision-makers and the myriad agencies involved in implementing the diverse components. The ‘Implement’ section ties the diverse interventions needed to ‘Make TOD happen’—from prioritizing catalyst projects and fostering partnerships between various stakeholders to local capacity building, and monitoring benchmarks for success.

TOD TIMELINE



**‘Design Layout’ for each step**

The guidelines are organized into a series of tasks and sub-tasks, each of which has been consistently structured as per the illustration shown below.



**Tasks:** Actions to be taken to complete step

**Purpose:** Describes the need of the task

**Sub- Tasks:** Activities to be undertaken that will aid in completing the identified task

**References:** References that provide additional information for completing the identified task.

**Outcomes:** Result expected following completion of the identified task.

**3.2.5. Gauge in-house technical capacity**

**PURPOSE**

To ensure adequate resources are available throughout the planning process and implementation stages

**SUB-TASKS**

- Identify the nature of in-house TOD supportive activities and programs. Depending on the scale and scope of the TOD identified in Strategy 4.2.3, activities may include:
  - o Transit system planning (in close coordination with land use planning)
  - o Land use planning along transit corridors
  - o Station accessibility/ NMT planning
  - o Reviewing development projects and proposals at site level
  - o Preparing TOD supportive development guidelines/ DCR modifications
  - o Infrastructure carrying capacity analysis
  - o Traffic impact analysis
  - o Planning future land uses for agency properties
  - o Preparing RFPs for joint development (PPP) projects
  - o Negotiations of joint development projects
- o Update GIS/ AutoCAD database
- o Funding of TOD studies and projects
- o Public outreach and education
- Undertake a review of existing technical and professional staff available to manage, implement and monitor TOD planning activities. The staffing resources required at a minimum are shown in Figure 15
- Conduct a gap analysis between resources available and TOD activities to determine the need for augmenting existing capacities through:
  - o Training of existing professional staff in various agencies and departments
  - o Recruiting new employees with requisite qualification
  - o Hiring external consultants to perform identified tasks if required

**REFERENCES**

- JnNURM Toolkit for Comprehensive Capacity Building Programme <http://jnnum.nic.in/wp-content/uploads/2012/03/CBToolKit.pdf>
- Report of Working Group on Capacity Building

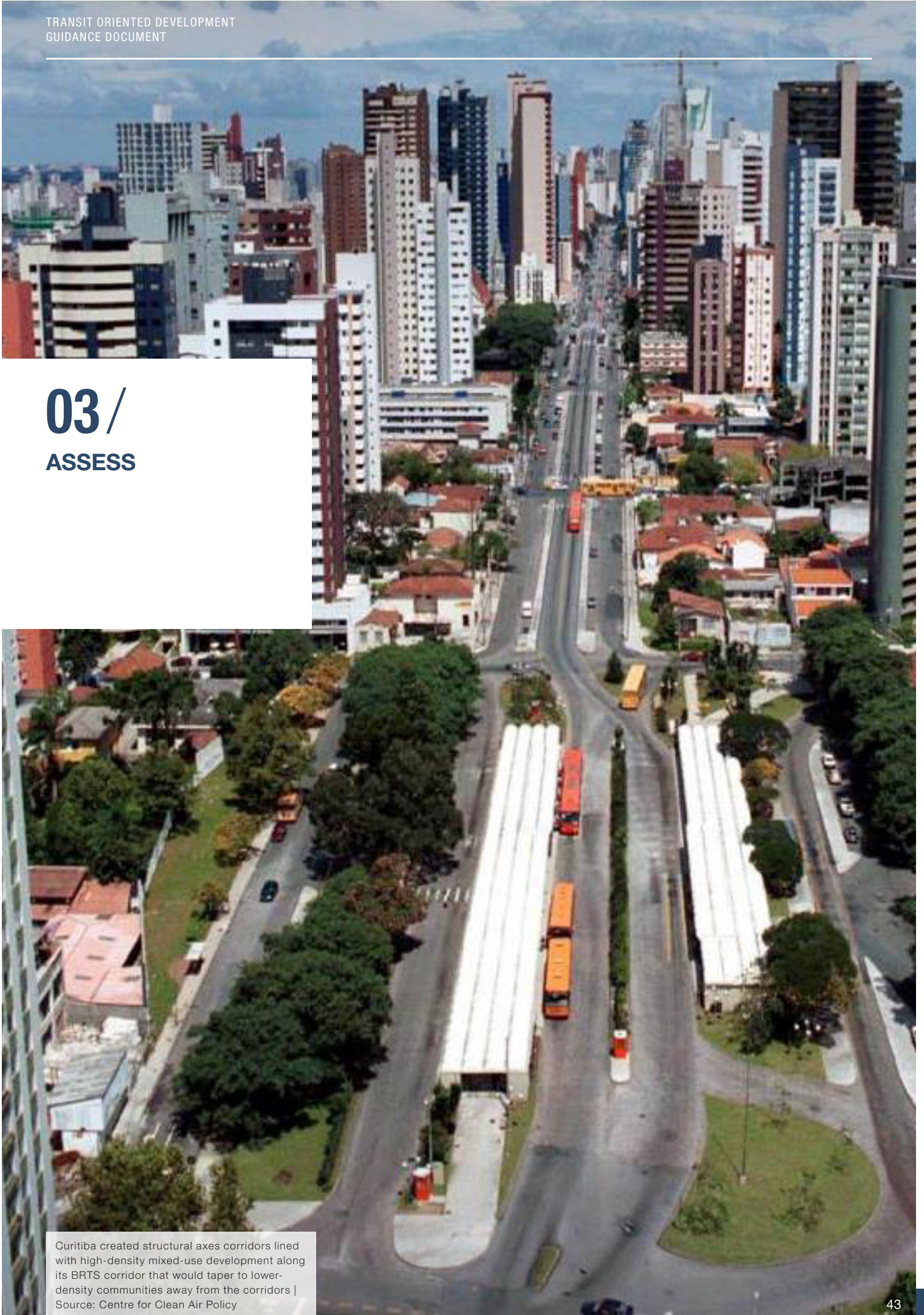
**OUTCOMES**

- Staffing Plan for TOD planning project.

**A series of tools are provided to support the key tasks identified in the step-by-step process. The tools are intended to provide additional detail on following a logical sequence of activities in accomplishing tasks in varying conditions.**



# 03 / ASSESS



Curitiba created structural axes corridors lined with high-density mixed-use development along its BRTS corridor that would taper to lower-density communities away from the corridors | Source: Centre for Clean Air Policy





### 3.1 Getting your City ready for TOD: Assessing the current status of transit oriented planning

TODs are typically associated with presence of higher order transit (bus rapid transit, light rail transit, metro rail transit). A closer examination of international case studies reveals that while higher-order transit systems often act as catalysts for creating successful transit oriented developments, accessibility and walkability are equally, if not more important.

The principles of TOD can be applicable to any city that wants to invest in creating resilient communities that are designed with people as the focus rather than automobiles. Accessibility to transit infrastructure- higher order or conventional busways- is equally important to ensure multimodal integration and completing the first and last mile journey for transit riders.

What could potentially be created in areas that lack access to higher order transit are pedestrian oriented developments with limited frequency bus service catering to long-distance commutes but an environment with comfortable pedestrian access to a mix of uses in close proximity to each other.

There are critical choices that Indian cities will need to evaluate in determining how limited resources available are invested in accommodating the growing population needs and aspirations. Often city development agencies are not involved in identifying transit alignment and stations along the corridor, and in return the transit agency is not concerned with land use planning. As a result, stations are often located in areas with limited scope for interventions that could transform the area surrounding the transit station from an auto-oriented neighbourhood into a pedestrian-oriented node. Therefore, interventions for TOD planning needs to be integrated in all mobility plans (e.g. CMPs, Transit DPRs, CTTs, NMT Plans, PBS schemes) and statutory plans (e.g. City Development Plans, Zonal Development Plans, Local Area Plans).

TODs are often perceived as a single project or site located in close proximity to the transit station. On the contrary, TODs typically consist of a series of projects that require interaction between adjoining private properties linked with high quality

public realm infrastructure. It is important to remember that there is no single solution for TOD-based planning and not all sites accessible from a station will exhibit all factors necessary for creating successful TODs.

Assessing the existing support for TOD principles in any jurisdiction (city or region) is an important aspect of the planning process. Often local governments are looking for 'quick-win' solutions that could be implemented with limited resources. While complete TODs are comprehensive programs aimed at improving all sustainability attributes- economic, social, environmental, and physical- there are interventions that could potentially show intent on the implementing agency's part to generate positive support for TODs in the long-term.

This section is applicable for municipalities, planners, transit agencies, private developers or any agency interested in getting their city ready for TOD. By utilizing this tool, the responsible agency will be able to develop a checklist that will help identify potential pitfalls early-on in the process. From this analysis, success factor indicators are determined that will help determine the scale and scope of TOD interventions that the city could undertake, as well as gauge the potential strengths and shortcomings of implementing TOD in a city from multiple perspectives, including: policy framework, institutional capacities, technical data availability, and political/community support.

Key questions answered in this section include:

- What are the sub-tasks employed for prioritizing TODs at a transit system or corridor scale?
- What are the appropriate scales of TOD interventions in any city?
- What are the resources (both human and capital) needed to review TOD projects?
- Who are the stakeholders typically involved in the initial stages of planning for TODs?



## 3.2 Assess Tasks, Key Outcomes and Tools

The ‘Assess’ step is designed to assist communities determine the city’s level of readiness for TOD planning or a pre-feasibility study for preparing a TOD strategic plan.

	Tasks	Outcomes	Tools
1	Review nature of transit and station areas	List of transit corridors, status and characteristics	
2	Conduct a review of current institutional support, plans, policies and programs	TOD readiness assessment	
<b>3</b>	<b>Define scale and scope of TOD planning area</b>	<b>TOD scale and scope</b>	<b>Tool 1: “How-to” determine scale of TOD plan?</b>
4	Identify funding opportunities to undertake TOD related studies	Funding	
5	Gauge in-house technical capacity	Staffing plan	
6	Identify stakeholders early-on in the decision making process	List of stakeholders	



### 3.2.1. Review nature of transit and station areas

#### PURPOSE

To understand transit characteristics, which would help identify the appropriate scale and scope for TOD, as well as identify opportunities to combine and integrate planning efforts.

#### SUB-TASKS

- Assess the implementation status of transit corridors, whether existing or planned, to determine the scale and scope of TOD
- Determine the type of transit existing or planned (Refer Section 3.1) including:
  - o Transit mode: BRTS or MRTS or any other mode
  - o Transit system size and service area
  - o Type of trips served by transit - Is the transit corridor a destination connector, commuter, or district circulator?
- Identify transit priority corridors for TOD planning based on population and employment densities, transit ridership and timeline of transit implementation
- Study types of stations and station areas, and identify need-based priorities:
  - o Existing stations may be prioritized for issue-based improvement Sub-Tasks
  - o Proposed stations may be prioritized for accessibility, transit integration or joint development opportunities.

#### OUTCOMES

- List of transit corridors, status, and characteristics
- Identification of possible TOD activities, their scale and scope, based on existing or planned transit investments

#### TOOLS AND RESOURCES

##### Transit System DPR/Existing Conditions Study

- To determine priority transit routes.
- To determine the current or projected passenger volumes using transit corridors.
- To determine implementation phasing.

#### REFERENCES

- IUT Publications on Public Transport (<http://www.iutindia.org/>)
- Transit Corridors and TOD (<http://ctod.org/pdfs/tod203.pdf>)



## 3.2.2. Conduct a review of current institutional support, plans, policies and programs

### PURPOSE

To evaluate the TOD readiness of the city with respect to the institutional support, plans, policies, and development market.

### SUB-TASKS

- Prepare a checklist of transportation and land use institutions and their mandates. Assess them based on their willingness and experience in supporting TOD initiatives.
- Prepare a checklist of land use, transportation and infrastructure plans undertaken and related policies adopted. Assess them against TOD principles (see 2.2). Some of these reference documents may include:
  - o Comprehensive Development Plans/City Development Plans
  - o Comprehensive Mobility Plans/Comprehensive Traffic and Transportation Plans/Low Carbon Mobility Plans at regional and municipal levels
  - o Transit Service Plan or DPRs (including future alignments)
  - o State Town & Country Planning Act
  - o Development Code Regulations (including Building Bye-Laws)
  - o Local Area Plans/Detailed Development Plans/Zonal Development Plans
- Determine the presence and success of the following TOD tools:
  - o Financial mechanisms such as Transfer of Development Rights (TDR), Land Pooling, Town Planning Schemes (TPS), and Land Value Capture.
  - o Micro-level planning instruments such as Zonal Development Plans, Local Area Plans, Specialized Area Plans, Overlay zones.
- Review existing market demands and housing needs as well as prevailing travel characteristics.

### OUTCOMES

- TOD readiness memorandum including:
  - o Review of institutional and policy framework
  - o Review of current plans enlisting Gaps and Consistencies as related to TOD principles.
  - o Identification of TOD tools that have succeeded in the area.
  - o Review of current housing needs and travel characteristics

### TOOLS AND RESOURCES

#### Relevant Town and Country Planning Acts

To determine the role of TOD in the existing institutional and policy framework.

#### Development/Master Plans

To identify gaps and consistencies in the current planning framework.

#### Market Studies

To identify the level of real estate market acceptance of high density mixed-use environments in the the city.

### REFERENCES

- UMTA Toolkit
- Ecomobility Readiness Assessment - ICLEI South Asia



### 3.2.3. Define scale and scope of TOD planning area

#### PURPOSE

To identify the focus of the TOD study and gain better control of the planning process and its outcomes through selection of an appropriate scale and scope.

#### SUB-TASKS

- Define the scale and nature of the TOD planning area based on the following key factors:
  - Primary agency's goals (4.2.1)
  - Primary agency's mandate and area of interest
  - Type and status of transit (4.2.2)
  - Ongoing or completed planning process
- Coordinate and collaborate with key stakeholders (Development Authority and Transit Agency at minimum) to identify the focus of the TOD study and the best scale suited to achieve the stakeholder goals.
- Identify the appropriate Scope depending on the determined scale of TOD intervention.

#### OUTCOMES

- TOD Scale and Scope, along with an analysis/justification based on selected parameters.

#### TOOLS AND RESOURCES

**Tool 1: "How-To" Determine the Scale of TOD**

#### REFERENCES

- Planning for TOD at the Regional scale <http://ctod.org/pdfs/tod204.pdf>
- Transit Corridors and TOD <http://ctod.org/pdfs/tod203.pdf>
- Station Area Planning <http://ctod.org/pdfs/tod202stations.pdf>





### 3.2.4. Identify funding opportunities to undertake TOD related studies

#### PURPOSE

To identify multiple funding sources to obtain direct financial assistance for preparing TOD plans.

#### SUB-TASKS

- Develop a consolidated grant securing strategy from central, state, local and other sources. Some available options include:
  - o Require land development planning as an integral component of transportation plans
  - o Collaborate with state agencies to dedicate funds for conducting TOD studies from infrastructure budgets
  - o Require transit agencies to conduct TOD planning as part of transit system planning and station design
  - o Contact international development agencies, NGOs and academic institutions to provide technical assistance in undertaking TOD studies
  - o Dedicate a systematic approach for setting aside a portion of tax revenues (property tax, development impact fees, sales tax, and service tax) or within the Urban Transport Fund (if established) for conducting TOD planning studies.
- Independent and private entities may be encouraged to undertake TOD planning at larger scales in exchange for development incentives.

#### OUTCOMES

- Systematic funding strategy including list of funding sources available for TOD planning studies.
- Identify funding source for intended TOD Study

#### TOOLS AND RESOURCES

##### Centrally and state sponsored schemes

To identify potential funding from the central or state governments.

##### Local planning budgets

##### Non-governmental funding sources

#### REFERENCES

- National Institute of Public Finance and Policy
- Planning, Connecting and Financing Cities Now. World Bank (2013) <http://siteresources.worldbank.org/EXTSDNET/Resources/Urbanization-Planning-Connecting-Financing-2013.pdf>



### 3.2.5. Gauge in-house technical capacity

#### PURPOSE

To ensure adequate resources are available throughout the planning process and implementation stages

#### SUB-TASKS

- Identify the nature of in-house TOD supportive activities and programs. Depending on the scale and scope of the TOD identified in Strategy 4.2.3, activities may include:
  - Transit system planning (in close coordination with land use planning)
  - Land use planning along transit corridors
  - Station accessibility/NMT planning
  - Reviewing development projects and proposals at site level
  - Preparing TOD supportive development guidelines/DCR modifications
  - Infrastructure carrying capacity analysis
  - Traffic impact analysis
  - Planning future land uses for agency properties
  - Preparing RFPs for joint development (PPP) projects
  - Negotiations of joint development projects
  - Update GIS/AutoCAD database
  - Funding of TOD studies and projects
  - Public outreach and education
- Undertake a review of existing technical and professional staff available to manage, implement and monitor TOD planning activities. The staffing resources required at a minimum are shown in Figure 15
- Conduct a gap analysis between resources available and TOD activities to determine the need for augmenting existing capacities through:
  - Training of existing professional staff in various agencies and departments
  - Recruiting new employees with requisite qualification
  - Hiring external consultants to perform identified tasks if required

#### OUTCOMES

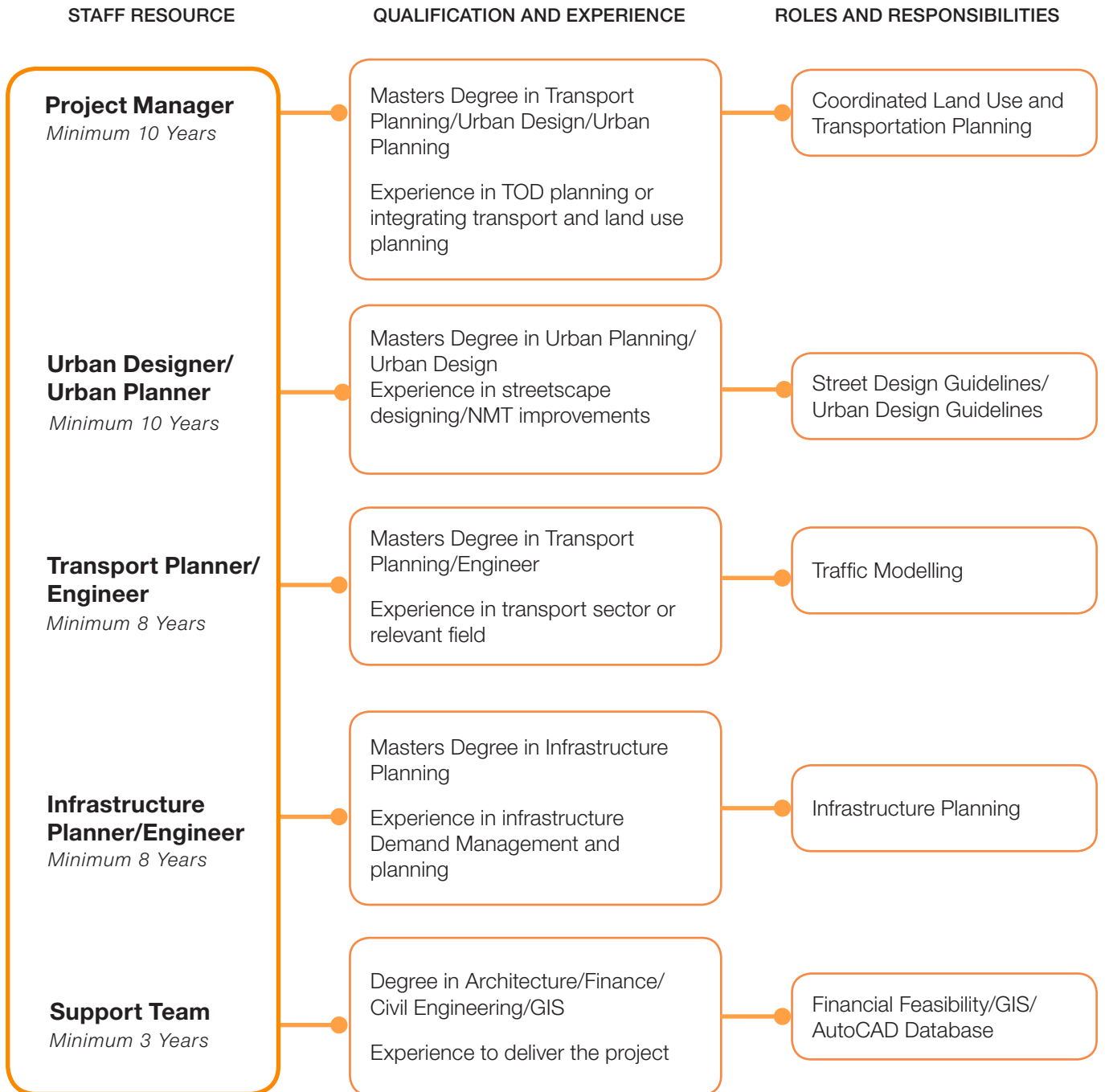
- Staffing Plan for TOD planning project.

#### REFERENCES

- JnNURM Toolkit for Comprehensive Capacity Building Programme  
<http://jnnurm.nic.in/wp-content/uploads/2012/03/CBToolKit.pdf>
- Report of Working Group on Capacity Building



Figure 15: Minimum staffing resources needed depending on the scale of the TOD Program | Source: IBI Group





## 3.2.6. Identify stakeholders early-on in the decision making process

### PURPOSE

To initiate an inclusive process of stakeholder engagement to generate awareness and early buy-in to the process and increase chances of supporting implementation of TOD Sub-Tasks.

### SUB-TASKS

- Prepare a list of stakeholders that have a role to play in planning, implementing and supporting TOD processes depending on the scale and scope of project identified in. Typical stakeholders in TOD projects include:
  - o Central government agencies: Ministry of Urban Development, Ministry of Transportation, Ministry of Environment and Forests play a key role in funding components of TOD projects.
  - o State agencies: State departments of urban development, housing, transportation and tourism
  - o Local agencies: Town & Country Planning departments, Development Authorities, Transit Agencies, Housing Boards, Public Works Department, Traffic Police
  - o Real Estate Developers
  - o Private/IPT Transit Operators
  - o NGOs, Community Service Organizations, Advocacy Groups
  - o Academic Institutions
  - o General Public
  - o Political Leadership and elected representatives

### TOOLS AND RESOURCES

- Consultations with Local Agencies
- Consultations with NGOs working on urban development issues

### REFERENCES

- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets - IFC
- Good Practice Guide to Public Engagement in Development Schemes - RTPI UK

### OUTCOMES

- o List of Stakeholders



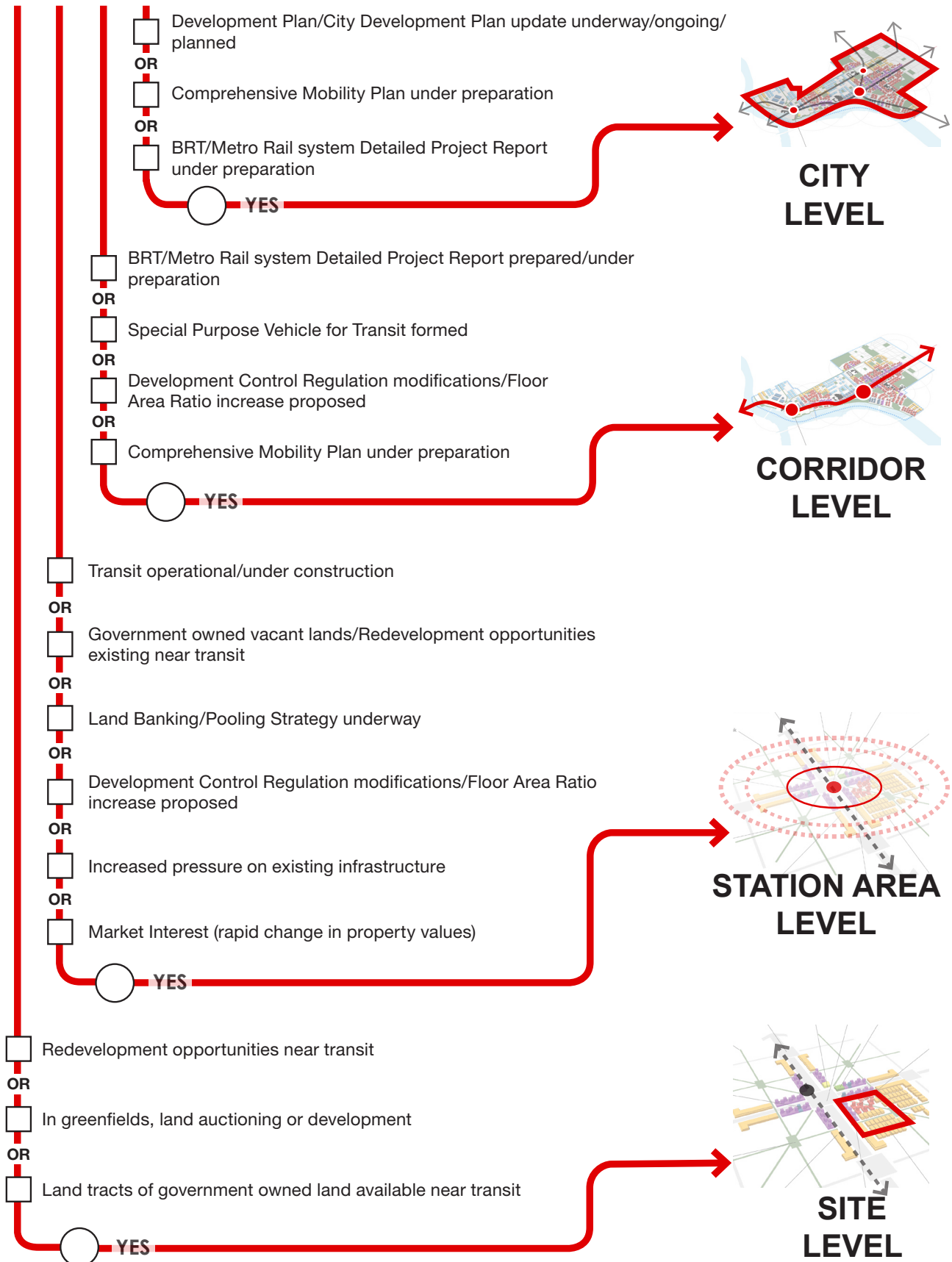




## TOOL 1: “HOW-TO” DETERMINE SCALE OF TOD PLAN?

It is possible that TOD can be planned for more than one scale at the same time. Any of the following four scales can be combined to address the needs of the specific project.

### Where does your city stand on the following?





# 04/ ENABLE



Integration of compact urban nodes with Bogota's TransMilenio system, that have their own specific regulations regarding maximum height, activities and land use. | Source: IBI Group



## 4.1 Preparing for a new Planning Paradigm

During the assessment stage, it is crucial that factors which would enable local governments to initiate plan and implement successful TOD projects be identified from the beginning. These factors include, but not limited to, **political will, financial tools, legal backing, and gaining the support of city leaders in bringing about a shift from automobile centric to transit and pedestrian oriented planning.** Strong leadership support may include actions such as issuing policy directives to require transit systems to maximize land development potential, advocating a community-driven neighbourhood planning process in TODs, or bringing private sector players to undertake TOD projects in a city.

Experiences show that collaboration is a key ingredient to create an enabling environment for promoting TOD. Identifying partnerships early-on between different levels of government, multiple transportation and planning agencies, private developers, and citizen groups are essential in overcoming political and economic hurdles in creating successful TODs.

As TOD is a new concept in India, cities typically do not have the regulatory framework in place that allow for flexibility in **zoning regulations such as prohibit mix of uses, disallow differential FARs, provision of premium FARs as incentives in exchange of infrastructure improvements, or use of financing tools such as land pooling.** Enacting statutes which enable the use of TOD principles in property development or making amendments to existing state acts and development control regulations are important in eliminating hurdles for TODs prior to engaging the private sector.

The government manages the land planning process and sets the standards and regulatory environment in which the private

sector must then find a formula to exist and profit from. Once the regulations are in place, the government should be able to apply value capture tools to receive much needed revenue in return for improving infrastructure and providing other public benefits.

The private sector, constituting real estate developers, commercial interests and financial institutions also all play a part in a successful TOD. Real estate market conditions along specific corridors also affect station-area development and accordingly should inform governmental policy in order to address the mismatch between potential TOD demand and supply.

Shortage of city staff and inexperience of local professionals in land use and transportation planning is often a challenge faced by local governments. **Increasing institutional capacities for planning and implementation is critically needed, particularly if contemporary planning tools such as transit oriented development, non-motorized transportation and public bicycle sharing are to be tailored according to Indian conditions.** Recruiting skilled staff, retaining industry experts as advisers in executing real estate projects, and collaboration with academic institutions for planning are some examples to build institutional capacities for successful implementation.

Ensuring an enabling environment for transit-based development is an attractive proposition for developers and users requires public-sector contributions and political will. The following section presents a series of task-based actions that will assist cities in making informed decisions and identifying tools and measures for eliminating obstacles to promote TODs.





## 4.2 Enable Tasks, Key Outcomes and Tools

The ‘Enable’ step focuses on proactive tasks that cities and states will need to take towards creating successful TOD planning processes. These tasks must be taken up at the beginning of the TOD plan preparation—once the needs assessment stage has been completed—and must continue throughout the course of the project.

	Tasks	Outcomes	Tools
1	Establish leadership support and project champions	TOD Task Force	Tool 2: “How-to” Create A TOD Task Force??
2	Develop Transit First goals in promoting integrated land use and transportation	TOD Vision, Goals and Targets	
3	Establish partnerships with the state to empower local governments	State level or regional involvement or financial aid	
4	Identify and address policy level and regulatory barriers	Gaps, Consistencies, and Recommendations	
5	Define TOD project methodology and delivery tools	TOD Terms of Reference and Planning Team	
6	Undertake capacity building	Augmentation of in-house technical skills	





## 4.2.1. Establish leadership support and project champions

### PURPOSE

To get buy-in from political leadership to support TOD policies as the building block for sustainable communities and cities; and to ensure continuity in TOD planning process beyond the office term of elected or appointed officials

### SUB-TASKS

- Constitute a TOD Task Force/Steering committee with representatives from various city agencies, local government departments, academic institutions, NGOs and private sector.
- Engage political leaders, policy makers and decision-makers, in goal setting and vision building for establishing transit-supportive development policies. Engagement techniques may include:
  - o Visioning workshops in collaboration with central government agencies, state agencies, and NGOs/advocacy groups
  - o Integrating TOD principles as the backbone of all city-level policy discussions across agencies related to transportation, land use and economic development
  - o Public outreach processes as part of transit planning or master planning activities.
- Identify project champions at the individual and organizational levels, preferably city staff, representatives from NGOs or local advocacy groups, that will remain engaged throughout the planning process.

### OUTCOMES

- Formation of Task Force under guidance of project champion

### TOOLS AND RESOURCES

TOD Task Force/Steering  
Committee Meetings

Tool 2: “How-To” create a TOD Task  
Force



## 4.2.2. Develop Transit First goals in promoting integrated land use and transportation

### PURPOSE

To evaluate the TOD readiness of the city with respect to the institutional support, plans, policies, and development market.

### SUB-TASKS

- Assess current goals of the region/city/neighbourhood and identify their transit related objectives.
- Integrate preliminary Transit First goals with region/city/neighbourhood or transit system goals. These goals may include transformations at macro and micro levels, such as:
  - o Economic Development
  - o Inclusive Development
  - o Integrated Mobility
  - o Development Control Regulations
  - o Programmes such as 'Smart Cities', 'Sustainable Development' or 'Eco-cities'.
- Prioritize goals into short-term, mid-term, and long-term opportunities.
  - o Short-term goals must aim at addressing existing issues at small scales in the immediate term. They should be easy to implement, apply at smaller scales, and be the responsibility of a single agency. For example, a transit agency may be able to construct better access routes to transit as part of the transit implementation.
  - o Mid-term goals must aim at addressing existing issues at larger scales within a timeline of 3-5 years. They may be the responsibility of few agencies to minimize the need for coordination.
  - o Long-term goals should be envisioned for a target year 15-20 years into the future and must aim at addressing existing and future issues.
- Develop preliminary targets to be achieved through Transit First goals. These targets may include:
  - o Increased transit mode share
  - o Improved housing affordability
  - o Improved air quality

### OUTCOMES

- Concept Note/Memorandum: TOD Preliminary Goals
- Integrate TOD early in other planning processes

### TOOLS AND RESOURCES

#### Development Plans/Master Plans/ Sustainable Mobility Studies

To prepare consolidated goals or vision for the City's growth for a horizon year.

### REFERENCES

- National Urban Transport Policy
- National Mission on Sustainable Habitat
- IUT Publications on Public Transport (<http://www.iutindia.org/>)



### 4.2.3. Establish partnerships at state and regional levels to empower local governments

#### PURPOSE

To enable coordination and assistance, both technical and financial, at all levels of governance. Partnerships at state levels should help address policy level barriers to TOD.

#### SUB-TASKS

- **Collaborate with state governmental agencies** to take an active role in promoting TOD as a growth management tool for urban areas. Roles that state governments can typically play in enabling TOD-supportive policies for local include:
  - o Technical assistance on planning
  - o Dedicate funding grants received from central government for TOD planning
  - o Remove regulatory and statutory barriers to land use such as state Town and Country Planning Acts
  - o Adopt 'transit-first' policies at state level and mandate for ULBs to adopt and implement these policies, where feasible
  - o Assist in forging collaborations with state and central government agencies; and
  - o Implement enabling policies such as land pooling, mandatory affordable housing provisions, joint development agreements, and land entitlement procedures.
- **Collaborate with neighbouring cities** that form a regional conglomeration to enable a comprehensive vision for sustainable growth of the entire region.
- Involve transit agencies in land use planning process and use transportation plans to incorporate integrated land use and transit supportive development.

#### OUTCOMES

- Interagency collaboration that can help address policy level barriers.

#### TOOLS AND RESOURCES

State Planning Acts and Regulations

Stakeholder Workshop involving regional partners

#### REFERENCES

- TOD Tools for Metropolitan Planning Organizations ( <http://ctod.org/pdfs/2010TODToolsMPOs.pdf>)



### 4.2.4. Identify and address policy level and regulatory barriers

#### PURPOSE

To address regulatory and statutory barriers in national-level policies and acts that currently hinder implementation of TOD policies and projects at the local levels.

#### SUB-TASKS

- Pro-actively influence central governmental agencies to mandate TOD policy implementation as a prerequisite for receiving financial grants to implement all planning and infrastructure development projects. Policy changes in support of transit supportive development include:
  - o Transit-first policies which prioritize transit and non-motorized transportation modes in the development of city policies. Policy examples include higher private vehicle sales taxes and registration fees, increased parking fees, and off-peak vehicle licensing systems
  - o Mandatory accessibility improvements within 10-minute walking distance from all transit stations
  - o Legislation compelling local authorities to conduct planning in specific ways that support containment of growth in urban areas.
  - o Modifications to existing automobile oriented policies and acts, including:
    - » National Building Code
    - » Regional and Urban Development Policy Formulation and Implementation (RUDPFI) guidelines
    - » Motor Vehicles Act
    - » Town and Country Planning Act
    - » Metro Railways Act
    - » Urban Land Ceiling Act
    - » Rent Control Act
    - » Land Acquisition Act
    - » Land Valuation Guidelines
- Work with relevant governmental agencies to incorporate TOD policies in state-level urban development policies and acts. Relevant acts and policies that are within the subject of the state include:
  - o State Town and Country Planning Acts include land conversion and land use amendments
  - o Building Bye-Laws (State) including parking and enforcement
- Determine coordination strategy with parallel planning processes such as Comprehensive Development Plans, Master Plan Updates, Local Area Plans, by-law amendments or Special Area Plans. Sub-Tasks may depend on local regulatory and implementation factors such as achieving density targets, implementation of rapid transit infrastructure, market realities, track record of implementing planning initiatives, and political support for change

#### REFERENCES

- TOD Tools for Metropolitan Planning Organizations ( <http://ctod.org/pdfs/2010TODToolsMPOs.pdf>)

#### OUTCOMES

- Modifications to state-level land development and transit investment acts and policies
- Identify opportunities for TOD interventions within existing policy framework.





## 4.2.5. Define TOD project methodology and delivery tools

### PURPOSE

To define the planning processes and mechanisms that can make TOD happen within the existing planning and development framework.

### SUB-TASKS

- Convene TOD Task Force/Steering Committee to determine the approach for embarking on preparing TOD plans. Some approaches include:
  - o In-house plan preparation by available resource capacities determined in-house.
  - o Retain an external consultant through a competitive and transparent bidding process:
- Prepare for a bid management process if an external consultant is to be retained, including:
  - o Assign a Project Manager to monitor the RFP selection process and actual preparation of TOD plans based on the Guidelines presented in the Plan + Design, Invest and Implement sections of this document.
  - o Prepare a Terms of Reference (ToR) with timelines and deliverables anticipated based on the scale and scope analysis conducted.
  - o Quality and Cost-Based Selection process is recommended with weights determined based on the scope of planning study.
  - o Refer the list of empanelment consultants prepared by MoUD.
- Allocate budgets according to the scale and scope defined.
- Explore innovative tools that can act as supplementary and interim policies to a TOD planning policy, such as:
  - o Street Design guidelines
  - o Bus stop/auto stop design guidelines
  - o Vending policy around transit stations
  - o Non-motorized transport policy
  - o Form-based codes

### OUTCOMES

- TOD Terms of Reference
- TOD Planning Team with requisite experts and project planners.

### TOOLS AND RESOURCES

- MoUD Empanelled consultants for TOD
- Appendix A: Model TOD Terms of Reference

### REFERENCES

- World Bank procurement methods <http://web.worldbank.org/WBSITE/EXTERNAL/PROJECTS/>
- Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers (January 2011; Revised July 2014)

## 4.2.6. Undertake capacity building

### PURPOSE

To build capacity within all the institutions involved to develop and follow up on TOD projects in the long term.

### SUB-TASKS

- Prepare a phased staffing plan to recruit skilled professionals covering key areas of TOD: land use planning, transportation planning including parking management, NMT planning, urban design, real estate development, infrastructure planning, and affordable housing.
- Collaborate with central government agencies under MoUD to design and implement training programmes for augmenting existing capacities of political executives and urban managers for planning, monitoring and evaluation of TOD policies, plans and projects.
- Work with state governments to provide technical/financial assistance and facilitate the creation of effective regional organizations that area focused on integrating land use and transportation planning implementation at the metropolitan scale such as the Unified Metropolitan Transportation Authority (UMTA).
- Contact local and international NGOs and academic experience with experience in TOD planning to hand-hold municipal staff in monitoring preparation, implementation and evaluation of TOD plans and projects.
- Undertake study tours with assistance from central/state governments both nationally and globally for experiential training.
- Outsource capacity building and technical assistance activities to qualified consultants through a competitive bidding process.

### OUTCOMES

- Augmentation of managerial and technical skills related to managing the project and its implementation.

### TOOLS AND RESOURCES

- Capacity building/Training workshops
- Study tours

### REFERENCES

- JnNURM Toolkit for Comprehensive Capacity Building Programme <http://urban.bih.nic.in/Docs/Capacity-Building-Guidelines.pdf>
- Institute of Urban Transport (India) Capacity Building Toolkits (<http://www.iutindia.org/CapacityBuilding/Toolkits.aspx>)
- Urban Capacity Building Programme, Janagraha Urban Space Foundation (<http://www.janaagraha.org/content/program/urban-capacity-building>)



## Tool 2: “How-To” Create a Task Force?

1

### Identify Type & Mandate of Task Force required (to be created) for the project

#### TYPES OF TASK FORCE

##### Policy Task Force

- Provide all the Guidance and Strategic support for the preparation and implementation of the project including assigning budgets for the project(s)
- Support of all the city level institutions namely - the ULB, the Development Authorities

##### TOD Project Specific Technical Task Force

- Work under the overall guidance and advice of the Policy Task Force
- Coordinate with all other stakeholder groups (private stakeholders/citizen’s group) as necessary
- Identify Scale & Scope of the TOD project
- Develop ToR and appoint Consultants/Identify in-house project team.

2

### Identify key Stakeholders and Chairperson for the Task Force

#### KEY STAKEHOLDERS (AT MINIMUM)

##### Policy Task Force

- Chairman/Vice-Chairman/ Commissioner/Secretary of Urban Development/Transportation of the City. (Executive Chairperson)
- Head of the Urban Development Authority
- Head of the Urban Transportation Authority
- Head of Project Specific Technical Task Force

##### TOD Project Specific Technical Task Force

- Chief/Deputy Chief Planner (Head of Project Specific Technical Task Force)
- HoD\*– Urban Development Authorities having jurisdiction over/within the study area
- HoD\*– Public Transport
- HoD\* – Infrastructure
- HoD\* – Housing/Housing Board/Urban redevelopment board
- HoD\* – Road & Traffic Dept.
- Representatives from enforcement agencies
- \*or representative

3

### Notify the appointment of the Task Force(s)

- Follow the City’s existing protocol for Notifying Task Force appointment.
- Notify the Mandate of the Task Force and the project Specific Goals of the Specific TOD Project

- Identify inter-agency coordination and assistance required from various inter-governmental agencies to achieve the Goals of the Specific TOD Project.





# 05 /

PLAN+DESIGN

Proposed view of Multimodal Town Centre at Bhubaneswar maximizing the site's potential to promote transit and pedestrian oriented development | Source: IBI Group





## 5.1 From Principles to Details

TOD dictates the need for an integrated master planning and design process that establishes a strong urban fabric, encouraging the use of public transportation and a healthy mix of activities along with the creation of green spaces and community areas. A well planned TOD strategy must reflect the urban context in which it is implemented and can be themed to provide services and opportunities that reflect the surrounding areas. What differentiates TOD planning from other conventional planning initiatives is the fact that from the outset **the focus is on walking, cycling and public transit as primary modes of movement and not personal vehicles.** It also **takes into consideration the generally ignored inter-dependent impacts of land use, transportation and infrastructure networks and real estate economics at multiple levels.** TOD supportive plans emphasize the importance of participatory urban design processes as tools in ensuring equitable allocation of public space by developing land use interventions that reduce the need to travel by automobiles.

International best practices show that successful TODs are a result of coordinated planning initiatives implemented consistently at **varying geographic scales—regional, city,**

**corridor, neighbourhood and site**—over a time period of 10-20 years. What remains constant in planning for various scales is the process adopted in preparing the framework. TOD planning frameworks also allow for developing action Sub-Tasks adjusted based on transit mode and local factors such as development typology (Greenfields, urban infill or redevelopment).

Some of the common TOD Planning Variables and TOD Planning Principles have been discussed in Chapter 1. These principles are derived from a study of global best practice examples of TOD design and planning fundamentals, contextualized for application in Indian cities. Each principle is elaborated in detail associated with key component. These metrics should not be construed as prescriptive standards for Indian cities. It is expected that through further research and implementation experiences, these metrics are updated at the city-level, which in turn will help build accurate standards at the national level.

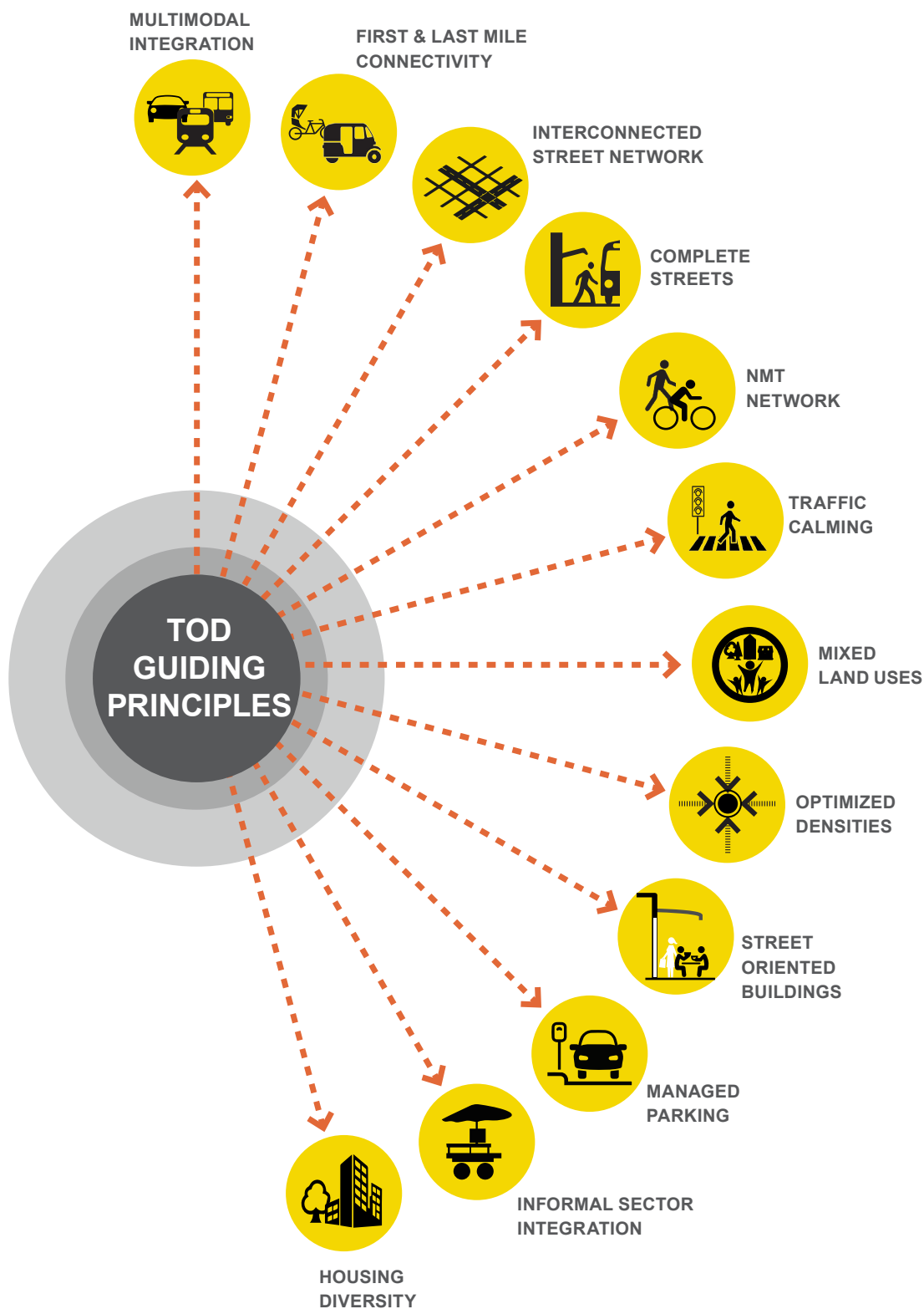
This section of the step-by-step TOD Planning Guide focuses on providing guidance on the planning and design process. Details on different aspects of the planning process have been explained through the tools at the end of this chapter.





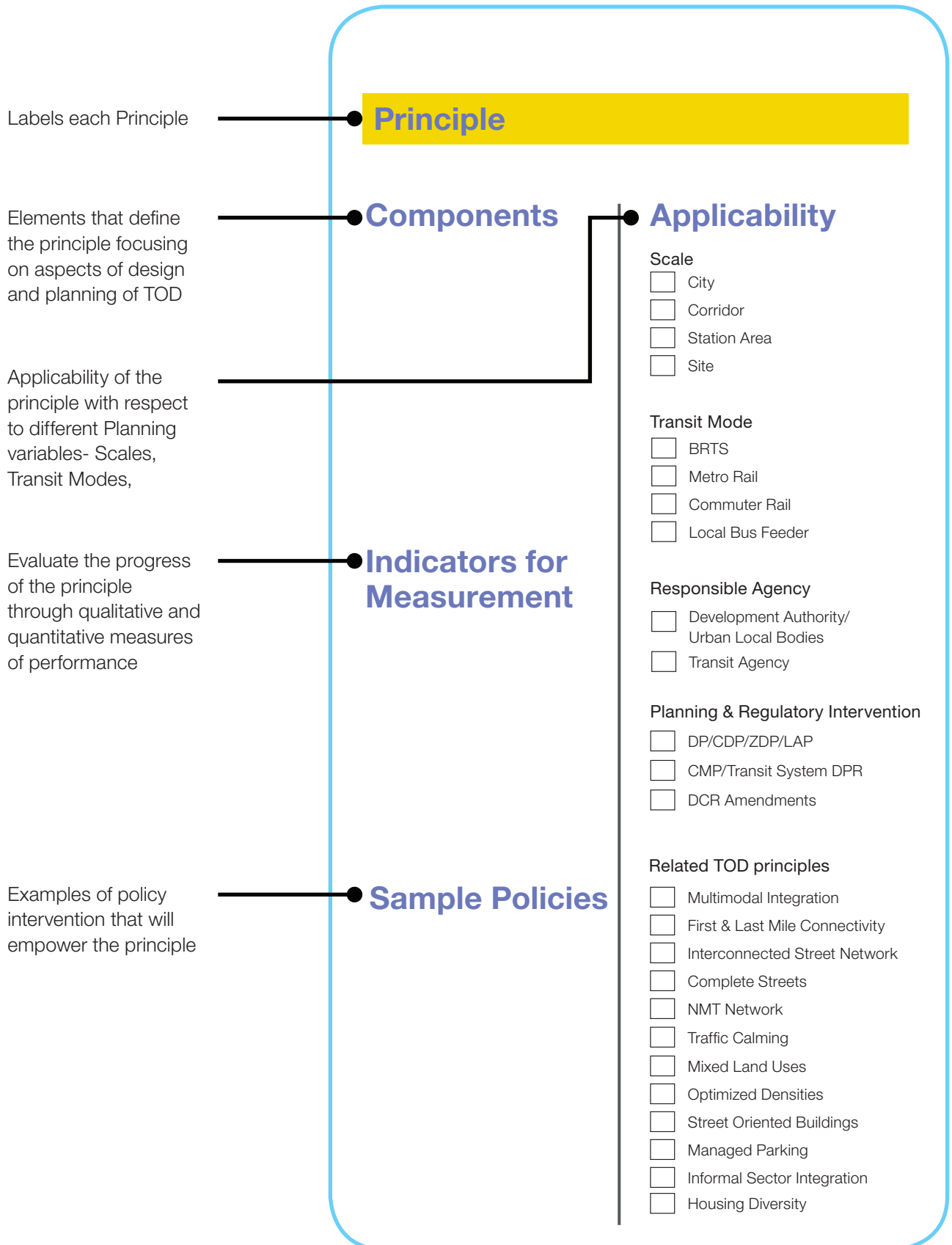
## TOD PRINCIPLES

The following section illustrates key TOD Guiding Principles, derived from a study of global best practice examples of TOD design and planning fundamentals contextualized for application in Indian cities. Each principle is further elaborated in detail, complete with descriptive supporting strategies and relevant graphics.





## 5.2 How to read the Principles





# 1. MULTIMODAL INTEGRATION

## Components

**Corridor Level:** Coordinate local feeder transit service schedules and routes to provide seamless connectivity between local, regional, and rapid transit services by reducing waiting times. Integration at corridor level TOD planning may include:

1. Bus Feeder Route Network Planning
2. Intermodal Facilities

### NORMS

- Bus routes along collectors and arterial roads provided every 800m- 1km
- Transit feeder stops/local bus stops: 400m or 5 min walk

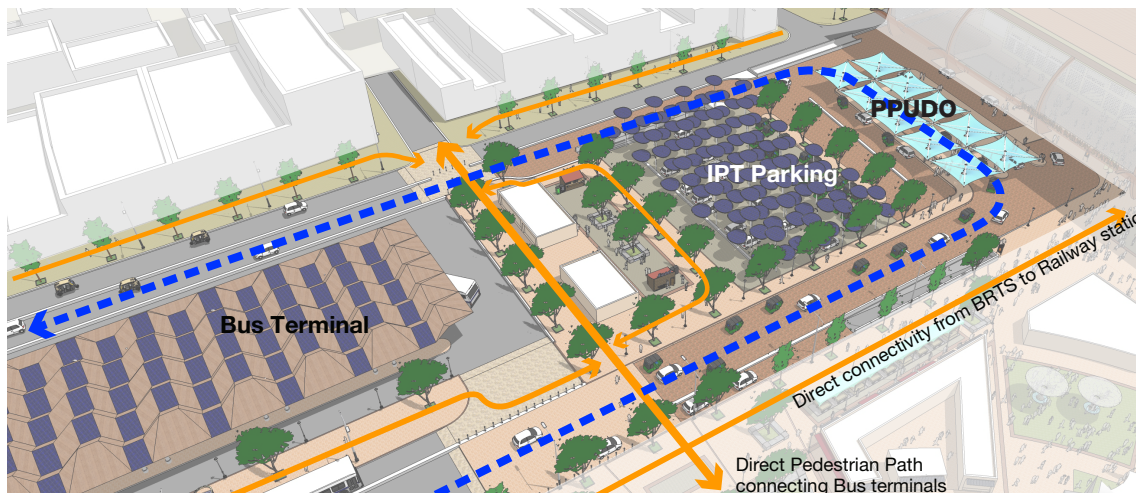
**Station Level:** Adopt transit priority measures to ensure the efficient movement of surface transit to and from the station area. Intermodal integration of formal public transport, para transit and cycle sharing should be within 200m from each other. Integration at station area may include:

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Feeder Bus Stops</li> <li>2. IPT (Auto-rickshaw and cycle rickshaw) Stands</li> <li>3. Cycle Sharing Docking Stations</li> </ol> | <ol style="list-style-type: none"> <li>4. Passenger Pick-up &amp; Drop-off (PPUDO): Private vehicles/Taxis</li> <li>5. Park &amp; Ride Lots/Parking Garage</li> <li>6. Sidewalks</li> </ol> |
|--|---|

### NORMS

Approx. walking distance from exits	Facility/Amenity and preferred Location:
Within 100 m	Bus stops; vendor zones; convenience shopping; cycle-rental station, high occupancy feeder stop/stand, public toilets; pedestrian-only plazas.
Beyond 100 m	Private car/taxi “drop-off” location only; validated car parking facility for metro users (park & ride) may be provided.
Within 500m	Cycle-rickshaw stand; cycle-parking stand; IPT/auto-rickshaw stand, improved lighting, proper signage, information for modal interchange and way-finding; interchange between any two mass rapid transit modes (Railway, Metro, RRTS, etc.)

(TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)



Multimodal integration at-grade level between different transportation facilities  
 Source: Adapted from Town Centre Master Plan, Bhubaneswar prepared for BDA by IBI Group

## Indicators for Measurement

- **Percentage of residents within 800m (10 minute walking distance) of high quality public transport stations.** *(NMSH Parameters, MoUD 2011)*
- **Ridership statistics for public transport.** *(NMSH Parameters, MoUD 2011)*
- **Percentage mode share of public transport and para transit versus private vehicles.** *(NMSH Parameters, MoUD 2011)*
- **Percentage of buses that adhere to Urban Bus Specification.** *(NMSH Parameters, MoUD 2011)*
- **Percentage of stops with frequency of service >15 buses per hour .** *(NMSH Parameters, MoUD 2011)*
- **Mode share targets:** This is the most common target set within transportation plans and involves percentage targets for walking, cycling and transit. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- **Trips per capita:** Similar to percentage targets, but based upon absolute values in relation to population and employment to reflect magnitude of travel choices. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- **Vehicle kilometres traveled/trip lengths:** Absolute values of distance traveled by vehicles and by trip in an area can provide an indicator of how far and how frequent travel is required. *(Mobility Hub Guidelines, Metrolinx, 2009)*

## Sample Policies

- Create clear, direct, and short transfers between transit modes and routes by minimizing walking distances and removing physical and perceived barriers within transit stations. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Adopt transit priority measures to ensure the efficient movement of surface transit to and from the station area, including measures such as signal priority and dedicated transit lanes. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Coordinate local feeder transit service schedules and routes to provide seamless connectivity between local, regional, and rapid transit services by reducing waiting times. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Provide clearly marked and protected access for pedestrians and cyclists at station areas to minimize conflicts, particularly at passenger pick-up and drop-offs (PPUDO), bus facilities, and parking access points. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Prioritize pedestrians, public transport, IPT and NMT modes over private modes in design and management of urban spaces. *(Mobility Hub Guidelines, Metrolinx, 2009)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/CDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity





## 2. FIRST & LAST MILE CONNECTIVITY

### Components

Strengthening first and last mile connections at the station area is aimed at overcoming barriers related access through application of a number of design components, including:



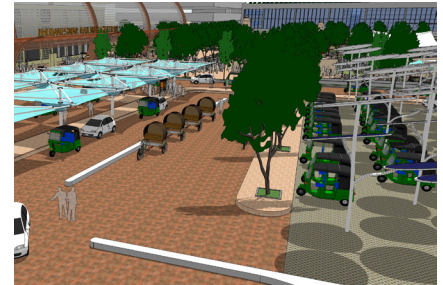
#### 1 CROSSING ENHANCEMENTS

- Mid-block crossings every 250m on average. Minimum 5 safe street-level crossings/km (NMSH Parameters, MoUD 2011).
- Standards for Mid-block Pedestrian Crossing: (IRC: 103:2012)
  - o Residential Areas: 80-250m
  - o Commercial/Mixed Use: 80-150m
  - o High Intensity Commercial Areas: Pedestrianization if possible



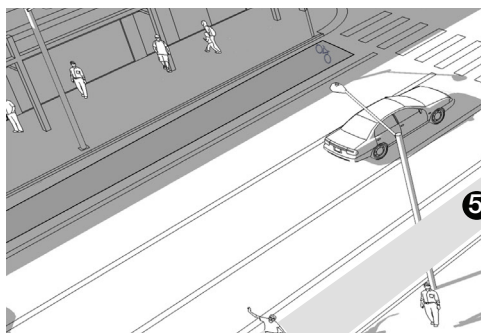
#### 2 CONNECTIONS: CUT-THROUGHS AND SHORTCUTS

Identify opportunities to provide 'cut-throughs' (i.e. across parking lots or through parks, where such cut-throughs shorten access routes.)



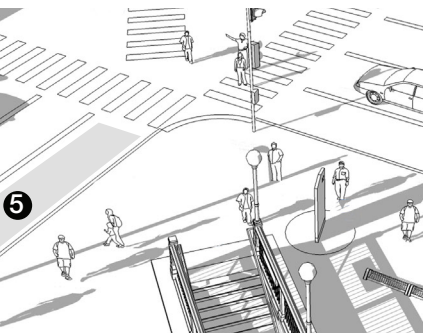
#### 3 ORGANIZED IPT

- Provide IPT designated parking within 150 m of walking distance from station exit (UTTIPEC, DDA, TOD Policy 2012)
- Cycle rickshaw parking and three wheeler parking bays of 1.5m width should be provided near the junctions. (Urban Road Code- Cross Section)



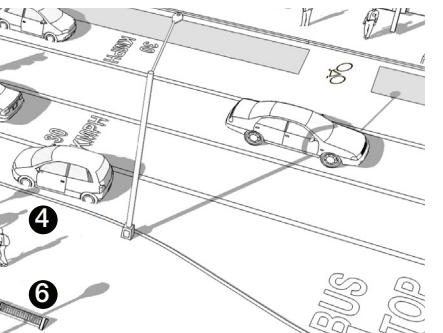
#### 4 SIDEWALK WIDENING

- A continuous unobstructed footpath of 2m minimum on each side of all streets with ROW wider than 12m. (NMSH Parameters, MoUD 2011 and IRC: 103:2012).
- Sidewalks should be scaled to the amount of pedestrian traffic they can handle and based on adjacent land uses. (IRC: 103:2012)
  - o Commercial/Mixed Use- 2.0m
  - o Shopping frontages- 2.5m
  - o Bus Stops- 3m
  - o High Intensity Commercial Areas- 4m



#### 5 BICYCLE LANES

- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not ROW) after providing adequately sized footpaths in each direction based on pedestrian traffic. (NMSH Parameters, MoUD 2011)



#### 6 PUBLIC BICYCLE SHARING

- Ridership of the system should be in excess of 1000 trips per bicycle per year. (NMSH Parameters, MoUD 2011)

## Indicators for Measurement

- Adoption of Street Design Guidelines for the transit corridor with an emphasis on NMT infrastructure. *(NMSH Parameters, MoUD 2011)*
- Total length of 12+ m streets with unobstructed footpaths as a percentage of the total length of streets in the city. *(NMSH Parameters, MoUD 2011)*
- Percentage of length of streets smaller 12m ROW with at least 125 trees per km. *(NMSH Parameters, MoUD 2011)*
- Percentage of length of streets wider than 12m ROW with at least 125 trees per km per footpath for which they provide continuous shade. *(NMSH Parameters, MoUD 2011)*
- Percentage of streets with total carriageway >10m which have 5 or more traffic calmed or signalized crossings per km. *(NMSH Parameters, MoUD 2011)*
- Percentage of intersections that have pedestrian crossings and refuges in all directions. *(NMSH Parameters, MoUD 2011)*

## Sample Policies

- Protect pedestrians and active transportation users when crossing vehicular traffic. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Break up long blocks by allowing pedestrians to safely cross mid-blocks, thereby traveling shorter distances. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Improve safety by shortening crossing distances, increasing pedestrian visibility, slowing turning vehicles. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Plan affordable and accessible cycle sharing/rental schemes to encourage public transit users in particular and public in general to use cycle as a mode to perform their first and last mile journey as well as to make regular short trips without using private vehicles. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Alternative planned IPT systems need to be introduced to better serve the population. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- All pedestrian facilities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments. *(Mobility Hub Guidelines, Metrolinx, 2009)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
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### Planning & Regulatory Intervention

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### Related TOD principles

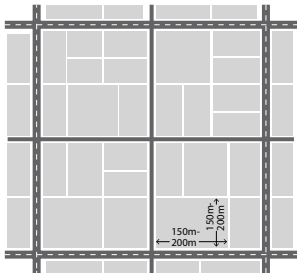
- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity



### 3. INTERCONNECTED STREET NETWORK

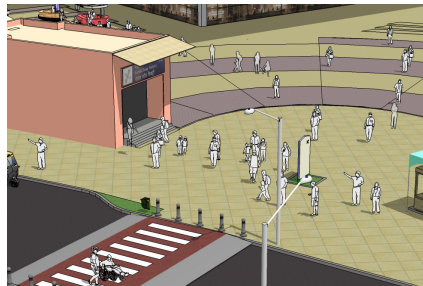
#### Components

Applicable at multiple levels, the principle of developing an interconnected streets and blocks system includes the following components:



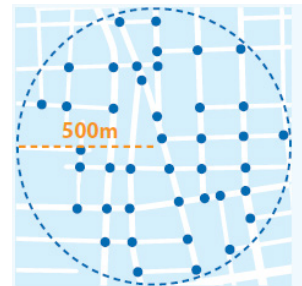
**1 BLOCK SIZES**

- Recommended block size: 150-200m (ITDP TOD Standard)
- Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. (NMSH Parameters, MoUD 2011)
- In existing built-up areas, statutory planning to be done for breaking up blocks with an area of more than 2 Ha, to provide publicly accessible pedestrian thoroughfare. (NMSH Parameters, MoUD 2011)



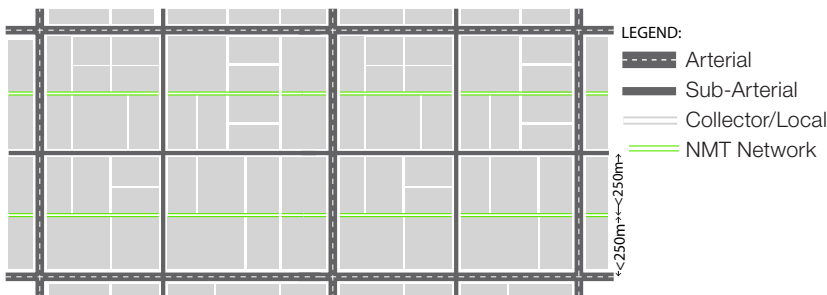
**2 STATION ACCESS**

- Recommended area of pedestrian spill-out space > 1.9 sqm/ped. (IRC code 103, 2012 Guidelines for Pedestrian Facilities)



**3 INTERSECTION DENSITY**

- 50 intersections per square km (NMSH Parameters, MoUD 2011)



**4 STREET SPACING**

- The maximum distance between two vehicular streets in a network should be no greater than 250m (C/C) at any point. (Draft TOD Policy, UTTIPEC DDA, 2012)

**5 STREET HIERARCHY**

- Hierarchy as per Urban Road Code-cross Section:
  - o Arterial - 50m to 80m - 50km/hr
  - o Sub-Arterial - 30m to 50m - 50km/hr
  - o Distributor - 12m to 30m - 30km/hr
  - o Access - 6m to 15m - 15km/hr
- On streets with ROW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire ROW should be notified for pedestrianization. (NMSH Parameters, MoUD 2011)

## Indicators for Measurement

- Number of intersections of public pedestrian and cyclist network per square kilometer. *(NMSH Parameters, MoUD 2011)*
- Existence of statutory provision for creating public access through large blocks. *(NMSH Parameters, MoUD 2011)*
- Percentage of street with carriageway width for one way motor-vehicle traffic of over 10m. *(NMSH Parameters, MoUD 2011)*

## Sample Policies

- Create dense street networks that are highly permeable to pedestrians, bicycles and public transport. *(NMSH Parameters, MoUD 2011)*
- Disperse high traffic volumes over multiple parallel human-scale streets rather than concentrating traffic on fewer major arterial streets. *(NMSH Parameters, MoUD 2011)*
- Create pedestrian-priority streets with optimum ROW to encourage non-motorized travel. *(NMSH Parameters, MoUD 2011)*
- Create pedestrian-friendly street networks which directly connect local destinations. *(Mobility Hub Guidelines, Metrolinx, 2009)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity

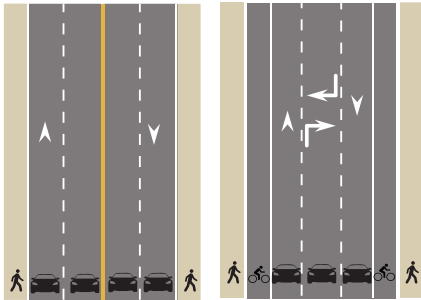




## 4. COMPLETE STREETS

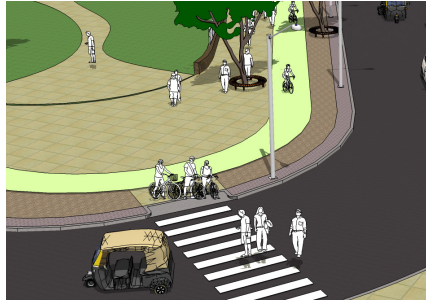
### Components

Create a network of complete streets which are designed to accommodate the most people, rather than vehicles. Complete Streets may consist of the following components:



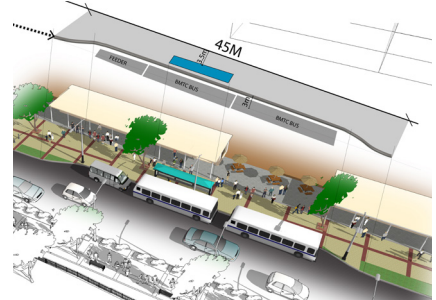
#### 1 REDUCED LANE (CARRIAGEWAY) WIDTHS

- In a slow-speed local street (below 30 km/h), the optimum width for a carriageway is 3 m for one-way movement and 4.5 m for two-way movement (ITDP Better Street, Better Cities).
- No vehicular street R/W within 500m of TOD station shall be more than 30m, unless already notified in the Master Plan. (Draft TOD Policy, UTTIPEC, DDA, 2012)



#### 2 ENHANCED BICYCLE FACILITIES

- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not ROW) after providing adequately sized footpaths in each direction based on pedestrian traffic. (NMSH Parameters, MoUD 2011)



#### 3 TRANSPORT ENHANCEMENTS

- Bus Rapid Transit System should be considered for demand greater than 2000 passengers per hour per direction. (NMSH Parameters, MoUD 2011)
- Metro Rail should be considered for demand greater than 15000 passengers per hour per direction. (NMSH Parameters, MoUD 2011)



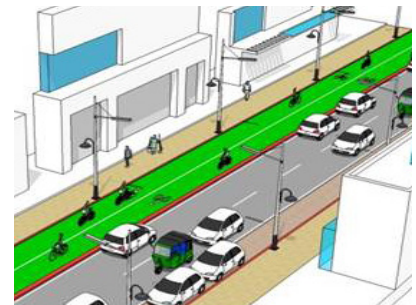
#### 4 SIDEWALK WIDENING

- A continuous unobstructed footpath on each side of all streets with ROW wider than 12m. (NMSH Parameters, MoUD 2011 and IRC: 103:2012)
  - o Commercial/Mixed Use- 2.0m
  - o Shopping frontages- 2.5m
  - o Bus Stops- 3m
  - o High Intensity Commercial Areas- 4m



#### 5 VENDING ZONE

- Vending zones shall be provided at regular intervals (approx. 10 minute walk from every home/workplace)



#### 6 BUILDING EDGE-TO-EDGE DESIGN

- Multi-Utility Zone (MUZ) of minimum 1.8 m width should be provided on all Collector and Arterial Roads, to accommodate bus stops, street utilities, trees, street furniture, planting for storm water management; IPT/NMT stands, paid idle parking, etc. (TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)



## Indicators for Measurement

- Percentage of residents within 800m (10 minute walking distance) of high quality public transport stations. *(NMSH Parameters, MoUD 2011)*
- Percentage of total length of streets with motor vehicle carriageway of 10 m and more that have dedicated and segregated cycle tracks. *(NMSH Parameters, MoUD 2011)*
- Percentage of total length of streets with motor-vehicle carriageway of 10 m or more, equipped with cycle tracks to standards. *(NMSH Parameters, MoUD 2011)*
- Percentage of total length of streets with at least 5 safe street crossing per km for bicycles with spacing between two crossings not more than 250m. *(NMSH Parameters, MoUD 2011)*

## Applicable Policies

- More equity in the provision of comfortable public spaces and amenities to all sections of society. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Prioritization of public transport and non-motorized private modes in street design. *(Mobility Hub Guidelines, Metrolinx, 2009)*
- Maximum number of people should be able to move fast, safely and conveniently through the city. *(Street Design Guidelines, Delhi, 2010)*
- To retrofit streets for equal or higher priority for public transit and pedestrians. *(Street Design Guidelines, Delhi, 2010)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

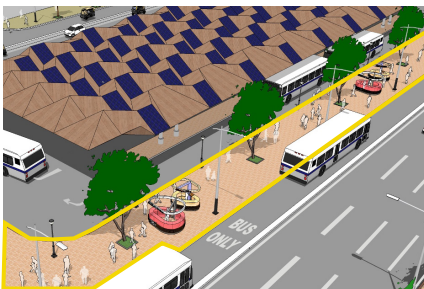
- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity



## 5. NMT NETWORK

### Components

Focusing on sidewalk networks at the corridor and station area scales is important in creating comfortable and attractive pedestrian linkages to and from all transit stations in order to support a walkable station area and promote the use of transit. Components of continuous sidewalks include the following, at a minimum:



#### 1 APPROPRIATELY SCALED SIDEWALK WIDTHS

- Pedestrian/NMT plans adopted and conditional to infrastructure funding in cities. (NMSH Parameters, MoUD 2011)
- Total length of 12+ m streets with unobstructed footpaths as a percentage of the total length of streets in the city. (NMSH Parameters, MoUD 2011)
- Width of footpath shall be determined based on pedestrian volume and have to be wider than 2m wherever required. (NMSH Parameters, MoUD 2011)



#### 2 STREETScape AMENITIES

- Street Trees (NMSH Parameters, MoUD 2011):
  - o At least 125 trees per km for streets with ROW smaller than 12m.
  - o At least 125 trees per km per footpath on streets with ROW greater than 12m.
- Street Lighting: Spacing should be uniform with the distance based on the minimum illumination required as per IRC 103:2012
- Street Furniture: Benches, trash receptacles, bollards, vending kiosks, signage
- Public Facilities: Provide Accessible Public Toilets at every 500-800 M distance – preferably located close to bus stops for easy access by pedestrians and public transport users (TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)



#### 3 ACTIVE STREET EDGES

- Primary pedestrian access for buildings from the main street, with location as per shortest walking distance from nearest bus-stop (NMSH Parameters, MoUD 2011).
- Vehicular/service access should be from secondary street wherever access to building is possible from multiple streets.
- Compound walls, if present, should be transparent above a height of 100cm. High security government buildings may apply for exemption. (NMSH Parameters, MoUD 2011)

## Indicators for Measurement

- Percentage of residents within 800m (10 minute walking distance) of high quality public transport stations (*NMSH Parameters, MoUD 2011*).
- Percentage of total length of streets with motor vehicle carriageway of 10 m and more that have dedicated and segregated cycle tracks (*NMSH Parameters, MoUD 2011*).
- Percentage of total length of streets with motor-vehicle carriageway of 10 m or more, equipped with cycle tracks to standards (*NMSH Parameters, MoUD 2011*).
- Percentage of total length of streets with at least 5 safe street crossing per km for bicycles with spacing between two crossings not more than 250m (*NMSH Parameters, MoUD 2011*).
- At least 25% NMT network coverage with in a year. The width of pedestrian path and cycle track can be combined if the roads are too narrow (*SLBs for Urban Transport- MoUD*).

## Sample Policies

- Create prioritized, safe and direct pedestrian and cycling routes to rapid transit stations from major destinations and regional cycling and pedestrian networks. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Provide an attractive pedestrian environment with a high level of priority, safety and amenities. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Encourage street-level activity and create places to relax. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Incorporate bike and pedestrian access. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Reclaim street space, especially footpaths and cycle-tracks, from car parking for other needed public uses such as cycling lanes, cyclist/shaw stands, para-transport/TSR stands, widened sidewalks, hawker zones or multi-utility zones. (*NMSH Parameters, MoUD 2011*).
- Prepare a cycling masterplan for the city that creates a network of routes integrating all arterial roads, eco-mobility corridors along nallahs, heritage routes, school precincts as well as other recreational routes. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- All pedestrian facilities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
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- Informal Sector Integration
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## 6. TRAFFIC CALMING

### Components

A variety of devices and techniques are used to help reduce both vehicle speed and volume on roadways. Key components include:



#### 1 CROSSING ENHANCEMENT

- Mid-block crossings every 250m on average. Min: 5 safe street-level crossings/km (NMSH Parameters, MoUD 2011)



#### 2 TRAFFIC SIGNALIZATION

- Desired average waiting time for a pedestrian is not more than 45 seconds (SLBs for Urban Transport- MoUD).
- Auditory signals should be provided for differently abled.

#### 3 REDUCED SPEED LIMITS

- Limit speed on urban arterial roads and sub-arterial streets to 50kmph and on collector and local streets to 30kmph. (NMSH Parameters, MoUD 2011)
- Streets meant primarily for NMT movement as well as all streets of ROW 12m or below, should be limited to maximum speed of 20km/hr by design. (NMSH Parameters, MoUD 2011)

#### 4 BUFFERING FROM TRAFFIC

- Traffic calming of all streets with ROW of 12m or less through narrowing of driveway and meandering path with use of trees, islands and street furniture. (NMSH Parameters, MoUD 2011)
- Pedestrian refuge with a minimum width of 1m at each street crossing location after crossing 7m of one way motor vehicle carriageway or 10m of two way motor vehicle carriageway at non signalized midblock crossings. (NMSH Parameters, MoUD 2011)
- Grade separated structures (foot-overbridges and pedestrian-subways)

should be avoided to prevent unnecessary detours to reach destinations. (NMSH Parameters, MoUD 2011)

- If grade-separated pedestrian crossings are unavoidable due to presence of highways, there must be at least 4 crossing opportunities per kilometer in areas with development at edges. (NMSH Parameters, MoUD 2011)
- Minimum buffer of 0.5m between cycle track and motor vehicle lanes (ITDP Better Street, Better Cities)

## Indicators for Measurement

- Percentage of streets with total carriageway >10m which have 5 or more traffic calmed or signalized crossings per km. (NMSH Parameters, MoUD 2011)
- Percentage of intersections that have pedestrian crossings and refuges in all directions. (NMSH Parameters, MoUD 2011)
- Percentage of intersections with complete, wheelchair-accessible crosswalks in all directions. (ITDP TOD Standard 2013)

## Sample Policies

- Emphasize pedestrian safety, comfort and convenience on all streets, old and new. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Protect pedestrians and active transportation users when crossing vehicular traffic. (*Mobility Hub Guidelines, Metrolinx, 2009*)
- Deploy network and time based congestion tax as a means of controlling number of vehicles on streets and accomplish free flow of traffic, thereby reducing emissions. (NMSH Parameters, MoUD 2011)
- Disperse high traffic volumes over multiple parallel human-scale streets rather than concentrating traffic on fewer major arterial streets. (*Street Design Guidelines, Delhi, 2010*)
- At-grade Pedestrian crossings must be provided at all T-junctions. (*Street Design Guidelines, Delhi, 2010*)
- Mid Block Crossings must be provided for people to cross the street safely between building entries or bus stop locations or active landuses on opposite sides of the street. (*Street Design Guidelines, Delhi, 2010*)
- Pedestrian Signals should be synchronized with the nearest full-traffic signals, for smooth movement of traffic along with safe pedestrian/NMT crossing. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
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- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
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- NMT Network
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- Mixed Land Uses
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- Managed Parking
- Informal Sector Integration
- Housing Diversity





## 7. MIXED LAND USES

### Components

While allowing mixed uses can take on many forms at different scales, in TODs the following components could be applied depending on local regulatory and real estate market conditions:

#### 1 MIXED USE OVERLAY DISTRICT

- Transit Oriented Zone: This is an Overlay Zone which provides opportunity for mixed use and high density development along the Bus Rapid Transit (BRT) corridor and Metro Rail Transit (MRT) corridor except in Core Walled City. Local Area Plans, including measures for road widening, parking management and pedestrianization, shall be prepared for this Zone. (Draft CDP 2021, AUDA).
- A maximum up to 2000 m. wide belt on both sides of centre line of the MRTS/Major Public Transport Corridor will be designated as Influence Zone. The entire influence zone shall be designated as "white zone. 'White Zone' is a land use category that allows flexibility in mix of various possible uses, with the exception of polluting and potentially hazardous uses. (UTTPIEC DDA, Draft TOD Policy 2012)

#### 2 MIXED USE AS A LAND USE CATEGORY

- Naya Raipur Development Plan 2031
  - o *Mixed Use (MU) Zone - 5 minute walking distance (MU-5)* indicates the mixed use area within the 5 minute walking distance (400m) circle from the transit station.
  - o *Mixed Use (MU) Zone - 10 minute walking distance (MU-10)*: indicates the mixed use area within the 10 minute walking distance (800m) circle from the transit station.
- URDPFI
 

The Mixed-use Zone can be subdivided into:

  - o Industrial Mixed-use (M1): In M1 Zone activities falling within non-polluting industry categories can coexist with maximum up to 10- 20% of commercial, institutional, recreational and residential land use.
  - o Non Industrial Mixed-use (M2): In M2 Zone all activities falling within permitted commercial, institutional, recreational and residential land use can coexist with maximum of 10% of non-polluting and household industry.

#### 3 HORIZONTAL MIXED-USE BLOCKS

- Residential Zone with Shop Line (R-2 Zone)
- The residential zone with shop line (R-2 Zone) in which shopping will be permissible as indicated herein will comprise:
  - o Plots in a residential zone along roads on which the shop line is marked on the development plan.
  - o Plots in a residential zone along roads having existing or prescribed width of and between 18.3 m. and 31 m. (Source: Mumbai DP 1991)
- The TOD Zone shall be delineated in all relevant Zonal Plans as per 3.3.1.1A. This Zone shall allow flexibility in provision of a mix of various uses within the same plot, with the exception of polluting and potentially hazardous uses.

#### 4 VERTICAL MIXED USE BUILDINGS

- In all integrated schemes, a minimum of 30% of overall FAR shall be mandatory for Residential use, a minimum 10% of FAR for commercial use and minimum 10% of FAR for community facilities. Mix of uses and FAR utilization for the remaining 50% FAR shall be as per the land use category designated in the Zonal Plan. (TOD Policy as part of MDD-2021, UTTPIEC, DDA, 2015)

## Indicators for Measurement

- Percentage of land area zoned for mixed use that specifically combines residential land use with commercial, institutional, or other public land uses
- Percentage of residences in TOD zones that have daily needs retail, parks, primary schools and recreational areas accessible within 400m walking distance.
- Percentage of residences in TOD zones that have access to employment and public and institutional services by public transport or bicycle or walk or combination of two or more.
- Percentage of streets in the city have mixed use development.
- Percentage of residential and commercial/institutional use in every TOD Zone within 800m of Transit Stations.

(NMSH, MoUD 2011)

## Sample Policies

- Create mixed-use high density development wherever missing, to make decentralized infrastructure provision and management techniques more feasible, thus making it more economical to recycle water/sewage locally to meet community needs. (Draft TOD Policy, UTTIPEC, DDA, 2012)
- Provide a diverse mix of uses, including housing, employment, regional attractions and public spaces to create a high quality urban environment in close proximity to the transit station. (Mobility Hub Guidelines, Metrolinx, 2009)
- The hierarchy and intensity of mixed use should be planned based on Street Hierarchy and Level of Public Transport Service. (NMSH, MoUD 2011)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
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- Housing Diversity



## 8. OPTIMIZED DENSITIES

### Components

Densification of existing built-up areas needs to be treated differently compared to greenfield areas or redevelopment sites located within TOD influence areas. The following components provide guidance on determining appropriate densities in TOD areas:

#### 1 DIFFERENTIAL LAND USE DENSITIES

- Ahmedabad Draft CDP 2021 proposes varying densities based on development potential of different areas:
  - Development of Central Business District
    - » Base FSI :1.8
    - » Maximum FSI: 5.4 (chargeable )
  - Transit Oriented Overlay Zone
    - » Base FSI :1.8 in R1 | 1.2 in R2
    - » Maximum FSI: 4.0 (chargeable)
  - Residential- Affordable Housing Zone
    - » Base FSI :1.8
    - » Maximum FSI: 2.7 (chargeable)
  - Residential Zone III
    - » Base FSI :0.3
    - » Maximum FSI: 0.3
- Mumbai Draft DP 2034 FSI Proposals:
  - FSI composed of three layers: Base, TDR and premium A and B
  - Distribution of FSI has to be varied depending upon the FSI already consumed, proposed land use zoning, and accessibility, particularly, areas in proximity to public transit stations, in order to ensure efficiency of use of land.
    - » Minimum Base FAR:1.5
    - » Maximum with Premium B: 2
    - » Minimum Base FAR: 2.5
    - » Maximum FAR with Premium B: 8

#### 3 POPULATION AND HOUSING DENSITIES

- New development in peripheral zone should be allowed only if it abuts existing developed areas with density of 175 inhabitants/ Ha. (NMSH, MoUD, 2011)
- 175 persons per Ha of developed area should be treated as a minimum standard for an urban density that begins to be transit supportive. (NMSH, MoUD, 2011)
- Minimum gross density permissible for TOD of 250 dwelling units per hectare
- Mandatory residential component in TOD areas shall comprise of 50% units of size ranging between 32-40 sq.m. and the balance 50% comprising of homes ≤65 sq.m. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)

#### 2 DENSITY BONUSING OR PREMIUM FSI/ FAR

- A typical density bonus program sets a base density that a development may achieve 'by right' and a maximum density that can be achieved by conformance to higher standards or through the provision of qualifying amenities/benefits/premium paid.
- Mumbai Draft DP 2034:
  - Base FSI –The Base FSI is the development right that the plot is allocated and is, generally, equal to or more than the FSI already consumed.
  - Premium FSI A and B –The premium FSI is divided into two parts, A and B. Premium FSI A is to be consumed before TDR at 70% the Ready Reckoner rate. Premium FSI B can be consumed after consuming TDR at 100% the Ready Reckoner rate.
  - TDR FSI –TDR is the development right that can be bought on the market and transferred to the plot.
  - The DP 2034 allows plots to consume a fixed quantity TDR once the base FSI is consumed.
- Delhi Master Plan 2031 Amendments:
  - TOD norms of FAR and density may be availed through the preparation and approval of comprehensive integrated scheme of minimum size 1 Ha, with maximum ground coverage of 40%. In case of MRTS/Government Agencies, the minimum plot size for development shall be 3000 sq.m.
- For any integrated scheme, a max. FAR of 400 and a maximum density of 2000 persons per hectare (PPH) is permissible. The entire amalgamated plot will be considered for calculating the FAR and density. EWS FAR of 15% over and above shall be applicable. Additional FAR may be availed through TDR only, for schemes larger than 1 Ha.
- A maximum up to 2000 m. wide belt on both sides of centre line of the MRTS/Major Public Transport Corridor will be designated as Influence Zone. The entire influence zone shall be designated as "white zone. 'White Zone' is a land use category that allows flexibility in mix of various possible uses, with the exception of polluting and potentially hazardous uses. (Draft TOD Policy, UTTIPEC, DDA, 2012)

## Indicators for Measurement

- Percentage of population living at densities greater than 175 Persons per Hectare (NMSH, MoUD, 2011)
- Ratio of transit area density versus density elsewhere (NMSH, MoUD, 2011)
- Total residential population, jobs and visitors higher than baseline density (TOD Standard, ITDP)
- Land Use Density (FSI/FAR) of development citywide compared to that along transit corridor. (NMSH, MoUD, 2011)
- Target population density citywide versus along transit corridor.
- Total housing targets and dwelling unit densities along transit corridor compared to citywide targets. (NMSH, MoUD, 2011)

## Sample Policies

- Focus and integrate increased and transit-supportive densities at, and around, transit stations to create compact built form and a critical mass of activity while ensuring appropriate transition to the surrounding community. (Mobility Hub Guidelines, Greater Toronto Area, Metrolinx, 2009)
- Provide easy, convenient and fast public transport access to the maximum number of people through densification and enhanced connectivity. To facilitate this, highest possible densities (as per context) and enhanced street connectivity networks should be planned around transit stations/stops. (NMSH, MoUD, 2011)
- New FSI allowances above current caps can be taxed or otherwise monetized to fund infrastructure while increased future property taxes could fund operation and maintenance of the systems. (NMSH, MoUD, 2011)
- In case FSI bonuses are used as a TOD tool, they must specify minimum density requirements with a desirable mix of uses as well as residential unit types and sizes, in order to ensure the required densities and desirable mix of incomes/uses. (NMSH, MoUD, 2011)
- Local area planning needs to be introduced for densification of existing zoned areas, which will act as a micro level planning tool. (Draft CDP 2021,AUDA).
- FSI as a framework for providing opportunity for adequate floor space for anticipated growth. (Mumbai Draft DP 2034, 2015)
- FSI not an entitlement, but a maximum possible subject to other conditions. (Mumbai Draft DP 2034, 2015)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

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### Responsible Agency

- Development Authority/  
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### Related TOD principles

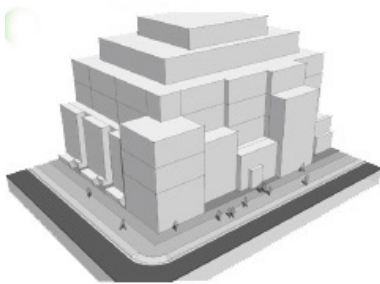
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- Housing Diversity



## 9. STREET ORIENTED BUILDINGS

### Components

Buildings should be oriented towards the pedestrian, with active uses located along the sidewalk and not located behind parking lots or blank walls. Key components to implement this principle include:



Increase building setbacks in some areas to create usable plazas



Views in and out of buildings should be maintained through transparency



Commercial or mixed use street frontages should be dedicated to pedestrian-oriented uses.

#### 1 SETBACKS

For Integrated TOD Schemes (Delhi Master Plan):

- Plot/Scheme size above 3,000 sq.m. and upto 10,000 sq.m.:
  - o Front Setback: 0 mts.
  - o Rear/Side(s): 6 mts.
- Plot/Scheme size above Above 10,000 sq.mts.:
  - o Front Setback: 0 mts.
  - o Rear/Side(s): 12 mts.

(TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)

#### 2 BOUNDARY WALLS

- In all TOD projects, boundary walls along any edge facing a public open space viz. pathway, road, park, etc. shall be prohibited. In case enclosure of sites is required, translucent fencing shall be used. (TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)

#### 3 ACTIVE FRONTAGE

Active frontages include arcades, shop-fronts, entrance doorways, access points, entry/exits and transparent windows of active areas facing the primary access street.

- For integrated TOD schemes, the main building facade(s) shall face the public street(s) without setback and have an active frontage as per the following requirements to facilitate visual surveillance of streets. (TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)

Facing Street Right-of-Way Frontage:	Minimum Percent of Building Frontage at built-to R/W Line to have Active Frontage:
R/Ws of $\geq 12$ m	$\geq 50\%$
R/Ws of $< 12$ m	No minimum requirement

- Commercial frontages shall have minimum 50% transparency (untinted) at ground floor level (Draft TOD Policy, UTTIPEC, DDA, 2012).
- The ground floor of all parking structures/podiums or stilts must be lined with active frontage facing the primary access street (Draft TOD Policy, UTTIPEC, DDA, 2012).



## Indicators for Measurement

- Average number of shops and pedestrian building entrances per 100 meters of block frontage. (TOD Standard, ITDP)
- Percentage of block frontage that abuts public walkways and provides visual connection to building interior activity. (TOD Standard, ITDP)

## Sample Policies

- Minimize boundary walls and setbacks of compounds, and build to the edge of the street R/W. Street walls with transparency, built-to-edge buildings, minimum setbacks and non-opaque fences help provide natural surveillance of public spaces. *(TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)*
- Street-level activity and well-watched streets need to be created through mixed-use, avoiding opaque boundary walls, creation of hawking/vending zones and round-the-clock activities, to ensure a safe environment for pedestrians. *(TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)*
- The main building facade should face the street, located on the property line without setback or with active use within set back and transparent edge that contribute to street safety. *(TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

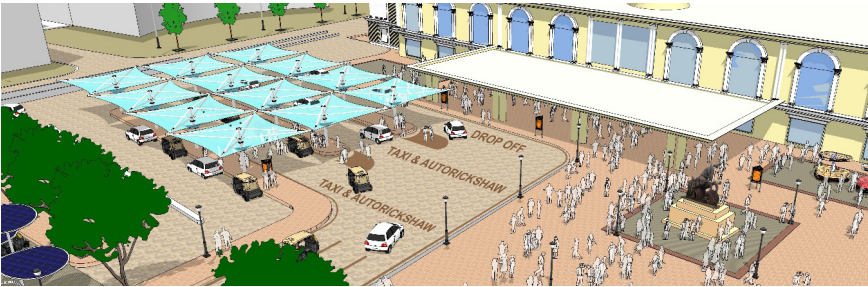
- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity



## 10. MANAGED PARKING

### Components

Strengthening first and last mile connections at the station area is aimed at overcoming physical access barriers through application of a number of design components, including:



#### 1 PARKING HIERARCHY

- Passenger Pick-up & Drop-off Area (PPUDO)
- Short-Term Parking (on-street & off-street): Approximately 70% of the total parking space/slots capacity to be kept for short term parking near the station. (Parking Policy, DDA, 2013)
- Long-Term Parking: Approx. 30% of the total available parking spaces/capacity to be for long term parking. (Parking Policy, DDA, 2013)
- On-street long term parking should be discouraged within Station Area. (Parking Policy, DDA, 2013)
- Park-and-Ride Lots: Park-and-Ride facilities for private modes may be provided only at Terminal MRTS Stations or major Multimodal Interchanges. (NMSH Parameters, MoUD 2011)

#### 2 PRICING

- Minimum parking rates may be fixed but maximum rates be variable based on market forces, similar to all real estate space in the city. maximum and minimum parking fee difference to at least 2:1. (Parking Policy, DDA, 2013)
- On-street private parking exponentially priced compared to off-street parking (5-20 times as per location). (Parking Policy, DDA, 2013)
- Increase fee exponentially with decreasing distance to BRTS/Metro Rail stations. (Parking Policy, DDA, 2013)
- Parking to be priced for every half hour slots, increasing exponentially as per the formula  $(2X+10)$ , where X is the charge for the previous hour, upto a maximum of three hours. (Parking Policy, DDA, 2013)



#### 3 REGULATIONS

- Reduced parking standards within 800m from transit stations: 1.33 ECS for all uses. (TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)
- Special parking spaces should be designated on-street for differently-abled, at a ratio of 1 for every 25 parking spaces. These parking spaces should have 1.2m access zones. (IRC 103:2012)

#### 4 SHARED PARKING

- At least 50% and preferably 100% of the total parking facilities (based on ECS) provided for any new/redevelopment/retrofit project greater than 2000 sq.m. plot area, shall be provided as a Shared Parking facility. (Parking Policy, DDA, 2013)

## Indicators for Measurement

- Percentage of on-street parking that is charged (should cover at least 50%). (Source: SLBs for Urban Transport, MoUD)
- Average off-street parking requirement for an average residential unit (closer to 0% within 400mts. from transit station) (*NMSH Parameters, MoUD 2011*).
- Ratio of parking required within 800m of a transit station versus all other areas (*NMSH Parameters, MoUD 2011*).
- Number of on-street parking spaces converted to public transport and NMT (*NMSH Parameters, MoUD 2011*).

## Sample Policies

- Limit commuter parking expansion by prioritizing feeder transit services to mobility hub stations. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- Develop a short and long term area-wide parking strategy with maximum and minimum parking standards and shared use parking practices. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- Implement parking pricing strategies as part of an overall transportation demand management program at transit stations, informed by modal split targets and local parking supply and demand. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- Minimize surface parking and integrate parking within surrounding development and parking structures. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- Fully subsidized parking facilities for IPT and NMT modes are mandatory at all terminals, stations and bus stops. (*TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015*)
- Development of Norms integrating measures related to Taxation, Parking and Congestion Charges, Public Carriage specifications and Service Norms to encourage public transportation. (*NMSH, MoUD, 2011*)
- Provision of secure parking for cycles at transit stations, all public spaces, and commercial & institutional buildings. (*NMSH, MoUD, 2011*)
- Use of existing/proposed depot and terminal lands should be made efficient and multi-level parking is to be prioritized. (*Parking Policy for Travel Demand Management, DDA 2013*)
- Remunerative cross-subsidy models should be used to generate funds for both provision of the multilevel facility as well as generating non-farebox revenue for bus transport. (*Parking Policy for Travel Demand Management, DDA 2013*)
- Multi-use of large public parking facilities can be permitted for use in off-peak hours for parking of private buses and commercial vehicles, chargeable at appropriate rates. (*Parking Policy for Travel Demand Management, DDA 2013*)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
- Traffic Calming
- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity



## 11. INFORMAL SECTOR INTEGRATION

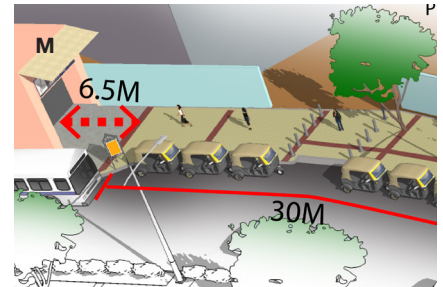
### Components

Components of informal sector integration near transit stations may include:



#### 1 STREET VENDORS

- Prepare Plan for Street Vending within 800mts. from transit station as per 'The Street Vendors Act', 2014
- Vending Zones within 50mts. walking distance from the exit of the station facility.
- Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas to activate the street and make it safe (NMSH Parameters, MoUD 2011).
- Determination of vending zones as restriction-free-vending zones, restricted vending zones and no-vending zones;



#### 2 INFORMAL TRANSPORT SECTOR

- Organize IPT and feeder bus systems within 800 mts. from transit station facility through Dial-an-auto/rickshaw services, pre-paid booths, Passenger Pick-up & Drop-off areas or Remote IPT/Taxi Parking lots.
- Multi-Utility Zone (MUZ) of minimum 1.8 m width should be provided to accommodate bus stops, street utilities, trees, IPT/NMT stands.

#### 3 INFORMAL SETTLEMENTS

- Preparation of Slum Redevelopment Plan as per Rajiv Awas Yojana Guidelines; or
- Slum Redevelopment with private sector participation; or
- Town Planning Schemes for land pooling and plot reconstruction in greenfield areas (Draft URDPFI, 2014)

## Indicators for Measurement

- Preparation of a Street Vending Plan. *(Derived from National Urban Livelihoods Mission)*
- Earmarking of space or area for vending zones near transit stations. *(Derived from National Urban Livelihoods Mission)*
- Percentage of population resettled or rehabilitated within 800mts. of transit station. *(Derived from National Urban Livelihoods Mission)*
- Percentage of IPT modes organized under formal management systems. *(Derived from National Urban Livelihoods Mission)*

## Sample Policies

- Provide and promote supportive environment for earning livelihoods to the Street vendors, as well as ensure absence of congestion and maintenance of hygiene in public spaces and streets. *(Street Vendors Act, 2014)*
- Provide sufficient spaces, designated as 'vendors markets' in layout plans at locations of such natural markets, for the number of vendors (static and mobile) which can cater to demand for their wares/services. *(Street Vendors Act, 2014)*
- All public transport nodes (intersection of two public transit corridors/routes) should accommodate para-transit facilities. (NMSH, MoUD, 2011)
- Incentivize use of public transport, para transit and NMT modes.
- Ensure parking for para-transport/feeder modes/NMT is to be prioritized and subsidized. (NMSH, MoUD, 2011)
- Provide "Short-Term" and "Long term" parking for Public Transport, Para-transport. (NMSH, MoUD, 2011)

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
- Metro Rail
- Commuter Rail
- Local Bus Feeder

### Responsible Agency

- Development Authority/  
Urban Local Bodies
- Transit Agency

### Planning & Regulatory Intervention

- DP/GDP/ZDP/LAP
- CMP/Transit System DPR
- DCR Amendments

### Related TOD principles

- Multimodal Integration
- First & Last Mile Connectivity
- Interconnected Street Network
- Complete Streets
- NMT Network
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- Mixed Land Uses
- Optimized Densities
- Street Oriented Buildings
- Managed Parking
- Informal Sector Integration
- Housing Diversity

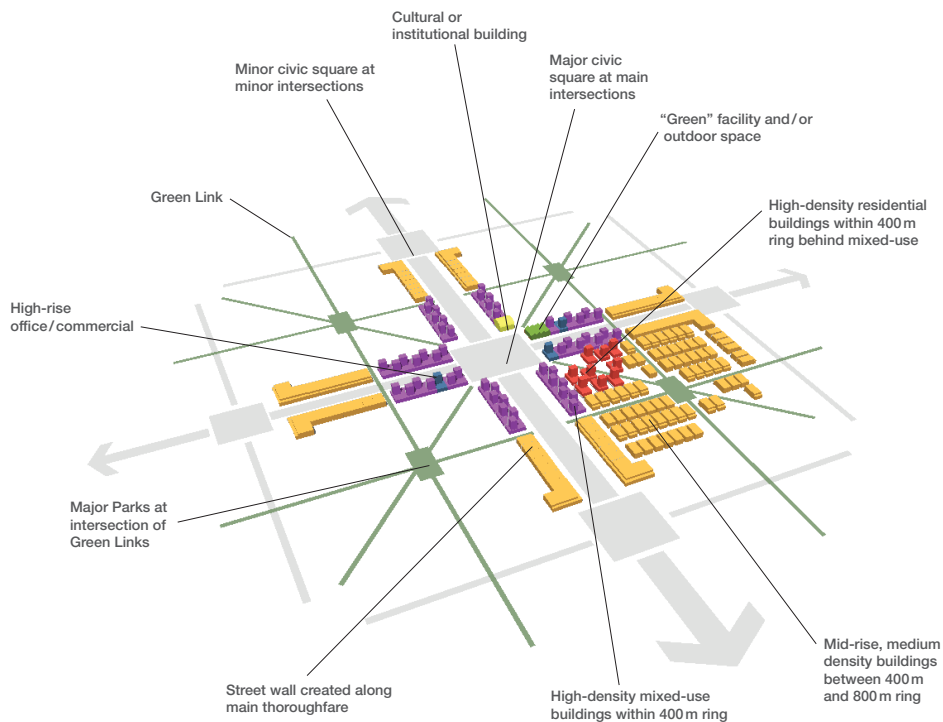




## 12. HOUSING DIVERSITY

### Components

To increase the formal supply of housing stock along transit corridors and station facilities with increased options for different income groups in the city, the following components may be applied independently or in combination with each other:



#### 1 MANDATORY DEVELOPMENT OF AFFORDABLE HOUSING

- All apartments/group-housing private and government schemes with a plot size exceeding 2,000 sq.m. within shall have to compulsorily reserve minimum 15% of the FAR, for affordable housing units. (Draft Policy for Housing for All in Urban Areas, Odisha, 2015)

#### 2 MINIMUM HOUSING MIX (BY UNIT SIZE)

- Minimum 15% of FAR for all TOD projects should be of unit sizes 40sq.m. or less. (Draft TOD Policy, UTTIPEC, DDA, 2012)

#### 3 DENSITY/FAR BONUSING

- The developer may be entitled to receive additional FAR equivalent to 100% of the built up area utilized for EWS and 50% of the built up area utilized for LIG units. (Draft Policy for Housing for All in Urban Areas, Odisha, 2015)

#### 4 RENTAL HOUSING

- Minimum 15% of FAR for all TOD projects to be allocated to rental or for-sale housing with unit sizes no larger than 25 sq.m.

#### 5 OTHER INCENTIVES

- Projects providing affordable housing within TOD areas shall be eligible for following incentives to the extent of EWS and Housing mix by units LIG housing in terms of FAR used, over and above the mandatory reservations:
  - Fast track approval process
  - Exemption from Building Plan sanction fee

## Indicators for Measurement

Indicators (applicable at a 10-min walking distance from transit station)

- Total Number of government housing units created for mixed-incomes
- Percentage of housing units less than 40sq.m. provided
- Percentage of residential units provided as affordable housing in market rate developments
- Percentage of group housing units, duplexes, and older housing stock
- Percentage of rental housing provided
- Percentage of informal settlements redeveloped in-situ

*(Derived from TOD Policy as part of MDD-2021, UTTIPEC, DDA, 2015)*

## Sample Policies

- Capture the value of transit for financing infrastructure and affordable housing. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Create a comprehensive, holistic policy framework to address all aspects of housing for the urban poor including slum rehabilitation and redevelopment as well as new housing and rental housing. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Promote inclusive mixed housing development in all new housing projects, both in the public and private domain. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Promote mixed land use in housing estates in future so as to meet requirements of neighbourhood shopping, retail etc. within walking distance. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Promote public private partnerships for affordable housing and slum rehabilitation projects. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Integrate various livelihood programmes with housing programmes benefiting beneficiaries of AH, SRRH and RH and ensuring overall socioeconomic development of the families. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Promote and ensure minimum relocation of the existing slum dwellers so as to maintain sanctity of existing economic and social linkages developed over a period of time in the informal settlements. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*
- Provide a framework for supply of Affordable Rental Housing for new migrants to prevent development of new slums. *(Draft Policy for Housing for All in Urban Areas, Odisha, 2015)*

## Applicability

### Scale

- City
- Corridor
- Station Area
- Site

### Transit Mode

- BRTS
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### Related TOD principles

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- Informal Sector Integration
- Housing Diversity



## 5.3 Plan+Design Tasks, Key Outcomes and Tools

This Plan+Design section outlines a process that can be followed as a template to develop a Transit Oriented Development (TOD) Plan/Strategy for the applicable scale (as identified in the Assess step). This step builds on TOD Planning Principles, and should take into account what is financially feasible and responsive to citywide goals and market forces, while still being reflective of the overall vision. Six tasks, listed below, are outlined within this step and are elaborated upon in this section.

	<b>Tasks</b>	<b>Outcomes</b>	<b>Tools</b>
<b>1</b>	Prepare data inventory	Site inventory	
<b>2</b>	Delineate boundaries for TOD study area	Project area definition	
<b>3</b>	Conduct stakeholder workshop to revalidate vision, issues and opportunities.	Stakeholder workshop key findings	
<b>4</b>	Formulate context-specific plan and strategic priorities	TOD Plan/Strategy DCR Modifications/ Policy Recommendations	Tool 3: “How-To” Prepare TOD Plans for Different Scales  Tool 4: “How-To” Develop DCR Modifications
<b>5</b>	Identify a pilot/demonstration project and develop design sub-Tasks	Urban Design Plan for pilot/ demonstration project	
<b>6</b>	Identify a phasing and implementation strategy including catalyst projects	TOD Plan- phasing strategy	



## 5.3.1. Prepare data inventory

### PURPOSE

To prepare a comprehensive database as a resource to help document baseline conditions and analyze constraints.

### SUB-TASKS

- **Review of Existing Documents & Studies:** Compile and review of the previously completed and current planning efforts underway in the Study Area with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of TOD Principles under the following broad categories:
  - o Planning & regulatory context
  - o Regional context
  - o Mobility & Access
  - o Land Use, Public realm & Urban Design
- **Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area** –The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.
- **Existing Conditions Inventory:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
  - o Existing land uses
  - o Proposed land uses
  - o Zoning
  - o Major nodes & activity centres
  - o Major roads & infrastructure (Parking)
  - o Existing natural features
  - o Proposed key developments
- **Develop Case Studies and Best Practices in Transit Oriented Development:** Select best practices that demonstrate successful TOD projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.
- **Undertake focus group meetings & key interviews** with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

### OUTCOMES

- Checklist of existing data sources, and identification of gaps in data.
- Site Inventory report including visual and photo surveys and physical conditions base map, CAD/GIS database

### TOOLS AND RESOURCES

#### Secondary Data Sources including GIS or AutoCAD data files

Secondary data sources may be used only if the data is fairly recent and reflective of current conditions.

#### Primary Surveys

To survey conditions where secondary data sources are not available.

#### Literature Review of Existing Documents and Studies

#### Focus Group Meetings and Interviews



### 5.3.2. Delineate boundaries for TOD study area

#### PURPOSE

To identify the influence area of transit where TOD interventions can be applied.

#### SUB-TASKS

- **Study the transit and the station characteristics (planned/ existing):** There are key differences in TOD strategies for different transit mode. Undertake an analysis of baseline conditions and prepare SWOT maps- utilize the existing conditions inventory to evaluate the physical characteristics of the study area to the scale and scope of the study, to address the following:
  - o Accessibility
  - o Land use, public realm and urban design
  - o Transit & Station amenities
- **Delineate Boundaries for TOD Study Area and Influence Area:** Refine TOD study boundary taking into account the existing and proposed site conditions.
- **Identify development context:** TOD Planning must take into consideration different aspects of the city and the context before beginning the planning of TOD. It helps in integrating sustainable development principles at the outset by respecting and nurturing existing environmental and settlements. The development context can be identified as:
  - o Greenfield
  - o Urban Infill
  - o Redevelopment
- **Identify preliminary goals and targets** with respect to the institutional support, plans, policies and development market

#### OUTCOMES

- Project Area Definition
- SWOT Analysis

#### TOOLS AND RESOURCES

**Tool 3: “How-To” Prepare TOD Plans for Different Scales**

#### REFERENCES

- Planning for TOD at the Regional scale <http://ctod.org/pdfs/tod204.pdf>
- Transit Corridors and TOD <http://ctod.org/pdfs/tod203.pdf>
- Station Area Planning <http://ctod.org/pdfs/tod202stations.pdf>
- Ped Sheds Tech Sheet by CNU [http://www.cnu.org/sites/files/CNU\\_Ped\\_Sheds.pdf](http://www.cnu.org/sites/files/CNU_Ped_Sheds.pdf)





### 5.3.3. Conduct stakeholder workshop to revalidate vision, issues and opportunities.

#### PURPOSE

To engage stakeholders in the planning process and obtain buy-in and feedback at critical junctures during the planning process.

#### SUB-TASKS

- Identify workshop dates and venues early on in the TOD Planning process.
- Prepare project backgrounder and agenda for the workshop for circulation to all stakeholders/participants of the workshop.
- Prepare questionnaires/surveys for the workshop—In addition to the project backgrounder, agenda, questionnaires, and surveys focusing on issues, opportunities, intended outcomes, and preferences among other relevant issues should be identified.
- Invite and engage the following well in advance, with weekly reminders sent out:
  - o Project stakeholders including developers.
  - o Elected officials and bureaucrats - to be invited to deliver keynote speeches to ensure media participation.
  - o Subject experts—who will present innovations; introduce planning subjects, techniques, solutions and lessons learned from different cities and projects.
- Prepare highly graphic and easy to understand workshop presentation materials in the form of PowerPoint presentations, and Display boards.
- Organize workshop to ensure active stakeholder participation—in three parts as follows:
  - o **Part One (Project Background and Education):** focus on introductions, workshop initiation, keynote speeches, project background, project goals and vision, intended outcomes, analysis, base line conditions and SWOT.
  - o **Part Two (Stakeholder engagement - Concept Development & Visual Preference Surveys)-** Divide stakeholders into different groups to focus on developing physical design concepts for Accessibility and Land use, public realm and urban design. Ensure that every group has a facilitator (ideally from consultant team), Rapporteur (Ideally a stakeholder), invited expert, and representation from the Planning/Development agency. This should be followed by a short reporting back session
  - o **Part Three (Stakeholder engagement – Plan Implementation) -** Focus on Q/A sessions, review of boards and materials and opportunity for informal engagement.
- Market, generate project interest and solicit feedback by publishing workshop results through print media, social media and dedicated project websites.

#### OUTCOMES

- Summarize workshop results in the form of a report outlining the workshop process, key findings, innovative solutions identified, key concepts developed, feedback obtained, and survey/questionnaire results. Summary of recommendations, expert comments and next steps should also be identified.

#### TOOLS AND RESOURCES

##### Visual Preference Surveys

To help stakeholders visualize how the suggested improvements may look, and to create consensus on the desired visual identity.

##### Design Charrettes

To provide opportunities for participants to feel involved in the brainstorming and design evolution stages.

##### Computer-generated Simulation tools

To allow participants to visualize the impact of decisions on the city environment.

#### REFERENCES

- Good Practice Guide to Public Engagement in Development Schemes - RTPi UK
- The NCI Charrette System Guide for Transit Oriented Development [http://www.fta.dot.gov/documents/NCI\\_Guide\\_8-14-13sm.pdf](http://www.fta.dot.gov/documents/NCI_Guide_8-14-13sm.pdf)



### 5.3.4. Formulate context-specific plan and strategic priorities

#### PURPOSE

To convert TOD principles to implementable details through identification of strategic interventions and regulatory modifications.

#### SUB-TASKS

- Develop a TOD Plan/Strategy at the selected scale. Refer to Tool 3 for guidance on planning processes for TODs at different scales.
- Prepare a TOD Planning Framework based on the Planning Principles (Section 1.3). The planning framework must be updated throughout the planning and implementation processes based on the lessons learned. Such a framework allows standardization of the planning process.
- Prepare the TOD Plan/Strategy in three phases
  - o Concept Plan, including alternatives, if any
  - o Draft TOD Plan, to be presented to stakeholders for review
  - o Final TOD Plan, based on stakeholder feedback.
- Develop a **Land use and Development Concept**, including identification of FARs, land uses, setbacks and marginal open space requirements.
- Develop an **Accessibility Concept**, focusing on all aspects and all modes of first and last mile connectivity.
- Assess the **infrastructural impacts** of the TOD Plan, particularly of higher densities, and suggest mitigation measures for the same.
- Prepare **Transit-supportive DCR modifications** to be applied at a citywide scale or within delineated TOD Zones.

#### OUTCOMES

- TOD Plan Report
- DCR Modifications

#### TOOLS AND RESOURCES

**Tool 3: “How-To” Prepare TOD Plans for Different Scales**

**Tool 4: TOD Planning Components by Transit Modes**

**Tool 5: “How-To” Develop DCR Modifications**

#### REFERENCES

- TOD Standard (ITDP) <https://www.itdp.org/tod-standard/>
- Safe Access to Mass Transit Manual (Embarq) <http://www.embarq.org/research/publication/safe-access-mass-transit-manual>



### 5.3.5. Identify a pilot/demonstration project

#### PURPOSE

To gauge market interests, risk tolerance of the development sector, relevance of zoning and by-law amendments, infrastructure upgrades and success of Public - Private Partnerships.

#### SUB-TASKS

- Develop a selection criteria matrix to identify a pilot project based on the following (but not limited to) quantitative and qualitative parameters within the project area boundary:
  - o Land availability for redevelopment (measured in acres)—presence of underutilized lots, vacant lots, lots of large block sizes and properties in dilapidated conditions
  - o Existing natural conditions—total acreage of under-utilized land that does not contain surface water, floodplain, wetlands, threatened or endangered species, or contaminated sites
  - o Market potential—for residential, office and retail mixed use development based on interviews with knowledgeable real estate development groups and review of other studies and planning documents. Station areas can be identified as having a strong, moderate or weak market potential
  - o Higher transit ridership (expected/proposed)
  - o Presence of intermodal service
  - o Typology and applicability number of station of the same typology
  - o Higher land use mixes
  - o Transit routes with frequent service based on number of trips per day
  - o Station area character.
- Develop an urban design strategy for the demonstration project, incorporating the TOD Planning Principles (Section 1.3).
- Prioritize—‘quick-win’ public realm investments as catalyst projects and low-cost demonstration projects to showcase future transformations envisioned in TODs.

#### OUTCOMES

Lessons learned from the pilot project can be scaled to develop city-wide or corridor-specific Sub-Tasks.

#### TOOLS AND RESOURCES

- Capacity building/Training workshops
- Study tours

#### REFERENCES

- JnNURM Toolkit for Comprehensive Capacity Building Programme  
<http://urban.bih.nic.in/Docs/Capacity-Building-Guidelines.pdf>



### 5.3.6. Identify a phasing and implementation strategy including catalyst projects

#### PURPOSE

Formulate preliminary strategies to ensure the successful implementation of TOD's in the form of quick wins, short, medium and long term improvements/ catalyst projects.

#### SUB-TASKS

- Prepare a redevelopment manual for the TOD Plan which includes preliminary recommendations to enable the City/development and planning agency to systematically implement the recommendations of the TOD Plan. In general, the redevelopment manual should identify:
  - o Description of capital/catalyst public and private projects
  - o Public-Private partnership opportunities
  - o Plan phasing in the form of quick win projects, medium and long term
  - o High-level cost estimates funding required for each phase of Plan implementation
  - o Technical capacity building recommendations
  - o Indicative list of tenders required for private sector/public realm improvement projects

#### OUTCOMES

- TOD Plan- Phasing Strategy

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**TOOL 3(A): “HOW-TO” PREPARE A CITYWIDE TOD PLAN?**

1

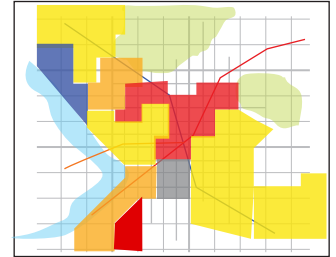
**Map land uses & key developments**

To understand the distribution of residential, employment, and institutional uses in the city.

**EXISTING AND PROPOSED LAND USES**

**Data Source:**

- Satellite Image/Remote Sensing/GIS Data
- As per approved Master Plan/Development Plan
- Field Surveys along major transit corridors
- Stakeholder Workshop



2

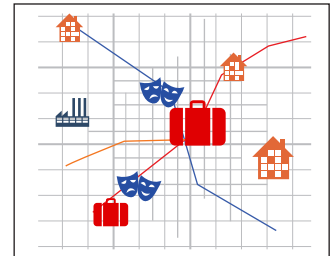
**Identify activity generators**

To help identify routes of high commuter traffic and origin-destination travel patterns.

**HOUSING, EMPLOYMENT AND RECREATIONAL CENTRES**

**Data Source:**

- As per approved Master Plan/ Development Plan (DP)
- Field Surveys along major transit corridors
- List of Approved Developments
- Stakeholder Workshop



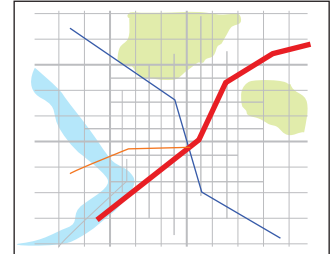
3

**Identify priority transit demand corridors**

Based on population distribution, land use plans, location of activity centres, travel demand forecasting (if available) based on high capacity transit type proposed (BRT or Metro Rail)

**Data Source:**

- As per approved Master Plan/ Development Plan (DP)
- Comprehensive Mobility Plan (CMP)
- Transit System Detailed Project Report (DPR)
- Census 2011 Population and Projected Estimates as per Master Plan/DP
- Right-of-way widths: Google earth/satellite images/field surveys



4

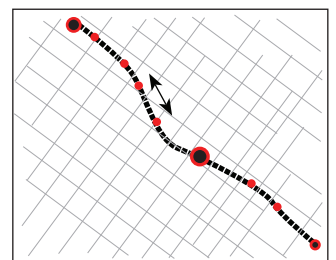
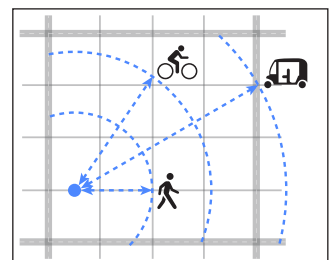
**Delineate influence zone of transit**

To determine the catchment area around transit routes where transit-supportive development needs to be prioritized. Variables to determine influence zone for modifying development regulations and transit ridership may include:

- Willingness to Walk/Cycle within 5-10 minutes from station
- Transit Station Spacing: BRT (400-500m); Metro rail (1km-2km)
- Transit Capacity: 800m (BRTS) | 2kms. (Metro Rail)

**Data Source:**

- Transit System DPR
- NMT Master Plan
- Local Bus Feeder Network Plan
- Existing Station Locations
- GIS based buffer analysis



5

## Determine Development Context

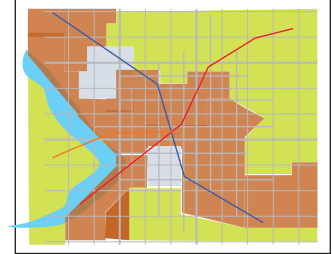
To determine the real estate market dynamics, land availability, and RoW constraints.

### CONTEXT TYPES

- Urban Infill
- Redevelopment
- Greenfield

### Data Source:

- Existing and Proposed Land Use (GIS data preferably)
- Field Surveys



6

## Identify goals and targets

For different areas within the TOD influence zone, based on city vision, growth scenarios, and multi-stakeholder participation.

### TYPICAL COMPONENTS

- Modal Share for Public Transportation and NMT
- Transportation Demand Management
- Integrated Land Use, Transportation & Infrastructure Planning
- Inclusive Development
- Environmental Preservation
- TOD Principles

### EXAMPLE: TOD GOALS

*80:20 modal share, favouring Public Transport excluding walk trips by 2021.*

*Reduction in vehicular emissions to meet the national ambient air quality standard*

*Source: Draft TOD Policy, UTTIPEC, DDA, 2012 (Appendix 1)*

7

## Draft Citywide TOD Plan

A strategic approach to implementing TOD at a citywide includes policy recommendations and actions that span multiple local and state departments. Policies related to TOD Principles are elaborated in the citywide TOD plan, and cut across various TOD implementing agencies, identified below:



Interconnected Street Network



NMT Network



Mixed Land Uses



Housing Diversity



Informal Sector Integration



Optimized Densities

8

## Establish Statutory Relevance

By including TOD concepts and principles into upcoming updates to the Development Authority-led Master Plan/Development Plan Update or Transit Agency led Transit System DPR. Options to establish statutory relevance for TOD Principles include:

### OPTION 1: INCLUDE A TOD CHAPTER IN MASTER PLAN/DP AS AN AMENDMENT

### OPTION 2: INCORPORATE TOD POLICIES IN RELEVANT SECTIONS OF MASTER PLAN/DP/STATE TCPO ACT AS AMENDMENTS

### OPTION 3: ESTABLISH A TOD OVERLAY DISTRICT AS A SPECIAL AREA IN EXISTING DCRs

Typical DCR elements applicable to TOD areas that could be included at this stage are:

- Applicability of TOD Overlay Area + Definitions
- Mix of Uses (including both vertical and horizontal mixing)
- Parking Requirements
- FAR and Densities
- Affordable Housing
- Street Design Regulations



**TOOL 3(B): “HOW-TO” PREPARE A CORRIDOR TOD PLAN?**

1

**Map transit alignment and station locations**

To understand transit system features and station characteristics.

**TRANSIT TYPE**

BRTS/MRTS/Commuter Rail

**ALIGNMENT**

System Coverage

**PHASING**

Priority Corridor(s)

**STATION SPACING**

Average distance between stations



**Data Source:**

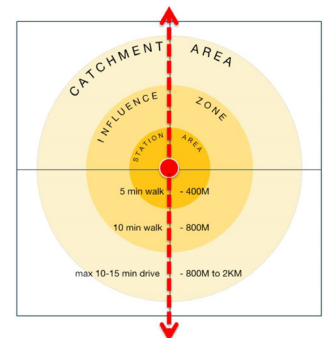
- Transit System DPR
- Comprehensive Mobility Plan (CMP)
- Master Plan/Development Plan (DP)

2

**Delineate influence zone along corridor**

To determine the catchment area around transit routes where transit-supportive development needs to be prioritized. Variables to determine influence zone may include:

- Willingness to Walk/Cycle within 5-10 minutes from station
- Transit Station Spacing: BRT (400-500m); Metro rail (1km-2km)
- Transit Capacity: 800m (BRTS) | 2kms. (Metro Rail)



3

**Analyze Development Opportunities**

To understand development context and capacity for intensification along transit corridor(s).

**REAL ESTATE MARKET POTENTIAL**

(Property Values, Undeveloped Lands, FAR Utilization)

**Data Source:**

- Guideline Values/Circle Rates
- Revenue/Land Departments
- Field Surveys
- Stakeholder Engagement

**LAND OWNERSHIP & VACANT LANDS**

**Data Source:**

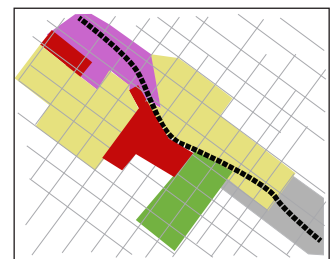
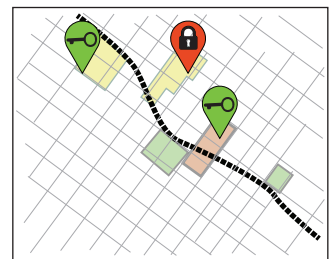
- Revenue Maps
- GIS Database
- Master Plan/DP
- Field Survey
- Stakeholder Engagement

**DEVELOPMENT PATTERN**

(Plot Sizes, Land Use Changes, Distribution of Employment & Residential Uses)

**Data Source:**

- Existing/Proposed Land Uses: Master Plan/DP
- GIS Database: Revenue Department
- Field Survey



4

**Assess Infrastructure carrying capacities**

To understand the maximum number of people that can be supported along the corridor through optimum utilization of the available resources.

**POPULATION ANALYSIS**

Growth Trends

**NMT+ TRAFFIC**

Level of Service Benchmarks

**UTILITIES**

Water, Waste, Energy, Drainage

**TRANSIT**

Service Coverage, Ridership Estimates

**Data Source:**

- Transit System DPR
- Comprehensive Mobility Plan (CMP)
- Traffic Impact Studies
- Master Plan/DP
- Infrastructure DPRs
- Service Level Benchmarks for Urban Transport (MoUD)

5

### Evaluate Connectivity Alternatives

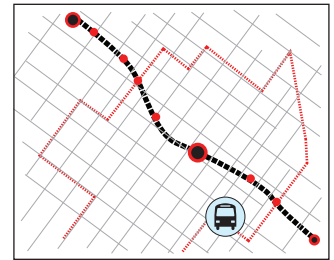
To provide seamless linkages between priority MRTS corridor(s) and city's transportation network.

#### CONNECTIONS TO NMT NETWORK

- Data Source:**
- NMT Master Plan
  - CMP/CTTP
  - Google Street Map
  - Field Surveys

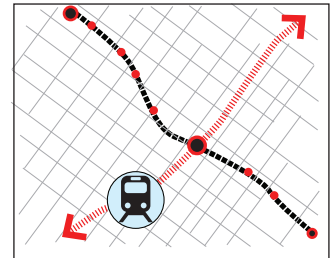
#### CONNECTIONS TO LOCAL BUS FEEDER ROUTES

- Data Source:**
- Bus System DPRs
  - CMP/CTTP
  - Route Rationalization Studies
  - Google Street Map
  - Field Surveys



#### CONNECTIONS TO OTHER PREMIUM TRANSIT CORRIDORS

- Data Source:**
- Transit System DPR
  - CMP



6

### Develop Station Area typologies

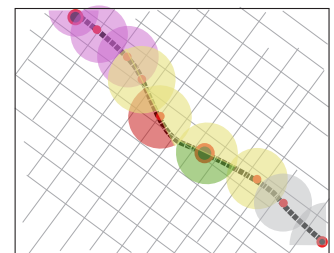
Typologies are conceptual used in initial phases to organize station design to establish vision based on local area context.

Described based on:

- Land Use Mix
- Access to transit
- Mobility
- Neighbourhood Character

#### EXAMPLES OF STATION AREA TYPOLOGIES:

- Central Business District
- Regional Destination
- Transit Neighbourhood
- Heritage Precinct
- Employment Node
- Intermodal Gateway
- Greenfield Mixed Use



7

### Prepare Corridor TOD Strategic Plan

To create a phased implementation plan for prioritizing station areas and level of intervention needed to maximize TOD potential.

<p>Network Level Improvements</p>	<p>Station Area Typologies</p>	<p>Priority Station Areas</p>
<p>Street Hierarchy</p>	<p>Catalyst Projects</p>	<p>DCR Modifications</p>

8

### Statutory/Planning Relevance

Inform Zonal Development Plan/Local Area Plan/ Station Area Plan

Inform Transit System DPRs/ Station Joint Development Opportunity



TOOL 3(C): "HOW-TO" PREPARE A STATION AREA PLAN?

1

Identify Station Area Planning Boundary and Influence Zone

**WALKING DISTANCE FROM TRANSIT STATION:** Willingness to walk up to 10-minutes to a given station at 5km/hr, boundary is defined by 800m radial circle centered on the station.

**EXISTING ROAD NETWORK:** The boundary is compromised by breaks in the road network and major roadways.

**PED-SHED ANALYSIS:** Ped shed is short for pedestrian shed. Ped sheds have irregular shapes because they cover the actual distance walked, not the linear (aerial) distance.

Station Area Boundaries are defined by the distance people walk in a set duration of time.

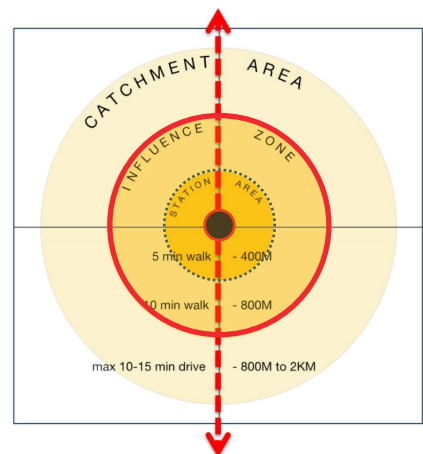
An effective strategy will work to increase the size of station area planning boundaries for both BRTS and Metro Rail by providing alternative mobility choices.

**Data Source:**

- Satellite Imagery
- GIS Database for land parcels, road network
- Master Plan/DP
- Google Street View
- Field Survey

**NATURAL ENVIRONMENT BOUNDARIES:** Station Area Boundary is remapped to include natural systems, greenways, waterways and opens space.

**EXISTING BUILT ENVIRONMENT:** Existing large scale developments and destinations beyond 10-minute walking distance



2

Map available Data for Station Area

**DEVELOPMENT**  
 Land Attributes: Existing & Proposed (EUse + Ownership + Plot Sizes)  
 Development: Population Densities + FAR Utilization

**ACCESSIBILITY**  
 NMT Network | Street Grid | Intersections  
 Road Alignment | Traffic Volume Count  
 Multimodal Integration: Station Entry | IPT Stands | Bus Stops

**INFRASTRUCTURE**  
 Physical: Drainage | Sewer | Water | Waste  
 Social: Parks | Public Facilities | Street Vendors | Weekly Markets

**ENVIRONMENTAL & HERITAGE FEATURES**  
 Environment: Natural Drainage | Topography  
 Heritage: Tangible (Built) | Intangible (Culture/Arts)



3

### Conduct SWOT Analysis

**Strengths** are favorable conditions that need to be built upon. **Weaknesses** are unfavorable conditions that need to be considered. **Opportunities** are potential improvements and favorable conditions that the project will seek to achieve. **Threats** are the potential barriers that may impede the realization of project goals.

#### COMPONENTS

- Urban Design
- Land Use Attributes
- Access to transit
- NMT Mobility
- Parking
- Context: Development/Redevelopment/Greenfield

4

### Develop Station Area Programming Alternatives

Programming Alternatives may include scenarios on how TOD station area programming may evolve over time:

- Accessibility Scenario
- Housing Development Scenario
- Employment Development Scenario

5

### Prepare Station Area Concept Plan

For the three influence areas: Primary, Secondary, and Transition, integrating policies and design interventions based on TOD Principles.

#### COMPONENTS OF A STATION AREA PLAN:

- Spatial Layout Plan illustrating connectivity, land use mix, and building densities
- Circulation and Multimodal Integration Plan
- Area- wide Parking Plan
- Physical Infrastructure Plan
- Landscape and Open Space Plan
- Architectural and Urban Design Guidelines
- Real Estate Market Potential Strategy
- Catalyst Redevelopment Projects
- Capital Improvements Program
- Phasing Strategy

#### TOD PRINCIPLES



Multimodal Integration



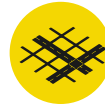
Traffic Calming



Strengthen First & Last Mile Connections



Mixed Land Uses



Interconnected Street Network



Optimized Densities



Design Complete Streets



Street Oriented Buildings



NMT Network



Managed Parking



Housing Diversity



Informal Sector Integration



**TOOL 3(D): “HOW-TO” PREPARE A SITE LEVEL TOD PLAN?**

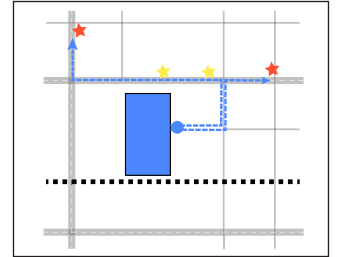
1

**Identify Site Context**

To understand the development opportunities and constraints.

**LOCATION, CONNECTIVITY & SURROUNDING DEVELOPMENT**

- Greenfield
- Urban Infill
- Redevelopment
- Proximity to Station



2

**Review of Planning Documents**

To apply development norms within MRTS Influence Zone

**STATUTORY & REGULATORY CONTEXT**

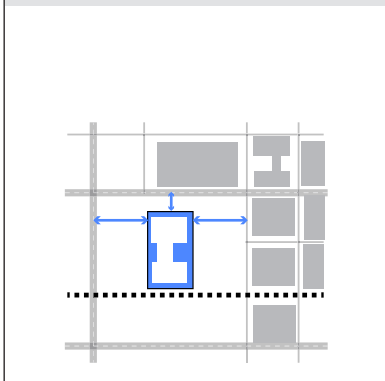
- Land Use as per MP/ZDP/LAP
- Building By-Laws
- Relevant Acts & Codes

3

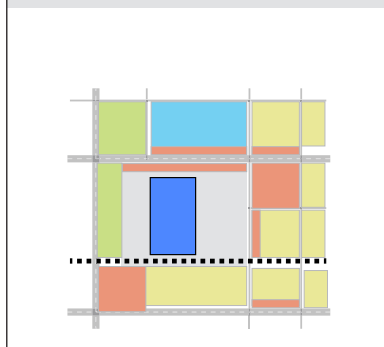
**Conduct Existing Conditions Baseline Assessment**

To gain an understanding of the existing or desired level of activity to develop TOD projects. Elements shall include:

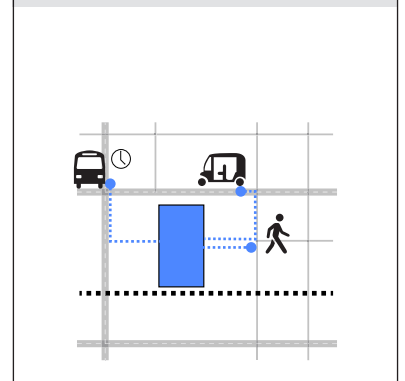
**STATION AREA CHARACTER: SITE HISTORY | POPULATION | CITYWIDE CONTEXT**



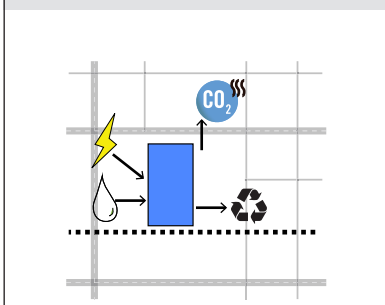
**EXISTING/PROPOSED LAND USE | SURROUNDING BUILDINGS | LAND OWNERSHIP**



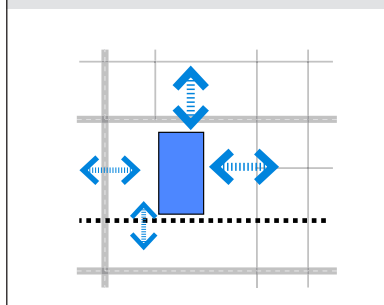
**NMT ACCESSIBILITY | TRANSIT ACCESS | IPT STANDS**



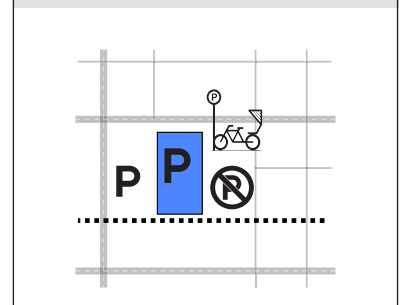
**EXISTING INFRASTRUCTURE: ROADWAYS | UTILITIES | PUBLIC FACILITIES**



**URBAN DESIGN: STREET GRID | SETBACKS | FAR | PLACEMAKING**



**PARKING: ON-STREET | OFF-STREET | LEGAL & ILLEGAL SPACES | PARK & RIDE**



4

### Conduct an Opportunities & Constraints Analysis

For individual developments within a site area to gauge the level of intervention needed to make the site TOD compatible.

#### COMPONENTS TO BE EVALUATED:

- Real Estate Potential
- Mobility & Circulation
- Mix of Land Use
- Urban Design

5

### Prepare Site Development Program Alternatives

To determine the highest and best use for the site and select a preferred alternative.

#### HIGHEST AND BEST USE:

*“The most probable use of land or improved property that is legally possible, physically possible, financially feasible (and appropriately supportable) from the market, and which results in maximum profitability.”*

6









### Develop Conceptual Site Master Plan and Urban Design Scheme

To translate the site development program into a physical layout plan with supporting street design and built form.

#### TOD PRINCIPLES

 Multimodal Integration	 Traffic Calming	 Design Complete Streets	 Street Oriented Buildings
 Strengthen First & Last Mile Connections	 Mixed Land Uses	 NMT Network	 Managed Parking
 Interconnected Street Network	 Optimized Densities	 Housing Diversity	 Informal Sector Integration

#### ADDITIONAL PRINCIPLES

 Engage Private Sector	 High Quality Transit System	 Preserve & Create Open Spaces	 Right-size Infrastructure
 Barrier Free Environment	 Land Value Capture	 Green Buildings & Infrastructure	 Technology Integration

7

#### FINANCIAL VIABILITY:

- project costs & revenues

#### IMPLEMENTATION STRATEGY:

- Phasing Plan
- institutional framework



**TOOL 4: "HOW-TO" PREPARE DEVELOPMENT CONTROL REGULATIONS (DCRs) MODIFICATION ?**

1

**Review Existing DCR's (Policy & Standards) vis-à-vie the situation on ground**

**COMPONENTS TO BE EVALUATED:**

- Identify existing DCR's that don't work; or are obsolete; are not developer friendly; and/or being constantly being superseded during site plan approval stage
- Evaluate whether existing FAR's are being utilized – This also provide an indication of market Demand and Absorption potential.



2

**Engage Development Community in DCR modification process**

**DCR MODIFICATION VISIONING WORKSHOP**

- Organize a workshop with multiple developers to identify:
  - o DCR Shortcomings
  - o What DCR's work and what needs to change
  - o What DCR's need to be included



3

**Assess and Document Existing Project Area conditions**

**EVALUATION PARAMETERS**

- Identify Property & Plot Sizes
  - o Land Uses & neighbourhood Character
  - o Potential for change & identification
  - o Plot Sizes
  - o FAR utilization
- Infrastructure Capacity – Existing & maximum carrying capacity
- Transit Ridership estimates
- Public Realm Character – Sidewalks, Open spaces, streetscapes,
- Street Row and Transportation character



4

**Update/Amend City  
Development Control  
Regulations (DCRs)**

**DCR CHAPTERS**

- Replace Existing DCR's where possible or create New Transit Supportive DCR's related to (at minimum):
  - o Transportation
    - » Parking Minimums/Maximums, Pricing
    - » Multimodal Integration
    - » NMT Infrastructure
    - » Street Design Regulations:
      - Shopfront/Active edge
      - Vending area
    - » Street Hierarchy
      - Shopfront/Active edge
      - Vending area
    - » Transportation Demand Management
    - » Universal Accessibility
  - o Development
    - » Introduce mixed use as a land use category
    - » % of mix of uses with various land use category
    - » Setbacks
    - » Ground Coverage, FAR (Minimum & Maximum both), Building Height
    - » Density People per hectare or Dwelling Units per Hectare or Jobs per Hectare
    - » Housing Diversity: Affordable housing, dwelling unit size
    - » Density Bonusing
    - » Open Space

5

**Initiate Development  
Review Process**

- Incorporate Updated DCR's in DRAFT form to
  - o Existing Master Plan
  - o Master Plan Update (if underway)
- Follow the City's existing protocol for Development Review Process

6

**Notify TOD Amendments**

- Follow the City's existing protocol for DCR Amendment Notifications



# 06 / INVEST



A Transit Plaza in Singapore illustrates the ideal of Transit Oriented Development | Source: IBI Group





## 6.1 Fundamentals of TOD Financing

The successful implementation of TODs will also require a significant amount of public and private sector investment. As evident from the case studies presented in the previous chapter, innovations to finance a TOD system—depending on a variety of factors and desired outcomes—is crucial in creating successful projects. A common method that has proven successful in many cases around the world is to form **public-private partnerships (PPPs)**. This system disperses risk and shares responsibility to maximize the best traits of the public and private sectors. When the PPP is used, the public sector often oversees the planning processes, including master planning, network design and rules and regulations enforcement.

The **public component of the partnership acts as a facilitator** by laying the groundwork and control mechanisms for investors to come in and develop. There are a plethora of actions that the municipality or any public sector agency can employ to entice investment. Designing provisions for **density bonuses and decreasing parking requirements to reduce construction costs are relatively simple measures**. In all cases, the government or the private developer should secure the maximum amount of land surrounding the proposed TOD stations. This is an important step to ensuring development is controlled and to capturing some of the high costs of infrastructure when the land prices increase.

**For the private sector, easier access to loans or low-interest loans provided by financial institutions should be encouraged.** This will take a large effort on the part of government and developers, in unison, to brief and ensure success to these financial institutions. This trust on the part of banks and financial institutions will decide the initial investments in station areas that, in turn, will translate on the ground into many users' first experiences with TOD. Thus, it is very important to secure adequate funding to ensure these stations are built to a high quality and on sound research so that they receive public support and confidence at inception.

In public-private partnership with multiple interests and varying capacities, it is important to control the revenue flow and ensure there is public accountability and enforcement

of standards. In this case, it has shown to be responsible to create a public-private entity that is publically accountable and transparent but receives income from the TOD system it implements rather than from the standard government budget.

**Public entities must also resolve land assembly issues and create optimal sites for a variety of applications.**

They can enact sliding scale impact fees to reduce required infrastructure costs. Land control agencies need to take every measure possible to ensure that sites are development ready. Depending on the current situation, there may be a need to ease the entitlement process. Providing **varied tax incentives such as tax abatements, tax increment financing, and tax exempt bonds are effective tools to spur development.** The public sector may also play a part in instigating development through incentives such as contributing land and infrastructure costs. Providing funds for project related capital improvements to enhance the streetscapes is also beneficial.

The public agencies that are overseeing this process need to acquire the proper training and data that is associated with these types of negotiations and transactions. It is critical that they attain, through private or public means, access to market and microeconomic analyses that are specific to the TOD location.

Real estate developers can be responsible for utilizing contacts with end users and deciphering all possible applications of the different types of sites. They will also be experts on the market value of the land. Private developers and investors have another helpful quality: capital. Having the private sector absorb as much of the upfront investment needs will unburden the public sector with the overwhelming strain on implementing a comprehensive TOD plan.

Municipalities around the world are implementing TOD and experiencing an increase in budget revenue from the rise in retail and other commercial taxation. As the real estate around the development increases in price, the city gains higher income streams through the leasing and parcel sales. This growing tax base delivers funds to create the capacity within cities and states to pursue more economic development plans.



### Financing tools

The financial concepts discussed below are some of the most commonly used tools for TOD and urban development financing around the world.

**Land Value Capture:** Financing tool generally used to finance infrastructure improvements through setting aside a pre-determined share of the increase in values or savings resulting from public investment in infrastructure improvements

*Cities using this tool: Delhi, Tokyo, Hong Kong*

**Tax Increment Financing (TIF):** TIF is a method to use future gains in taxes to finance current improvements (which theoretically will create the conditions for those future gains). When a development or public project is carried out, there is often an increase in the value of surrounding real estate, and perhaps new investment. This increased site value and investment sometimes generates increased tax revenues. The increased tax revenues are the tax increment. Tax Increment Financing dedicates tax increments within a certain defined district to finance debt issued to pay for the project. TIF is designed to channel funding toward improvements in distressed or underdeveloped areas where development might not otherwise occur. TIF creates funding for public projects that may otherwise be unaffordable to localities, by borrowing against future property tax revenues.

*Cities using this tool: Arlington, Florida, Chicago*

**Town Planning Scheme (TPS):** plots are acquired by a public authority under the Land Acquisition Act by paying compensation to its owners based on the prevailing land prices. Public amenities and infrastructures are then provided using government funds or loans and then the serviced plots are sold at market rates. The increment in the land value goes to the development agency instead of the original land owners, which can be again used to finance infrastructure upgrades.

*Cities using this tool: Mumbai, Maharashtra, Gandhinagar, Gujarat*

**Developer Fees:** This financing tool is used to augment revenues as charges assessed on new developments. They are often collected in the form of impact fees in India as one-time fees and used as part of the city's general fund to finance public infrastructure improvements such as utilities and transportation.

*Cities using this tool: Impact fees, Bangalore*

**Joint Development:** One of the oldest financing mechanisms used for financing development by transit agencies, this tool is a form of public-private partnership involving real estate development on public owned land with private investment.

*Cities using this tool: Mantri Mall, Sampige station Bangalore*

**Municipal bonds:** These are debt obligations issued by municipalities to fund urban infrastructure projects. Purchasing municipal bonds means lending money to the government body which in return pays specified interest throughout the locking period and returns the principal amount at the end of tenure. Municipal bonds are available in both taxable and tax exempt formats. There are two types of bonds: General Obligation Bonds (GO) and Revenue Bonds. GO bonds, issued to raise immediate capital to cover expenses, are supported by the taxing power of the issuer. Revenue bonds, which are issued to fund infrastructure projects, are supported by the income generated by those projects.

*Cities using this tool: Ahmedabad Municipal Corporation, Gujarat, Delhi*

**Bank loans and financing:** The most conventional methods for financing urban infrastructure projects are term loans from bank or other lending institutions. The steps involved are:

- Municipal council/standing committee approval to issue debt
- Technical approval from the concerned local authorities
- Apply for term loan with brief description of the proposed project, DPR with an accompanying financing plan, past budget documents, and necessary approvals
- The lending institution establishes loan terms based on the risk perception of the project and applicant's financial viability

*Cities using this tool: Tamil Nadu Urban Development Fund*

**Direct fees through tools such as Congestion Pricing and Parking Fees:** Direct fees are user charges for public amenities and infrastructure such as transit, toll roads, bridges and parking facilities. Direct fees are dependent on local conditions and case specific based on the demand. Normally these fees are collected by public and private authorities to recover capital cost and operation and maintenance cost of the infrastructure.

Congestion pricing is a tool to manage demand for a particular service based on level of use or time of day. It is used to mitigate traffic congestion. The revenue collected is used to support and improvement of transit services and transportation systems.

*Cities using this tool: Singapore, London*



**Grants:** Grants are non-repayable funds disbursed by one party (grant makers), often a government department, corporation, foundation or trust, to a recipient, often (but not always) a non-profit entity, educational institution, business or an individual. In order to receive a grant, some form of “Grant Writing” often referred to as either a proposal or an application is required. Most grants are made to fund a specific project and require some level of compliance and reporting. The grant writing process involves an applicant submitting a proposal (or submission) to a potential funder, either on the applicant’s own initiative or in response to a Request for Proposal from the funder.

*Cities using this tool: Singapore, London*

**Special Funds such as Urban Transport Fund (UTF):** The Ministry of Urban Department, Government of India recommended the creation of a dedicated transport fund both at the state and the city level for utilizing the same for funding urban transport initiatives. Creation of Urban Transport Fund is a mandatory reform under JnNURM guidelines. The UTF will be collected in the form of surcharge on sale of petrol, cess on existing personalised vehicles and Urban Transport tax on purchase of personalised vehicles. It will be used for traffic transportation studies, capacity building, awareness building, projects aimed to promote public transport, NMT and accessibility to public transit.

*Cities using this tool: Indian Infrastructure Debt Funds*

### Non-Financing Tools

**Land Pooling:** In this process, numerous small plots are assembled by a public authority and then again subdivided and returned to the original owners in proportion to the value of their land contribution (cost equivalent land) after retaining a portion of such assembled lands without paying any compensation to the owners. The retained land portions are used for creating public amenities and infrastructure such as roads, utilities, parks and open spaces and the remainder is sold to recover the development cost.

*Cities using this tool: Land Pooling Policy, Delhi*

**Land Banking:** Land banks are public, quasi-public, or private entities that acquire, hold and manage lands to facilitate future developments. Originally it was designed for redevelopment of abandoned and unused properties. In principle, a land bank might acquire land for future TOD projects to avoid increases in land value that can result from the introduction of transit service. Land banks are typically dependent on private developers for developments.

*Cities using this tool: Curitiba*

**Development Agreements:** It is a contract between the land owner or developer and the local jurisdiction. This agreement governs developments as per standards and conditions specified by the local jurisdiction to govern the development in that particular property. This agreement enables the developer to develop a property as per conditions and standards laid out in the contract. Further change in regulations will not affect the development. This also helps the local jurisdiction to control unaccepted impacts of that project on infrastructure and the community. The contract may have project phasing and timeline, developer’s role towards community improvements and detailed obligations of both the parties.

*Cities using this tool: Land Pooling Policy, Delhi*

**Density Bonuses:** This tool offers developments a level of density that surpasses the allowable Floor Area Ratio (FAR). In exchange for increased height/density that surpasses the zoning by-law, developers are required to provide a service or benefit to the community as negotiated by the municipality such as amenities or housing needed by the community. Density bonus policies must be written into a municipality’s Official Plan in order for it to be used as a development tool.

*Cities using this tool: Land Pooling Policy, Delhi*

**Transfer of Development Rights (TDR):** This tool makes available extra built up area in lieu of surrendered or relinquished area generally during land acquisition for public purposes such as road widening, creation of public amenities and infrastructures. The owner of the land can use the extra built up area himself in the same land parcel or sell it to another.

*Cities using this tool: TDR, Jaipur Development Authority*

**Real Estate Investment Trust:** A real estate investment trust (REIT), generally, is a company that owns and typically operates income producing real estate or real estate-related assets such as residential, commercial, warehouses, and mortgages or loans. REIT acquires, develops and operates the assets as a part of their own investment portfolio as opposed to the real estate companies which sells the asset after developing. The shares of REIT are traded on major stock exchanges. Similar to stocks anyone can invest in REITs by purchasing shares.

*Cities using this tool: India*



### 6.2 Invest Tasks, Key Outcomes and Tools

The 'Invest' section explores Sub-Tasks to secure adequate financing including augmenting the private sector's role in sharing the benefits of increased land values for implementing TOD related public infrastructure projects.

Tasks	Outcomes	Tools
<b>1</b> Identify capital costs for critical improvements that require public investment	Capital Improvement Program	
<b>2</b> Introduce innovative funding tools	Financial Models	
<b>3</b> Enhance development potential and attract investors through appropriate incentives	Development Incentives	





## 6.2.1. Identify Capital Costs for Critical Improvements that require Public Investment

### PURPOSE

To establish a structured investment and revenue generation strategy for designated TOD study area.

### SUB-TASKS

- Prepare a Capital Improvement Strategy—to prioritize and phase strategic interventions and tools to finance TOD supportive incentives. Key components of the investment plan should include:
  - o Real Estate Market Study including Socio-Economic Profile for TOD study area identified
  - o List of broad infrastructure improvement proposals with order of magnitude costs within the TOD study area, including:
    - » NMT improvements
    - » Utility upgrades
    - » Private sector development/redevelopment opportunities
    - » Transit Station joint development opportunities
  - o Land Acquisition Costs
  - o Additional planning studies and DPRs to be prepared
  - o Institutional Roles and Responsibilities
  - o Resource Mobilization and Revenue Generation Strategy
- Develop land assembly/land banking plans to secure lands for future development in a land bank and release as prior development phases meet land use and mobility targets:
  - o Identify potential sites for future development through market assessment studies and development plans and acquire as they are released for sale
  - o Lease-back or allow for interim development on these acquired lands to provide a revenue stream to offset land carrying costs
  - o Provide opportunity for public sector agencies and municipalities to exercise greater control of phasing and subsequent development to reflect the master plan.
- Complete strategic land assembly required to create a continuous public lane or service road encroaching on existing properties.

### OUTCOMES

- Capital Improvement Program - including a systematic public financing strategy for implementing critical improvements.

### TOOLS AND RESOURCES

Guideline Value GIS Database

City annual budgets

City Business Plans

Real Estate Market Surveys

Market Studies

Real Estate Investment Trusts (REITs), Securities and Exchange Board of India

### REFERENCES

- Infrastructure Financing Options for Transit Oriented Development, U.S. Environmental Protection Agency
- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India



### 6.2.2. Introduce innovative funding tools

#### PURPOSE

Develop a set of investment tools to integrate TOD within city's urban management and financing systems

#### SUB-TASKS

- Evaluate—the feasibility of introducing innovative financing models to implement TOD projects typically applied in globally, based on the analysis conducted in Task 6.2.1. The following are **financing tools** that local governments and transit agencies have used globally.
  - o Land Value Capture
  - o Tax Increment Financing (TIF)
  - o Town Planning Scheme (TPS):
  - o Developer Fees
  - o Joint Development
  - o Municipal bonds
  - o Land leasing
  - o Bank loans and financing
  - o Direct fees through tools such as Congestion Pricing, Parking Fees and Advertising Fees
  - o Grants
- Apply **non-financing tools**—to TOD districts in order to offset the costs of planning, construction and maintenance of TOD projects. Some of these non-financing tools include:
  - o Land Pooling/Land Banking
  - o Land Swapping
  - o Development Agreements
  - o Density Bonuses
  - o Transfer of Development Rights
  - o Anchor Institution Partnership
  - o Corridor-Wide Tax Increment Financing
  - o Multi-Station Tax Increment Financing

#### OUTCOMES

- Project financing models

#### REFERENCES

- Capturing the Value of Transit (CTOD) <http://ctod.org/pdfs/2008ValueCapture.pdf>



### 6.2.3. Enhance Development Potential and Attract Investors through Appropriate Incentives

#### PURPOSE

To stimulate private development in TOD station areas in exchange for private investment in providing public benefits.

#### SUB-TASKS

- Provide developer incentives such as **density exchange or density bonus** as a tool for attracting private sector investment as well as improving the public realm. Additional building height and density can be exchanged for facilities, services or affordable housing—if included as part of the appropriate statutory law. The exchange of height and density for community benefits will reflect the specific needs of the station area where these exchanges will be applied, after the preparation of a detailed Station Area Plan. Typical examples of public improvements that could be exchanged for density bonuses with the private sector include:
  - **Infrastructure upgrades** along the property edge or within the primary influence zone (5-minute walking distance) of the transit stop facility
  - **Affordable housing** in new developments near transit
  - At grade **publicly accessible pedestrian links** between transit station and other land uses
  - **Urban plazas** or parks in the vicinity of the transit station facility
  - **Pedestrian access routes to transit stations** from buildings containing employment uses should be developed through public-private partnership in cases where the routes cross public streets or publicly owned lands
- Implement density transfers through by-law amendments, sometimes referred to as **Transferable Development Rights (TDR)**, as a mechanism to attract development and investment around the station area. TDRs are generally used as a mechanism to:
  - Conserve significant heritage buildings
  - Achieve built form and development density targets.
- Implement **municipal approval fast tracking measures** in prioritized TOD station areas:
  - Expedited and streamlined development review and building permitting process for projects meeting a minimum criterion of connecting development with station facilities and public realm.
- Leverage land purchased by transit agency to offer short and long-term leases (land and space) to private sector developers as an investment.

#### OUTCOMES

- Recommendations for development incentives with estimate of resulting revenues and expenditure on public realm improvement projects.



# 07 / IMPLEMENT



Naya Raipur Charatte, May 2013 | Source: IBI Group





## 7.1 Making it Happen

Cities that decide to commit to large TOD projects should enact, through law, the creation of a special body (task force, committee or agency) that, from inception, has deep ties to the TOD Plan. This organization must be held accountable to the public, and operate with a very clear transparency and mission. The organization will **promote the development of planning research, design master plans and regulations, oversee implementation and continued adaption of systems, and coordinate with planning guidelines and professionals from different levels of government and the private sector.** It is crucial that this agency exist outside of the political sphere to ensure long-term ownership, management, and security of singular vision. To further ensure legitimacy, the organization should receive its **budget from a percentage of the revenue garnered from the transit system.** This motivates continued dedication to creating and maintaining the effectiveness of the system. A funding mechanism built into the fare costs will also ensure its exemption from political budgetary issues and protect the government from further economic stress

The **central government should also provide expertise** and be willing to consult and assist the states and cities throughout the planning and implementation process. This assistance could come in the **form of grants, loans, and other financial support to state and local governmental bodies** who show promise in achieving successful TOD implementation. The states will act similarly to the central government in respect to cities. They will provide financial support and create the regulatory and legal formula needed for cities to seek out TOD opportunities. They can also act as a liaison between the national TOD priorities and the cities that

desire to implement them. They can disseminate information to cities and regional bodies and express the importance and benefits of TOD through context specific workshops and public presentations.

Receiving cues from the state and national governments, local government entities need to initiate the TOD planning and implementation. The government needs to facilitate TOD proposals that are intrinsically based in the urban context of the city. The transit agencies within each level of government, aside from being managers and planners, need to be leaders in preparing and implementing TOD. They also need to adapt to a new organizational hierarchy that can handle the planning and implementation as well as the long-term management of the TOD system.

**Transit agencies will serve as direct facilitators to TOD.** They will require the budgetary capacity to undertake such endeavours, as their role will decide the effectiveness of the transit system. The zoning regulation that will inspire development will need to be enforced and implemented by a planning agency.

After government intervention in the creation of infrastructure and policy, the private sector must rise to the occasion and invest in the TOD vision. The private sector operates many functions of the TOD project. In most cases, it is private enterprise that brokers the real estate, provides capital for construction, builds housing, etc. Private entities such as financial institutions, developers, store owners, real estate professionals and, most importantly, customers will then sustain the economic growth.





### 7.2 Implement Tasks, Key Outcomes and Tools

Developing successful TOD projects requires mobilizing a multitude of resources, partnerships and innovative implementation mechanisms that helps leverage public sector investment in transit and infrastructure with private sector development. IMPLEMENT is a discussion of programs, Sub-Tasks and interventions that can convert plans to reality. It includes a discussion on evaluation tools as well as on programs that are directly targeted towards the end users. The purpose of this section is to identify programs, Sub-Tasks and tools that can help in ensuring success.

	<b>Tasks</b>	<b>Outcomes</b>	<b>Tools</b>
<b>1</b>	<b>Formulate a phasing strategy</b>	Phasing Strategy	
<b>2</b>	<b>Establish clear roles and responsibilities to empower key players for implementation</b>	TOD Implementation Committee	
<b>3</b>	<b>Establish statutory relevance</b>	TOD-based Policy / Regulations	
<b>4</b>	<b>Adopt a flexible planning approach to accommodate growth and change</b>	Interim Regulations	
<b>5</b>	<b>Develop a communications, outreach and marketing strategy</b>	Communications Strategy	
<b>6</b>	<b>Develop monitoring and evaluation benchmarks to measure success of TOD</b>	Monitoring and Evaluation Framework	



## 7.2.1. Formulate a phasing strategy

### PURPOSE

To propose preliminary Sub-Tasks to ensure the successful implementation of TOD's in the form of quick wins, short, medium and long term improvements / catalyst projects.

### SUB-TASKS

- Develop a phasing strategy for implementation of short-term, mid-term and long-term interventions needed to move towards city-wide TOD supportive transformations. The projects include:
- **Quick Wins (0-3 years)**
  - TOD policy as amendment in Master Plan including demarcation of TOD overlay districts
  - Station area planning including accessibility and DCR modifications
  - Formation of interdepartmental TOD Task Force under Development Authority
  - Create TOD programme office under Transit Agency
  - Identify staff resources for TOD planning
  - TOD capacity building including training of staff
  - Multimodal integration at station facility
  - Signage and wayfinding
  - Streamline approvals of proposed Transit Oriented Developments
- **Short- Term (3-5 years)**
  - Master Plan update integrating TOD principles
  - Zonal Development Plan/Local Area Plan formulation with TOD principles
  - Station accessibility planning
  - Complete sidewalk network within a 5-minute walking radius of the station
  - Traffic calming measures
  - Upgraded pedestrian infrastructure including footpaths, street furniture, designated waiting areas
  - Improved station facilities including passenger amenities
  - Bicycle rental or public bicycle sharing systems near transit stations
  - Park-and-ride lots at strategic transit locations
  - Multimodal integration for various modes
  - Implement area wide parking management plan
  - Changes to state acts to include financing tools such as tax increment financing and FAR density bonusing
- **Mid- Term (5-10 years)**
  - Land pooling (greenfield TODs)
  - Infrastructure utility upgrades in TOD areas
  - Streetscape improvements to achieve complete first and last mile connectivity
  - Redevelopment of government owned vacant lands as mixed use development
  - Complete detailed station area planning
  - Formalize street vendors near transit stations
- **Long-Term (10+ years)**
  - Joint development of stations with private sector
  - Land banking (urban TODs)
  - Build mixed-use affordable housing near transit stations on government owned vacant lands
  - Redevelopment of underutilized sites near transit stations

### OUTCOMES

- Implementation and Phasing Strategy, including
  - Preliminary list of projects
  - List of additional studies/streetscape improvement projects/public-realm redevelopment projects
  - TOD Plan - phasing strategy



## 7.2.2. Establish clear roles and responsibilities to empower key players for implementation

### PURPOSE

To facilitate partnerships and delineate responsibilities to coordinate implementation activities in a structured manner.

### SUB-TASKS

- Typically, responsibilities for various stakeholders in a coordinated TOD implementation programme include:
  - **Local Governments:** Systems (transit and infrastructure) planning, master planning (city and corridor), local area planning (station area and neighbourhood), development control regulations and building by-laws, site plan review and approvals, infrastructure upgrades, land assemblage, active marketing of TOD opportunities, developer incentives, secure financing, enforcement (traffic police) and public outreach;
  - **Transit Agencies:** Infrastructure investment, station design, systems planning, transit service, land assemblage, active marketing of TOD opportunities, secure financing and joint development of stations with private sector;
  - **Regional Planning Agencies (UMTA/Metropolitan Authorities):** Long-Range Transportation Plan, Regional Transit Plan, Regional Growth Management Plan, technical assistance to local agencies, and monitoring of Urban Transport Fund;
  - **Citizens, NGOs and Advocacy Groups:** Advocacy for NMT improvements, community participation in planning and design, get educated, attend planning meetings and advocate high quality design;
  - **Elected officials:** Developer and citizen awareness about benefits of TOD, changing regulatory climate, advocate transportation demand management policies and local economic development incentives;
  - **Businesses/Real Estate Developers:** Joint development with transit agencies, Public Private Partnerships, affordable housing construction, private sector investment in real estate, employee incentives;
  - **State Government:** Policy changes, funding assistance, capacity building, technical assistance, Land and Market Reforms; and
  - **Central Government:** Policy changes, guidelines formulation, funding assistance, and capacity building.

### TOOLS AND RESOURCES

State Planning Acts and Regulations

Stakeholder Workshop involving regional partners

### REFERENCES

- JnNURM CDP Toolkit (2013), Ministry of Urban Development
- Urban Capacity Building Programme, Janagraha Urban Space Foundation (<http://www.janaagraha.org/content/program/urban-capacity-building>)



- Empower the TOD Taskforce/Steering Committee to serve as the coordinating body or a TOD Implementation Committee with the following functions at a minimum:
  - o Attend planning meetings to ensure that development around transit is aligned with sustainable transportation and development principles, in accordance with the TOD plan;
  - o Facilitate development approvals;
  - o Coordinate infrastructure investments between different agencies;
  - o Promote education and awareness related to TOD projects;
  - o Convene a meeting on a regular basis to monitor progress of implementation tasks outlined in the TOD report;
  - o Facilitate partnerships between public and private agencies; and
  - o Ensure participatory approach in TOD plan preparation and inclusive planning.
- Collaborate—with local professional associations, academic institutions and resident welfare associations to reach a broader audience and stakeholder base. Potential partners may include:
  - o Confederation of Real Estate Developers' Association of India (CREDAI);
  - o Indian Institute of Architects (IIA);
  - o Institute of Town Planners of India (ITPI);
  - o The Institution of Engineers (India);
  - o Indian National Trust for Art and Cultural Heritage;
  - o Educational institutes- SPA, CEPT, IIT, IIM; and
  - o Citizen and advocacy groups
- Ensure—TOD station areas are included in devolution of functions for Unified Metropolitan Transport Authorities and identified as priority areas during allocation of Urban Transport Funds.

## OUTCOMES

- Roles and Responsibilities
- TOD Implementation Committee



### 7.2.3. Establish statutory relevance

#### PURPOSE

To identify the appropriate intervention for implementing transit-supportive policies and area plans with existing statutory processes.

#### SUB-TASKS

- Work with relevant governmental agencies to incorporate TOD policies in state-level urban development policies and acts. Relevant acts and policies that are within the subject of the state include:
  - o State Town and Country Planning Acts include land conversion and land use amendments
  - o Building Bye-laws (State) including parking and enforcement
- Involve transit agencies in land use planning process and use transportation plans to incorporate integrated land use and transit supportive development. Transit agencies can play an advisory role in:
  - o Reviewing walking distances to transit stops and design recommendations
  - o Review of proposed developments and ensuring they are appropriate for existing and future projected levels of transit service
  - o Identification of modal split targets
  - o Station facility design and joint development opportunities with private sector
- Determine coordination strategy with parallel planning processes such as Comprehensive Development Plans, Master Plan updates, Local Area Plans, Bye-laws amendments or Special Area Plans. Sub-tasks may depend on local regulatory and implementation factors such as achieving density targets, implementation of rapid transit infrastructure, market realities, track record of implementing planning initiatives, and political support for change.

#### OUTCOMES

- Integration of TOD plan/policies within existing statutory framework.





Figure 17: Statutory intervention to city level documents in India | Source: IBI Group

Policy Intervention	Advantages	Disadvantages	Intervention Tools
1. <b>Master Plan/ Comprehensive Development Plan</b>	<ul style="list-style-type: none"> <li>Aligns TOD as a long-term policy for shaping city growth; and</li> <li>Helps align interests of various agencies and integration with transit systems planning</li> </ul>	<ul style="list-style-type: none"> <li>Often a tedious and lengthy process, especially as it relates to land use amendments;</li> <li>Dependent on political will for approval; and</li> <li>Poor track record of implementing master plan policies at local area levels.</li> </ul>	<ul style="list-style-type: none"> <li>TOD policy integration at city scale is critical;</li> <li>Incorporate separate chapter on TOD;</li> <li>Emphasise the following components in master plans: complete streets, NMT planning, mixed land- uses, parking, urban design housing and Infrastructure chapters; and</li> <li>Policy recommendations may include: TDM strategies, NMT prioritization in all roadway design infrastructure projects, greenhouse gas emission targets, 'transit-first' policies</li> </ul>
2. <b>Local Area Plans/Zonal Plans</b>	<ul style="list-style-type: none"> <li>Aligns well with the preferred scale for TOD station area planning;</li> <li>Allows for detailed analysis and proposing context-sensitive solutions;</li> <li>Opportunity to partner with transit agency in funding these studies; and</li> <li>Appropriate scale for stakeholder and community engagement.</li> </ul>	<ul style="list-style-type: none"> <li>Poor municipality track record in preparing such plans;</li> <li>Lack of dedicated funding; and</li> <li>Requires dedicated staff resources needed to monitor implementation.</li> </ul>	<ul style="list-style-type: none"> <li>Corridor Plans (Zonal Plan)/ Station Area Plans (Local Area Plans) are the fundamental unit of TOD plan preparation and should be aligned with local area planning districts.</li> </ul>
3. <b>TOD Special Area Plans/ Detailed Development Plans (DDPs)</b>	<ul style="list-style-type: none"> <li>Could be applied similar to DDPs prepared for special areas such as heritage precincts;</li> <li>Allows for preparing specific guidelines and bye-laws applicable only to the designated area; and</li> <li>Appropriate scale for stakeholder and community engagement.</li> </ul>	<ul style="list-style-type: none"> <li>May require State Legislation/TCPO Act modifications.</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Station Area Planning Process illustrated in Section 6 (Plan+Design).</li> </ul>



<p>4. <b>Development Control Regulations (DCRs)/ Building By-Law Modifications</b></p>	<ul style="list-style-type: none"> <li>• Mechanism through which municipalities implement policies related to site planning, building design and urban design elements including densities, parking requirements;</li> <li>• Modification process relatively easier and less time-consuming; and</li> <li>• Can be tailored to be applied to special areas such as TODs through Overlay Zoning Districts.</li> </ul>	<ul style="list-style-type: none"> <li>• Local regulations generally refer national standards such as National Building Codes and Indian Roads Congress codes. Standards in these codes are predominantly automobile-oriented and contradict transit supportive policies such as reduced setbacks based on fire-safety norms.</li> </ul>	<ul style="list-style-type: none"> <li>• DCRs should have metrics related to the following elements:             <ul style="list-style-type: none"> <li>o Pedestrian-friendly built form guidelines including setbacks, heights, and active frontages;</li> <li>o Vertically mixed-use buildings percentage;</li> <li>o Mix of transit and non-transit supportive uses;</li> <li>o Differential FARs based on proximity to transit;</li> <li>o Reduced parking minimums and maximum parking standards, where applicable;</li> <li>o NMT parking; and</li> <li>o Complete Streets for multi-modal mobility.</li> </ul> </li> </ul>
<p>5. <b>Overlay Zoning Districts</b></p>	<ul style="list-style-type: none"> <li>• Create a separate set of regulations that amend existing by-laws in specific areas, often with less emphasis on land use;</li> <li>• Applied when property developed or redeveloped; and</li> <li>• Market determines the ultimate use of the property.</li> </ul>	<ul style="list-style-type: none"> <li>• Relies on market to determine the mix of development; and</li> <li>• Needs to be supported with detailed Station Area Plans and Development Guidelines (public RoW and private development) at a minimum for effective implementation.</li> </ul>	<ul style="list-style-type: none"> <li>• Applied at the DCR level.</li> </ul>
<p>6. <b>Site Plan Review</b></p>	<ul style="list-style-type: none"> <li>• Used to evaluate transit-supportive elements at the parcel level;</li> <li>• Helps align high-level policy directives with site-specific decisions; and</li> <li>• Used in developer agreements and negotiations.</li> </ul>	<ul style="list-style-type: none"> <li>• Requires dedicated staff resources needed to monitor implementation; and</li> <li>• Typically, reviewed and approved by elected decision-makers or special committee.</li> </ul>	<ul style="list-style-type: none"> <li>• Typically supported by preparation of development checklists for assisting local staff.</li> </ul>



## 7.2.4. Adopt a flexible planning approach to accommodate growth and change

### PURPOSE

To support near-term development needs while maintaining long-term vision and objectives and providing clarity on the bare minimum requirements as per the Plan.

### SUB-TASKS

- Formulate phased and interim building by-laws to integrate TOD principles into the development process:
  - o Allows for the screening out of undesirable land uses and development that is incompatible with the vision of TOD districts in preliminary development phases, such as large-format big box retail, heavy industrial uses, car dealerships and other auto-related uses
  - o Surface parking should be designated as interim uses with regular review periods to ensure that parking supply is justified.
  - o Provide for regular periods of review of interim by-laws and requirements to ensure they are reflective of development needs and context
  - o To allow for uses that otherwise may not be permitted in the ultimate phase of development, but are required for the viability of initial development stages.
- Develop and implement interim transit service plans that would support and ultimately be replaced by the regional rapid transit network:
  - o Provide improved transit infrastructure to build transit ridership in advance and clearly identify rapid transit corridors with features such as high quality and enhanced transit stops and transit priority and dedicated lanes.
- Coordinate infrastructure implementation and upgrade plans with development phasing between state governments, development authorities, and transit agencies:
  - o Review plans between stakeholders to ensure infrastructure is supportive of station area goals and objectives.

### OUTCOMES

- Interim by-laws
- Interim transit plans
- Interim infrastructure upgradation plans

### TOOLS AND RESOURCES

Development Plans/ Master Plans/  
Development Control Regulations

### REFERENCES

- JnNURM CDP Toolkit (2013), Ministry of Urban Development
- Urban and Regional Development Policy, Formulation and Implementation (URDPFI) Guidelines



### 7.2.5. Develop a communications, outreach and marketing strategy

#### PURPOSE

To disseminate benefits of transit-supportive initiatives to a broader audience.

#### SUB-TASKS

- Use marketing promotion and outreach programmes to publicize benefits of transit oriented developments as a lifestyle choice:
  - o Conduct individualized marketing programs at rapid transit stations and in households and offices along transit service routes as part of larger transportation demand management programs
  - o Position branding and marketing for feeder services to reflect positive benefits of using feeder services, such as the convenience and time saved in not being stuck in traffic and finding a parking space
  - o Create a unified theme for branding transit service, station facilities and adjoining private sector development
  - o Utilize visual presentation techniques to disseminate planned changes near TOD stations as a means to enable stakeholders gain a tangible understanding of community vision.
- Ensure effective public engagement and consultation process through the implementation of the project.
- Program and Design stations such that they serve as 'destinations' creating a sense of place for area residents.
- Retain a consultant to prepare an Outreach and Communications Plan for transit system and tie the benefits and key components of TODs with improved quality of life.

#### OUTCOMES

- Ongoing support and feedback from citizens and stakeholders

#### REFERENCES

- 'From Here to There: A creative guide to making public transport the way to go,' EMBARQ (<http://www.embarq.org/sites/default/files/From-Here-to-There-EMBARQ.pdf>)



## 7.2.6. Develop monitoring and evaluation benchmarks to measure success of TOD

### PURPOSE

To provide the development industry with some direction on the key features and type of development and; evaluate progress of achieving plan goals, objectives, and policies through qualitative and quantitative measures of performance.

### SUB-TASKS

- Develop time-bound targets to be achieved through TOD planning. These targets may include measuring indicators to evaluate performance for:
  - o Progress and quality of the transportation network
  - o Pedestrian and cycling network
  - o Land use and economic goals
- Create a development checklist as a tool for monitoring new development and redevelopment in TOD areas:
  - o Assist municipalities in evaluating and negotiating applications for developments around station areas
  - o Ensure conformance to TOD principles through performance measures connected to phasing strategy
  - o Develop a tracking database of development performance and details to serve as an information tool for developers, planners and other users.

### OUTCOMES

- Potential list of performance indicators
- Monitoring and Evaluation Framework

### REFERENCES

- User guide for TOD Evaluation Framework (





Figure 18: Performance Indicators | Source: IBI Group

**Adopt road and transit network performance measures to evaluate progress and quality of the transportation network.**

Performance Indicator	Description	Goal
Mode share	Transit or NMT mode shares	Increase
Vehicle kilometers traveled	Distance traveled by vehicles in station areas annually	Decrease
Vehicle ownership	Average household vehicle ownership	Decrease
Commute time	Average travel time from home to work	Constant/ Decrease
Parking supply	Supply of parking near transit stations (per square footage of office space and number of residential units)	Decrease
Transit ridership	Daily, annual, time of day, and mode of transit ridership	Increase
Transit reliability	On-time performance of transit	Increase
Transit and driving perceptions, satisfaction	Qualitative performance indicator based on travel satisfaction surveys of station area residents/ workers	Improve

**Introduce and evaluate the performance of the pedestrian and cycling network based on the following performance indicators:**

Performance Indicator	Description	Goal
Mode share	Cycling and walking mode share	Increase
Pedestrian Infrastructure	Proportion of roadways with sidewalks on both sides of street Crosswalk improvements Street amenity improvements	Infrastructure based targets that track completion of projects
Cycling infrastructure	Length of bike lanes and cycle tracks Connectivity measures to ensure completeness of networks PBS docking station density	Increase
Safety and security	Number of pedestrian and cycling injuries and fatalities Surveyed perceptions of safety and security	Decrease Improve



**Measure demographic and economic performance on the following indicators to evaluate progress in achieving land use and economic goals and objectives.**

<b>Performance Indicator</b>	<b>Description</b>	<b>Goal</b>
Population and housing density	The target number of residents and density	Meeting density targets set in Plan
Number of jobs by sector	Diversity and number of jobs	Meeting jobs density targets
Average household and disposable income	Household and disposable income levels	Increased disposable income resulting from reduced transport costs
Average property values	Property values of housing and office rents	Increase to reflect increase in mobility
Affordable Housing	Equitable distribution of affordable housing and market-rate units at diverse price points	Increased share of affordable housing units in the station area Increase in diversity of housing unit sizes in the station area
Home ownership versus rental	Mix of rental and owner-occupied housing	Balanced mix
Quality of life perception	Satisfaction with living and working in mobility hub areas	Satisfaction rates should be increasing



## TOD CHECKLIST

### USER GUIDE FOR TOD EVALUATION FRAMEWORK

#### TRIAL PERIOD AND PUBLIC FEEDBACK

The TOD evaluation framework should be introduced on a trial basis and will be reviewed and refined after a period of 6 months. Applicants and staff are encouraged to provide feedback and update the checklist based on input from the local developers.

#### THE FRAMEWORK AND THE DEVELOPMENT REVIEW PROCESS

This Checklist will be used to evaluate applications for development within the TOD Zone identified in the Development Plan or Local Area Plan.

1

Pre-Application Meeting: Applicant contacts TOD Review Committee to discuss proposed TOD application. Committee Member provides applicant with TOD evaluation framework and user guide comprising of TOD principles and related standards.

2

Applicant prepares and submits development application to the TOD Review Committee.

3

Committee Member conducts a preliminary review and evaluates/scores the development application using the TOD Evaluation Framework.

4

Member discusses results/score from TOD Evaluation Framework with the applicant, and negotiates changes, where necessary.

5

Applicant submits (amended) development application.

6

Member submits report to the concerned authority with summary of TOD Evaluation Score.



A		DENSITY			
<p>The intent is to concentrate development at the transit stations with densities that will support transit and a range of housing, businesses and services. The density and height of development should also decrease with distance from the transit station/centre to ensure compatibility with surrounding lower density residential areas.</p>					
Features		Yes	No	N/A	Comments
A1	Development is comparatively high density within 5 minute walking distance of stations, as compared to areas beyond 5 minute walking distance.				
A2	Development within 5 minute walking distance of station is transit supportive, i.e. meant for transit users, and pedestrian oriented.				
A3	The density of dwelling units per acre decreases with distance from the transit stations/ stops				
	Sub - Total				
B		MIX OF USES			
<p>The intent is to develop “activity nodes” at transit stations that have a mix of residential and commercial land uses, as well as other land uses. This mix will offer people opportunities to live and work close to transit, to obtain at least basic/daily goods and services locally, and to use transit to travel to destinations for recreation or education.</p>					
Features		Yes	No	N/A	Comments
B1	The development includes a horizontal or vertical mix of residential and commercial (office/retail) land uses, or adds to the mix of built/ planned uses within the station area.				
B2	Residences should have daily needs retail, parks, primary schools and recreational areas accessible within 400m walking distance.				
B3	At least 85% of all streets in the station are to have mixed use development.				
B4	The development includes commercial uses that are beneficial and compatible with residential uses (e.g. restaurants, departmental stores, bookstores, fitness centres, hair salons).				
B5	Residential development includes a mix of housing types and/or housing unit sizes, with atleast 25% of the housing units of 400 sqft or less.				
B6	Social and physical infrastructure is provided for projected population.				
	Sub - Total				
C		TRANSIT AND CYCLING			
<p>The intent is to provide features at or in the vicinity of the transit station that will further promote transit ridership and cycling.</p>					
Features		Yes	No	N/A	Comments
C1	Shelters are provided for all bus stops within the subject area.				
C2	Weather-protected bicycle parking for longer term use is provided in a secure area.				
	Sub - Total				



D STREETS AND WALKABILITY					
The intent is to provide attractive and safe streets that encourage people to walk to stations.					
Features		Yes	No	N/A	Comments
D1	Local street and pedestrian network provides direct routes from surrounding area to transit station.				
D2	Block lengths are a maximum of 200 meters.				
D3	Sidewalks are provided along both sides of all streets.				
D4	Sidewalks have a minimum clear walking width of 1.5m. Sidewalks below metro stations have a minimum clear walking width of 2.5m.				
D5	Pedestrian routes to the transit station/centre are well lit with provisions to discourage encroachment.				
D6	Pedestrian crossings are located every 100m.				
D7	Traffic calming measures such as “bulb-outs” are provided to enhance pedestrian safety and reduce pedestrian crossing distance.				
D8	Pedestrian access from development to transit station/centre is at grade or involves short flight of stairs or ramps.				
	Sub - Total				
E PARKING					
The intent is to minimize parking within the TOD area while encouraging transit use and active transportation.					
Features		Yes	No	N/A	Comments
E1	The majority of parking for residential and commercial buildings is provided in the basement or in multi-level parking.				
E2	Public parking garages are provided to serve parking demand.				
E3	The number of parking spaces provided for residential buildings has been reduced based on proximity to high level transit service.				
E4	Different land uses share parking capacity.				
E5	Car accessways are consolidated and located to the side or rear of buildings to minimize sidewalk crossings.				
E6	Parking garages are developed with office or retail uses at the ground level and aligned with adjacent buildings to integrate into streetscape.				
	Sub - Total				





F		URBAN DESIGN AND AMENITIES			
The intent is to create a high quality built environment that is functional, attractive, safe, comfortable, vital, and distinctive with a sense of community					
Features		Yes	No	N/A	Comments
F1	The building architecture and features give the transit station area a distinct character (“place-making”)				
F2	Buildings and main pedestrian entrances are oriented to the street.				
F3	Buildings have high levels of transparency at grade and/or active frontages for at least 40% of the street front facade.				
F4	The development provides a “public square” (spill-out space) in the TOD core.				
F5	The development in the TOD core does not have compound walls.				
F6	Front setbacks or “Frontage Zones” have a high standard of landscaping and public amenities (e.g. benches, waste receptacles, special lighting, water features, and public art).				
F7	The development and buildings have been designed (e.g. stepped back) and sited to maximize shaded open spaces, and well lit and ventilated interior spaces.				
F8	The development and buildings along pedestrian routes or around public open spaces provides protection for inclement weather (e.g. arcades, awnings)				
	Sub - Total				



### TRANSIT ORIENTED DEVELOPMENT SCORECARD

1 point is assigned per item if 'Yes' is checked. 0 points are assigned if 'No' is checked. All 'Yes' and 'No' checks are considered applicable and points from each section should be added and included in the table below. The 'Score' for each section is calculated by dividing the points by the 'Total Applicable'. This produces a percentage score. Comments may be written to explain the score for each section. The final scores are 'graded' into bands (81-90% for instance) and given a corresponding 'star' rating as outlined below.

		Total Possible	Total Applicable	Points	Score (%)	Comments
A	Density	3				
B	Mix of use	5				
C	Transit and Cycling	2				
D	Streets and Walkability	8				
E	Parking	6				
F	Urban Design and Amenities	8				
TOTALS		30				
FINAL SCORE						

### TRANSIT ORIENTED DEVELOPMENT – SCORECARD RESULT RATING SYSTEM

Insert your 'final score' into the appropriate band below to determine the project's rating; from 5 stars to 0 stars as described below:

Final Score Band	Rating		SMART BAR
91 – 100%	*****	5 star	
81 – 90%	****	4 stars	
71 – 80%	***	3 star	
61 – 70%	**	2 star	
50 – 60%	*	1 star	
Less than 50%		No stars	

# **APPENDIX A:**

## **CASE STUDIES**

## New Delhi, India

### CITY PROFILE:

Population	: 11,007,835 (2011)
Land Area	: 1484 Sq. Km
Gross Density	: 7,418 Persons /Sq. Km
Urban Area Density	: 11,297 Persons /Sq. Km <sup>33</sup>
Per capita Income	: 2.01 Lakh (2012-13) <sup>34</sup>

### TRANSPORT MODE SHARE:

Walking	: 35%
Cycling	: 4%
Bus/ BRT/ Public Transport	: 31%
IPT / Taxis	: 7%
Motorised Personal Transport	: 23% <sup>35</sup>

### City Overview

Public transport in India’s capital city New Delhi is provided by buses and a metro rail system. Buses are the most popular means of transport catering to about 60per cent of the total demand. The state-owned Delhi Transport Corporation (DTC) is a major bus service provider for the city. The DTC operates the world’s largest fleet of environment-friendly CNG buses.

The Delhi Metro, a mass rapid transit system built and operated by Delhi Metro Rail Corporation (DMRC), serves many parts of Delhi as well as the satellite cities of Gurgaon and Noida. Under an agreement with NDMC, DMRC acquired land for the construction of metro rail and stations in New Delhi without any financial implications. NDMC is also constructing multi-level parking systems in collaboration with DMRC at various Delhi metro stations across New Delhi to increase parking space.

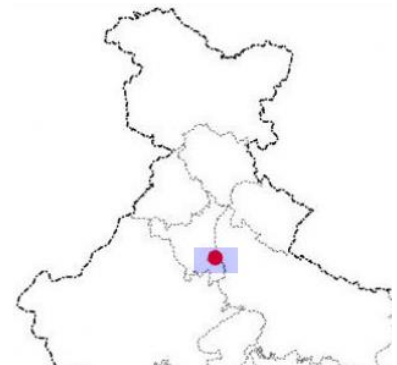


Figure 4-31: Location of New Delhi in India



Figure 4-32: Delhi Metro is the largest mass rapid system in India with a combination of elevated, at-grade and underground lines | Source: IBI Group

There are more than 6 million registered vehicles in the city—the highest in the world among all cities, most of which do not follow any pollution emission norm (within municipal limits)—while the Delhi metropolitan region (NCR Delhi) has 11.2 million vehicles. A working population of 70 lakh people in Delhi and NCR are estimated to lose almost 42 crore man-hours every month by having to commute between home and office by public transport through traffic congested streets and increasing traffic jams during peak morning and evenings hours. (See Table 4-4 below).

Table 4-4: Delhi's modal share, 2010

Mode of transport	Share	
<b>Private Modes</b>	<b>23 per cent</b>	
	Car/Taxi	9 per cent
	2 wheeler	14 per cent
<b>Public Modes</b>	<b>38 per cent</b>	
	Metro	3 per cent
	Train	1 per cent
	Bus	27 per cent
	Auto Rickshaw	5 per cent
	Cycle Rickshaw	2 per cent
<b>NMT modes</b>	<b>39 per cent</b>	
	Cycle	4 per cent
	Walk	35 per cent

Source: RITES Transport Demand Forecast Study for DoT, GNCTD, 2010 (as cited in the presentation of Mriganka Saxena, Sr. Consultant, UTTIPEC)

#### 4.8.2 Existing Transport Policies

In accordance with the changing transportation scenario in India over the last two decades, there has been a change in the policies at both the national and central levels. Following are details of each:

1. National Urban Transport Policy–2006, recommends:
  - (i) Integrated land use and transport policy
  - (ii) Priority to the use of public transport & non-motorised vehicles

The National Urban Transport Policy, Government of India, states the following vision:

- To recognize that city residents occupy centre-stage and all plans should be for their common benefits and wellbeing;
- To make cities more liveable and develop them as “engines of economic growth” to power India’s development in the 21st century;
- To allow cities to evolve into an urban form that is best suited to their unique geography and is best placed to support the main social and economic activities that take place in that city; and
- To reduce car dependency and increase transit use by changing the morphology from Auto-City to Transit City.

2. Master-plan for Delhi –2021 has given a thrust to redevelopment and re-densification of existing urban areas and city improvement. It calls for a comprehensive redevelopment strategy for accommodating a large population, and strengthening of infrastructure facilities.

TOD Goals as per the MPD-2021:

- Mobility: Move more people not cars;
- Equity: Equal access to amenities;
- Affordability: Low income housing; and



### Institutional Framework: UTTIPEC

In order to address/tackle all issues related to Delhi's traffic and transportation system—such as mobility, congestion, traffic engineering/management, capacity building, adopting transport planning policies etc., the Delhi Development Authority has set up a separate body called UTTIPEC to deal with all Delhi's aforesaid transportation system matters.

The principle of this body is to ensure safe, affordable, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within Indian cities. Following are the institution's goals:

- Create safe, universally accessible, equitable and efficient street infrastructure;
- Implement multi-modal integration at all transit hubs and stops to enable safe, convenient and efficient transfers between modes with the aim to achieve the target modal share towards public transport;
- Promote Transit Oriented Development to induce people to walk and use public transport instead of private modes of transportation; and
- Encourage Parking Strategy as a Demand Management Tool.



Figure 4-33: Delhi Transport Corporation (DTC), Delhi's main public transport operated on CNG, has the maximum share of public transport modal split according to RITES, 2010 | Source: IBI Group

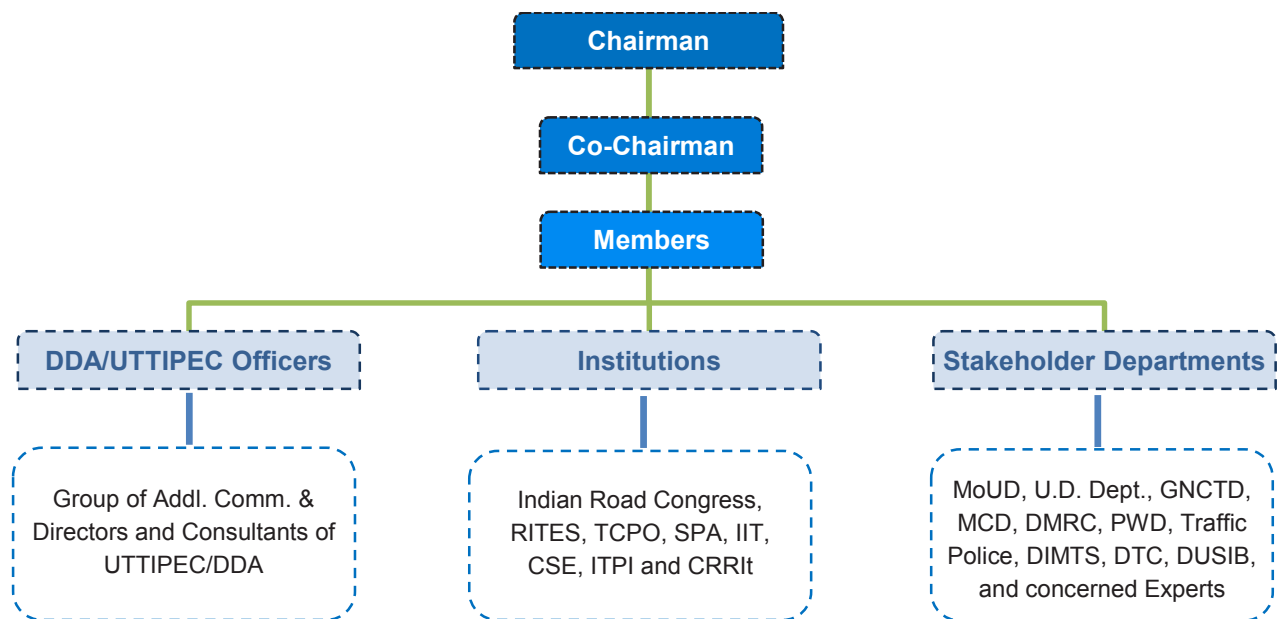


Figure 4-34: Flowchart for TOD Task force | Source: UTTIPEC, retrieved online from: [www.uttipee.nic.in](http://www.uttipee.nic.in)

### Highlights of UTTIPEC's TOD Reports and Guidelines

Following are highlights of the UTTIPEC's reports and guidelines related to TOD:

#### I. Vision of Transit Oriented Development and Introduction to TOD Policy

This document presents a comparative description/vision of the existing scenario vs. one after Transit Oriented Development has been implemented by detailing the daily life of a common Dehi-ite and the problems he/she faces as he/she drops children off at school, commutes to work, tries to access affordable food (depicting the problem of illegal hawkers), gets stuck in traffic on the journey home from work, stumbles across inadequate sidewalks, and deals with poor public transportation.

#### II. Conceptual Demarcation Plan for Phase – I Corridors

- Redevelopment within developed areas of the city would be permitted only when an overall Influence Zone Plan has been prepared for the station;
- While amalgamation is desirable it may not be a pre-requisite. Densification should be allowed in all plot sizes subject to the project complying to the approved Influence Zone Plan, so that incremental development and densification can start taking place;
- It is highly inappropriate to allow land banking in TOD zones. Penalties such as vacant land tax, etc. on underutilized land and/or underutilized FAR could be levied, in order to ensure time bound densification along with MRTS corridor. Such penalties should apply to all developers as well as Govt. bodies, to prevent inefficient use of valuable land;
- If the Influence Zone layout plan for the station area does not exist, individual developments housing a residential population of 10,000 shall be permitted subject to compliance with the TOD norms; and
- For projects accommodating residential populations above 10,000, the residents/ cooperative societies/ private developers should get the detailed layout and services plan prepared in consultation with the concerned authority for final approval. Variations from the existing influence zone plan prepared by DDA would be permissible subject to adherence to all TOD norms and Codes.

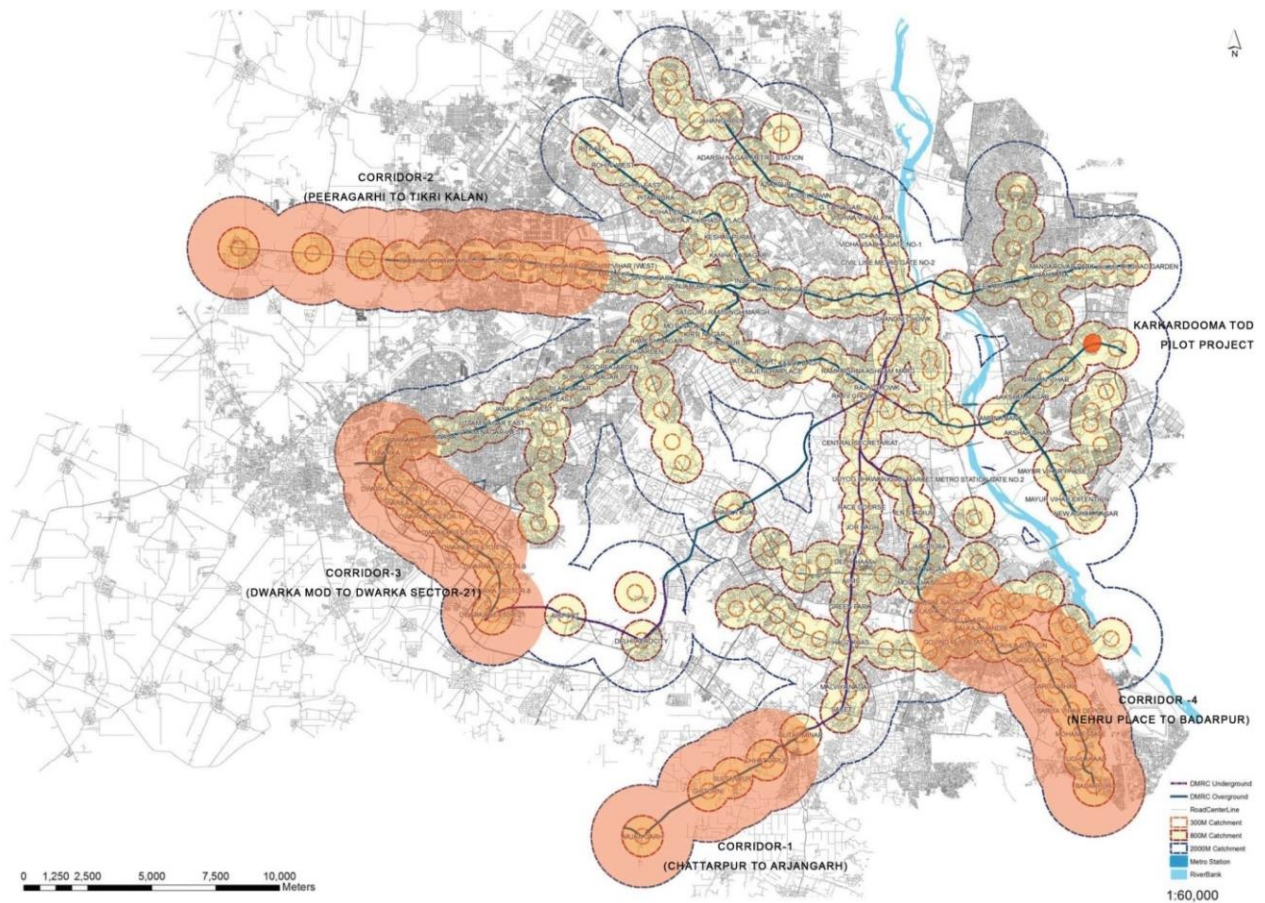


Figure 4-35: Example of TOD corridor planning along Delhi's Metro Rail system, exhibiting four corridors to be implemented in the first phase | Source: UTTIPEC, retrieved online from: [www.uttipeec.nic.in](http://www.uttipeec.nic.in)

### Influence Zone Plan Components

The entire influence zone is considered as “white zone” with mixed use permitted throughout the zone. All projects and sites within TOD influence zones may have a mix of uses. Intensity and type of mix would vary by distance from station, street hierarchy and network, and level of public transport and IPT service.

Following is a list of the four components of the influence zone plan:

1. Urban Design framework
  - Overall framework for movement structure, street hierarchy and landscape structure;
  - Net FAR and residential densities for each block within the influence zone; and
  - Vertical mix of uses for each TOD parcel and for parking.
2. Transport Impact Assessment
  - Integrated strategy for Public transport, Pedestrian and Cycle access;
  - Determining the optimum mix of uses to mitigate negative impact on surrounding land uses and transport networks;
  - Parking Strategy as a Demand Management Tool; and
  - Mitigation strategies for traffic noise and vibration.
3. De-centralized Infrastructure and Sustainability Plan
  - Solid Waste Management Strategy;
  - Energy Strategy maximising use of renewable sources; and
  - Integrated Infrastructure and Services Systems Plan indicating space requirements for all infrastructures.



#### 4. Economic Viability & Implementation Plan

- Determining a financially profitable mix of uses;
- Determining a financial model and delivery mechanism for affordable housing, public infrastructure and public; and
- Strategy for revenue collection from the Influence zone.



Figure 4-36: An illustration of development near TOD with a mix of land uses | Source: TOD: Policy, Norms, Guidelines, UTTIPEC, retrieved online from: [www.uttipeec.nic.in](http://www.uttipeec.nic.in)

#### Proposed Strategies for TOD

Following section presents strategies proposed by UTTIPEC for implementing key TOD components:

##### 1. Pedestrian and NMT Friendly Environments:

- Street Hierarchy;
- Minimum Walking Zone;
- Universal Accessibility;
- Multi-Functional Zone;
- Bicycle and NMT Infrastructure;
- Crossings;
- Medians and Refuge Islands;
- Street Lighting;
- Urban Utilities;
- Public Amenities;
- Traffic Calming Measures; and
- Public Art, Street Furniture and Educative Signage.

##### 2. Connectivity and Network Density:

- Finer and Complete Street Network; and

- Maximize Street Density to provide Pedestrian Short cuts.
3. Multi-modal Interchange:
    - Walkability and Mixed-use;
    - Station Area Planning (Priority to Pedestrians); and
    - Easy, Comfortable transfers between modes.
  4. Inducing Modal Shift:
    - Accessibility Guidelines For Social Infrastructure And Open Space;
    - Minimum Mixed-use Criteria; and
    - Parking Policy and Norms for Travel Demand Management.
  5. Place making and Ensuring Safety:
    - Street Edge Regulations;
    - Active Frontage (Mixed-use Edge Condition);
    - Minimum Ground Coverage; and
    - Vending Zones.
  6. High Density, Mixed-use Mixed-income Development:
    - FAR and Density Thresholds;
    - Open Space and Social Infrastructure;
    - Minimum Housing Mix Criteria (by Unit Sizes); and
    - Non-Permissible Uses and Desirable Uses within the 300 m Intense Zone.
  7. Physical Infrastructure and Resource Standards:
    - Water;
    - Energy;
    - Landscape;
    - Solid Waste; and
    - Incentives for Additional Green Building Compliance.

Transit Oriented Development in Delhi is therefore not just about redevelopment and re-densification along 500 m of MRTS corridors. It is about restructuring a Transit Oriented City.

### Lessons

This final section draws lessons from UTTIPEC's proposed Transit Oriented Development policy along the MRTS corridor in Delhi. The lessons learned are categorized under the four themes of Enable, Plan + Design, Invest, and Implement to understand their experiences in implementing integrated land use and transportation principles in the city's development process.

- Policy Intervention
  - Integration with Master Plan-2021 through inclusion of a chapter on Transit Oriented Development;
  - TOD policy to be implemented at local level through Station Area Plan by aligning them with existing framework of Local Area Plan (LAP);
  - Proposed new target for modal split as 80-20 (Public- Private Transport) by 2021 against the 60-40 modal split in Master Plan 2021; and
  - The Master Plan-2021 proposes the land pooling policy to encourage public-private land assembly and redevelopment of existing plots.
- The TOD Policy proposes identifying an 'Influence zone of 2000m'that is also designated as a



“white zone”, a type of landuse category that allows flexibility in mix of various possible uses, with the exception of polluting and potentially hazardous uses. The Influence Zone is further subdivided into three zones based on the intensity of development:

- Zone 1: Intense TOD Zone (300m),
  - Zone 2: Standard TOD Zone(800m), and
  - Zone 3: TOD Transition Zone (2000m);
- Adhering to the UTTIPEC’s Street design guidelines is mandatory for new development in TOD Zones;
  - The key components of Station Area Plan;
  - Multi-modal integration;
  - Mix of Housing applicable for all new and redevelopment projects within Zone 1 and Zone 2;
  - Decentralized infrastructure mandatory for all Station Influence Zone Plans;
  - Vending Zone(s);
  - Develop a TOD-based Urban Development Code with associated revisions to the Building Bylaws; and
  - Recommendations to the proposed parking Policy for Delhi to manage and control the parking supply and demand around the transit areas.
  - Mechanisms of cross subsidy, additional FAR and density bonuses for delivering affordable housing, public infrastructure and public transport facilities;
  - Strategy to collect revenue from TOD zones based on the cost of infrastructure provided coupled with the projected land values; and
  - Additional benefits for green building compliance such as:
    - Faster clearances from civic authorities
    - Reduced government fee for processing clearances
    - Additional FAR of 10% of the permissible/ availed FAR (excluding additional 15% of prescribed FAR for services), free of cost for the Gold and Platinum rated building.
  - Delhi Development Authority has established a separate body- UTTIPEC- to improve coordination between various agencies involved in planning and implementing transportation, land use and infrastructure policies in Delhi;
  - Proposed two parallel studies to implement TOD policy:
    - TOD pilot projects based on Greenfield, Infill and Redevelopment sites.
    - TOD combined modelling scenario for multi-modal transportation and land use coordination;
  - Formulated strategies, framework and benchmarks for public and private developer to adhere while preparing Influence Zone plan; and
  - Facilitated public participation through stakeholder consultations and workshops.

**DELHI TOD POLICY, UTTIPEC, 2015****MINISTRY OF URBAN DEVELOPMENT  
(DELHI DIVISION)****NOTIFICATION**

New Delhi, the \_\_\_\_\_th March, 2015

**S.O. .... (E).**- Whereas, certain modifications which the Central Government proposed to make in the Master Plan for Delhi-2021 as part of its review exercise which were published in the Gazette of India, Extraordinary, as Public Notice S.O.2975 (E) dated 26<sup>th</sup> November, 2014 by the Delhi Development Authority in accordance with the provisions of Section 44 of the Delhi Development Act, 1957 (61 of 1957) inviting objections / suggestions as required by sub-section (3) of Section 11-A of the said Act, within forty-five days from the date of the said notice.

2. Whereas, objections/suggestions received with regard to the proposed modifications have been considered by the Board of Enquiry and Hearing, setup by the Delhi Development Authority and also approved at the meeting of the Delhi Development Authority.

3. Whereas, the Central Government has, after carefully considering all aspect of the matter, decided to modify the Master Plan for Delhi-2021.

4. Now, therefore, in exercise of the powers conferred by sub-section (2) of Section 11-A of the said Act, the Central Government hereby makes the following modifications in the said Master Plan for Delhi-2021 with effect from the date of publication of this Notification in the Gazette of India.

**MODIFICATIONS TO RELATED CHAPTERS IN MPD-2021**

<b>Modifications to Chapter 3.0 DELHI URBAN AREA-2021, MPD-2021</b>		
<b>3.3 REDEVELOPMENT OF EXISTING URBAN AREA</b>		
<b>S. no</b>	<b>Existing Provision</b>	<b>Proposed Amendment</b>
<b>1</b>	<b>2</b>	<b>3</b>
<b>1</b>	<b>3.3.1 REDEVELOPMENT STRATEGY</b> The target areas for redevelopment will have to be identified on the basis of their need for up-gradation and potential for development. Redevelopment Schemes will be prepared by the respective local body / land owners / residents. The concerned local body should promote private land owners to take up assembly and redevelopment of a minimum area of 4 hectares. Some of the areas identified are:	<b>3.3.1. REDEVELOPMENT STRATEGY</b> The target areas for redevelopment will have to be identified on the basis of their need for up-gradation and potential for development. Redevelopment Schemes will be prepared by the respective local body / land owners / residents. The concerned local body should promote private land owners to take up assembly and redevelopment of <b>land as per the criteria below</b> . Some of the areas identified are:
<b>2</b>	<b>3.3.1.1 Planned Areas</b> <b>A. Influence Zone along MRTS and major Transport Corridor</b> Growth of Delhi over the years has been	<b>3.3.1.1 Planned Areas</b> <b>A. Influence Zone along MRTS Corridors</b> <b>The growth of Delhi has</b> over the years has

<p>on the ring and radial pattern with reliance on road based public transport. The development envisaged by the previous Plans was poly nodal with hierarchy of Commercial Centres located either on ring or radial roads. The proposed MRTS network will bring sizable urban area within walking distance from the proposed stations. This will have an impact on the existing structure of the city and consequently its development. This changed scenario provides opportunities for city restructuring and optimum utilization of the land along the MRTS corridors. In this process, a sizable proportion of the additional population with requisite facilities and employment can be absorbed along these corridors.</p> <p>Influence Zone along MRTS corridor is envisaged as intensive development zone. The scheme for Redevelopment of Influence Zone shall be prepared on the basis of the following:</p> <ol style="list-style-type: none"> <li>i) Maximum upto 500 m. wide belt on both sides of centre line of the MRTS / Major Transport Corridor (to be identified in consultation with GNCTD) will be designated as Influence Zone which will be identified in the respective Zonal Development Plans.</li> <li>ii) Entire approved layout plan of a scheme will be included in the zone if more than 70% of the plan area falls inside the influence zone. In case of large schemes, block / pocket boundary should be considered as one scheme for this purpose.</li> <li>iii) The approval of schemes will be granted only after commencement of execution of the respective phase of MRTS.</li> <li>iv) Development Controls applicable will be as permissible for the respective use zones / use premises.</li> <li>v) Higher FAR and height can be availed of through the preparation and approval of comprehensive integrated scheme.</li> <li>vi) In the proposed Urban Extension areas the land uses will be integrated with the proposed movement corridors at planning stages only.</li> <li>vii) The following areas shall be excluded</li> </ol>	<p>been on the ring and radial pattern with reliance on road based public transport. The development envisaged by the previous Plans was poly nodal with a hierarchy of Commercial Centres located either on ring or radial roads. The proposed MRTS network will bring sizable urban area within walking distance from the proposed stations. This will have an impact on the existing structure of the city and consequently its development. This changed scenario provides opportunities for city restructuring and optimum utilization of the land along the MRTS corridors. In this process, a sizable proportion of the additional population with requisite facilities and employment can be absorbed along these corridors.</p> <p>Influence Zone along MRTS corridor is envisaged as intensive development zone.</p> <p><b>The concept of Transit Oriented Development shall be adopted for development within the Influence Zone, such that maximum number of people can live, work or find means of recreation within walking/cycling distance of the MRTS corridors/ stations.</b> The scheme for <b>Development/ Redevelopment of Influence Zone</b> shall be prepared on the basis of the following:</p> <ol style="list-style-type: none"> <li>i) <b>About 500 m. wide belt on both sides of centre line of the existing and planned/approved MRTS Corridors</b> will be designated as Influence Zone which will be identified in the respective Zonal Development Plans, except for those corridor lying within the land pooling area and Low Density Residential Area (LDRA) of Urban Extension..</li> <li>ii) Entire approved layout plan of a scheme will be included in the zone if more than <b>50%</b> of the plan area falls inside the influence zone. In case of large schemes, block/ pocket boundary <b>may</b> be considered as one scheme for this purpose.</li> <li>iii) The approval of schemes will be granted</li> </ol>
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	<p>from the enhancement of FAR:-</p> <ul style="list-style-type: none"> <li>- Lutyens' Bungalow Zone, Chanakya Puri., DIZ Area and Matasundari Area.</li> <li>- Civil Lines Bungalow Area.</li> <li>- Monument Regulated Zone (As per ASI guidelines).</li> <li>- Comprehensive commercial schemes.</li> </ul>	<p>after <b>the approval/ notification</b> of the respective phase of MRTS.</p> <ul style="list-style-type: none"> <li>iv) Development Controls applicable will be as permissible <b>TOD Zone specified in Chapter 12.0 and 17.0.</b></li> <li>v) Higher FAR and height can be availed of through the preparation and approval of comprehensive integrated scheme.</li> <li><b>vi) This TOD zone may be also used as TDR absorption zone.</b></li> <li><b>vii) TOD norms will not be applicable to the following areas:</b> <ul style="list-style-type: none"> <li>- Lutyens' Bungalow Zone, Chanakya Puri</li> <li>- Civil Lines Bungalow Area.</li> <li>- Monument Regulated Zone (As per ASI guidelines).</li> <li>- <b>Zone-O</b></li> </ul> </li> </ul>
<p>3</p>	<p><b>3.3.2 GUIDELINES FOR REDEVELOPMENT SCHEMES</b></p> <p>The basic objective of redevelopment is to upgrade the area by implementing specific schemes on the basis of existing physical and socio-economic conditions in the following way:</p> <ul style="list-style-type: none"> <li>i) Influence Zone along MRTS Corridor and the Sub-Zones for redevelopment and renewal should be identified on the basis of physical features such as metro, roads, drains, high tension lines and control zones of Monuments / Heritage areas, etc.</li> <li>ii) The residents / cooperative societies / private developers should get the layout and services plan prepared in consultation with the concerned authority for approval.</li> <li>iii) Within the overall Redevelopment / Regularisation plans, building plan approval shall be at following two stages:             <ul style="list-style-type: none"> <li>a) Planning Permission for an area of around 4 Ha. This permission may not be required in case an approved layout/ Redevelopment/ Regularisation plan exists.</li> <li>b)                 <ul style="list-style-type: none"> <li>1. Cluster Block for a</li> </ul> </li> </ul> </li> </ul>	<p><b>3.3.2. REGULATIONS FOR REDEVELOPMENT SCHEMES</b></p> <p>The basic objective of redevelopment is to upgrade the area by implementing specific schemes on the basis of existing physical and socio-economic conditions in the following way:</p> <ul style="list-style-type: none"> <li>i) Influence Zone along MRTS Corridor and the Sub-Zones for redevelopment and renewal should be identified on the basis of physical features such as metro, roads, drains, high tension lines and control zones of Monuments / Heritage areas, etc. <b>and designated as TOD Zone with additional norms applicable as per Section 12.18.</b></li> <li>ii) The residents / cooperative societies / private developers should get the layout and services plan prepared in consultation with the concerned authority for approval.</li> <li>iii) Within the overall Redevelopment / Regularisation plans, building plan approval shall be at following two stages:             <ul style="list-style-type: none"> <li>a) Planning Permission for an area of around 4 Ha. <b>However, in TOD Zone, comprehensive schemes shall be considered for a minimum area of 1Ha.</b> This permission may not be required in</li> </ul> </li> </ul>

<p>minimum area of 3000 sq.m. The owners should pool together and reorganise their individual properties so as to provide minimum 30% of area as common green / soft parking besides circulation areas and common facilities.</p> <p>2. Individual buildings shall be given sanction by the concerned authority within the framework of cluster block approval.</p> <p>c) The norms of Group Housing with respect to ground coverage, basement, parking, set backs etc. (except FAR) shall be applicable.</p> <p>iv) Amalgamation and reconstitution of the plots for planning purpose will be permitted.</p> <p>v) To incentivise the redevelopment a maximum overall FAR of 50% over and above the existing permissible FAR on individual plots subject to a maximum of 400 shall be permissible. Higher FAR shall however not be permissible in redevelopment of Lutyens Bungalow Zone, Civil Lines Bungalows Area and Monument regulated Zone.</p> <p>vi) In case of plots with service lanes, the lane area may be included in the scheme. However, no FAR / coverage will be granted and the area shall be used as public area.</p> <p>vii) The standards of housing density, minimum width of roads and community facilities can be relaxed, wherever justified, by planning considerations (e.g., pedestrianization of the area).</p> <p>viii) The Public and Semi-public uses and services like hospitals / tertiary health care centres, dispensaries, colleges, schools, police stations, fire stations, post offices, local government offices, parking etc. shall be retained in their present locations as far as possible and if not, relocated as part of the redevelopment scheme. Alternative</p>	<p>case an approved layout/ Redevelopment/ Regularisation plan exists.</p> <p>b)</p> <p>1. Cluster Block <b>approval may be given to DE</b> for a minimum area of 3000 sq.m. <b>only if an approved influence zone plan or integrated scheme for the area exists.</b> The owners should pool together and reorganise their individual properties so as to provide minimum 30% of area as common green / soft parking besides circulation areas and common facilities.</p> <ul style="list-style-type: none"> <li>• <b>In TOD Zone, 20% of the public recreational/ open space which shall be designed, developed and maintained by the DE and will remain open for general public at all times, failing which it will be taken over by Public agency. The location of such space will be tentatively indicated in the plan as mentioned in clause 12.18.1.</b></li> <li>• <b>At least 20% of land shall be handed over as constructed roads / circulation areas to the Government/ local body for public use. However FAR can be availed on the entire amalgamated land parcel.</b></li> <li>• <b>Land to be surrendered as roads/ public spaces to the extent of at least 10% shall be along one side, to be consolidated with the adjacent plot wherever applicable.</b></li> </ul> <p>2. Individual buildings shall be given sanction by the concerned authority within the framework of cluster block/ <b>integrated scheme approval. Single window clearance software may be used for approval of TOD projects which shall be notified by DDA separately.</b></p> <p>c) The norms of <b>Group Housing</b> with respect to ground coverage, basement, parking, setbacks etc.</p>
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<p>sites shall be indicated in the Redevelopment Schemes / Zonal Development Plans. Any change or addition thereof shall be in accordance with the overall policy frame prescribed in the plan.</p> <p>ix) Reduced space standards may be adopted for community facilities / social infrastructure for the areas mentioned in 4.2.2.2 B sub para (ii) 'social'. The land required for any public purpose may be acquired with the consent of the owner through issue of Development Rights Certificate in lieu of payment towards cost of land as per the prescribed regulations. The concept of Accommodation Reservation i.e. allowing construction of community facilities without counting in FAR may also be utilized.</p> <p>x) Subject to preparation and approval of integrated / comprehensive Redevelopment schemes and provision of parking and services, up to 10% of the FAR may be allowed for commercial use and 10% of the FAR for community facilities with a view to trigger a process of self-generating redevelopment.</p> <p>xi) The circulation pattern should include segregation of pedestrian and vehicular traffic, entry control, access of emergency vehicles to every block, provision of adequate parking etc.</p> <p>xii) Appropriate levies for increased FAR, and landuse conversion shall be charged from the beneficiaries by the competent authority as per prevailing rules / orders.</p> <p>xiii) Urban Design and Heritage to be ensured as per the guidelines.</p> <p>xiv) The land use shall be governed as per the Master Plan / Zonal Development Plan. The non-residential use will be permitted as per the provisions of the Mixed Use Regulations and Special Area Regulations.</p>	<p>(except FAR) shall be <b>applicable in all areas except TOD Zone where TOD norms shall be applicable.</b></p> <p>iv) Amalgamation and reconstitution of the plots for planning purpose will be permitted.</p> <p>v) To incentivise the redevelopment a maximum overall FAR of 50% over and above the existing permissible FAR on individual plots subject to a maximum of 400 shall be permissible <b>in all redevelopment projects, except in TOD Zone where TOD norms shall be applicable.</b> Higher FAR shall however not be permissible in redevelopment of Lutyens Bungalow Zone, Civil Lines Bungalows Area and Monument regulated Zone.</p> <p>vi) In case of plots with service lanes, the lane area may be included in the scheme. However, no FAR / coverage will be granted and the area shall be used as public area.</p> <p>vii) The standards of housing density, minimum width of roads and community facilities can be relaxed, wherever justified, by planning considerations (e.g., pedestrianization of the area).</p> <p>viii) The Public and Semi-public uses and services like hospitals, dispensaries, colleges, schools, police stations, fire stations, post offices, local government offices, parking etc. shall be retained in their present locations as far as possible and if not, relocated as part of the redevelopment scheme. Alternative sites shall be indicated in the Redevelopment Schemes / Zonal Development Plans. Any change or addition thereof shall be in accordance with the overall policy frame prescribed in the plan.</p> <p>ix) Reduced space standards may be adopted for community facilities / social infrastructure for the areas mentioned in 4.2.2.2 B sub para (ii) 'social'. The land required for any public purpose may be acquired with the consent of the owner through issue of Development Rights Certificate in lieu of payment towards cost of land as per the prescribed regulations. The concept of Accommodation Reservation i.e. allowing construction of community</p>
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		<p>facilities without counting in FAR may also be utilized.</p> <p>x) Subject to preparation and approval of integrated/comprehensive Redevelopment schemes and provision of parking and services, <b>a minimum 10% of the FAR may be for commercial use and 10% of the FAR for community facilities with a view to trigger a process of self-generating redevelopment.</b></p> <ul style="list-style-type: none"> <li><b>In addition, within TOD Zone, a minimum of 30% of overall FAR shall be mandatory for Residential use. This component comprises of 50% units of size ranging between 32-40 sq.m. and the balance 50% comprising of homes ≤65 sq.m. Indicative mix of uses within Zonal Plan landuses falling within TOD Zone are shown in Table 12.8.</b></li> </ul> <p>xi) The circulation pattern should include segregation of pedestrian and vehicular traffic, entry control, access of emergency vehicles to every block, provision of adequate parking etc.</p> <p>xii) Appropriate levies for increased FAR, and landuse conversion shall be charged from the beneficiaries by the competent authority as per prevailing rules / orders.</p> <p>xiii) Urban Design and Heritage <b>Conservation</b> to be <b>ensured</b> as per the <b>regulations/</b> guidelines.</p> <p>xiv) The land use shall be governed as per the Master Plan / Zonal Development Plan. The non-residential use will be permitted as per the provisions of the Mixed Use Regulations and Special Area Regulations. <b>The MRTS Influence Zone shall be designated as TOD Zone and norms shall be applicable as per Section 12.18.</b></p>
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**Modifications to Chapter 4.0 Shelter, MPD-2021**

**Annexure- 4.0 (I)**

S. no	Existing Provision	Proposed Amendment
1	i) In case if Metro Corridor is passing through villages in LDRA, development along Metro Corridor and Metro influence zone shall also be allowed in LDRA villages as per TOD policy.	<b>Transit Oriented Development (TOD) policy would not be applicable to the influence zone of MRTS corridors lying within the villages falling in Low Density Residential Area.</b>

## 12.0 TRANSPORTATION

The period between 1981 and 2001 and subsequently 2011 has seen a phenomenal increase in the growth of vehicles and traffic in Delhi. There has been a rise in per capita trip rate (excluding walk trips) from 0.72 in 1981 to 0.87 in 2001 and exponentially more in 2011. Keeping in view the population growth, this translates into an increase from 45 lakh trips to around 118 lakh trips in 2001 and 144 lakh trips till 2008. As per the Transport Demand Forecast Study (TDFS) undertaken by GNCTD and approved by the UTTIPEC in 2011, it is seen that between 2001 and 2008, the private motor vehicle trips have increased from 28% to 35% and non-motorized vehicle trips from 9% to 15%, however bus trips have unfortunately decreased from 60% to 42% of the total number of trips.

Besides the above, Delhi has developed as a seamless city and an urban continuum comprising of a number of rapidly growing towns in Haryana and UP. This has added to the flow and movement of traffic within Delhi.

Despite measures by way of increasing the length of the road network and road surface space through widening, construction of a number of flyovers / grade separators and, launching of the Metro, the traffic congestion has continued to increase unabated. This has its inevitable consequences in terms of accidents, pollution, commuting time, and wasteful energy / fuel consumption.

Based on the rate of increase in the number of trips between 1981 and 2001/2011, it is estimated that the total trips would rise to 280 lakh by the year 2021, including 257 lakh motorized trips and 23 lakh non-motorized trips. In this context, it needs to be noted that roads already occupy approx. 21 percent of the total area of the city, which clearly limits the potential for increase in road space.

Apart from the problems and requirements of transportation at the macro level, there are special problems in specific areas, particularly the old city, which deserve special attention. Special requirements also tend to arise from the mega events such as the Commonwealth Games.

The plan and strategy for transportation will have to be worked out in this background. The broad aim of this would be to ensure safe and economical commuting between place of origin and destination, convenient and quick access to all areas for all sections of the society, reduction of pollution and congestion, energy efficiency and conservation, safety for all sections of the road and transport users and, towards meeting these objectives, providing a significant increase in efficient rapid public transport systems and facilities with a corresponding reduction in individual private transport usage. This is in addition to pedestrianisation and properly planned use of non-motorised transport systems throughout the city.

The National Urban Transport Policy, 2006 had also recognized that 'people occupy center stage in our cities and all plans would be for their common benefit and well being and recommended to make our cities most liveable and to allow the cities to evolve into an urban form that is better suited to support the main socio-economic activities that take place in the city'. In addition, the National Mission on Sustainable Habitat (NMSH), 2011 provides various parameters 'to address the issue of mitigating climate change by taking appropriate action with respect to the transport sector such as evolving integrated land use and transportation plans, achieving a modal shift from private to public modes of transportation, and encouraging the use

of non-motorized transport”. The Transport policy for Delhi aims to deliver the objectives of NUTP and NMSH through its vision, policies, strategies and standards.

The Vision for Delhi is to have a mobility transition which will deliver a sustainable urban transport system for the city that is equitable, safe, comfortable, affordable, energy efficient and environment-friendly; a system that satisfies the mobility needs of all sections of the population and enhances their quality of life.

“The seven primary objectives of the Transport Policy are as follows:

1. 80:20 modal share, favouring Public Transport excluding walk trips by 2021.
2. Reduction in vehicular emissions to meet the national ambient air quality standard
3. Achieving Zero fatality through an uncompromising approach to reduction of fatalities of all road and transport users.
4. Safety and accessibility for all through safe, convenient, comfortable and barrier-free movement for all users,
5. Equity through equitable distribution of road space for all modes
6. Affordability by providing range of mobility options for all users
7. Efficiency in movement of people and goods”

The following strategy is proposed in order to meet these objectives:

- i. Preparation and operationalisation of an integrated and mutually complementary multi-modal transportation and traffic plan comprising the Road, Rail and Metro-rail network, so that work centers / residences are within a walkable distance.
- ii. The multimodal system will be integrated with safe facilities for pedestrians, bicyclists, differently abled persons, children, women and the elderly and Intelligent Transport System (ITS) enabled public transport, taxis and three-wheeled scooter rickshaws (TSR).
- iii. Optimal use and utilisation of the existing road network and full development of ROW by removing all impediments and equitable distribution of road space as per National Urban Transport Policy. All arterial roads will be restructured to allow for smooth and safe flow of buses non-motorised transport and pedestrians to minimize pollution and congestion.
- iv. Restructuring of the finer street networks and creating alternate access ways and reducing congestion on the existing roads to the extent possible. New Urban Link Roads should also be identified as additional or alternative links, wherever possible, to reduce congestion.
- v. Planning of new road network in such a manner as to prevent possibilities of future congestion by modifying road sections to promote use of public transport, non-motorized transport and walking, which would reduce use of private transport modes.
- vi. Making all roads usable and safe at all times for women, children, elderly and the differentially abled.
- vii. Planned and targeted expansion of the Metro-rail network.
- viii. Expansion and strengthening / restructuring of the Ring Rail System and sub-urban rail system.
- ix. Developing an integrated relationship between the bus, rail and metro-system to provide for seamless multi-modal transport, through provision of additional stations,

park and ride facilities, introduction of single multi-modal ticketing, etc. The choice of technology for the multimodal public transport system (Bus Rapid Transit System, Metro, Mono-Rail, Light Rail) be based on comparative cost-effectiveness analysis studies to ensure rapid development of public transport and to ensure judicious use of public funds. Public transport modes be made more reliable and affordable to the end-user to induce shift from private modes.

- x. Development of a comprehensive parking policy in line with the broad aims of the Plan for transportation mentioned earlier, including measures for linking new vehicle registration with owner parking facilities.
- xi. Establishment of a quick and efficient transport network between the NCR and the NCT of Delhi.
- xii. Provision of directional Goods and Passenger Terminals with adequate infrastructure.
- xiii. Review of the licensing policy and systems, and effective arrangements for training of drivers / transport operators.

### 12.1. INTEGRATED MULTI-MODAL TRANSPORT SYSTEM

Keeping in view the diverse built up physical forms within the city, it is logical to state that a single mode of transport cannot practically and effectively, serve the needs of the city. Accordingly, an Integrated Multi-Modal Transport System suitable for the overall structure of the city and at the same time interlinking the various sub-structures is necessary. It is envisaged that the future transport system shall consist of a mix of rail and road based systems which may include Metro Rail, ring rail, dedicated rail corridors for daily commuters, (IRBT / RRTS corridors as identified in NCR Plan 2021), Bus Rapid Transit System (BRTS), Bus (both State run and private), other mass transit modes as technologies become available and Intermediate Passenger Transport (IPT) including Feeder Services, Taxis, Auto-rickshaws and Cycle-rickshaws and private modes. In addition, all roads should be made pedestrian, bicycle/ non-motorized transport (NMT)-friendly and for children, elderly and the differently abled.

### 12.2. METROPOLITAN TRANSPORT AUTHORITY

Establishment of a single authority is the need of the hour for planning/development of an integrated system, implementation and enforcement of the policies, which may be framed in that context. Inter alia, this would help to avoid wasteful expenditure and other problems that could arise from duplication, overlap and even mutually exclusive / and contradictory facilities. Therefore, a single unified Metropolitan Transport Authority, on the lines recommended by the National Transport Policy Committee, needs to be established on priority.

### 12.3. ROADS

Delhi is planned on a ring - radial pattern with a hierarchical road network. Broadly, the road network is designed for regional, intra - city and local traffic. The proposed roads are classified taking into account the land use pattern and road system hierarchy with recommended right of ways as follows:

#### 1. National Highways

All National Highways (5 Nos.) are connected to the city's Ring-Radial arterial road network system resulting in regional traffic passing through the city in absence of any bypass. National



Highways Authority of India (NHAI) would incorporate the Street Design Regulations (Annexure-12.0 (I)) while designing the National highways in Delhi during strengthening/ re-designing/ widening/ upgrading of the National Highways in Delhi as per periodic maintenance by the road owning agency. The recommended Right of Way (ROW) is 90 meters, wherever possible. However, within the city it shall not be less than 60 meters. All the National Highways within the NCTD shall be access controlled upto the Delhi Border and follow regulations as per the Arterial roads.

## 2. Arterial Roads

Arterial Roads provide long distance mobility connecting one part of the city to another, carrying heavy volume of traffic of all modes. These include ROW above 30m, and need to have multi-modal high-capacity Public transportation systems apart from private motor vehicular movement space, in addition to fully segregated space for pedestrians and NMT.

## 3. Collector Roads

Collector roads provide connections between neighbourhoods and also connect local streets to arterial roads. All roads with ROW above 12m to 30m may be considered as collector roads. However, the existing roads which are less than 30m yet functioning as Arterial Roads on ground may be continued in future also.

## 4. Local Streets

These are intended for neighbourhood (or local) use on which through traffic is to be discouraged. The suggested ROW is 9 to 12 m in the existing and proposed urban area. These roads should be made pedestrian and bicycle friendly by using modern traffic calming designs to keep the speeds within limits as per design. A special cell should be set up within Transport Department for developing standards and guidelines for traffic calming designs and for their implementation in the whole city in a phased manner.

As a matter of general policy, it is proposed that for all categories of roads, the full cross section should be developed in future and no encroachments will be permitted on the existing road network. Further, the development of roads should start from the extremes ends of the designated ROW.

The following definitions for various components of Roads may be considered for planning and enforcement purposes:

- i) 'Right of way' (ROW) is a reserved space for movement of all modes of traffic which includes pedestrian, cycles, cycle rickshaws, buses, cars, scooter, taxis, autorickshaws, etc. ROWs are shown on the zonal plan and master plan of Delhi with designated widths. Space for services, underground/ overground utilities, public conveniences and amenities, vendors, drinking water kiosks, etc, must be planned and reserved within the row, without encroaching on walking space or motor vehicle movement space, as per street design regulations.
- ii) 'Carriageway' is a reserved space for movement of motorized vehicles only, in case segregated space is reserved for non-motorized vehicles within the ROW, and for mixed traffic in case segregated space is not reserved for NMT.
- iii) NMV/Cycle Track – is a reserved space for movement of non-motorized vehicles like cycle, cycle rickshaws and hand pull carts.
- iv) Cross section of the road- shows the typical space reservation along the width of the ROW for all motorized vehicles (cars, scooter, buses etc.) non-motorized vehicles (cycle, cycle

rickshaws etc.), pedestrians, medians, street furniture, utilities, etc. within the Right of Way (ROW).

Table 12.1: **Guidelines** for Road Hierarchy

	Arterial Roads	Collector Roads	Local Streets
RIGHT OF WAY	> 30 M	>12 - 30 M	9 - 12 M
SUGGESTED SPEED LIMIT	40-50 km/hr	20-30 km/hr	10-20 km/hr
SPEED CONTROL	Enforcement and Traffic Calming required	Enforcement and Traffic calming required.	Enforcement and Traffic calming required
BUSWAYS	Segregated busways (3.5M) per direction	Demarcated bus-lanes (3.3M) per direction.	No segregated bus lanes required.
MOTORIZED LANES	2 to 3 motorized lanes (min. 3.3 m wide each) per direction, excluding busways	1 to 2 motorized lanes (min. 3.1m wide each) per direction, excluding buslanes	No minimum lane width specification.
CYCLE/ NMV TRACKS	Segregated cycle tracks required; min. 2.5 m wide for two-way movement.	Traffic calming essential where segregated cycle lanes (min. 2.5m) are not provided.	No special provision for cyclists
SERVICE LANES	Service lanes required.	No service lane required	No service lane required
MEDIANS AND JUNCTIONS	Continuous median; all openings and intersections accompanied by signals and traffic calming.	Intermittent or No median; openings/ intersections accompanied by signals and traffic calming.	No medians; traffic calmed crossings, or mini roundabouts

**12.3.1. ROAD NETWORK AND CONNECTIVITY**

In the current scenario, only arterial roads are forming the network system of the city. There is complete absence of a secondary road network system resulting in restricted distribution of traffic over a network and concentration of even local traffic on arterial roads, resulting in congestion on these roads. Further, closure of medians all along arterial/ sub-arterial roads to have signal-free corridors, have restricted movement of traffic/ people between neighbourhoods on either side. Moreover, connections between colonies are also not planned to enable direct connectivity to local destinations, forcing people to come on to arterial roads to make even short local trips.

In order to reduce congestion on the existing roads, it is proposed to identify additional/ alternative links and access corridors to augment the current network, with the following measures:

- i. Augmentation of road network to distribute high traffic volume over multiple roads, instead of stand-alone corridor/ junction capacity improvement strategies.
- ii. Road networks to be planned with a vehicular route network of approximately 250m c/c,

as also specified in the NMSH parameters, 2011. Additional pedestrian/ NMT thoroughfares should be provided as required.

- iii. Road networks/ alignments need to be planned with minimum disruption of existing settlements/ structures and environmentally significant areas sensitive to such development.
- iv. All roads to be cleared from impediments and developed as per street design regulations (Annexure-12.0 (I)).
- v. Area level parking management should be taken up as part of network improvement for effective utilization of the capacity of roads to augment the network.
- vi. In urban extension, alignment of all right-of-ways should be based on ground realities to minimise disruption to existing settlements. The right-of-ways of zonal plan roads may be reconsidered as required, if network augmentation as per above criteria is achieved through a greater number of roads with smaller ROWs.
- vii. All UERs to be designed and implemented with a mass transit system such as a Metro, LRT, BRT etc.

### 12.3.2. ROAD MAINTENANCE AND MANAGEMENT

Factors like achieving good level of service and removal of impediments go a long way in providing safety and usability and all vulnerable road users. Therefore, the institutional mechanism for long term, regular maintenance and management of roads needs to be strengthened by all road owning and maintaining agencies. Maintenance of road and transport infrastructure should be part of construction and retrofitting projects by all road owning agencies.

### 12.3.3. INTERSECTIONS AND CROSSINGS

Intersections and crossings are the most crucial components of a road network system as they allow directional traffic to move through the junctions, resulting in complex movements and conflict points for MV, NMV and pedestrian traffic. Intersections must be designed to reduce delays and increase safety for all road users, with a priority to non-motorized and public transport modes. The design of intersections with proper signalization and signage, markings etc. is very important for regulated and safe movement of all modes. Road owning agencies concerned shall be responsible for installing the appropriate road signages and markings, and maintaining them on regular basis.

In Delhi the average distance of signalized intersections allowing movement of all modes, is very large. This creates barriers to movement of pedestrians, cyclists and public transport users for crossing the road or interchanging between modes or accessing destinations. To facilitate easy interchange between modes and allow local trips to be made on NMT or foot, mid-block crossings need to be provided at approximately every 250 metres or less, as specified in NMSH parameters.

In addition, pedestrians including children, women, elderly and the differentially-abled, must be given the shortest possible direct route to cross the street, therefore the most preferred crossing for them is "at-grade" with signalization, both at intersections and mid-block crossings.

Pedestrian signals should be synchronized with the nearest traffic signals, for smooth movement of traffic along with safe pedestrian/ NMT crossing.

Foot Over Bridges (FOBs) are to be considered as an exception, not the rule. They are to

be provided only under circumstances where no at-grade crossings are feasible. For rapid transit corridors, grade separated crossings such as FOBs may be considered in case no other solution is possible at grade.

Grade separators may also be provided at junctions as per codes, where thoroughfare traffic may be in high volume. Care must be taken that local level connectivity at the ground level and safe at-grade crossings are provided for all modes as per the criteria of this Section. In any case, grade separator should not be implemented as a standalone project but as part of a comprehensive network plan with traffic circulation system and traffic management measures for an influence area around the junction.

#### 12.3.4 REGIONAL NETWORK & CONNECTIVITY

The primary function of the regional road network is to provide strategic regional linkages for safe and efficient movement of both passengers and goods between the NCT and other regional centres. While this is essential, it is equally critical to ensure the mobility and safety needs of local communities and neighborhoods are not compromised.

In this regard, Regional Plan-2021 for NCR has proposed regional road connectivity and transportation connectivity like Regional Rapid Transit System (RRTS) which have been incorporated in the 'Sub Regional Transport Network Plan for Delhi' at (Annexure-12.0 (II)) for providing strong linkages between Delhi and its neighbouring states, with an efficient transportation links for performing work and other trips in a regular manner. The following strategies may be adopted:

- i)* Discourage vehicular trips external to Delhi to go through the NCT.
- ii)* All national highways within the NCT boundary to be treated as urban arterial roads and retrofit as per street design regulations (Annexure-12.0 (I)).
- iii)* To segregate passengers and goods movements to improve safety and efficiency.

#### 12.4. MASS RAPID TRANSIT SYSTEM (MRTS)

Mass Rapid Transit System may be defined as any system with capacity to carry greater than 10,000 persons per hour per direction. The Metro Rail System is one of the most important component of a Mass Rapid Transport System (MRTS) in the City. The Metro Rail network for the entire city has been identified in various phases, which comprises of a network of underground, elevated and surface corridors aggregating to **more than 300** Kms. and is expected to carry 108 lakh daily passengers with an average trip length of 15 Km. by 2021.

Phase I and Phase II of the network are already implemented and operational. Phase III is under implementation and Phase IV is in the planning stages. All corridors (including Phase-IV) are shown in the comprehensive 'Sub Regional Transport Network Plan for Delhi' at Annexure-12.0 (II).

It is expected that about 60% of the urban area will be within 15-minute walking distance from the proposed MRTS stations, after full development of the system. Additional areas could come within easy access and connectivity with the Metro Rail through inter-linkages with other transport modes. About 15% of urban area of Delhi is likely to be directly affected, and may undergo a dramatic impact and change. Further, due to development of economic activities along the Metro Corridors and optimization of connectivity provided by it, the ridership on the Metro is expected to grow substantially over time. Correspondingly, it is expected that vehicular trips may also progressively shift from road-based transport to

MRTS, particularly, with reference to the longer trip lengths (greater than 10 Kms) within the city.

To achieve the above potential impact of the Metro Rail System a number of measures will be necessary. These will include the following:

- i. Preparation of detailed plans to facilitate and encourage direct pedestrian access to the Metro Rail System/ Station.
- ii. Preparation of detailed multi-modal transport plans with reference to each major Metro Station, with particular reference to bus transport routes, which could provide inter-linkages and feeder arrangements.
- iii. Parking arrangements for all modes at Metro Stations, in particular for IPT and NMT modes along with all conveniences required for metro commuters.
- iv. Provision of Park and Ride facilities at identified points from where feeder bus services would be available, or convenient direct pedestrian access would be feasible.
- v. For any green open space/ recreational areas taken up by DMRC for construction purposes, adequate compensation of green space must be provided by DMRC by providing public spaces within the metro station plot/ premises, so that local population may also be served.

#### 12.4.1. SYNERGY BETWEEN TRANSPORT AND LAND USE

The concept of the Master Plan for Delhi 1962 was based on a poly-nodal, polycentric, distribution of work centres, largely based on road transport nodes. A major fall-out of this has been distortion between infrastructure, transport and land use. To achieve spatial balance, development should take place according to new corridors of mass movement. This has implications in terms of land use planning along the Mass Rapid Transport / Transit System. This would not only help to solve, to some extent, the enormous problems of mass transportation, but would also generate a dynamic potential for growth and employment. This is particularly true for the Metro Rail System. In this context the MRTS corridors upto 500m depth on either side from centre line of MRTS would require selective re-development and re-densification / intensification of existing land uses based on site conditions. The concept of Transit Oriented Development (TOD) needs to be adopted such that maximum number of people can live, work or find means of recreation within walking/ cycling distance of the MRTS corridors/ stations.

TOD is essentially any development, macro or micro, that is focused around a transit node, and facilitates complete ease of access to the transit facility, thereby inducing people to walk and use public transportation over personal modes of transport.

TOD is generally characterized by compact, high-density, mixed use development near new or existing high quality public transportation infrastructure that provides housing, employment, entertainment and civic functions within walking distance of the transit system. Pedestrian-oriented design features of TODs encourage residents and workers to use their cars less and ride public transit more.

The primary goals of TOD are to:

1. Reduce/ discourage private vehicle dependency and induce public transport use – through policy measures, design interventions & enforcement.
2. Provide public transit access to the maximum number of people through densification and enhanced connectivity.

A dynamic city-level integrated transport-land use model for Delhi needs to be prepared to assess transportation and landuse planning needs of the city. It is proposed that



integrated redevelopment schemes of the influence area of MRTS stations be prepared based on TOD principles.

#### 12.4.2 TRANSIT ORIENTED DEVELOPMENT (TOD) PRINCIPLES

- i. Pedestrian & Non-Motorized Transport (NMT) Friendly Environment
  - Design for pedestrian safety, comfort and convenience.
  - Create street-level activity and vibrant urban spaces.
  - Provide amenities and infrastructure for pedestrians, cyclists, NMT and public transport users.
  - All streets and public spaces shall be universally accessible.
- ii. Connectivity and Network Density
  - Disperse high traffic volumes of traffic over a network of streets rather than concentrating traffic on few major streets and junctions.
  - Provide the shortest direct route to pedestrians and non-motorized modes to station as well as between individual buildings/ complexes.
  - Integration of infrastructure development and travel demand management (TDM) strategies e.g. bus lanes, station plazas, intersections improvements, etc.
- iii. Multi-Modal Interchange
  - Minimize travel time and cost for majority of commuters. Provide multiple mode options for all sections of society with safety and affordability. Ensure reliable, frequent and affordable public transport systems/ networks across the city. Minimize the number and time required for mode transfers for maximum number of commuters.
  - Prioritize pedestrians, public transport, IPT and NMT modes over private modes in design and management of urban spaces.
- iv. Inducing Modal Shift
  - As far as possible, locate public transport stations, homes, jobs and civic facilities within easy access of each other, to incentivize walking and cycling/ NMT use especially for short distances.
  - Dis-incentivize private motor vehicle use. Limit supply and appropriately price private parking spaces to discourage private vehicle use in TOD Zones.
- v. Placemaking and Ensuring Safety
  - Create a safe, vibrant, comfortable urban “place”, by providing round-the-clock active streets and incidental spaces to relax. Introduce mixed land use and other informal street activities like vendors, etc. to promote round-the-clock activity and also promote informal surveillance.
  - Minimize boundary walls and setbacks of compounds, and build to the edge of the street R/W. Street walls with transparency, built-to-edge buildings, minimum setbacks and non-opaque fences help provide natural surveillance of public spaces.
- vi. High Density, Mixed-use, Mixed-Income Development near stations
  - Maximize densities within TOD, in order to facilitate maximum number of people walking or cycling, or use NMT or feeder services easily to access public transit facility.
  - In greenfield development, higher the density, lower the per kilometre infrastructure cost.

- Enable a balanced mix of jobs and housing along MRTS corridors coupled with caps on parking supply, higher housing affordability through design and technology options, and improved efficiency and equity in the resulting developments.

## 12.5. BUS

Apart from the Metro Rail System, buses will continue to be the other major public transport in the city. The Bus Transport system is presently estimated to carry around 23.40 lakh passengers per day (2002). Even after the introduction/ expansion of the Metro, major dependence will continue to be on Bus Transport as a form of comfortable and convenient public movement within the city. Therefore bus service needs to be made comfortable, affordable and reliable and safe so that is a viable alternative to private modes.

However, keeping in view the extension of road network in Delhi on one hand and the existing/likely congestion on the roads on the other, it is necessary to take steps for rationalization of Bus Transport. This would entail action on the following fronts:

- i. Bus routes in Delhi need to be rationalized to connect to Metro/ MRTS/ RRTS stations as well as local/ city level destinations to provide convenience to all bus commuters.
- ii. Park and ride facilities will have to be developed at important bus terminals.
- iii. The quality and design of buses would have to be significantly improved with a view to provide comfort and universal accessibility to the riders thereby making bus travel a part of an efficient mass public transport system which could also help to reduce private vehicle usage.
- iv. New bus terminals need to be planned and developed in strategic locations, except in Zone-O, to make the use of **public transport** convenient for all commuters.
- v. On all new arterial roads, road owning agencies to incorporate provision for **MRTS**, NMV lanes and footpaths, in addition to motor-vehicle lanes, as per the street design regulations (Annexure-12.0 (I)).

## 12.6. INTERMEDIATE PUBLIC TRANSPORT (IPT)

There should be vigorous effort to reduce private vehicle dependency and increase facility of public transport in all areas of the city. In areas that are not served by buses within 500 M walking distance from homes, alternative planned IPT systems need to be introduced to better serve the population. Definition of IPT is provided in Annexure-12.0 (I).

## 12.7. NON-MOTORIZED TRANSPORT (NMT)

### 12.7.1. BICYCLE / CYCLE-RICKSHAW

Bicycle/ cycle-rickshaw could be an important mode of travel, particularly with reference to short and medium trip lengths. To the extent that it meets individual or public transport requirements, it is a non-energy consuming and non-polluting mode of transport. However, there are several issues which have to be kept in view while planning in respect of these modes.

With a mixed type of fast moving traffic on the roads, travel by bicycle and rickshaws is very unsafe. Data has shown that although approximate 35% of population of Delhi owns cycles, only a fraction of them use cycles for commuting due to the lack of safe cycling facilities or cycle-parking facilities.

In so far as rickshaws are concerned, apart from issues pertaining to the aspect of mixed traffic, this mode also provides employment to a very large number of unskilled workers residing in the city.

In view of the above, the following actions should be considered/ taken:

- i. Prepare a cycling masterplan for the city that creates a network of routes integrating all arterial roads, eco-mobility corridors along nallahs, heritage routes, school precincts as well as other recreational routes.
- ii. On all arterial roads fully segregated cycle/NMT tracks should be provided with provision for safe parking in park and ride lots. Wherever full ROW is not available, the cycles/ NMT may be allowed to flow in mixed-traffic condition.
- iii. In urban extension, cycle tracks should be provided at the sub-arterial and local level roads and streets.
- iv. In all areas of the city, the use of cycles/rickshaw as a non-motorised mode of transport should be consciously planned along with pedestrianisation.
- v. Plan and implement city wide, affordable and accessible cycle sharing / rental schemes to encourage public transit users in particular and public in general to use cycle as a mode to perform their first and last mile journey as well as to make regular short trips without using private vehicles.

### 12.7.2. PEDESTRIANS

Walking is the most important and sustainable mode of transport. In Delhi, about 35% of the commuters of the city use walking as the only means of travel for short trips, in addition to public transport users. Therefore, the right to walk safely is a non-negotiable condition. For this, the following steps need to be taken:

- i. All roads must provide proper footpaths as per street design regulations (Annexure-12.0 (I) and adequate share of walking space within ROW.
- ii. All pedestrian facilities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments.
- iii. All impediments/ encroachments shall be removed from footpaths all over the city to create safe walking environment in all colonies, office /shopping areas, terminal areas etc which will encourage more people to walk.
- iv. As mentioned in the NMSH Parameters (MOUD, 2011), at least five safe street-level crossing opportunities per kilometre of road with approximately 250m being maximum spacing between two crossings should be provided. Depending on context, these crossings may be signaled and/ or traffic calmed to reduce vehicular speed and increase safety.
- v. Pedestrian Signals should be synchronized with the nearest full-traffic signals, for smooth movement of traffic along with safe pedestrian/ NMT crossing.
- vi. Pedestrian oriented vehicle-free spaces throughout Delhi need to be created. Major work centres, where large number of pedestrian networks emerge and culminate, should have enhanced facilities for the pedestrians.
- vii. New areas should plan for pedestrian zones, plazas, activity spaces based on locations of public transport nodes/ stations, employment centres, residential communities and local/city level destinations.
- viii. Street-level activity and well-watched streets need to be created through mixed-use, avoiding opaque boundary walls, creation of hawking/vending zones and round-the-clock activities, to ensure a safe environment for pedestrians.
- ix. Planning, design, implementation and maintenance of pedestrian routes and facilities needs to be prioritized.
- x. As per NMSH parameters, to create active streets for pedestrian security and enjoyment: (1) Primary pedestrian access for buildings should be from the main street, with location as per shortest walking distance from nearest bus-stop; (2) The main building facade

should face the street, located on the property line without setback or with active use within set back and transparent edge that contribute to street safety. Commercial frontages should have facades with minimum 50% transparency (untinted) to facilitate visual surveillance of streets, Compound walls, if present, should be transparent above a height of 100cm. High security government buildings may apply for exemption.

(4) Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas to activate the street and make it safe. Space to be planned for utilities including drinking water kiosks and toilets, so that the walking space is enhanced but not compromised.

## 12.8. TRANSPORTATION FOR SPECIAL AREAS

Central congested areas of the Walled City, Sadar Bazar, Karol Bagh and other similar areas like certain Trans Yamuna areas are characterized by heavy traffic congestion. In order to address this problem a medium capacity Mass Transit system comprising of BRTS, Light Rail Transit System (LRT) and battery operated bus system may be considered on selected routes based on feasibility.

For proper functioning of above said systems a restraint on the use of private modes and provision of parking would be required. This would be necessary in order to revitalize the area and to improve its environment quality. This will also increase accessibility to such areas considerably.

In order to manage the additional traffic of Metro stations at Old Delhi, Chandni Chowk and Chawri Bazar, the following management measures are required to be taken:-

- i. Need based traffic circulation schemes integrating various modes.
- ii. Improvement of major road stretches and intersections like Ajmeri Gate, Fountain Chowk, Fatehpuri Chowk, Kaudia Pul, Khari Baoli, etc.
- iii. Removal of encroachments from footpaths to facilitate smooth pedestrian movement.
- iv. The movement of heavy vehicles will continue to be banned in the Walled City. However, for the servicing of this area light commercial goods vehicles may be allowed during the night.

## 12.9. RAIL

In the National Capital Territory of Delhi both intercity and intra-city passenger movements are being catered to by the existing rail network comprising the Regional and Ring Rail Systems respectively.

- The ring railway system is currently one of the most under-utilized public transport systems of Delhi. It is still a very affordable mode of transport for long distance commuters due to its speed and low cost. However due to bad connectivity to the station areas, lack of integration with Metro and bus stops, etc. it is not considered a desirable option for long distance commutes.
- Incentives such as TOD may be provided to ring railway at particular stations which may overlap with Metro stations or Railway terminals, in order to generate cross-subsidy for improvement of the system.
- Railways must cooperate with city agencies in facilitating better connectivity, access and multi-modal integration at all their stations within city limits.

In order to improve the rider-ship on Ring Rail, the following is proposed:

- a) Restructuring land use around the following:
  - i. Anand Parbat
  - ii. INA Colony
  - iii. Pusa Institute
  - iv. Kirti Nagar
  
- b) Accessibility improvement and augmentation of infrastructure on ring rail stations:
  - i. Shivaji Bridge
  - ii. Bhairon Marg
  - iii. Kasturba Nagar (Sewa Nagar)
  - iv. Lajpat Nagar
  - v. Kirti Nagar
  - vi. Shakur Basti
  - vii. Sarai Rohilla
  
- c) Provision of Halt Stations on ring rail at the following locations:
  - i. Moti Bagh
  - ii. Bhairon Road
  - iii. Hans Bhawan (ITO)
  - iv. Ganesh Nagar
  - v. Preet Vihar
  - vi. Shyamlal College

The interchange points of Regional Rail, MRTS, Ring Rail and any other future rail network should be developed as interchange stations/ convergence zone where guidelines for multi-modal integration are to be followed.. The change over facilities should integrate ISBTs/ local bus stands/ feeder buses/ IPT modes, wherever feasible, and they should also include approach roads, pedestrian walkways, parking areas for various modes including feeder buses/ IPT modes and adequate public conveniences, etc.

## 12.10. MODAL SPLIT

The transport network is based on the modal split for Delhi to cater to 280 lakh trips by the year 2021 as given below:

### 1. Present Scenario

As per Modal Split (2001) among the vehicular trips, maximum 60% trips are being performed by buses, which include chartered and school buses. The personalised modes of transport are carrying about 35.9% of vehicular trips. The modal split projected for the years 2011 and 2021 is as follows:

**Table 12.1 Modal Split Projections**

Mode	Modal Split (%)	
	2011	2021
Public Transport (including Rail/ Light Rail/ MRTS/ IRBT/ Bus/ Tram)	70.25	80.0
Personal modes (including Personal Fast Modes / Hired Fast Modes/ Hired Slow Modes/ Bicycle)	29.75	20.0



### 12.11. INTERCITY PASSENGER MOVEMENT

In 2001, on a normal weekday 56.46% of the commuters visited Delhi by Road, 42.67% by Rail and 0.87% by Air.

**Table 12.2: Passenger Trips at Outer Cordons per Day**

Medium	Total Passengers	Commuters
Road	15.98 lakh (56.46%)	9.59 lakh
Rail	12.08 lakh (42.67%)	9.06 lakh
Air	0.22 lakh (0.87%)	N.A.

#### 12.11.1. RAIL

As per Regional Plan-2021 for NCR, the total of 625 trains including 253 long distance passenger trains and 176 EMU trains (suburban trains) were handled at the three major railway stations in Delhi viz. Old Delhi, New Delhi and Hazrat Nizamuddin. Apart from this, large number of goods trains move into and out of NCR. The commuter traffic in NCR is about 0.61 million per day.

Several directional Metropolitan Passenger Terminals (MPT) have been proposed to decongest the central area. These are:

- i. Anand Vihar, East Delhi
- ii. Bijwasan in Dwarka, South-West Delhi
- iii. Holumbi Kalan in Narela, North Delhi
- iv. Tikri Kalan, West Delhi
- v. Hazrat Nizamuddin, South East Delhi
- vi. Kashmere Gate, North Delhi

It is proposed to integrate the Inter State Bus Terminals with the direction metropolitan passenger terminals.

National Capital Region Planning Board has prepared 'Functional Plan on Transport for NCR-2032' which recommended the following eight Regional Rapid transit System (RRTS) corridors in the National Capital Region (NCR) with high speed rail based commuter transit system along with up-gradation of the National Highways from the present level of 4-6 lanes to 8-10 lanes:

S.No.	Corridor	Length
1	Delhi-Ghaziabad-Meerut	90
2	Delhi-Gurgaon-Rewari-Alwar	180
3	Delhi-Sonapat-Panipat	110
4	Delhi-Faridabad-Ballabgarh-Palwal	60
5	Ghaziabad-Khurja-Aligarh	83
6	Delhi-Bahadurgarh-Rohtak	70
7	Ghaziabad-Hapur	57
8	Delhi-Shahdra-Baraut	56

Following three RRTS corridors have been prioritized:

- i) Delhi-Sonipat-Panipat (111 km)
- ii) Delhi-Gurgaon-Rewari-Alwar (180 km)
- iii) Delhi-Ghaziabad-Meerut (90 km)

National Capital Region Transport Corporation (NCRTC) has been registered under the Companies Act to design, develop, implement, finance, operate and maintain RRTS in NCR.

RRTS stations should have direct interchange facilities with all integrated passenger terminals, metro stations and ISBTs to provide seamless travel facilities to commuters. Since RRTS is a Mass Rapid Transit System, Transit Oriented Development (TOD) along RRTS corridors shall be permissible as per the provisions of the Masterplan.

### 12.11.2. BUS

The total passenger trips per day catered by road-based transport are 15.97 lakh, out of which about 9.54 lakh (60%) are commuters. Majority of such trips are by bus.

Out of four new Interstate Bus Terminals (ISBT) as proposed in MPD-2001, only one at Anand Vihar in East Delhi has been developed as a part of Metropolitan Rail Terminal. The terminal at Dwarka (Bijwasan) has also been included in Dwarka Project. The remaining two terminals at Okhla (Madanpur Khadar) and Narela (Holambi Kalan) are yet to be developed.

In order to cater to the additional passenger requirements, it is proposed to develop the following ISBTs (10 Ha each) along the Metropolitan Passenger Terminals:

- i. At Bijwasan, Dwarka.
- ii. At Holambi Kalan, Narela Subcity.
- iii. At Sarai Kale Khan. The existing Bus terminal may be upgraded and be linked to Hazrat Nizamuddin Railway Station.
- iv. At Tikri Kalan.
- v. At Kashmere Gate.
- vi. At Anand Vihar.

Apart from above ISBT, it is proposed to identify exclusive bus terminal sites at the intersection points of NH and outer ring road/ ring road to cater to the passenger movement.

These may be developed at:

- i. Dhaula Kuan.
- ii. IFC Madanpur Khadar to relieve Intercity Passenger congestion at Ashram Chowk.
- iii. Tikri Kalan to relieve Intercity Passenger congestion at Peeragarhi Chowk.
- iv. Narela to relieve Intercity Passenger congestion at Outer Ring Road and G.T. Karnal Road Junction-Jahangirpuri Bypass.

A smaller Terminal at Narela Railway Station and ISBT along G.T. Road may be considered. This concept may be applied wherever possible to intercept Intercity Passenger Traffic at Arterial roads.

### 12.11.3. AIR

The International and Domestic air passenger movement in Delhi is catered to by Indira Gandhi International Airport and Palam Airport. This has been linked to other parts of the city and urban extension through the transport networks to facilitate fast movement.

Table: Distribution of Daily Air passengers (as per NCR Regional Plan-2021):

Passenger Traffic	International	30% of total passengers
	Domestic	70% of total passengers
Cargo Traffic	International	65% of total cargo
	Domestic	35% of total cargo

Indira Gandhi International Airport (IGIA) is the major airport in NCR. In terms of traffic volumes, it is second to Mumbai, and handles annually about 35.88 million passengers and 0.56 million tonnes of cargo traffic (2011-12). Presently it has three operational runways with a peak hour handling capacity of 75 aircraft movement. There are three separate terminal areas for domestic passengers, international passengers and cargo.

The Airport connects 60 destinations all over the globe through 51 international airlines. Of the passenger traffic, about 76% was generated within NCTD, 19% in NCR (excluding NCTD) and 5% beyond NCR. Besides, it is expected to handle a large quantity of cargo on commissioning of Delhi Mumbai Industrial Corridor (DMIC).

A strong and vibrant economy of Delhi Metropolitan Area provides a backdrop to a healthy demand for air travel. IGI Airport, Delhi has witnessed a phenomenal growth of traffic during the last few years both on account of business travel and leisure trips.

In order to meet the requirements of growing traffic and to upgrade the facilities to world-class standards, phased development of the airport has been initiated according to a Master Plan. The first phase of development has been completed in early 2010, in line with the Commonwealth Games. The airport has been connected by an expanded NH-8, as well as the MRTS by providing a rail station close to the passenger terminal to shorten the journey time. The development of the airport will also require augmentation of utilities serving the airport, particularly power supply, water supply and drainage facilities.

#### 12.11.4. GOODS MOVEMENT

With the expansion of commercial and industrial activities in Delhi Metropolitan Area, the goods movement within urban area and outside has grown considerably, leading to environmental deterioration in the city.

In 2001, on an average day, the goods movement by various modes at outer cordons in Delhi was as under:

**Table 12.4: Goods Traffic at Outer Cordons**

Road	68808 vehicles/day
Rail	1463 wagons/ day
Air	644 tonnes/ day

##### 1. Goods movement by Rail

Presently the goods are terminating as below: -

- Iron and Steel - Tuglaqabad (Bahadurgarh) thereafter by road to Naraina
- Food Grains - Delhi Cantt., Narela, Ghevra
- Coal - Badarpur Border, Rajghat, I.P. Thermal Power Station.
- Fruits and Vegetables - Naya Azadpur
- Fuel - Shakur Basti
- Cement - Shakur Basti, Naya Azadpur, Safdarjung Rail siding.

##### 2. Goods movement by Road

Out of the total Goods traffic volume, major share is handled by the points at NH-8, NH-1,

NH-24 and Kalindi Kunj. On an average day in 2001, about 68,808 goods vehicles were entering and/or leaving Delhi.

Movement of incoming /outgoing goods traffic in 2001, on different highways and other major roads on average weekday, is given as under:

**Table 12.5: Directional Distribution of Daily Goods Traffic in Delhi – 2001**

Name of Location	No. of Goods Vehicles	Modal Share (%)
South and South East		
Kalindi Kunj	9948	14.46
Badarpur Border (NH-2)	5993	8.71
North and North East		
Singhu Border (NH-1)	8542	12.41
Loni Border	4881	7.10
West		
Tikri Border (NH-10)	4460	6.48
South West		
Sirhole Border (NH-8)	9139	13.28
Dundahera Border	4933	7.17
East		
Ghaziabad Border (NH-24)	7914	11.51
Chilla Check Post	2101	3.05
Jhundupura	1376	2.01
Gazipur	2220	3.22

## 12.12. INTEGRATED FREIGHT COMPLEXES

Integrated Freight Complexes have been recommended for the integration of goods movement by road and rail. These would consist of wholesale market, warehousing, road for trucks and rail transport terminals so as to curtail the movement of heavy vehicles within the city. The freight complexes are to be located in the places where they intercept the maximum possible regional goods traffic entering Delhi.

Based on the pattern of goods traffic movement in Delhi, following four sites for Integrated Freight Complexes (IFC), are presently at various stages of planning and / or development and one more new site is proposed in Urban Extension area. These freight complexes shall be dedicated to meet the demand of Delhi's needs and not cater to the distributive requirements of regional goods.

- i. Madanpur Khadar (NH-2)

- ii. Gazipur (NH-24)
- iii. Narela (NH-1)
- iv. Dwarka (NH-8)
- v. New site in Urban Extension (Rohtak Road) Tikri Kalan

### 12.13. FUEL STATIONS

The environmental concerns have been constantly advocating identification of clean and environment friendly fuels. Presently, the main fuel types being used include: Petrol, Diesel and CNG. These fuels are being made available from Petrol Pumps and CNG stations.

With the advancement of technology some new types of clean fuels may also be used in future. CNG stations may be permitted in all use zones except in 'Regional Park/ Ridge', developed district parks and Zone 'O'. Petrol pumps are permissible in all use zones except in Zone 'O' and recreational use zone.

#### 12.13.1. FUEL STATIONS IN URBAN AREAS.

Fuel Stations are permissible on Master Plan / Zonal Plan roads and shall not be permitted in absence of an approved Zonal Plan of the area.

At the time of preparation of layout plans of various use zones namely viz. residential commercial, industrial, PSP facilities and other areas, the location of Fuel Stations should be provided as per the norms given in Table 12.6.

#### 12.13.2. DEVELOPMENT CONTROL NORMS AND PERMISSIBILITY

The regulations for locating the fuel stations -cum-service stations, the development control and permissibility shall be governed by the policy / decision by competent Authority / Government Notifications issued from time to time. Fuel stations shall be regulated by the following controls:

- i. Fuel stations shall be located on roads of minimum 30m ROW.
- ii. The plot size for fuel stations shall be minimum of 30m X 36m and maximum of 33m X 45m (75m X 40m for CNG mother station as per requirement).
- iii. The minimum distance of plot from the ROW line of road intersections shall be as follows:
  - a. For minor roads having less than 30m ROW- 50m
  - b. For roads of ROW 30m or more- 100m
  - c. Frontage of plots should not be less than 30m.
- iv. Maximum Ground Coverage: 20%, Maximum FAR: 40
- v. Maximum Height: 6m
- vi. Canopy: equivalent to ground coverage within set back.
- vii. Maximum 10 FAR permissible for non-inflammable, non-hazardous commercial activities subject to payment of conversion charges/ levies as may be prescribed by the government from time to time.
- viii. In case of existing petrol pumps the provision of maximum 10 FAR for commercial activity would be permissible only to those fuel stations / petrol pumps which conform to the controls given in i, ii, and iii, above subject to payment of appropriate fees/ levies/ misuse, penalty and other charges.
- ix. Dispensing capacity of CNG stations should be substantially increased to cater to the increasing demand from all types of CNG vehicles.



**Table 12.6: Norms for Fuel Stations**

S. No	Land Use/Use Premises	Norms
1.	Residential Use Zone	Two Fuel Stations (One Petrol Pump + One CNG station) per 150 ha. Of gross residential area
2.	Industrial Use Zone	Two Fuel Stations (One Petrol Pump + One CNG station) per 40 ha of gross industrial area
3.	Freight Complexes	Four Fuel Stations (Two Petrol Pumps + Two CNG stations) in each
4.	District Centres	Four Fuel Stations (Two Petrol Pumps + Two CNG stations) in each district centre
5.	Community Centre	Two Fuel Stations (One Petrol Pump + One CNG station) in each
6.	Public & Semi Public use zone	Two Fuel Stations (One Petrol Pump + One CNG station) in each PSP area.
7.	Security Forces Campus / Police/ Hospitals/Tertiary Health Care Centres/ Govt.	For captive use/ as per requirement.

**12.13.3. CNG SERVICE STATIONS:**

Already existing authorized CNG service stations for public transport vehicles may continue for this purpose alone, till regulations in this regard are notified or the Zonal Plans for such areas are finalized, whichever is earlier. While finalizing Zonal plans, efforts may be made to integrate such service stations in the Plan.

**12.14. PARKING**

With the phenomenal increase in personalized motor vehicles, one of the major problems being faced today is an acute shortage of parking space. In the absence of adequate organized parking space and facilities, valuable road space is being used for vehicular parking. The problem of parking in the city can be broadly divided into the following categories:

- i) Along streets
- ii) In planned commercial centres.
- iii) In residential colonies.
- iv) In the large institutional complexes.

Experience has shown that:

- (a) The provisions relating to parking within the plot area are normally not adhered to resulting in vehicles spilling over on to the roads and adding to congestion; and
- (b) The lack of enforcement and inadequate policy interventions has resulted in growth of parking demand along with growth of vehicles in the city.

In the above background, the whole subject of parking has become a matter of serious public concern and requires a carefully considered policy and planned measures to alleviate the problem to the maximum feasible extent in existing areas and for adequate provisioning with reference to future developments. As recommended by the Environment Pollution (Prevention & Control) Authority for the National Capital Region, the approach should be focused more on demand management (restricting vehicle numbers) through enforcement and pricing policy rather than only on increasing supply of parking.

Parameters for the National Mission on Sustainable Habitat (NMSH) of 2011 state that parking management strategies should be aimed at encouraging more efficient use of existing parking facilities, reduce parking demand and shift travel to non-private modes. Individual user of personal vehicle should pay for the use of the space for parking. Therefore, the 'user pays' principle should govern the pricing of parking. Parking is a consumer commodity, not a legal right. No subsidized parking is to be provided in public spaces. To ensure accessibility to maximum number of people, parking for para-transport / feeder modes/ NMT is to be prioritized and subsidized. In areas designated for public parking, short term parking must be prioritized over long-term parking, in order to maximize turnover and enable economic vibrancy. The parking policy for the Delhi aims to deliver the objectives of NMSH, through its vision, policies, following strategies and standards:

- Private vehicle must be parked on 'a fully-paid rented or owned' space, based on the 'user pays' principle.
- Parking management must be effectively used as a tool to reduce overall demand for parking space.
- Pricing and enforcement will be key drivers to eliminate or reduce long term on-street parking demand for private vehicles.
- Planning and design of public parking facilities (surface, underground or multi-level) in an area need to provide for all modes and include creation of pedestrianized areas/ public spaces in the area with necessary amenities.
- Parking is permitted in all use zones except Recreational Open space, which shall not be used or converted for parking. No environmentally sensitive lands shall be used/ converted for parking of any kind. Surface Parking would only be provided to meet the parking requirement of the park premise. Creation of underground parking structures within or under green recreational open spaces is prohibited under all circumstances.
- Parking spaces will be adequately provided on priority basis for IPT, pick and ride and feeder systems especially non-motorised transport and fully subsidized.

In this background, the following measures are proposed:

#### **12.14.1. PARKING STANDARDS IN USE PREMISES**

Parking is one of the utilities permitted in all use zones except in regional park/ ridge, recreational open space and parks as per the approved zonal plan/ layout plan. Parking standards have been prescribed in each use premises. However, where not prescribed, these will be followed as per standards given in Development Code section of the Master Plan. The standards given are in Equivalent Car Space (ECS) which include parking for all types of vehicles i.e. cars, scooters, cycles, light and heavy commercial vehicles, buses etc. as per Chapter 17: Development Code. Parking adequacy statement/study for large projects like Stadia, Shopping Malls, Multiplexes will be desirable. Mode-wise parking spaces are to be marked on drawings to be submitted for approval.

#### **12.14.2. PUBLIC PARKING**

Major efforts will have to come through the creation of public facilities in designated commercial/ work centres and other areas and corridors where significant commercial activity has developed by way of mixed use. In the context of the latter, it would also need to be linked to pedestrianisation within the identified areas. In the above context following steps would be necessary:

##### **12.14.2.1. PARKING MANAGEMENT DISTRICTS**

Parking Management District (PMD) provide comprehensive facilities for all modes

including pedestrians, NMT, cycle tracks, NMT and IPT parking, vending zones, bus stops, public amenities, etc. in addition to on-street and/or off-street parking for private vehicles. PMDs are to be planned to improve availability of on-street and off-street parking and promote greater walking, cycling and public transport use. A PMD provides more net available parking space in an area by increasing parking turnover through good design, management and pricing strategies. A portion of the revenue generated could be used for local improvement of footpaths, cycle-tracks, and maintenance of facilities with involvement of the local communities.

Parking facilities to be provided as part of the overall PMD plan incorporating all modes, with a clear cut community benefit strategy. However, in the absence of PMD plan or depending upon the local needs of the area and subject to the availability of land, multi-level parking plots may be developed. In such cases, the development control norms as per para 12.14.3.7 shall apply.

Municipalities and/or planning bodies should develop detailed parking management plans for such districts, with physical design and demarcation of spaces on ground and strict enforcement. The following strategy should be applied:

- i. Total parking capacity of the PMD to be defined based on ground surveys, capacity analysis and Transport Impact Assessment if required.
- ii. Encroachments and impediments to be removed to provide more space for pedestrians, NMT, vending zones and public amenities.
- iii. 'Short-Term' and 'Long term' parking spaces with the PMD must be identified, demarcated and priced appropriately to reduce demand, and be managed by a single agency.
- iv. Stringent provisions by way of fines and other penal actions need to be provided for violation of parking rules. Proper signage and markings must be provided to enable effective enforcement.
- v. A graded parking fee structure should be evolved as a measure of parking demand management, and encouraging use of public transport.
- vi. In congested areas, 'park and walk'/ 'park and ride' facilities may be planned in PMDs. Street improvements must be implemented in about 10-minute walking catchment of such facilities to make it comfortable and convenient for commuters/ shoppers.
- vii. All existing areas of concentration of business/ commercial activity, where absence of adequate parking and congestion is visible, should be identified and listed based on studies of vehicle/ modal volumes. Comprehensive area level PMD plan must be prepared by local bodies in consultation with planning bodies, multi-disciplinary experts and local stakeholders.
- viii. Major corridors along which commercial activity has grown over the years by way of mixed land use should be identified and taken up for redevelopment with a major objective being the identification and development of areas for parking, green development and pedestrianisation.
- ix. In all new Commercial/ Business/ Industrial centres, adequate parking on the surface as well as below and above the ground must be provided.
- x. The development of multi level parking facilities may be taken up, wherever, feasible

in a public private partnership framework, with private sector investment and involvement.

- xi. Entire stretches of road or areas other than the demarcated/ designated/ managed parking areas, should be declared as 'no parking zones' in the PMDs. Enforcement agency/ traffic police to be responsible for penalizing, removing or taking action against violators.
- xii. Advanced public information systems regarding parking supply availability should be provided through websites, on-ground display and digital media, to guide people in making travel/ mode choices.
- xiii. The use of basement wherever provided for parking, must be strictly adhered to.
- xiv. Serious consideration should be given to evolve a policy linking registration of new vehicles to availability of owner parking facilities.
- xv. All encroachments on land earmarked for public parking should be removed.
- xvi. Wherever feasible, space on roofs, under stilts and basements should be exploited to the optimum for parking so as to reserve the maximum ground space for landscape development, pedestrian movement, etc.

### 12.14.3. PARKING PRICING

The supply of free/ inexpensive parking at the final destination is a key decision factor for people choosing to drive a personal vehicle, rather than taking a bus, Metro, IPT, NMT, walk or carpool. It is suggested that the following pricing strategies be employed to manage and bring down public parking space demand:

- i) Pricing of parking should be based on principle of 'user pay', reflecting the cost of the public good – precious urban space. Current parking rates in cities are low and act as a hidden subsidy to the car owners. Parking rates should be freed up and market driven. Parking revenue should be augmented and utilised to create a dedicated fund for public transport.
- ii) No government subsidized parking for private motor vehicles is to be provided in public spaces or roads. High parking fee should be charged in order to make the use of public transport attractive. Cycle parking space should be fully subsidized.
- iii) Implement localized variable scale of parking fee based on time, location and use based local demand and congestion levels. As a thumb rule – higher the congestion, higher the fee to be levied in the area to reduce parking demand.
- iv) Curb Spillover Parking Impact: Spillover parking from high-priced areas should be minimized (through pricing and enforcement) as it may cause excessive congestion within neighbourhood streets making access difficult for emergency vehicles. Market-rate parking pricing is to be applied to this entire zone, not just a few streets. The entire area should be implemented as a PMD zone.
- v) Actual Parking pricing rates may be taken up by ULBs from time to time as per their notifications based on the above suggested principles.

#### 12.14.3.1. PARK AND RIDE

Apart from providing Park and Ride facilities with reference to integration between the Road and Metro Rail / Rail Transport systems, such facilities would also need to be provided to reduce the problem of parking on main arterial roads in the context of identified work and activity centres which may not be directly connected by the MRTS and to encourage use of public transport.

- (i) Park & Ride facilities for private vehicles should be provided at peripheral locations abutting Highways and MRTS/BRTS/RTS stations as per requirement, coupled with

excellent public transport linkages to the city centre and various work centres. Subsequently, highway entry tolls for private transport should be increased substantially to discourage private vehicle commutes and cross-subsidize public transport.

- (ii) Subsidized park and ride facilities for bicycle users with convenient interchange at all MRTS stations are a mandatory requirement, to promote this sustainable mode of transport.

#### **12.14.3.2. PARKING FACILITIES FOR BUSES IN DTC DEPOTS**

There is an acute shortage of parking facilities for buses in the city. Therefore, the planning for bus depots and terminals capacity and future requirement needs to be done comprehensively.

- i. As per norms of bus parking, adequate bus parking and terminal spaces in the city should be provided in the city.
- ii. The selection and allocation of depot lands needs to be planned in sync with the routing of both DTC and cluster buses, so that dead mileage and other losses to the transport agency may be minimized.
- iii. To ensure optimum utilization of land, multi-level parking for buses is to be prioritized. Norms for multilevel bus parking shall be as per 12.14.3.6 below.
- iv. As far as possible, all bus depots must function as Terminals as well.
- v. Large public parking facilities, underside of flyovers, wide arterial roads and underused areas of the city should be permitted for use in off-peak hours for parking of public/private buses and commercial vehicles, chargeable at appropriate rates.
- vi. Planning and provision of space for private buses, private commercial vehicles, trucks and logistics terminals at the peripheries of the city, need to be planned at the Zonal Plan level.

#### **12.14.3.3. PARKING FOR NMT AND IPT**

Fully subsidized parking facilities for IPT and NMT modes are mandatory at all terminals, stations and bus stops, on all roads of 18m and above (and not prohibited on any road), near all major public buildings and destinations. In areas where provision of adequate IPT/ NMT parking is not possible within ROW, setbacks of use premises may be acquired. Parking spaces for differently abled to be provided as per code.

#### **12.14.3.4. PARKING IN RESIDENTIAL AREAS**

Over the years a large number of the residential areas have been experiencing severe problems of vehicular congestion and shortage of parking space. Most of the parking is, in fact, being done on the road, which significantly reduces the carriageway width. The problem has been exacerbated by the traffic congestion generated by schools in residential use areas. Some measures required to alleviate the problem are:

- i. Parking of all vehicles of any residential building, group housing, commercial building etc to be provided within the plot area/ building only. Parking outside the plot area (i.e. on the ROW of road, public spaces) will not be permissible and should be penalized. RWA with the help of local police may enforce the same.
- ii. Road cross sections may be redesigned wherever possible to accommodate planned car parking along the residential streets, and also creating more surface movement space.
- iii. Paid on-street and off-street parking to be developed for long term and short term parking provisions.
- iv. Resident Welfare Associations will have to be called upon to participate in this process by raising contributions from the residents on the basis of objective criteria such as number of cars owned, etc.



- v. Problem of congestion arising on account of the traffic generated by schools have to be specifically addressed, and the main responsibility for putting up the required additional facilities has to be borne by the schools themselves.

#### **12.14.3.5. PARKING STANDARDS FOR PUBLIC PARKING**

Public parking for all modes may also be provided at designated/ demarcated locations at off-street parking locations in form of surface, underground or multi-level parking. Short term and long term parking should be differentiated and provided based on local demand and provided as per comprehensively planned Parking Management Districts (Section 12.4.2.1).

On-street parking may be planned as per Street Design Regulations (Annexure-12.0 (I)). Majority of on-street parking spaces should be for hired/ shared IPT and NMT modes. Only short-term parking for private modes may be provided on street.

Off-street parking may be provided as per the following:

#### **12.14.3.6. BI-LEVEL PARKING FOR PUBLIC BUSES**

Land is scarce and efficient use of land for bus parking is essential. At the same time, in order to reduce dead mileage and making buses travel to locations outside the city to depots in large plots of land, it is more desirable to provide them parking within developed urban areas in multi-use multilevel parking facilities with bus-parking in upper-basement and lower ground levels, and parking for smaller vehicles may be provided in other levels

Within developed urban areas, bi-level parking should be developed as mixed use projects with the following norms:

- i. Minimum Plot Size – 20,000 sq.m.
- ii. An FAR of 100 is permissible over 50% of plot area. Norms for podium based buildings shall be applicable as per Chapter 17: Development Code.
- iii. Operational structures and circulation areas may cover 100% of the plot area and shall not be counted towards FAR. The site must accommodate at least the required bus parking space on site at the rate of minimum 1 bus per 70 sq.m.
- iv. If the bus depot site lies with the MRTS influence zone, Norms as per 12.18.1-2 shall be applicable.
- v. The maximum height shall be as per local constraints like flight paths, heritage zones, etc.
- vi. There will be no restriction on the number of levels of basement subject to structural safety, or till minimum 1 m above post monsoon ground water level of the site or safe distance above post monsoon ground water table.
- vii. In case of integrated schemes, development controls including height shall be as per approved scheme or as per local restrictions if any.

#### **12.14.3.7. MULTI-LEVEL PARKING FOR PRIVATE MODES**

Several multilevel parking projects have been implemented by local bodies/ agencies in the recent past. It has been seen that none of the parking lots are being used even to half their capacity due to availability of unlimited subsidized parking on streets/ public spaces in the vicinity of these projects. In other words, low-pricing of on-street parking is leading to failure of off-street multilevel parking facilities.

Therefore, multi-level parking projects should be integrated as part of comprehensive PMD schemes at designated locations. In order to ensure viability of the projects and optimum use, strict enforcement and appropriate pricing of on-street parking, is required. Preferably, on-street and off-street parking (including multi-level) should be managed and enforced by a single agency. All multi-level or exclusive parking facilities for private parking shall also provide at least 10% of total space provision for IPT modes, NMV and feeder buses, as per local requirement.

Detailed regulations and comprehensive parking policy may be worked out subsequently, in consultation with all stakeholders.

For plots for multi-level car parking already earmarked/ designated by local bodies, the existing development control norms will continue, as follows:

- i. Minimum Plot Size – 1000 sqm.
- ii. In order to compensate the cost of Multi-level parking and also to fulfill the growing need of parking spaces within urban area, a maximum of 25 % of gross floor area may be utilized as commercial / office space.
- iii. In addition to the permissible parking spaces on max. FAR, 3 times additional space for parking component shall be provided.
- iv. Maximum FAR permissible shall be 100 (excluding parking area) or as per the comprehensive scheme. However, no FAR shall be permissible in plots / existing buildings where 5% addl. ground coverage is permissible (Refer para 8 (4) i) Parking Standards, Chapter 17.0 Development Code).
- v. Maximum ground coverage shall be 66.6%. The maximum height shall be restricted to permissible height of the land use in which the plot falls. There will be restriction on the number of levels of basement subject to structural safety.
- vi. In case of comprehensive schemes, development controls including height shall be as per approved scheme.
- vii. Number of basements - No Limit, subject to adequate safety measures.
- viii. For development of Multilevel Parking, models should be worked out to encourage the private sector initiative with restricted commercial component, not exceeding 10% limited to FAR 40 on the plot.
- ix. Specific proposals requiring relaxation in above-mentioned norms for already designated sites would be referred to the Authority.

#### **12.15. REGISTRATION AND LICENSING**

The aspects of registration and training of transport operators / drivers needs to be viewed as an important element of the overall transport plan and policy. Licensing system should be made strict to create awareness about traffic rules and regulations among road users.

#### **12.16. BARRIER FREE ENVIRONMENT**

A major consideration in the planning and design of outdoor and indoor movement should be such that people with disability, older persons women and children may move about without help from others. This requires that:

- i) All public spaces, paths and pavements shall be flat, uniform, non-skid and free from unnecessary obstacles with necessary features required as per codes for barrier-free movement.
- ii) Orientation points, guide routes, universal signage and auditory signals should be provided for the differently disabled;
- iii) Information and warning signs must be understandable, clear and well lit.

#### **12.17. TRAFFIC IMPACT ASSESSMENT (TIA)**

The goal of a traffic impact assessment is to determine potential impacts of traffic changes caused by large proposed developments on city level transportation infrastructure i.e. capacity of roads and transit systems, and to identify any infrastructure and transit improvements or mitigation measures needed to ensure that transport networks will operate acceptably and safely upon completion of the proposed development. Comprehensive policy about Traffic Impact Assessment (TIA) should be prepared and placed before the Authority.

The benefits of Traffic Impact Assessment are:

- i. Providing decision makers with a consistent basis on which to assess transportation implications of proposed development applications.
- ii. Providing a rational basis on which to evaluate if the type and scale of the development is appropriate for a specific site and what improvements may be necessary to provide safe and efficient traffic, pedestrian, cycling and transit flow.
- iii. Providing a basis for determining existing or future transportation system deficiencies that should be addressed.
- iv. Addressing transportation related issues associated with development proposals that may be of concern to neighbouring residents, businesses and other stakeholders.
- v. Providing a basis for negotiations for improvements and funding in conjunction with planning applications.
- vi. A traffic impact assessment may vary in scope and complexity depending on the type and size of the proposed development.

Table 12.7: Development Controls for Transportation

S. No.	Use Premises	Activities Permitted	Development Controls (4)			
			Area under Operation (%)	Area under building (%)	FAR *	Floor area that can be utilised for passenger accommodation
1.	Airport	All facilities related to Airport / Aviation Passengers as decided by Airport authority of India including watch & ward		-NA-		
2.	Rail Terminal/ Integrated Passenger Terminal Metropolitan Passenger Terminal	All facilities related to Railway, Passengers, operations, Goods handling, passenger change over facilities, including watch & ward, Hotel, Night Shelter.	All Rail Terminals / Integrated Passenger Terminals/ Metropolitan Passenger Terminals may be developed as per TOD norms, subject to traffic and transportation studies related to surrounding road network.			
3.	Rail Circulation	All facilities related to Railway Tracks, operational Areas including watch & ward.		-NA-		
4.	Bus	All facilities related to	50	50	100	25%

	Terminal/ Bus Depot	Bus & Passengers, parking including watch & ward, Soft Drink & Snack Stall, Administrative Office, Other Offices, and Hotel, Night Shelter, Commercial, Social infrastructure, Residential, Service Apartments, hostels.	(100 in case of multilevel parking)	<p>A Multilevel bus parking is permitted in all Use Zones except Recreational Open Space and environmentally sensitive areas.</p> <p>B Site must accommodate at least the required number of bus parking space on site at the rate of minimum 1 bus per 70 sq.m.</p> <p>C Additional multi-level bus parking norms shall be as per Section 12.14.3.6.</p> <p>D All bus depots/ terminals within Influence Zone of MRTS corridors excluding in Zone-'O' to be developed as per TOD norms (Section 12.18) except for those corridors lying within the land pooling area and Low Density Residential Area (LDRA) of Urban Extension.</p>
5.	ISBT	All facilities related to Bus & Passengers, parking including watch & ward, Bus Terminal, Soft Drink & Snack Stall, Administrative Office, hotel, Night Shelter, Commercial, Social Infrastructure, Residential, Service Apartments, Hostels		<p>a. Maximum Ground coverage:40%</p> <p>b. FAR: 100, subject to the following:</p> <ul style="list-style-type: none"> <li>(i) FAR shall be available on a maximum area of 10 ha. or area of site whichever is less.</li> <li>(ii) ISBT, including operational structures Maximum FAR 70</li> <li>(iii) Hotel / passenger accommodation and facilities Maximum FAR 30.</li> </ul> <p>c. Parking: In addition to the requirement of parking for ISBT / buses, parking for Hotel/ passenger accommodation and facilities shall be at the rate of 2 ECS per 100 sq.m. of floor area.</p> <p>d. The development shall be undertaken in a composite manner.</p> <p>e. However, ISBTs within Influence Zone of MRTS corridors to be developed per TOD norms (Section 12.18) except for those corridors lying within the land pooling area and Low Density Residential Area (LDRA) of Urban Extension.</p>
6.	Toll Plaza	Toll collection booth, utilities, facilities and required infrastructure.		-NA-
7.	Road Circulation	All types of road, street furniture, vending zones, bus shelters, underground & over ground services utilities, signals, metro tracks as part of R/W, sub-ways, under-passes, ROB & RUB including watch & ward.		Development of roads shall be as per Street Design Regulations (Chapter 12, Annexure-12.0 (I))

8.	Metro Yards	Idle parking of coaches, washing and cleaning facilities, maintenance related facilities, watch & ward and staff related facilities.	80%	20%	100
			In case the Metro Yard falls within the Influence Zone of MRTS corridors, it may be developed as per TOD norms (Section 12.18.1&2) only if more than 50% of the Yard area lies within Influence Zone of MRTS corridors and/or they are developed as multi-storey yards.		

\* The F.A.R. is to be calculated on the Building Plot. Area under Bus Shelter not to be included in FAR.  
Development Controls for Metro Stations and Railway Stations/ Terminals:

1. Metro Stations along with property development (composite development) up to a maximum area of 3.0 ha shall be permitted in all Use Zones, except in Recreational and Regional Park / Ridge Use Zone, Lutyens' Bungalow Zone and Heritage Zones.
2. This enabling provision of property development would have the following broad development controls:
  - i. TOD norms as per Section 12.18 and 17.0 Development Code shall apply to all property development of metro/ railway stations, except for those corridors lying within the land pooling area and Low Density Residential Area (LDRA) of Urban Extension.
  - ii. Within about 500m of the metro station, pedestrians, public transport users, IPT and NMT modes need to be prioritized over private modes. The following guidelines for multi-modal integration may be followed:

Table 12.8: Guidelines for multimodal integration at metro stations

Approx. walking distance from exits	Facility/ amenity and preferred location:
Within 100 m	Bus stops; vendor zones; convenience shopping; cycle-rental station, high occupancy feeder stop/ stand, public toilets; pedestrian-only plazas.
Beyond 100 m	Private car/ taxi "drop-off" location only; validated car parking facility for metro users (park & ride) may be provided.
Within 500m	Cycle-rickshaw stand; cycle-parking stand; IPT/ auto-rickshaw stand, improved lighting, proper signage, information for modal interchange and way-finding; interchange between any two mass rapid transit modes (Railway, Metro, RRTS, etc.)

- iii. The development shall be undertaken in a composite manner and DMRC shall obtain approval of all the concerned local bodies/ agencies.
3. The following structures shall be treated as operational structures:
  - i. All Metro Stations and tracks supporting at grade, elevated and underground including entry structures, ancillary buildings to house DG sets, chilling plants and electric substation, supply exhaust and tunnel ventilation shafts etc.
  - ii. Depots and maintenance workshops.
  - iii. Traction sub-stations.



- iv. Operational Control Centers
- v. Police Station.
- vi. Recruitment and Training Centers for operational and maintenance staff
- vii. Housing for operational staff and Metro security personnel only
- viii. Rehabilitation work to be undertaken for the construction of Metro Project
- ix. Shops in Metro Stations to cater to the public amenities
- x. Structures above platform over the foot print of the Metro Stations

**12.18. DEVELOPMENT CONTROL NORMS FOR TRANSIT ORIENTED DEVELOPMENT (TOD)**

The Influence Zone of MRTS Corridors (as per Section 3.3.1 A) shall be designated as Transit Oriented Development (TOD) Zone where the following development control norms shall apply:

**12.18.1. FAR and Density:**

- a. TOD norms of FAR and density may be availed through the preparation and approval of comprehensive integrated scheme of minimum size 1 Ha, with maximum ground coverage of 40%. In case of MRTS/ Government Agencies, the minimum plot size for development shall be 3000 sq.m., but all other development norms apply as per this Chapter.
- b. Cluster Block approval may be given to DE for a minimum area of 3000 sq.m. only if an approved influence zone plan or integrated scheme for the area exists.
- c. For any integrated scheme, a max. FAR of 400 and a maximum density of 2000 persons per hectare (PPH) is permissible. The entire amalgamated plot will be considered for calculating the FAR and density. EWS FAR of 15% over and above shall be applicable. Additional FAR may be availed through TDR only, for schemes larger than 1 Ha.
- d. All residents residing in that scheme area shall have to be accommodated within the same scheme only, with no induced displacement of existing residential population.

**12.18.2. Mix of Uses:**

In all integrated schemes, a minimum of 30% of overall FAR shall be mandatory for Residential use, a minimum 10% of FAR for commercial use and minimum 10% of FAR for community facilities. Mix of uses and FAR utilization for the remaining 50% FAR shall be as per the land use category designated in the Zonal Plan.

Table 12.8: Indicative FAR utilization and mix of uses within various land use categories falling within TOD Zone (except Recreational):

Landuse as per ZDP (At Least 50% of total FAR to be as per ZDP Use)	Indicative Mix of Uses within FAR Utilization			
	Minimum Residential*	Minimum Commercial*	Minimum Facilities**	Indicative Mix of Uses within remaining 50% FAR, as per ZDP landuse
RESIDENTIAL	30%	10%	10%	<ul style="list-style-type: none"> <li>•Of the remaining FAR, at least 20% or more (upto 70% of total) is for Residential use.</li> <li>•Other uses are permitted upto 30%.</li> </ul>

COMMERCIAL	30%	10%	10%	<ul style="list-style-type: none"> <li>•Of the remaining FAR, at least 40% or more is to be for commercial use.</li> <li>•Other uses are permitted upto 10%.</li> </ul>
INDUSTRIAL	30%	10%	10%	Remaining 50% of FAR to be for Industrial use.
GOVERNMENT	30%	10%	10%	Remaining 50% of FAR may be for any Government use.
TRANSPORTA-TION	30%	10%	10%	Remaining 50% of FAR may be for any use after meeting all operational requirements for transportation facilities. Additional norms as per Table 12.7 are applicable.
PUBLIC AND SEMIPUBLIC FACILITES (PSP)	30%	10%	10%	Of the remaining FAR, at least 40% or more is to be for PSP use. Other uses are permitted upto 10%.
MIXED-USE	30%	10%	10%	Remaining 50% of FAR may be for any use.

Notes:

- \*1. The mandatory residential component shall comprise of 50% units of size ranging between 32-40 sq.m. and the balance 50% comprising of homes ≤65 sq.m. EWS FAR of 15% over and above the permissible FAR will be applicable.
- \*\*2. The mandatory facilities and commercial component shall include the requirements of the residential population in that land parcel.
- 3. DMRC/ RRTS/ Railways (MRTS) to be exempted from providing the minimum 30% Residential component which is part of the TOD norms applicable to all other DE. In case residential is provided in MRTS projects, the mix of dwelling unit sizes (for middle income group) may not be made applicable to DMRC/ RRTS/ Railways. Minimum scheme area for development to be relaxed to 3000 sq.m. for DMRC/ RRTS/ Railways (MRTS) agencies.

**12.18.3. Roads:**

- i. Of the area taken up for development as integrated scheme, at least 20% of land shall be handed over as constructed roads/ circulation areas to the local body/ road owning agency for public use. However FAR can be availed on the entire amalgamated land parcel.
- ii. Land to be surrendered as built roads/ public spaces to the extent of at least 10% shall be along one side, to be consolidated with the adjacent plot wherever applicable.
- iii. The roads handed over to govt. will be designed, developed, maintained and kept encroachment free by the DE and will remain open for general public at all times. Efforts shall be made to provide appropriate property tax rebates to Developer entities for keeping the roads/ public spaces encroachment free.
- iv. Road Networks to be planned with a vehicular route network of approximately 250m c/c and pedestrian network of approximately 100m c/c. Additional thoroughfares should be provided as required.
- v. The Authority will prepare/approve plans for TOD Zones indicating the ROW's, public spaces, build-to lines and connectivity links to Metro Stations and probable areas where

amalgamation can take place with land parcels of 1Ha or more. The regulations/ guidelines for creating arcades, boulevards, paseos, woonerfs and other active streets shall be tentatively indicated in the influence zone plans prepared/approved by the Authority.

#### **12.18.4. Green Public Open Space Provision:**

- i. 20% of the area of the amalgamated plot shall be designated as green Public Open Space which shall be designed, developed and maintained by the DE/agency and will remain un-gated and open for general public at all times, failing which it will be taken over by Public agency. The location of such space will be tentatively indicated in the plan as mentioned in clause 12.18.1.
- ii. The location and design guidelines for such spaces shall be tentatively indicated in the influence zone plans prepared by the Authority.
- iii. In addition to the above, at least 10% of plot area shall be in the form of Green/ Recreational area for the exclusive use, including circulation and common areas. In plots less than 1 Ha, this may be provided in the form of accommodation reservation i.e. as part of common terraces, rooftops, podiums, etc. .
- iv. Areas indicated as Master plan level/ Zonal Level Recreational will remain unchanged.

#### **12.18.5. Social Infrastructure:**

- i. Social Infrastructure may be allocated the required built-up area within planned re/development schemes in the form of Accommodation Reservation, instead of individual plots.
- ii. Open area requirement of the social infrastructure uses shall be accommodated/ integrated into the multi-use Public Open spaces provided in the area. For example, school playgrounds may be provided within the Neighbourhood Play Area.
- iii. After approval of the integrated scheme and demarcation of civic/PSP sites and recreational open space, change of use shall not be permitted.

#### **12.18.6. Green Buildings**

- i. The entire development has to be with minimum 3 star or gold rating as per approved rating agencies and appropriate rebate in the property tax may be applicable.
- ii. As the TOD development will take place through redevelopment and reconstruction, no levy on additional FAR is applicable except additional services charges.

#### **12.18.7. Impact Assessment**

Once the Influence Zone plans for TOD areas are prepared by DDA indicating the street networks, indicative amalgamations areas, location of public spaces, active edges, etc. a complete assessment of traffic generation and its dispersal, requirement of services, mitigation measures for environment impact will be done and got approved from bodies concerned so that the redevelopment process through TOD can be effective and beneficial for general public. Challenges arising during implementation need to be addressed progressively.

## Annexure-12.0 (I)

**Street Design Regulations:**

Based on the overall Mobility, Safety and Environmental Goals for the City, the following Regulations must be followed for design, execution, management and maintenance of all Roads:

**1. To Promote Preferable Public Transport Use:**

- 1A. Streets should be Retrofit for equal or higher priority for Public Transit and Pedestrians.
- 1B. Prohibit street parking or enforce high parking charges for private vehicles on public streets and spaces, in order to encourage use of other modes.
- 1C. Provide dedicated lanes for high occupancy vehicles (HOVs) and carpool during peak hours.
- 1D. Provide transit-oriented mixed landuse patterns and redensify city within walking distance of MRTS stops, wherever permissible.

**2. For Safety of All Road Uses by Design:**

- 2A. Limit speed by design on urban arterial roads and sub-arterial streets to 50kmph and on collector and local streets to 30kmph. Street design should be used as a means of limiting speed where possible aided by enforcement in the case of higher speed limit.
- 2B. Traffic calming of all streets with ROW of 12m or less, through narrowing of driveway and meandering path with use of trees, islands and street furniture. Speed should be limited to 20km/hr by design.
- 2C. Maximum kerb height shall not exceed 150 mm, as higher kerbs are difficult to climb for pedestrians causing them to walk on carriageways. Higher kerbs are also dangerous for speeding vehicles during off-peak hours as they may cause overturning of vehicles, accidents, etc.
  - Final road level should be fixed for all streets in the city. When repaving roads, previous layers must be scraped such that final road level remains the same.
  - Footpath level should never be more than 150mm above adjoining carriageway level.
- 2D. Intermittent buffers, bollards and other physical elements should be used to protect footpaths from encroachment by motor vehicle parking. However, such elements should not form a barrier, such as continuous railings, that constrain access to pedestrians. Active enforcement is required to protect encroachment of footpaths.
- 2E. Corner radius of Kerb should not exceed 12 m, in order to control speeding of vehicles at blind turns and intersections, causing accidents. No slip roads or free left turns should be provided on Collector or Local Streets. In case slip roads or turning pockets are provided on Arterial roads, safe at-grade pedestrian crossings with traffic calming and signal should be provided.
- 2F. Multi-Utility Zone (MUZ) of minimum 1.8 m width should be provided on all Collector and Arterial Roads, to accommodate bus stops, street utilities, trees, street furniture, planting for storm water management; IPT/NMT stands, paid idle parking, etc. so that these don't encroach upon the carriageway or safe pedestrian movement spaces.
- 2G. Secure parking facilities and services for cyclists/ NMT should be provided on all Collector and Arterial Roads.
- 2H. Provide Accessible Public Toilets at every 500-800 M distance – preferably located close to bus stops for easy access by pedestrians and public transport users.

### 3. For Pedestrian Safety, Comfort and Convenience on All Streets:

- 3A. Pedestrians should remain at ground level with comfortable and safe access and minimum detours from the most direct path, unless there is no other alternative.
- 3B. A continuous unobstructed footpath on each side of all streets with ROW wider than 12m. Minimum width of footpath should be 1.8m (with clear height 2.4 m.) in addition to space for trees/greenery/vending spaces and surface utilities. Width of footpath shall be determined based on pedestrian volume and have to be wider than 1.8m wherever required.
- 3C. Frontage Zone or Dead Width: For sidewalks in shopping areas, an extra 1m should be added to the footpath width. In residential areas, a dead width of 0.5m may be added.
- 3D. On streets with ROW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire ROW should be notified for pedestrianization. Streets may be considered for pedestrianization even if pedestrian traffic is lower than 8000 per hour depending on the potential to improve economic activity and/or safety and convenience.
- 3E. Elevation of footpaths over the carriageway at all times should be <150 mm and adequate cross slope for storm water runoff. The elevation should be low enough for pedestrians to step onto and off of the footpath easily.
- 3F. All facilities and amenities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments.
- 3G. At least 5 safe Street-Level Crossing Opportunities per kilometer of street with 250m being maximum spacing between two crossings. Depending on context, these crossings may be signalized and/or traffic calmed (through raising crosswalk over street level by 150mm) to reduce vehicular speed.
- Pedestrian refuge with a minimum width of 1m at each street crossing location after crossing 7m of one way motor vehicle carriageway or 10m of two way motor vehicle carriageway at non signalized midblock crossings. Pedestrian refuge width may be expanded to 1.75m where possible to accommodate a bicycle.
  - Grade separated structures (foot-overbridges and pedestrian-subways) should be avoided to prevent unnecessary detours to reach destinations.
  - If grade-separated pedestrian crossings are unavoidable due to presence of highways in peripheral zones of urban areas, then such crossings structures should be frequent. There must be at least 4 crossing opportunities per kilometer in areas with development at edges. Every crossing should be universally accessible.
- 3H. Natural Surveillance or “eyes on the street” should be enabled on all roads by removing setbacks and boundary walls and building to the edge of the street ROW, wherever permitted as per norms. This would allow people from inside to look out on to the pavement, thus discouraging harassment of women on footpaths, bus-stops and public spaces.
- The main building facade should face the street, located on the property line without setback or with active use within set back and transparent edge that contribute to street safety. Commercial frontages should have facades with minimum 50% transparency (untinted) to facilitate visual surveillance of streets.
  - In case enclosure of sites is required, transparent fencing should be used above 300 mm height from ground level.
  - Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas to activate the street and make it safe.



Space to be planned for utilities including drinking water kiosks and toilets so that the walking space is enhanced but not compromised.

- 3I. Provide adequate low-mast Street Lighting for pedestrians and bicycles, in addition to any high-mast lighting provided for the carriageway. . Approx. 20 lux level is suitable for non-shopping areas and footpaths and 25-30 lux-level is required for shopping areas, bus-stops, Metro station exits and any areas where pedestrians are expected to gather or wait.
- 3J. Provide Dustbins, post-boxes, signage and other public amenities at street corners for high usability.
4. For climatic comfort for all Road Users:
  - 4A. Trees are an essential component for all streets – to provide shade to pedestrians/cyclists and reduce solar gain.
    - At least 125 trees per km for streets with ROW smaller than 12m. At least 125 trees per km per footpath on streets with ROW greater than 12m. Spacing of trees at no place should be greater than 12m except at intersections.
  - 4B. High albedo (diffuse reflectivity) materials should be used for paving to reduce urban heat island effect.
  - 4C. Built to Pavement Edge Buildings with overhangs and arcades provide good protection to pedestrians.
5. To ensure universal accessibility and amenities for all street users:
  - 5A. All facilities and amenities should be barrier free for universal access by all persons with reduced mobility including those with hearing and visual impairments, as per Codes.
  - 5B. Continuous barrier free pavement should be provided for ease of movement for elderly/ persons with disabilities. Pavement height of the footpath should be maintained at a constant level of 150 mm all along the ROW, for proper provision of table-tops/ ramps, etc. at various locations such as entry to properties, crossings, etc.
  - 5C. Provide at-grade crosswalks (and foot-over-bridges on highways or BRT corridors) at intervals of approx.70-250 M, aligning with location of transit stops, type of street / landuse activities and neighbouring building entries and destinations.
  - 5D. Provide Accessible Public Toilets should be provided every 500-800 M distance, preferably located close to bus stops for easy access by pedestrians and public transport users.
6. To reduce Urban Heat Island Effect and Aid Natural Storm Water Management:
  - 6A. Decrease impervious surfaces through permeable paving, tree planting zones, etc. to increase ground water infiltration & prevent seasonal flooding.
  - 6B. Integrate Natural Storm Water filtration and absorption into street design through bio-filtration beds, swales and detention ponds.
  - 6C. Decrease Heat Island Effect (HIE) by increasing greenery, planting trees, using reflective paving, etc.

#### 7. Intermediate Public Transport:

Intermediate Public Transport (IPT) are hired/shared modes of transport that may serve as feeders to trunk public transport systems or as another alternative to private transport use. IPT includes cycle-rickshaws, auto-rickshaws, e-rickshaws, taxis and any other vehicle type serving as a shared mode/ feeder service that is also prescribed under the Motor Vehicle Act. Taxis play an important role in providing an integrated transport service which should also be available on road like all other metro cities for people who choose not to use a car and combine taxi with

public transport for certain trips. Auto-rickshaws also play an essential role as a shared or hired mode of public transport which provide door-to-door connectivity for a variety of trips and provide an affordable alternative to private modes. Adequate space for IPT, Bus, private bus, truck and commercial parking must be provided on all Layout Plans.

8. Definition of Mass Rapid Transit System (MRTS):

Mass Rapid Transit System (MRTS) may be defined as any public transit system having the capacity to carry more than 10,000 peak hour peak direction trips (PHPDT).

Annexure- 12.0 (II)  
**Sub Regional Transport Network Plan for Delhi**



**LEGEND**

- NCT Delhi Boundary
- Major Roads (60M & above R/W)
- Major Roads (45M & above R/W)
- Major Roads (30M & above R/W)
- Railway Line
- RRTS & Stations ( Approved in 36th GBM dated 10.412)
- MRTS Ph- I & II
- MRTS Ph- III
- MRTS Ph- IV ( Proposed)
- MRTS ( Proposed)
- Monorail ( Proposed)
- Integrated Transport Corridor/BRTS
- Integrated Transport Corridor/BRTS ( Proposed)
- Integrated Passenger Terminal
- Interstate Bus Terminal
- Integrated Freight Terminal
- Proposed Inter-State Roads (60M & above R/W)

- F1** Madanpur Khadar Integrated Freight Complex
- F2** Ghazipur Integrated Freight Complex
- F3** Narela Integrated Freight Complex
- F4** Dwarka Integrated Freight Complex
- F5** Tikri Kalan Integrated Freight Complex
- P1** Anand Vihar Metropolitan Passenger Terminal
- P2** Bijwasan Metropolitan Passenger Terminal
- P3** Holumbi Kalan Metropolitan Passenger Terminal
- P4** Hazrat Nizamuddin Metropolitan Passenger Terminal
- P5** Tikri Kalan Metropolitan Passenger Terminal
- P6** Kashmere Gate Metropolitan Passenger Terminal



MAP NOT TO SCALE  
FOR REFERENCE PURPOSE ONLY

Modifications to Chapter 15.0 Mixed Use Regulations, MPD-2021		
15.4 General Terms and Conditions Governing Mixed Use Other terms and Conditions		
S. no	Existing Provision	Proposed Amendment
1	<p>(v) Parking @ 2.0 ECS per 100 sqm built up area shall be provided within the premises. Where this is not available, cost of development of parking, shall be payable by the plot allottee / owner to the local body concerned. This condition shall apply even if residential premises are used only for professional activity.</p> <p>(vi) Common parking areas would be earmarked on notified mixed use streets taking into account the additional load on traffic and parking consequent upon notification of the street under Mixed Use Policy. If no parking space is available, land/ plot on the said street may be made available by Traders association, wherever possible, or acquired for construction of parking facilities, preferably, multi level parking. Development of such parking facilities shall be done by either the traders Association or by local bodies and may include public-private partnership as model for implementation.</p>	<p>(v) Parking @ 2.0 ECS per 100 sqm built up area shall be provided within the premises. <b>Residents/ traders' organizations/ private parties shall be responsible for providing for their own private parking facilities.</b> This condition shall apply even if residential premises are used only for professional activity.</p> <p>(vi) Common parking areas would be earmarked on notified mixed use streets taking into account the additional load on traffic and parking consequent upon notification of the street under Mixed Use Policy. If no parking space is available, land/ plot on the said street may be made available by Traders association, and <b>public shared parking facilities provided before approval/ notification of the said building/ project/ street as mixed-use.</b></p> <p>(vii) <b>Issues related to mixed-use streets for which conversion charges have already been levied by local bodies needs to be addressed by the concerned local body.</b></p>

Modifications to Chapter 17.0 DEVELOPMENT CODE, MPD-2021		
S. no	Existing Provision	Proposed Amendment
1	<p><b>CLAUSE 4.0 USE ZONES DESIGNATED</b> (New Use Zone Added)</p> <ul style="list-style-type: none"> <li><b>TOD ZONE</b> The TOD Zone shall be delineated in all relevant Zonal Plans as per 3.3.1.1A. This Zone shall allow flexibility in provision of a mix of various uses within the same plot, with the exception of polluting and potentially hazardous uses and activities as per C2 and PS2. Norms shall be applicable as per 12.18.</li> </ul>	
2	<p>8(3) REGULATIONS FOR BUILDING CONTROLS WITHIN USE PREMISES (New rows and notes added)</p>	

**Table 17.1: Minimum Setbacks (Other than Residential Plotted Development)**

S.No.	Plot size (in sq.m)	Minimum Setbacks			
		Front (m)	Rear (m)	Side (m) (1)	Side (m) (2)
1	Upto 60	0	0	0	0
2	Above 60 & upto 150	3	1.5 (avg.)	-	-
3	Above 150 & upto 300	4	2 (avg.)	-	-
4	Above 300 upto 500	4	3	3	-
5	Above 500 upto 2,000	6	3	3	3
6	Above 2,000 upto 10,000	9	6	6	6
7	Above 10,000	15	12	12	12
<b>Minimum Setbacks for integrated TOD schemes:</b>					
S. No.	Plot/ scheme size (in sq.m)	Minimum Setbacks			
		Front* (m) (for all edges facing a public ROW of 18m+)	Rear (m)	Side (m) (1)	Side (m) (2)
8	Above 3,000 upto 10,000	0	6	6	6
9	Above 10,000	0	12	12	12

Note:

- i) In case the permissible coverage is not achieved with the above given setbacks, the setbacks of the preceding category may be **allowed**.
- ii) **TOD schemes** shall be located on existing roads **having** a minimum width of 18m ROW (12m ROW for redevelopment areas, Slum Rehabilitation / Special Area and Villages).
- iii) The setbacks are subject to requirements of height and ventilation as per building byelaws. **However, TOD Schemes shall be planned as per above setback norms, while endeavouring to ensure that all dwelling units get a minimum 2-hour solar access in at least one habitable room on the shortest winter day, and have the option for natural ventilation. Relevant additions to building byelaws shall be made.**
- iv) In case a layout is sanctioned with more/**less** than the minimum prescribed setbacks, the same shall be followed in the sanction of the building plans.
- v) The Technical Committee of DDA may relax setbacks, ground coverage and height in special circumstances.
- vi) ESS wherever required to be provided within the plot, is allowed by shifting of side /rear setbacks.
- vii) **\*In TOD schemes, any edge of plot facing an existing public ROW >18m shall**



be considered as “front”.

- viii) For integrated TOD schemes, the main building facade(s) shall face the public street(s) without setback and have an active frontage as per Table 17.2 below, to facilitate visual surveillance of streets.

**Table 17.2: Minimum Active Frontage\* and built-to ROW line requirements.**

Facing Street Right-of-Way	Minimum Percent of Building Frontage at built-to R/W Line to have Active Frontage:
R/Ws of $\geq 12$ m	$\geq 50\%$
R/Ws of $< 12$ m	No minimum requirement

\*Active frontages include arcades, shop-fronts, entrance doorways, access points, entry/exits and transparent windows of active areas facing the main street. Commercial frontages shall have minimum 50% transparency (untinted) at ground floor level. The ground floor of all parking structures/ podiums or stilts must be lined with active frontage facing the main streets.

- i) Access and all other provisions shall be made as per Delhi Fire Service Act.
- ii) In the new layouts, underground pipelines for fire hydrants on the periphery, exclusively for fire fighting services shall be provided. Necessary provisions for laying underground/ over ground fire fighting measures, water lines, hydrants etc. shall be made by Authority/ local body.
- iii) In all TOD projects, boundary walls along any edge facing a public open space viz. pathway, road, park, etc. shall be prohibited. In case enclosure of sites is required, translucent fencing shall be used.

**3 8(4) PARKING STANDARDS**

Parking Standards have been prescribed in each use premises however, where it is not prescribed, it will be followed as given in the Table 17.2.

**Table 17.2: Parking Standards**

S.No	Use Premise	Permissible Equivalent Car Spaces (ECS) per 100 sq.m. of floor area*
1	Residential	2.0
2	Commercial	3.0**
3	Manufacturing	2.0
4	Government	1.8
5	Public and Semi-Public Facilities	2.0
6	<b>All Use Premises within TOD Zone</b>	<b>1.33</b>

Notes:

\*Additional parking may be created within integrated schemes only as paid, shared parking facilities accessible to general public at all times.

\*\* *Planned commercial centres may be developed/ redeveloped as per integrated schemes, in which mixed use component may be introduced along with comprehensive PMD plans, feeder systems, public spaces, etc. In such cases, parking norms may be rationalized and ECS norms for mixed use may be applied*

**subject to approval of Technical Committee of DDA. Activities permitted shall be as per Table 5.1 of the Masterplan.**

(Following Notes Added)

- v) Parking is one of the utilities permitted in all use zones except in regional park / ridge, **Recreational Open Space** and parks as per the approved zonal plan/ layout plan.
- vi) The standards given in Equivalent Car Space (ECS) **shall** include parking for all types of vehicles i.e. cars, scooters, cycles, light and heavy commercial vehicles, buses etc. Parking adequacy statement/study for large projects like Stadia, Shopping Malls, Multiplexes will be desirable. Mode-wise parking spaces are to be marked on drawings to be submitted for approval.

**Table 17.4: Indicative On-site Parking (ECS) Requirements for projects\***

Mode	ECS Standard by mode	Area in Sq.m. (including circulation)	Distribution by mode - per 1 ECS/100 sq.m. of Built Up Area for all projects	Distribution by mode per 1 ECS/100 sq.m. of Built Up Area within TOD Zone.
Cars/ Taxis	1	23.00	0.60	0.60
2 Wheelers	0.25	5.75	0.25	0.10
Cycles	0.1	2.30	0.05	0.10
Buses/ Shared Vans	3.5	80.50	0.05	0.10
Commercial vehicles	3.5	80.50	0.05	0.10
<b>Total</b>			<b>1.00 ECS</b>	<b>1.00 ECS</b>

\*The above figures are indicative and may be customized on case to case basis. However minimum proportion of cycle parking is mandatory.

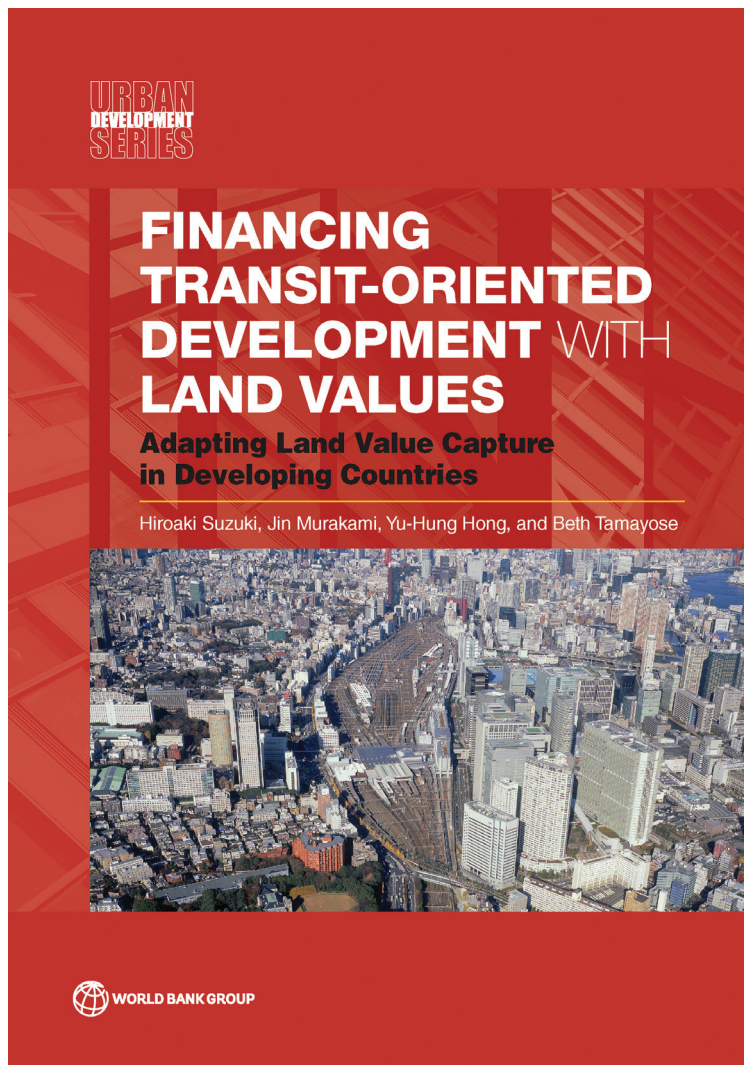
**Modifications to Chapter 19.0 Land Policy, MPD-2021**

**Para 19.7 Other terms and conditions**

S. no	Existing Provision	Proposed Amendment
1	19.7.1 (i) Land Pooling to be permitted as per this policy in the urbanisable areas of entire urban extension for which Zonal Plans have been approved. However, <b>development along TOD corridors in these areas will be as per TOD policy.</b>	19.7.1 (i) Land Pooling to be permitted as per this policy in the urbanisable areas of entire urban extension for which Zonal Plans have been approved. <b>Transit Oriented Development (TOD) policy would not be applicable to the influence zone of MRTS corridors lying within the land pooling areas.</b>

Under Secretary  
Govt. of India  
(F.No. K- )

## Delhi Case Study



*(Suzuki Hiroaki, Mukarani Jin, YU-Hung Hong, Beth Tamayose, 2013, Financing Transit Oriented Development with land values: Adapting land value capture in developing countries/ The World Bank)*

### Population and Urbanization Trends

The Delhi Metropolitan Area consists of the National Capital Territory of Delhi (NCTD) and the first ring of towns around the capital, including Ghaziabad, Loni, Noida, Faridabad, Gurgaon, and Bahadurgarh (map 7.1). It was home to more than 22 million inhabitants within 1,483 square kilometers in 2010 and is projected to increase to 33 million inhabitants by 2025 (figure 7.1). The NCTD's per capita income is 2.4 times higher than the national average (Rs 70,238/\$1,545 versus Rs 29,524/\$650 in 2006–07), so its population ratio below the poverty line is also around half the national figure (14.7 percent versus 27.8 percent in 2004–05) (Gladstone and Kolapalli 2007).

Delhi's economic supremacy comes mainly from trade, commerce, banking, finance, manufacturing, and tourism, which, however, accounted for only 15 percent of jobs in 2006, whereas government is the largest employer. Development policies, such as transport network extensions, large-scale slum redevelopment, and special economic zones, have gradually diminished the cohesiveness of traditional business activities around the city center. Delhi's regional territory already expands beyond the NCTD's original boundary (1,483 square kilometers) and has gradually engulfed the surrounding cities, towns, villages, and rural hinterlands. This has been spurred on by recent rapid motorization (the number of registered motor vehicles in Delhi climbed from 6.0 million in 2008–09 to 7.4 million in 2011–12), further complicating interjurisdictional coordination.

## Regulatory and Institutional Framework, Delhi

### Master Plans

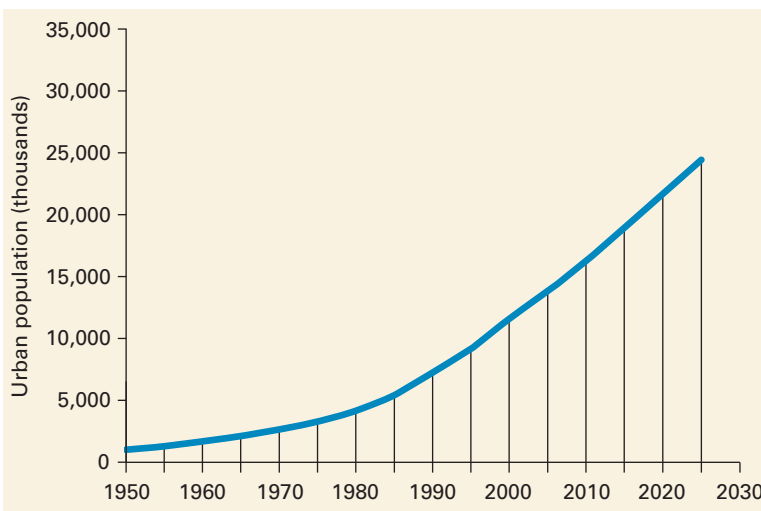
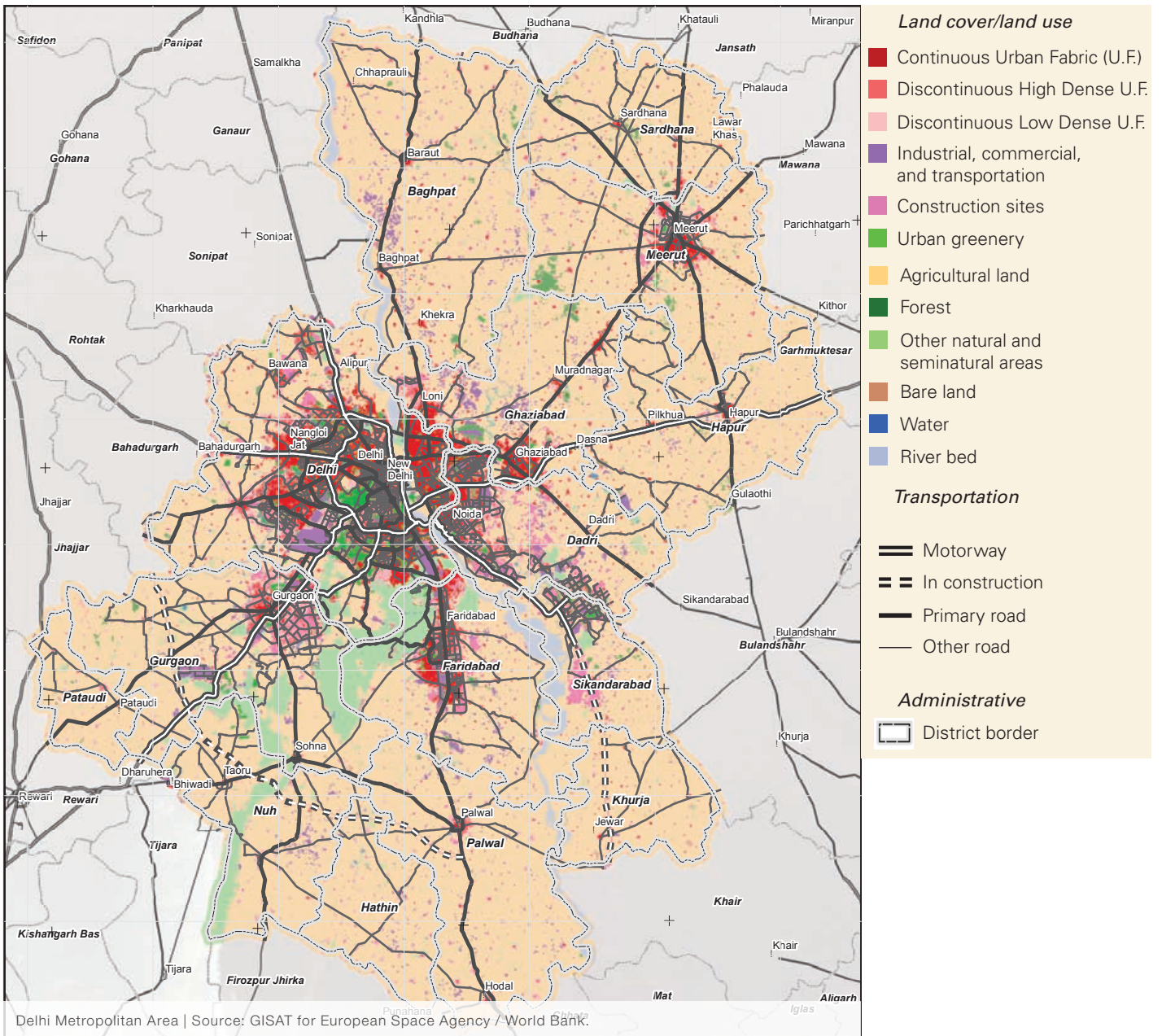
Delhi's strategic planning exercise began with the Delhi Development Act of 1957, which was followed by the Master Plan of Delhi, 1962 (MPD-62). MPD-62 first formulated the government's land acquisition, development, and disposal scheme to extend the urbanized areas of Delhi from 172.9 to 447.8 square kilometers by 1981. It also promoted the first ring of towns within a radius of 35 kilometers of the capital, along with provision of public infrastructure and services. Between 1961 and 1981, 155.4 square kilometers was identified for public land acquisition. The initial procedure was highly government led with limited private participation in housing development (shelter provision) and infrastructure investment until the early 1990s. Thereafter, the Master Plan of Delhi, 2001 (MPD-2001), elaborated land use characteristics with a hierarchical planning system: master, zonal, and layout plans for specific development schemes within each zone. Nevertheless, the government has acquired only 39 percent of the land proposed for development in MPD-2001 (Delhi Development Authority 2013).

The latest version, the draft Master Plan of Delhi, 2021 (MPD-2021), takes into account the achievements and shortfalls of MPD-62 and MPD-2001. Several studies made for preparing MPD-2021 reveal that there had been substantial gaps between the land areas targeted, acquired, and developed due to the limitations of financial, physical, and human resources and various difficulties encountered in the course of land assembly.

The draft MPD-2021 thus stresses the importance of four approaches: improving the scheme of large-scale land acquisition and development, involving the private sector in the assembly and development of land and the provision of infrastructure and services, integrating land use planning and infrastructure investment, and promoting redevelopment and densification with more flexible land use and development codes (Delhi Development Authority 2013). MPD-2021 also envisages an integrated multimodal transport network for the overall structure of the city, including various guided transit systems, such as Metro Rail, ring rail, dedicated rail corridors for daily commuters, bus rapid transit corridors, and regional rapid transit system corridors.

The Mass Rapid Transport System (MRTS) is the most important transport mode, forming a roughly 250-kilometer network of underground, elevated, and surface lines across the territory by 2021. It is expected that after the full network is developed, about 60 percent of the urbanized area of Delhi will be no more than a 15-minute walk from MRTS stations. Such investments are also expected to generate greater opportunities for economic growth and employment by calling for selective redevelopment and densification of the existing built-up areas given local conditions and informal settlement patterns such as land pockets of slum and Jhuggi Jhoppadi (a cluster of slum colonies). In the MPD-2021 framework, therefore, it is recommended that a comprehensive redevelopment scheme of the catchment areas of MRTS stations be made with multiple land use categories and floor area ratios (FARs)



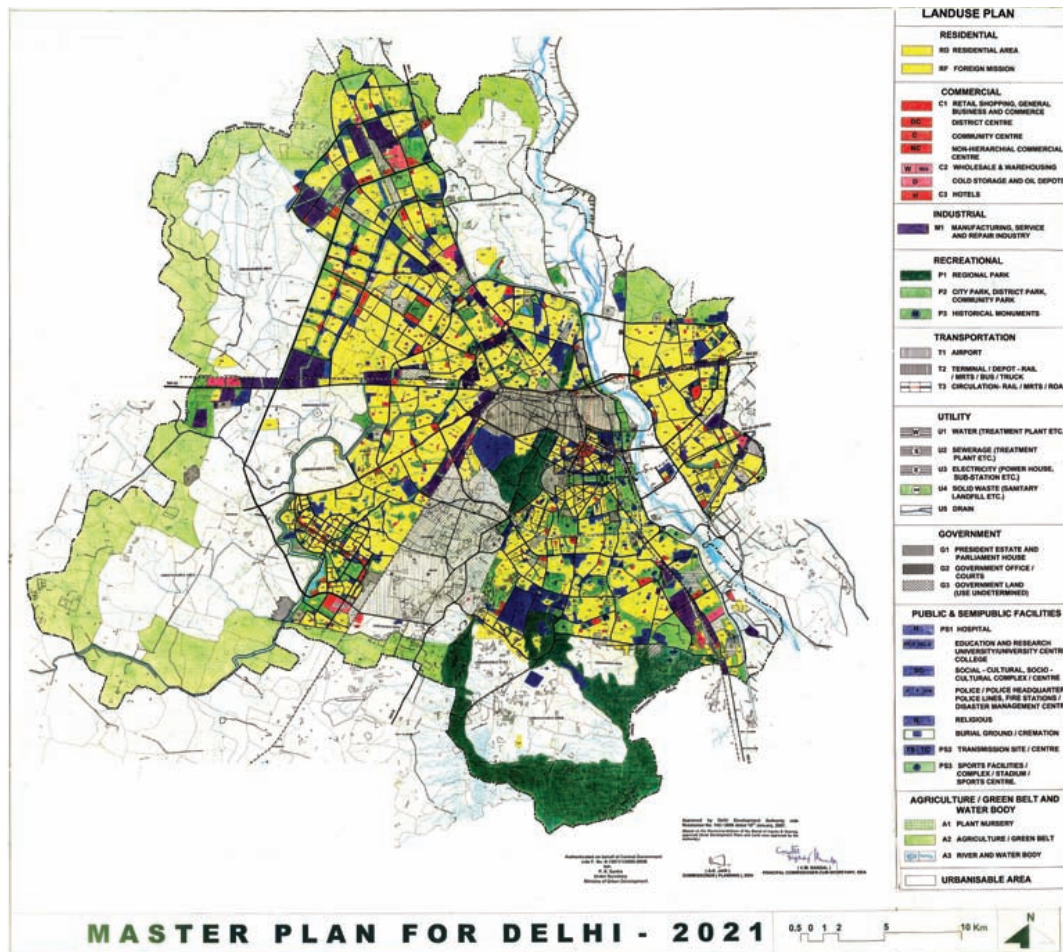


Population trends and projections, Delhi, 1950-2025 | Source: UN 2012.



### Zoning and Land Administration

Delhi's zonal plans aim to detail the policies of the master plan and lead to the practices of the layout plan. Between the master plan and layout plan, Delhi's urban area is divided up into planning zones A through P, whose population and housing capacities are to be enhanced with target densities for redevelopment projects, especially along some sections of the rail corridors. Like many other large cities in India, the FAR of Delhi's central business district has been kept much lower than those of global megacities in developed countries (1.12–3.5 versus 12.0 in Hong Kong SAR, China, 15.0 in New York City, and 20.0 in Tokyo) (World Bank 2013b). In addition, the FAR for the properties of the Delhi Metro Rail Corporation Limited (DMRC) at its station sites has been capped at 1.0, which does not allow DMRC to maximize revenues from property development.



Land use plan of the draft Master Plan for Delhi - 2021 | Source: Delhi Development Authority 2013.

The Delhi Development Authority (DDA), set up in 1957 and in charge of the master plans, proposes to greatly raise FARs in Delhi under MPD- 2021. A 500-meter wide transit-oriented development (TOD)/multi-use zone would be overlaid on both sides of the metro corridor to encourage a mix of commercial and employment-generating activities along with residential developments. Higher FARs would be permitted subject to certain setback and height restrictions. One redevelopment package will be included in the influence zone if more than 70 percent of the site area falls inside the 500-meter buffer. Property developments around the MRTS stations, up to a maximum area of 3.0 hectares, will be allowed in all use (mixed land use) zones, with some exceptions. This flexible land use coordination could lead to a mix of residential and commercial uses as well as densely built-up areas, but whether this actually triggers redevelopment along the corridor remains to be seen.

In practice, other regulatory impairments have impeded property development in the influence zones besides a low FAR limit. For example, the delivery of property development projects around the MRTS stations is subject to the approval of multiple statutory bodies as well as statutory clearance from local municipalities and related agencies, a process that can take several years. In addition, approvals of any development activities in the influence zones are granted only after the start of the MRTS extension projects, which blocks planners, developers, and operators from coordination and physical integration between public spaces, private properties, and station facilities (Delhi Development Authority 2013).

The private sector is expected to mobilize financial resources for land acquisition of slum areas, resettlement, and redevelopment through capital markets, while the government agency (DDA) enforces development controls, such as higher FARs and targeted land use planning, to achieve broader social objectives. In Delhi, the local government has set up mandatory provision of housing units for “economically weaker sections” (EWS) by exercising slum redevelopment to the extent of 15 percent of the permissible FAR, or 35 percent of the dwelling units on the plot. After private developers complete construction, EWS housing units are handed over to the government agency and are allotted to beneficiaries. Slum rehabilitation requires a minimum lot size of 2,000 square meters and an FAR of 4.0 for residential use. The FAR for remunerative use (mixed and commercial use) is up to 10 percent of the permissible FAR for residential areas. A minimum proportion of squatter resettlement area is 60 percent of the total areas for the residential use, while a maximum proportion of area for the remunerative use has to be up to 40 percent of the total area.

The practice of land banking in Delhi started in 1961, allowing DDA to take control of land designated for urban development and management. However, despite its financial success, fundamental issues remain with implementation. First, land acquisition is often difficult due to an outdated land valuation system. Second, land disposal has reallocated a high share of land resources to a small number of wealthy groups rather than a large number of low-income people. Third, DDA has been unable to provide affordable housing units to low-income people and new immigrants, which has generated yet more informal settlements beyond the city boundaries. Fourth, land values have escalated as DDA has deliberately limited the release of DDA-owned sites to land markets (Nallathiga 2009; Gladstone and Kolapalli 2007).

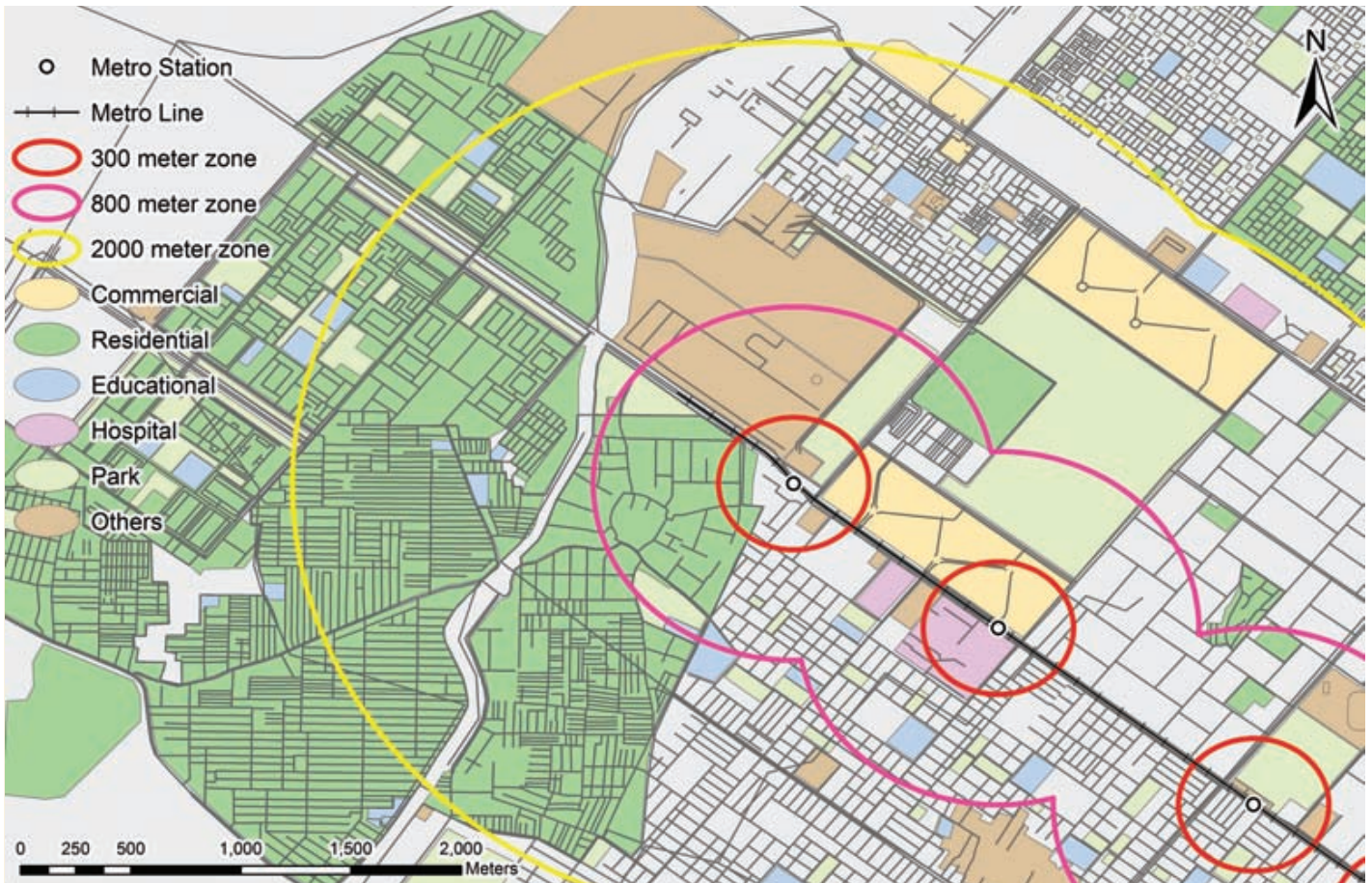
**MPD-2021: Guidelines for TOD**

The term TOD has become increasingly popular across Indian cities, yet even as TOD standards for Indian cities are still being set up and executed, they face new challenges in urban land markets. In response, the current draft MPD-2021 attempts to provide guidelines for TOD practices that aim to reduce private automobile dependency through urban design and policies and to maximize public transport access through enhancing connectivity and densifying. It states that “the MRTS influence zone may catalyze the private sector into cross subsidizing and providing the various public amenities, greater affordable housing stock and high-quality public transport” (UTTIPEC 2012).

The draft MPD-2021 proposes that the influence zones of MRTS stations be further classified into three zone categories with certain location thresholds. The total area covered by these TOD zones will be around 44.1 percent of Delhi, or 665.1 square kilometers. Applying the principles of TOD to Delhi would probably require more diversified approaches (including redevelopment, infill, and greenfield development) and using incentives and restrictions within the intense and standard zones.

<b>Three transit-oriented development zones around Mass Rapid Transport System stations</b>	
<b>Zone categories</b>	<b>Location thresholds</b>
Zone 1: Intense TOD	<ul style="list-style-type: none"> <li>• 300 m influence zone of all metro stations</li> <li>• 800 m (10 minutes’ walking) influence zone of regional interchange station (that is, interchange between rail and metro or two different metro lines)</li> </ul>
Zone 2: Standard TOD	<ul style="list-style-type: none"> <li>• 800 m (10 minutes’ walking) influence zone of all metro stations</li> </ul>
Zone 3: Nonmotorized transport	<ul style="list-style-type: none"> <li>• 2,000 m (10 minutes’ cycling) influence zone of all regional interchange stations and metro stations</li> <li>• 300 m influence zone of all bus rapid transit corridors</li> <li>• Zones within intense or standard TOD influence zones, which are not permitted for redevelopment but need enhancements in public realm</li> </ul>
Source: Adapted from Delhi Development Authority 2013.	
Note: TOD = transit-oriented development.	





Example of drawing the 300-m, 800-m, and 2,000-m catchments of Mass Rapid Transport System stations | Source: Map data © OpenStreetMap contributors.

Any development practices in the zones are intended to be flexible, subject to development parameters and land use criteria: minimum site area of 6 hectare or 5,000 residents, minimum gross density permissible for TOD of 250 dwelling units per hectare, no universal cap on the FAR, minimum 30 percent residential and 30 percent commercial/institutional use of the FAR, and minimum 15 percent of the FAR to be allocated to rental or for-sale housing with unit sizes no larger than 25 square meters (table 7.2). However, the TOD zones and criteria listed are still inconsistent with the land use map shown in the MPD-2021. MPD-2021 implies that DDA will continue to restrict the FAR for DMRC's properties at its station sites up to 1.0.

The guidelines also encourage integration of multimodal public transport at key interchanges, with a checklist of interchanges, public facilities and open spaces, urban designs, and parking locations/policies over the 300-meter influence zone of MRTS stations. Similarly they target pedestrian and cyclist access to public transport systems, with street connectivity, housing density, and job-home accessibility standards (Delhi Development Authority 2013). The guidelines present a range of opportunities to tap developable sites around target interchanges and create greater benefits to several transport bodies, but the plethora of development-related bureaus in Delhi's multilayered government rather inhibits seamless decision making and joint development.

Proposed permissible floor area ratios and density for transit-oriented development			
Gross FAR (site)	Net FAR (block)	Minimum permissible density (with ±10% variation)	
		Residential-dominated (FAR ≥ 50%), dwelling units per hectare	Less residential (FAR ≤ 30%), dwelling units per hectare
Below 1.0	Below 2.0	Underutilization of FAR not permitted	
1.1-1.5	2.1-3.0	300	250
1.6-2.0	3.1-4.0	400	350
2.1-2.5	4.1-5.0	500	450
2.6-3.0	5.1-6.0	600	550
3.1-3.5	6.1-7.0	700	650
3.6-4.0	7.1-8.0	800	750

Source: Adapted from Delhi Development Authority 2013.

Note: FAR = floor area ratio.



Inconsistencies between Master Plan for Delhi-2021 and proposed transit-oriented development zones | Source: Adapted from Delhi Development Authority 2013.



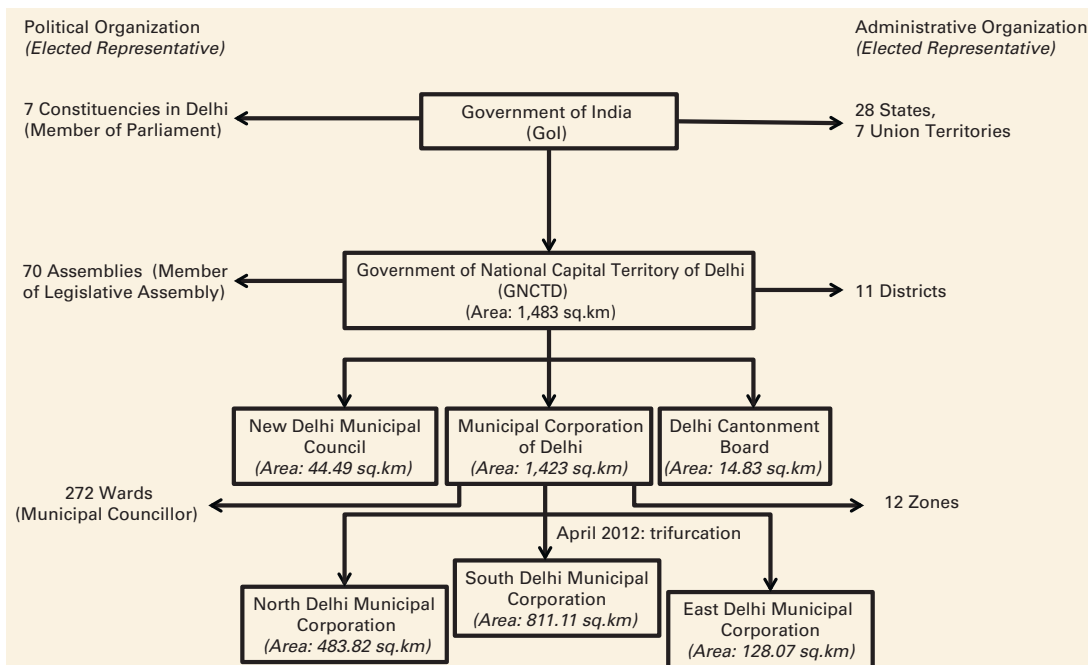
### A Complicated Government Structure

Delhi is statutorily distinct from other Indian cities. It is the seat of the national government, which heavily involves itself in managing urban affairs. Multiple government bodies over multiple jurisdictions often overlap territorially and functionally. Unlike other Indian city-states, Delhi has no metropolitan planning committee—the NCTD has no control over its urban development. Instead, DDA administers land acquisition, disposal, and development within the NCTD. It started institutionalizing the TOD concept in 2007 for MPD-2021, while the Unified Traffic and Transportation Infrastructure Planning and Engineering Centre (UTTI-PEC), established as one branch of DDA in 2008, is responsible for TOD policies and projects.

Transport, nationwide, is the domain of multiple government agencies. For example, since 1986 the Ministry of Urban Development has been the nodal body for planning and coordinating urban transport. Major transport projects in 65 Indian cities are sanctioned under the Urban Infrastructure and Governance component of the Jawaharlal Nehru National Urban Renewal Mission (JnNURM), launched in 2005 and administered by the Ministry of Urban Development. The writ of the Unified Metropolitan Transport Authority runs in all municipalities with more than 1 million people, such as Hyderabad, Bangalore, Chennai, Mumbai, and Jaipur. Beyond that, with the Dedicated Urban Transport Fund (funded by a green surcharge on petrol, “a green tax” on registered personalized vehicles, and an urban transport tax on purchase of new cars at national government level), state- and city-level transport agencies attempted to raise their own capital funds from revenues from the increased FAR, enhancement of property tax, and parking charges.

In Delhi, matters are even more complicated. Three major bodies—DDA, National Capital Region Board, and DMRC (see just below)—are under the national Ministry of Urban Development, whereas several transport-related branches, such as the Delhi Transport Corporation, Delhi Integrated Multi-Modal Transit Systems, and IFDC Foundation, are also involved in coordinating fares and services, operating bus transit, integrating multimodal activities, and funding infrastructure under the government of Delhi.

Still, India may be one of the few developing countries to have adopted a national urban transport policy. Its objective is “to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of city residents to jobs, education, recreation and such other needs within our cities” (Ministry of Urban Development 2006). The policy thus encourages municipal governments and transit agencies to “raise funds, through an innovative mechanism that taps land as a resource, for investments in urban transport infrastructure” (Ministry of Urban Development, Government of India 2006).



Multiple administration layers, different territorial boundaries, Delhi | Source: World Bank 2013a.



**DMRC**

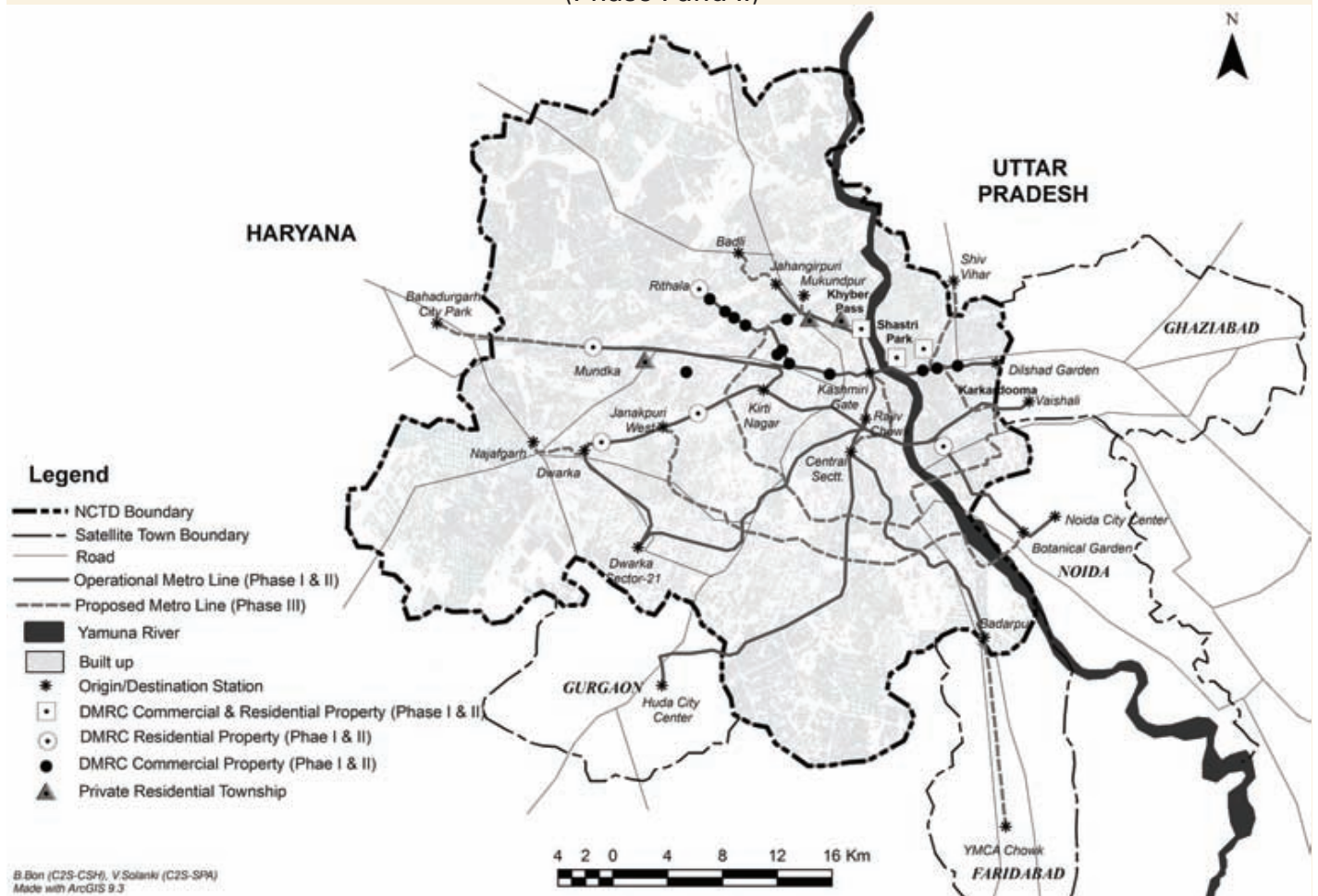
DMRC was established as a state-owned company in 1995 through an equal partnership between the national and Delhi governments, specifically for building and operating MRTS in the National Capital Region and beyond. It has powers of decision in railway business practices, while the exercise of land development rights remains with government authorities—the Ministry of Urban Development often intervenes in DMRC’s station plans with property development projects.

Since its beginning, DMRC has held a strong position in public infrastructure and urban mobility services. Due in large part to the financial difficulty faced by its initial operations, it was allowed to carry out property development projects and generate real estate revenues from the sites granted by the national government in and around its station facilities (map 7.5). The DDA and other municipal authorities agreed on such development practices to support the implementation of the DMRC’s railway projects in the early years. However, the DMRC was also exempted from paying most taxes levied by the national and Delhi governments—a source of conflict between the Municipality of Delhi and DMRC. The municipal agencies eventually refused to sanction some plans for commercial development on land granted because the DMRC was exempted from property taxes on some projects that were not directly related to MRTS operations.

DMRC has to get statutory clearance from multiple government stakeholders at NCTD level: for architectural and conceptual plans, from the Delhi Urban Arts Commission; land use changes—DDA; building plans—municipal authorities; no objection certificates—the Land and Development Office and DDA; archaeological surveys—the Archaeological Survey of India; fire-fighting clearance—Delhi Fire Service; and environmental clearance—the Ministry of Environment.

This slow and convoluted process (requiring two or three years a project) is often held up by DMRC and by private developers as the main barrier to delivering property development projects on MRTS station sites (see the second bullet in the Delhi “Conclusion”). Nevertheless, the process of generating revenues from property development in Delhi has been generally recognized as a metro finance model for other Indian cities.

Property Development in Delhi  
(Phase I and II)



B. Bon (C2S-CSH), V. Solanki (C2S-SPA)  
Made with ArcGIS 9.3

Delhi Metro Rail Corporation Limited network phases I (1995–2006), II (2006–11), and III (2011–16) | Source: World Bank 2013a (drawn by B. Bon).  
Note: DMRC = Delhi Metro Rail Corporation Limited; NCTD = National Capital Territory of Delhi.

## Land Value Capture, Delhi

### Funding Arrangements

The current and proposed Delhi MRTS network combined is about 293 kilometers long and has three project phases (table 7.3). The national government's direct participation in project funding in the three phases was required to secure concessional Japanese yen loans (30 years, including a 10-year grace period, with an interest rate of about 1.8 percent) from the Japan International Cooperation Agency (JICA).

The land parcels belonging to the various bureaus, agencies, and municipalities were transferred to DMRC at intergovernmental transfer rates decided by the Ministry of Urban Development for a 99-year lease. The

<b>Mass Rapid Transport System financing</b>	
Phase I (1995–2006)	<p>Project completion cost (in crores Rs): 10,891 (\$3,472 million)</p> <ul style="list-style-type: none"> <li>• Government of India equity: 14%</li> <li>• Government of Delhi equity: 14%</li> <li>• Subordinate debt of government of India: 2.5%</li> <li>• Subordinate debt of government of Delhi: 2.5%</li> <li>• Interest free subordinate debt representing land cost: 7%</li> <li>• JICA loan: 60%</li> </ul>
Phase II (2006–11)	<p>Project completion cost (in crores Rs): 19,390 (\$4,304 million)</p> <ul style="list-style-type: none"> <li>• Government of India equity: 17%</li> <li>• Government of Delhi equity: 17%</li> <li>• Subordinate debt of government of India: 3.26%</li> <li>• Subordinate debt of government of Delhi: 3.26%</li> <li>• Interest free subordinate debt representing land cost: 4.35%</li> <li>• JICA loan: 55.13%</li> </ul>
Phase III (2011–16)	<p>Project completion cost (in crores Rs): 35,242 (\$7,889 million)</p> <ul style="list-style-type: none"> <li>• Government of India equity: 10.6%</li> <li>• Government of Delhi equity: 10.6%</li> <li>• Subordinate debt of government of India: 7.2%</li> <li>• Subordinate debt of government of Delhi: 7.2%</li> <li>• Interest free subordinate debt representing land cost: 4.50%</li> <li>• JICA loan: 40%</li> <li>• Others: 19.9%</li> </ul>
<p>Source: DMRC 2001, 2010, 2013b. Note: JICA = Japan International Cooperation Agency.</p>	

Delhi government is essentially in charge of acquiring private lands for public projects and then transferring them to DMRC. In some locations, DDA also provides the land for free to DMRC. The cost of land acquisition is treated as a premium to be recovered as an interest-free subordinate debt over a 25-year period in the fund allocation schemes.

From 2006 to 2012, DMRC gained more passengers (about a 285 percent increase in daily ridership), leading to operational cost recovery of about 247 percent in fiscal year 2011–12 (DMRC 2013a). However, this exceptional outcome can be explained by tax exemptions (see above), preferential power tariffs, and low-cost labor. The recurrent income from traffic operations, which accounts for 57 percent of total corporate revenue in fiscal year 2011–12, is a primary source for DMRC to pay back the low-interest foreign loans.

### Property Development

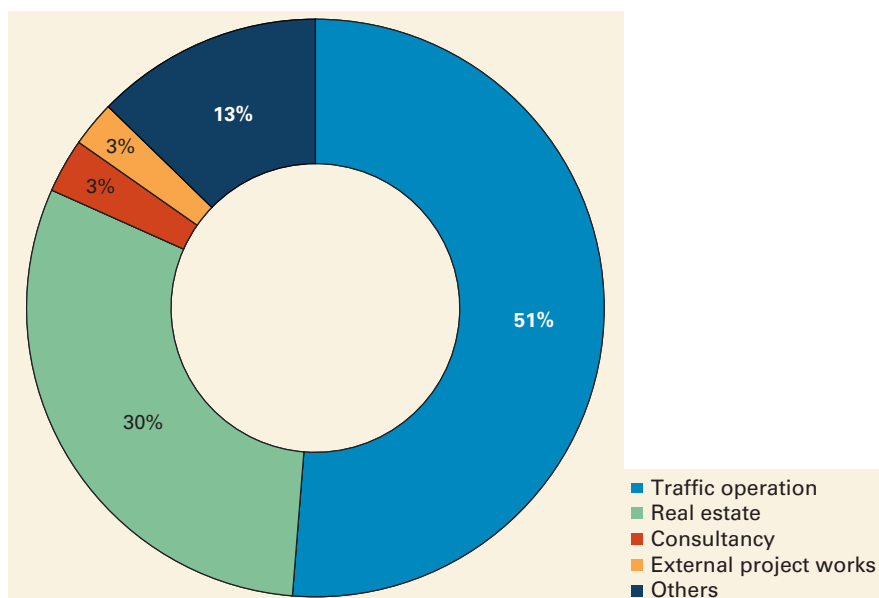
In 1996 during phase I, DMRC was granted a mandate from the union cabinet to raise 7 percent of the total cost of the first phase of the metro project through property development. Its property division, set up in July 1999, deals with smaller commercial properties inside the MRTS, reserved developable land parcels close to stations, and larger residential and commercial property projects on the sites initially acquired for constructing depots and maintenance buildings. This funding approach—development-based LVC, in other words—was followed by phases II and III, but the capital proportion from property development fell.

Most residential development projects on depot and standalone plots with 90-year leases generate substantial upfront payments, whereas commercial properties within station buildings with short (6–12-year) leases and on large plots outside stations with medium-term (20-year) leases produce more recurrent revenue streams. DMRC’s recurrent income from real estate accounted for about 30 percent of the total over seven recent years (figure 7.3). Yet the financial contribution from the real estate practice has been minor for the last few years (such as only 6 percent in 2011–12).

Sales of development rights are in two steps. After it gets the land transfers from multiple government agencies, DMRC usually invites shortlisted bidders to make concession agreements with successful tenders for the development rights. Only DMRC selects the developer and sets the lease terms. Yet inefficiencies in implementation remain at the site level. An audit report of the Comptroller and Auditor General of India (2008) highlighted weak responses and poor performance on the amount of development realized at a reasonable price. From a private developer’s standpoint, two impediments stand out: restrictive clauses for land use in the allotment letter and stringent technical criteria fixed through the bidding process; and inadequate FAR and plot size to generate a profit.

Capital share funded by property development, Mass Rapid Transport System			
Phase	Metro Rail Project cost (crores Rs)	Funded by property (crores Rs)	(%)
I	10,891	762.37	7.00
II	19,390	843.46	4.35
Subtotal	30,291	1,605.83	5.30
III	35,242	1,586.00	4.50
Total	65,523 (\$12,049 mn)	3,191.83 (\$587 mn)	4.87

Source: World Bank 2013a.



Delhi Metro Rail Corporation Limited's net income share, 2004–05 to 2011–12 | Source: Data from DMRC 2013a.

## Development Cases, Delhi

To illustrate Delhi’s TOD and LVC practices at the site level, this short section presents two current Delhi cases. Both sites are being mainly developed with large-scale properties: one by UTTIPEC based on the TOD principle, the other by a private developer without a TOD-planning framework and control. Their experiences reveal some of the potentials and barriers to these practices.

### Case 1: TOD Pilot Project, Karkardooma Metro Station

In 2010, the DDA decided that UTTIPEC would conduct a TOD pilot project at MRTS stations. The UTTIPEC team drafted a project for a group housing complex around Karkardooma Metro Station (photo 7.1). The area has more than 30 hectares of developable land connected to Vikas Marg Station and the new MRTS Line III that stretches from Yamuna Bank to Anand Vihar Terminal and points to huge accessibility benefits from the multiple metro lines, commuter rail, and feeder services.

UTTIPEC is attempting to demonstrate TOD principles, which aim to improve neighborhood connectivity and reduce automobile trips. It proposes mixed-use developments with a variety of housing types (including EWS units) and civic amenities, all intended to encourage affordable and walkable communities around a multimodal transport node. The area is surrounded by informal housing clusters. Yet the implementation of such an ideal TOD proposal would require drastic changes and several modifications to the strict FAR and coverage regulations, zoning and design codes, and painstaking clearance procedures (table 7.5). Worse, there has been no coordination between UTTIPEC and DMRC on the metro station area’s land use and layout plans, design parameters, multimodal facilities, feeder services, and travel and property demand estimates, even though these conditions will determine the financial feasibility of the project and the metro line extension.

<b>Proposed transit-oriented development project around Karkardooma Metro Station</b>	
<b>Project period</b>	<b>2010–present</b>
Distance to central business district	9 km
Population	24,800 (projection)
Site area	30.72 ha
FAR	2.0
Floor area use	Residential: 43% Commercial: 38% Social: 19%
Parking requirement	34% less
Key stakeholders	DDA; UTTIPEC
Financial figures	Not available <sup>a</sup>
<p>Source: World Bank 2013a.                      Note: DDA = Delhi Development Authority; FAR = floor area ratio; UTTIPEC = Unified Traffic and Transportation Infrastructure Planning and Engineering Centre.                      a. Because the project is a pilot, financial figures have not been published, and official financing data was not available as of May 2013.</p>	



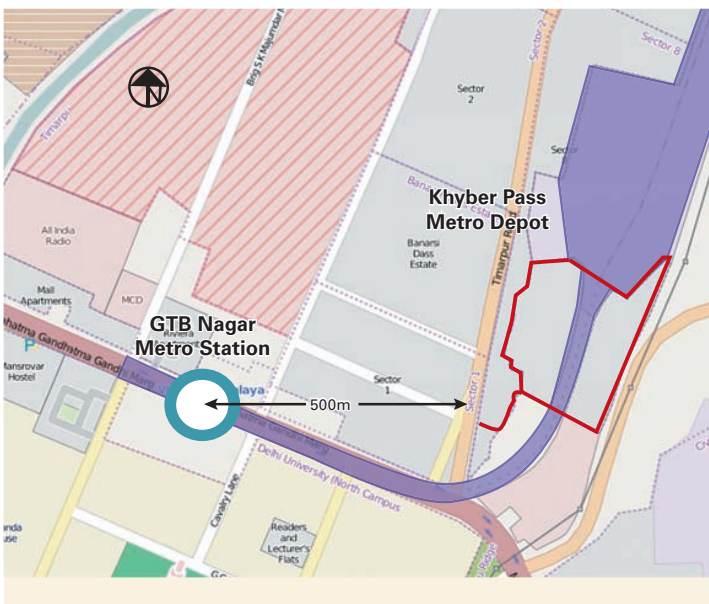
Group housing site and Mass Rapid Transport System extension around Karkardooma Metro Station | Source: © Jin Murakami. Used with permission. Further permission required for reuse.



**Case 2: Sales of Development Rights for High-End Residential Complex, Khyber Pass Metro Depot**

The Khyber Pass Metro Depot is located 9 kilometers north of the city center near the Yamuna River and a series of major roads that were originally selected by the Delhi government for building a new bridge. In 1999, more than 37 hectares of land were transferred from the Land and Development Office to DMRC for more than Rs 210 million (\$4.9 million) with an annuity of 2 percent of this amount. In 2003, DMRC invited tenders for much of the depot site. It received six bids for a residential condominium package and two for a shopping mall. The developer Parsvnath won the bid for residential development at about Rs 194 crores (\$40 million) for a long-term leasehold of 99 years (property development rights); the up-front payment was 94 percent higher than the reserve price set by the DMRC. Parsvnath then sold the leasehold rights to high-end housing units to private buyers. To finance the project, the developer raised Rs 115 crores (\$24 million) from a private investment company for a 22 percent stake in the property package.

Parsvnath’s residential condominiums are mainly three- to five-bedroom units with about four parking spaces per household along the depot (figure 7.4). But the layout is not connected to the nearest MRTS station—making it a typical transit-adjacent development (TAD) for DMRC’s financial gain rather than a TOD. Still, a social component of the project is housing reserved for economically weaker sections (EWS) of society: the MPD-2021 stipulates that large housing projects must reserve 35 percent of their units for EWS residents (table 7.6). This development includes 273 such units. Yet the physical configuration between the condominium and EWS units raises questions whether this public requirement will promote social inclusiveness.



Layout of residential complex property development around Khyber Pass Metro Depot | Source (top): Map data © OpenStreetMap contributors. Note: EWS = economically weaker section.



## Ahmedabad, India

### CITY PROFILE:

<b>Population</b>	: 5,570,585 (2011)
<b>Land Area</b>	: 466 Sq. Km
<b>Gross Density</b>	: 12,000 Persons / Sq. Km

### TRANSPORT MODE SHARE:

<b>Walking</b>	: 22%
<b>Cycling</b>	: 14%
<b>Bus/ Public Transport</b>	: 16%
<b>IPT / Taxis</b>	: 6%
<b>Motorised Personal Transport</b>	: 42% <sup>16</sup>

### City Overview

Ahmedabad, the largest city in the state of Gujarat and the fifth most populous city in the country, accommodates a population of 5.5 million (Census 2011). It is also one of the fastest-growing cities in the world; its population is expected to reach 10 million over the next 20 years, placing it among the world's mega cities (CoE UT CEPT 2011; Forbes 2010). The city's expansive infrastructure, strong industrial base, and strategic location continue to attract significant numbers of businesses, investments and new residents. Like other large cities in India, Ahmedabad is grappling with the challenges of rapid urban expansion, mounting motorization, congestion and uncoordinated land and transportation development. As a response to address some of these challenges, the city invested in the first BRT system of the country. Since then, the city has made tremendous advancements in capitalising upon the opportunities provided by BRT systems to shape the urban form of the city.

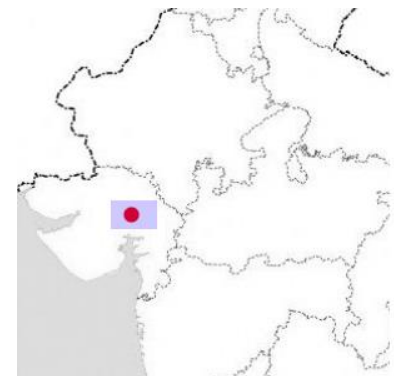


Figure 4-2: Location of Ahmedabad in India

### TOD Transit System Planning- Janmarg Bus Rapid Transit System

In 2005, the Ahmedabad Municipal Corporation (AMC) proposed Janmarg BRT to achieve its long term goal of "Accessible Ahmedabad". This vision of an accessible city focuses primarily on the introduction of rapid buses and orienting land-use activities to the bus way. The following year, the national government adopted the National Urban Transport Policy, which included integrated urban transport and land-use planning as its first objective. To promote this policy, the national government encouraged cities to undertake public transport projects, particularly BRT, together with non-motorised transport investments by linking JnNURM's funding with the principles embodied in the National Urban Transport Policy. Ahmedabad's Janmarg was the first BRT project to receive JnNURM funding, which accelerated its implementation. Janmarg was planned in three phases:

- Phase I- 45-kilometre network (Completed);
- Phase II- 58.0 kilometres (Under Construction); and
- Phase III- 40.2 kilometres (Proposed).

Janmarg witnessed constant increase in the ridership since the day of operation, from 13,000 in October 2009 to 1.4 lakhs in December 2012<sup>17</sup>. For Phase I corridors, 20 percent of the city's population lives within walking distance of the 1-kilometer buffer zone.<sup>18</sup>

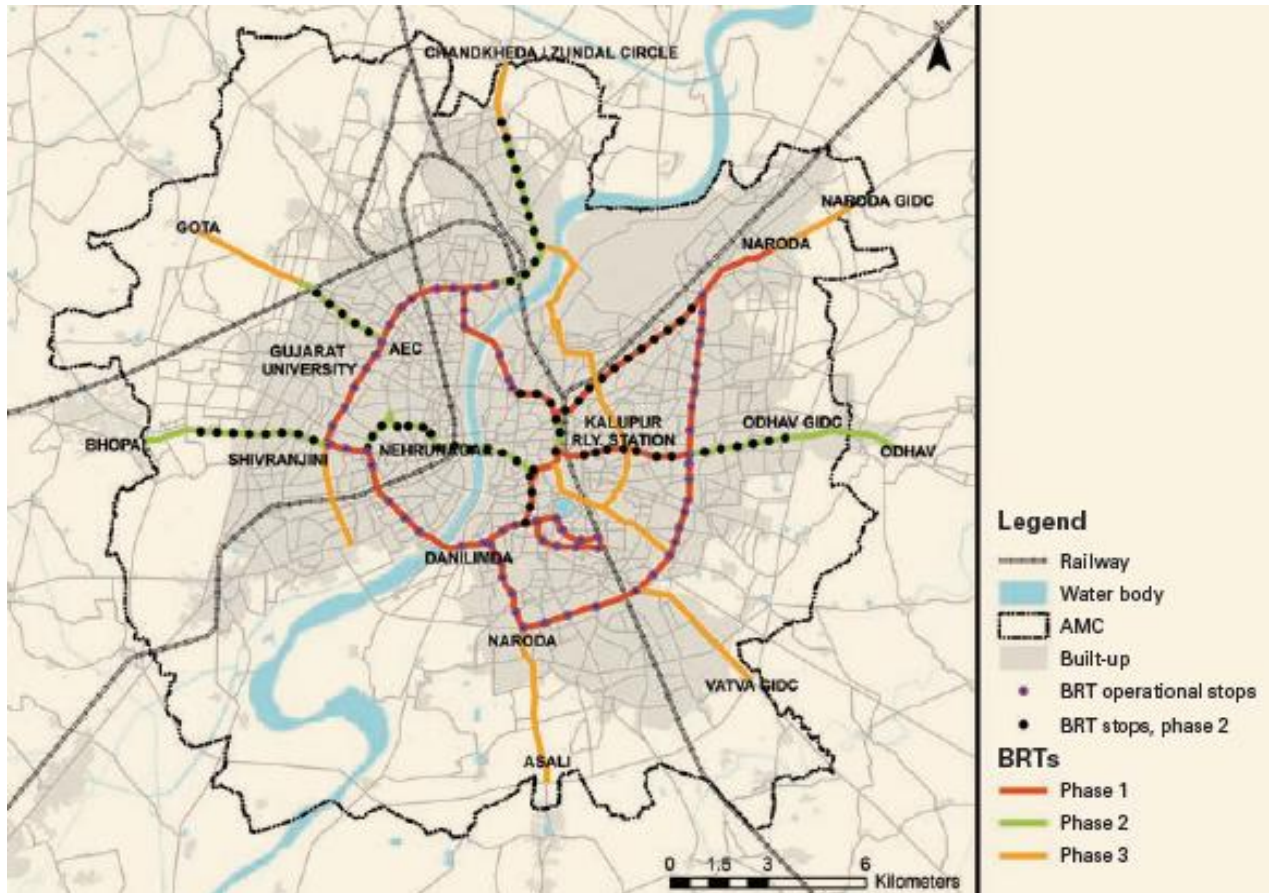


Figure 4-3: Map of Ahmedabad's Janmarg BRT system illustrates the three phases | Source: CoE UT CEPT 2012

**Transit Oriented Development- AUDA**

Ahmedabad Urban Development Authority (AUDA) has prepared and published the Comprehensive Draft Development Plan-2021 (Second Revised) that describes several projects to be taken up as a part of the implementation of the same at the city scale. These include Local Area Planning for the overlay zones of Central Business District (CBD), Transit Oriented Zones (TOZ) and Residential Affordable Housing Zone (RAH). AUDA plans to undertake these projects through the efforts of the in-house planning team with technical expertise support from professional organisations. AUDA has requested ITDP for technical assistance in the areas of sustainable urban transport and transit oriented development. The specific areas of involvement will include the following:

- Guiding the preparation of the local area plans in transit oriented zones; and
- Building AUDA's internal capacity to undertake sustainable urban transport planning and transit oriented development planning.

To align with the vision of 'Accessible Ahmedabad', AUDA has also proposed a three tier development approach for land use and transport integration that includes:

- **REGIONAL PLAN** (Greater Ahmedabad Region)
  - Integrating the main city and surrounding nodes/towns.
  - Developing Freight Corridors for the Specially developed zones
- **URBAN PLAN** (Ahmedabad -Gandhinagar City)
  - Preparing Compact City Plan
  - Developing strong ring roads and city wide radial network
  - Promoting NMV transit

- **NODAL PLANS** (e.g. Sanand)
  - A plan for the nodes to develop as towns of high quality residential/activity areas comparable to that of Ahmedabad



Figure 4-4: The transformation of the Anjal Station Area after BRT development | Source: CoE UT CEPT, 2009

Following are the highlights of Draft Master Plan 2021:

### Zoning Regulations

- Encourage compact development in central areas, transit nodes and corridors.
- Special planned development zones along- Walled city, Sabarmati Riverfront, Gandhi Ashram and Science City-Thol Lake etc.
- 218 ha land of 38 closed mills to be used for institution, education and affordable housing.
- Affordable housing zone planned in 76 sq. km area encircling SP Ring Road apart from land of 38 closed mills in Ahmedabad.
- Separate General Development Control Regulation (GDCR) norm for the Walled city and for areas around the Sabarmati riverfront
- Local Area Planning to superimpose for better urban design and to integrate people to transit

### Promoting Redevelopment

- Increasing FSI along transit corridors- BRTS & MRTS from 1.8 to 3.6 or 4 based on chargeable FSI with concessions for affordable housing.
  - 4.0 FSI provision in 200mtr BRTS & proposed metro corridor
  - 4.0 FSI in high density corridor between National Highway (BRT) & 132ft ring road (Metro) on east side of Ahmedabad
  - Highest 5.4 FSI for 10 sq.km area surrounding the Sabarmati riverfront, allowing nearly 22-storey buildings.
  - 4.5 - 5 FSI provision for CBD area
- Introduced differential FSI in the city to balance environmental preservation and development priorities
- Intensification in landuse through change in General Development Control Regulations (GDCR)
  - Height restrictions removed
  - Minimum floor height specified
  - 51 per cent ground coverage instead of existing 30 per cent
  - Extra 2.2 FSI at highly concessional rates above the FSI of 1.8 for providing affordable houses
- Increased parking space from 5 per cent of total utilizable space to 20 per cent for residential areas. For commercial construction, this limit has been raised to 50 per cent of permissible maximum FSI from the existing 30 per cent<sup>19</sup>
- Improvement of green cover from 4% to 15%

### Environment Management

- Re-use of waste water and utilization of solar energy (solar water heating system) for plot areas/ built up areas > 5000 sq.mt;
- Compulsory solar water heaters atop all hotels, hostels, hospitals and public buildings;
- Premium FSI for energy efficient buildings(Green Building); and
- Water harvesting mandatory for new buildings.

### Finance

Ahmedabad Janmarg Ltd. (AJL), wholly owned by the AMC is responsible for the operation of Janmarg. AJL has implemented various tools to capitalise development along transit such as: fare-box payments, parking charges, advertising, and proceeds from the sale of additional floor area ratio (FAR) along BRT corridors. Apart from the above mentioned innovative financing tools, AJL receives funds from Urban Transportation Fund, AMC's municipal bonds and new improved property tax reform.

Additionally, Ahmedabad has been in the forefront as it relates to developing financing mechanisms for urban infrastructure projects in the country. Some of the earliest examples of municipal financing in India such as issuance of municipal bonds and Town Planning Schemes (TPS) were introduced in Ahmedabad. AMC has carried over its innovative approach for municipal financing to TOD projects as well. For example, the city has introduced a system of chargeable FAR bonuses as a tool to finance public infrastructure improvements. Furthermore, it is one of the few cities in India that follows a system of property appraisal based on the guideline values that are updated every three years based on land use changes and supporting infrastructure investments<sup>20</sup>.

### Implementation

AMC and AUDA are the two key implementing agencies in the city responsible for the planning, development and enforcement of urban development policies. The following are the primary responsibilities of these agencies:

#### **AUDA**

*Jurisdiction: Metropolitan Region*

*Role: Formulate Development Plans for Ahmedabad Urban Agglomeration, prepare and implement the draft Town Planning Schemes, and monitor the development activities in accordance with the Revised Development Plan.*

#### **AMC**

*Jurisdiction: Municipal Limit*

*Role: Provision of physical and social infrastructure, construction and maintenance of roadways and investment in public transportation systems planning, implementation and operation.*



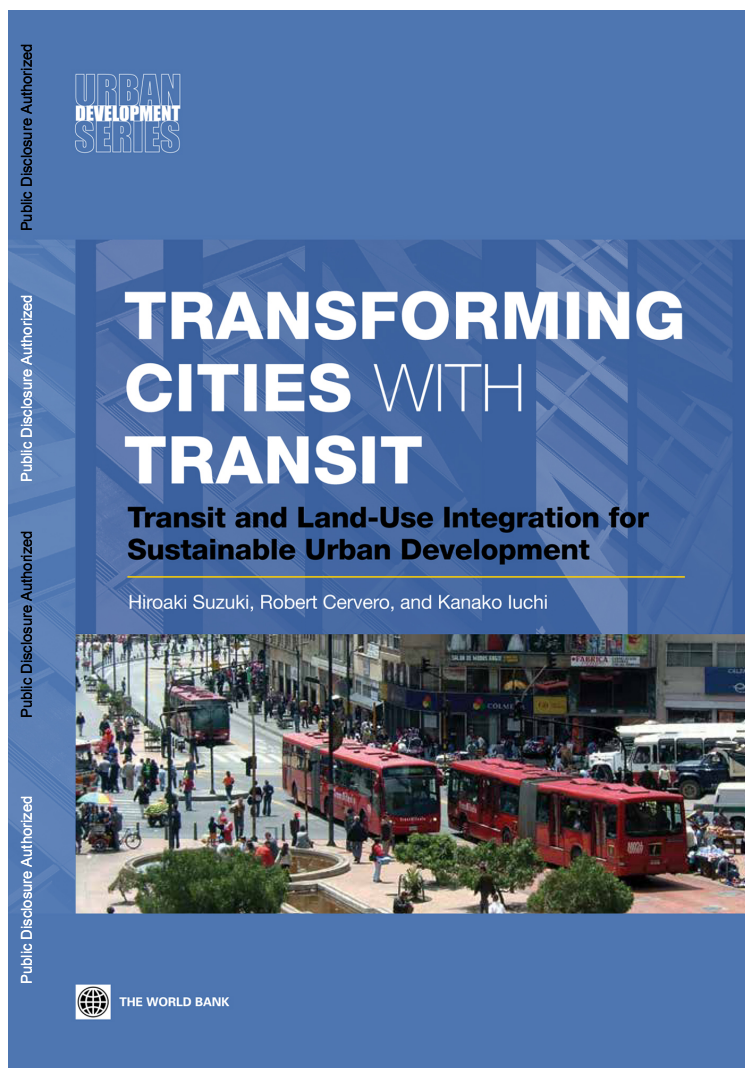
## Lessons

This final section draws lessons from Ahmedabad's experience of improving accessibility and promoting sustainable forms of urban development through Development Plan as a planning tool. The lessons learned are categorized under the four themes of Enable, Plan + Design, Invest, and Implement to understand their experiences in implementing integrated land use and transportation.

- Integrated TOD in the revised Comprehensive Draft Development Plan-2021; and
- Proposed Local Area Plans for the overlay zones of Central Business District (CBD), Transit Oriented Zones (TOZ) and Residential Affordable Housing Zone (RAH).
- Encourage compact development in central areas, transit nodes and corridors;
- Increment in FSI along transit corridors- BRTS/MRTS from 1.8 to 3.6 or 4 based on chargeable FSI with concessions for affordable housing
  - 4.0 FSI provision in 200mtr BRTS & metro corridor
  - 4.0 FSI in high density corridor between National Highway (BRT) & 132ft ring road(Metro) on east side of Ahmedabad;
- Introduced differential FSI in the city to balance environmental preservation and development priorities;
- Premium FSI for energy efficient buildings(Green Building);
- Intensification in landuse through change in General Development Control Regulations (GDCR)
  - Height restrictions removed
  - Minimum floor height specified
  - Separate GDCR for walled city
  - 51 per cent ground coverage instead of existing 30 per cent
  - Extra 2.2 FSI at highly concessional rates above the FSI of 1.8 for providing affordable houses; and
- Utilization Of Solar Energy (Solar water heating system) for plot areas/ Built up areas greater than 5000 sq.mt.
- Chargeable FSI along transit corridor; and
- Affordable Housing Zone designated with a 2.7 FSI along the BRTS corridor.
- Overlay Zoning Districts in line with infrastructure, transport and civic amenities;
- Local area planning adopted to better integrate urban design strategies at micro-level with transportation improvements;
- Land pooling of smaller parcels along the BRTS corridor; and
- Facilitated public participation through stakeholder consultations and workshops.



## Ahmedabad Case Study



*(Suzuki Hiroaki, Cervero Robert, Kanako Luchi, 2013, Transforming Cities with Transit: Transit and Land-Use Integration for Sustainable Urban Development, International Bank for Reconstruction and Development / The World Bank)*

Today, Ahmedabad finds itself at a critical juncture. The city, in the Indian state of Gujarat, is emerging as a thriving economic hub in India. Located in the Delhi-Mumbai Industrial Corridor, Ahmedabad is the fifth most populous city in the country, with a population of 5.5 million. It is also one of the fastest-growing cities in the world; its population is expected to reach 10 million over the next 20 years, placing it among the world's megacities (CoE UT CEPT 2011; Forbes 2010). The city's expansive infrastructure, strong industrial base, commercial tradition, and strategic location continue to attract significant numbers of businesses, investments, and new residents. Like other large cities in India, Ahmedabad is grappling with the challenges of rapid urban expansion, mounting motorization and congestion, and uncoordinated public and private land and transportation development.

Janmarg, India's first BRT system, began operations in 2009.<sup>1</sup> It has significantly improved the mobility of Ahmedabad's citizens. It has gained fame as an exemplary BRT system for developing countries, receiving national and international awards.<sup>2</sup>

However, because Janmarg has been framed and envisioned as a mobility improvement rather than an instrument for guiding urban growth, the city has yet to exploit the huge potential of BRT investment to promote sustainable forms of urban development. Such achievement would significantly improve economic competitiveness, quality of life, and social inclusiveness in the city over the long term.

<sup>1</sup> Delhi and Pune built busways before Ahmedabad completed its BRT system. Their busways are similar to the low-performing busways built in the 1970s and 1980s in some Latin American countries, however.

<sup>2</sup> In 2010, the International Transport Forum and International Association of Public Transport recognized Janmarg for "outstanding innovation in public transport," and the Institute for Transportation and Development Policy (ITDP) awarded it the Sustainable Transport Award. Other organizations—including the Transportation Research Board Committee on Developing Countries, EMBARQ, the German Agency for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit [GIZ]), the International Association of Public Transport (UITP), the United Nations Centre for Regional Development (UNCRD), the Clean Air Initiative for Asian Cities (CAI Asia), and Latin American Cities (CAI LAC)—have also recognized Janmarg (<http://www.itdp.org/news/ahmedabad-wins-2010-sustainable-transport-award/>).

## The Janmarg Bus Rapid Transit System

In 2005, the Ahmedabad Municipal Corporation (AMC) made the Janmarg BRT its highest-priority transit investment in its “Accessible Ahmedabad” vision, a linchpin in achieving its longer-term goal of enhancing accessibility for all.<sup>3</sup> This vision of an accessible city focuses primarily on the introduction of rapid buses as opposed to orienting land-use activities to the busway. Improved accessibility is to be achieved by moving people around the city more swiftly, not by bringing urban activities closer together.

The decision to build Janmarg coincided with the national government’s announcement of a reform-linked urban investment financing program, the Jawaharlal Nehru Urban Renewal Mission (JnNURM), initiated in 2005. The JnNURM provides matching grants to local governments, on the condition that cities prepare a city development plan articulating their long-term visions, a detailed project report, and an implementation schedule for the proposed urban reforms.

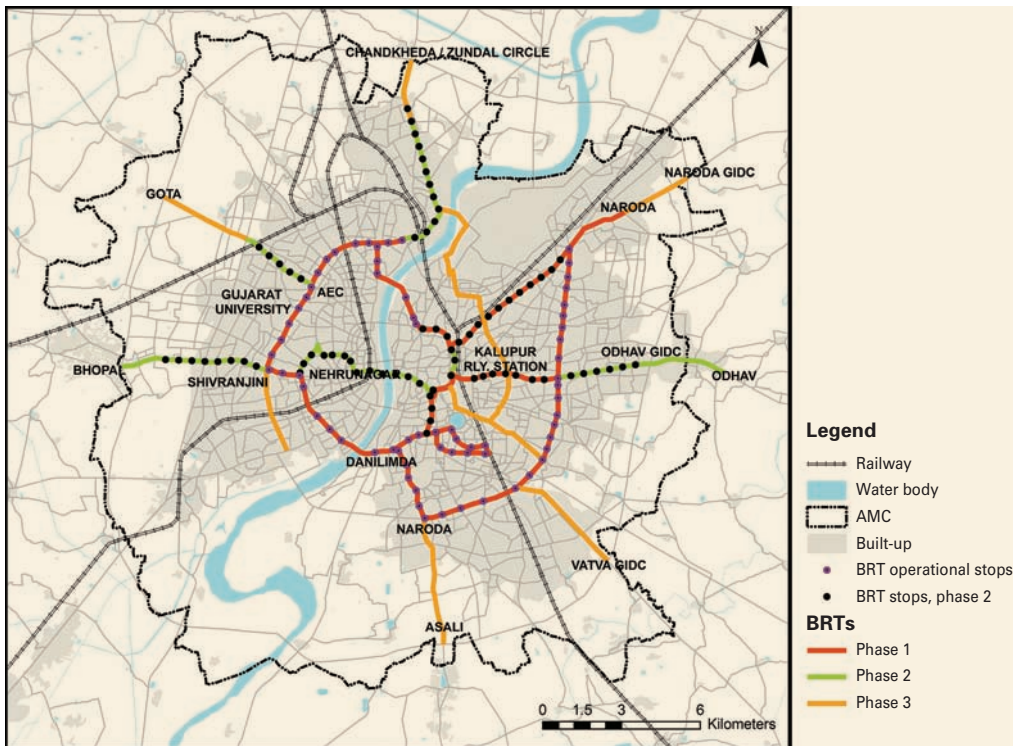
The following year, the national government adopted the National Urban Transport Policy, which included integrated urban transport and land-use planning as its first objective. To promote this policy, the national government encouraged cities to undertake public transport projects, particularly BRT, together with nonmotorized transport investments by linking JnNURM’s funding with the principles embodied in the National Urban Transport Policy. Ahmedabad’s Janmarg was the first BRT project to receive JnNURM funding, which accelerated its implementation.<sup>4</sup>

When complete, Janmarg’s busway system will span some 220 kilometers. Phase I of the project led to a 45-kilometer network . Phase II, currently under construction, adds another 58.0 kilometers; Phase III proposes adding an additional 40.2 kilometers. The rest of the system will be constructed in subsequent phases.

Accessibility is an important plan component for Janmarg. For Phase I corridors, 20 percent of the city’s population lives within walking distance of the 1-kilometer buffer zone. This figure is expected to increase to about 73 percent when the 143-kilometer system is built, after completion of Phase III. In order to reach the largest number of people possible, Ahmedabad planners carefully selected routes in the fastest-growing areas of the city, emphasizing high-quality operations (for example, dedicated bus lanes, full-service bus stations, and pay-and-park systems) in the planning and design processes. The BRT routes were also selected to connect busy places but avoid congested roads. To achieve these goals, planners gave priority to widening roads, providing new road linkages, and adding grade separations (bridges and underpasses) for both rail and intersecting roadways. Janmarg Phase I, which began construction in October 2007, was opened to the public at the end of October 2009, serving the eastern and western portions of Ahmedabad. Its three operational routes pass through the city’s densest areas. It is operated as a “closed system” with dedicated bus lanes, meaning no buses leave the lanes and become feeders on local streets.

<sup>3</sup> Other investments include suburban rail transit systems, a metro system, and upgraded regular bus systems. Recognizing the importance of an integrated transport system, the AMC’s vision aims to redesign the city structure and transport systems to provide greater accessibility, more efficient mobility, and a lower carbon future.

<sup>4</sup> Janmarg Phase I cost Rs 5,400 million (\$100 million), of which JnNURM financed Rs 2,700 (\$50 million), the Gujarat state government financed Rs 810 (\$15 million), and the AMC financed RS 1,890 million (\$35 million).



Phases I, II, and III of Ahmedabad's Janmarg bus rapid transit system | Source: CoE UT CEPT 2012.

Janmarg is heavily utilized. Daily ridership increased by a factor of 10 in two years, from 13,000 in October 2009 to 135,000 in November 2011. During peak periods, buses operate with average headways (intervals between buses) of 2.5 minutes, travel at 25 kilometers per hour, and average 95 percent on-time departure. Fares are affordable: the distance-based fare structure ranges from Rs 2 (\$0.02) for a 1.5-kilometer trip to Rs 5 (\$0.09) for a 5.0-kilometer trip. Citizens appreciate the improved citywide mobility provided by the accessible, affordable, and safe Janmarg, consistently giving the system an 8.5 out of 10 rating in monthly user satisfaction surveys.<sup>5</sup> The system also provided opportunities to improve open space around station areas.

Effective system design and speedy construction were possible thanks to a supportive institutional framework that enabled collaborative planning and decision making by all relevant institutions. Under an AMC initiative, participation by the Gujarat state government in decision making as well as funding was particularly effective in seamlessly implementing the project.

**a. Before**



**b. After**



Before and after Janmarg at the Anjal station area | Source: CoE UT CEPT 2009.

<sup>5</sup> The surveys are conducted by the Centre of Excellence in Urban Transport at the Center for Environmental Planning and Technology (CEPT) University.



Janmarg's steering committee also included other key urban development players, such as state government departments, the Gujarat Urban Development Corporation, the Gujarat Infrastructure Development Board, AMC's various departments, and the Ahmedabad Urban Development Authority (AUDA).<sup>6</sup> Each institution had a different role to play in Janmarg's construction, based on its comparative strengths and advantages. For instance, transportation planners and engineers from the Centre for Environmental Planning and Technology University carried out system design, and the AMC supervised construction work by private contractors.

Today, Janmarg is operated and managed by Ahmedabad Janmarg Ltd. (AJL), which is wholly owned by the AMC. Bus operators are selected through a transparent public bidding process, and tenders are evaluated on a per kilometer basis. Under a public-private partnership (PPP) scheme, the private sector also provides other services, including automatic ticketing, passenger information systems, and maintenance of the BRT corridor, stations, and parking facilities. AJL's revenue comes from the Urban Transport Fund (UTF), which includes fare-box payments, parking charges, advertising, and proceeds from the sale of additional floor area ratio (FAR) along BRT corridors. Janmarg can use this fund to finance transit improvements and operational deficits.

### Development along the Janmarg Corridor

Ahmedabad has experienced a flurry of new property development in recent years. Much of it, however, has been away from Janmarg corridors. The eventual impact of the Janmarg BRT on urban form is still unclear, because the system only opened in 2009 and many more kilometers of services are yet to be built. As the city has focused mainly on improving mobility rather than shaping urban growth, development has been left mainly to market forces. There has been little proactive planning to incentivize or encourage private growth near Janmarg stations.

The built-up area of Ahmedabad is currently expanding toward the city periphery, with more development along the roads networked citywide, which are also used and planned for BRT corridors.<sup>7</sup> However, the current BRT system primarily serves built-up areas—where land for new development and densification is limited—whereas corridors planned for future phases extend beyond the built-up areas, suggesting a greater potential for shaping urban growth in coming years.

Corridor assessments reveal that the initial market response has been a reaction to development opportunities along the planned and constructed segments of the Janmarg system. New developments along the corridors are most evident in economically vibrant areas, such as the corridors of Dudeshwar–Delhi Darwaza and the Kalupur Narod. The first corridor is close to the Sabarmati Riverfront Development Project, whose 10.4-kilometer stretch along the river is undergoing redevelopment with sidewalks, parks, and gardens to make the area more accessible to the public. The Kalupur Narod corridor is also being upgraded, following the redevelopment of textile mill sites that had been closed for decades.

Brownfield development of closed state-owned textile mills—once the economic backbone of the city called the “Manchester of the East”—has also been apparent. Although many mills were forced to shut down during the 1970s and 1980s, most remained unredeveloped until recently, partly because of the repealed Urban Land Ceiling Act (ULCA) which involves many creditors and lengthy procedures.<sup>8</sup> Currently, these sites are being handed over to the AMC and private developers after the arbitration process.<sup>9</sup> Land parcels occupy premier locations throughout the city, many of them near Janmarg stations on the eastern side of Ahmedabad, on the east side bank of the Sabarmati River.

Not surprisingly, private developers have aggressively sought to maximize profits over the past half decade, taking advantage of the city's economic boom. Many have accelerated property development in response to the increasing demand for housing, capitalizing on both greenfield and brownfield opportunities. However, few private developers coordinate their projects with public plans or give much thought to TOD integration with land parcels located near Janmarg stations. According to private developers, prices of land near the stations have nearly doubled between 2006 and 2011. To date, however, private developers have been the only beneficiary, profiting from the increased land value created by government investment.

6 The Ahmedabad Urban Development Authority (AUDA) was originally established as an agency responsible for areas that fall outside the AMC but within the Ahmedabad Metropolitan Area. It currently manages an area of 1,295 square kilometers, 449 square kilometers of which belong to the AMC. Its responsibilities include preparing development plans, ensuring the availability of land for development, preparing the Town Planning Scheme, controlling development activities in accordance with the development plan, improving environmental conditions, and providing physical and social infrastructure.

7 The study team investigated Janmarg's impact on the built environment at three different scales: across the city, within its corridor, and in neighborhoods. The first two scales were observed by assessing the transformation of building footprints that fall within a 500-meter buffer of the trunk lines. A matched-pair analysis was conducted at the neighborhood level by selecting station areas (target areas) and control areas (non-BRT station areas) that were similar in social status and land use. The target areas were selected at the 500-meter buffer of the Janmarg stations, the control areas at 1,250 meters from the target area stations. Three pairs were selected for this analysis. The key data used for the three analyses were statistics on new construction and changes in building height between 2006 and 2011.

8 The ULCA was a national state regulation that set a ceiling on urban property ownership of 1,000 square meters per person in an effort to prevent the concentration of property in the hands of a small number of owners. The regulation was repealed in 1999.

9 The AMC is allocated 20 percent and private developers 80 percent.

**Box 3.1 Ahmedabad's Sabarmati Riverfront Development Project**

Initiated in 1997, the Sabarmati Riverfront Development Project is a notable Ahmedabad success story. The 10-kilometer riverfront had long faced problems, such as illegal settlements, environmental degradation, and water pollution. The project revitalized the riverfront neighborhoods for business and residential uses, installed public amenities, connected the east and west sides of the river and re-located riverfront residents in degraded houses to 4,000 units of new social housing prepared by the city. The project's success has instilled the local government and citizens with pride and confidence.



International kite festival at the riverfront, 2006 | Source: Sabarmati Riverfront Development Corporation, Ltd. 2010.

**Factors Working in Ahmedabad's Favor**

Ahmedabad's experiences managing urban growth and promoting economic development have been remarkable, especially compared with other large cities in India. The city is often rated as one of India's best-planned cities.<sup>10</sup> Its achievements are the result of a planning culture that embraces innovative tools and financing schemes, as well as good governance that enables smooth planning implementation. Several elements, discussed below, represent opportunities to develop transit and land in a more coordinated way.

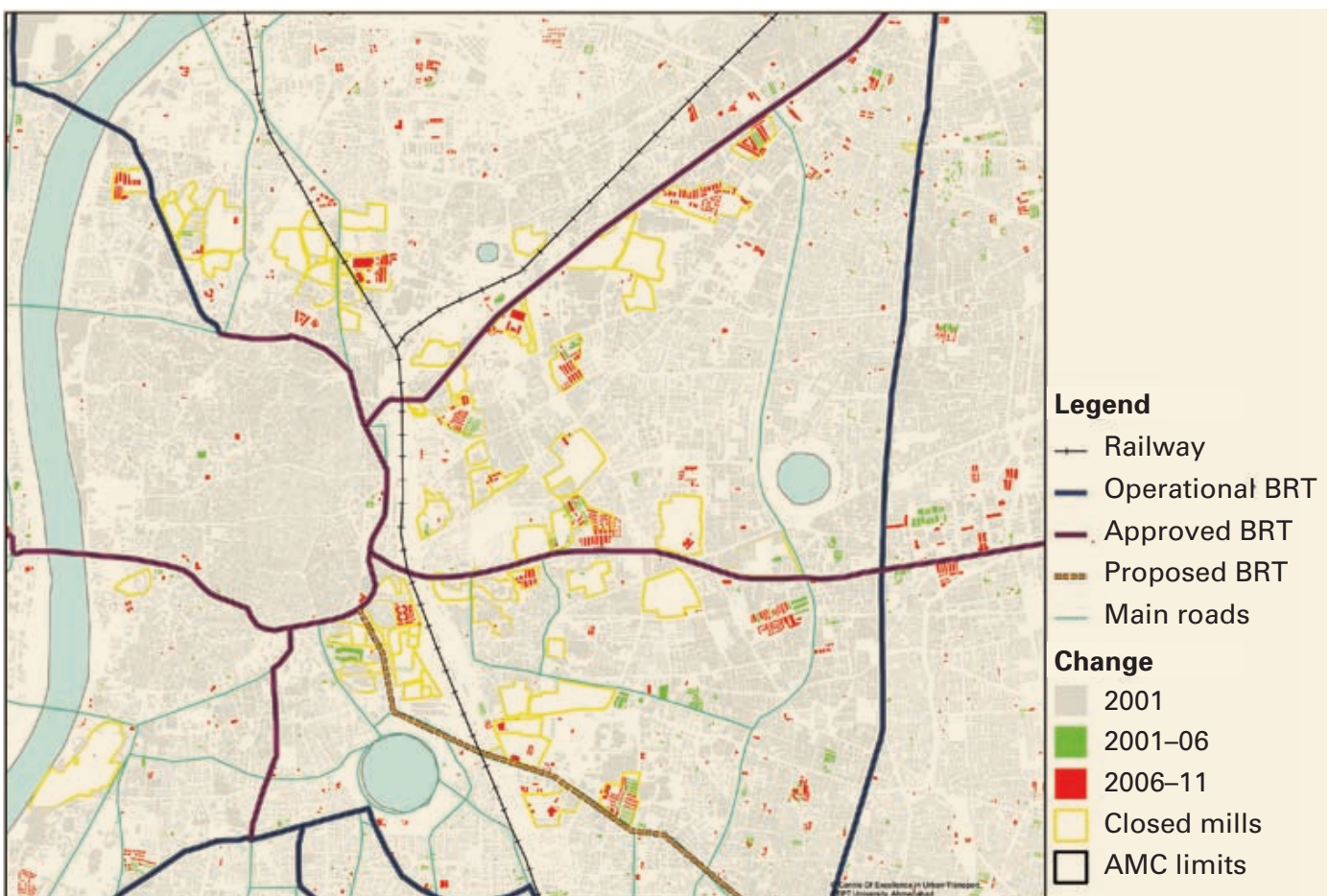
*Linking transit and public housing in development.* Informal housing in Ahmedabad has been increasing for three decades, rising from 17.2 percent of total housing in the 1960s to 22.8 percent in the 1970s, and then to 25.6 percent in the 1990s (Bhatt 2003). During the late 1990s, an estimated 40 percent of households were living in informal housing and chawl houses (Bhatt 2003). Originally built to accommodate textile mill workers, chawl houses are dilapidated structures rented to low-income households. In the late 1990s, they accounted for about 18 percent of the city's housing stock. Informal settlements are apparent along the riverfront, on public lands, and on any available vacant spaces. Together with a lack of adequate and affordable housing for the city's marginalized residents, residential demand for the growing population as a whole is becoming a progressively pressing issue.

<sup>10</sup> The Lee Kuan Yew World City Prize recognized Ahmedabad's "early success in implementing a comprehensive city development plan, which aims to transform India's seventh-largest city into a more livable, equitable and sustainable metropolis with a dynamic multisector economy and an emerging auto-hub" (Lee Kuan Yew World City Prize 2012).



The AMC is addressing such housing issues by developing former textile mill sites. After these sites are redistributed to the public and private sector, redevelopment plans will focus on social housing and commercial development. The planned housing is especially crucial because low-income residents, particularly residents affected by public infrastructure development projects, including Janmarg, are prioritized for relocation into these developments. Welfare facilities, including schools and medical clinics, are also being developed. Incoming households will improve livelihoods through better housing conditions and access to services, including proximity to Janmarg. Private developers will also benefit, as they are free to use their allocation for the construction of commercial or residential buildings, made more lucrative by their premier location in the city center and proximity to public transport.<sup>11</sup>

To date, capacity to accommodate marginalized residents on former textile redevelopment sites has been limited, partly because of the FAR constraint (capped at 2.25). Development that accommodates the growing demand for housing and commercial space could be encouraged by allowing higher FARs to increase the maximum building volume or by requiring private developers to reserve a certain percentage of units, often 25 percent, as “affordable social housing” units for low-income residents who are eligible for government rental assistance, with the remaining housing units priced at market rates.<sup>12</sup>



Closed textile mill sites and development progress in Ahmedabad | Source: CoE UT CEPT 2012.

*Financing scheme that captures land value.* Ahmedabad has traditionally taken a progressive approach toward municipal and infrastructure financing. It has introduced a number of innovative financing schemes including India’s first municipal bond, various PPP arrangements, and the Town Planning Scheme system.

From a TOD perspective, the sale of additional FAR and the “guidance value” property tax system are particularly notable. In 2002, a law allowing the sale of additional FAR for properties abutting streets 18 meters wide or wider, including all BRT corridors, was passed. The current permissible FAR is 1.80, which can be increased to 2.25. In 2011, the city earned about \$26 million from the sale of FAR bonuses, which represented 4.5 percent of the city’s total revenues and 5.0 percent of its total investment budget. Currently, the city is discussing raising the FAR along transit corridors. The guidance value property tax levying system captures the increased land value created by public investment. The amount levied changes once every three years based on location, land use, and occupation of the owner/renter.

*Strong urban planning tradition.* Ahmedabad stands apart from other Indian cities for its strong tradition of urban planning. Institutionally,

<sup>11</sup> Developers who intend to redevelop textile mill sites usually purchase additional floor area ratio (discussed in the next section) to take full advantage of the property.

<sup>12</sup> Possible financing schemes include cross-subsidization of affordable housing segments by high-income households and provision by the local government of a bonus FAR, allowing the developer to construct more units.

the AMC collaborates closely with the AUDA, which manages urban planning and development, formulates development plans, controls development activity, and provides physical and social infrastructure in the metropolitan region. AUDA delegates AMC to assume the same responsibilities and functions in the city area in close coordination with AUDA. The existence of the AUDA provides an efficient mechanism for coordinating regional growth and ensures consistency in urban planning practice and implementation across different administrations in the metropolitan region.

Planning and development follow a two-level process. The first level is the Development Plan, a macro strategy defining the direction of growth and envisioning citywide infrastructure. The second level is the Town Planning Scheme, which covers smaller geographic territories within the city, as delineated in the Development Plan. Ahmedabad has used the Town Planning Scheme since 1915; about 75 percent of the city (about 300 square kilometers of urban development) was developed based on the scheme.

**Box 3.2 Ahmedabad’s Town Planning Scheme**

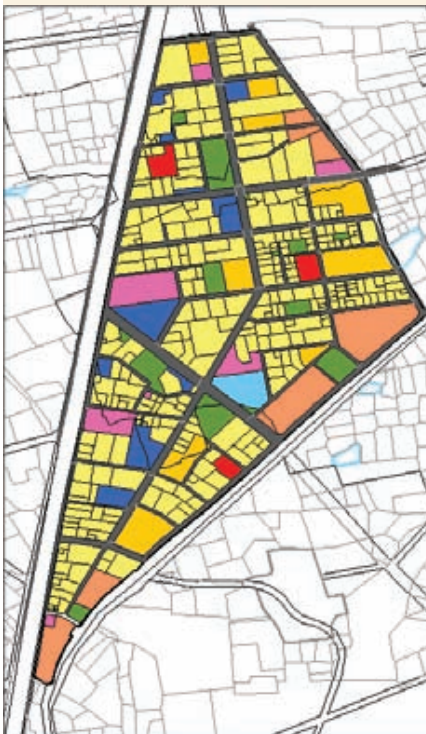
Ahmedabad’s Town Planning Scheme includes the following elements:

- reconstitution of landholdings
- appropriation of land for public uses without acquisition (up to 50 percent)
- local road networks (up to 20 percent)
- local social and physical infrastructure (up to 5 percent)
- land bank for urban poor (up to 10 percent)
- land appropriation as an adjusted compensation against increased land value (as a result of infrastructure investment )
- land bank for financing of infrastructure (15 percent).

**a. Before adjustment  
(unarranged land parcels)**



**b. After adjustment  
(arranged land parcels)**



Land adjustment in Ahmedabad | Source: Ahmedabad Urban Development Authority n.d.

The Town Planning Scheme has allowed a rational pattern of land development to unfold. It has enabled local authorities to establish agricultural plots suitable for urban uses by altering the shapes of, sizes of, and access to specific land parcels. For example, a parcel of land could be differentiated for the use of roads (up to 20 percent of total parcel use); other public purposes (parks, playgrounds, and so forth, up to 15 percent); and low-income housing (up to 10 percent).

The Town Planning Scheme is particularly important because it makes development an almost self-financing activity. The system aims to adjust irregular-shaped land parcels into a more productive shape upon development while investing in infrastructure, including roads, public parks, water lines, and a sewerage system. Although the original landowners lose some portion of their land in the adjustment process (by selling it to the public as part of the infrastructure fund or donating it for public use), they may benefit from higher land values in the area as a result of better infrastructure and land configuration. Throughout the process, landowners are not required to invest additional money, as relinquishing part of their original land parcel effectively covers the land readjustment and infrastructure investment cost.

The Town Planning Scheme process has also helped nurture an inclusive culture of plan making and implementation, as it includes intensive stakeholder participation and consultation in several stages. The first draft is unveiled at a landowners meeting, which is followed by three or four rounds of individual hearings with each landowner regarding physical and financial proposals before finalizing the land use.

Collaborative planning culture. Ahmedabad has strong political leadership and efficient horizontally and vertically coordinated government administrations, including the local and regional administrative bodies of the AMC and AUDA. In addition, institutions of higher learning and think tanks, such as the Centre for Environmental Planning and Technology University, are invited to take part in planning processes whenever necessary. This collaborative and inclusive planning culture was particularly apparent in the BRT planning and implementation phases. Citizens were also invited to comment and provide feedback on the Janmarg system at the initial stage of operation.

With a people-oriented and business-friendly city administration, governments in the Ahmedabad metropolitan area, especially the AMC, have nurtured a strong trust-based relationship with the business community and citizens. In fact, businesses as well as citizens have supported development efforts that might have faced opposition in some circumstances, such as the Sabarmati Riverfront Development Project, which involved resettling of some 4,000 households. The city's efforts to improve the livelihoods of the underprivileged population are also well accepted, as their plans are often shared publicly.<sup>13</sup>

### Overcoming Obstacles to Sustainability

A number of challenges hamper the opportunity to promote TOD in Ahmedabad. These challenges concern land-use strategies and tools, land fragmentation and building deterioration, and the design of transit improvements and urban development.

*Uniformly low floor area ratios and lack of strategically articulated densification.* Low and fairly uniform FARs (of 1.8–2.25) limit growth around transit nodes. According to Ahmedabad's planners, allocating moderate FARs citywide is intended to disperse travel demand and thus decongest the city. The local government is also cautious about modifying the FAR for fear of possible accusations of land-related corruption. The maximum FAR in Ahmedabad (2.25) is modest compared with FARs in other Asian cities, such as Tokyo (20); Hong Kong SAR, China (12); and Seoul (10). As a result, strategic locations such as transit nodes and Janmarg stations are not much denser than other parts of the city. Although some efforts have been established between the strategic nodes and FAR modification, progress has been limited, in contrast to Janmarg construction and provision of services.

If FARs remain low and relatively uniform, a more automobile-oriented built form is almost inevitable. Given the current cap, most new development will be pushed out to the periphery, increasing the share of trips by motorized vehicles. Coupled with economic development and income growth, the share of future trips by small, atomized vehicles (such as two-wheelers and three-wheelers) is likely to grow as well. Low-density growth will more likely promote private automobile use than public transit use. In the near term, the city may experience less traffic congestion, as a result of evenly dispersed urbanization, but over the long term this pattern of development creates an urban form that is less conducive to high-capacity transit and more dependent on private automobile use, leading to more traffic congestion and air pollution.

Keeping FARs low also prevents property owners and developers from redeveloping their deteriorated low-rise properties into newer, taller buildings. Without redevelopment, the stock of degraded, uninhabitable buildings will deteriorate even further. These unfavorable conditions are particularly evident around Janmarg station areas and corridors, which are already surrounded by older, low-rise buildings situated on small parcels.

Together with a low FAR ceiling, the lack of a strategic development plan thwarts efficient and sustainable development. Although the region seems to be committed to creating a few satellite centers as part of the planned metrorail investment, little systematic effort or planning appears to be placed for creating third-tier centers along Janmarg's corridors. In contrast, as noted in chapter 2, hierarchical centers are a pivotal component of Singapore's successful integration of transit and development, supplemented by integrated intermodal services, including rail, bus, paratransit, and pedestrian ways. Development along Janmarg's corridors is left mostly to private developers, without guidelines or rules to maximize the use of urban space proximity of the transit stations and corridors.

<sup>13</sup> In recognition of its success in reducing urban poverty, Ahmedabad received a national award for "Best City in the Implementation of Basic Services to Urban Poor (BSUP)" under the Jawaharlal Nehru National Renewal Mission program.



The lack of strategic development is also apparent in the redevelopment of closed textile mill sites. Although these land parcels are located near Janmarg's stations and corridors, development is not sufficiently integrated. Public and private land developers are concentrating solely on redeveloping their allocations, without institutional or design coordination with surrounding counterparts. TOD guidelines, which typically provide principles for increased density and mixed land-use development, are lacking.

To strategically increase building volume and mixed land use around key nodes, such as areas around Janmarg stations or planned metro stations, the AMC needs to consider adopting a more flexible density control policy. Together with TOD principles and other urban development measures, such a policy could better promote the redevelopment of inner city areas and more efficiently plan subcenters.

Small parcels, informal land transactions, and degraded buildings. A host of issues, including the prevalence of small land parcels, the informality of land transactions, and the city's degraded building stock, is suppressing efforts to encourage BRT-based TOD. These problems stem in large part from various land-use regulations. The Rent Control Act of 1949, which aimed to protect tenants from eviction by landlords, resulted in dilapidated rental housing, as owners had little incentive to maintain the units or redevelop the land. The now-repealed Urban Land Ceiling Act of 1976 significantly contributed to the expansion of built-up areas outside the AMC, while promoting smaller development within the city's boundary. The Land Acquisition Act of 1984, used to acquire and develop lands by the public, unintentionally supports informal transactions because the large time gap between notice and payment, during which the land is often underpriced, discourages formal sales.

Together with the national government, the city needs to proactively address these issues if TOD is to be leveraged aggressively. In other countries, including Germany, Japan, and the Republic of Korea, land-adjustment schemes similar to the Town Planning Scheme have been used to revitalize long-distressed urban districts. In contrast, to date, Ahmedabad has applied the Town Planning Scheme only to convert rural land to urban uses.

*Design shortcomings.* Janmarg is designed as a closed system, requiring users to access stations situated in the medians of roads by foot, bicycle, car, two-wheeler, or other mode of public transit. Good design—for example, direct line-of-site access and clear way-finding—is needed to encourage people to choose Janmarg over other modes. The city has plans to include pay-and-park systems, bike lanes, and pedways, but more can be done. Currently, cycle tracks parallel the BRT lanes but do not allow for modal interaction; these tracks function more as an adjunct than as a feeder to Janmarg. There are no bicycle parking spaces. There is also no well-designed network of pedestrian ways and sidewalks that feed into stations; places where pedestrian ways do exist are sometimes occupied by motorcycles and other fast-moving vehicles. Local buses run by the Ahmedabad Municipal Transport Services (AMTS) function as feeders to other destinations in the region, but they are not well connected to the BRT system.<sup>14</sup> Ahmedabad could learn from some of Bogota's experiences building green feeder networks that support non-motorized transport, described later in this chapter.

Greater emphasis should be placed on increasing connectivity between surrounding land uses and Janmarg stations. Prioritizing design considerations during initial planning stages, when mobility investments and land development take place, would increase walkability around stations and Janmarg ridership. To date, little consideration has been given to place-making. Many key redevelopment sites, such as former textile mill parcels, are undergoing redevelopment without much regard to urban design, aesthetics, or environmental quality. Station areas lack a distinguishing identity, accessibility is poor, and opportunities for mixed land uses have been completely missed.

*Development of new, automobile-dependent towns.* The New West, a new town in western Ahmedabad City, accommodates global corporations and attracts upper-class residents. The district's built environment is distinct from the rest of the city, symbolized by tall, modern buildings in superblocks with few pedestrian ways in between. The road network was designed to accommodate smooth operation of private automobiles. Most buildings have at least one parking lot to accommodate residents and commuters.

Although this district should be connected to extended BRT services or the planned metro, the area is currently completely disconnected from any public transport; all residents and commuters must therefore depend on automobiles. Increasing FARs and mixed land uses at an early stage of New West's development, coupled with vastly improved transit services and pedestrian connections, would, with time, make the area far less automobile oriented and more transit oriented.

<sup>14</sup> The Janmarg BRT (served by Ahmedabad Janmarg Ltd.) and the regular bus system (served by AMTS) are the two main public transit modes in the city. With 212 routes covering 550 kilometers of road network, AMTS covers about 97 percent of the AMC's developed area and carries 0.9 million passengers per day. It accounts for about 11 percent of all trips in Ahmedabad.

## Embracing Opportunities for Sustainable Growth

Ahmedabad's major challenge to achieving smart, sustainable growth that is sensitive to community needs, is balancing rapid population and industrial expansion with available funding. The city's progressive planning culture, innovative development tools, and business-friendly mindset provide the necessary support to meet these challenges.

Janmarg's expansion and the new metro present significant opportunities for Ahmedabad to develop as a sustainable metropolis supported by transit. The city's current megaplans and projects, along with redevelopment opportunities at closed textile mill sites, could trigger locally tailored TOD.

One example of such an opportunity is the new metro development that plans to link Ahmedabad City and Gandhinagar City, the state capital, located in the north. This project provides an excellent opportunity for shaping Ahmedabad and surrounding regions with a strategic planning vision and implementation processes, especially as the planned rail line will pass through the city's landmark Sabarmati Riverfront Development Project. Successful integration of transit and land use through the development of the riverfront and mobility projects could serve as an iconic model for guiding future metropolitan development.

The Town Planning Scheme used in the greenfield development process could be proactively adjusted in the process of promoting TOD. Because the city's land parcels are small, particularly in the inner city, they require an additional land consolidation process. With almost a century of experience with the Town Planning Scheme in new development, the city could apply its knowledge and techniques to currently urbanized areas, as promoting building density in the already built-up area cannot be achieved without this capacity. The collaborative planning culture between governmental agencies and departments, as well as between the government and its citizens, is a great asset that could address current challenges facing transit and land-use planning.

Proactively exploring opportunities to capture increased land value as a result of transit development is a key element of successful long-term urban management. Captured value could be used to recover various costs of transit investment, social housing, infrastructure, and other developments, including physical designs for TDM. It could also help cover expenses for operations and maintenance of public transit. As TOD projects require significant financial resources, as evidenced by all three phases of Janmarg's construction and expansion, such effort becomes crucial as future megatransit projects—like the planned metro—require much greater resources.

At a smaller scale, city officials are considering raising the FAR of proposed metro and BRT corridors to 3.5. Doing so would allow the public sector to capture land value increases. At the same time, the city should strategically assign FARs to reflect the intensity of transit services as well as factors of economic, cultural, and environmental importance. The "Rail+Property" real estate development undertaken by private railway companies in Hong Kong SAR, China and Tokyo are examples that cities like Ahmedabad should consider emulating.

Advancing urban development in close coordination with improvements in land use and public transit would help Ahmedabad become a sustainable city. Many growing cities, including other cities in India, are developing or planning BRT systems and metros. Lessons learned from the proactive and strategic integration of transit and land use in Ahmedabad will be of critical importance for growing and expanding cities worldwide.



## Arlington, Virginia

### CITY PROFILE:

Population	: 2, 21,045 (2012)
Land Area	: 67 Sq. Km
Gross Density	: 3,284 Persons /Sq. Km
Per capita Income	: \$57,724 (2012)
Governance:	Arlington County Government

### TRANSPORT MODE SHARE:

Walking	: 5%
Public Transport	: 23%
Motorized Personal Transport	: 55%

**KEY TOD THEMES:** Joint Development, Integrated Transit + Land Use Planning, Financing TOD, Station Area Planning, Multimodal Integration

Source: Federal Transit Administration, TCRP-108 Effects of TOD on Housing, Parking, and Travel, available at: [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_rpt\\_128.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_128.pdf)

### City Overview

Arlington County is part of the Washington, DC, metropolitan region, situated in Northern Virginia across the Potomac River. With an area of 26 square miles, it is one of the smallest counties in the United States in terms of land area. However it is among the most densely populated jurisdiction in the U.S. with more people per square miles (7,625 persons).<sup>38</sup> Due to the county's proximity to Washington, D.C., many federal offices are located here. Combined with federal policy that mandates government offices be located near rail stations, TOD is actively encouraged as an important city policy<sup>39</sup>.

Washington Metrorail, consisting of two Metrorail corridors: Rosslyn-Ballston and Jefferson Davis that initiated development in the surrounding areas. Prior to the construction of Washington Metrorail system, Arlington was home for government offices. Conscious planning decisions in anticipation of the construction of Metrorail into Northern Virginia, and prediction of a strong market for office construction, have accounted for significant changes in land use development patterns in Arlington. These changes have greatly shaped the economic and community activity levels of Arlington and transit ridership levels for trips originating from or terminating in the county.



Figure 6-2: Location of Arlington in Virginia

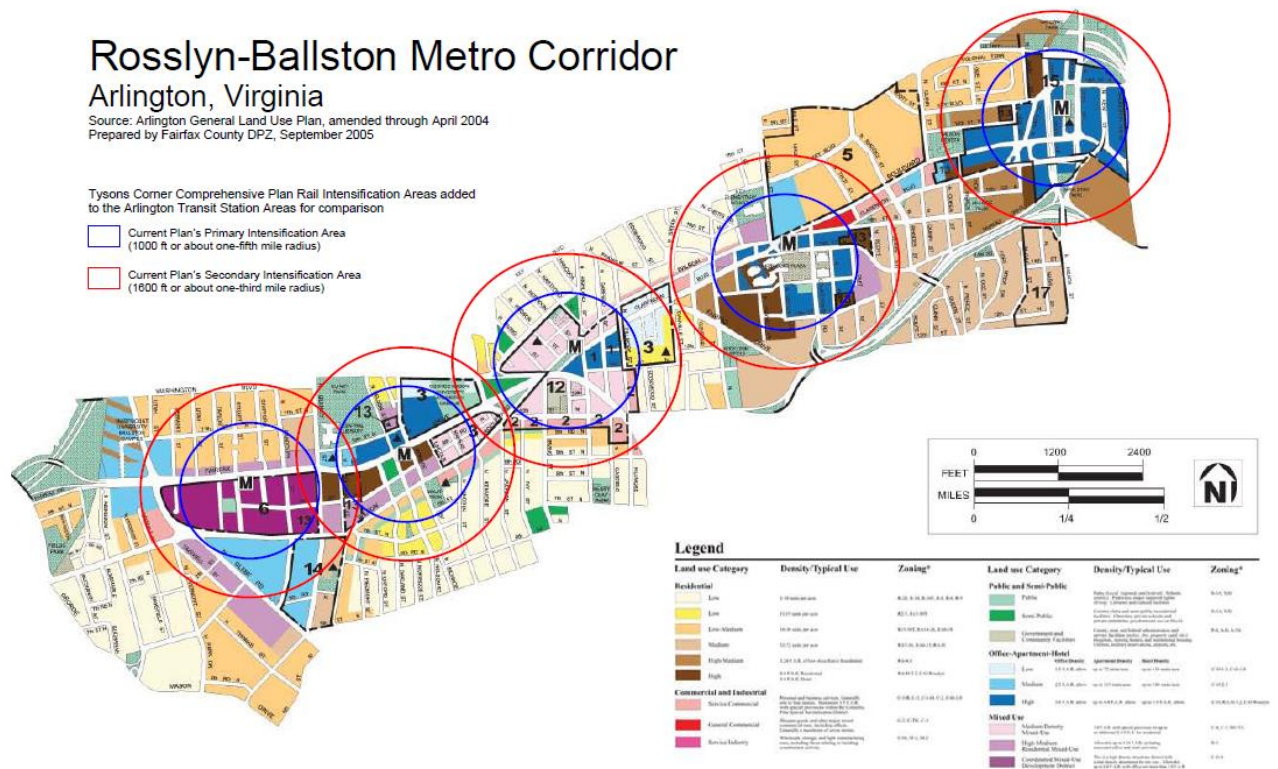


Figure 6-3: Arlington General Land Use Plan amended through April 2004 | Source: Fairfax County Department of Planning and Zoning (2005), 'Land Use and Development along the Rosslyn-Ballston Metro Corridor'

### Enable

The transformation of rural Arlington County into a compact, mixed-use TOD has been a decision of the County's planners and the local leadership. The decision makers opted for proposing a rail corridor along its two major arterials (Wilson Boulevard and Fairfax Drive) instead of placing it along the interstate, thereby creating opportunities for synergetic public and private developments<sup>40</sup>. One of the primary tools adopted by the County to promote transit oriented development was to create a general land use plan (GLUP). The GLUP sets the broad policy framework for guiding development decisions along the Metrorail corridor. In addition, the County also planned sector plans for individual sectors that detailed land- use and overlay zoning ordinances along with urban design, transportation, and open-space guidelines for individual stations. As illustrated in the table below, the site plan allows significantly higher density & heights than the underlying zoning around station areas.

Table 6-1: Development norms for Arlington County

	By-Right Zoning	Site Plan Permitted Development
FAR	1.5	3.8-10
Height	35-45 ft.	100-300 sq.ft.
Car space	4 spaces per 1,000 sq.	2 spaces per 1,000 sq.ft.

Source: A presentation by the Arlington County Department of Community Planning, Housing and Development, Planning Division, December 6<sup>th</sup>, 2012

The plans also focussed on the supportive infrastructure development within the quarter mile radius based on the concept of "necklace-of-pearls" or 'Bull's Eye Concept' adopted in the late 1960s. Regular revision of the plan to review the existing condition of the new development emphasized on revising and promoting higher densities along the metro corridor.

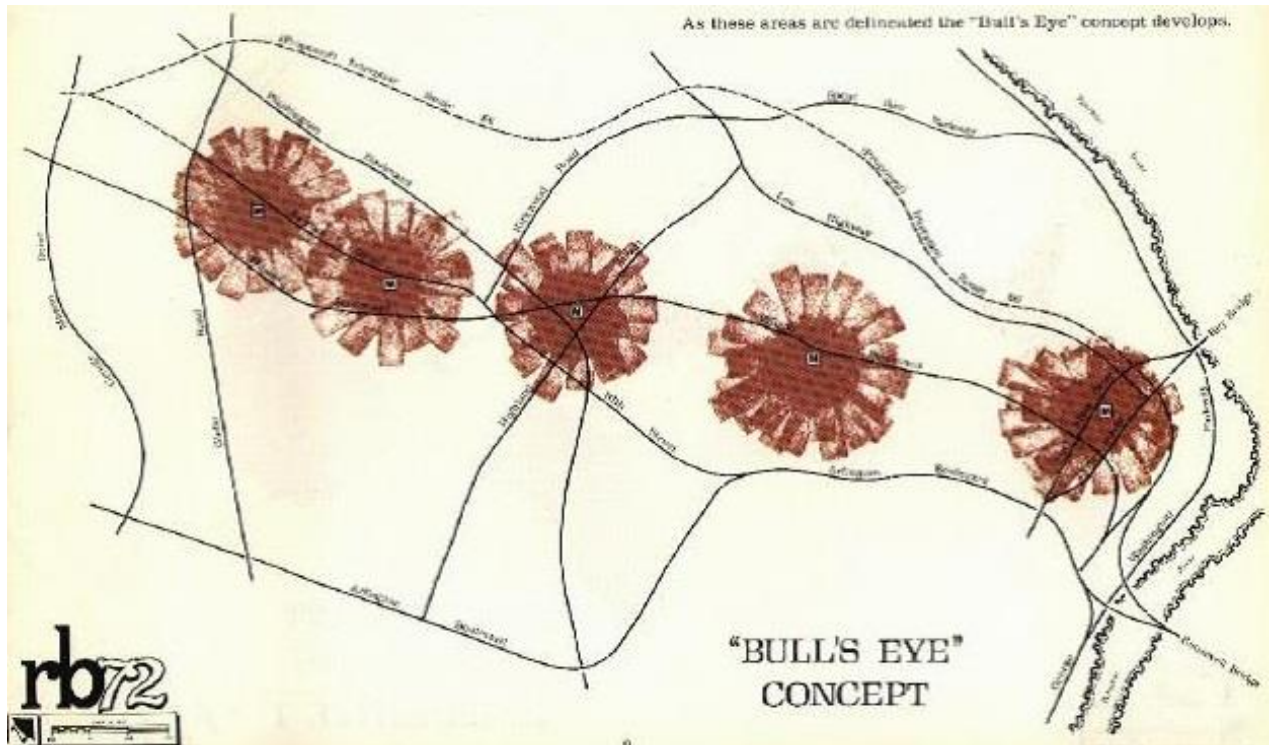


Figure 6-4: Bull's eye concept for the development of Arlington | Source: Arlington County Dept. of Environmental Affairs Planning Division, Rosslyn-Ballston Commercial Corridor Study, June 1974

The Arlington County Board adopted new policies to manage the new development that has encroached upon the open spaces and had put some historic sites in jeopardy. An Open Space Policy was adopted that not only regularised the depletion of open spaces but also led to the preparation of Open Space Master Plan as part of comprehensive plan. Public outreach and community participation were facilitated by concerted outreach efforts in collaboration with Neighbourhood Conservation groups, individuals and business associations.

Arlington enables joint venture mechanism with private sector investment in TODs. In order to get approval for higher densities than those allowed as per the zoning code, developers are required to provide public improvements including services, undergrounding utilities, and other amenities with respect to the proposed population.

### Housing supportive policies

Although landuse plan and sector plans had been supportive in catering to the development in Arlington, they could not address gentrification and affordability issues generally related to TOD projects. In 1990, to address the issue, a Special Affordable Housing Protection District (SAHPD) was formed to offer preference to the affordable housing developments along the transit corridor, followed by adoption of Housing Policy Principles in 1991. To further encourage affordable housing along the transit corridor, developers were lured with increased density bonuses to provide market rate and affordable housing within the same development without compromising on the quality of construction for cheaper housing units.

### Transit Supportive policies

In addition to supporting and prioritizing transit service, the County also worked on the expansion of its Transportation Demand Management program by improving parking management, enhancing community bike-ability and improved local and regional bus service. The immediate station-areas encourage walking between nearby places to live, work, shop, and play. The five stations on the three mile corridor ranged from  $\frac{2}{3}$  to  $\frac{7}{8}$  of a mile apart from one another making every point along the corridor a 10-15 minute walk from a station.





Figure 6-5: Walkability & Multimodal Transportation Planning near stations | Source: Arlington County Dept. of Environmental Affairs Planning Division, Rosslyn-Ballston Commercial Corridor Study, June 1974

## Design

The Rosslyn-Ballston corridor in Arlington Virginia is one of the successful examples of integrated land use and transportation planning. Rosslyn-Ballston (R-B) corridor runs on three miles of tracks and includes five stations. Overall, the development of Arlington cannot be credited to just the introduction of a high quality transit system but numerous other layers that include a strong market demand being in close proximity to Washington D.C., a clear and articulate vision for growth planned by the city government involving various stakeholder consultations and the application of tax increment financing policies.

In the early 1950's and 60s, the R-B corridor had predominantly industrial land uses composed of lumber yards and light industrial uses. The redevelopment of Arlington was a community led program and had much of community support. Due to public planning efforts and available incentives to the developer's the corridor witnessed a boom of real estate investors. The county focussed more on integrating planning with the transit rather than treating transit in isolation. The 1972 Rosslyn-Ballston Bull's Eye Plan identified Metro stations as the heart of the activity and proposed tapered growth towards neighbourhoods. The key principles of the development concept were:

- Use the Metrorail transit investment as the catalyst for intensive redevelopment of the commercial spine of central Arlington;
- Concentrate density and promote mixed use at the five stations, and taper development down to adjacent neighbourhoods; and
- Preserve and reinvest in established residential neighbourhoods adjacent to the corridor.<sup>41</sup>

These principles provided consistency in achieving planning objectives. While the corridor's proximity to Washington D.C. created demand for institutional land use, Arlington County focused on balanced development to maximize use of metro. They planned housing adjacent to station to create lively places on the R-B corridor, rather than just a business district. Rezoning along Rosslyn-Ballston corridor was done centring the proposal on individual site plan. In order to get approval for higher densities inconsistent with a site plan, developers had to provide public improvements including services, undergrounding utilities, and other amenities with respect to the proposed population.



Figure 6-6: Change in development around the Rosslyn metro station area from 1950s to 2000s | Source: Presentation by the Arlington County Department of Community Planning, Housing and Development, Planning Division, (2012), 40 Years of Smart Growth Arlington County's Experience with Transit Oriented Development in the Rosslyn-Ballston Metro Corridor

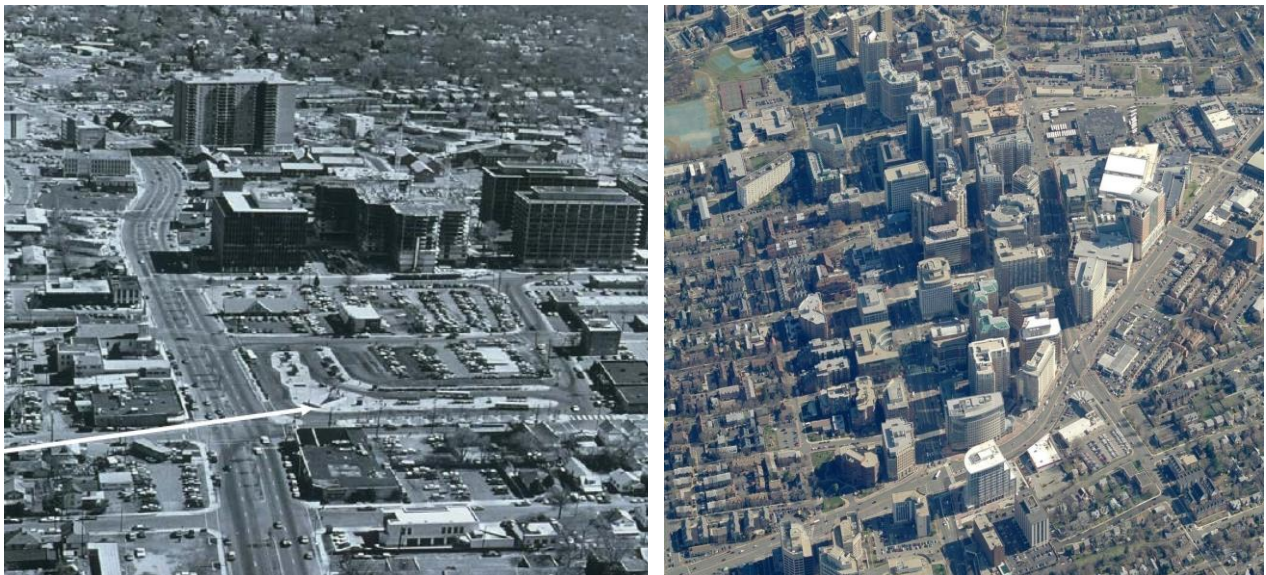


Figure 6-7: Ballston metro station witnessed a drastic increment in high rise buildings from 1960's to 2000's after the introduction of metro corridor | Source: Presentation by the Arlington County Department of Community Planning

## Finance

Mixed-use developments along the metro are one of the income-producing mechanisms used in Arlington. According to research from Jones Lang LaSalle in 2012, retail and office space in walkable urban places possessed a 68 per cent rental premium per square foot over properties located more than one mile from Metro. In terms of tax-assessed property values, the Brookings Institution reported that within one year of opening Rosslyn-Ballston Metro Stations, property values rose by \$1 billion.

Instead of just using strong economic development incentives, traditionally used in the neighbouring jurisdictions, Arlington County also focused on creating a place that developers and firms would choose to invest in. Arlington County did regular land value assessments based on the land use as indicated by the General Land Use Plan and Sector Plans, which resulted in much higher assessments compared to those done normally, based on income or replacement costs of existing structures.





Figure 6-8: Example of mixed use and mixed density development, Arlington | Source: Presentation by Arlington county Board, 'Three Decades of Smart Growth: Arlington's Urban Village'

### Implementation

Arlington's strong commitment to good planning that includes specific station-area plans, density bonuses and supportive infrastructure investment played a key role in transit supportive development. Arlington has elected board members that are long-time community residents and have been a part of the transformation that Arlington has witnessed over the last two decades. In addition, the County Manager is appointed by the Board, rather than elected, maintaining a consensus between legislative and executive officials at the local level. With minimal intervention from the local political system, it had been easier to promote the concept of TOD and uplift it over the years.

Washington Metropolitan Area Transit Authority (WMATA) is an independent regional transportation authority, responsible for designing, building, and operating the region's rail transit and public bus services.<sup>42</sup> WMATA also assisted in identifying land for redevelopment among the unutilised land parcels that were once used for the construction of the transit line but became vacant after the construction completed. It also acknowledged opportunities to develop underutilized agency-owned land, such as parking lots.

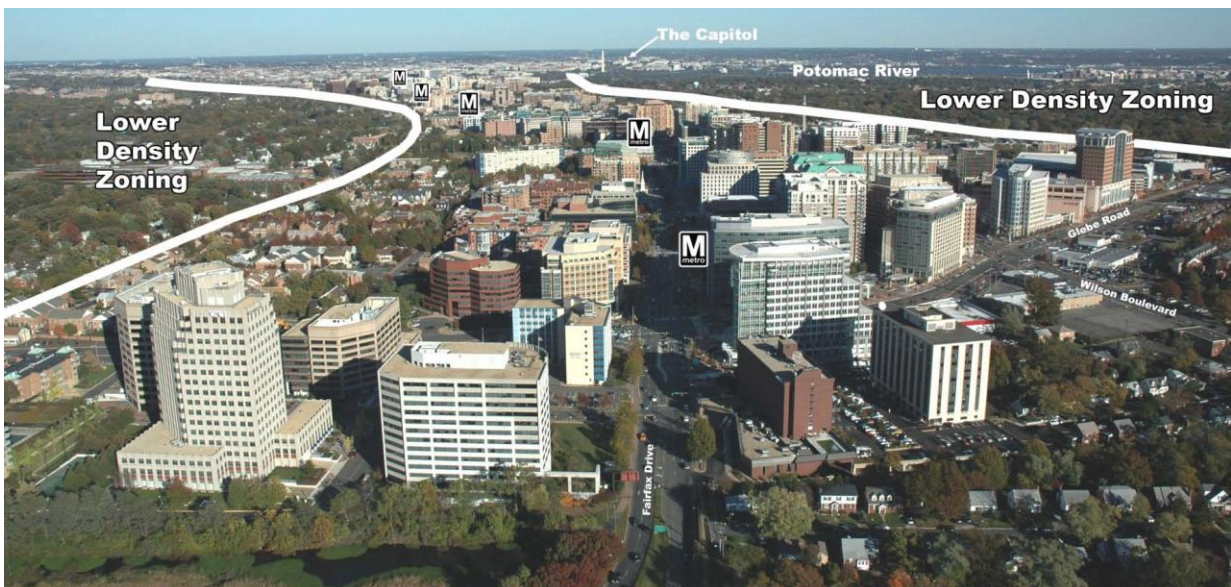


Figure 6-9: High density development concentrated around metro station and tapered growth towards neighbourhoods | Source: Presentation by the Arlington County Department of Community Planning, Housing and Development, Planning Division, (2012), 40 Years of Smart Growth Arlington County's Experience with Transit Oriented Development in the Rosslyn-Ballston Metro

## Lessons

This final section draws lessons for policymakers and planners from Arlington's experience with implementing transit oriented developments through strategic public- private partnerships. First, a discussion on the strengths and weaknesses of the Arlington model is presented; which is followed by a section on the lessons learned from the model that could be applicable in the large-scale rail-based transit investments being projected for many large Indian cities.

### Strengths

- Successful value capture model;
- High FARs has enabled Arlington to grow vertically, develop compact communities, conserve large expanses of open space and as a result curtail urban sprawl;
- Coordinated decision making mechanism between WMATA and the government's planning and transportation department has resulted in the success of R+P projects;
- The County has maintained low property tax rate while maintaining amongst the highest levels of services and also consistently maintains AAA bond rating from all rating agencies;
- Development along the corridor included the addition of 2,500 residential units, 140,000 m<sup>2</sup> (1.5 million ft<sup>2</sup>) of office space, 35,000 m<sup>2</sup> (379,000 ft<sup>2</sup>) of retail commercial space and 8 km (5 mi) of new bike lanes; and<sup>43</sup>
- The national average for car ownership is almost 90% with 55% having two or more vehicles. In the Arlington metro corridors: 17.9% have zero cars; Less than 25% have two or more cars; Less than 50% drive to commute to work; 39.3% use transit; 10.5% walk or bike; and 2.3% work at home.

### Lessons Learned

- Proactive planning to enable TOD in a redevelopment context;
- Design standards for buildings and pedestrian infrastructure that emphasize a more human scale;
- High tax yields from vacant, unused and financially underachieving developments revitalized by TOD;
- Specific station area plans accompanied by density bonuses and supportive infrastructure investments; and
- Realistic scale of implementation: Physical size of the area makes the people and authorities have a good grasp of the territory.

## Curitiba, Brazil

### CITY PROFILE:

<b>Population</b>	: 1,764,570 (2010)
<b>Land Area</b>	: 430.9 Sq. Km
<b>Gross Density</b>	: 4,095 Persons /Sq. Km
<b>Urban Area Density</b>	: 4200 Persons /Sq. Km
<b>Per Capita Income</b>	: \$20,154 (2012)

**Governance:** Curitiba-Mayor system (Brazil-Federal; presidential; constitutional republic)

### TRANSPORT MODE SHARE:

<b>Walking</b>	: 21%
<b>Cycling</b>	: 5%
<b>Bus/ BRT</b>	: 45%
<b>Motorized Personal Transport</b>	: 28%
<b>Others</b>	: 1%

**Key TOD Themes:** BRT-based TOD, Transit System Design, Minimized ecological footprint, Integrated Transit + Land Use Planning, Land Value Capture, Corridor based TODs, Institutional Framework.

(Source: <http://Itaacademy.gov.sg/doc/J11Nov-p60PassengerTransportModeSHares.pdf>)

### City Overview

Curitiba, the capital city of the Brazilian state of Parana, is home to nearly 2 million people making it the 7th most populous city in Brazil. The city is considered to be the trend setter and benchmark for establishing global standards in applying sustainable urban development principles through integrated land use and transportation investments. Between 1950 and 2005, Curitiba's metropolitan area witnessed a six-fold increase in its population- from 300,000 inhabitants in 1950 to 1.9 million in 2005. What makes Curitiba's case even more interesting is that the city is one Brazil's wealthiest cities and has one of the highest private car-ownership rates in Brazil (400 cars registered per 1,000 inhabitants<sup>44</sup>), yet it averages more transit trips than New York, Rio or Sao Paulo.<sup>45</sup>



Figure 6-10: Location of Curitiba in Brazil

Several large and medium-sized cities around the world are looking to emulate the city's Bus Rapid Transit (BRT) systems and its carefully coordinated physical land use planning and TOD principles, since the inception of its "RedeIntegrada de Transport" (RIT) system or the Integrated Transit System in 1974. That same year, the Curitiba Master Plan was enacted. This document was crafted to swiftly manage the rapidly increasing population (4% a year during '60s and early '80s) and to appease fears of uncontrolled sprawl and haphazard development that was plaguing similar cities in Latin America. The Master Plan also laid the foundation for future planning with the innovation, foresight, and flexibility needed to guide sustainable development.

While the city has a long history of planning, the introduction of the BRT systems was a game-changer in the evolution of Curitiba's urban form. Curitiba's BRT model with double-articulated buses and an expanding network of dedicated bus rapid corridors carrying nearly 16,000 passengers per hour is recognized globally as an affordable yet high-performance alternative for cities looking to invest in public transit systems. The example of Curitiba as a best practice for transit-oriented development is not limited to the success of its BRT system and its integration with land use planning along the corridors, lessons can also be drawn from Curitiba's experience in banking on investment opportunities through property development along the corridors as a financing mechanism to fund the transit system.



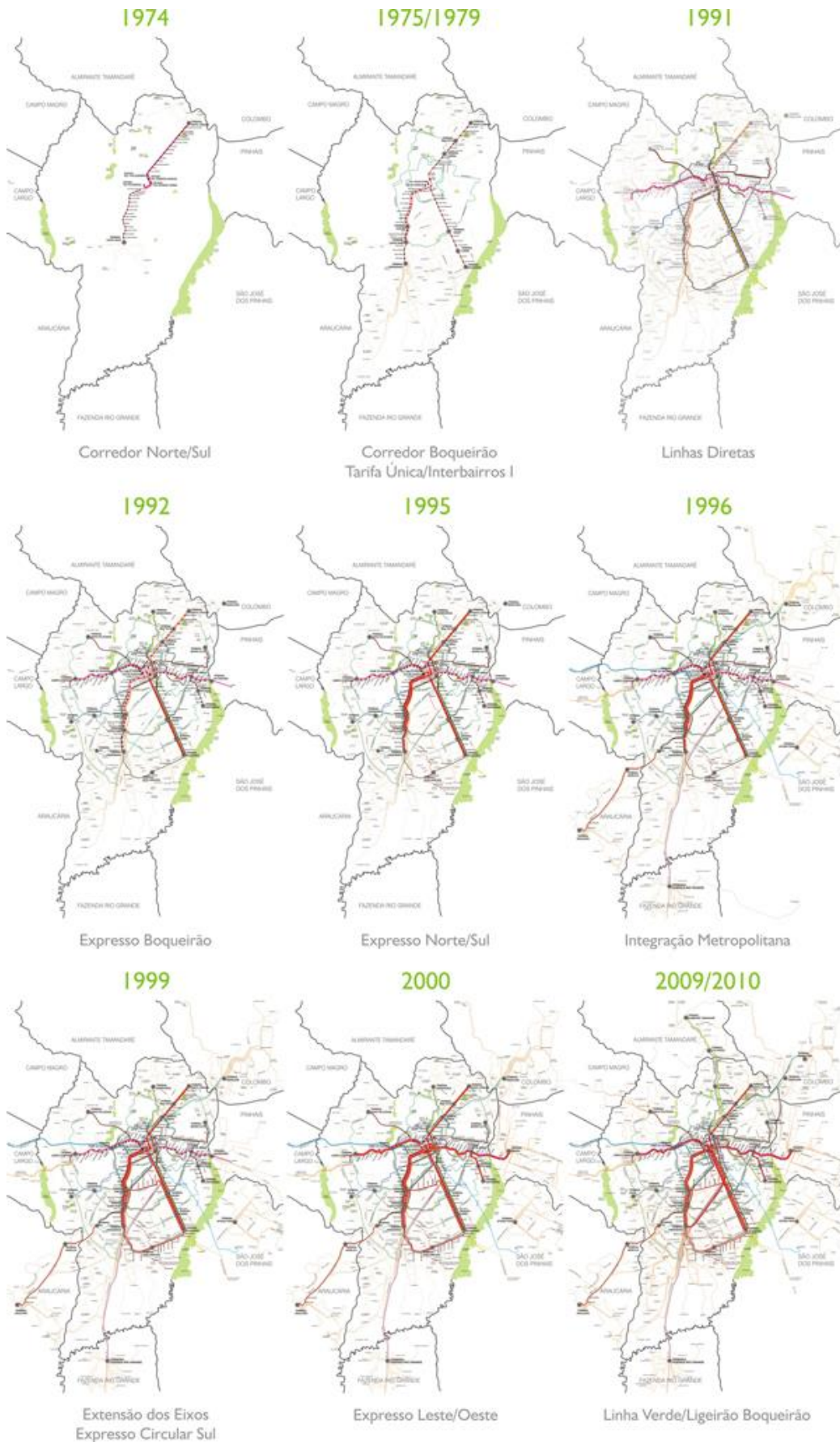


Figure 6-11: Growth of Curitiba's Transit Network | Source: BRT in Curitiba: Transportation and urban development: successes and challenges, Fábio Duarte, accessible at: <http://www.ing.puc.cl/transporte-y-logistica/wp-content/uploads/2013/04/Presentaci%C3%B3n-Fabio-Duarte-de-Ara%C3%BAjo-Silva.pdf>

## Enable

Curitiba's urban evolution can be categorized into three key stages in its planning history that set the foundation for its successful integrated land use and transit programme

**Stage 1: 1943-1970:** Agache Plan, prepared in 1943, was instrumental in raising the awareness about the significance of urban planning to manage growth. While the plan was never implemented due to insufficient funds, its focus was on accommodating automobile growth by strengthening the city's downtown through radial avenues and concentric roads in "hub-and-spoke" road system. Formation of the Institute for Research and Urban Planning of Curitiba (IPPUC) in 1965, under the visionary leadership of Jaime Lerner (later recognized as the "father of BRT" as Mayor), was one of the key steps in implementing the plan.

**Stage 2: 1972-1988:** The 1965 Curitiba Master Plan, was the turning point in the city's history and deviated significantly from the Agache Plan. This plan was ahead of its times in several aspects: mass transit was prioritized over automobiles to meet the city's mobility needs; linear city form as opposed to the sprawling radial form proposed in the Agache Plan; and importance was given to achieving the cultural, social and economic goals for the city. In 1971 when Lerner became the Mayor he empowered the IPPUC to implement the 1965 Master and it was during this phase that exclusive BRT lanes as part of the city-wide integrated bus transit system were executed along with several other transit-first policies and pedestrian-friendly initiatives.

**Stage 3: 1989-Present:** Curitiba's integrated BRT system and ped-ways system continues to improve incrementally its network, scheduling, fare structure and facility design. In the mid-90s, the success of the BRT system and lack of funds to implement a rail-transit system forced Curitiba's planners to innovate to increase the capacity of the existing system. The result was the idea to operate high-capacity buses on streets parallel to the exclusive bus lanes with elements of BRT that are currently being adapted in cities around the world such as same-level boarding and fare payment prior to boarding the bus- the "metronisation" of the bus.



Figure 6-12: Integrating land use planning with BRT system is one of the hallmarks of Curitiba's development | Source: Karl Fjellstrom, ITDP-China.org



### Supporting Transit- First Policies:

In addition to its integrated land use and transit planning process, the city has also ensured that transit supportive policies are in place as a demand management strategy. Key supporting policies include:

- **Parking Policy:** In the CBD, on-street parking time restricted parking is the only option available to drivers, and that too in limited areas supported by strict enforcement. Off-street parking facilities are private owned and prices are market-driven resulting in expensive parking charges and in return controlling traffic demand. Paid, on-street parking remains mostly in the CBD and is regulated by the URBS, the semi-private organization that also manages the entire public transportation system. Limited parking provision in the central area has assisted in maintaining a high mode share to transit (about 70%–75% of journey to work) despite the relatively high automobile ownership rates.
- **Employer-subsidized transportation:** According to a national law (Vale Transport Program) in Brazil, 20% of an individual's income should be channelled into transportation expenses. Also, the law stipulates not more than 7% of a worker's earnings should be spent on transportation and any share above this amount must be paid by the employer. This has resulted in employers subsidizing the transit fares for low-income workers and these employers are the primary purchasers of bus tokens.

### Design

Transit corridor was always part of Curitiba, but over the years integration of transport planning with zoning laws and other modes of transport gave place to high density development along the transit corridors specially BRT.

### BRT system

Adopted in 1968, the Curitiba master plan became the cornerstone of Curitiba's design and includes an urban design strategy whose centre-piece was an affordable and efficient transportation system to combat sprawl and congestion. The bi-articulated buses are able to carry high volume of passengers (270 passengers, 24.6 m long with 5 doors) on dedicated lanes at speeds rivalling metro systems around the world, though at a fraction of the cost. In the 1970's, about 7% of city travel in Curitiba was done by transit. Later, in the 90s, about 25% of city travel was done by transit. Today nearly 75% of city travel is accomplished using the transit system that is in place.

Curitiba's busways are viewed as a model BRT system and are widely recognized for many of their innovative features. Trunk and feeder bus lines routed through terminals allow convenient fare-free transfer. Bi-articulated five-door buses and tube stations with off-vehicle fare collection and floor-level boarding facilitate passenger access. Finally, direct express service and tube stations are provided along parallel, one-way arterial streets. Planning for Curitiba's next major project has already begun. New roads will be constructed near new residences and businesses, each with access to a new BRT route, the "Green Line." Another key element of Curitiba's transportation system is the complex network of feeder lines that are synchronized to support the BRT system. Figure 6-13 below provides a snapshot of the bus fleet, its capacities, and lines served currently as part of the city's overall system. The buses operating the various RIT services are colour-coded by function and include the following:

- "Troncal or express" (trunk line buses operating on the axes/busways – red/orange);
- "Ligeirinho" (express – grey/silver);
- "Interbarrios" (inter-district – green);
- "Alimentador" (feeders to/from terminals and stops serving trunk line or express buses – orange);
- Convencional" (operating regular services on normal roads where other services are not justified - yellow);
- "Circular centro" (serving the CBD – white); and
- "Metropolitano" (serving out of city destinations – blue).

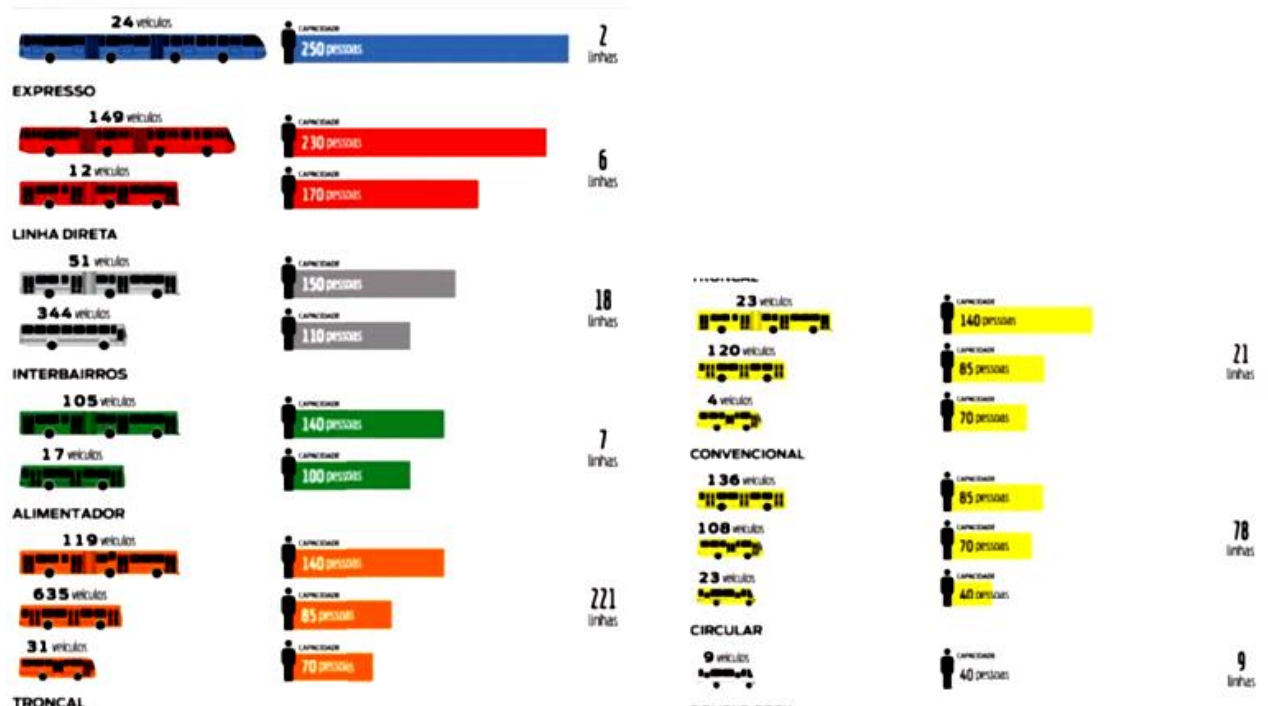


Figure 6-13: Curitiba Bus fleet types | Source: Duarte Fabio, TOD in Curitiba: How BRT may reshape a city. Retrieved from: <http://www.cseindia.org/userfiles/Fabio%20Duarte.pdf>

### Non-Motorized Transportation (Ped-ways and Bicycle tracks)

Curitiba has a combined length of 150 km dedicated to pedestrian and cycle paths. In addition, about 49 downtown blocks are open-air pedestrian malls complete with special lighting, kiosks, newsstands, landscaping and other special amenities. In 1971, Mayor Lerner embarked on a drive to convert downtown streets to pedestrian avenues. While met with fierce resistance from business owners initially when a major thoroughfare was converted into a pedestrian-only street, the increase in retail sales turned the wave to an extent that other traders in downtown demanded pedestrianizing their streets as well. Now Curitiba has the largest downtown pedestrianized shopping area in the world.



Figure 6-14: Dedicated Bicycle Tracks to Promote Non-Motorized Transportation in Curitiba | Source: Karl Fjellstrom, itdp-china.org

The bus stops are connected to bicycle paths, which extended to 160km into the city. IPPUC has recently completed a Bicycle Master Plan that will enlarge the cycling network for bicycle transportation in Curitiba by up to 400 kilometres.



### Urban Form: Trinary Road System and Structural Axes

As discussed earlier, the 1965 Master Plan set the stage for Curitiba's linear transit-oriented urban form. The key elements of the master plan included: 1) limiting circular sprawl moving outward from the urban core, thus decreasing congestion focused downtown; 2) creating **structural axes corridors** lined with high-density mixed-use development that would taper to lower-density communities away from the corridors; 3) typical structural corridors are in **trinary road system**: two one-way streets moving in opposite directions which surround a smaller, two-lane street where the express buses have their exclusive lane.

**Trinary Structural Axes**<sup>46</sup>: Curitiba's linear corridors or structural axes were complemented by the hierarchical road network- busway, local street, one-way arterial- that was designed to accommodate higher densities along the corridor while tapering to lower densities farther away from the central axis. In the trinary system, there are two bus-only lanes in the centre flanked by two local one-way roads that provide access to the buildings fronting the central busway. Parallel to the central axis, are two high-capacity one-way service roads heading in opposite directions which now accommodate limited stop "direct line" bus service and also define the extent of the structural axes concept. In terms of land uses, high-rise, high-density mixed-use buildings are located in the block between the central busway and one-way streets. One-way streets in opposite directions was identified as a necessary step towards retaining the transit ridership and mixed-uses supported a balance in trip generation as it would "both produce and attract transit trips".



Figure 6-15: Aerial view of Curitiba's CBD showing dedicated BRT lanes, station location and pedestrian refuge islands | Source: ITDP, China

### Regulatory Framework: Land Use, Urban Design and Zoning:

The busway system has been instrumental in driving land use development and has been used to stimulate development along transit corridor and has influenced been pivotal in influencing planning strategies:

- Land within two blocks of the busway has been zoned for mixed commercial residential uses while beyond these two blocks, zoned residential densities taper with distance from the busways;
- In the block adjacent to the busway, intensive, high-density development has been encouraged / permitted;
- Residential Densities along Curitiba’s BRT Corridors and adjoining residential neighbourhoods taper as they move away from the busways, accounting for the reduced service access;
- The land use form creates a concentrated, high demand for transport services along a narrow corridor that can be met efficiently by a public transport service;
- Transit service declines with density as there are fewer patrons. While in high density areas the stops are as close as 400m, in lower density areas this drops to 1200m in some places;
- Building heights range from 2 to 20 storeys along the corridor providing a strong street wall in many areas of the busway corridor; and
- Controls place both minimum and maximum values on density within the structural corridors. The density ceiling in urban center pushes growth out of the center into structural corridors, which reduces congestion.

Zoning prescribed by the structural axes has been realized by a combination of control and incentives. Some of the key development control features include:

- Initially, FARs of 6.0 were permitted; later in the 1990s, maximum FARs were lowered to 5.0 for offices and 4.0 for residential;
- Along the structural axes, only the first two floors can extend to property lines;
- 50% of the ground and first floor mandated to be dedicated to retail uses;
- Retail-commercial uses at the street level are exempt from FAR calculation;
- Minimum 5 meter setback required for buildings above the second floor;
- Density bonuses were also offered to develop as planned;
- Incentives to transfer development rights;
- Control over large-scale development;
- Incentives to developers to increase residential density close to the transit corridors; and
- Development of transit terminals with a wide range of facilities – both public and private.

Table 6-2: Residential Densities in Curitiba’s Structural Axes and Adjoining Neighborhoods

Zone	Residential Population			Dwelling Units	
	Population	Per Hectare	Per Acre	Per Hectare	Per Acre
<b>Mixed High-Rise Residential</b>	130,700	294	119	93	37.6
<b>Medium-to-High-Density Residential (ZR 4)</b>	217,300	164	66.4	40	16.2
<b>Medium Density Residential (ZR 3)</b>	240,800	76	30.8	22	8.5
<b>Low Density Residential (ZR2)</b>	416,506	63	63	17	6.9

Source: Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC), Advanced Planning Section, data files.

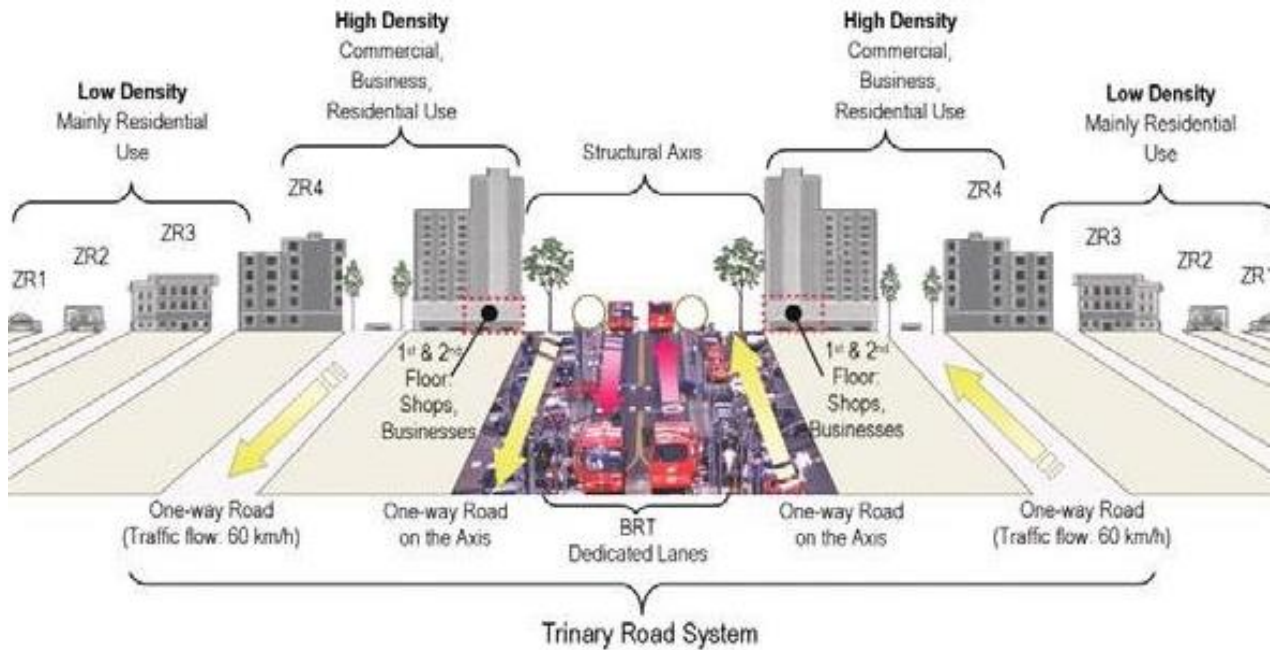


Figure 6-16: Typical Trinary Road System followed in Curitiba | Source: Brazil's green economy, Retrieved from University of Mumbai, <http://chaurahha.wordpress.com/?s=curitiba&submit=Search>

### Macro-Zoning

The establishment of different areas of density, use, and occupation of land in order to give each region better use according to the guidelines of growth, urban mobility, and the environmental and locational characteristics. This aims at the harmonious development of the community and the social welfare of its inhabitants.

The urban area constituted the entire city of Curitiba is divided into the following areas:

- I - Structural Axes** - Main growth of the city, characterized as areas of expansion of the traditional center and as corridors mixed high occupation density, supported circulation systems and transport;
- II - Axes Densification** - Axes of growth of complementary urban structure, occupancy and average mixed high-density;
- III - Areas with predominantly residential occupancy high, medium and low density** - Which should be promoted primarily a residential occupancy with high, medium and low densities, according to the natural support infrastructure deployed and proximity of structural axes and density;
- IV - Mixed occupation areas of high, medium and low density** - Which should promote mixed occupancy, residential, commercial and service of high, medium and Low density according to the natural support and infrastructure deployed;
- V - Areas with specific purposes** - Those whose use and ordering land use is characterized by the existence or forecasting facilities aimed at major institutional uses, industrial, commercial and services, which by its size or nature that require confinement in their own areas; and
- VI - Protected areas** - Those publicly owned or private, which imposes restrictions on land use in order to protect the aspects natural, such as water bodies, vegetation or any other thing of value environment.







Figure 6-19: Curitiba's Zoning Regulation | Source: Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC), Advanced Planning Section

**Affordable Housing**

The city of Curitiba has successfully implemented some innovative housing policies that have helped control gentrification; however, the problems of the poorest neighbourhoods being located in the outskirts continue to plague the city. In Brazil, normally affordable housing projects are funded by a state-run bank, called CaixaEconomica. In addition, attempts were made to ensure that affordable homes did not compromise on quality. The strategy applied was to focus on generating a sense of ownership and pride in residents for the living spaces through training, education and awareness programmes that focussed on skills development and income-generating opportunities. Some of the city led affordable housing initiatives included

- Land banking by the government along or close to the structural axes, has resulted in construction of public housing projects along the transportation corridors;
- “Buy-up” program through the Municipal Housing Fund Act as a form of density bonus program



where developers are offered two extra floors in residential buildings for contributing 75% of the market value to a low-income housing fund; and

- Curitiba's public housing programme (COHAB-CT) works in close co-operation with the Institute of Research and Urban Planning (IPPUC) to ensure a continuous supply of low-cost housing, especially along the transportation corridors.



Figure 6-20: Example of BRT based TOD in constrained RoW conditions with equitable allocation for pedestrians and motorized vehicles, Curitiba, Brazil | Source: IBI Group

### Implementation

Curitiba has a unique model for governing its urban planning and transit system. The Institute for Research and Urban Planning of Curitiba (IPPUC), an independent agency was established in 1965 to ensure continuity in plan implementation and supervision- an agency that was less exposed to political pressures and unpredictability seen in typical municipalities. The creation and sustenance of IPPUC to the present day has been one of the key instruments in ensuring the incremental urban development and transit improvements accomplished at a relatively low-cost in Curitiba. **URBS** serves as the urban development authority of Curitiba and is empowered to plan and manage all the transportation modes within the Curitiba metropolitan area. The consolidation of traffic, transportation and urban development into URBS supported by a total staff of 1,730 employees has been a major contributor in the successful implementation of the plan.

Table 6-3: The roles and responsibilities of the URBS and IPPUC

Urbanização de Curitiba (URBS)	Institute for Research and Urban Planning of Curitiba (IPPUC)
<ul style="list-style-type: none"> <li>• Publically administered, privately funded.</li> <li>• Manages the publically-owned transportation infrastructure and acts as liaison with private companies.</li> <li>• Administers the bus terminals, monitors the performance of routes, collects and distributes revenues, and negotiates with concessionaires.</li> <li>• Negotiates permissions with private bus companies to ensure they meet standards.</li> <li>• Responsible for regulating taxi services and public parking in the city.</li> </ul>	<ul style="list-style-type: none"> <li>• Consolidates urban development plans, programs and projects of different administrative units of Curitiba and its metropolitan area.</li> <li>• Designs the extension of the Curitiba Master Plan.</li> <li>• Shape transportation and land use initiatives to ensure they complement each other.</li> <li>• Coordinate planning, housing and environmental policies throughout the city.</li> </ul>

Source: IBI Group

The IPPUC and URBS work closely together to ensure long-term planning aligns with current operations. A large amount of their continuing success results from these two entities being publically accountable but largely independent of the political sphere, thus avoiding issues with political barriers and break in continuity of plan implementation.

The private bus companies also have a symbiotic relationship with the city administration. The bus companies provide buses, drivers, maintenance, and capital. There are three categories of companies, which determine revenue – small, medium and large. The companies exist through negotiated permissions given by URBS rather than term contracts and are paid on the basis of distance travelled and not number of passengers. This form of contract allows for easier elimination if standards or services are not met by firm.

### Lessons

This final section draws lessons for policymakers and planners from Curitiba's experience over the last four decades of integrated transit and land use planning. First, a discussion on the strengths and weaknesses of the Curitiba BRT-based TOD model is presented; which is followed by a section on the lessons learned from the model that could be applicable in the BRT investments that several Indian cities are emulating.

### Strengths

- Strong political leadership and commitment to promote transit-first policies and urban planning;
- Increased modal share of public transit- Curitiba's transit ridership increased by 30% between 1975 and 2007, even though during the same time the city had the highest personal vehicle ownership rates in Brazil. About 85% of Curitiba's residents use the bus system;
- Continuity between planning and implementation of the integrated land use and transportation strategies mainly due to empowerment of the independent IPPUC and URBS that transcended political administration;
- Multi-modal integration;
- Balanced development and conservation: In 1970, there was less than 1 square meter of green space per person; now there are 52 square meters for each person;
- High quality, frequent and affordable BRT system that is integrated seamlessly with a network of feeder systems. Curitiba was the first city in Brazil to organize private bus operation in catchment areas of the BRT;
- Bus-system has adopted a flat-rate "social" fare that contributes to ensuring stable ridership numbers;
- BRT is self-financing through the fare system and covers the costs of operation and maintenance generating profit for the bus companies; and
- Social programs as part of the urban planning strategy, such as slum rehabilitation programs and transfers of development rights for historic preservation.

### Weaknesses / Challenges

- Overcrowding of the BRT system and increase in fares has resulted in a decrease in ridership;
- Ongoing competition at the policy level between the existing BRT system and potential rail investments;
- Inability to respond to changing demographics with a slow growth rate;
- Increasing urban sprawl trends;

- Increasing gap between public housing demand and supply; and
- Lack of citizen participation in planning.

#### Lessons Learned from Curitiba applicable to Indian cities

- **Articulated densities as opposed to average densities<sup>47</sup>.** Curitiba has followed the principle of promoting articulated densities along its BRT corridors rather than uniform densities. In the Indian context, further research is needed to develop similar density calculation mechanisms that take into consideration the market realities, socio-economic conditions and infrastructure capacities of typical areas;
- **High quality, affordable and integrated public transit system.** The significance of providing a high quality transit service in influencing a modal shift is nowhere more evident than in the case of Curitiba's BRT system. The system continues to be the inspiration for cities in the developing and developed countries as a low-cost flexible transit investment alternative to rail-based systems. Initial investments in creating high-performing busway systems is an absolute necessity for capitalizing on the benefits of transit oriented development. Integration of main transit lines with citywide feeder systems;
- **Continuity in plan implementation.** This aspect is attributed as one of the key factors for Curitiba's successful urban experiment. With IPPUC and URBS functioning as semi-independent agencies separate from the administrative and political system, Curitiba was able to provide the continuity and technical input needed for successful plan implementation beyond the typical three-five year terms political terms;
- **Integrated Corridor TOD Planning as an urban development strategy;**
- **Designing for people as a priority;**
- **Advanced bus stop designs with integrated intelligent transportation systems;**
- **Self-financing public transit system;**
- **Innovative "value capture" mechanisms; and**
- **Capacity Building.**



## Hong Kong, China

### CITY PROFILE:

Population	: 7,071,576 (2011)
Land Area	: 1,104 Sq. Km
Gross Density	: 6,544 Persons /Sq. Km
Urban Area Density	: 20,700 Persons /Sq. Km
Street/ Block Density	: 300-400,000 Persons /Sq. Km
Per capita Income	: \$32,741 (2012)
Governance	: Special Administrative Region of the People's Republic of China

### TRANSPORT MODE SHARE:

Bus/ Tram	: 55%
Rail	: 25%
IPT / Taxis	: 8%
Motorized Personal Transport	: 11%
Others	: 1%

**Key TOD Themes:** Joint Development, Integrated Transit + Land Use Planning, Financing TOD, Station Area Planning, Multimodal Integration

(Source: <http://taacademy.gov.sg/doc/J11Nov-p60PassengerTransportModeSHares.pdf>)

### City Overview

Hong Kong is one of the world's leading international financial centres with a long history of designing and implementing a robust and sophisticated multimodal public transportation network. The network is estimated to move over 12 million passengers a day which includes automated people mover systems (escalators and moving pavements), two high-capacity railways, trams, buses, mini and double-decker buses, taxis, and ferries.<sup>48</sup> It is estimated that over 90% of the daily journeys in Hong Kong on public transport, making it the highest rate in the world.<sup>49</sup>



Figure 6-21: Location of Hong Kong in China

From the lens of urbanization and city form, Hong Kong's compactness can be attributed largely to its constrained geography and topography consisting of several islands, hills, and the sea. While the city has some of the highest urban area densities in the world, only 30% of its total area is built-up resulting in relatively low gross densities compared to other Asian cities. Hong Kong is estimated to have an urban area density of 26,100 people per square kilometre as compared to 31,700 persons per square kilometre in Mumbai, and 29,800 people per square kilometre in Surat (Gujarat)<sup>50</sup>. The city's resilience and its high quality of life index have helped in placing it as one of the top five liveable cities in Asia. On the other hand, high cost of living expenses, housing affordability and deteriorating air quality are some of the challenges that the city continues to address through its integrated long-range planning process.

Governed under the structure of "one country, two systems", Hong Kong has capitalized on its autonomous status and strategic location to emerge as one of Asia's leading metropolises with a strong sustainable development agenda. The integration of land use, transportation demand management and rail transit has been one of the hallmarks of Hong Kong's evolution as a compact city with one of the most profitable mass transit systems in the world. In Hong Kong, all lands are public-owned (except the land on which St John's Cathedral stands) and the government has the "powers to lease and grant state land to the public for ownership for a limited period of time."<sup>51</sup>

Hong Kong's "**Rail + Property**" development model has enabled the city to maximize the limited area available for development in an innovative and aesthetic manner while at the same time enable its transit agency to generate revenues to finance investments in transit infrastructure and high quality public realm design. In addition to this successful development model, Hong Kong's transportation demand management strategies such as car registration fees and transit-first policies have also played a substantial role in making Hong Kong one of the success stories of Transit Oriented Development in the world.

The Hong Kong rapid transit railway system, known as the MTR, is financed, constructed and operated by

the Mass Transit Railway Corporation (MTR)- currently serving as a private entity with Hong Kong's administration (HKSAR) serving as a large shareholder. The following narrative highlights some of the key elements of Hong Kong's successful experience with creating transit-oriented development communities with a special emphasis on MTR's integrated property and rail development model within the organizing framework: **enabling** governmental policies, **planning and design** processes, use of innovative **financial investment** tools, and supporting **implementation** mechanisms



Figure 6-22: Hong Kong MTR system route plan, 2009; | Source: [http://commons.wikimedia.org/wiki/File%3AHong\\_Kong\\_Railway\\_Route\\_Map\\_en.svg](http://commons.wikimedia.org/wiki/File%3AHong_Kong_Railway_Route_Map_en.svg); Accessed on 19th October, 2013

	Office (sq.m.)	Retail (sq.m.)	Others (sq.m.)	Residential (units)	Total GFA (million sq.m.)	Residential/Commercial ratio
Urban Line	234,898	299,363	-	31,366	2.6	78%
Airport Express Line	611,877	306,571	316,473	28,473	3.5	65%
Tseung Kwan O Line	5,000	105,814	63,030	30,414	2.3	93%
East Rail Line	67,541	113,238	113,491	4,771	0.7	60%
West Rail Line	95,800	145,130	50,346	19,206	1.8	84%
Ma On Shan Line	-	65,193	38,191	10,314	0.9	88%
Light Rail	-	53,117	-	9,108	0.6	91%
Kowloon Southern Link	-	-	-	1,500	0.1	100%
	1,015,116	1,088,426	581,531	135,152	12.5	

Figure 6-23: MTR "R+P" Development Overview | Source: Railway and Property Model-MTR Experience, Thomas HO, MTR Corporation, Hong Kong, 2011

**Enable: TOD Supportive Policies and Legal Controls**

The initial investment in Hong Kong’s mass transit system was limited to a 20 kilometre stretch, constructed in 1972. In the early years, two agencies were charged with operating the rail service- Mass Transit Railway Corporation (MTR) and Kowloon- Canton Railway Corporation (KCRC).<sup>52</sup> In 2000, MTR was partially privatized with no subsidies received from the government in theory. Subsequently in 2007, MTR merged with Kowloon-Canton Railway (KCR) Corporation. Through its development control legal framework, transit-first policies and a shareholding in the MTRC, the government of Hong Kong has successfully created an environment that provides financial flexibility and development control which ensures public interest related to transit oriented developments in the city. The following table outlines some of the key enabling policies and legal framework used in support of transit and property development:

Table 6-4: Enabling policy and legal framework for transit and property development in Hong Kong

	POLICY: LAND DEVELOPMENT	KEY FEATURES
1	Grant of <b>exclusive property development rights of the station areas to MTRC</b> in exchange for its commitment to provide and improve mass transit railway as an essential mode of public transportation	Incentive-based approach to encourage the corporation to plan and develop sites in a financially viable manner by "internalizing" benefits from rail and property development; Eliminates the costs associated with land banking and acquisition
2	Established <b>MTRC as an independent corporation with government as a major shareholder</b> to strengthen the role of transit agency as the single entity to serve as the master planner, property developer and property manager as well as generate revenues to sustain the transit service	Government’s commitment to remain as the majority shareholder of the MTRCL after the privatisation for at least 20 years and own no less than 50% of shares and votes of the MTRCL; Lower transaction costs with single entity as opposed to multiple agencies
3	Permit <b>joint ventures in real estate development</b> with private sector investment in TODs	
4	<b>Use of Transfer of Development Rights</b> combined with commitment to encourage redevelopment of existing areas rather than allowing for suburban development	

Source: IBI Group

The supporting public transportation system policies that have enabled TOD projects to flourish in Hong Kong’s case include:

POLICY: TRANSPORTATION <sup>53</sup>	KEY FEATURES
<b>Limiting private car ownership and usage</b>	Initial registration tax ranging from 35 per cent to 100 per cent of the vehicle cost.
	High fuel tax
<b>Transit service coordination and protection (1980s)</b>	White Papers on transportation policy
	Prohibited direct competition by other PT/feeder modes along the rail routes
<b>Service proliferation and competition (1990s)</b>	Railway Development Strategy, which set out development plans for four new rail lines or extensions.
	Relaxed regulations on bus services
<b>Service rationalization and consolidation</b>	Public transport interchanges became a required component of new railway stations, in order to facilitate feeder services provided by other public transport modes.
	Increase the proportion of rail-based public transport journeys from 33 per cent in 1997 to 40–50

Source: IBI Group

## Plan + Design

“The principle of self-financing has seen the status of MTR gradually evolve and its roles diversify, from being a mere transport operator to a powerful real estate developer and now a real player in today’s urban planning.”<sup>54</sup> Hong Kong’s planning system comprises development strategies at the territorial level and various types of statutory and departmental plans at the district/local level. In 1996, a consolidated plan known as the Territorial Development Strategy (TDS) - TDS is the highest tier in the hierarchy of town plans in Hong Kong. It provides a board, long-term framework on land use, transport and environmental matters for the planning and development of the territory.

### Transit Agency as the Master Planner and Property Manager

In addition to acting as the transit operator and real estate developer, MTR has a significant role in the master planning and controlling the development processes in collaboration with the private sector.<sup>55</sup>

MTRC works in close collaboration with the city planners to define various parameters of station area planning from the time any plans to extend or construct new rail transit lines are proposed.

These parameters include:

- Transit Alignment;
- Station Locations;
- Land values;
- Density potential;
- Financial returns;
- Long-term planning objectives; and
- Land use mix based on market demands and zoning constraints.

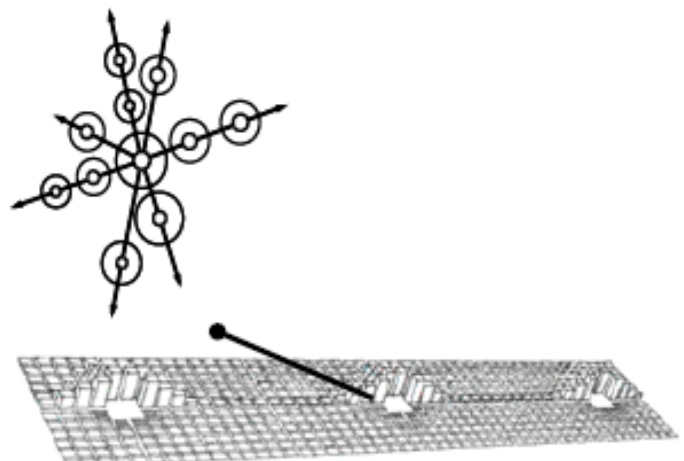


Figure 6-24: TODs as a "Necklace of Pearls" | Source: Cervero, Robert and Murakami, Jin 2008

Based on the above mentioned parameters, the viability of a particular R+P project is assessed and if considered feasible, the government grants MTR exclusive development rights along with prescribing the permissible uses and plot-ratio densities or FARs. Following that, MTR’s planners then prepare the master plan for the site and obtain necessary approvals from the government. Next, MTR solicits qualified developers to invest in the subject site and after negotiations related to minor site modifications for the R+P proposal, the developer purchases the development rights by paying a “with rail” land premium. The involvement of MTR throughout the process also ensures transit and land use integration in the long-term as well as provides confidence in the market for reducing risks related to uncertainties in dealing with the approval process. Another unique aspect of MTR’s model is that it remains involved in the construction process initially a supervisions and oversight role and often as the property manager. Finally, the presence of MTR as a property manager ensures that the social benefits of TODs are safeguarded through enforcement of development standards and high standards for maintenance and development of the stations and its surroundings.

### Transit Agency as a facilitator of sustainable urban planning

MTR’s transit oriented development (TOD) model follows the ‘network of pearls’ urban development model, which designates widely spaced transport hubs connected through a fast transit network. Majority of the new R+P projects are defined by well-design station area plans that ensure “seamless integration” with its surrounding neighbourhoods. Each station area is unique and varies by virtue of its contextual relationship with surrounding properties. Cervero and Murikami (2008) classify the R+ P projects into five broad typologies. These include<sup>56</sup>:

- High-Rise Office (HO): high-rise, predominantly office uses on small sites;

- High-Rise Residential (HR): high-rise, predominantly residential uses on small sites;
- High-Rise Residential (HR): high-rise, predominantly residential uses on small sites;
- Mid-Rise Residential (MR): medium-density, predominantly housing projects on medium-size plots;
- Large-Scale Residential (LR): predominantly residential uses on large sites with comparatively low plot ratios; and
- Large-Mixed Use (LM): mixture of housing, offices, retail, hotels, and others on large sites with medium plot rate.

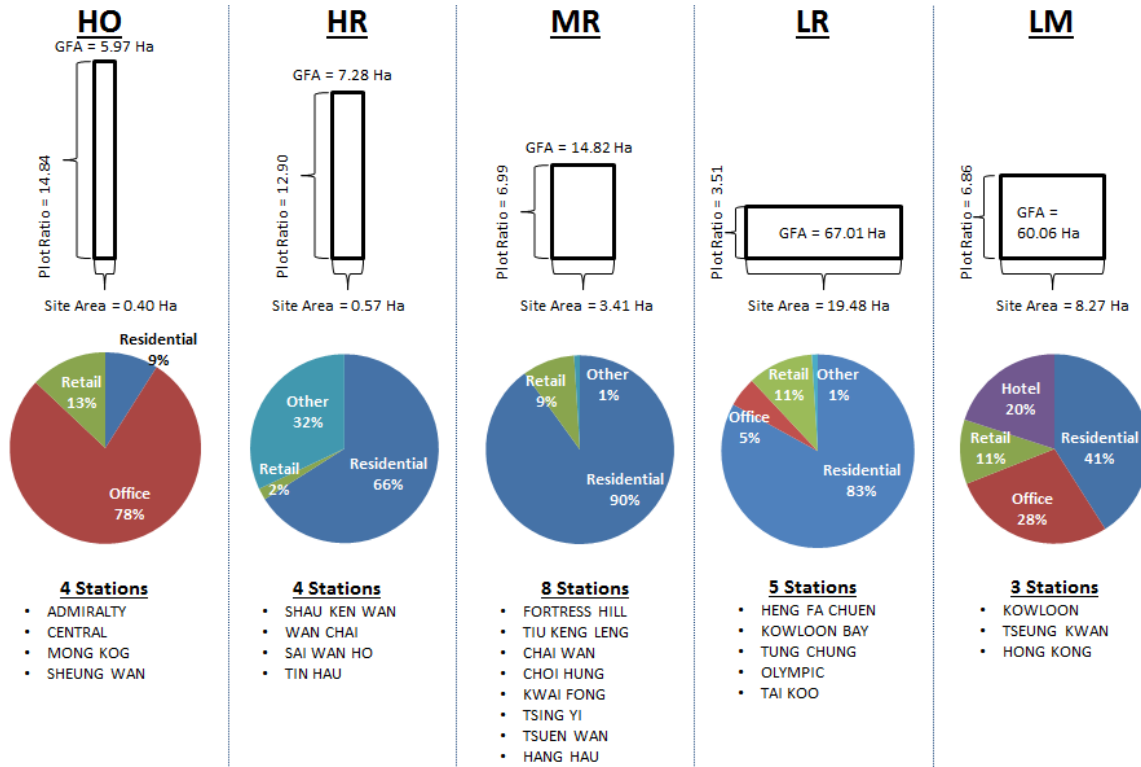


Figure 6-25: Classification of MTR Stations according to the Built-Environment Type and key clustering variables | Source: Cervero, Robert and Murakami, Jin; 2008



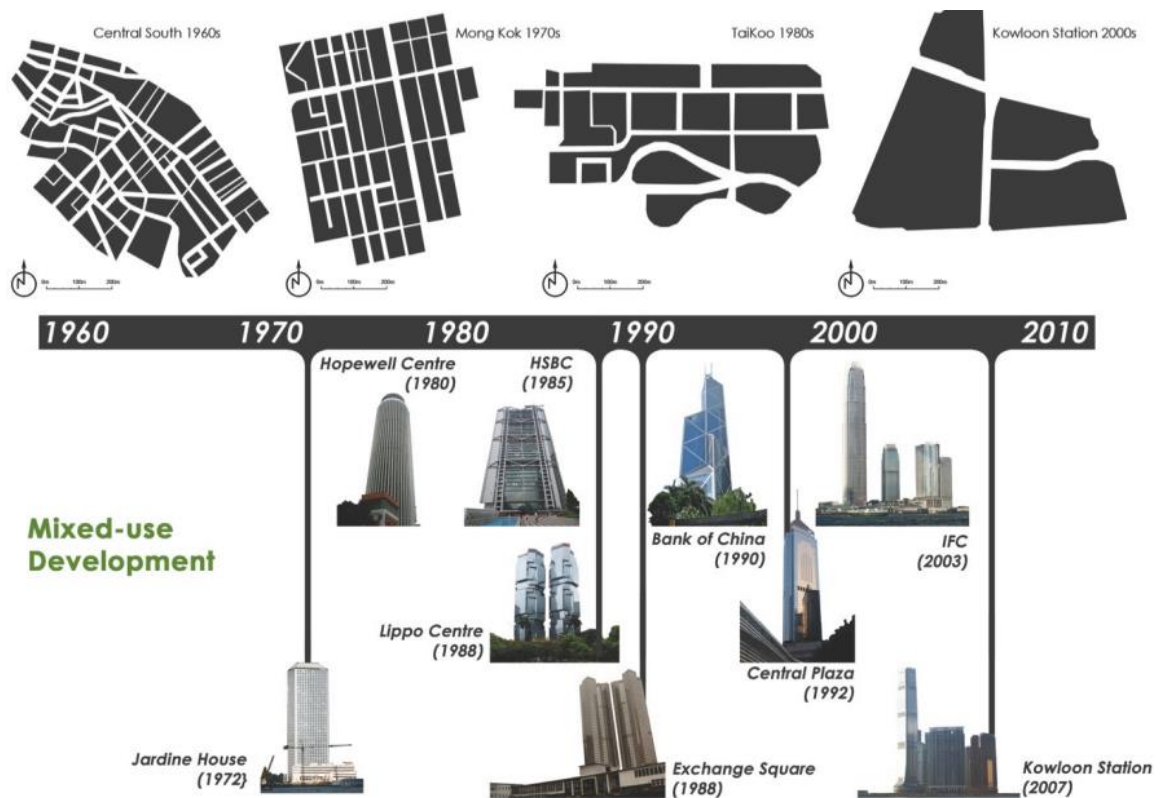


Figure 6-26: Hong Kong Development Timeline | Source: Dr. Sujata S. Govada; Large-Scale Development-ULI and the Asia Society<sup>57</sup>

### Station Area Planning and “Podium” Development.

As discussed above, the 2<sup>nd</sup> and 3<sup>rd</sup> generations of MTR property developments have exerted a strong focus on pedestrian integration and connecting with the surrounding communities. The figures shown below illustrate the conceptual model followed by MTR in some of its recent property developments as some of its large-scale developments were raised public concerns related to alienating the surrounding neighbourhoods, creating wall effects with towers that reduce air ventilation, and increasing housing costs within these developments.

One of the typical station architecture styles representative of Hong Kong’s development in the last two decades or so, is the “podium development” model. The podium model involves building above the railway station, a “podium” retail level that can be accessed through the street level. Residential and commercial towers often sit on top of the podium level that are accessible from the station and the street level. The podium’s roof is also seen in many instances serving the dual function of a landscaped park with community facilities for the residents.

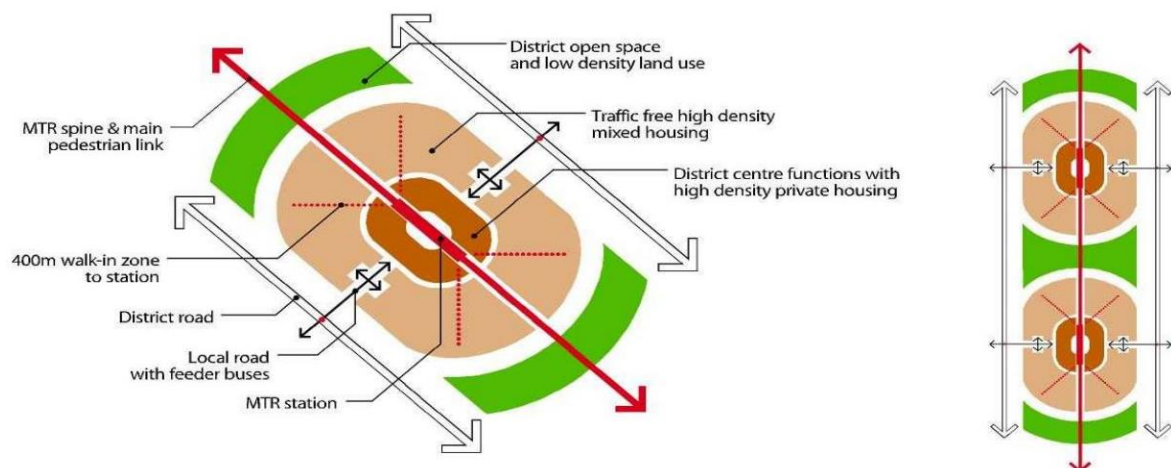


Figure 6-27: Overview of MTR’s concept of R+P Development | Source: Railway and Property Model-MTR Experience, Thomas HO,

MTR Corporation, Hong Kong, 2011



Figure 6-28: Podium Development Typologies in Hong Kong | Source: Dr. Sujata S. Govada; Large-Scale Development-ULI and the Asia Society

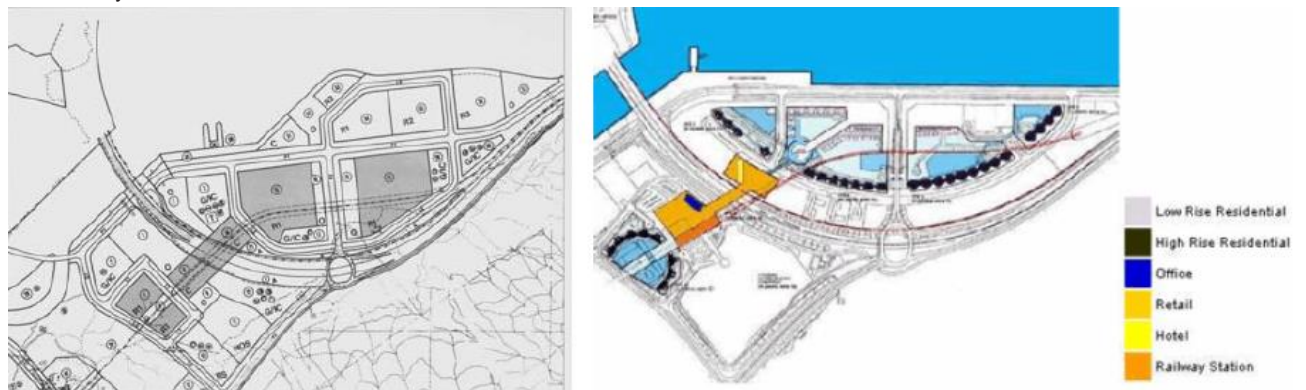


Figure 6-29: MTRC revised the landuse and density around Tung Chung station on the right in comparison to the existing master plan on the left | Source: Study of the Integrated Rail-Property Development Model in Hong Kong. Hong Kong Polytechnic University.

### Multimodal Integration

Hong Kong has a very robust and well-integrated transportation network comprising of pedestrian street network and foot-bridges, automated people movers, dedicated bicycle lanes, buses, trams, rail network, ferries, and IPT modes such as taxis and cycle-rickshaws (in some areas). The MTR Corporation operates MTR Bus routes to complement its MTR and Light Rail transit services; and employs Kowloon Motor Bus to operate several MTR Feeder Bus routes on behalf of MTRC, using vehicles owned by MTRC. Pedestrian schemes in Hong Kong include: Full-time Pedestrian Streets; Part-time Pedestrian Streets, and Traffic Calming Streets.





Figure 6-30: Multimodal integration in Hong-Kong | Source: Karl Fjellestrom, itdp-china.org

### Invest: Rail + Property (R+P)-Hong Kong's Joint Development Financing Model

Since all lands are owned by the government in Hong Kong and leased to the private sector on a 50-year lease (renewable once for the same time period),

MTR receives assistance from the government in the form of land grants and development rights. This implies that MTR has to function as a self-sufficient entity able to generate its own revenue for operation maintenance and infrastructure improvements.

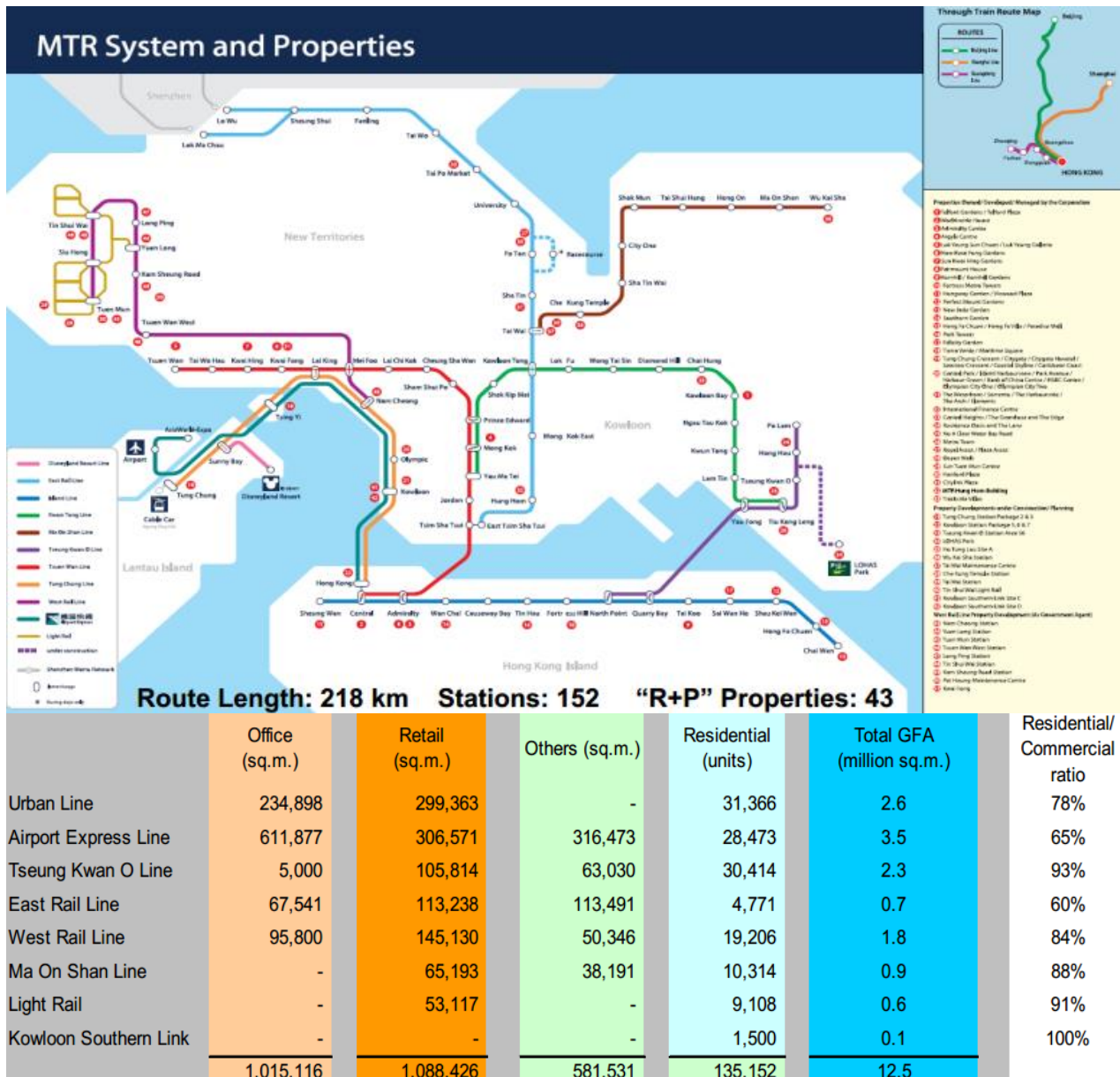


Figure 6-31: MTR System and “R+P” Properties | Source: Railway and Property Model-MTR Experience, Thomas HO, MTR Corporation, Hong Kong, 2011

Since its inception in the late 1970s, MTR has focused on leveraging its property assets as a source of revenue by undertaking diverse real estate development projects in the lands surrounding above the transit stations. MTR’s strategy to pursue integrated property development has been the driving force for attracting the right mix of residential and employment densities that continues to improve the viability of its public transit system serving its dense urban cores. What helped Hong Kong apply the principles of value capture so effectively was the “combination of high population density, public land ownership, and low automobile dependency”. The R+P programme could be divided into three stages:

**1st Generation:** This initial stage of the R+P programme used solely a financing mechanism to recover the transit infrastructure investment costs and yield a net profit from nearby property developments as single-use properties above new stations along its Urban Line.<sup>58</sup>

**2nd Generation:** The 2nd generation of the programme was influenced by Hong Kong’s growth as a financial hub in the global market resulting in large scale foreign-direct investments and international property developers (Murakami, 2010). During this phase, the development models transitioned from single-use properties to “mixed-use, pedestrian oriented town developments examples of place-making”<sup>59</sup>

along the new Airport Express and Tseung Kwan O line extensions, also aimed to better connect jobs near the airport with residential areas concentrated in the traditional urban core.

**3<sup>rd</sup> Generation:** The 3<sup>rd</sup> and the present generation of the R+P programme coincides with the opening of the fifth MTR subway line are more typical of “greenfield TODs” built on undeveloped or reclaimed lands from the sea, encompasses a diverse set of urban and suburban areas (in the New Territories). These sites encompass nearly 62 hectares and are planned based on unique station typologies that are context-sensitive and integrate innovative architectural and urban design concepts to create new destinations for the growing city. The most recent of such developments was the large Pop Corn shopping centre development which was built in conjunction with Tseung Kwan O station.

As mentioned earlier, the R+P model is one of the most successful joint development models in contemporary urban planning practice in terms of achieving the economic, social and growth management goals envisioned through implementation of TODs. In Hong Kong’s case, this principle has also enabled the MTR to be classified as one of the most profitable transit systems in the world. The financial mechanism for the R+P development is relatively simple- MTR receives from the government the right to purchase 50-year leases on lands and in return pays a land premium to the government on a “Greenfield no railways basis”<sup>60</sup>. Next, the MTR invests in the transit infrastructure and develops the property either on its own as a developer or in partnership with the property developer. With time, the property values increase because of its proximity to the rail transit network and its integration with the station. The increment in values is captured by MTR to invest in new infrastructure as well as offset the maintenance and operation costs.

In some cases, for example on lands with technical complexities such as development above stations, MTR generally sells the land only after having built the foundations and thus undertakes a part of the construction activities as an alternative profit source. In addition to selling development rights, MTR generally negotiates a share in the future property with the selected developer and profits and/or receives a co-ownership. MTR has also been successful in developing a strong portfolio of residential and commercial real estate projects that the agency has constructed, leased and rented. Finally, MTR often remains involved in the development as a property manager, generating additional incomes that way. At the end of 2011, MTR owned and rented over 85,000 residential units and 750,000 m<sup>2</sup> of commercial and office spaces in Honk Kong.<sup>61</sup>

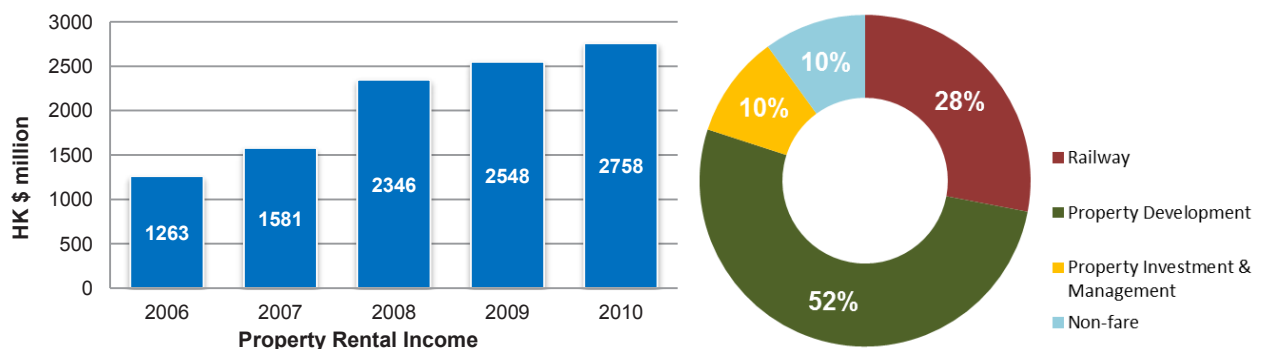


Figure 6-32: Property Rental Income, MTR (Left) and MTRC Revenue 2001-2005 Average (Right) | Source: MTRC, 2011



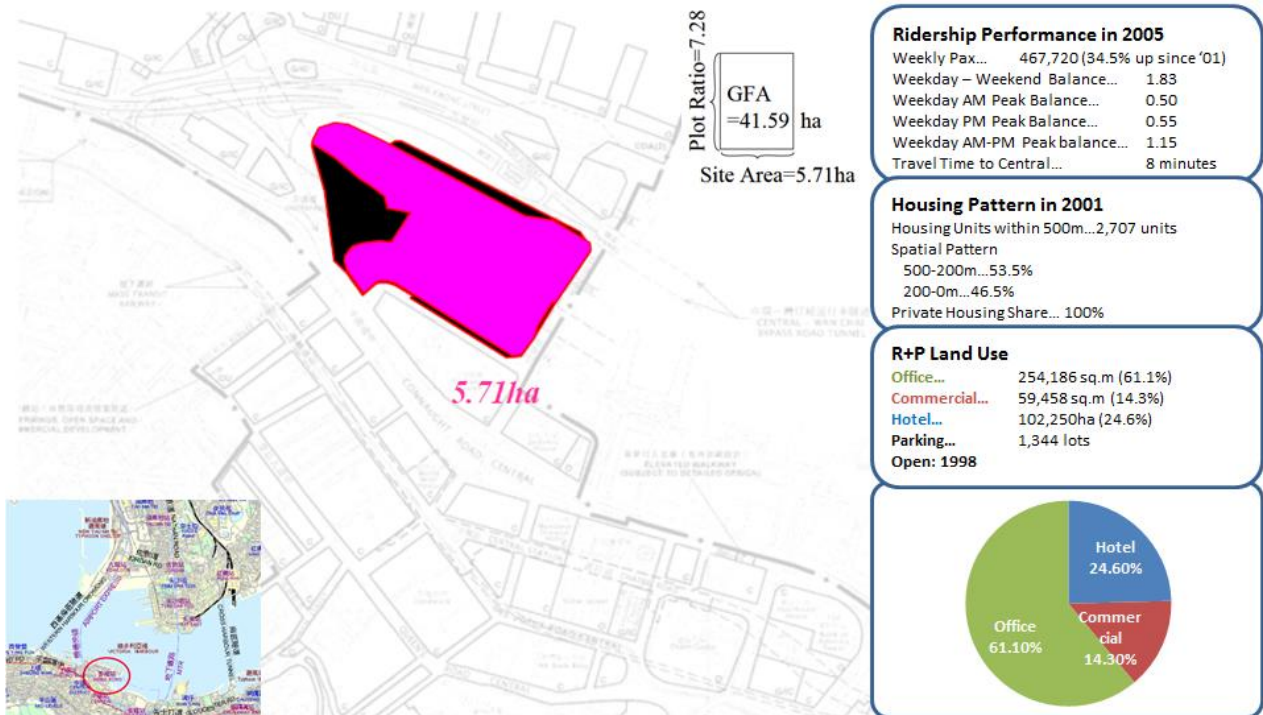


Figure 6-33: A case summary of Hong Kong's Rail + Property development | Source: Cervero, Robert and Murakami, Jin; Rail + Property Development: A model of sustainable transit finance and urbanism

**Implement**

Tang et al. (2004) identified the following four key elements behind the R+P approach in their study of the Integrated Rail-Property Development in Hong Kong<sup>62</sup>:

1. Policy. Favorable government support of transit and land-use integration, expressed by land grants and financial assistance to MTRC;
2. Process. Forward looking planning, management, and control procedures that ensure an efficient approach from project inception to completion;
3. Project. High-quality real estate projects that appeal to tenants, shoppers, and transit users; and
4. Organization. An entrepreneurial entity that balances the financial interests of investors with larger societal goals.

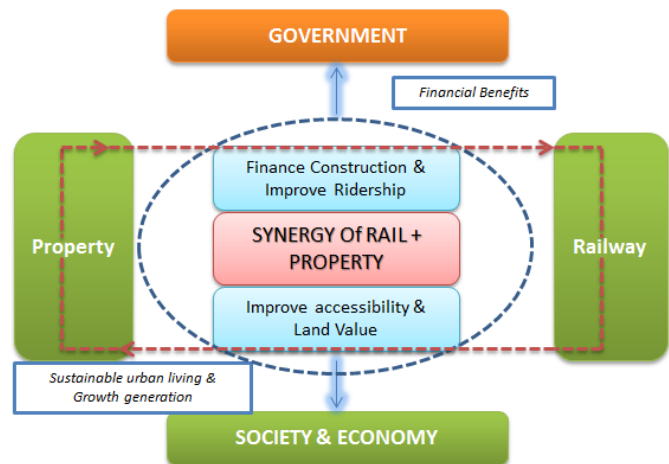


Figure 6-34: Institutional Mechanism of "R+P" Model | Source: Railway and Property Model – MTR Experience, Thomas HO Hang-Kwong

The main agencies involved in shaping urban development policy and its integration with transit services in Hong Kong include:

- Land Development Corporation;
- Urban Renewal Authority (URA)- statutory government agency;
- Mass Transit Railway Corporation (MTRC)- statutory corporation with government as a majority stakeholder listed on the Hong Kong stock exchange; and
- Hong Kong Housing Society.

From a perspective of defining the roles and relationships of these agencies pertaining to the “R+P Development Model”, the following illustrations provide a summary of the institutional arrangement and functions that have ensured successful implementation of TOD projects in Hong Kong.

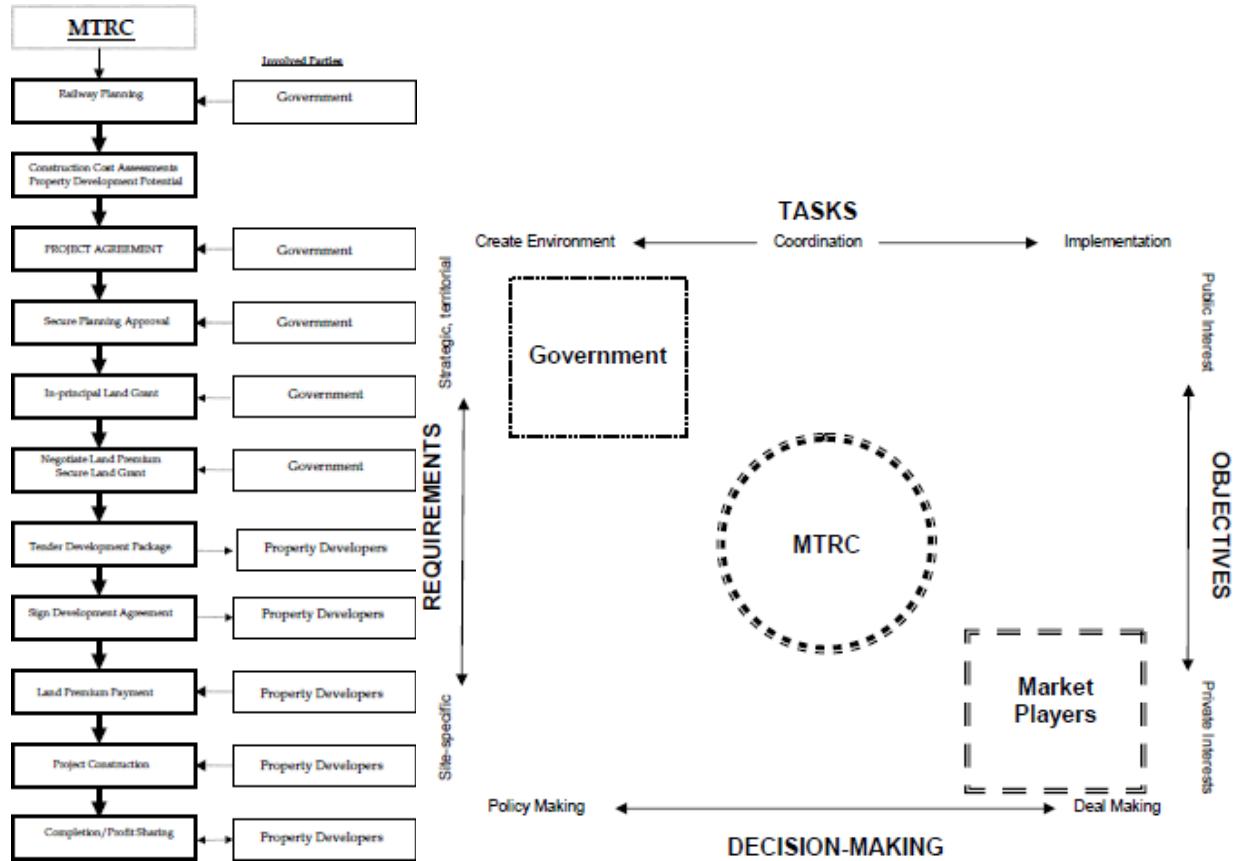


Figure 6-35: Institutional arrangement for R + P Development Model | Source: Railway and Property Model – MTR Experience, Thomas HO Hang-Kwong

### Lessons

This final section draws lessons for policymakers and planners from Hong Kong’s experience with implementing transit oriented developments through strategic public- private partnerships. First, a discussion on the strengths and weaknesses of the Hong Kong model is presented; which is followed by a section on the lessons learned from the model that could be applicable in the large-scale rail-based transit investments being projected for many large Indian cities.

### Strengths

- The R+P model of value capture functions well as a sustainable financing model; but its combination with TOD principles has rendered it also as a sustainable community development model;
- MTR’s revenue generation through real estate development has ensured its success as one of the most profitable transit systems in the world with limited reliance on government subsidies. Ridership is considerably increased because of the integration of stations with residential development as a vertical mix;
- R+P has also contributed in furthering larger regional development objectives with the nodal development patterns and the “necklace of pearls” concept that underscore the concept of TOD projects;
- R+P’s investment in transit-oriented design has added as much as 35,000 additional weekday passengers (travelling in both directions) to stations with R+P projects;
- Coordinated decision making mechanism between MRT and the government’s planning and transportation department has resulted in the success of R+P projects;

- MRT's involvement from conceptualization to property management provides a high level of certainty for investors;
- Integration of station designs with surrounding development and multiple modes have ensured a successful model of integrated land use + transit development;
- High FARs (maximum plot ratio of 10) has enabled Hong Kong to grow vertically, develop compact communities, conserve large expanses of open space and as a result curtail urban sprawl;
- More than 50% of Hong Kong's total jobs concentrated in the 77 MTR station areas that covered only 5% of the whole Hong Kong territory. Especially FIRE+ jobs (the finance, insurance, real estate and business service sector) in the 77 MTR station areas accounted for over 70% of all FIRE+ jobs;
- Nearly 68% of workers in Hong Kong took either the MTR or buses to employment; and
- In 2002, around 2.8 million people, or 41% of Hong Kong's population, lived within 500m of an MTR station. One in five households lived within 200m of a station.

### Weaknesses

- R+P model has increased property prices to the extent where living near transit stations is increasingly becoming unaffordable for majority of the city's population;
- Recent large-scale R+P developments have in some instances resulted in disconnecting the station areas from surrounding communities as the urban grid is not extended;
- The podium development model has resulted in creating retail spaces that are designed in a conventional mall-format, thereby reducing the street edge activities in some areas with public open space limited to the podium level; and
- Hyper-vertical development in Hong Kong is often cited as one of the reasons for deteriorating environmental quality (air ventilation) and stress on existing infrastructure in a concentrated manner.

### Lessons Learned from Hong Kong applicable to Indian cities

- **Land banking and land pooling.** Unlike Hong Kong where the government owns all the lands and leases development rights to private interests and the transit agency pro-actively gains control of the lands around the station, majority of the Indian cities and transit agencies are lagging behind in utilizing this instrument for implementing TODs. Assemblage of land around the stations and utilizing the development rights to fund transit investments is a successful model worth serious consideration in the Indian context. Land banking is also one of the ways to control speculation in the market while at the same time promoting social, environmental and economic goals through government oversight of the public realm. What it requires to work is a commitment by governmental agencies in delivering high-quality real estate products with equally high-quality operation and maintenance standards.
- **Transit Agency as a Master Planner and Developer.** The role of MTRC in developing stations with a master plan that includes a larger catchment area has been instrumental in moving the R+P model from being a transit financing model to a prototype for sustainable urban development. As Indian cities seek to develop their public transit networks (whether rail or rapid bus), transit agencies will need to take on a multi-disciplinary role as the master planner, developer and project manager to ensure construction of high-quality development products.
- **Regional Planning for TODs.** Effective planning for TODs begins at the regional scale and is followed through consistently to the level of station area planning. As evident in the case of Hong Kong, the Territorial Development Strategy at the highest level is supported by the sub-regional Development Strategies, and finally the statutory plans and the local levels. Although India has a similar hierarchical planning system in theory, there are a few shortcomings that could be drawn from Hong Kong: First, transit development forms the backbone of the territorial and sub-regional

strategic plans which has traditionally not been the case in Indian planning practice. For example, the Territorial Development Strategy and Railway Development Strategy was prepared in parallel in Hong Kong's case and not isolated from each other. Second, most of the city level master plans, comprehensive development plans and development controls in India are based on outdated automobile-oriented development patterns and rarely trickle down to the local area planning or station area planning level. Adopting integrated transit and land use policies at all levels of planning that are aimed at achieving balanced employment and residential ratios (spatially as economic clusters) at the larger scale will be essential in shaping growth of Indian cities in the next 20 years. Finally, TOD planning and financing needs to be also tied to larger regional plans (Unified Metropolitan Transportation Authority and Urban Transport Fund are the first steps in this direction in the Indian context)

- **Station Area Planning.** In India, the absence of station area planning and integration of adjoining private developments as part of the overall station design has led to substandard development and development which is adjacent to transit. MTR station and its above-station property development are excellent examples of TOD value capture. For example, Gurgaon's MG Road station (along the Delhi Metro line) although located in the middle of a large employment centre surrounded by retail malls on both sides and residential within a walkable distance, is characterized by an extremely poor urban environment. Lack of continuous footpaths, queuing of auto-rickshaws on the station entry points, and overall disconnect with the surrounding development underscores the importance of station area planning by an oversight entity that is able to weave the public and private realms in a seamless manner. Furthermore, the concepts of Station Area typologies and models will help create context-specific projects that translate the broad principles to on-ground functional TOD communities. Finally, the concepts of "podium" development, strategic pedestrian footbridges and multimodal integration could be adapted to suit the Indian conditions which will be instrumental in bridging the gap between public and private realms and avoiding the single-use, master planned development currently trending in India's cities.
- **Value Capture.** The principle of value capture has already entered the planning and development policies with India's National Urban Transport Policy (2006). Hong Kong's R+P model provides an excellent practical example in offering rail-induced financial gains for cities. However, as the MTRC Property Division's mission statement emphasizes: "value-capture is only part of the goal; creating high-quality, viable communities and enhancing station-area environments is equally important."
- **Strategic Densification along transit corridors.** High density, high-rise development concentrated along strategic transit interchange nodes are a stable feature amongst majority of Hong Kong's transit stations. Minimum plot ratios (or FARs in the Indian context) of at least 2.5 are generally viewed as necessary if R+P is to be financially viable. The range of densities (FARs) from 3.5 to 14.8 has played a significant role in increasing the value capture potential for MTRC. In India, because of the uniform densities and FARs applied throughout the city and the low values of FAR (1.5-2), the opportunity to capitalize on the financial returns on investment is lost. At the same time, densification needs to be strategically located along transit corridors to create a competitive market for prime properties that are located in close proximity to the stations.
- **Investment in Design of the Public Realm with Station Development.** The recent generations of "R+P" developments emphasize urban design and place making as a strong marketability element of TOD projects. Emphasis on, physical integration of R+P project with stations and surrounding buildings, vertical connectivity for pedestrians at above ground levels and vehicular connectivity at ground floor level and underground levels, integrating in-station retail with pedestrian footbridges and corridors; and presence of high-quality public spaces are some of the elements that have contributed in enhancing the overall quality of life and increased property values.

## Singapore

**CITY PROFILE:**

Population	: 5,183,700 (2010)
Land Area	: 716.1 Sq. Km
Gross Density	: 7,276 Persons /Sq. Km
Per capita Income	: \$60,410 (2013)
Governance	: Constitution of the Republic of Singapore

**TRANSPORT MODE SHARE:**

Walking	: 22%
Cycling	: 1%
Bus	: 25%
Rail	: 19%
IPT / Taxis	: 4%
Motorized Personal Transport	: 29%

**Key TOD Themes:** Greenfield TODs, New Town Development, Rail-based TODs, Articulated Density distribution, “transit-first” policies, Transportation Demand Management, Affordable Housing, and Citizen Participation

*(Source: <http://taacademy.gov.sg/doc/J11Nov-p60PassengerTransportModeSHares.pdf>)*

### City Overview

Singapore, the third most densely populated country in the world, functions as a city-state accommodating a population of 5.2 million within 700 square kilometres. Recognized globally as one of the exemplary cases of integrated transit and land use planning, the city-state has witnessed a dramatic transformation from a struggling developing nation to one of Asia’s leading commercial and industrialized economies.

Due to its geographical constraints as an island with limited scope of expansion, Singapore has been forced to shape its urban form based on its symbiotic relationship with various transit modes. However, the integrated transportation and land use planning was not the case from the early beginnings of the city. During the late 19<sup>th</sup> century, urban transit modes in Singapore comprised of gas and electric trams, intermediate public transit (IPT) modes such as rickshaws, trishaws, and buses. These were informal arrangements primarily market-driven with little control from the state, resulting in a highly inefficient system that was not able to curtail typical urban transportation issues of congestion, underserved areas, and unreliable service. Following the advent of the automobiles in the mid 20<sup>th</sup> century coupled with rising incomes, automobiles replaced the sub-standard public transport and IPT modes. It was not until the 1970s that the government started taking proactive steps to create urban planning strategies to resolve the deteriorating urban environment.

The Singapore MRT system or SMRT opened in 1987 and formed the backbone of the city’s growth management philosophy. Today, the SMRT boasts of an average daily ridership of 2.6 million serviced by 102 stations. In addition to the MRT network, light rail transit (LRT) systems and an extensive bus network completes the system’s connectivity through multiple modes.



Figure 6-36: Location of Singapore



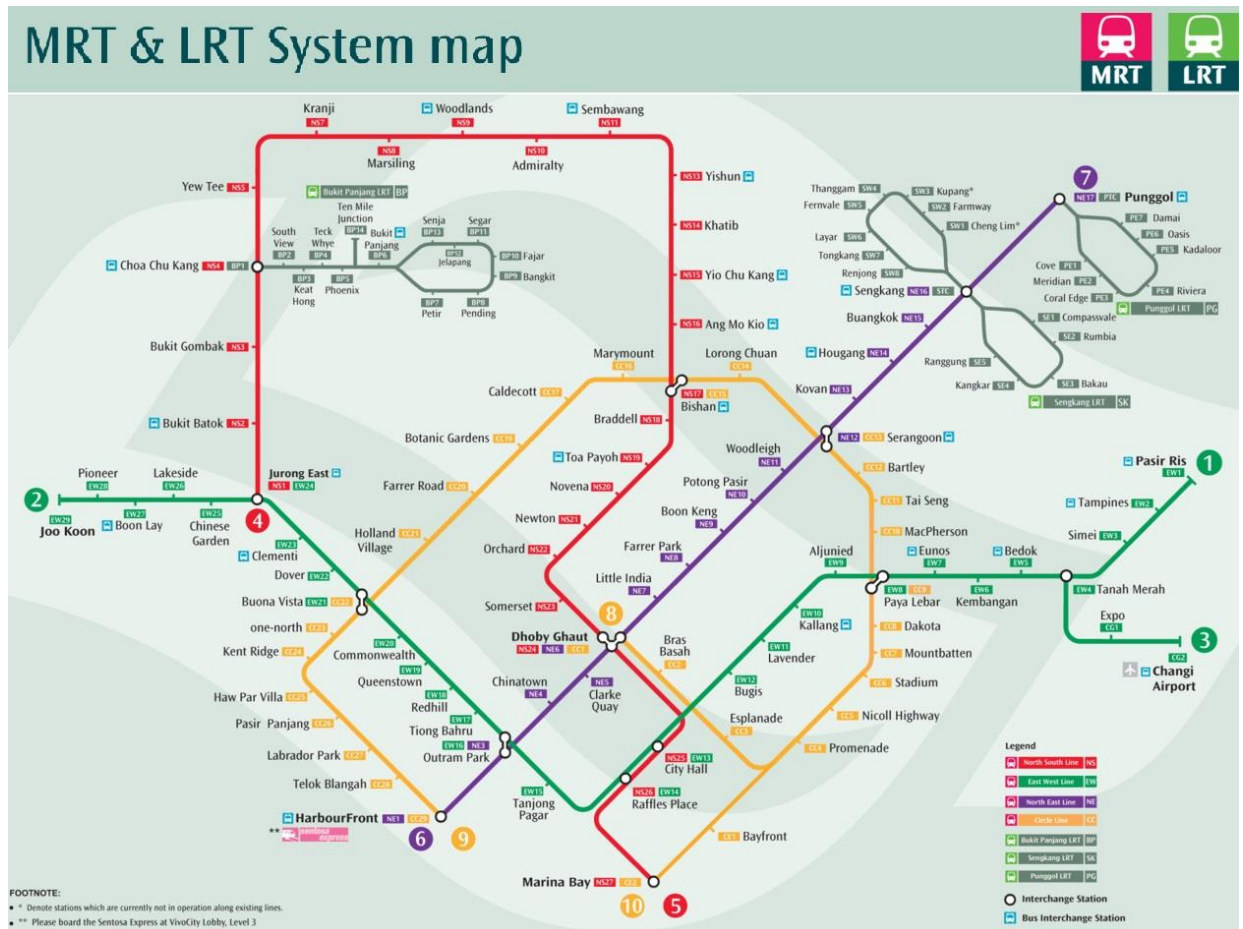


Figure 6-37: Map of Mass Rapid Transit & Light Rail Transit System of Singapore | Source: Official website of SMRT, [http://www.smrt.com.sg/Portals/0/PDFs/Trains/Network\\_Map\\_100112.pdf](http://www.smrt.com.sg/Portals/0/PDFs/Trains/Network_Map_100112.pdf)

### Enable

Concept plans and the master plans are the two influential schemes prepared by Urban Redevelopment Authority to guide the development in Singapore. The Concept Plan guides integrated land use and transportation development for future population and economic growth with a vision of 40-50 years. Although concept plan is not a statutory document, it provides a backdrop for master plan to regulate future development such as proposing new towns, industrial estate and land reclamation. Master Plan is the development control system, which permits the Singapore's Government to exercise its control over development of land. Alterations, conservation or new development have to be approved by URA that certifies proposed development is in accordance with the master plan.

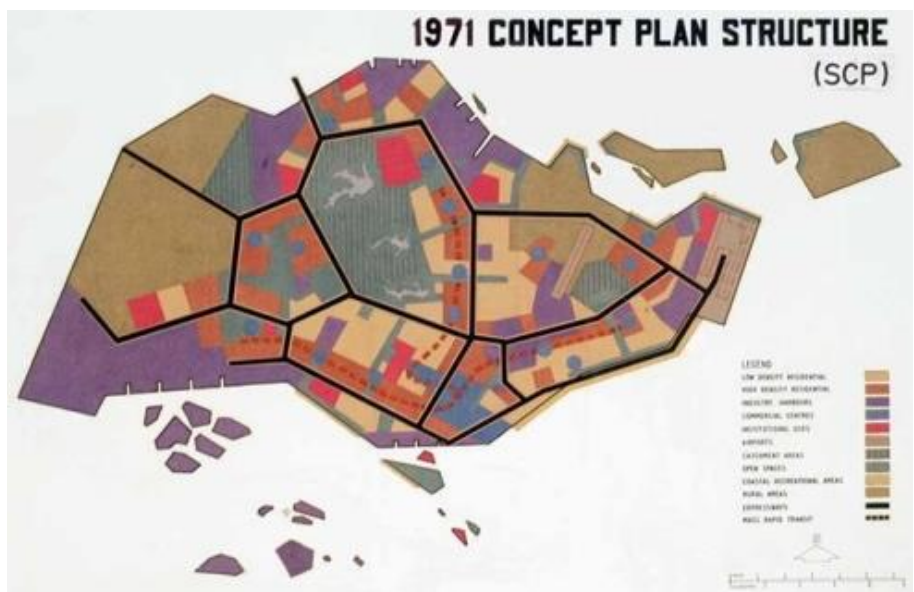


Figure 6-38: Singapore Concept Plan, 1971 | Source: Official website of urban redevelopment authority of Singapore <http://www.ura.gov.sg/uol/concept-plan.aspx?p1=View-Concept-Plan&p2=Concept-Plan1971>

Singapore is also noted for its TOD based planning of its new towns is supported by its “transit first” and transportation demand management policies. Some of Singapore’s best practices in this respect include<sup>63</sup>:

- 3-tier pricing system:
  - **1<sup>st</sup> tier:** High subscription fees for car-ownership
  - **2<sup>nd</sup> tier:** User-fees in the form of fuel taxes and parking fees
  - **3<sup>rd</sup> tier:** Electronic Road Pricing as a congestion pricing tool;
- Vehicle ownership quota system: The government allows an annual growth of 3% in vehicle population; and
- Off-peak licensing scheme: Vehicles holding this license during off-peak.

## Design

Singapore adopted planning principles that focused on developing an urban growth pattern hinged on linking its central core with master planned new towns through radial corridors served by a mass rapid transit system (MRT).

### Concept Plans: Singapore’s Integrated Planning System for its New Towns

Concept Plans updated every decade are used as the main planning tool in Singapore. The Concept Plan specifies 55 detailed “development guide plans” that addresses land use needs such as housing, commercial and industrial development, transportation and recreational facilities. Citizen participation is a key component of the planning process.

The Concept Plan 1971(CP 1971) adopted a ‘Ring Plan’ structure which visualized the development of a ring of new high –density satellite towns around the central water catchment area, with each town separated by green spaces and a system of parks and open spaces. Low-density and medium-density private housing would be built beside these towns and there would be provisions for industrial estates. The Mass Rapid Transit (MRT) and the island wide system of expressways are the outcome of the strategies outlined in CP 1971.

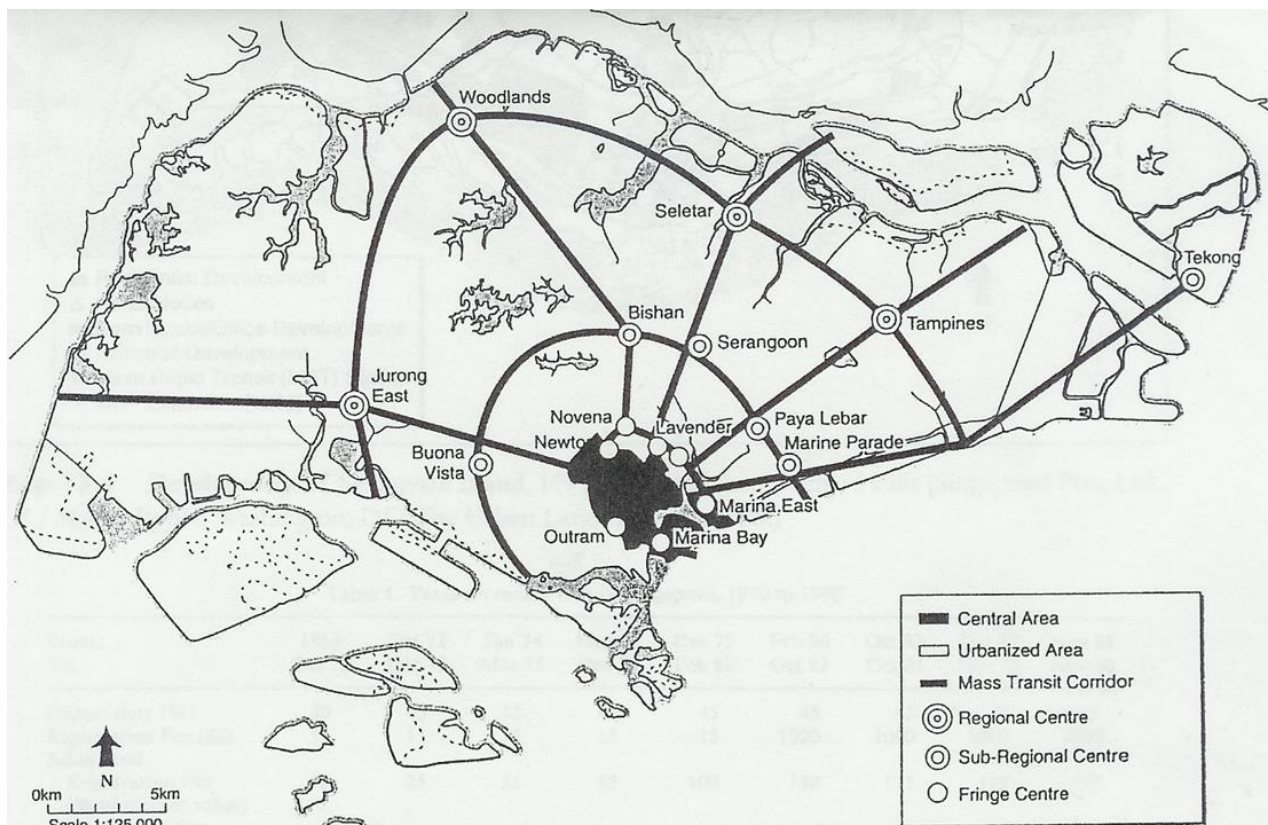


Figure 6-39: Radial Heavy Rail, Orbital Light Rail & New Town Circulators | Source: <http://www.cities21.org/extendedTOD.htm>;



The 1991 Concept Plan also known as the Constellation Plan which built further on the 1971 Plan. Resembling a “constellation of satellite “planets,” or new towns, that surround the central core, interspersed by protective greenbelts and interlaced by high-capacity, high-performance rail transit”, this plan became the guiding framework for Singapore’s future growth. What was innovative in Singapore’s case was its approach of decentralization and centralization simultaneously- instead of building master planned towns that are “self-contained units” there was a synergetic relationship created between these new towns and the CBD. These new towns were designed as mixed-use centres that allowed for travel in both directions through the transit system. Radial transit lines enabled people to travel from the new towns into the central core while orbital lines link the new towns with each other.

The new town planning concept was introduced in Singapore with the building of the first New Towns, Queenstown, from July 1952 to 1973 by the country’s housing authority, the Housing and Development Board (HDB). Today, there are a total of about 22 new towns in Singapore. Each new town is designed in such a way that they are further sub-divided into precincts-smaller components that group four to eight blocks around an open space. Industrial estates are located within several towns which provide employment opportunities which are in close proximity to their homes.

All the new towns have the following key TOD components in place:

- Mixed land use ;
- Articulated densities;
- Accessibility to public transportation;
- Walkability; and
- Expansive Open Space.

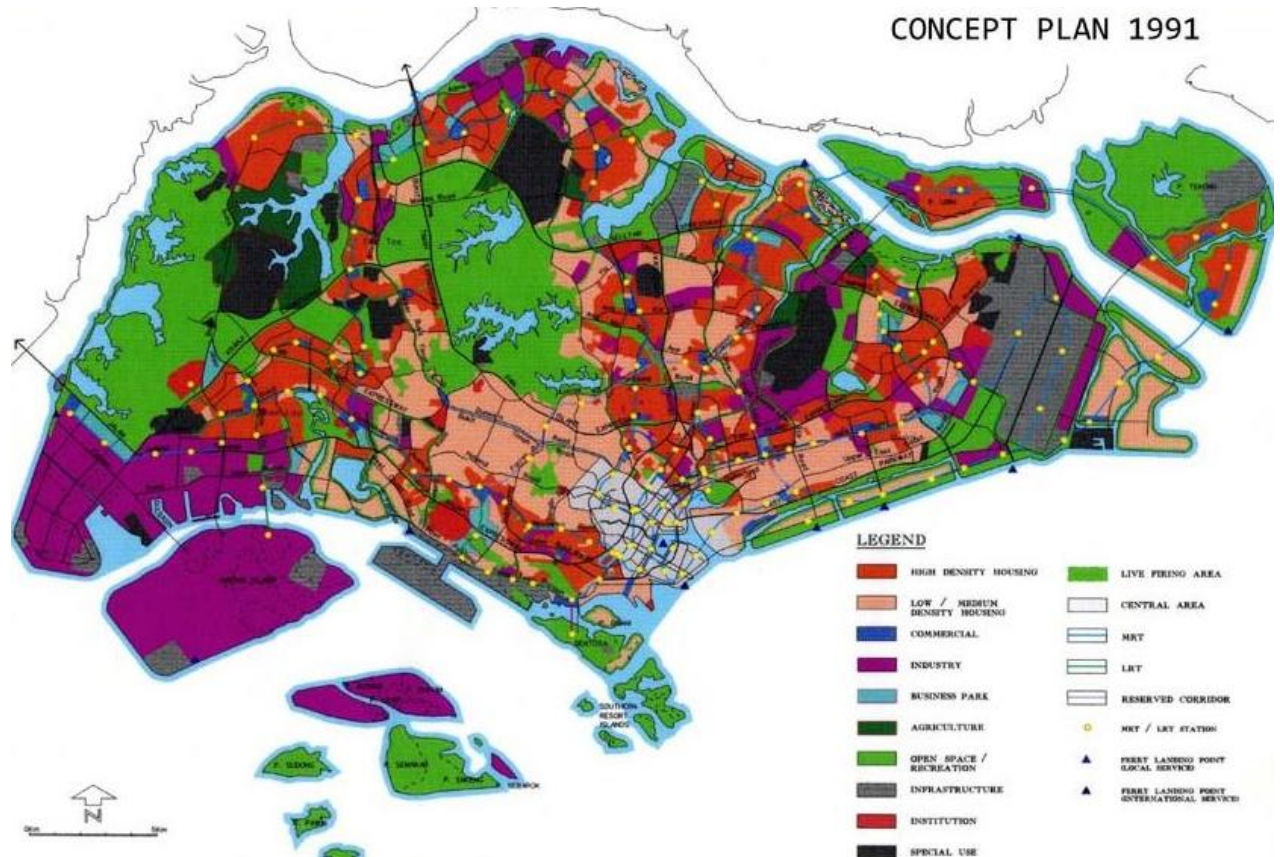


Figure 6-40: Singapore Concept Plan, 1991 | Source: <http://www.ura.gov.sg/uol/concept-plan.aspx?p1=View-Concept-Plan&p2=Concept-Plan1991>; accessed on 20.10.2013

### Density and Urban Form

Jin Murikani in his dissertation on Transit-Oriented Global Centres for Competitiveness and Livability identifies the following seven typologies categorizing the GLS programme<sup>64</sup>:

1. **Small-scale Residential (SR)**: residential plus commercial use development package on small site with relatively low FAR of 3.3 (small-scale GFA)
2. **Mid-scale Residential (MR)**: residential plus industrial office use development package on medium site with medium FAR of 4.38 (mid-scale GFA)
3. **Mid-scale Community (MC)**: dominantly community use development package on medium site with medium FAR of 3.85 (mid-scale GFA)
4. **Small-scale White (SW)**: white (flexible) use development package on small site with relatively low FAR of 2.88 (small-scale GFA)
5. **Mid-scale Mixed (MM)**: mixed use development package on medium site with medium FAR of 3.97 (mid-scale GFA)
6. **Large-scale Mixed (LM)**: mixed-use development package on large site with high FAR of 9.54 (large-scale GFA)
7. **Large-scale Global (LG)**: commercial plus white (flexible) use development package on large site with high FAR of 8.09 (large-scale GFA)



Figure 6-41: Example of Singapore's active street edge: sidewalk activity, slow vehicular traffic and continuous building edges | Source: IBI Group



### Case Study: Tampines New Town

Tampines new town started its development in the 1970's. Since then, Tampines New Town has blossomed into an institutional, social, recreational and commercial hub of the eastern part of Singapore. By 1992, it has been recognized as one of the best town model when it won the World Habitat Award for Excellence in Housing Foundation of the United Nations for its outstanding design and contribution to human settlement development. Now, with a size of only 4.25sq.km, it house over 200,000 people with a population density of 47,000people/sq.km.

#### Mixed Land Use

- a. Mixed of different kind of residential housing estates: Public and private high-rise compact apartment blocks are located all around the New Town. There are also private low rise single-housing properties resided by the rich.
- b. Recreational land use: Tampines Sports Complex, parks, gardens, Tampines Mountain Biking Trail and two golf courses. These facilities provides the residents with a better quality of living, keeping them relax and happy.
- c. Commercial areas: Tampines mall, Century Square, banks, private and government offices are present. The main idea of developing a regional centre is to serve to relieve strain on traffic drawn into the city centre. Hence, residents living in this region of the island will be able to find jobs that are near to their home.
- d. Public Buildings: There are Tampines Regional library, 11 primary school, 7 secondary schools, 2 junior colleges and 9 polytechnics. This allows children to study within close proximity in their schools.



Figure 6-42: Singapore MRTS integrates parking facility for cycles at stations to offer last mile connectivity | Source: Karl Fjellestrom, itdp-china.org



### Accessibility to public transportation

- a. Buses: Buses are the most comprehensive and affordable means of public transportation for the most Singaporeans. There are more than 300 bus services covering all parts of Singapore. Tampines has frequent and wide-spread bus services to serve within the town and linking to rest of Singapore too.
- b. Mass Rapid Transit (MRT): It is the backbone of Singapore, spanning the entire city state. With daily frequencies of 3 to 8 minutes from 5.30 am to 1 am at night. It connects to all parts of Singapore.
- c. Taxis: This is the alternative for a more comfortable and direct services to the destination. There are total of 8 taxis companies with a total fleet of 24,022 taxis.
- d. Cycling: There is cycling tracks next to pedestrian path to promote cycling as a new mode of transportation within town. This complements the effort to improve public health by increasing the residents' level of physical activity.



Figure 6-43: Example of transit plaza setting: mix of activities adjacent to metro station entry giving priority to pedestrians and creating active places | Source: IBI Group

### Affordable Housing

Providing affordable public housing is another distinguishing feature of Singapore's urban amenities. The Housing and Development Board (HDB) website reports that over 80% of Singapore's population reside in publicly governed and developed housing. The city-state has developed an impressive menu of housing assistance programs that cater to a diverse income base with a range of high-quality products. Although cheaper than market-rate housing, majority of the residents living in public housing are not below poverty line and therefore the stigma associated with public housing projects in other countries is not prevalent in the case of Singapore. Some of the recent initiatives of HDB include<sup>65</sup>:

- Home Protection Scheme;
- Adding Variety and Choice – Involving the Private Sector;
- Design, Build, and Sell Scheme (under which the private sector designs, builds and sells HDB flats);
- Help for First-Timers;
- Help for Second-Timers;
- Help for Couples comprising First-Timer and Second-Timer;
- Ageing-in-Place Priority Scheme;
- Launch of Home Office (HO) Scheme;
- Lease Buyback Scheme;
- Right-sizing Your Flat; and
- Multi-Generation Priority Scheme.

### Finance

Singapore's Land transport Authority is responsible for design, plan and maintenance of MRT and LRT systems. The operating cost of transit is high which is compensated through finances from the management fees, grants from government consolidated fund of central treasury and external borrowing in the form of consolidated fund. In Singapore, LTA receives among the largest transfer payments from the central fund, reflecting government's commitment to build world-class infrastructure<sup>66</sup>.

Housing Development Board and Urban Redevelopment Authority revenue intakes come from car parking fees, investment interest and recovery of development cost. One of the most important missions of both HDB and URA is implementing the Government Land Sales (GLS) programmes, in which developments rights of land parcels are sold through public auctions on the basis of property type, building height, and plot ratio requirements<sup>67</sup>. In Singapore, public leasing of urban land raises more money than any tax, supplying funds for two-fifths of the government's budget. Applying mechanisms of land banking and increasing public ownership in controlling speculation by the private sector assists in delivering affordable public housing.

### Implementation

The Urban Redevelopment Authority (URA), Housing Development Board (HDB) and the Land Transport Authority (LTA) are the primary agencies involved with implementation of the Concept Plans under the guidance of the Ministry of National Development (MND). The URA and HDB are responsible for development of large-scale properties and controlling the private sector intervention, while the LTA (formed in 1995) is responsible for the development of the city's transportation infrastructure. The city-state's centralized form of governance has promoted close coordination between the three different agencies. HDB and URA are also involved in implementing and monitoring Singapore's "Government Land Sales" (GLS) programme. The GLS programme involves selling government owned lands to private interests through an auction-based system and is often used as a revenue source for development.

LTA, a statutory board under the Ministry of Transport, was formed with the consolidation of the city's various transport related departments: Registry of Vehicles, Mass Rapid Transit Corporation, Roads & Transportation Division of the Public Works Department and Land Transportation Division of the former Ministry of Communications. LTA is responsible for preparing 5-year master plans for the city's transportation needs and fulfil its mission to "making public transport a choice mode".

### Lessons

Singapore's dense living conditions and socio-economic composition are similar to Indian conditions and provide for an excellent case study to understand implementation of TOD in greenfield context or new towns planned along extension of transit systems in several Indian cities. Similar initiatives in India include

Indore's Super Corridor and the satellite towns planned along the Delhi-Mumbai Industrial corridor. The following section first highlights the strengths and weaknesses of Singapore's TOD programme and then provides a summary of the lessons learned that are applicable to the Indian context.

### Strengths

- Strong vision provided by the Constellation Plan hinged on integrated land use and transportation planning;
- Political commitment to prioritize transit as the primary mode of transportation;
- "Transit-first" policies and enforcement of travel demand management strategies;
- Integrated proactive planning processes between the HDB, URA and LTA at the institutional level;
- Flexibility in applying FARs as articulated densities as opposed to uniform densities;
- Strong public housing programmes that support housing for mixed-income housing near the new transit towns;
- High-quality public housing development;
- Focus on environment as an integral component of balanced urban growth and a crucial quality of life indicator;
- Compact urban development forms due to geographical constraints and scarcity of land;
- Value capture through land banking and increase in property values associated with transit investments;
- Prevalence of mixed land uses as a basic unit of planning;
- Strong enforcement mechanisms; and
- Citizen participation in planning.

### Weaknesses and Challenges

- Rising incomes have resulted in increase in car ownership;
- Increased congestion;
- Housing affordability; and
- Rising land acquisition costs.

### Lessons Learned from Singapore applicable to Indian cities

**Regional vision based integrated land use and transit planning.** One of the common features prevalent in successful TOD cities including Singapore is the ability of the government to influence change in travel behaviour and urban living at the regional or metropolitan scale. Singapore's Constellation Plan is an exemplary example of creating "places" and urban form which informs the mobility choices planned to shape future cities.

**Strong institutional framework for plan implementation.** Support for regional planning at the local levels is necessary with adequate support from the political leadership is pivotal in creating successful TOD models. Inter-agency planning of transit, housing and land development as seen in the case of Singapore is also equally important in ensuring that the long-term goals set by regional vision plans and master plans are manifested.

**Densification in strategic transit-supportive areas.** Transitioning from uniform densities to articulated densities as a best practice is a crucial lesson that Indian cities need to emulate in order to capitalize on the benefits of location efficiencies and value capture opportunities offered by TODs.

**Affordable housing for mixed-income groups.** Singapore's housing agency (HDB) has invested significantly in providing high-quality affordable housing for mixed-income groups (both owner-occupied and rental) to the extent that 85% of Singaporeans are living in these residential complexes. These



housing complexes are part of the transit-oriented new towns planned and implemented by the government.



Figure 6-44: Example of transit first and pedestrian prioritization practices, Singapore | Source: Karl Fjellestrom, itdp-china.org

**Transportation Demand Management strategies.** Singapore has been a leader in enforcing transportation demand management and transit-first policies that are instrumental in bringing a change in travel behaviour to support the viability of TODs. These strategies are needed and can be implemented in several growing medium-sized Indian cities, provided it is backed by political support.

**Land monetization as a value-capture mechanism.** In Singapore, public leasing of urban land raises more money than any tax, supplying funds for two-fifths of the government's budget. Applying mechanisms of land banking and increasing public ownership of strategic lands near transit stations is one of the ways that Singapore has adopted in controlling speculation by the private sector and using these revenues to provide for affordable public housing for its residents.

**Citizen participation in planning.** While not completely successful, the URA has been actively soliciting feedback on its planning initiatives through the social media, public forums, exhibitions and other outreach tools to integrate civic participation in planning. The URA also formed the International Panel of Architects and Urban Planners, as an expert advisory committee to provide input on planning and urban design strategies of cities from other parts of the world.

Below is the summary table for lessons learned from International case studies



# **APPENDIX B:**

## **SAMPLE TERMS OF REFERENCE**

# City-Level TOD Plan

## Task 1 – Data Compilation and Inventory:

- **Review of Existing Documents & Studies:** Compile and review of the previously completed and current planning efforts underway in the Study Area with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of TOD Principles (Refer Guidance Document) under the following broad categories:
  - Planning & regulatory context
  - Regional context
  - Mobility & Access
  - Land Use, Public realm & Urban Design
- **Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area** –The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.
- **Existing Conditions Inventory:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
  - Existing land uses
  - Proposed land uses
  - Zoning
  - Major nodes & activity centers
  - Major roads & infrastructure (Parking)
  - Existing natural features
  - Proposed key developments
- **Develop Case Studies and Best Practices in Transit Oriented Development:** Select best practices that demonstrate successful TOD projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.
- **Undertake focus group meetings & key interviews** with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

## Task 2 – Study Area Analysis

- **Analysis, Baseline Conditions Assessment and SWOT analysis:** Undertake an analysis of baseline conditions and prepare Weaknesses & Threats maps - utilize the existing conditions inventory to evaluate the physical characteristics of the study area.
- **Identify priority transit corridors-** Prioritize the “right” corridor to determine momentum for TOD based on the following parameters:
  - **Map existing land uses, proposed land uses and key developments** to understand the distribution of residential, employment and institutional uses in the city.
  - **Identify activity generators:** Map housing, employment and recreational centres to determine the desired lines and identify routes of high commuter traffic.
- **Delineate influence zone of transit** to determine the area around transit routes or stations, where transit-supportive development needs to be prioritized based on:
  - Population Density
  - Employment Density
  - Accessibility
  - Environmental Context
- **Identify development context:** TOD Planning must take into consideration different aspects of the city and the context before beginning the planning of TOD. It helps in integrating sustainable development principles at the outset by respecting and nurturing existing environmental and settlements. The development context can be identified as:
  - Greenfield
  - Urban Infill
  - Redevelopment
- **Identify preliminary goals and targets** with respect to the institutional support, plans, policies and development market.

**Task 3 – Visioning and Stakeholder Engagement, TOD “Charrette”**

An organized design workshop; where more focus will be to create a vision for TOD plan. Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop. Focused charrette shall achieve the following objectives:

- Discuss the integration of land use, transportation, and infrastructure and solicit implementation strategies from charrette participants;
- Share and revalidate the identified transit first goals and targets;
- Prioritize goals into short term, mid-term, and long term opportunities; and
- Identify the market, generate project interest and solicit feedback.

**Task 4 – Draft Transit Oriented Development Recommendations**

- **Prepare a draft conceptual TOD Plan:** Recommend modifications to the Development Plan and/or land development regulations, policy changes, DCR amendments in order to achieve the desired intent of TOD within the city. Draft TOD Recommendations Plan should be inclusive of the followings:
  - o Parking Management Tools
  - o Infrastructure Upgrades
  - o First & Last Mile Connectivity
  - o Differential Densities
  - o Desired Land Use Mix
  - o Financial Strategy
  - o Public Transport Goals
  - o Affordable Housing

**Task 5 – Identify a Financing strategy**

- Develop an understanding of the city’s financing system impacting implementation of TOD related land development and infrastructure projects.
- Introduce innovative funding tools to integrate TOD within the city’s urban management and financing systems
- Develop a Capital Investment Strategy for TOD station areas and projects.

**Task 6 – Identify a phasing and implementation strategy including catalyst projects**

- **Prepare a phasing for the TOD Plan** which includes preliminary recommendations to enable the City / development and planning agency to systematically implement the recommendations of the TOD Plan.
- **Technical Capacity Building Recommendations:** Assessment of existing capacity of the Planning teams and to identify gaps and to recommend measures of augmentation of Technical Capacity.

# Corridor-Level TOD Plan

## Task 1 – Data Compilation and Inventory:

- **Review of Existing Documents & Studies:** Review and analysis of the previously completed and current planning efforts underway in the Study Area with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of promoting TOD Principles under the following broad categories:
  - o Planning & regulatory context
  - o Regional context
  - o Mobility & Access
  - o Land Use, Public realm & Urban Design
  - o Transit & Station Area
- **Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area** –The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.
- **Existing Conditions Inventory:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
  - o Existing land use
  - o Proposed land uses
  - o Land Ownership
  - o Parking
  - o Zoning
  - o Major nodes & activity centers
  - o Major roads & infrastructure
  - o Existing Natural features
  - o Parks and Open Spaces
  - o Proposed key developments
  - o Circulation and Accessibility, with special emphasis on Multimodal Integration and NMT infrastructure
- **Develop Case Studies and Best Practices in Transit Oriented Development:** Select best practices that demonstrate successful TOD projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.
- **Undertake focus group meetings & key interviews** with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

## Task 2 – Study Area Analysis

- **Study the transit and the station characteristics (planned/existing):** There are key differences in TOD strategies for different transit mode. Undertake an analysis of baseline conditions and prepare SWOT maps- utilize the existing conditions inventory to evaluate the physical characteristics of the study area
- **Delineate influence zone:** Identify catchment area around station by transit type where TOD interventions can be applied.
  - o Boundary may be defined by a 5 – 10 minute walking distance
  - o Larger catchment area can be defined as the areas that are accessible by feeder transit
- **Identify preliminary goals and targets** with respect to the institutional support, plans, policies and development market

## Task 3 – Visioning and Stakeholder Engagement, TOD “Charrette”

An organized design work-shop; where more focus will be to create a vision for TOD plan. Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop. Focused charrette shall achieve the following objectives:

- Discuss the integration of land use, transportation, and infrastructure and solicit implementation strategies from charrette participants;
- Share and revalidate the identified transit first goals and targets;
- Prioritize goals into short term, mid-term, and long term opportunities; and
- Identify the market, generate project interest and solicit feedback.



**Task 4 – Define Station Area Typologies and Prioritization of TOD areas:**

- **Identify Station Area Typologies in relation to the urban context and character-** Station areas along a transit corridor are set in different urban contexts, play different roles in the transportation network, and present unique challenges and opportunities. The typologies will include the following at a minimum
  - o Urban Context
  - o Station Area Character
  - o Predominant land use & intensification potential
  - o Land use mix and density & FAR's
  - o Retain characteristics
  - o Planning & development challenges
  - o Ideal Land use mix
  - o Transportation Parameters
  - o Multimodal Integration
- **Create a vision for each of the identified station types in terms of ultimate character and development form:** Based on this vision, land use mix, urban design and parking policies and a set of development standards should be developed in order to provide the basis of a regulatory framework that would allow this vision to be achieved.
- **Develop a selection criteria matrix to identify the prioritized TOD areas:** Based on the following (but not limited to) quantitative and qualitative parameters
  - o Identify development/ redevelopment potential based on:
    - » Land availability and ownership- presence of underutilized lots, vacant lots, lots of large block sizes, and properties in dilapidated conditions
    - » Allowable land uses
    - » Future/ proposed development patterns
    - » Real Estate Market Potential
  - o Higher transit ridership (expected / proposed)
  - o Presence of intermodal service
  - o Typology and applicability number of station of the same typology
  - o Higher land use mixes
  - o Station area character
  - o Market Potential - for residential, office, and retail mixed use development based on interviews with knowledgeable real estate development groups and review of other studies and planning documents

**Task 5 – Draft Transit Oriented Development Recommendations**

- **Create a conceptual Corridor Plan**
  - o **Establish and / or reconnect street grid** – develop a comprehensive street grid of small blocks, accommodating pedestrian, vehicular and cycling connections
  - o **Provide intermodal connections** - near transit stations, for IPT with the intention of establishing a well-connected, efficient, transportation system, providing robust connections throughout the community for all modes.
  - o **Develop appropriate parking strategies** with reduced parking as the goal- Encourage use of on-street parking to meet parking requirements. Conceal parking structures within development or screen from view on low value land
  - o **Upgrade the Infrastructure carrying capacity** to support the increased demand
- **Integration of TOD Plan with Zonal Development Plan/ Local Area Plan**
- **Identify Priority Station Areas as TOD demonstration project.**

### Task 6 – Identify a Financing strategy

- Develop an understanding of the city's financing system impacting implementation of TOD related land development and infrastructure projects.
- Introduce innovative funding tools to integrate TOD within the city's urban management and financing systems
- Develop a Capital Investment Strategy for TOD station areas and projects.

### Task 7 – Identify a phasing and implementation strategy including catalyst projects

- **Prepare a phasing for the TOD Plan** which includes preliminary recommendations to enable the City / development and planning agency to systematically implement the recommendations of the TOD Plan.
- **Technical Capacity Building Recommendations:** Assessment of existing capacity of the Planning teams and to identify gaps and to recommend measures of augmentation of Technical Capacity.

# Station-Level TOD Plan

## Task 1 – Data Compilation and Inventory:

- **Review of Existing Documents & Studies:** Review and analysis of the previously completed and current planning efforts underway in the Study Area with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of promoting TOD Principles under the following broad categories:
  - Planning & regulatory context
  - Regional context
  - Mobility & Access
  - Land Use, Public realm & Urban Design
  - Transit & Station Area
- **Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area** –The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.
- **Existing Conditions Inventory:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
  - Existing land use
  - Proposed land uses
  - Land ownership
  - Parking
  - Zoning
  - Circulation and Accessibility, with special emphasis on Multimodal Integration and NMT infrastructure
  - Public facilities
  - Major nodes & activity centers
  - Public realm & urban design elements
    - » Parks, Open Space and Plazas
    - » Sidewalk conditions
    - » Natural Features
    - » Lighting and signage conditions
    - » Utilities
  - Proposed key developments
- **Develop Case Studies and Best Practices in Transit Oriented Development:** Select best practices that demonstrate successful TOD projects nationally and internationally. The case studies will highlight successes, failures and lessons learnt.
- **Undertake focus group meetings & key interviews** with stakeholders to help generate buy-in, identify major issues confronting the project, and the social, economic, and political goals for the project.

## Task 2 – Study Area Analysis

- **Delineate Boundaries for TOD Study Area and Influence Area:** Refine TOD study boundary taking into account the existing and proposed site conditions in the following order:
  - Walking Distance from Transit Station based on Willingness to Walk
  - Existing Road Network
  - Ped-Shed Analysis
  - Critical Destinations beyond 10mins
  - Natural Environment Boundaries
  - Existing Built Environment
  - Existing Land Ownership

- **Analysis, Baseline Conditions Assessment and SWOT analysis:**
  - o Identify the development character of the station area based on:
    - » Station Typology
    - » Market Realities
    - » Community Needs
  - o Undertake an analysis of baseline conditions and prepare SWOT maps based on TOD planning Principles broadly classified into:
    - » Accessibility
    - » Urban Form and Development
    - » Transit & Station amenities
- **Identify preliminary goals and targets** with respect to the institutional support, plans, policies and development market

### Task 3 – Visioning and Stakeholder Engagement, TOD “Charrette”

An organized design work-shop; where more focus will be to create a vision for TOD plan. Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop. Focused charrette shall achieve the following objectives:

- Discuss the integration of land use, transportation, and infrastructure and solicit implementation strategies from charrette participants;
- Share and revalidate the identified transit first goals and targets;
- Prioritize goals into short term, mid-term, and long term opportunities; and
- Identify the market, generate project interest and solicit feedback.

### Task 4 – Draft Transit Oriented Development Recommendations

- **Prepare a Conceptual Plan** incorporating the TOD Planning Principles (TOD Guidance Document - 1.3) under the themes: Integrated Transportation | NMT Accessibility | Compact Development | Liveability.
- **Prioritize**—‘quick-win’ public realm investments as catalyst projects and low-cost demonstration projects to showcase future transformations envisioned in TODs.
- **Prepare transit supportive development code at the station level** which will include the following at a minimum
  - o **Develop appropriate parking strategies** with reduced parking as the goal
  - o **Urban form**- compact development, articulated densities, mix of uses, integrate informal sector, active building frontage, and housing typology

### Task 5 – Identify a Financing strategy

- Develop an understanding of the city’s financing system impacting implementation of TOD related land development and infrastructure projects.
- Introduce innovative funding tools to integrate TOD within the city’s urban management and financing systems
- Develop a Capital Investment Strategy for TOD station areas and projects.

### Task 6 – Identify a phasing and implementation strategy including catalyst projects

- **Prepare a phasing for the TOD Plan** which includes preliminary recommendations to enable the City / development and planning agency to systematically implement the recommendations of the TOD Plan.
- **Technical Capacity Building Recommendations:** Assessment of existing capacity of the Planning teams and to identify gaps and to recommend measures of augmentation of Technical Capacity.



## Site -Level TOD Plan

### Task 1 – Data Compilation and Inventory:

- **Review of Existing Documents & Studies:** Review and analysis of the previously completed and current planning efforts underway in the Study Area with the intent to identify gaps and consistencies of the various policies, strategies and development projects when assessed against a backdrop of promoting TOD Principles under the following broad categories:
  - o Planning & regulatory context
  - o Regional context
  - o Mobility & Access
  - o Land Use, Public realm & Urban Design
  - o Transit & Station Area
- **Undertake site visits(s) & prepare inventory of the planning & physical characteristics of the Study Area** –The existing conditions inventory will include the preparation of a detailed base map and a series of inventory maps and photographs.
- **Existing Conditions Inventory:** Map the existing data using AutoCAD and GIS mapping procedures. Inventory will include the following at a minimum:
  - o Existing land use
  - o Proposed land uses
  - o Land ownership
  - o Parking
  - o Zoning
  - o Circulation and Accessibility, with special emphasis on Multimodal Integration and NMT infrastructure
  - o Public facilities
  - o Major nodes & activity centers
  - o Public realm & urban design elements
    - » Parks, Open Space and Plazas
    - » Sidewalk conditions
    - » Natural Features
    - » Lighting and signage conditions
    - » Utilities
  - o Proposed key developments

### Task 2 – Study Area Analysis

- **Identify development context:** TOD Planning must take into consideration different aspects of the city and the context before beginning the planning of TOD. It helps in integrating sustainable development principles at the outset by respecting and nurturing existing environmental and settlements. The development context can be identified as:
  - o Greenfield
  - o Urban Infill
  - o Redevelopment
- **Analysis, Baseline Conditions Assessment and SWOT analysis:** Undertake an analysis of baseline conditions and prepare Weaknesses & Threats maps - utilize the existing conditions inventory to evaluate the physical characteristics of the study area.
- **Identify preliminary goals and targets** with respect to the institutional support, plans, policies and development market
- **Create a development program**
  - o Site Layout Plan- proposed land use mix
  - o Detailed Development Programme
  - o Infrastructure Upgrades Plan
- **Prepare the Real Estate Market Feasibility Study based on**
  - o Demand assessment of the site
  - o Feasibility assessment/study of the proposal

### Task 3 – Visioning and Stakeholder Engagement, TOD “Charrette”

An organized design work-shop; where more focus will be to create a vision for TOD plan. Invite and engage key stakeholders including elected officials and staff from various agencies to the visioning workshop. Focused charrette shall achieve the following objectives:

- Discuss the integration of land use, transportation, and infrastructure and solicit implementation strategies from charrette participants;
- Share and revalidate the identified transit first goals and targets;
- Prioritize goals into short term, mid-term, and long term opportunities; and
- Identify the market, generate project interest and solicit feedback.

### Task 4 – Draft Transit Oriented Development Recommendations

- **Prepare a Conceptual Master Plan** include the following at a minimum
  - **Built Form**
    - » Site Layout Plan- proposed land use mix
    - » Detailed Development Programme
    - » Infrastructure Upgrades Plan
  - **Placemaking**
    - » Public Realm Strategy
    - » Access Management
    - » Transit Plaza Design
    - » Streetscape Improvement
  - **Mobility and Circulation Strategy**
    - » Pedestrian Accessibility Plan
    - » Traffic Circulation Plan
    - » Road Network Design
    - » Parking Management
- **Prioritize**—‘quick-win’ public realm investments as catalyst projects and low-cost demonstration projects to showcase future transformations envisioned in TODs.

### Task 5 – Identify a Financing strategy

- Develop an understanding of the city’s financing system impacting implementation of TOD related land development and infrastructure projects.
- Introduce innovative funding tools to integrate TOD within the city’s urban management and financing systems
- Develop a Capital Investment Strategy for TOD station areas and projects.

### Task 7 – Identify a phasing and implementation strategy including catalyst projects

- **Prepare a phasing for the TOD Plan** which includes preliminary recommendations to enable the City / development and planning agency to systematically implement the recommendations of the TOD Plan.
- **Technical Capacity Building Recommendations:** Assessment of existing capacity of the Planning teams and to identify gaps and to recommend measures of augmentation of Technical Capacity.

# **APPENDIX C:**

## **GLOSSARY OF TERMS**

### Active uses

Land uses such as retail, coffee shops, storefronts, cafes, restaurants, and hawkers zones which keep the area active with pedestrian activity at street level and maintain visual interest are termed as active uses.

### Affordable Housing

Affordable housing provides housing mainly for those whose income is below the median household income. Both the private sector and government in India are exploring options for creating housing for low income group. Government of India, both at central and state level has initiated various schemes to assist in delivery of affordable housing. It includes public sector working as facilitator and engaging private sector to build housing with rental units that are subsidized by the government through rental subsidy programs.

### Brownfield redevelopment

Development on a brownfield site is commonly referred to as Brownfield redevelopment. Brownfield sites are abandoned or under used industrial and commercial facilities available for re-use. Expansion or redevelopment of such a facility is often complicated by real or perceived environmental contaminations. The land may be contaminated by low concentrations of hazardous waste or pollution, and has the potential to be reused once it is cleaned up. Land that is more severely contaminated and has high concentrations of hazardous waste or pollution, such as a Superfund site, does not fall under the brownfield classification.

### Bus Rapid Transit (BRT)

BRT systems use buses or specialized vehicles on roadways or dedicated lanes to transport passengers without interference from other traffic. Such systems usually include dedicated bus lanes, signal priority at intersections, off-bus fare collection to speed up boarding, level boarding (low-floor buses or high-level platforms) to speed up boarding and enhance accessibility, and enclosed stations.

### Complete street

Road design philosophy where road space is allocated to safely balance the needs of all road users including pedestrians, cyclists, transit, and motorists. Transportation choice is increased when safe and appealing options for getting from place to place are provided - options to walk and bike provide opportunities for increased community health and reductions in air and noise pollution.

### Crime Prevention Through Environmental Design (CPTED)

Crime Prevention Through Environmental Design (CPTED) is a multi-disciplinary approach to deterring criminal behavior through environmental design. CPTED strategies rely upon the ability to influence offender decisions that precede criminal acts. As of 2004, most implementations of CPTED occur solely within the built environment.

### Development Control Regulations (DCRs)

DCRs are the primary regulatory tool used to guide development that ultimately shapes a city's urban form and functions. It includes guiding the development and use of land, built environment- FAR's, Density, Heights, Setbacks, and public realm. Critical to the success of an efficient and effective transit system is the combination of basic employment opportunities and a mix of housing typologies supported with major retail, civic, cultural, entertainment and community facilities. The DCRs which are currently proposed as blanket for the entire city needs to be revisited and should be more modified into more creating context-specific Development Code Regulation

### Floor Area Ratio (FAR) | Floor Space Index (FSI)

The FAR or FSI is the ratio of the total floor area of buildings on a certain location to the size of the land of that location, or the limit imposed on such a ratio.

As a formula: Floor Area Ratio= (Total covered area on all floors of all buildings on a certain plot)/(Area of the plot).

Thus, an FSI of 2.0 would indicate that the total floor area of a building is two times the gross area of the plot on which it is constructed, as would be found in a multiple story building.

### Feeder bus routes

A feeder bus route is a bus service that picks up and delivers passengers to a higher order transit station such as a rapid rail transit station, express-bus stop or terminal.

### Form-based code

Form-based codes foster predictable built results and a high-quality public realm by using physical form (rather than separation of uses) as the organizing principle for the code. These codes are adopted into city or county law as regulations, not mere guidelines. Form-based codes are an alternative to conventional zoning.

Form-based codes address the relationship between building facades and the public realm, the form and mass of buildings in relation to one another, and the scale and types of streets and blocks. The regulations and standards in Form-based codes, presented in both diagrams and words, are keyed to a regulating plan that designates the appropriate form and scale (and therefore, character) of development rather than only distinctions in land-use types. This is in contrast to conventional zoning's focus on the micro management and segregation of land uses, and the control of development intensity through abstract and uncoordinated parameters (e.g., FAR, dwellings per acre, setbacks, parking ratios, traffic LOS) to the neglect of an integrated built form. Not to be confused with design guidelines or general statements of policy, Form-based codes are regulatory, not advisory.

### **Greenfield development**

Greenfield development is the creation of planned communities on previously undeveloped land. This land may be rural, agricultural or unused areas on the outskirts of urban areas. Unlike urban sprawls, where there is little or no proper suburban planning, greenfield development is about efficient urban planning that aims to provide practical, affordable and sustainable living spaces for growing urban populations. The planning takes future growth and development into account as well as seeks to avoid the various infrastructure issues that plague existing urban areas.

### **Higher order transit**

Higher order transit refers to a transit service that operates on a dedicated right-of-way or in a priority situation, and therefore moves more efficiently than the regular flow of traffic and can carry large numbers of people quickly and comfortably. Examples of higher order transit include buses that have dedicated lanes, metro and commuter rail, which operates on its own separate track.

### **Infill Development**

Infill development is the term used for new development within existing communities on previously underutilized sites, typically at a higher density. Good infill developments fit in seamlessly within the existing urban fabric, and the contributing elements include: setback- the distance from the front facade of the house to the street and should be the same distance as other houses on the street, height -which should be compatible with the height of buildings surrounding the lot, and mass- the bulk of the house

### **Intelligent Transportation Systems (ITS)**

ITS refers to the application of information and communication technologies to transportation infrastructure and vehicles.

### **Intensification**

Urban intensification is the construction and reconstruction of compact communities in the existing built up area of the city. Intensification includes new development which raises the density on sites and within communities. These compact communities are supportive of transit, bicycle and pedestrian friendly and promote local jobs and services.

### **Intermodal transit hub**

Intermodal Transit Hubs are stations or centres where a range of different transportation modes (i.e.: cycling, walking, metro, private vehicle, bus, autos and taxis) come together and allow for easy transfers from one mode to another. They can also facilitate transfers at different scales: local, regional, and intercity.

### **LEED (Leadership in Energy and Environmental Design)**

A green building rating system, since expanded to rate neighbourhood development. Buildings can qualify for four levels of certification related to environmentally sustainable construction. Certification is granted by the Green Building Council based on an application documenting compliance with the rating system requirements, as well as paying registration and certification fees.

### **Local bus**

Conventional bus service typically operated by a municipality with frequent stops and connections to surrounding communities

### **Mixed Use**

Mixed Uses are defined by diverse mix of uses, including housing, employment, regional attractions and public spaces allowing people to walk to work or to shop rather than driving for all daily needs. It also includes vertical type of mixed use development like residential land use over the commercial places so that the distance between the activities is decreased and accessibility between different activities is increased.

### **Mode share**

Trips taken by a particular mobility choice, such as car, transit, cycling, or walking as a proportion of the total number of trips.



### **Park and Ride**

Park and Rides are car parking lots that offer transit users a place to park their car, then transfer to a public transit service to complete their journey. They are typically used in suburban locations where distances from destinations to transit service are further. Park and ride facilities should be visible from and located along heavily used commuter routes. They should be landscaped, weather resistant, well-lit, and contain a range of amenities.

### **Pedestrian plaza**

A public space that can act as important organizing elements within a station area, helping to facilitate transfers between modes, acting as receiving points for pedestrians and containing a range of services and amenities for transit users.

### **Placemaking**

Placemaking is a term that began to be used in the 1970s by architects and planners to describe the process of creating squares, plazas, parks, streets and waterfronts that will attract people because they are pleasurable or interesting.

### **Public amenities**

Public amenities are resources, conveniences, facilities or benefits continuously offered to the general public for their use and/or enjoyment, with or without charge (e.g., restrooms, information displays, public telephones, rain shelters, drinking fountains, etc.).

As such, public amenities are expected to function around the clock, in adverse conditions such as inclement weather, high noise environments and in varying degrees of light and heat. Consequently, there are several key attributes that should be integrated into all public amenities to ensure universal usability.

### **Public Private Partnerships (PPP)**

Public-private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. These schemes are sometimes referred to as PPP or P3.

PPP involves a contract between a public-sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. In some types of PPP, the cost of using the service is borne exclusively by the users of the service and not by the taxpayer. In other types (notably the private finance initiative), capital investment is made by the private sector on the strength of a contract with government to provide agreed services and the cost of providing the service is borne wholly or in part by the government. Government contributions to a PPP may also be in kind (notably the transfer of existing assets). In projects that are aimed at creating public goods like in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to the private investors. In some other cases, the government may support the project by providing revenue subsidies, including tax breaks or by providing guaranteed annual revenues for a fixed period.

PPP involves many models including Design Build Finance (DBF), Design Build Finance Maintain (DBFM).

### **Public realm**

The public realm consists of public spaces such as streets, parks and sidewalks. The public realm is also a place where the community can come together through collaborative activities such as street festivals and other programmable activity.

### **Right-of-way**

A right-of-way is land that is used for transportation purposes, such as for a trail, driveway, rail line, street or highway. A right-of-way is often reserved for the purposes of maintenance or expansion of existing services.

### **Semi-public amenities**

The semi-public area is the zone that extends from the edge of the building to the public sidewalk outside the public right-of-way but accessible to the public. Gardens, fountains, seating areas, and kiosks with small outdoor dining areas are all types of semi-public amenities to consider for this zone - these may be closed or cordoned off during certain hours.

### **Sense of place**

Though sense of place has been defined differently and used in different ways, it is often used in relation to characteristics that make a place special or unique, as well as to those that foster a sense of authentic human attachment and belonging.

### **Side lanes**

Side lanes are a type of bike lane in-between a main travel lane and a dedicated turn lane. They can help prevent conflicts between cyclists and motorists who wish to make a turn (this assumes there is a bike lane along the street on the preceding block or blocks).

### Smart growth

Smart growth refers to a collection of land use and development principles that aim to enhance our quality of life, preserve the natural environment, and save money over time. Smart growth principles ensure that growth is fiscally, environmentally and socially responsible and recognizes the connections between development and quality of life. Smart growth enhances and completes communities by placing priority on infill, redevelopment, and densification strategies.

### Street grid network

The grid plan, street grid plan or gridiron plan is a type of city plan in which streets run at right angles to each other, forming a grid. These patterns display a higher degree of connectivity than other road hierarchical road patterns that feature dead end streets and fewer through connections.

### Streetscapes

The visual elements of a street, including the road, adjoining buildings, street furniture, trees and open spaces, etc, that combines to form the street's character.

### Multi-level Car parking

Structured parking refers to an above- or below-grade structure designed to accommodate vehicle parking. This type of parking is more expensive than surface parking, but is a much more efficient use of land (a 3-storey parking structure requires a third as much land as a surface lot) and has long term value of integrated mixed-use development.

### Tax Increment Financing (TIF)

TIF is a method to use future gains in taxes to finance current improvements (which theoretically will create the conditions for those future gains). When a development or public project is carried out, there is often an increase in the value of surrounding real estate, and perhaps new investment. This increased site value and investment sometimes generates increased tax revenues. The increased tax revenues are the "tax increment." Tax Increment Financing dedicates tax increments within a certain defined district to finance debt issued to pay for the project. TIF is designed to channel funding toward improvements in distressed or underdeveloped areas where development might not otherwise occur. TIF creates funding for "public" projects that may otherwise be unaffordable to localities, by borrowing against future property tax revenues.

### Transfer of Development Rights (Height and density exchange)

Also called density bonusing, this tool offers developments a level of density that surpasses the allowable Floor Area Ratio (FAR). In exchange for increased height/density that surpasses the zoning by-law, developers are required to provide a service or benefit to the community as negotiated by the municipality such as amenities or housing needed by the community. Density bonusing policies must be written into a municipality's Official Plan in order for it to be used as a development tool.

### Traffic calming

Traffic calming is intended to slow or reduce motor-vehicle traffic in order to improve safety for pedestrians and bicyclists and improve the environment for residents. These may include narrower traffic lanes, speed bumps, raised pedestrian crossings, pedestrian refuge islands in medians amongst others.

### Transit Adjacent Development (TAD)

Development that is in close proximity to transit stops or facilities. However, this type of development is not designed to promote transit ridership. A TAD lacks functional connectivity to transit, whether in terms of land-use composition, station access, or site design.

### Transit-oriented Developments (TOD)

Transit-oriented developments (TOD) are 'urban villages' where all residents are within a 5-10 minute walk of quick, efficient public transit and can 'live, work, play, shop and learn' in a pedestrian-friendly environment- without the need of a car. TOD is a planning approach that calls for high-density, mixed-use business/residential neighbourhood centers to be clustered around transit stations and corridors. TOD is considered a "smart growth" strategy, because it addresses the issue of where growth should occur from a sustainability perspective and it coordinates land use and transportation such that both land and infrastructure are used efficiently. As its name implies, TOD is designed to be served by transit rather than or in addition to the automobile. Networks of streets and multi-use paths are also created to provide a walkable and bikeable environment that is conducive to living, working, and shopping in the same area. TOD is focused within a 800m radius of transit stops, with the highest intensity and mix of land uses concentrated within one-quarter mile or adjacent to the station. Land use intensities and densities decrease away from the core area, with transitions included in development plans to ensure compatibility with existing neighbourhoods.

Peter Calthorpe summarizes the main characteristics and goals of TOD as follows:

1. Organize growth on a regional level to be compact and transit-supportive.
2. Place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops.
3. Create pedestrian-friendly street networks which directly connect local destinations.
4. Provide a mix of housing types, densities, and costs.
5. Preserve sensitive habitat, riparian zones, and high quality open spaces.
6. Make public spaces the focus of building orientation and neighbourhood activity.
7. Encourage infill and redevelopment along transit corridors within existing neighbourhoods.

### **Transit priority signals**

Traffic signal priority allows transit vehicles to travel through signalized intersections with little or no delay. Since transit vehicles hold many people, giving priority to transit can potentially increase the person throughput of an intersection. There are different types of signal priority: passive, active, and real-time. A passive priority strategy uses timed coordinated signals in the area-wide traffic signal timing scheme. An active priority strategy involves detecting the presence of a transit vehicle and gives the transit vehicle special treatment. The system can give an early green signal or hold a green signal that is already displaying. Real-time control strategies can consider not only the presence of a transit vehicle but the adherence to schedule and the volume of other traffic. One common strategy is to give priority only to late buses but not to early buses. This strategy optimizes schedule adherence (and therefore waiting time) rather than running time.

### **Transit Supportive Development (TSD)**

TSD consists of a mix of housing, shops, restaurants, offices, civic buildings, and open space in close proximity to a transit station. Transit-supportive planning and development rethink land use and development patterns to achieve a balanced transportation system where walking, bicycling, and riding transit are used more than the private automobile. This is primarily accomplished by designing communities so that the walking, cycling, and riding transit is convenient and attractive options.

### **Transportation Demand Management (TDM)**

By influencing travel behavior through the implementation of strategies such as carpooling, parking management, cycling programs, flexible working hours, high occupancy vehicle lands, incentives for transit, walking and cycling, the resulting transportation system is more efficient.

### **Wayfinding**

The means in which people orient themselves in physical space and navigate from place to place. Can include the physical design of spaces and assistive features, such as signage.

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