

TRANSIT ORIENTED DEVELOPMENT GUIDANCE DOCUMENT LOCAL AREA PLAN

Making cities more liveable, sustainable and vibrant



Ministry of Housing and Urban Affairs
Government of India



National Institute of Urban Affairs

URBAN
SH/FT

TRANSIT ORIENTED DEVELOPMENT GUIDANCE DOCUMENT

LOCAL AREA PLAN

Making cities more liveable, sustainable and vibrant

PARTNER CITIES



PREPARED BY



Published in March, 2025

The work is a product of the staff members of the National Institute of Urban Affairs (NIUA) and Urban Mass Transit Company Limited (UMTC) with external experts.

The document has been prepared as a part of the “Guideline of Transit Oriented Development - Local Area Plan” and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of UMTC being obtained. UMTC accepts no responsibility or liability for the consequence of this document being used for a purpose other than the purposes for which it was commissioned. Any person using or relying on the document for such other purpose agrees, and will by such use or reliance be taken to confirm his agreement to indemnify UMTC for all loss or damage resulting therefrom. UMTC accepts no responsibility or liability for this document to any party other than the person by whom it was commissioned.

ACKNOWLEDGEMENT

Our sincerest gratitude to the following institutions/ experts for being an inspirations by adopting various policies and providing their valuable feedback and suggestions:

- ◆ *Ministry of Housing and Urban Affairs, GOI*
- ◆ *Global Environment Facility (GEF)*
- ◆ *United Nations Environment Programme (UNEP)*
- ◆ *National Institute of Urban Affairs (NIUA)*
- ◆ *Urban Shift*
- ◆ *Centre For Environmental Planning and Technology (CEPT)*
- ◆ *Pune Municipal Corporation (PMC)*
- ◆ *Agra Nagar Nigam (ANN)*

TEAM MEMBERS

NIUA

- ◆ *Sarika Chakravarty*
- ◆ *Varsha Singh*
- ◆ *Shinjini Saha*
- ◆ *Manas Kulkarni*
- ◆ *Sudheer Sutar*

UMTC

- ◆ *Kanika Kalra*
- ◆ *Preeja Nair*
- ◆ *V. Surya Prakash*
- ◆ *Pushkar Dhawale*
- ◆ *Prateek Kaur*
- ◆ *Quresh Bhanpurawala*
- ◆ *Shahul Hameed*

FOREWORD

As cities are evolving, the need for sustainable and integrated urban developments has become increasingly imperative. To effectuate this, the Ministry of Housing and Urban Affairs (MoHUA), Government of India, under the AMRUT Mission, has launched a “Pilot on Formulation of Local Area Plan

(LAP) and Town Planning Scheme (TPS) For Selected Cities”. To integrate TOD in LAPs, “Transit Oriented Development (TOD) Guidance Document for Local Area Planning”, has been prepared by the joint efforts of the National Institute of Urban Affairs (NIUA) and Urban Mass Transit Company (UMTC). This document is an initial step in creating cities which are more liveable, sustainable and vibrant urban centres.

The document offers a detailed framework for integrating land use and transportation planning around the transit nodes. It emphasizes mixed-use development, supports walkable neighbourhoods, encourages public transportation, reduces dependence on private vehicles, minimizes environmental impact, and promotes more equitable and accessible communities.

The guidance document is designed with the intent to help the planning authorities, transit authorities, and private developers implement TOD strategies at the local level. It serves as a roadmap for creating an urban environment that is not only efficient and sustainable but also facilitates the transformation of cities into hubs of economic growth and social inclusion.

We express our heartfelt appreciation to all the experts, institutions, and partner cities who have contributed to the creation of this guidance document. We hope this document will inspire cities to collaborate in shaping sustainable urban growth centres in India.



Kishor Nathani
(Urban Mass Transit Company Pvt. Ltd.)



TABLE OF CONTENT

01.	
Introduction	18
1.1 What is Transit Oriented Development	20
1.2 Why do we need Transit Oriented Development	22
1.3 Relevance of TOD in India	23
1.4 Key Outcomes from Global Case Studies	24
1.5 Why Transit Oriented Development is not successful in India till now	26
1.6 Who will this Document Help?	28
1.7 How to Read the Handbook?	29
1.8 How to Read the Principle?	30
02.	
Planning Framework of Transit Oriented Development	32
2.1 Transit Oriented Development Planning Context	34
2.1.1 Scale of Transit Oriented Development	35
2.1.2 Typologies of Development Context	41
2.1.3 Local Area Typologies based on Development Context	43
2.1.4 Local Area Typologies Based on Land Use	43
2.1.5 Nature of Transit Service	44
2.2 Transit Oriented Development Framework	47
2.3 Detailed Transit Oriented Framework	48
2.4 Step by Step approach to start planning for Transit Oriented Development of Local Area Plan	50

03. Assessment Before Planning 52

- 3.1 Getting City Ready for Transit Oriented Development 54
- 3.2 Department Wise Roles and Responsibility 68
- 3.3 Summary of Assessment Before Planning 70

04. Planning and Design Principle for Transit Oriented Development 72

- 4.1 From Principle to Details 74
- 4.2 Plan and Design TOD Principle 90
- 4.3 Performance Measures 144
- 4.4 Design Layout of Each Step 145
- 4.5 How to evaluate each Performance Measure 145
- 4.6 Performance Measure - Section A (Common for all Local Area Zones) 146
- 4.7 Performance Measure - Section B (Local Area Specific) 156
- 4.8 Summary of Planning and Design Principle of Transit Oriented Development 158

05. Financing and Implementing for Transit Oriented Development 160

- 5.1 Making it Happen 162
- 5.2 Existing Financial Strategies 169
- 5.3 Innovative Financial Strategies 172

5.4 Summary of Financial and Implementation for Transit Oriented Development	180
Annexures	182
Annexure A1- Case Studies	186
Annexure A2 - TOD Readiness Assessment Tool	218
Annexure A3 - Parameter for Defining Local Area Typologies	226
Annexure A4 - Pilot Station - Study Area Delineation	230
Annexure A5 - Pilot Station - Planning Framework of TOD	240
Annexure A6 - Pilot Station - Study For Multi-Modal Integration	276
Annexure A7 - Pilot Station - Impact Assessment of TOD	310
Annexure A8 - Detailed Cross Sections	314
Annexure A9 - Survey Formats	350
Definitions	366
Bibliography	374

Acronyms

BRTS	Bus Rapid Transit System
CB Toolkit	Capacity Building Toolkit
CBD	Central Business District
CDP	City Development Plan
CNU	Congress for the New Urbanism
CREDAI	Confederation of Real Estate Developers' Association of India
CTOD	Center for Transit Oriented Development
DCR	Development Control Regulations
DPR	Detailed Project Report
ECS	Equivalent Car Space
EWS	Economically Weaker Section
FAR	Floor Area Ratio
FSI	Floor Space Index
GHG	Green House Gases
GIS	Geographical Information System
IBRD	International Bank of Reconstruction and Development
ICLEI	International Council for Local Environmental Initiatives
IDA	International Development Association
IFC	International Finance Corporations
IIA	Indian Institute of Architects
IPT	Intermediate Public Transport
IRC	Indian Road Congress
ITDP	Institute of Transportation and Development Policy
ITPI	Institute of Town Planner of India
IUT	Institute of Urban Transport
JnNRUM	Jawaharlal Nehru National Urban Renewal Mission
LAP	Local Area Plan
LCPD	Litres Per Capita Per Day

MoHUA	Ministry of Housing and Urban Affairs
MoUD	Ministries of Urban Development
MRTS	Mass Rapid Transport System
NBC	National Building Code
NCI	National Charrette Institute
NGOs	Non- Governmental Organizations
NIUA	National Institute of Urban Affairs
NMT	Non-Motorized Transport
PCMC	Pimpri-Chinchwad Municipal Corporation
PED-SHED	Pedestrian Shed
PPP	Public Private Partnership
REITs	Real Estate Investment Trusts
RFP	Request for Proposal
RTPI	Royal Town Planning Institute
RUDPFI	Regional and Urban Development Formulation and Implementation
SAP	Station Area Plan
SP	Strategic Plan
SPV	Special Purpose Vehicle
SUTP	Sustainable Urban Transport Project
SWOT	Strength, Weakness, Opportunity, Threats
TDR	Transfer of Development Rights
TIF	Tax Increment Financing
TOD	Transit Oriented Development
ToR	Terms of Reference
TOZ	Transit Oriented Zones
TPS	Town Planning Scheme
ULB	Urban Local Body
UMTA	Unified Metropolitan Transport Authority
UMTC	Urban Mass Transit Company Limited
URDPFI	Urban and Regional Development Policy Formulation and Implementation
VKT	Vehicle Kilometre Travelled



CHAPTER 1

INTRODUCTION

1.1 What is Transit-Oriented Development?

Transit-oriented development, commonly known as TOD, is essentially a development concept focused around a transit node and facilitates complete ease of access to the transit, thereby inducing people to walk or cycle and use public transportation over personal modes of transport. TOD is focused on an area of 500-800 m of a transit station that offers a mix of housing, offices, shopping, and transportation choices within a neighbourhood or business district. The primary goals of TOD are:

- ◆ To reduce/discourage private vehicle dependency and induce a shift towards public transport use through design, policy measures and enforcement.
- ◆ To provide easy access to the transit system, catering to the maximum number of people within walking distance through densification and enhanced connectivity.

To achieve the paradigm shift towards public transport, TOD offers pleasurable walking experiences, easily accessible mass transportation with easy, convenient and comfortable intermodal transfers for last-mile connectivity, and other low cost, comfortable, non-motorized transportation options.

It relies on a dense network of streets and paths surrounding high-quality public transport, shortens street crossings, improves both pedestrian and traffic flows, and facilitates a denser, more compact development pattern.

Streets and edge conditions prioritize the liveability, safety, and mobility of pedestrians and cyclists. Regulating parking and road use not only increases mobility, but also provides one of many sources of additional financial resources. Using appropriate mechanisms to capture the increased value of higher density may also help to fund public transport and its associated infrastructure. Intense development around the transit affords ample space for more inhabitants and visitors, which, in turn, maximizes transit ridership and fare box revenues. [8]



Figure 1: Transit Oriented Development

Source: Author

The components of TOD are shown in **Figure 2**.

Land Use Planning

- Integrated land use development with priority to mixed-use development
- Increase in FAR/ FSI along the transit corridors
- Provision of affordable housing
- Integration with Local Area Plans and Development Control Regulations

Network

- Dense Network of streets and paths surrounding the public transport nodes
- Creation of shortest paths connecting to transit stations

Integration

- Seamless integration with the existing public transport network through gap assessments

Public Realm

- Public facilities such as resting areas and washrooms
- Safe and accessible infrastructure for all sections of the society

Non-Motorized Transport

- Complete footpath network connecting transit stations to major institutions, commercial and religious centres
- Dedicated cycle track network connecting transit stations to major institutional, commercial and religious centres

Parking

- Providing adequate parking provisions and effective parking management

Figure 2: Components of Transit Oriented Development

Source: Author

1.2 Why do we need Transit-Oriented Development?

The increasing obsolescence of traditional administrative boundaries is a trend observed as cities evolve. As urban areas continue to expand, the clear distinctions between urban area boundary gets blur.

TOD is a powerful strategy to address these challenges, promoting sustainable urban growth by focusing on integrating land use and transit systems. TOD is essential for following reasons:

- A. **Efficient Urban Planning:** TOD integrates land use and transport planning, and creates efficient movement of people across growth centres with high-density mixed land use, promoting walkable and livable communities with easy access to public transport. ^[48]
- B. **Economic Benefits:** TOD creates concentrated jobs and housing within small areas, promoting agglomeration effects that enhance economic productivity. ^[3]
- C. **Environmental Sustainability:** Reducing dependency on private vehicles helps to lower carbon footprint, leading towards higher productivity and a better environment. TOD reduces greenhouse gas (GHG) emissions by decreasing reliance on private vehicles and promoting the use of public transit, walking and cycling. It also reduces energy consumption. ^[80]
- D. **Social Equity:** TOD enhances access to job opportunities and services for residents of all income groups to stay, work and provide inclusive access to public transport systems. ^[80]
- E. **Resilience and Disaster Risk Reduction:** Mitigation measures taken as part of TOD, when located in areas less exposed to natural hazards, can enhance resilience by supporting high-density housing and activities in lower-risk zones, contributing to disaster risk reduction. ^[80]

Overall, TOD is a key strategy for climate mitigation by reducing emissions and climate adaptation by promoting resilient development patterns. This can be implemented by focusing on equity to maximize the benefits of creating sustainable, vibrant and inclusive communities.



Figure 3: Transit-Oriented Development

Source: Author

1.3 Relevance of Transit-Oriented Development in India

Urbanization has led to the horizontal growth of cities, resulting in urban sprawl. This has also led to an increase in trip lengths, usage of private vehicles, pollution levels, and demand for infrastructure.

To address these issues, many cities have strengthened their public transport by developing Mass Rapid Transit Systems (MRTS), such as metro rails, and Bus Rapid Transit Systems (BRTS). However, it is important to use these systems efficiently by integrating the land use with transport infrastructure to make the cities livable and healthy. [48]

The National TOD Policy defines TOD as a measure to integrate land use and transport planning by developing planned, sustainable urban growth centres linked with high-quality transit systems. The policy intends to support walkable and liveable communities with high-density and mixed land use, where citizens have access to open, green and public spaces. In particular, TOD plays a key role in addressing urban issues such as urban sprawl, encouraging development within transit influence zones. For Indian cities, TOD calls for strengthening the institutional, planning and financing frameworks that enable its effective implementation. [48]

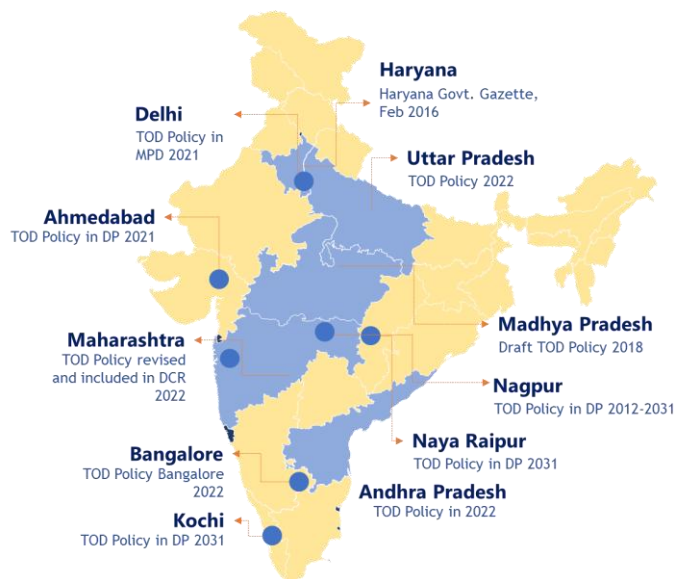
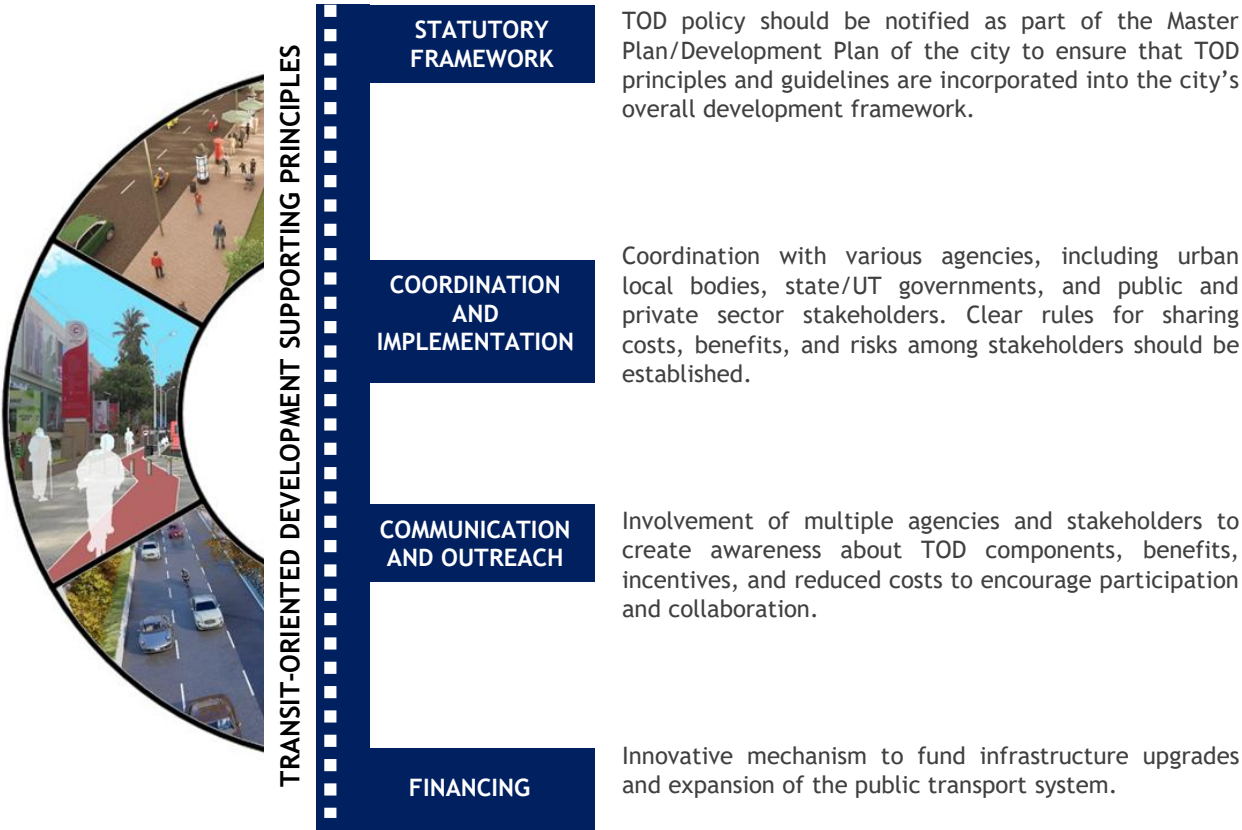


Figure 4: Transit-Oriented Development in India

Source: Author

1.4 Key Learnings from Case Studies





The summary of the case studies is elaborated in Annexure A1.

1.5 How to make Transit-Oriented Development successful in India?

Coordinated planning, regulatory frameworks, project funding and quality regulations, availability of land and land acquisition, and capacity constraints are the five major implementation challenges that TOD encounters and which prevent it from realizing its full potential. ^[6]

The following points highlights how challenges can be resolved and making TOD successful in India.

◆ Coordinated Planning:

- Collaboration between land and transportation planners is crucial for integrated urban development, transportation, and economic growth. This collaboration shall enable efficient project delivery, cost-effective infrastructure development, and positive environmental and social outcomes. ^[6]
- Strategies like transit-oriented development, mixed-use development, and accessibility to open space and transport services are the key measure to achieve these goals. ^[6]

◆ Regulatory Framework:

- Supportive TOD policies are essential for progress in many cities. Their absence often leads to isolated developments that lack consideration for future growth. TOD flourishes with policies that foster high-density, mixed-use environments, frequently achieved through adaptable form-based codes.

- Local policies and mechanisms that facilitate land redevelopment are crucial. Without them, cities may find themselves limited by national regulations and encounter difficulties in addressing financial limitations and navigating regulatory processes. ^[6]
- Streamlining the amendment of local laws and minimizing the time between state-level TOD policy notification and implementation are important steps for successful TOD execution. Integrating TOD into local area plan and state bye-laws is essential for translating policy into tangible action. ^[22]

◆ Project Funding and Quality Regulations:

- TOD projects requires significant investment and innovative financing mechanisms that offer promising solutions for cities seeking to secure initial funding. ^[6]
- Amending bye laws and policies to prioritize public transport over private vehicles is a key strategy for promoting TOD. Addressing the often underpriced nature of parking can further incentivize public transit use, making it a more attractive and competitive option compared to private vehicles. ^[22]

◆ Availability of Land and Land Acquisition:

- As TOD is a relatively recent policy approach, it hasn't been integrated into city development from the beginning. While TOD projects often require acquiring of substantial land parcels, streamlining land acquisition processes, and learning from past infrastructure projects. ^[22]

- Given the challenges of financing and acquiring large land parcels, promoting land pooling and transferable development rights are a valuable strategy for TOD. This can be enhanced by streamlining regulatory measures, including policy reforms that encourage foreign direct investment.^[7]
- ◆ **Capacity Constraint:**
 - Proactive planning around transit corridors is crucial to prevent land speculation and ensure sufficient space for future TOD projects. This forward-thinking approach, coupled with designed public transportation infrastructure in both greenfield and brownfield areas, will support sustainable growth and facilitate successful TOD implementation.^[22]
- ◆ **Gaps in Implementation:**
 - TOD offers a comprehensive approach towards urban development, extending beyond just increased Floor Space Index (FSI). It encompasses integrated mobility, expanded public spaces, accessible green areas, vibrant street frontages, and minimized parking, all of which are essential components of successful TOD implementation.^[17]
 - Dynamic master plans that adapt to evolving demands and consider on-the-ground realities of land ownership and plot sizes are crucial for effective urban development.^[17]
 - Context-specific action plans are essential for successful TOD. Uniform TOD policies applied across diverse station areas are unlikely to succeed without considering the unique urban conditions of each location.^[17]

1.6 Who will this Document Help?



PLANNING AUTHORITY

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



TRANSIT AUTHORITY

- Transit Agency or SPV for MRTS
- Bus Transport Department
- Indian Railways Department
- Other Transport Agency



PRIVATE DEVELOPERS

- Confederation of Real Estate Developers Association of India (CREDAI)
- National Real Estate Development Council (NAREDCO)
- Builders Association of India
- Private Infrastructure Development Group

HOW WILL THIS DOCUMENT HELP?

- **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.

- **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 and DESIGN** accessibility to transit or station facility designs
- **INVEST** in capturing the value around transit to fund transit system improvements
- **IMPLEMENT** development projects with city agencies and private sector

- Increased real estate development opportunities along transit corridors and stations
- Joint development opportunity with government reduce 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

For detailed TOD planning framework refer to chapter 2

1.7 How to Read the Handbook?

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 the step

PURPOSE

Describes the need of the task

OUTCOMES

Result expected following completion of the identified task

TOOLS AND RESOURCES

Methods and instruments used to achieve TOD goals

REFERENCES

References that provide additional information for completing the identified task

SUB-TASKS

Activities to be undertaken that will aid in completing the identified task

1. What are the existing gaps?

PURPOSE

To evaluate the TOD readiness of the city with respect to the plans, policies, and developments.

OUTCOMES

Review of existing institutional and policy framework of the city and identifying gaps.

TOOLS AND RESOURCES

- Relevant Town and Country Planning Acts
- Zonal and Local area Development/Master Plans
- Comprehensive Mobility Plan
- TOD Policy
- Parking Policy
- Development Code Regulations

REFERENCES

- UMTA Toolkit^[87]
- Ecomobility Readiness Assessment - ICLEI South Asia^[81]
- Form Based Codes Guidebook URDPFI Guidelines^[65]
- MoHUA
- WRI

ASSESSMENT BEFORE PLANNING

- 1 Plans and Policies available/ adopted by the city

Multiple Choice

- A Master Plan / Development Plan
- B Development Code Regulations (including Building By-Laws)
- C Local Area Plans/ Zonal Development Plans
- D Comprehensive Mobility Plans/ Comprehensive Traffic and Transportation Plans
- E Transit Service Plan or Detailed Project Report (including future alignments)
- F Traffic Improvement Plan
- G TOD Policy*
- H Parking Policy**
- I Any Others Study (Describe)



The listed plans and policies should be available before preparing Local Area TOD Plans.

* The policy can be separate or part of the Master Plan

** The policy can be separate or part of the CMP/ Master Plan

1.8 How to Read the Principles?

The principles elaborated in chapter 04 “Planning and Design Principles for TOD” are structured as per illustration below.

ACCESSIBILITY PLANNING

B1.I. MULTI-MODAL INTEGRATION

PURPOSE

Describes the need of the principles

GOALS

Results expected after the completion of the principle

COMPONENTS

Components to achieve Transit Oriented Development

REFERENCES

Documents, Reports, IRC Codes etc. used for the reference of the guideline

Common for all stations

PURPOSE

Mobility hubs strive to optimize intermodal connectivity, facilitating seamless transfers between various transportation systems and routes, while ensuring efficient first- and last-mile connections.

GOALS

- ◆ Create clear, direct, and short transfers between transit modes and routes
- ◆ Optimize travel costs and time for all users
- ◆ At transit interchanges, prioritize pedestrian, cycling, public transport, and IPT infrastructure for a people-centric design.
- ◆ Ensure seamless intermodal connections by integrating formal public transport, paratransit, and cycle-sharing options at MRTS stations.

REFERENCES

- ◆ Development of Toolkits under the “Sustainable Urban Transport Plan” by HM Shivanand Swamy et.al [87]
- ◆ Station Area Planning Guide by WMATA et al [67]
- ◆ Planning for First and Last Mile Connectivity for Mass Transit Users by Das A. [1]

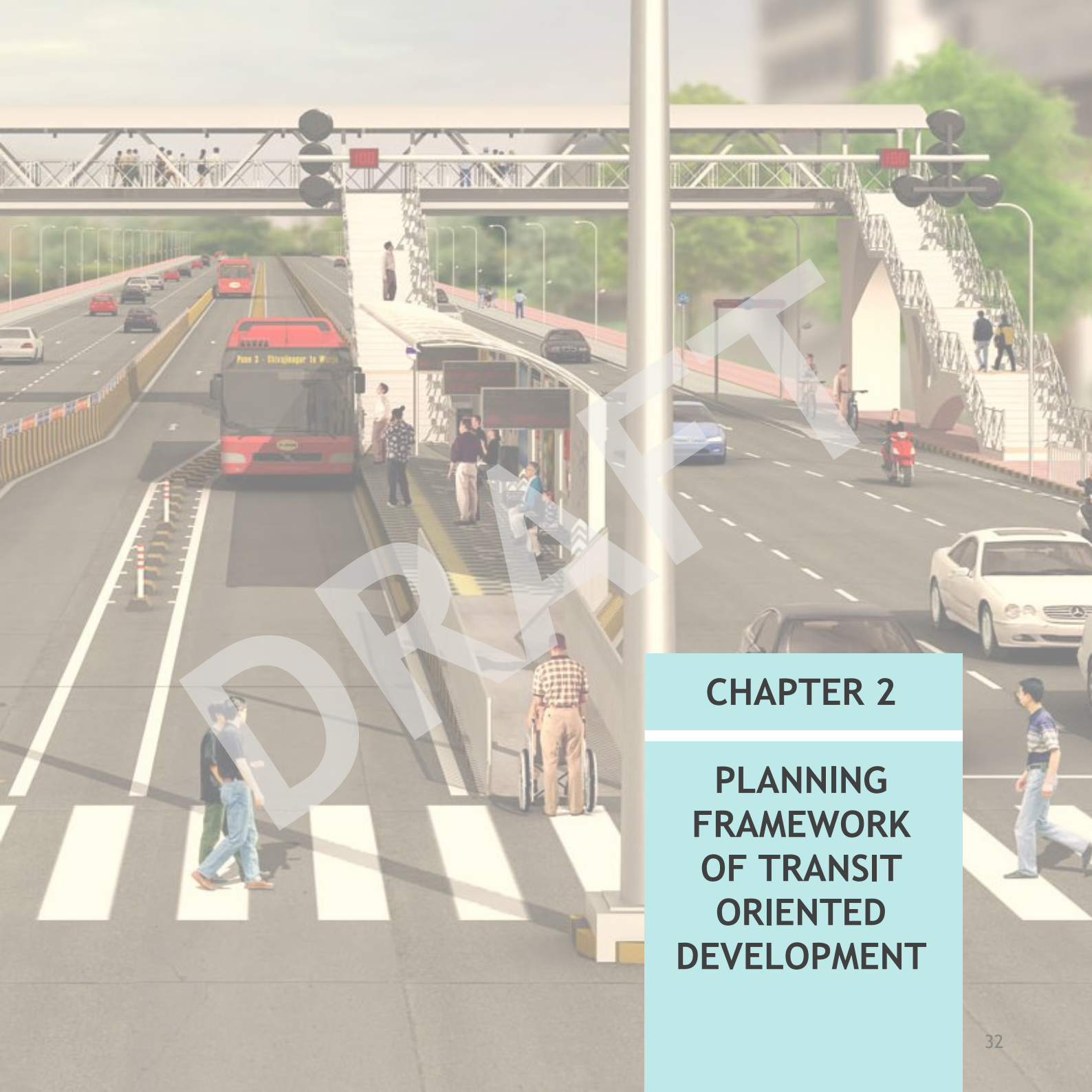


I. SEAMLESS CONNECTIVITY

- ◆ Physical integration refers to the connectivity between multiple transportation modes and their services to facilitate passenger transfers.
- ◆ Fare integration refers to implementing a single ticket or card that can be used across multiple transportation modes (e.g. NCMC card).
- ◆ Operational integration aims to enhance the transportation network's overall performance and user experience by synchronizing schedules and systems.
- ◆ Information integration aims to provide users with a seamless and efficient experience by combining and organizing data from various transportation systems and services.
- ◆ Institutional integration describes how different agencies, organizations, and institutions work together to achieve common goals. [87]

Examples: Kempegowda Metro Station, Bengaluru, New Delhi Railway Metro Station, New Delhi

COMPONENTS



CHAPTER 2

PLANNING FRAMEWORK OF TRANSIT ORIENTED DEVELOPMENT

2.1 TOD Planning Context

Planning for TOD must consider different aspects of the city and contextual variation. The key variables that influence the Transit-Oriented Development planning process and projects include:

1. Scale of TOD:

The scale of TOD refers to the scope and extent of the development around the transit node or station. The scale of TOD is categorised into four types: ^[22]

- Regional Level
- City Level
- Corridor Level
- Local Area Level
- Station Level

2. Typology of Development Context:

Each Indian city is at a different stage of development. Development context is categorised into three types: ^[22]

- Urban Redevelopment Areas (Brownfield)
- Urban Infill Development Areas
- Greenfield Areas

3. Local Area Typologies based on

Development Context: ^[87]

- Core Area Station
- Mid Line Station
- Terminal Station

4. Local Area Typologies based on Land Use

In the Indian context, typical station typologies may include: ^[87]

- Intermodal Gateway
- Employment Centres
- Destination/Heritage Nodes
- Transit Neighbourhoods
- Infill Neighbourhoods

5. Nature of Transit Service: ^[22]

The nature of transit service is a key variable that influences TOD planning processes and projects. It encompasses several aspects:

- Station Spacing
- Station Placement
- Station Facilities

Prerequisite:

For Local Area Transit Station, a TOD Readiness Assessment needs to be carried out. Refer to Annexure A2.

For defining local area typologies. Refer to Annexure A3.

2.1.1 Scale of TOD

The implementation of TOD is done at various levels/scales, i.e., from the micro level by connecting nodes that promote walkability at local level to the macro level by connecting activity zones at the city/ corridor level or sometimes outskirts and satellite towns to induce development at the regional level. The success of TOD is dependent on the accomplishment of the objectives perceived at each level/ scale, which ultimately contributes to the economic growth of the metropolitan city while promoting a better standard of living. While planning for TOD at any level or scale, it is vital to ensure that the TOD is prepared and it is integrated with the development plans and policies. To evaluate such statutory tools it is also important to understand and identify the scale of TOD implementation.

Typically, TOD is implemented on five levels/ scales in succession: ^[22]

1. Regional Level
2. City Level
3. Corridor Level
4. Local Area Level
5. Station Area Level

These levels/ scales are described in further sections.

This guideline focuses on Local Area Planning (LAP).

Prerequisite:

- *TOD policy needs to be prepared at the city/ state level.*
- *FAR revision shall be implemented for Influence Area and Catchment Area.*

The map represents different scales of TOD

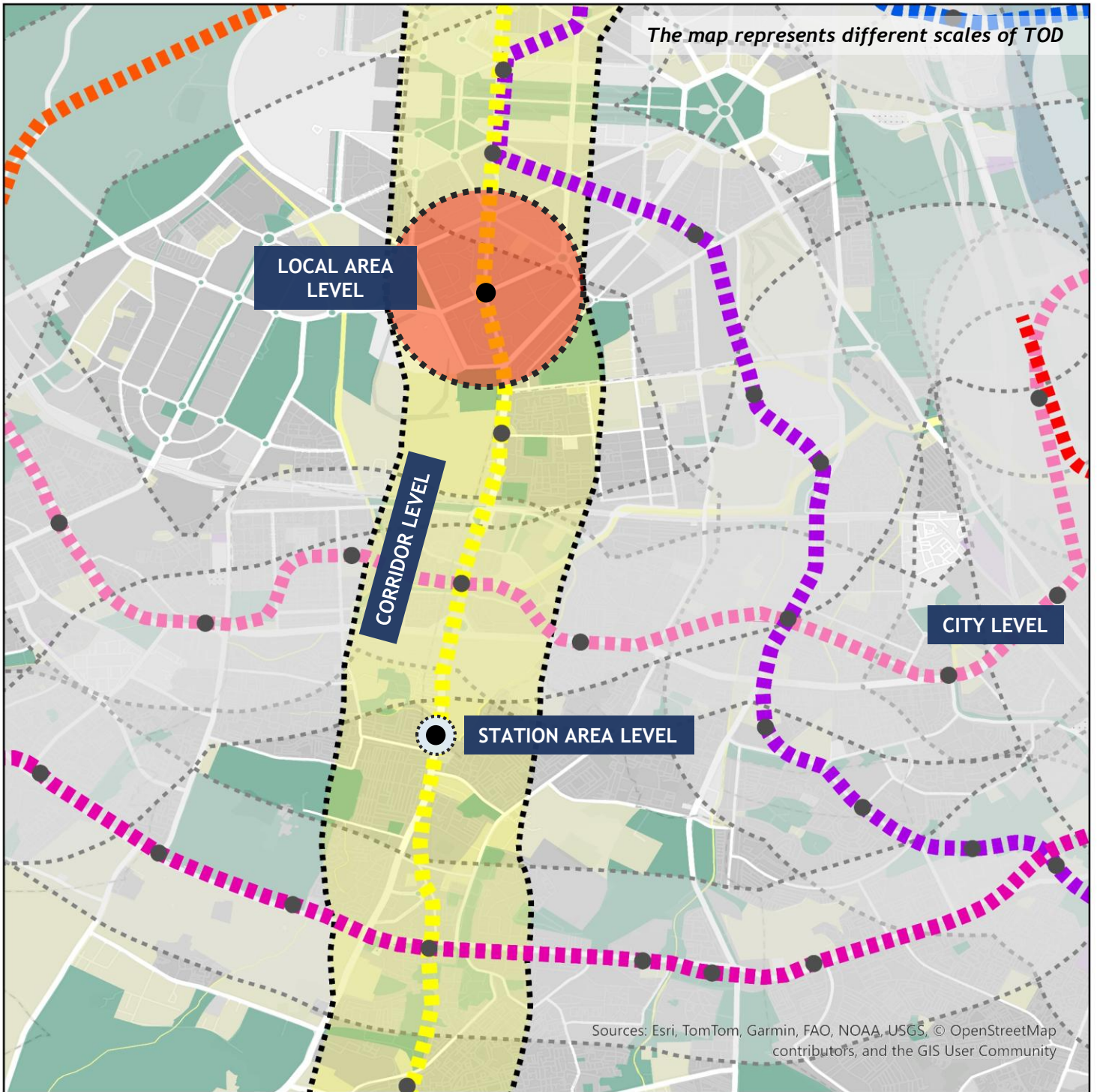
LOCAL AREA
LEVEL

CORRIDOR
LEVEL

STATION AREA
LEVEL

CITY LEVEL

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community



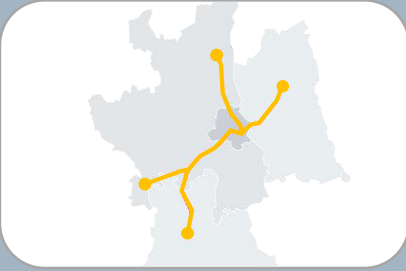
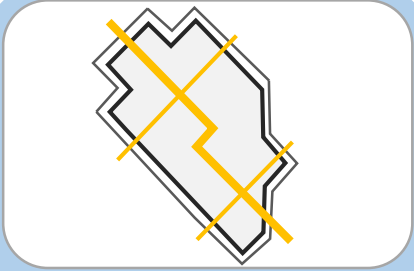
		
	I. Regional Level	II. City Level
OBJECTIVE	Focuses on connecting city with surrounding sub-urban/ satellite towns. It develops multi-modal transit system in the city.	Focuses on sustainable urban growth along multiple Rapid Transit System. It aims to improve overall accessibility and reduce private vehicle dependency.
KEY ELEMENTS		• Type of TOD based on 3V's approach (Node, Place and Market value) • Modal share of the city • City Level Nodal Plan • Land Development Model
OUTPUT	Regional Level Plan to be incorporated by the competent authority in the Master Plan	City Level Plan to be incorporated by the competent authority in the Master Plan

Figure 5: Scale of TOD
Source: Adapted from TOD Guidance document^[22]



III. Corridor Level

Focuses on enhancing urban environment along single mass transit corridor, integrating land use and transportation to create vibrant and accessible commute for the users.

- Demarcation of broad Land Use along the corridor
- Prioritisation of the station for TOD in the identified corridor

Corridor Level Plan should be incorporated by the competent authority in the Zonal Development Plans



IV. Local Area Level

Focuses on local area planning of about 500-800 metre influence zone around the transit station. It aims to enhance urban density and economic growth at local area level.

- Accessibility Planning
- Urban Planning
- Urban Design
- Area Management Plan

Local Level Plan (LAP) to be incorporated by the competent authority



V. Station Area Level

Focuses on area concentrating adjacent to transit station. It aims to maximize public transport modal share through seamless connectivity.

- Multi-modal Integration for seamless connectivity experience for the user.

Multi-Modal Integration Plan to be incorporated by the competent authority

2.1.1.1 Regional Level

TOD planning at the regional level connects city with surrounding sub-urban/ satellite towns. It is usually connected by regional transit system such as Regional Rapid Transit System (RRTS).

The scale focuses on developing and improving sub-urban areas across a broader area, considering the entire public transit network. The key elements includes:

- Planning for sub-regional centres of population and employment.
- Establishing TOD policies and institutional frameworks for implementation
- Addressing regional contexts strategies to ensure cohesive development

This shall be incorporated by the competent authority in the Regional Master Plan.

2.1.1.2 City Level

City Level TOD emphasis on sustainable urban growth along multiple mass transit corridors. It connects residential neighbourhoods with different activity nodes (such as employment centres, recreational areas and regional transit stations) along multiple transit corridors in the city. The aim is to improve overall accessibility, reduced private vehicle dependency, creating walkable and vibrant neighbourhoods.

If the inter-station distance of mass transit system is greater than 1 km then the city should focus on planning city level transit oriented development.

For city level TOD the influence zone is generally considered to be 500-800 meters (10-12 mins. of walking distance) along the transit corridor.

The key elements includes:

- Implementing city level TOD plan in statutory documents that shall align with the regional goals.
- TOD typology based on 3V's policy (Node, Place and Market) should be formed. ^[80]
- Integrating land use policies with public transportation planning to enhance seamless connectivity through multi modal integration.
- Fostering high-density mixed use developments within the city's influence zones.
- Ideal vehicular modal share at city level to be achieved.
- Buffer area of the TOD should be defined (500-800m)
- Implementation and Policy support which shall include incentive program and strong governance.
- High FAR shall be proposed at city level through policy mandate.
- City Level Nodal Plan should be prepared as per design requirements.

This shall be incorporated by the competent authority in the Master Plan.

2.1.1.3 Corridor Level

Corridor Level TOD focuses on enhancing urban environments along single mass transit corridor, integrating land use and transportation to create vibrant, accessible communities. It connects residential neighbourhoods with different activity nodes (such as employment centres, recreational areas, regional transit stations, etc.) along single transit corridor in the city.

The key elements includes:

- Identification of existing and proposed land use along the corridor.
- Prioritisation of station in the corridor for TOD implementation.

This shall be incorporated by competent authority in Zonal Development Plan.

2.1.1.4 Local Area Level

Local area TOD focuses on neighborhood planning of about 500-800 meter of influence zone around the transit station. It aims at creation of dense and vibrant communities in neighborhood by enhancing the accessibility of urban densities and economic activities.

The key elements includes:

- Planning of support infrastructure for pedestrian and non-motorized transport such as footpath, cycle tracks, pedestrian crossing etc.
- Creating walkable communities with easy access to transit station.

- Implementing specific land use strategies that promote mixed-use developments around transit facility.
- Revision of FAR/ FSI shall be implemented for Influence Area.

This shall be incorporated by the competent authority in the Local Area Plan (LAP).

2.1.1.5 Station Area Level

The Station area TOD plan focuses on land concentrating immediately adjacent to transit stations. This planning strategy aims to maximize public transport modal share through seamless connectivity, first and last mile connectivity and support infrastructure facilities.

The key elements includes:

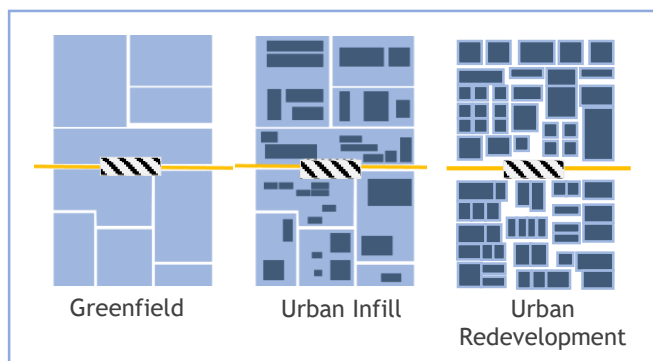
- Multi Modal Integration of different transit modes
- Developing detailed layouts of first and last mile connectivity, bus stops, public realm, parking space, signage's etc.

This shall be incorporated by the competent authority in the Multi Modal Integration (MMI) Plan.

2.1.2. Typologies of Development Context

Each Indian city is at a different stage of development. Metro cities such as Mumbai and Bangalore, which are already in development, offer urban infill and redevelopment opportunities. Cities like Naya Raipur and Bhubaneswar offer significant greenfield opportunities for development. Development Context is categorized into three types: ^[22]

- ◆ Greenfield Areas
- ◆ Urban Infill Development
- ◆ Urban Redevelopment Areas (Brownfield)



Greenfield Areas

Advantages:

- ◆ Large plot sizes
- ◆ High percentage of government-owned lands
- ◆ Opportunity to master plan new communities around transit
- ◆ Lower land costs
- ◆ Opportunity for constructing higher capacity infrastructure systems
- ◆ Strong political support
- ◆ Minimal regulatory barriers
- ◆ Easier implementation
- ◆ Easy to achieve income mix

Disadvantages:

- ◆ Time period for new areas to take shape is long-term
- ◆ Unknown population composition
- ◆ Limited employment opportunities initially to achieve job-housing balance
- ◆ Engaging developers may not be easy

Urban Infill Development (Built-up Area)

Advantages:

- ◆ Served by multiple transit options with inherently high availability of public transportation
- ◆ Higher residential and employment densities
- ◆ Opportunity for redeveloping aging building blocks
- ◆ Higher road density

Disadvantages:

- ◆ Higher property values
- ◆ Multiple land ownership
- ◆ Smaller plot size not conducive to increased densities unless amalgamated
- ◆ Constrained right of ways
- ◆ Existing congestion issue
- ◆ Aging infrastructure
- ◆ Difficult to achieve optimal housing mix

Urban Redevelopment Areas

Advantages:

- ◆ Often located near major transportation corridors and established employment centres
- ◆ NMT modal share is higher, specifically in low-income areas
- ◆ Opportunity to improve transit accessibility
- ◆ Availability of vacant land pockets

Disadvantages:

- ◆ Multiple ownership requiring land assemblage
- ◆ Irregular property sizes and configurations
- ◆ Existing land use typically not transit supportive

Figure 6: Development Context

Source: Author

2.1.3. Local Area Typologies based on Development Context

The local areas can be based on development context as follows:^[87]

1. **Core Area Stations:** These stations are located in high-density employment areas and mixed-use destinations. These stations are accessible primarily by walking, bicycling and bus.
2. **Mid Line Stations:** These stations are typically located in areas with low to medium density and are usually accessed by park-and-ride, bus, bicycling and walking modes.
3. **Terminal Stations:** These stations are located at the ends of metro rail lines and accessed through park-and-ride more than by walking and cycling.

2.1.4. Local Area Typologies Based on Land Use

The local area typologies based upon land use are listed below: ^[22]

1. Intermodal Gateway
2. Employment Centres
3. Destination/ Heritage Node
4. Transit Neighbourhoods and
5. Infill Neighbourhoods

1. **Intermodal Gateways:**
Area with significant hubs of transport activity with supporting commercial and informal activities.



Shivaji Nagar, Pune



Barakhamba, Delhi

2. **Employment Centres:**
Area with significant economic and community activity. Stations serve the main public/ semi-public amenities and offices of the city.

3. **Destination/ Heritage Node:**
The stations provide access to unique destinations (Heritage or Religious importance area).



Taj Mahal, Agra



Azad Nagar, Mumbai

4. **Transit Neighbourhoods:**
Predominantly residential district with good access to regional and sub-regional centres.

5. Infill Neighbourhood:
Predominantly residential district located just outside the core/old city.



Koh-e-fiza, Bhopal

2.1.5. Nature of Transit Service

BRTS and MRTS are the dominant types of mass transit systems being planned in Indian cities. There are inherent differences between planning for TOD along BRTS and MRTS which need to be addressed proactively to attract the desired investments. These differences are primarily related to station design (spacing, placement and facility), as illustrated below:

1. Station Spacing

The optimal station spacing is determined by average transit speed or capacity of the system. For BRTS and metro rail, the station spacing shall be 500-800 m and 800-1500 m, respectively (Refer to Figure 7). ^[22]

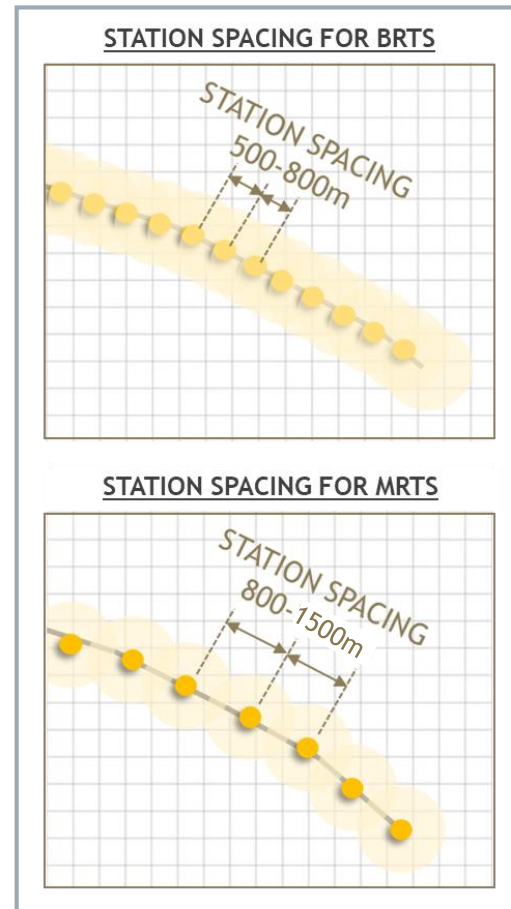


Figure 7: Station Spacing for MRTS

Source: Author

2. Station Placement

Transit stations can be positioned in various ways depending on factors like geography, urban planning, etc. Some common types of transit station placements are as follows:

A. Elevated Stations: Stations built above ground, typically supported by columns or a viaduct.

- **Pros:** It is often quicker and cheaper to construct than underground stations. Disruption of existing infrastructure is less.
- **Cons:** It can be less aesthetically pleasing and may impact local views. Noise and vibration can be an issue for nearby residents.

B. Underground Stations: Underground metro stations are built below street level, typically constructed by Tunnel Boring Machine (TBM).

- **Pros:** Reduces impact on surface land use, and can be less disruptive to street-level activities and urban aesthetics.
- **Cons:** Generally more expensive to build and maintain. Construction and ventilation requirements are complex.

C. At-Grade Median Based (Mid Block): These stations are built at the ground level, often integrated into the existing street grid. The transit station is situated in the middle of a block, typically within the median of a road.

- **Pros:** It is less expensive to build and has less of an effect on intersections.
- **Cons:** There may be issues with pedestrian crossings and traffic congestion.

D. At-Grade Curb Side: It is a transit station located along the edge of a road, typically integrated into the sidewalk or curb area.

- **Pros:** It is convenient for passengers with high visibility.
- **Cons:** It can interfere with road traffic, especially in case of bottle necks or if transit stops.

The different transit station placements are shown in **Figure 8**.

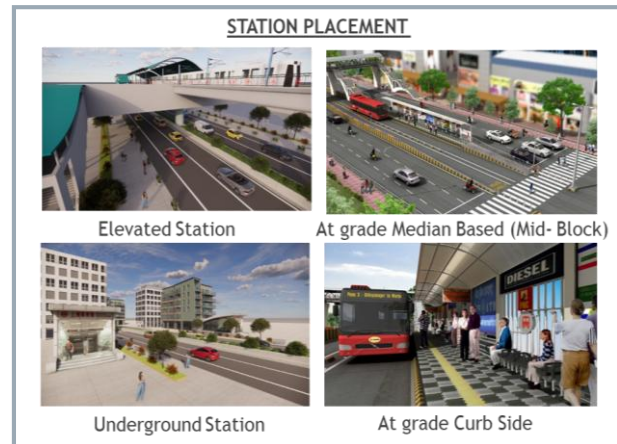


Figure 8: Station Placement

Source: Author

3. Local Area Facilities

Transit systems requires various station facilities to ensure accessibility, safety, comfort, and efficient operation for passengers. The specific facilities can vary based on the type of transit system (e.g., rail, bus rapid transit, metro) and the expected passenger volume. Some essential station facilities include:

A. Accessibility to Transit Station

- Road Safety
- Multi-Modal Integration
- Location of feeder bus pick up
- Safe crossing
- Drop-off/ pick up zone
- NMT Facilities
- Barrier-Free Design
- Bicycle Parking
- IPT Integration
- Parking Facilities

B. Passenger Amenities

- Waiting Area
- Information Displays/Way Finding/ Signage
- Restrooms

C. Ticketing and Fare Collection

- Ticket Vending Machine (TVMs)
- Customer Service Counters
- Automated Fare Collection Gate

D. Safety and Security

- Lighting
- CCTV Surveillance
- Emergency Services

E. Additional Facilities

- Waiting Shelters
- Vending Spaces
- Integration with surrounding areas

These facilities ensure that transit stations are functional, comfortable, efficient, enhancing the overall travel experience and supporting smooth transit operations.

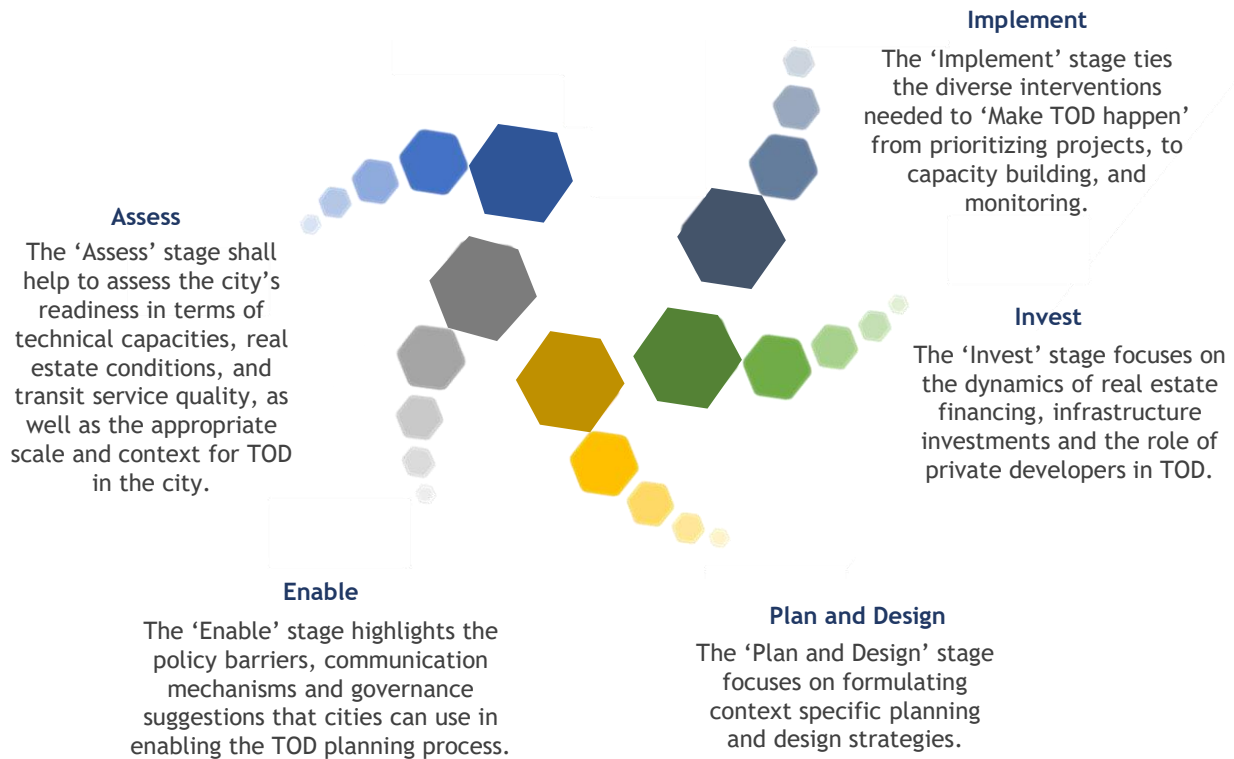


Figure 9: Local Area Facilities

Source: Author

2.2 Transit- Oriented Development Framework

The entire TOD process from inception to implementation can be captured in five key steps. ^[22]



2.3 Detailed TOD Framework

2.3.1 Assess

The "Assess" step of the process is meant to assist authorities in determining a city's level of readiness for TOD.

This extend of TOD engagement in terms of identifying the existing gaps, which includes whether the city has incorporated TOD policy in the Master Plan. This shall determine the strategies city may adopt for future investments.

Once the scale has been established, the following stage involves identifying potential opportunities and barriers city is facing to implement TOD. This is done to evaluate whether the local area is "ready" for TOD and to improve the readiness for TOD at specific station areas. ^[22]

Building local capacity through training programs and technical assistance to equip municipalities with the skills to plan, finance, and manage TOD projects.

2.3.2 Enable

The Enable stage focuses on policy barriers and strategies that cities can use to encourage TOD development around stations.

This is second step to addresses legislative and regulatory obstacles, which is essential to establish the implementation plan of TOD.

By resolving the problems mentioned in this section of Enable, cities may create an environment that is supportive of and conducive to TOD. This will improve people's overall quality of life, encourage sustainable urban growth, and reduce reliance on cars.

2.3.3 Plan and Design

To create the Local Area TOD Plan, a number of comprehensive planning guidelines and design elements have been incorporated to form TOD Principles.

This stage is essential for formulating plans, establishing priorities, and delineating the actions required to reach the intended results.

The Plan and Design section contains a series of detailed TOD principles and design components to formulate the Local Area TOD plan.

Establishing performance measure and evaluation frameworks to track progress against defined benchmarks for success, such as increased transit ridership, walkability, and mixed-use development

2.3.4 Invest

A summary of the funding options available to cities to carry out the TOD planning policies, projects, and initiatives are identified in the Invest section.

This section provides strategies for understanding the complexities of financing real estate, infrastructure projects, and how private sector organisations should collaborate with governmental institutions to optimise earnings and fairly distribute the advantages of transit investments.

2.3.5 Implementation

Implement provides an overview of the tasks and sub-tasks to implement TOD plans including institutional framework and supportive public policies.

Continuous support and feedback from various stakeholders at all the levels of implementation is essential. For the project to be executed successfully, a comprehensive consultant process and a strong public involvement is required.

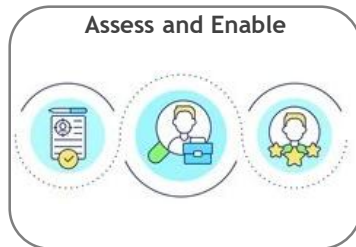
Fostering partnerships between various stakeholders like local governments, transit agencies, developers, and community groups to align interests and coordinate implementation

2.4 Step by Step approach to start planning for TOD of Local Area Plan?

The entire process of TOD for Local Area Plan has been captured in three steps.

STEPS TO PLAN FOR TOD LOCAL AREA PLANNING

STEP 1- ASSESSMENT BEFORE PLANNING

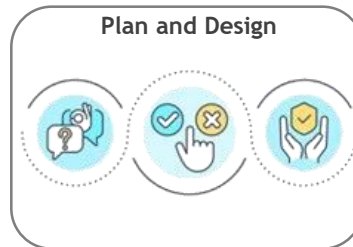


- What are the existing gaps?
- What is the policy framework?
- Who will be involved in the decision-making process to plan and execute TOD?

This step helps the city to check the readiness of the city, where is it lacking behind and the essential requirement to plan for Transit-oriented development

Elaborated in Chapter 3

STEP 2- PLANNING AND DESIGN PRINCIPLES FOR TRANSIT-ORIENTED DEVELOPMENT

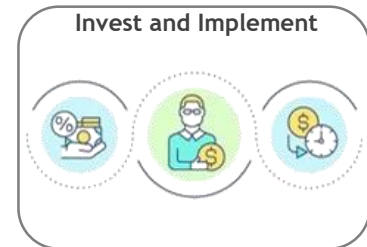


- How to define the TOD Local Area Plan?
- How to prepare data inventory?
- How to formulate Local Area Plan?
- Who will be involved during the planning and implementation stage of the project?

This step will guide the city on how to plan and design TOD for Local Area Plan.

Elaborated in Chapter 4

STEP 3- FINANCING AND IMPLEMENTING FOR TRANSIT-ORIENTED DEVELOPMENT



- What is the best approach to invest and generate revenue from a project?
- What are the different financing and non-financing tools to encourage TOD?
- How to plan a project phasing and implementation strategy?
- How to plan for a public outreach program?
- What are the goals and objectives of TOD?
- How to measure the success of TOD in the city?

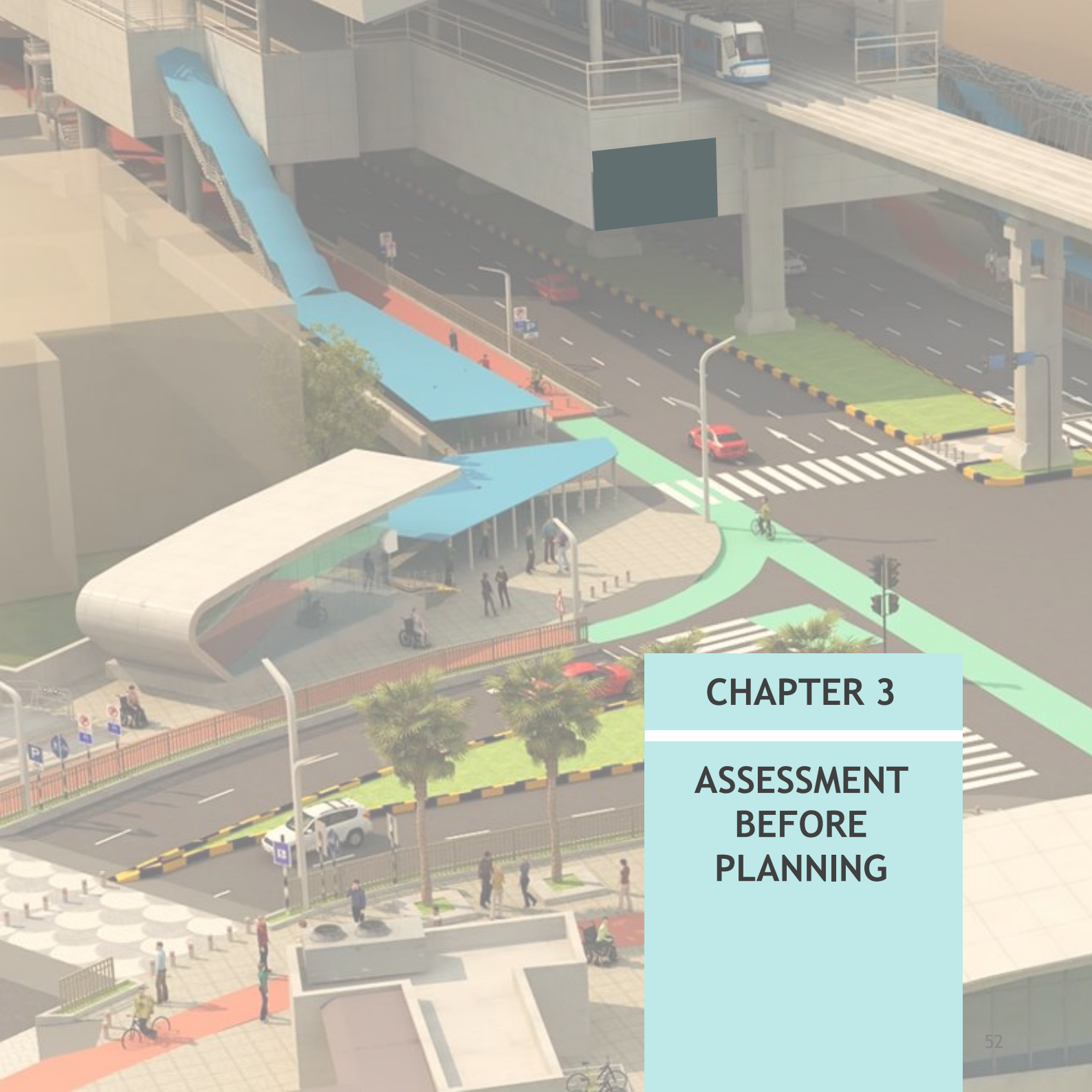
This step will guide the city on how to plan for investment and generate revenue. Further, how to plan for better implementation of TOD.

Elaborated in Chapter 5

TIMELINE OF THE PROJECT



**Depending on the scale and scope of work*



CHAPTER 3

ASSESSMENT BEFORE PLANNING

3.1 Getting City Ready for TOD

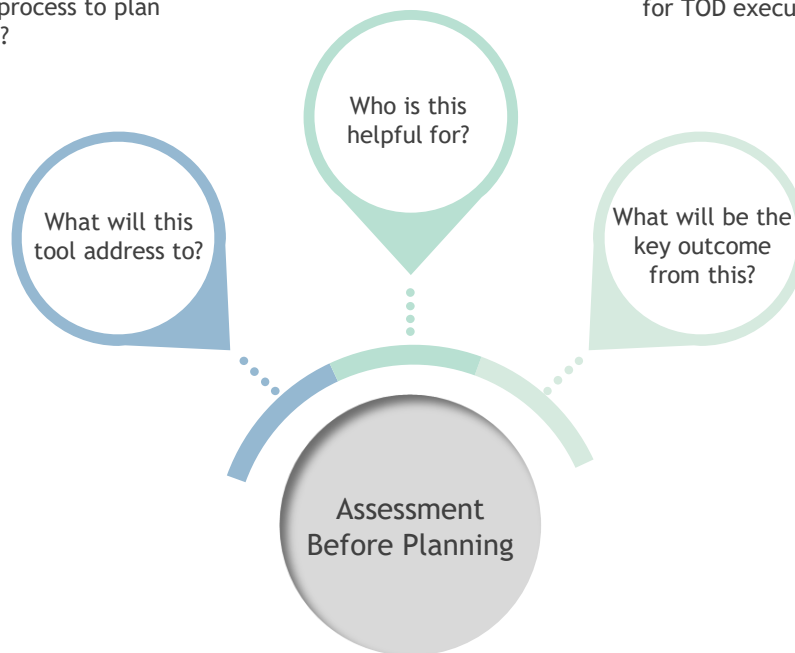
Assessing the existing support for TOD principles in any city or region is an important aspect of the planning process. Local authorities often look for ‘quick win’ solutions that can be implemented with limited resources. A complete TOD process should involve comprehensive initiatives designed to enhance all the aspects of sustainability- economic, social, environmental and physical.

By using this tool, the responsible agency will be able to develop a checklist that will help in identifying the potential gaps/challenges the city might encounter in the process of implementing TOD.

- What are the existing gaps?
- What is policy framework?
- Who will be involved in the decision-making process to plan and execute TOD?

Urban Local Body, Urban and Transport Planner, Transit Agencies and Private developer

- Preparation and updation of statutory document in GIS format
- Formation of umbrella organization for TOD execution.



ASSESSMENT BEFORE PLANNING

1

What are the existing gaps?

To evaluate the TOD readiness of the city with respect to the plans, policies, and developments.

Outcomes: Review of existing institutional and policy framework of the city and identifying gaps

2

What is the policy framework?

Identify the scope and scale of TOD in the city.

Outcomes: To understand if the city has adopted the National TOD policy in their statutory documents

3

Who will be involved in the decision-making process to plan and execute TOD?

Identifying scope of work of each Organisation/ Authority and identification of Stakeholders

Outcomes: Formation of Organisation to plan and implement TOD in the city and list of Stakeholders

Note:

Before beginning to plan for Transit- Oriented Development, the city must address the following questions.

1. What are the existing gaps?

PURPOSE

To evaluate the TOD readiness of the city with respect to the plans, policies, and developments.

OUTCOMES

Review of existing institutional and policy framework of the city and identifying gaps.

TOOLS AND RESOURCES

- Relevant Town and Country Planning Acts
- Zonal and Local area Development/ Master Plans
- Comprehensive Mobility Plan
- TOD Policy
- Parking Policy
- Development Code Regulations

REFERENCES

- UMTA Toolkit^[87]
- Ecomobility Readiness Assessment - ICLEI South Asia^[81]
- Form Based Codes Guidebook URDPFI Guidelines^[65]
- MoHUA
- WRI

1 Plans and Policies available/ adopted by the city

- ☐ A Master Plan / Development Plan
- ☐ B Development Code Regulations (including Building By-Laws)
- ☐ C Local Area Plans/ Zonal Development Plans
- ☐ D Comprehensive Mobility Plans/ Comprehensive Traffic and Transportation Plans
- ☐ E Transit Service Plan or Detailed Project Report (including future alignments)
- ☐ F Traffic Improvement Plan
- ☐ G TOD Policy*
- ☐ H Parking Policy**
- ☐ I Any Others Study (Describe)



The listed plans and policies should be available before preparing Local Area TOD Plans.

** The policy can be separate or part of the Master Plan*

*** The policy can be separate or part of the CMP/ Master Plan*

- 2
- Status of existing Plans, Acts and Policies
- A - Completed

B - Under Approval

C - Draft Stage

D - Under Preparation

E - Needs Revision

F - Not Prepared



Document Type	A	B	C	D	E	F
Master Plan/ Development Plan	☐	☐	☐	☐	☐	☐
Development Code Regulations (including Building By-Laws)	☐	☐	☐	☐	☐	☐
Local Area Plans/ Zonal Development Plans	☐	☐	☐	☐	☐	☐
CMP / CTTT/ LCMP at Regional and Municipal Level	☐	☐	☐	☐	☐	☐
Transit Service Plan or DPR (including future alignments)	☐	☐	☐	☐	☐	☐
Traffic Improvement Plan	☐	☐	☐	☐	☐	☐
TOD Policy	☐	☐	☐	☐	☐	☐
Parking Policy	☐	☐	☐	☐	☐	☐
Others (Describe) _____	☐	☐	☐	☐	☐	☐

In case, any of the above mentioned documents are not prepared or need revision, the concerned organization in the city, should start the process immediately

- 3
- Is High Demand/ Mass Transit Corridors have been identified in one of the following documents:
- ☐ A Comprehensive Mobility Plan (CMP)

☐ B Master Plan (MP)

☐ C Development Plan (DP)



- 4
- The Master Plan has incorporated the recommendations of Comprehensive Mobility Plans/ Comprehensive Traffic and Transportation Plans.
- ☐ A Yes

☐ B No



If No, the recommendations should be incorporated to ensure the city adopts and implements the proposed mobility interventions.

- 5
- The proposed master plan is available in GIS format or in a format that can be easily converted into GIS format.
- ☐ A Yes

☐ B No



If No, then the process of preparing the plan in GIS should be completed for smooth implementation of TOD.

- 6 The master plan is less than 10 years old (based on the date it was drafted)

☐ A Yes
☐ B No



If No, a revision exercise is mandatory to update the city's land use.

- 7 The Master Plan has incorporated the recommendations of the Transit Orient Development Policy and Plan prepared for the city.

☐ A Yes
☐ B No



If No, the recommendations should be incorporated to ensure the city adopts and implements the proposed mobility interventions.

- 8 The Zonal Development Plans/ Local Area Plans around the identified stations are formulated taking into consideration the TOD principles

☐ A Yes
☐ B No



If No, the plans would need revision to incorporate the TOD principles.

- 9 Is Master Plan being implemented within the identified TOD local area?

☐ A Yes
☐ B No



If yes, what is the percentage of implementation in the Master Plan.

_____ %

- 10 Is Development Code Regulations (including Building By-Laws) city-specific, incorporated in the Development Plan (DP) or Master Plan (MP).

☐ A Yes
☐ B No



If No, the same needs to be incorporated to ensure planned development.

- 11 The Development Code Regulations (including Building By-Laws) permit a mix of land uses and flexible activities with varying percentages of use around transit station.

☐ A Yes
☐ B No



If No, necessary modifications should be made in the Regulations to implement TOD.

- 12 The Development Code Regulations (including Building By-Laws) incorporate Form-Based Codes.

☐ A Yes
☐ B No



If No, the codes to be adopted by the city. (refer Form Based Codes Guidebook of MoHUA)

2. What is the policy framework?

PURPOSE

Identify the scope and scale of TOD in the city.

OUTCOMES

To understand if the city has adopted the National TOD policy in their statutory documents.

TOOLS AND RESOURCES

- Modifications to state-level laws and regulations
- Identify opportunities to implement TOD interventions within the existing policy framework.

REFERENCES

- TOD Tools for Metropolitan Planning Organizations ^[11]
- National Urban Transport Policy, 2006 (NUTP) ^[48]

1. Example: Accessibility Plan of Vancouver, 2023-2026
2. Example: Ahmedabad Metro Line (East to West) - High Court Metro Station, Doordarshan Metro Station and Thaltej Metro Station- Detailed Project Report (Draft Stage)
3. The master plan should be reviewed every after 10 years. Building by-laws should consider the TOD policy.

- 1 Acts/ Guidelines that are being referred to enable transit-supportive development:

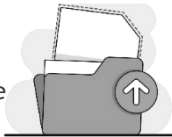
- A Motor Vehicles Act
- B Metro Railways Act
- C National Building Code
- D Town and Country Planning Act
- E Urban Land Ceiling Act
- F Rent Control Act
- G Land Acquisition Act
- H Land Valuation Guidelines
- I Building Bye-laws
- J State Town and Country Planning Act
- H Formulation and Implementation (URDPFI) guidelines



The cities may refer to these Acts and Guidelines for formulating or amending policies for transit-supportive development.

- 2 Policy changes/ amendments required in support of transit-supportive development:

- A Prioritize transit and non-motorized transportation modes in the development of the Master Plan and CDP in line with the National Urban Transport Policy, 2006 (NUTP)
- B Mandatory accessibility improvements within 10-minute walking distance from all transit stations in the Master Plan, CMP or CDP ¹

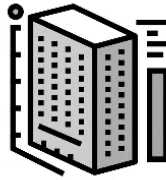


- ☐ C Legislation compelling local authorities to conduct planning in specific ways that support the containment of growth in urban areas²

3 The Acts and Policies that would be required to modify for planning and implementing TOD

Multiple Choice

- ☐ A State Town and Country Planning Act that includes conversion and land use amendments
- ☐ B Building By-Laws (state) including parking and enforcement
- ☐ C Town Planning Scheme



The modifications in the Acts and Policies is required to ensure mixed-use development, higher or graded FAR and parking restrictions in the influence zone of the station

4 Modify building bylaws to include TOD ideas in the planning and development phase:

- ☐ A Enable the filtering out of unfavorable land uses and developments that are incompatible with the TOD influence zone's vision during the early stages of development, such as large retail spaces, heavy industrial uses etc.

- ☐ B On-street parking laws should be categorized as temporary uses with regular review periods (annually, but no more than three years). In the long term parking supply should be limited in the TOD zones as per the TOD principles (Chapter 4)
- ☐ C Establish regular review periods for building bylaws and requirements for them to respond to the context and demands of development.³
- ☐ D To authorize uses that are necessary for the viability of the early stages of development but might not otherwise be allowed in the final phase of development.

3. Who will be involved in the decision-making process to plan and execute TOD?

PURPOSE

Identifying scope of work of each Organisation/ Authority and identification of Stakeholder

OUTCOMES

Formation of Organisation to plan and implement TOD in the city

List of stakeholder involvement such as Central Government, State Government, Local Agencies, private transit operators etc.

TOOLS AND RESOURCES

- Relevant Town and Country Planning Acts
- Zonal and Local area Development/Master Plans
- Comprehensive Mobility Plan
- TOD Policy
- Parking Policy
- Development Code Regulations

REFERENCES

- UMTA Toolkit^[87]
- Ecomobility Readiness Assessment - ICLEI South Asia ^[81]
- Form Based Codes Guidebook URDPFI Guidelines ^[65]
- MoHUA
- WRI
- JnNURM Toolkit for Comprehensive Capacity Building Programme ^[55]
- Report of Working Group on Capacity Building^[50]
- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets - IFC^[30]
- Good Practice Guide to Public Engagement in Development Schemes - RTPI UK ^[25]
- JnNURM CDP Toolkit (2013), Ministry of Urban Development ^[55]

- 1 The organization in charge of the aforementioned plans and policies



- A Municipal Corporation
- B Development Authority
- C Transit Agency (Name)_____
- D Other Agency (Describe)_____

Document Type	A	B	C	D
Master Plan/ Development Plan	☐	☐	☐	☐
Development Code Regulations (including Building By-Laws)	☐	☐	☐	☐
Local Area Plans/ Zonal Development Plans	☐	☐	☐	☐
CMP / CTPP/ LCMP at Regional and Municipal Level	☐	☐	☐	☐
Transit Service Plan or DPR (including future alignments)	☐	☐	☐	☐
TOD Policy	☐	☐	☐	☐
Parking Policy	☐	☐	☐	☐
Others (Describe) _____	☐	☐	☐	☐

Identifying organizations give an understanding of the stakeholders involved in planning

- 2 Umbrella Organization for planning and implementing TOD

- ☐ A Unified Metropolitan Transit Agency (UMTA)
- ☐ B Development Authority
- ☐ C Municipal Corporation
- ☐ D Transit Agencies
- ☐ E Others (Describe) _____



The city needs to identify the Umbrella Organization for Planning and Implementing TOD.

- 3 An independent or private entity (such as SPV) identified/ set up to undertake TOD planning?

- ☐ A Yes
- ☐ B No

If No, it is recommended to set up an SPV. Alternatively, the city may also set up a TOD Cell under the Umbrella Agency.



- 4 Roles that state government can typically play in facilitating TOD supportive policies for local government include:

- ☐ A Technical assistance in planning
- ☐ B Provide dedicated funding grants received from Central Government
- ☐ C Remove regulatory and statutory barriers to land use
- ☐ D Adopt “transit-first policies at State level and mandate for ULBs to adopt and implement these policies
- ☐ E Assist in forcing collaborations with state and central government agencies
- ☐ F Implement enabling policies such as land pooling, mandatory affordable housing provisions, joint development agreements, and land entitlement procedures



The city can approach the state for support in these areas.

5 Stakeholders include

- A Central Government Agencies: Ministry of Housing and Urban Affairs (MoHUA), Ministry of Road Transportation and Highways (MoRTH), Ministry of Environment, Forests and Climate Change (MoEFCC).
- B State Agencies: State departments of urban development, housing, transportation and tourism
- C Local Agencies:
Municipal Corporation/
Municipal Council, Town
and Country Planning
Departments,
Development Authorities,
Transit Agencies (Bus, rail etc), Housing
Boards, Public Works Department, Traffic
Police
- D Real Estate Developers
- E IPT Operators (Auto, Taxi, E-rickshaw
etc.)
- F NGOs, Community Service Organizations,
Advocacy Groups
- G Academic Institutions
- H General Public
- I Political Leadership and Elected
Representatives



For organisations in charge of plans and policies Refer to Chapter 3, 3.1

6 In house and external staff for TOD supportive activities and programs

	Activity	In-House	Outsourced
A	Land use planning along transit corridors	☐	☐
B	Station accessibility/NMT planning	☐	☐
C	Reviewing development projects and proposals at the site level	☐	☐
D	Preparing TOD supportive development guidelines/ DCR modifications	☐	☐
E	Infrastructure carrying capacity analysis	☐	☐
F	Traffic impact analysis	☐	☐
G	Planning future land uses for agency properties	☐	☐
H	Updation of GIS/ AutoCAD database	☐	☐
I	Preparing RFPs for joint development (PPP) projects	☐	☐
J	Negotiations of joint development projects	☐	☐
K	Funding of TOD studies and projects	☐	☐
L	Public outreach and education	☐	☐

The list will help in identifying activities that can be taken up in house and those which need to be outsourced.

- 7 Review of existing technical and professional staff available in the SPV to manage, implement and monitor TOD planning activities. The key resources required in the SPV:

- A Project Manager [Experience in TOD Planning/ integrating transport and land use planning]
(Min. 10 years of experience)
- B Urban Designer/ Urban Planner [Experience in street design/ walking and bicycle improvements]
(Min. 10 years of experience)
- C Transport Planner/ Engineer [Experience in transport sector, traffic modeling or relevant field]
(Min. 8 years of experience)
- D Infrastructure Planner/ Engineer [Experience in infrastructure demand management and planning]
(Min. 8 years of experience)
- E Real Estate and Housing Specialist [Experience in feasibility studies and real estate assessment]
(Min. 8 of years experience)
- F Finance Specialist
(Min. 10 years of experience)
- G Trainer [Experience of conducting trainings for government officials in urban transport sector and TOD]
(Min. 5 years of experience)



- H Gender Expert (Min. 8 years experience)
Procurement Specialist
(Min.10 years experience)
- I Support Team (Min. 3 years experience)

Professional Staff identified from F to H are required in the SPV only if the activities I to L identified in Question 6 (above) are carried out in-house.

- 8 Gap Analysis of the resources available w.r.t. the TOD activities to determine the need for augmenting existing capacities through:

- A Training of existing professional staff in various agencies and departments
- B Recruiting new employees with requisite qualifications
- C Hiring external consultants to perform identified task if required



For expertise and proficiency required please refer to Chapter 5, 1.3

- 9 Mode of preparation of local area TOD Plans:

- A In-house by available resources in the SPV/ TOD Cell
- B External consultant appointed through a competitive and transparent bid process

In case, activities A to H under Chapter 3, 3.6 are to be taken up in-house, the plan can be prepared by the SPV, else an external consultant needs to be hired. For the in-house team required refer to Chapter 3, 3.7

10 Responsibilities for various stakeholders in a coordinated TOD implementation program includes:

- A** Local Governments:
 - ☐ Master Planning (City and Corridor),
 - ☐ Local Area Planning (Station Area and Neighborhood),
 - ☐ Development Control Regulations
 - ☐ Building By-Laws,
 - ☐ Site Plan review and approvals
 - ☐ Infrastructure Upgradation,
 - ☐ Planning for Land Assemblage
 - ☐ Active Marketing of TOD opportunities to private attract developers
 - ☐ Developer Incentives
 - ☐ Secure Financing,
 - ☐ Enforcement (traffic police)
 - ☐ Public Outreach
- B** Transit Agencies:
 - ☐ Transit development
 - ☐ Station design
 - ☐ Systems planning
 - ☐ Transit Service
 - ☐ Secure financing and joint development of stations with private sector
- C** Transit Agencies:
 - ☐ Transit development
 - ☐ Station design
 - ☐ Systems planning
 - ☐ Transit Service
 - ☐ Secure financing and joint development of stations with private sector
- D** Regional Planning Agencies (UMTA/Metropolitan Authorities):
 - ☐ CMP
 - ☐ Regional Transit Plan
 - ☐ Regional Growth Management Plan
 - ☐ Technical assistance to local agencies
 - ☐ Monitoring of Urban Transport Fund
 - ☐ Policy Formulation
- E** NGOs and Advocacy Groups
 - ☐ Advocacy for NMT improvements
 - ☐ Community Participation in Planning and Design
- F** Elected officials:
 - ☐ Developer and citizen awareness about benefits of TOD
 - ☐ Changing regulatory climate
 - ☐ Advocate transportation demand management policies and local economic development incentives
- G** Businesses/Real Estate Developers:
 - ☐ Joint development with transit agencies Public Private Partnerships
 - ☐ Affordable housing construction
 - ☐ Private sector investment in real estate
 - ☐ Employee incentives
- H** State Government:
 - ☐ Policy changes
 - ☐ Funding Assistance
 - ☐ Capacity Building
 - ☐ Technical Assistance
 - ☐ Land and Market Reforms
- I** Central Government:
 - ☐ Policy changes,

- Guidelines Formulation Funding Assistance
- Capacity building

The list of responsibilities are only indicative in nature and may be modified. However, it should be ensured that each stakeholder has a defined role with minimal overlap with other agencies.

- 11 Set up a TOD Taskforce/ Steering Committee as the coordinating body, and assign it the following responsibilities:
- A Convene meetings to ensure that development in the local area is aligned with the principles, of TOD;
 - B Facilitate approvals from local agencies and the state government;
 - C Coordinate infrastructure investments between different agencies;
 - D Promote education and awareness related to TOD projects;
 - E Convene a meeting regularly to monitor the progress of implementation in each phase
 - F Facilitate partnerships between public and private agencies
 - G Ensure a participatory approach in TOD plan preparation and inclusive planning.
 - H Facilitate necessary approvals from local agencies as well as the State
 - I Monitor the implementation of each phase

- 12 Transit agencies can play an advisory role in:
- A Facility development such as feeder route service in station premises for multimodal integration (*Chapter 4, B1.I.*)
 - B Reviewing walking distances to transit stops and design recommendations (*Section Chapter 4, B1.I.*)
 - C Review of proposed developments in and around influence zone of the station.
 - D Identification of modal split targets
 - E Station facility design and joint development opportunities with private sector
- 13 Integration of TOD plans/Policies with existing statutory framework.
- A Master Plan/ Development Plan
 - B Development Code Regulation (including Building By-Laws)
 - C Local Area Plans/ Zonal Development Plans
 - D CMP/ CTP/ LCMP at Regional and Municipal Level
 - E Transit Service Plan or DPR
 - F TOD Policy
 - G Parking Policy

3.2 Department Wise Roles and Responsibility

Successful TOD relies on stakeholder alignment, timely collaboration and effective implementation. Coordination among multiple stakeholders is essential, necessitating a clear allocation of roles and responsibilities.

Local Governments	Transit Agencies / Unified Transport Authorities	Regional Planning and Development Agencies
Municipal Corporation	• UMTA • Metro Rail Corporation	• Metropolitan Region Development Authority • Industrial Development Corporation • State Road Development Corporation
Overall systems planning, master planning (city and corridor), local area planning (local area and station area), development control regulations and building by-laws/form based codes, site plan review and approvals, infrastructure upgrades, land assemblage, active marketing of TOD opportunities, developer incentives, secure financing, enforcement and public outreach	Regional transportation planning and monitoring of urban transport funds, transit systems planning and development, coordination and integration of multiple modes of transit, infrastructure investment, station design, systems planning, transit service, land assemblage, active marketing of TOD opportunities, secure financing and joint development of stations with the private sector.	Long-range land utilisation and transportation planning, regional transit planning, regional growth management, technical assistance to local agencies
Police and Security Agencies	Citizens, NGO's and Advocacy Groups	Elected Officials
• State Police Department • City Police Division	Any city's citizen welfare NGO	• Member of a Legislative Assembly • Mayor of city • Member of Parliament
Prepare and maintain geo-spatial road crash data inventory, identify road safety and security concerns within the city and station areas, review design interventions and safety plans	Advocacy for NMT improvements, help with community outreach, participation in planning and design, get educated, attend planning meetings and advocate for high-quality design	Developer and citizen awareness about the benefits of TOD, changing regulatory climate, advocate transportation demand management policies and local economic development incentives

Private Sector/ Business/
Real Estate Developers

- CREDAI
- NAREDCO
- Builders Association of India

Provide financial support for TOD implementation, joint development of infrastructure in public- private partnerships, construction, investment in real estate and funding transport system operations. Joint development with public agencies, affordable housing construction, operation & maintenance of infrastructure, etc.

State Government

- Divisional Commissioner
- Commissioner of Municipal Corporation
- Commissioner of Police

Policy changes, funding assistance, capacity building, technical assistance, Land and Market Reforms

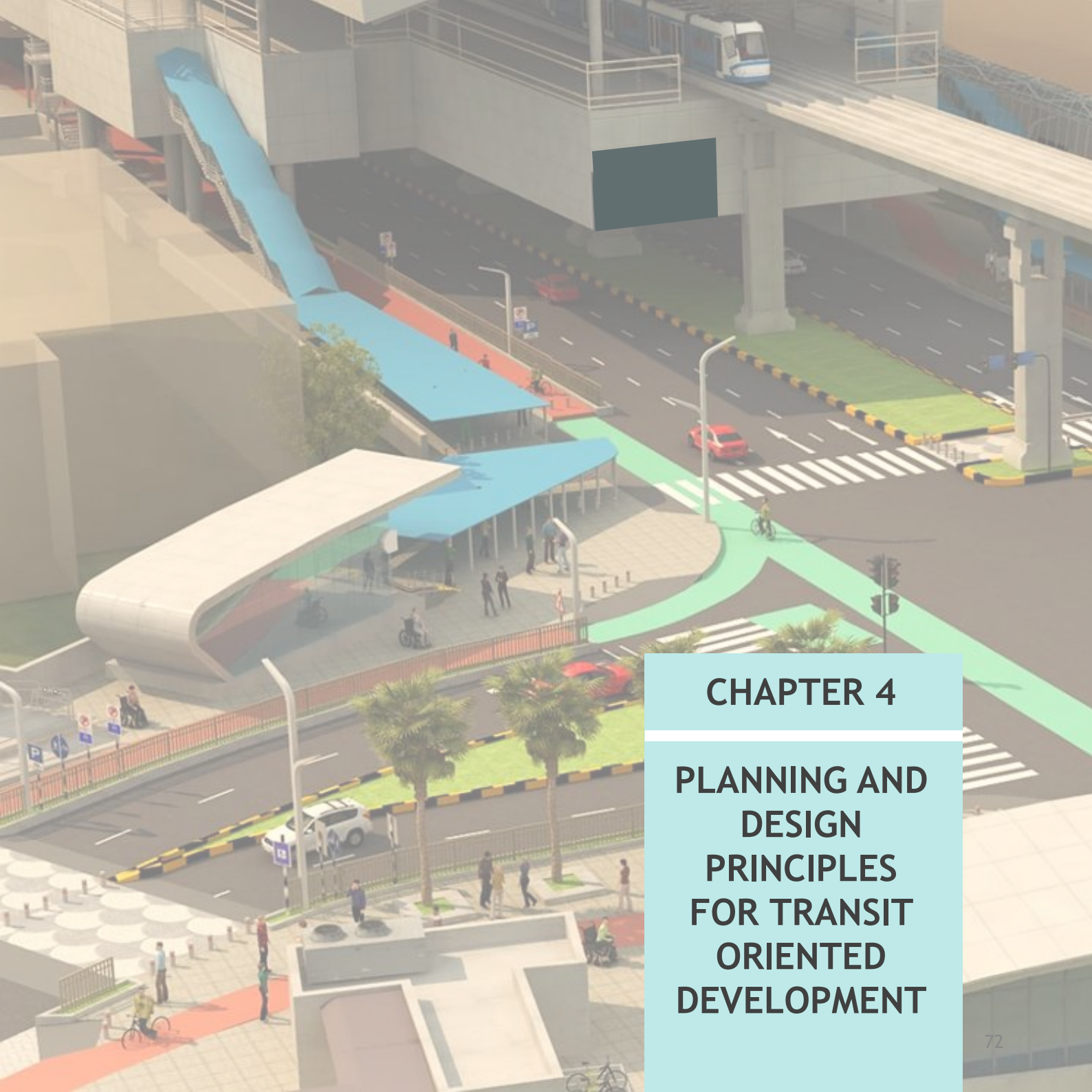
Central Government

- National Highways Authority of India (NHAI)
- Ministry of Housing and Urban Affairs (MoHUA)

Policy changes, guidelines formulation, funding assistance, and capacity building

3.3 Summary of Assessment Before Planning

- *Before planning for TOD, the city should have plans and policies such as a Master Plan/ Development Plan, CMP, CTTS, Transit Service Plan etc. The Municipal Corporation must incorporate the TOD Policy as a separate document or as a part of the CMP/ Master Plan.*
- *The statutory documents to be readily available in GIS Format.*
- *To enable Transit- Supportive Development, the acts and policies required to be modified by the Municipal Corporation/ Development Authority include the State Town and Country Planning Act, Building By-Laws and Town Planning Scheme.*
- *The State Government/ Urban Development Authority form an Umbrella Organisation. Additionally, it is advised that an SPV be established under the Umbrella agency for the planning and execution of TOD.*
- *Staff is required with expertise and proficiency in the following key areas of TOD:*
 - *Land Use Planning*
 - *Transport Planning*
 - *NMT Planning*
 - *Urban Design*
 - *Real Estate Development*
 - *Infrastructure Planning*
 - *Affordable Housing*
 - *Finance and Procurement*



CHAPTER 4

PLANNING AND DESIGN PRINCIPLES FOR TRANSIT ORIENTED DEVELOPMENT

4.1 From Principles to Details

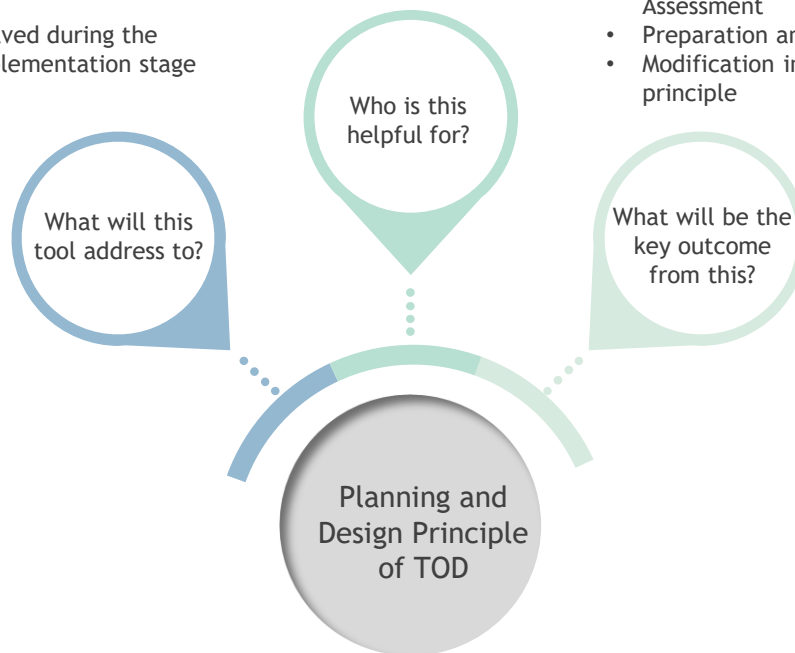
The section provides detailed instructions on how to proceed with transit-oriented development planning and design stage after assessing the Assessment before Planning (*Chapter 3*).

The section emphasises integrating transportation and land use planning, combined with ‘spaces in between’ - which includes open space, mixed uses and streetscape interventions that contribute to urban place-making.

These principles are derived from global best practices contextualised for application to Indian cities. Each principle is elaborated in detail and associated with the key component.

To stitch these principles together, it is important to integrate them with the design (IRC codes, National TOD policy, MoHUA documents, etc.) standards. Thus, the section is a ready resource as a starting point for the cities that are interested in applying the TOD design values to standards and regulations. This is a crucial step that will help in the implementation of TOD in the city.

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> • How to define Local Area Plan? • How to prepare a Data Inventory? • How to formulate a Local Area Plan? • Who will be involved during the planning and implementation stage of the stage? | Urban Local Body, Urban and Transport Planner, Transit Agencies and Private developer | <ul style="list-style-type: none"> • The scale and scope of TOD Local Area Plan • Checklist of existing data and Gap Assessment • Preparation and phasing of Local area plan • Modification in DCR based on design principle |
|--|---|--|



Sections

- A. Prerequisite :** This sections elaborates on how to delineate the local area level plan and the lists the data required before starting the planning and design of the local area.
- B. TOD Principles:** This section is further divided into four sub section such as Accessibility Planning, Urban Planning, Urban Design and Area Management Plan.
- C. Performance Measure:** After planning the LAP ranking of each station area is needs to be evaluated.

A.
Prerequisite

B.
TOD
Principles

C.
Performance
Measure

B. TOD Principle

The TOD Principles (from Section B) are categorised into four parts:

1. Accessibility Planning refers to multi-modal integration and street network
2. Urban Planning refers to infrastructure, housing and mix land use planning
3. Urban Design refers to active ground floor and public spaces
4. Area Management Plan refers to traffic management

B1
Accessibility
Planning

B2
Urban Planning

B3
Urban Design

B4
Area Management
Plan



Urban Planning

Urban Design

Accessibility Planning

Area Management Plan

SECTION A. PREREQUISITE

1

How to define the TOD Local Area Plan?

To identify the local area characteristics and the type of transit that would help to identify the appropriate scale of TOD.

Outcomes: Identification of possible TOD activities, their scale and scope, based on existing or planned ridership

2

How to prepare a data inventory?

To prepare a comprehensive database and assist in documenting baseline conditions and analyzing restrictions.

Outcomes: Checklist of existing data source, and identification of gap in the data.

Site inventory report with base map of physical conditions, visual and photographic surveys, and CAD/GIS database.

1. How to define the TOD Local Area Plan?

PURPOSE

Understanding the TOD catchment area characteristics and the type of transit would help identify the appropriate scale of TOD. It will also help to identify the opportunities for multimodal integration.

OUTCOMES

- Identification of possible TOD activities, their scale and scope, based on existing or planned transit ridership

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.
- Pilot Station - Study Area Delineation - Refer to **Annexure A4**

REFERENCES

- Transit Corridors and TOD^[89]

- 1 Population Density in the influence area (Person per Hectare).

(For optimal population density refer Chapter 4. B2.II)

- 2 Employment Density in the influence area (Person per Hectare).

(For employment density refer Chapter 4, B2.II)

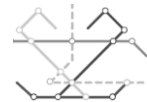
- 3 Does the city have Mass Transit Corridor

- ☐ A Yes
☐ B No



- 4 At least one corridor is either

- ☐ A Proposed
☐ B Under Implementation
☐ C Operational



- 5 If proposed, the timeline for commercial operations (in Months):

- ☐ A Less than 12
- ☐ B 12 to 18
- ☐ C 19 to 24
- ☐ D 25 to 30
- ☐ E 31 to 36
- ☐ F Greater than 36



- 6 Type of Mass Transit Modes:

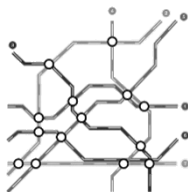
- ☐ A BRTS
- ☐ B Metro Neo
- ☐ C Metrolite
- ☐ D Metro
- ☐ E RRTS
- ☐ F Sub Urban Rail

Multiple Choice



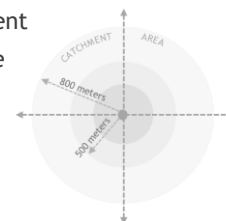
- 7 The number of stations that are to be taken up for planning and implementation of TOD

- ☐ A <5
- ☐ B 5-10
- ☐ C 11-15
- ☐ D 16-30
- ☐ E 31-50
- ☐ F >50



- 8 Transit Oriented Development Zone/ walk shed around the station; (in meters)

- ☐ A Less than 500
- ☐ B 500-800
- ☐ C More than 800



For defining TOD Zone refer Chapter 2, 2.1.5

- 9 Typology of Development Context

- ☐ A Urban Infill Areas
- ☐ B Urban Redevelopment Areas
- ☐ C Greenfield Areas



For identifying the development context refer Chapter 2, 2.1.2 and Annexure A3

- 10 Typology of the selected Local area based upon development context

- ☐ A Core City Station
- ☐ B Mid Line Stations
- ☐ C Terminal Stations

For selection of local area typology based upon development context refer Chapter 2, 2.1.3 and Annexure A3



- 11 Local Area Typology based on Land Use

- ☐ A Intermodal Gateways
- ☐ B Employment Centres
- ☐ C Destination/ Heritage Nodes
- ☐ D Transit Neighborhoods
- ☐ E Infill Neighborhoods



For Local Area Typology based upon land use refer to Chapter 2, 2.1.4 and Annexure A3

- 12 Total Transit System Ridership boarding and alighting at the station selected for TOD



Boarding: _____

Alighting: _____

In case, the corridor is proposed or under implementation, the boarding and alighting data as given in the DPR can be considered. If the corridor is operational, then the actual boarding and alighting numbers may be taken from the transit operating agency. This would provide an assessment of the facilities that need to be planned for feeder services (refer to Chapter 4, B1.I)

- 13 Top three Predominant Land use in the Influence Zone

i. _____ %

ii. _____ %

iii. _____ %

For parameters for defining Local Area Typologies refer to Annexure A3.

- 14 Modes that are connected to the station

Multiple Choice

- ☐ A BRTS
- ☐ B Metro Neo
- ☐ C Metrolite
- ☐ D Metro
- ☐ E RRTS
- ☐ F Suburban Rail
- ☐ G City Bus Service
- ☐ H Cable Car
- ☐ I Public Bicycle Sharing System
- ☐ J IPT (Taxi, Shared Taxi, Auto, Shared Auto, Two Wheeler Taxi, E-Rickshaw)
- ☐ K Others



2. How to prepare a data inventory?

PURPOSE

To prepare a comprehensive database and assisting in documenting baseline conditions and analyzing restrictions

OUTCOMES

- Checklist of existing data source, and identification of gaps in the data
- Site inventory report with base map of physical conditions, visual and photographic surveys, and CAD/GIS database

TOOLS AND RESOURCES

- Secondary Data Source 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 source are not available
- Literature Review of Existing Documents and Studies
- Focus Group Meetings and Interviews
- Survey Formats- Refer to **Annexure A9**

- 1 Planning aspects that need to be taken into consideration while undertaking TOD study

- A Zonal regulations
- B Planning and regulatory context
- C Regional context
- D Mobility and Access
- E Land Use Plans (Existing and Proposed)
- F Existing and Proposed Key Developments
- G Infrastructure Plans
- H Transit Stations in the TOD Zone
- I Major Intersections
- J Activity Nodes
- K Existing Natural Features such as Water body, forest and green areas



Zonal regulations, planning and regulatory Context, Land Use plans, key development projects can be adopted from Development Plan/ Master Plan. Infrastructure Plan, Transit Stations, major intersections, activity nodes can be adopted from CMP/ CTTS documents.

- 2 Inventory to be prepared through site visit to understand the planning and physical characteristics of the Study Area

- ☐ A Land Use Patterns (Residential, Commercial, Industrial, Recreational etc.)
- ☐ B Building type, FAR, FSI and heights
- ☐ C Road Network Inventory and Connectivity (FAR, Carriageway, Footpath, Junction type etc.)
- ☐ D Public Transportation Infrastructure (Stations, Stops, Terminal, Routes etc.)
- ☐ E Pedestrian and cyclist infrastructure
- ☐ F Parking availability and management (On-Street and Off-Street Parking, Parking Pricing)
- ☐ G Open spaces, green areas and natural features
- ☐ H Existing Infrastructure (water, electricity etc.)
- ☐ I Decadal Development activities (projects underway or recently completed)
- ☐ J Vacant Lands and buildings (size and ownership)



The inventory helps to document base line, which will be essential for preparing Local Area TOD Plan. The information collected should be used to prepare base maps using GIS interface.

Refer to Annexure A9 for survey formats.

- 3 The information gathered for a site inventory such as physical condition and base map collected using GIS interface

- ☐ A Yes
- ☐ B No



If No, the mapping is not done using GIS interface

SECTION B. TOD PRINCIPLES

1

How to formulate Local Area Plan?

To translate ideas of TOD into details that can be implemented through the identification of strategic actions and the modifications of the laws.

Outcomes: TOD Plan Report and DCR modifications

2

Who will be involved during the planning and implementation stage of the project?

To ensure availability of resources throughout the planning process and implementation stage.

Outcomes: An overview of the workshop's outcomes, shall include the innovative solutions found, the key concepts created, the feedback obtained, and the survey/questionnaire responses

1. How to formulate Local Area Plan?

PURPOSE

To translate the ideas of TOD into details that can be implemented through the identification of strategic actions and the modification of laws.

OUTCOMES

- TOD Plan
- DCR Modification

REFERENCES

- TOD Standard (ITDP) ^[22]
- Safe Access to Mass Transit Manual (Embarq) ^[85]

1 Preparation of TOD Plan/ Strategy in three phases:

- Concept Plan, including alternatives, if any
- Draft TOD Plan, to be presented to stakeholders for review
- Final TOD Plan, based on stakeholder feedback



2 Preparation of TOD Framework and Plans based on the Planning Principles:

(refer to Chapter 4.2)

- Accessibility Planning
- Urban Planning
- Urban Design
- Area Management Plan



3 Context-specific strategies formulated for the development of the area:

- A Land use and Development Concept, including identification of FARs, land uses, setbacks and marginal open space requirements
- B Accessibility Concept, Focusing on all Aspects and all modes of first and last mile connectivity
- C Infrastructural Impacts of the TOD Plan
- D Transit-supportive DCR modifications to be applied at a citywide scale or within delineated TOD Zones.



The section in the DCR that may be required to be modified are as follows:

- *Parking provision*
- *Building Height*
- *FAR*
- *Ground Coverage*
- *Building Setback*

2. Who will be involved during the planning and implementation stage of the project?

PURPOSE

To ensure availability of resources throughout the planning process and implementation stage.

OUTCOMES

An overview of the workshop's outcomes, shall include the innovative solutions found, the key concepts created, the feedback obtained, and the survey/questionnaire responses.

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 ^[25]
- The NCI Charrette System Guide for Transit Oriented Development ^[62]

1 Collaboration for Capacity Building

- A Central Government agencies under MoHUA to design and implement training programs to augment existing capacities of political executives and urban managers to plan, monitor and evaluate TOD policies, plans and projects.
- B State governments to provide technical/financial assistance and facilitate the creation of effective regional organizations that are focused on integrating land use and transportation planning implementation at the metropolitan scale such as the Unified Metropolitan Transportation Authority (UMTA)
- C Municipal staff in monitoring preparation, implementation and evaluation of TOD plans and projects
- D Study tours with assistance from central/state governments for experiential training
- E Outsource capacity building and technical assistance activities to qualified consultants through a competitive bidding process

2 The subject experts to be included for the workshop:

- A** Central Government Agencies: Ministry of Housing and Urban Affairs (MoHUA), Ministry of Road Transportation and Highways (MoRTH), Ministry of Environment, Forests and Climate Change (MoEFCC).
- B** State Agencies: State departments of urban development, housing, transportation and tourism
- C** Local Agencies: Municipal Corporation/ Municipal Council, Town and Country Planning Departments, Development Authorities,
- D** Transit Agencies (Bus, rail etc), Housing Boards, Public Works Department, Traffic Police
- E** Real Estate Developers
- F** IPT Operators (Auto, Taxi, E-rickshaw etc.)
- G** NGOs, Community Service Organizations, Advocacy Groups
- H** Academic Institutions
- I** General Public
- J** Political Leadership and Elected Representatives



Phase 1 Workshop - Project Introduction & Initiation.

(the presentations should be illustrative.)

The workshop should be in three parts

- A** Part One (Project Background and Education): focus on introductions, project background, project goals and vision, intended outcomes, analysis, baseline conditions and SWOT
- B** Part Two (Stakeholder engagement - Concept Development)- Assemble stakeholders into several groups and assign them to create physical design concepts for land use, public realm, accessibility, and urban design. A facilitator (preferably from the consultant team), a rapporteur (ideally a stakeholder), an invited expert, and a planning/ development agency representative should be present in every group.
- C** Part Three (Stakeholder engagement - Plan Implementation) - Focus on Q/A sessions, discussion on the concept plans prepared by each group and conducting a SWOT analysis of each.

At the end of this workshop, the concept plan prepared by the groups to be collated to prepare a comprehensive TOD Concept Plan.

Phase 2 Workshop - finalization of Concept Plan

(the presentations should be illustrative.)

The workshop should be in three parts

- A** Part One - Present the Comprehensive TOD Concept Plan prepared along with its SWOT analysis and intended outcome and get feedback on the same.
- B** Part Two - (Stakeholder engagement - Components of Concept Plan) Divide the stakeholders into minimum - groups as done in Workshop 1. Each group to be assigned one component of the concept plan that they are required to detail out. A brief note is to be provided to the group which gives them an understanding of the component to be addressed and the expected inputs to be provided by the group.
- C** Part Three - (Stakeholder engagement - Draft Plan Outline) - discussion on the Components detailed by each group and conducting a SWOT analysis of each.

At the end of this workshop, components detailed by the groups is to be collated and overlaid to prepare a Draft TOD Plan.

Phase 3 Workshop - Feedback on the Draft TOD Plan (the presentations should be illustrative.)

The workshop should be in three parts

- A** Part One - Present the Draft TOD Plan prepared along with its SWOT analysis.
- B** Part Two - (Stakeholder engagement - Plan Implementation) - Focus on Q/A sessions, discussion on the Draft TOD Plan
- C** Part Three - Final TOD plan presentation

At the end of this workshop, the feedback received is to be collated and incorporated to revise the Draft TOD Plan.

- 3** Collaborate- with local professional associations to reach a broader audience and stakeholder base. Potential partners may include:

- A** Confederation of Real Estate Developer's Association of India (CREDAI);
- B** Indian Institute of Architects (IIA);
- C** Institute of Town Planners of India (ITPI);
- D** The Institution of Engineers (India);
- E** Institute of Urban Transport (IUT),
- F** National Institute of Urban Affairs (NIUA)
- G** Indian National Trust for Art and Cultural Heritage

The list only indicates nature and the cities may collaborate with other local institutes.

- 4 Aspects to be included while conducting the workshop.

- ☐ A Project Background
- ☐ B Agenda of the Meeting
- ☐ C Questionnaires/ Surveys focusing on issues that are required to be addressed, alternatives for consideration and intended outcomes



The questionnaire to the extent possible should be in multiple-choice question (MCQ) format for focused responses from the participants

4.2 Plan and Design Principles for TOD

The analysis of different reports based on design principles was systematically structured to identify and classify key insights. The report included:

1. National TOD policy
2. Consultancy Services for Developing Guidance Documents for TOD, NMT and PBS, TOD Guidance document by SUTP, MoUD and IBI Group.
3. TOD Standard by ITDP
4. TOD Implementation Resource and Tools, 1st and 2nd Edition by World Bank, IBI and WRI India.
5. Safe Access Manual- Safe access to mass transit stations in Indian cities by EMBARQ and WRI India
6. Assessing TOD- A list of indicators by NIUA
7. LAP for Transit by TCPO, CEPT, Shakti Foundation and MoHUA

Further, these topics were then consolidated into four categories: **Accessibility Planning, Urban Planning, Urban Design and Area Management Plan**. This categorization ensures a comprehensive perspective on design principles, facilitating their application in urban planning and development projects.

The inference of plan and design principles derived from various documents is shown in **Figure 10 and 11**.



Figure 10: Documents referred for TOD Plan and Design Principles

S.No	National TOD Policy	ITDP	EMBARQ (DOTS)	IBI	LAP for transit	
1	High Density Compact Development	Walk Promote	Non-motorized transport	Pedestrian friendliness	Plan and Design	Improve Road Network
2	Mixed Use Development	Prioritise NMT	Community involvement and safety	Open Space and Civic uses		Improve Public Realm
3	Mandatory and Inclusive Housing	Dense Street Network	Active ground floor and Street front	Streets and blocks	Regulate	Improve Density
4	Multi Modal Integration	High quality public transit	High quality public transit	Transit Station and transit Plaza		Improve Diversity
5	Focus on Pedestrian, Cyclist and NMT User	Mixed-use	Mixed-use spaces	Mixed-use	Incentivize	Support Affordability
6	Street Oriented Building and Vibrant Public Spaces	Optimize density and transit capacity	Active and safe public spaces	Compact development	Parking	Manage Parking
7	Managed Parking	Short commutes	Parking and vehicle management	Scale and density		
8	Informal Sector Integration	Regulate parking and model share		Parking		
9	Traffic Calming			Streets and intersections		
10	Interconnected Street Network			Architectural variety		
11	Last Mile Connectivity			Building orientation and frontage		
12						

Source: Components of TOD, Table-4:Global Overview of components, TOD, NIUA;

<https://niua.org/tod/todfisc/book.php?book=1§ion=3>

Note: All the above principles are broadly grouped under the below three categories and adopted for this study

Broad Grouping of above principles

Figure 11: Inferences of Plan and Design Principles derived from various documents

Source: Author

CDT (California Dept. of Transport)	WRI India	SUTP, MoHUA and IBI India	World Bank
Access to the transit station	Complete Streets (network, Geometry)	Multimodal integration	Well Designed Transit System
Continuous and safe sidewalks and pathways	Integrated Public Transport	First and last mile connectivity	Multi-Modal Integration
Bicycle access	Environmental and Cultural landscapes	Interconnected St Network	Complete Streets
Identity for the neighbourhood, district, or community itself	Public Spaces	Complete streets	Traffic Management
Mix of land uses	Mixed-uses, compact development	NMT network	Transit Plaza
Safe and comfortable public places	Active Edges / frontage (transport supportive uses)	Traffic calming	Walkability
Services and conveniences that are located in or in close proximity to the transit station	Travel Demand Management	Mixed land uses	Public Realm
Parking, Drop off, Pick up. and direct transfer. Between modes of transit		Optimized densities	Urban Parks and Open Spaces
Diverse and interesting surroundings. Where people are encouraged to walk		Street oriented buildings	Compact Development
		Managed parking	Mix of Uses
		Informal sector integration	Housing Diversity
		Housing diversity	Informal sector Integration

TOD Guidance Document-4, SUTP, MoHUA, 2016

Accessibility Planning	Urban Planning	Urban Design	Area Management Plan
------------------------	----------------	--------------	----------------------



B1. ACCESSIBILITY PLANNING

- I. Multi-Modal Integration
- II. First and Last Mile Connectivity
- III. Interconnected Street Network

B2. URBAN PLANNING

- I. Infrastructure Planning
- II. Adopt Optimal Dense Development
- III. Affordable Housing
- IV. Promote the Mix Use

B3. URBAN DESIGN

- I. Vibrant Active and Safe Public Spaces
- II. Incorporate Diverse Uses and Informal Activities
- III. Integrate Architectural Variety
- IV. Promote Active Ground Floor and Street Frontage of the Building

B4. AREA MANAGEMENT PLAN

- I. Traffic Management Measures
- II. Manage on-street and off-street Parking for Motorised Vehicles



B1.I. MULTI-MODAL INTEGRATION

Common for all stations

PURPOSE

Mobility hubs strive to optimize intermodal connectivity, facilitating seamless transfers between various transportation systems and routes, while ensuring efficient first- and last-mile connections.

GOALS

- ◆ Create clear, direct, and short transfers between transit modes and routes
- ◆ Optimize travel costs and time for all users
- ◆ At transit interchanges, prioritize pedestrian, cycling, public transport, and IPT infrastructure for a people-centric design.
- ◆ Ensure seamless intermodal connections by integrating formal public transport, paratransit, and cycle-sharing options at MRTS stations.

REFERENCES

- ◆ Development of Toolkits under the “Sustainable Urban Transport Plan” by HM Shivanand Swamy et.al ^[87]
- ◆ Station Area Planning Guide by WMATA et al ^[67]
- ◆ Planning for First and Last Mile Connectivity for Mass Transit Users by Das A. ^[1]



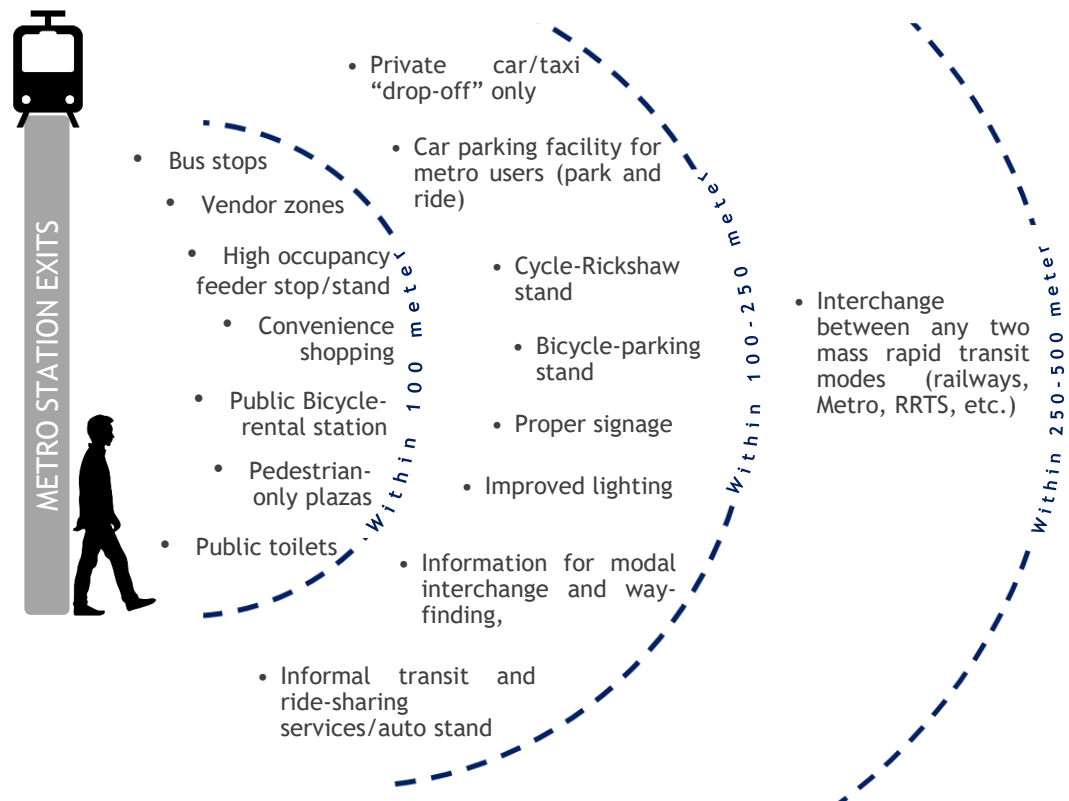
Integration between two different transit modes

I. SEAMLESS CONNECTIVITY

- ◆ **Physical integration** refers to the connectivity between multiple transportation modes and their services to facilitate passenger transfers.
- ◆ **Fare integration** refers to implementing a single ticket or card that can be used across multiple transportation modes (e.g. NCMC card).
- ◆ **Operational integration** aims to enhance the transportation network's overall performance and user experience by synchronizing schedules and systems.
- ◆ **Information integration** aims to provide users with a seamless and efficient experience by combining and organizing data from various transportation systems and services.
- ◆ **Institutional integration** describes how different agencies, organizations, and institutions work together to achieve common goals. ^[87]

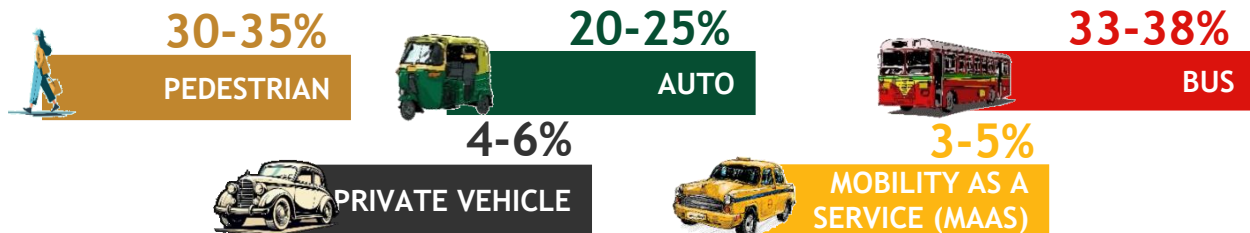
Examples: Kempegowda Metro Station, Bengaluru, New Delhi Railway Metro Station, New Delhi

FACILITIES FROM WALKING DISTANCE FROM STATION EXITS ^[100]



MODAL SPLIT FOR ACCESS AND EGRESS TRIPS (LOW-DENSITY, HIGH RIDERSHIP STATION) ^[1]

The ideal modal split at each station for first and last mile connectivity should be as given below.





Railway Station

Bus Stand

NEW DELHI RAILWAY STATION, DELHI

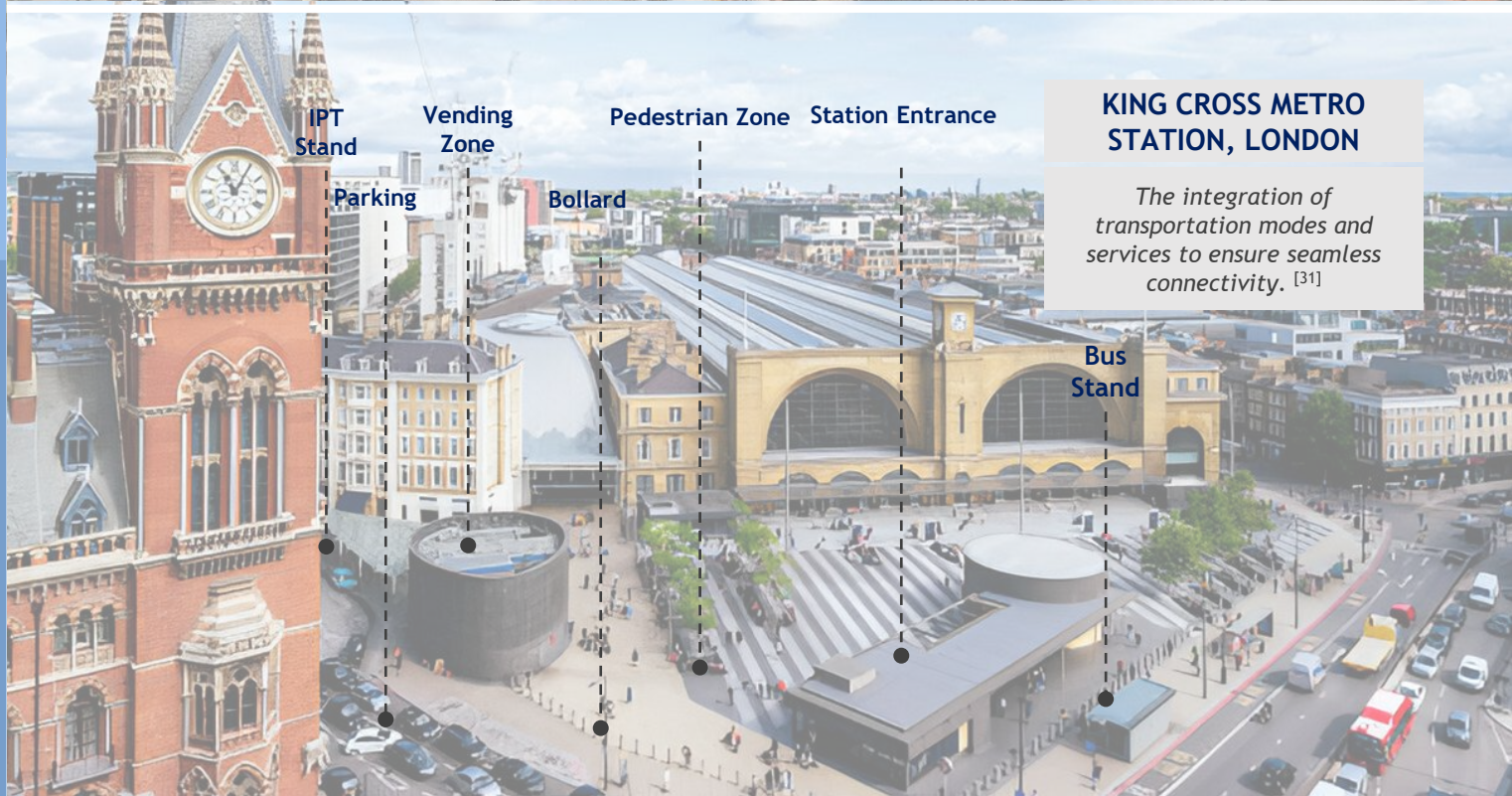
Seamless connectivity between New Delhi Railway Station and adjacent metro Station on Yellow and Airport Express line with a dedicated skywalk. ^[66]

IPT Stand

Two Wheeler
Parking

Skywalk

Metro Station



IPT
Stand

Vending
Zone

Pedestrian Zone

Station Entrance

KING CROSS METRO STATION, LONDON

The integration of transportation modes and services to ensure seamless connectivity. ^[31]

Parking

Bollard

Bus
Stand

B1.II. FIRST AND LAST- MILE CONNECTIVITY

Common for all station

PURPOSE

For many trips, public transportation is a convenient option, but for a smooth travel experience, it is frequently necessary to augment the first and last mile with other modes like walking, cycling, or feeder services.

GOALS

- ◆ Reduce the access and egress travel time and distance for commuters from the starting point to their final destination.
- ◆ Stimulate modal shift towards the transit system by providing an alternative mobility option and expanding the reach of transit to maximum commuters.

REFERENCE

- ◆ Guidelines For Pedestrian Facilities (IRC - 103:2022) ^[28]
- ◆ National Mission on Sustainable Habitat by MoHUA ^[49]
- ◆ Code of Practice - Cross Section by IUT, MoUD ^[35]
- ◆ Better Streets, Better City by ITDP ^[13]
- ◆ National Transit Oriented Development (TOD) Policy by MoHUA ^[48]
- ◆ Healthy Streets Design Workbook by NIUA, ITDP, MoHUA ^[64]



Unobstructed Footpath

I. UNOBSTRUCTED FOOTPATH

- ◆ A continuous unobstructed footpath network of 2m minimum on each side of all streets. One-sided footpath can be considered on narrow local streets with RoW less than 10m^{[49][28]}
 - Minimum clear width of different zones on footpath as per adjoining land use.^[28]
 - Residential land use - 2.0m/ 4.0m (including MUZ)
 - Neighborhood level, commercial street - 2.5m/ 5.0m (including MUZ)
 - City level, high shopping street - 4.0m/ 6.5m (including MUZ)
 - School, hospital, markets, bus stops, public parks - 2.5m
- ◆ Table-top crossings should be provided at crossings of minor streets, property entrances etc. to ensure continuity of footpath. This also helps in reducing the speed of the merging traffic. ^[28]

The illustration is represent in **annexure A8**.



Footpath widths are based on pedestrian flow. Footpath should normally be designed for pedestrian Level of Service B, however, under certain constraints, Level of Service C can be adopted for footpath width.

Design Flow in Number of Persons per hour ^[28]				
Footpath Width (m)	Both Directions		All in One Direction	
	LOS B	LOS C	LOS B	LOS C
1.8	1350	1890	2025	2835
2	1800	2520	2700	3780
2.5	2250	3150	3375	4725
3	2700	3780	4050	5670
3.5	3150	4410	4725	6615
4	3600	5040	5400	7560

Example: PCMC Metro Station, PCMC



II. Organized Intermediate Public Transport System

- ◆ Provide IPT-designated parking stand/Dial-an-auto/rickshaw services, pre-paid booths, passenger pick-up and drop-off areas or remote IPT/taxi parking lots within 100-250 m of walking distance from the station exit. ^[48]
- ◆ A Multi-Utility Zone (MUZ), minimum 1.8 m in width, should be provided to accommodate bus stops, street utilities, trees, and IPT/NMT stands.
- ◆ Cycle rickshaw parking and three-wheeler parking bays of 1.5 m width should be provided at least 50 m away from the junctions. ^[35]

Example: Kashmere Gate Metro Station, Delhi



Segregated Bicycle Track

III. SEGREGATED BICYCLE TRACK

- ◆ In case of no space on street or streets <30kmph recommendations should be provided for traffic calming. Cycle tracks should be only considered after providing adequate pedestrian footpaths.
- ◆ Minimum cycle track on arterials and sub arterial road should be 2.2m for a two lane and 3-4m for common cycle track. For distributary roads 1.2m of painted cycle lane is required while on access road it can be with mixed traffic.
- ◆ Provide a minimum buffer of 0.5 m between the cycle track and motor vehicle lanes.^[13]

Example: Sant Tukaram Nagar Metro Station, PCMC



Public Bicycle Docking Stations

IV. PUBLIC BICYCLE DOCKING STATIONS

- ◆ The parameter is based on the number of potential users in the service area to ensure that there are enough bicycles to meet the demand. Large, dense cities or areas with high commuter or tourist numbers will likely require 10 to 30 bicycles per 1,000 residents to meet the demand.^[22]
- ◆ The types of bike-share systems are:
 - Station-based system
 - Manual bikes
 - Pedal assist e-bikes/manual bikes
 - Station-based system
 - Dock-less
 - GPS-enabled manual bikes
 - GPS-enabled pedal-assist e-bikes
 - Hybrid
 - GPS-enabled manual and/or pedal assist e-bikes with some physical and/or geo-fenced station
- ◆ Cycle parking facilities shall be provided at intervals of 100 m along the network.

Example: Sant Tukaram Nagar Metro Station, PCMC



Street Design Elements - street furniture



Street Design Elements - bollards and signage

V. STREET DESIGN ELEMENTS

◆ Bollards:

They should be provided at locations where vehicle encroachment is possible, such as pedestrian median refuge, table-top crossings and at the property entrances on footpath.

- Bollard height: Bollard height should be minimum 0.7 m for footpaths. ^[64]
- Bollard spacing: The clear spacing between the two bollards should be 0.6 m. Additionally, spacing of 0.9 m should be provided near the building edge for wheelchairs. ^[64]
- Reflective tapes: Bollards with a minimum height of 1,000 mm should be identifiable using contrasting colors with the provision of reflective tapes. ^[64]

◆ Railings:

These may be provided near schools, and should be located 0.25 m away from the edge of footpaths and should have a height of 0.7 m. This safety measure helps protect pedestrians, especially children, by preventing accidental falls onto the road. ^[64]

◆ Signage location:

Signage should be located 0.25 m from the kerb edge with a minimum vertical clearance of 2.1 m from the finished footpath level to the bottom of the signage board. ^[64]

◆ Street furniture:

Benches, trash, receptacles, bollards, vending kiosks, and signage to be provided adequately. ^[64]



Street Design Elements - Trees and railings

◆ Trees on Footpath

- The number of trees per kilometre:

S. No.	Right of Way (RoW)	Minimum number of trees per km (inclusive of existing trees)
1	Less than 35m	200
2	35m - 45m	300
3	46m - 60m	500
4	61m - 120m	700

- As per IRC:SP:119-2018, the centre-to-centre distance between tree trunks shall be >15 m for large trees, >10 m for medium trees, and >6 m for small trees. ^[64]



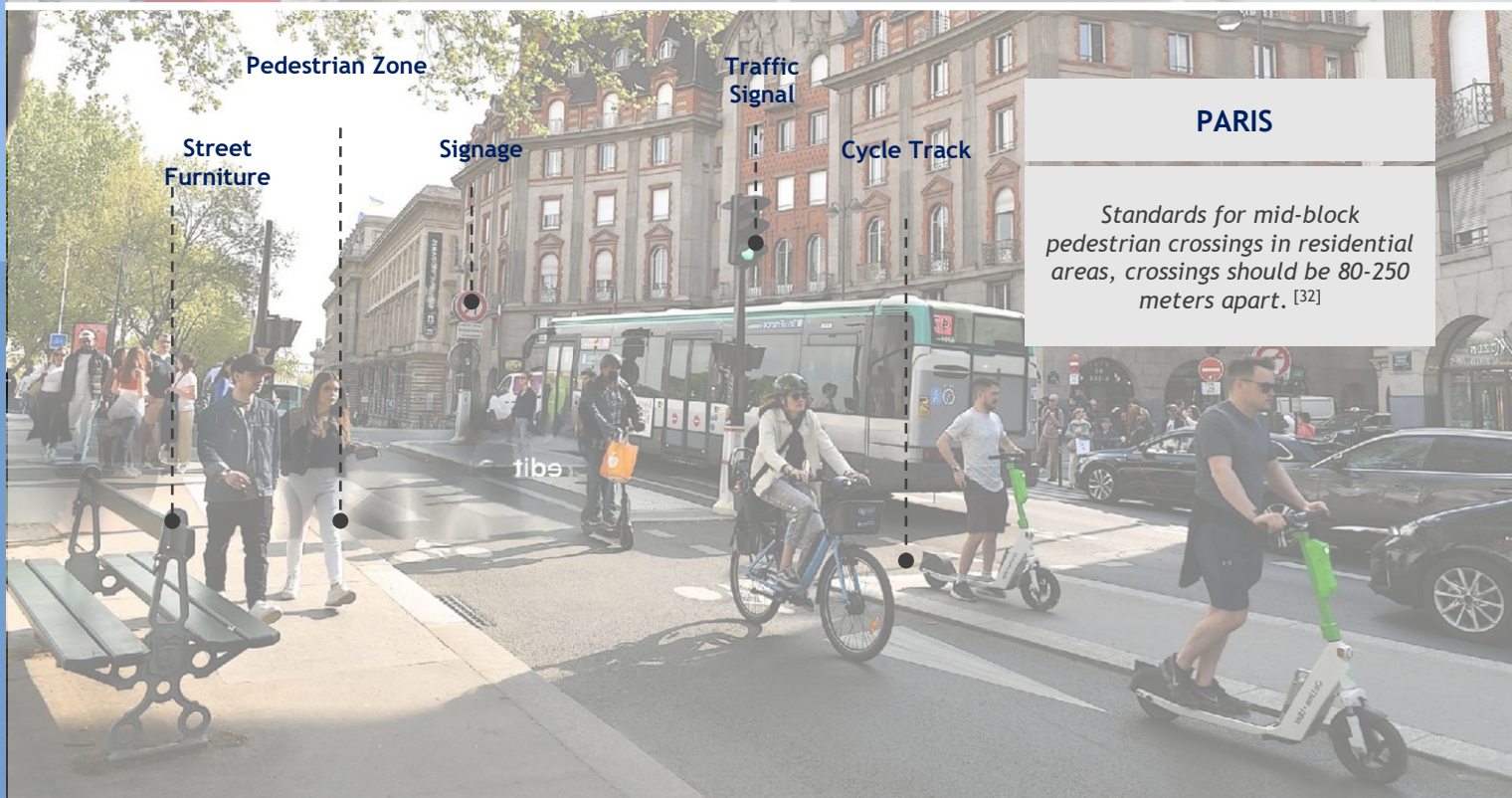
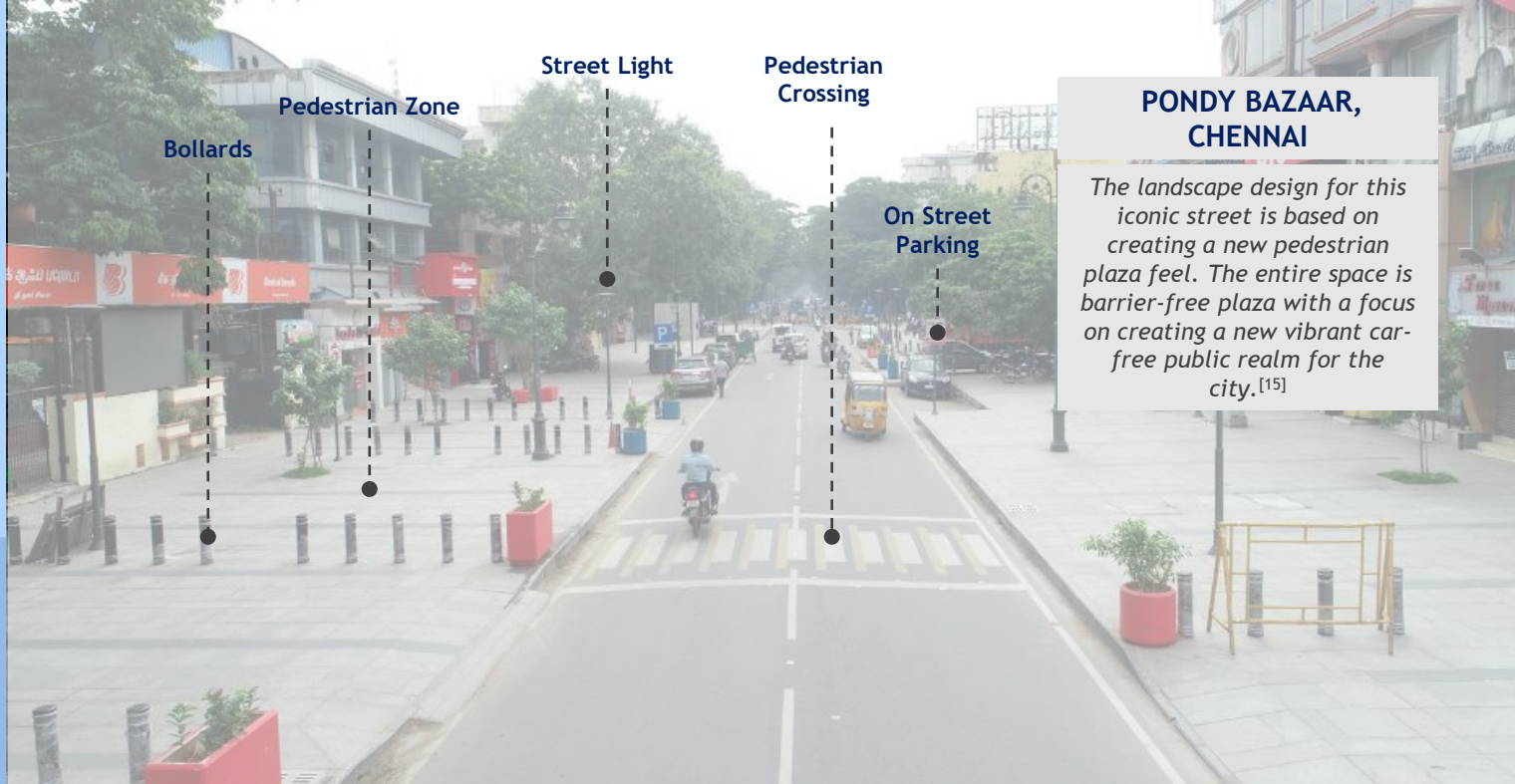
Street Design Elements - street light

◆ Street lights and fixtures:

- Street light spacing should be uniform with the distance based on the minimum illumination required.
- LED light fixtures are recommended for low energy consumption. Warm white LED light is preferred. 25-30 lux levels of lighting should be available on the footpath as per IRC 103-2012.
- Street lights should be placed in a way to illuminate the street surface, minimizing glare and light pollution.
- Spacing between two light poles should be about 3 times the height of the fixtures to ensure full coverage.

- ◆ **CCTV surveillance:** Facilities such as CCTV cameras, panic buttons, etc. should also be installed for around-the-clock surveillance.

Example: King's Cross Station, London



B1.III. INTERCONNECTED STREET NETWORK

Common for all stations

PURPOSE

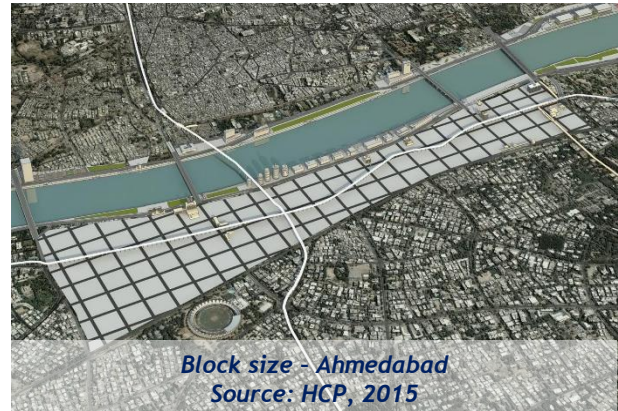
The interconnected network of urban streets provides multimodal transportation alternatives, efficient traffic management, and optimal accessibility within cities.

GOALS

- ◆ Create a network of connected streets with designated walkways to ensure smooth transit integration with important locations.
- ◆ Create a multimodal network with a defined vehicle hierarchy and infrastructure for cyclists and pedestrians that is prioritized.
- ◆ Disperse high traffic volume over multiple parallel human-scale streets.

REFERENCE

- ◆ TOD Standard by ITDP ^[34]
- ◆ National Mission on Sustainable Habitat by MoHUA ^[49]
- ◆ National Transit Oriented Development (TOD) Policy by MoHUA ^[48]
- ◆ Transit Oriented Development (TOD) Policy and Implementation Framework by UTTIPEC ^[99]
- ◆ Healthy Streets Design Workbook by NIUA, ITDP, MoHUA ^[64]



I. BLOCK SIZES

- ◆ Recommended block size: 100-150 block perimeter. ^[34]
- ◆ Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 hectares. ^[49]
- ◆ Blocks larger than two hectares must be divided with statutory planning to provide publicly accessible pedestrian thoroughfares in existing built-up regions. ^[49]
- ◆ Schools and markets should be less than a kilometre distant from any location inside a neighbourhood, and retail establishments and playgrounds should not be more than 600 m away. ^[22]

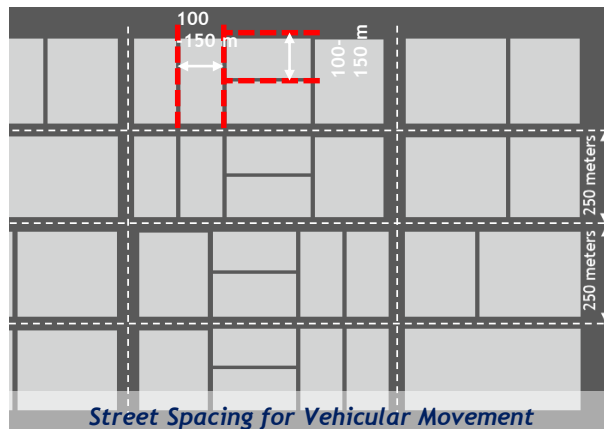
Example: Super Block Barcelona, Spain



II. MULTI-UTILITY ZONE

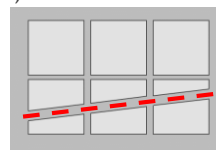
- ◆ All collector and arterial roads should have a Multi-Utility Zone (MUZ) with a minimum width of 1.8 m to enable bus stops, street utilities, trees, street furniture, planting for storm water management, IPT/NMT stands, paid idle parking, etc. [53]

Examples: Bellasis Road, Mumbai and Queens Road, Bengaluru



III. STREET SPACING

- ◆ In a network, the maximum distance (centre to centre) between two vehicular roadways should never be more than 250 m. [48]
- ◆ Non-motorized transport (NMT) only street to be provided at 100-150 m (center to center).
- ◆ The total area of blocks encircled by streets or routes open to pedestrians and cyclists should not be greater than 2 hectares. Properties should allow public/pedestrian circulation if they are more than 2 hectares. [49]
- ◆ Determine when to offer "cut-throughs." (For example, across parks or across parking lots, where these cut-throughs minimize access routes.). [64]



The large block size are cut-through across to reduce the travel distance and time.

- ◆ 50 intersections per square km. [49]

Example: Ahmedabad CBD Local Area Plan



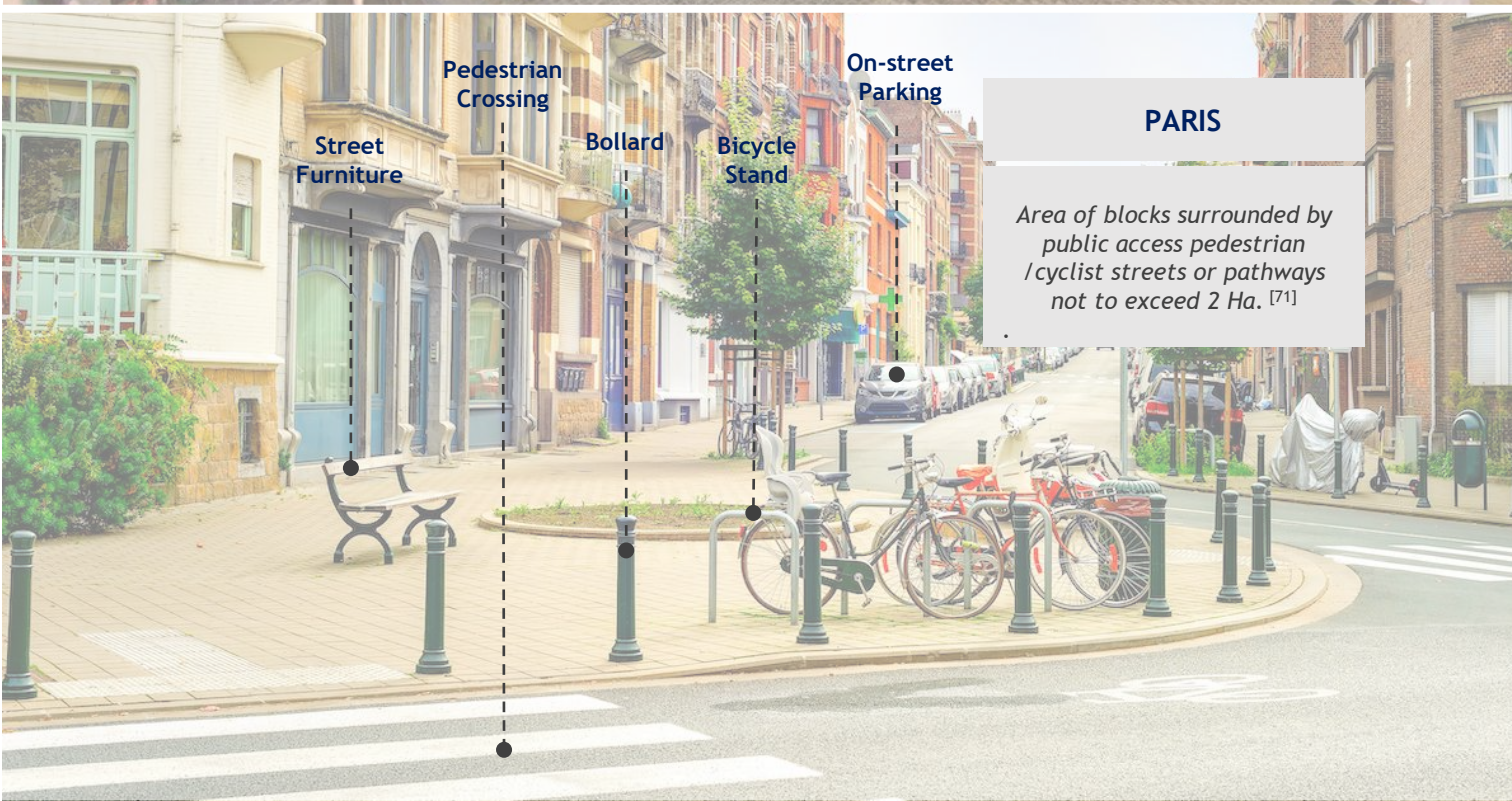
Pedestrian Zone

Commercial shops

Public Sitting Space

LEH LADAKH

Retail and playgrounds should be placed 600 meters from any point within a neighbourhood, and schools and markets should be less than a 1 km trip. [82]



Pedestrian Crossing

On-street Parking

Street Furniture

Bollard

Bicycle Stand

PARIS

Area of blocks surrounded by public access pedestrian /cyclist streets or pathways not to exceed 2 Ha. [71]

B2.I. INFRASTRUCTURE PLANNING

Common for all station

PURPOSE

Making well-informed judgments about the infrastructure projects to undertake and when to do them depends on infrastructure planning. It has a major impact on the productivity of the economy and helps achieve objectives like improved accessibility, connection, and regional economic development in addition to more general strategic economic objectives.

GOALS

- ◆ Coordinating the delivery of infrastructure to serve both new and existing development.
- ◆ To engage and coordinate across sectors and boundaries.
- ◆ To regulate, set conditions and raise revenue for infrastructure.

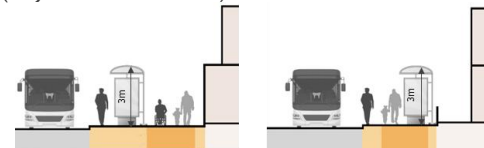
Reference

- ◆ Consultancy Services For Developing Guidance Documents For Transit Oriented Development (TOD), Non-motorised Transport (NMT) And Public Bicycle Sharing (PBS) by IBI Group with iTrans, MoHUA^[22]
- ◆ Healthy Streets Design Workbook by NIUA, ITDP, MoHUA^[64]



I. TRANSIT STATION ACCESSIBILITY

- ◆ Infrastructure design should maximize pedestrian and cycling access, ensuring seamless connectivity for residents and businesses. (Refer Chapter 4, B1.I)
- ◆ For footpaths > 4.5m wide, bus stops should be in the MUZ. For footpaths < 4.5m wide, bus stops should be pushed to the wall to ensure sufficient space in the front for walking zone. (Refer **Annexure A8**).^[64]



Footpaths > 4.5m wide Footpaths < 4.5m wide

- ◆ Recommend situating bicycle docking stations as close as possible to metro station entry gates to ensure maximum utility and ease of access. (Refer Chapter 4, B1.I)
- ◆ Skywalks should be provided near the transit stations for the users to enhance the connectivity of public transport (Refer Chapter 4, B4.I)

Example: MG Road Metro Station, Bengaluru



Public Amenities

II. PUBLIC AMENITIES

- ◆ **Dustbins:** Within the MUZ, separate wet and dry waste dustbins should be installed with a maximum surface area of 1.5 square m and preferably spaced 50 to 75 m apart.^[64]
- ◆ **Public toilets:** Provide accessible toilets every 500-800 m, close to the bus stop.^[22] It is advised that public restrooms be situated off of streets to ensure everyone's safety and accessibility. If it is offered on the street, it must be positioned with a minimum of 2 m of clear pedestrian space in front of it and a minimum of 0.6 m of open space between it and the curb edge. To guarantee a clean atmosphere, routine maintenance needs to be carried out.

Example: The pink toilet in Vikaspuri, Delhi

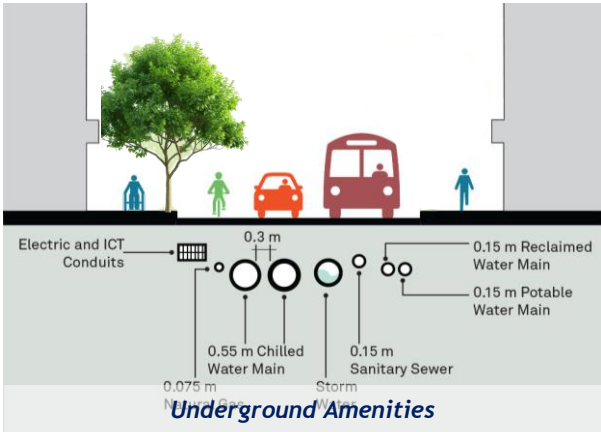


Street Designing Elements

III. ENVIRONMENTAL SUSTAINABILITY

- ◆ Requirements for sustainability, such as rainwater collecting, waste water recycling and reuse, and reduced hardscaping, must be included in the development mandate.
- ◆ New/redeveloped buildings should prioritize the use of solar energy by installing photovoltaic panels, heating water with solar power, and utilizing HVAC systems and appliances with minimal energy consumption under the green buildings/ LEEDS specification in India.
- ◆ Given that manholes are spaced regularly, ducts are advised for all subterranean utilities. They provide benefits including simplified installations, simpler maintenance, less visual clutter, and increased safety by combining several services into one shared infrastructure.^[64]

Example: Vesu Linear Park, Surat



IV. IMPACT ON SERVICE AND MITIGATION MEASURES

- ◆ The impact of the additional population due to TOD policy implementation on the utilities/ services is given in the following sections.
- ◆ **Water Supply:** The water’s impact on the water demand is evaluated based on the water supply standards indicated by the CPHEEO Manual 1999.
- ◆ **Watershed Basin Map:**A total of 72 litres of water can be recycled, but the Manual of Sewerage and Sewage Treatment of CPHEEO prescribes a minimum supply of 100 lpcd of water for sewerage systems with gravity sewers to maintain self-cleaning velocity; a lower velocity would lead to sedimentation, which ultimately decreases the capacity of a sewer.

- ◆ **Solid Waste Management:**
 - Municipal Solid Waste (MSW) is the trash/garbage that is discarded on day to day basis in human settlements. The quantity of waste generated indicates the development and character of the city.
 - For the calculation of per capita of municipal solid waste ,the Manual on Municipal Solid Waste Management by CPHEEO has been used. As per the Manual, solid waste generated vary between 0.2-0.6 kg/capita/day.
 - CPHEEO also gives the waste generation per capital per day for estimation and forecast for different land use type which is given in table below.

Sr. No	Land Use Type	Estimated Water Generation
1	Residential Refuse	0.3 to 0.6 kg/cap/day
2	Commercial Refuse	0.1 to 0.2 kg/cap/day
3	Street Sweeping	0.05 to 0.2 kg/cap/day

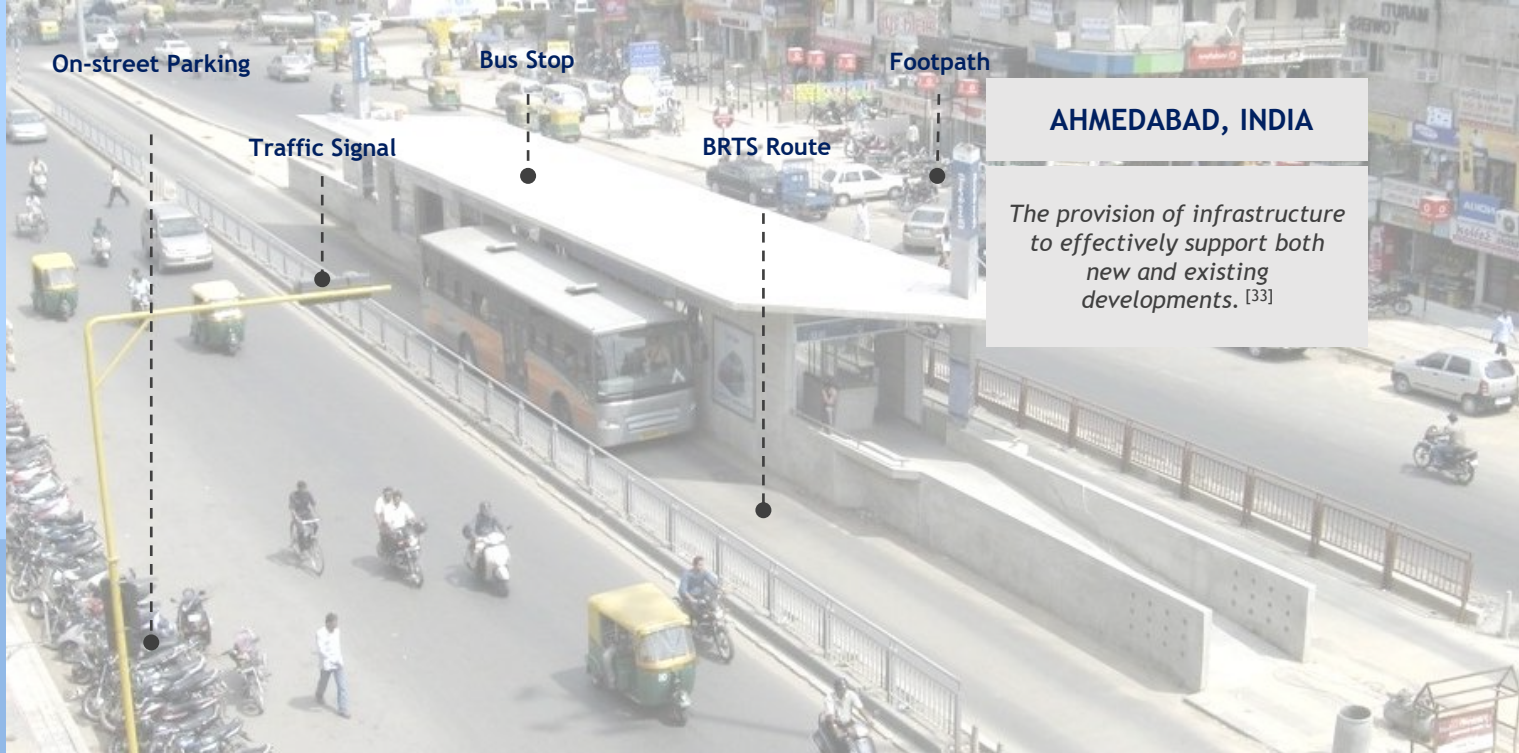
IV. Impact on Service and Mitigation Measures

◆ **Storm water and Sewerage:**

- A well-developed sanitation system leads to healthy and liveable cities/ towns.
- As per CPHEEO, 80% of water supply may be expected to reach the sewers, however, it recommends designing the system by considering minimum waste water flow of 100 litres per capita per day.

◆ **Electricity:**

- As per the National Electricity Policy (2005), for the estimation of requirement of power supply, the recommended consumption is 1000 units per capital per year or 2.74 Kwh per capita per day which includes domestic, commercial, industrial and other requirements.
- The provision of one electric substation of 11kV for population of 15,000 can be considered as standard for electricity distribution.



On-street Parking

Bus Stop

Footpath

Traffic Signal

BRTS Route

AHMEDABAD, INDIA

The provision of infrastructure to effectively support both new and existing developments. [33]



Metro Corridor

Off-street
Parking

Footpath

SINGAPORE

Planned public transportation nodes (bus stops, light rail) to guide development. [83]

B2.II. ADOPT OPTIMAL DENSE DEVELOPMENT

Site-specific

PURPOSE

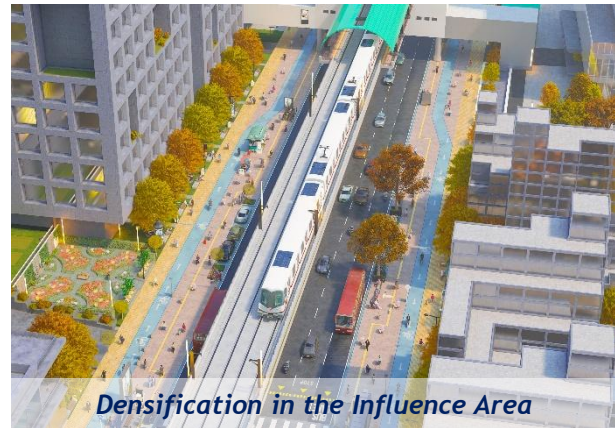
To maximize the number of people who use public transportation, bicycles, and foot traffic, strategically balance the job and residential densities inside transit corridors while taking infrastructure carrying capacities into account.

GOALS

- ◆ Permit higher density construction in the vicinity of transit hubs, taking into account the current capabilities for bicycles, pedestrians, transit, and utilities.
- ◆ Strategically distribute density to create a compact urban form.
- ◆ Adopt a tier-based Floor Area Ratio (FAR) scheme that provides higher density for projects that support vital infrastructure in the transit zone.

REFERENCE

- ◆ Consultancy Services For Developing Guidance Documents For Transit Oriented Development (TOD), Non-Motorised Transport (NMT) And Public Bicycle Sharing (PBS) by IBI Group with iTrans, MoHUA ^[22]
- ◆ Florida DOT

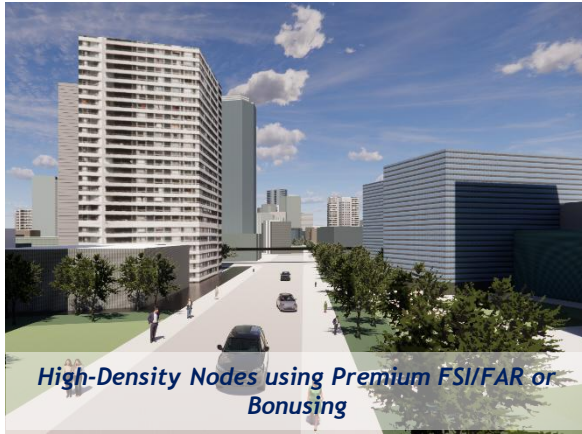


Densification in the Influence Area

I. DIFFERENTIAL LAND USE DENSITIES

- ◆ By offering a larger Floor Area Ratio (FAR)/ Floor Space Index (FSI), as well as a higher population and employment density in comparison to the surrounding and beyond the influence areas, TOD encourages densification in the affected area.
- ◆ The minimum FAR should be 300-500% to enable sustainable development. It may be greater based on the size and location of the city. This will encourage more individuals to live close to the transit station, that is, within walking distance.
- ◆ It is recommended to have a gradual different zones - Intense TOD to low -intense TOD. The available infrastructure, land use zoning, transit capacity, and market factors can all affect it.
- ◆ Land consolidation can be facilitated for larger developments.

Example: Noida Sector 51 Metro Station, UP



II. CREATING HIGH-DENSITY NODES USING PREMIUM FSI/FAR OR BONUSING

- ◆ A typical density bonus program sets a base density that development may achieve 'by right' and a maximum density that can be achieved by conforming to higher standards or by providing qualifying amenities/benefits/premium paid. ^[22]
- ◆ For increased accessibility, planning should consider the station's degree of connectedness and be in line with mass transport capacity, network features, and population and economic densities.

Example: Noida Electronic City Metro Station, UP



III. ENSURE OPTIMUM POPULATION AND HOUSING DENSITIES

- ◆ Design for buildings and unit sizes can also be adopted to increase density. On smaller-sized properties, micro-unit apartments or offices can be introduced to increase density. Their compact design can raise the number of units able to be constructed within an apartment or office building.
- ◆ Development in the peripheral zone should be allowed only if it abuts existing development areas. Minimum standards must be prescribed for urban areas in the TOD influence zone.
- ◆ 175 persons per hectare of developed areas should be the minimum standard for an urban density that begins to be transit-supportive. If higher densities are desired within the 800-m transit catchment, densification strategies should be holistically evaluated and planned for, based on local need and context.

Example: Andheri West Metro Station



IV. EMPLOYMENT DENSITIES

- ◆ The two elements that determine employment density are the quantity of space each employee occupies at work and the volume of use.
- ◆ All employees working on-site, expressed as Full Time Equivalents (FTE), should be the number of workers measured. The number of workplaces in a development should be used to reflect the number of proposed employees for regeneration and economic development projects at the ex-ante appraisal stage.
- ◆ FTE:

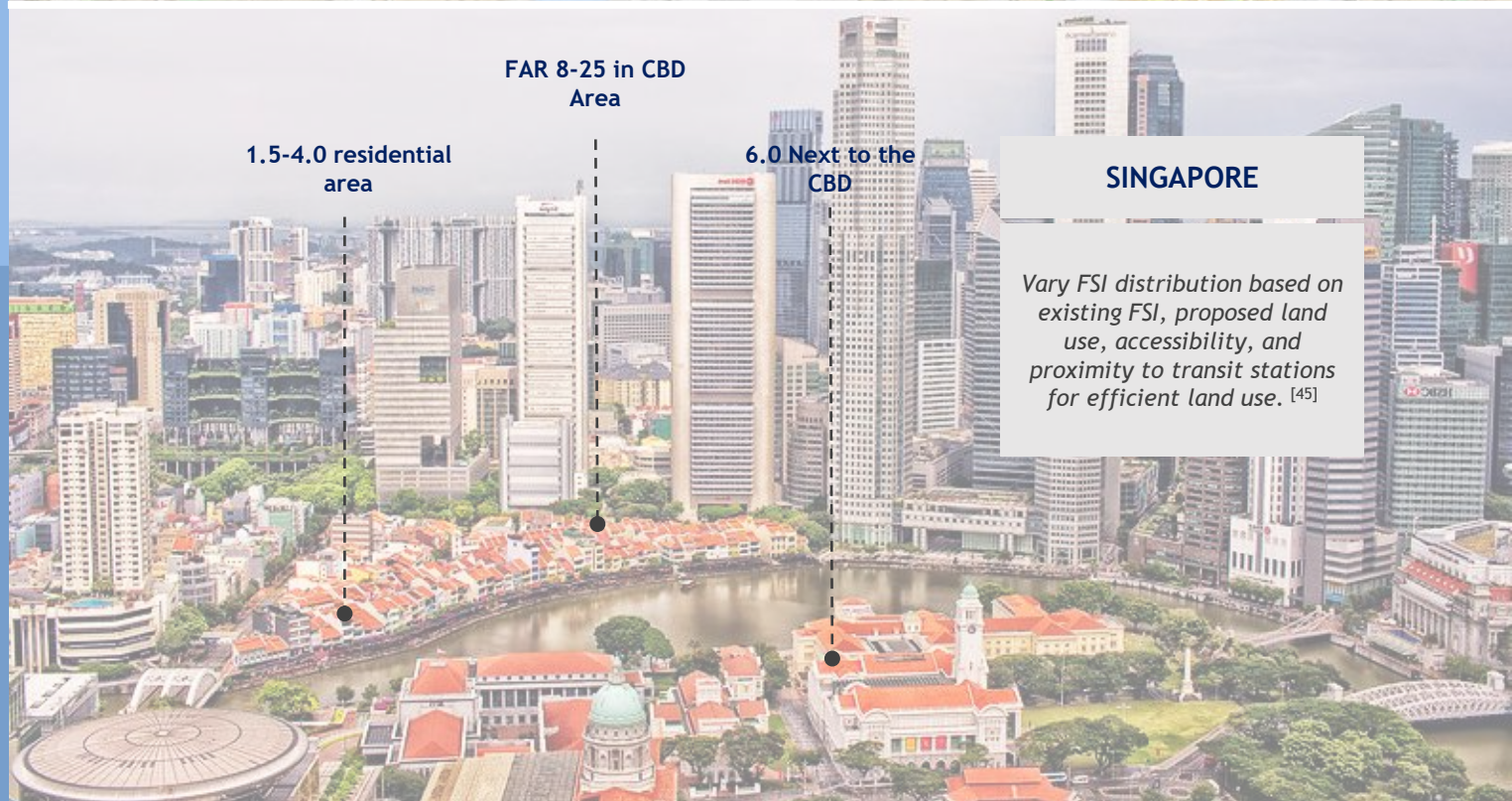
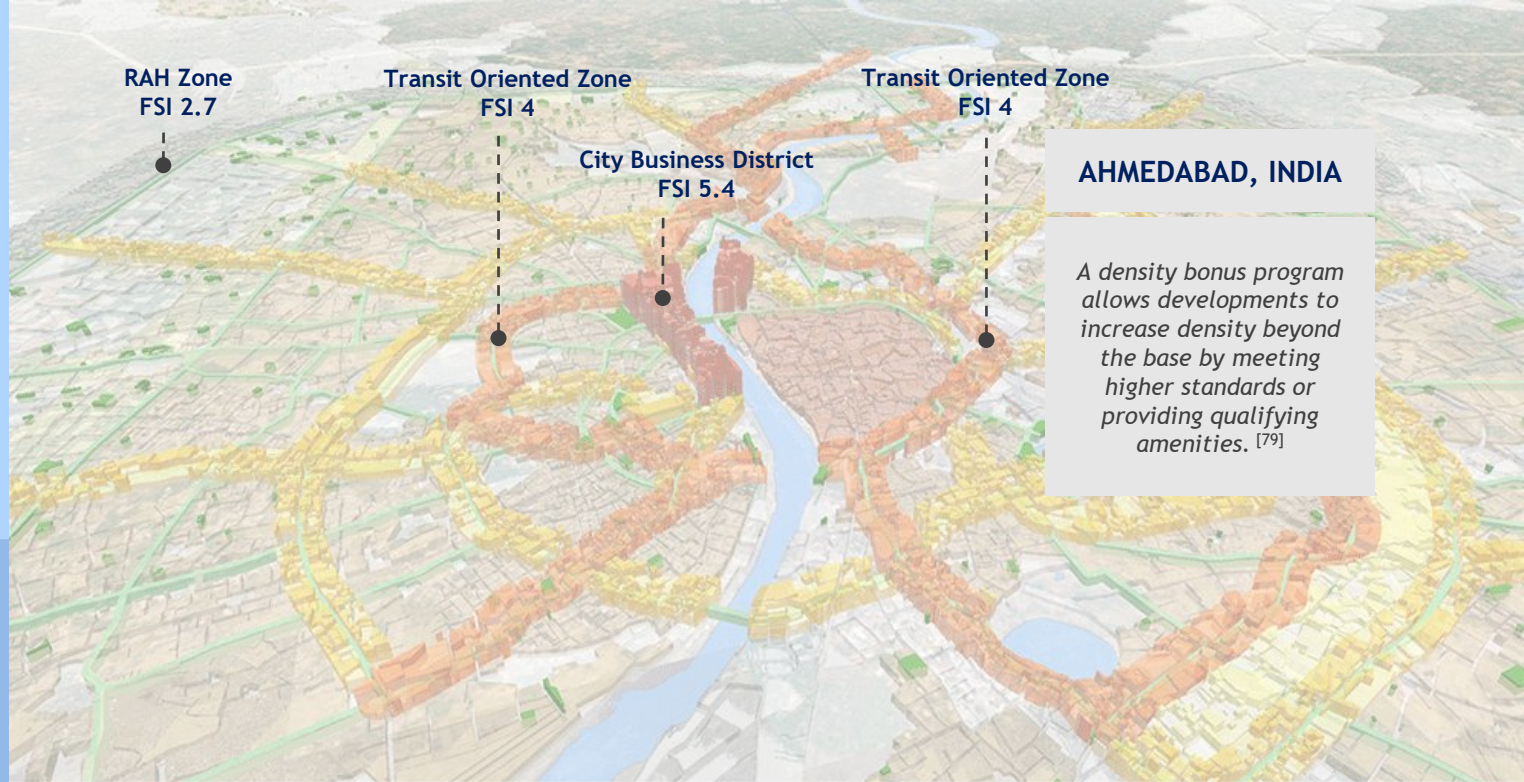
$$\frac{\text{Total number of hours worked by part-time staff (permanent on site contract staff) each week}}{\text{Number of hours in the working week (37.5 hours usually)}}$$

- Construction/industrial/office- 2 part-time equivalent = 1 FTE
- Retail/leisure/hotels/catering 2.5 part-time equivalents = 1 FTE ^[57]

Job Household Ratio Goals for the Influence Zone ^[Florida DOT]

Regional Center	6:1	6:1	6:1	6:1
Community Center	3:1	3:1	3:1	3:1
Neighbourhood Center	1:1	1:1	1:1	1:1

Example: Noida Sector 62 Metro Station, UP



B2.III. AFFORDABLE HOUSING

Site-specific

PURPOSE

Housing regulations should be around TOD corridor and not outskirts. Should mandate minimum dwelling unit size and incentives for smaller units. A range of housing kinds, styles, pricing points, and tenure possibilities should be included in this mix.

GOALS

- ◆ Give equal access to TOD by guaranteeing that all urban dwellers have access to a variety of affordable housing options within 10 minutes by foot or bicycle from transit stations.
- ◆ Ensure a minimum number of low- and middle-income housing options that are affordable and accessible by foot or bicycle from transit stops, job hubs, and leisure facilities.

REFERENCE

- ◆ Rajiv Awas Yojana - Guidelines for Slum-free City Planning by MoHUPA^[47]
- ◆ Delhi Transit Oriented Development (Tod) Policy by MohUA^[53]



I. PROVIDE FORMAL SUPPLY OF AFFORDABLE HOUSING STOCK WITHIN TOD INFLUENCE ZONE

- ◆ According to local acts or rules, any private or public apartment complex or group housing project with a site size larger than 2,000 square m is required to set aside a minimum floor area ratio (FAR) for affordable housing units.
- ◆ Draft a slum redevelopment plan as per the Rajiv Awas Yojana guidelines, a slum redevelopment plan including the private sector, or a town planning scheme to pool land and reconstruct plots in greenfield areas.^[47]

Example: Andheri West Metro Station, Mumbai



EWS Housing

II. MANDATORY AND INCLUSIVE HOUSING

- ◆ The cities should fix a minimum percentage (30% or higher) of allowed FAR for affordable housing (for example up to 60 sq. m. area) in all development/redevelopment in the influence zones. ^[53]
- ◆ If a TOD scheme consists of plots without any residential development currently in place, atleast half of the residential FAR must be developed into dwelling units of 80 sq m or larger by giving incentives to EWS housing builders such as increased FSI, TDR, etc. ^[53]
- ◆ The EWS FAR shall be 15% over and above the maximum permissible residential FAR. A distinct, well-designed region within the scheme with low- to mid-rise, high-density built form, access to public open spaces, and social amenities to satisfy the requirement for EWS housing. ^[53]

Example: Housing Scheme, AUDA, Ahmedabad



Affordable Housing Scheme

III. ADOPT INCENTIVES IN PROMOTING HOUSING FOR ALL IN TOD AREAS

- ◆ In addition to required reservations, projects that provide affordable housing inside TOD regions are eligible for the following incentives, according to the amount of EWS and housing mix by units by LIG housing in terms of FAR used: ^[53]
 - Fast-track approval process
 - Exemption from building plan sanction fee

Example: Housing Scheme, AUDA, Ahmedabad

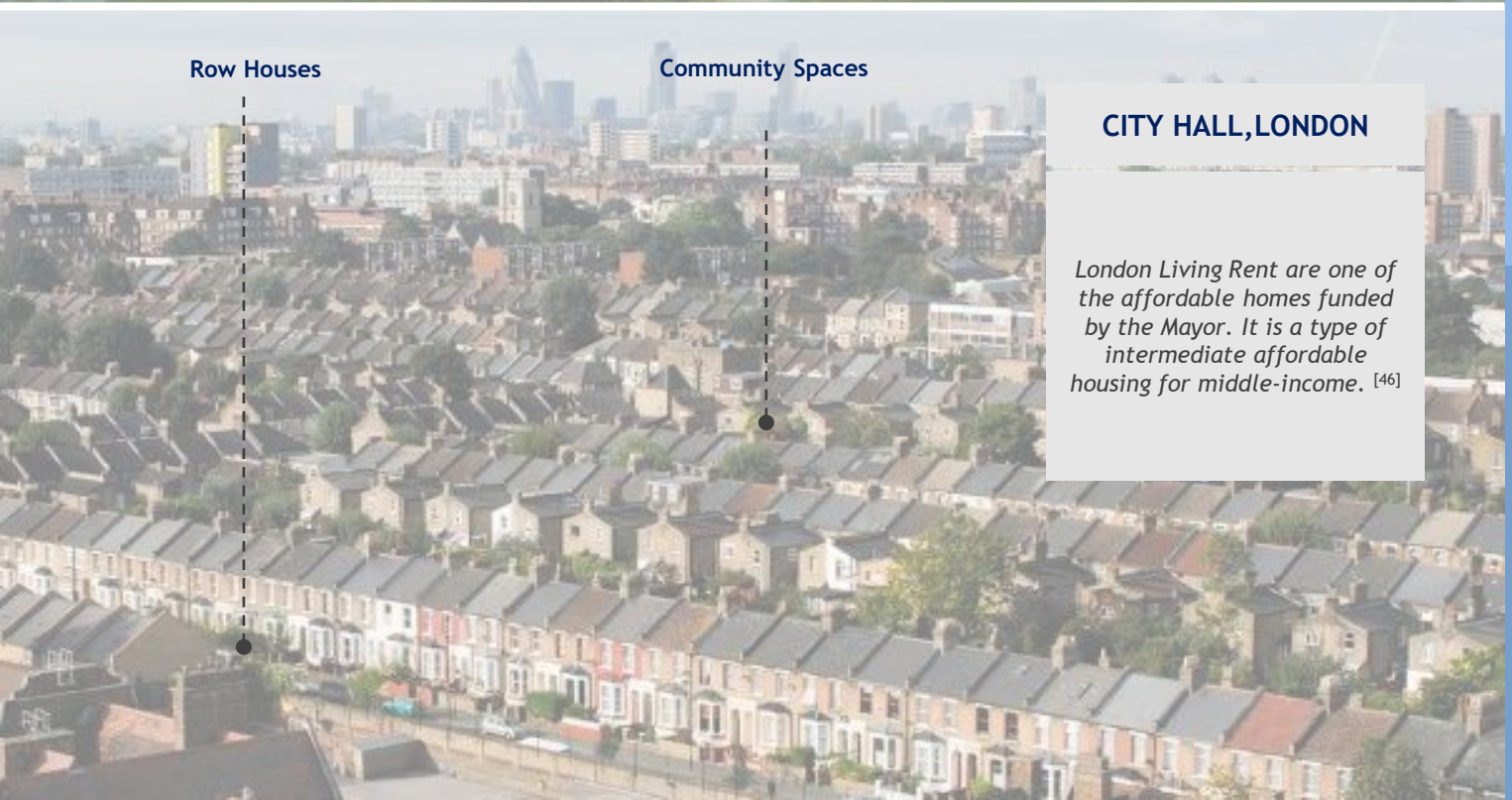


Multi-storied
Apartments

Open Space

DDA FLATS ,DELHI

TOD housing should mix income levels (EWS, LIG/MIG) for inclusive, walkable neighborhoods. [20]



Row Houses

Community Spaces

CITY HALL,LONDON

London Living Rent are one of the affordable homes funded by the Mayor. It is a type of intermediate affordable housing for middle-income. [46]

B2.IV. PROMOTE MIXED USES

Site-specific

PURPOSE

TOD plans justify increased service frequency by clustering population and a variety of land uses (housing, employment) near transit stops, which increases patronage.

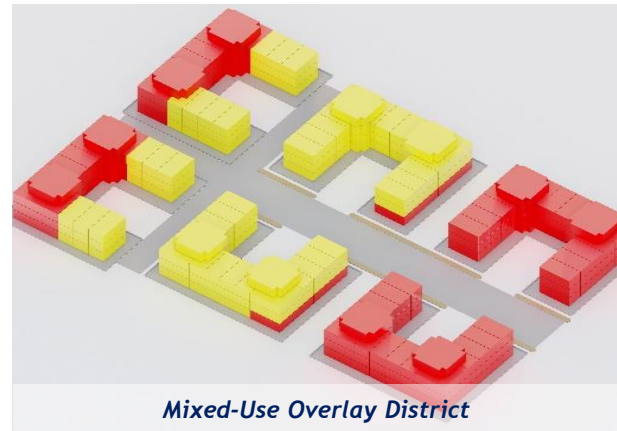
GOALS

- ◆ Adopt compact, mixed-use construction patterns to reduce reliance on automobiles and foster lively, walkable urban areas.
- ◆ Prioritise transforming under-utilised, single-use corridors along transit alignments into higher-density, mixed-use communities.
- ◆ Mixed-use developments improve pedestrian traffic, safety, and economic viability.

REFERENCE

- ◆ Transforming the Urban Space through Transit-Oriented Development, 2016 by The World Bank Group^[80]
- ◆ TOD Implementation Resources and Tools, 2018 by The World Bank Group^[17]
- ◆ Transit-Oriented Development Implementation Resources and Tools: Second Edition, 2021 by The World Bank Group^[67]

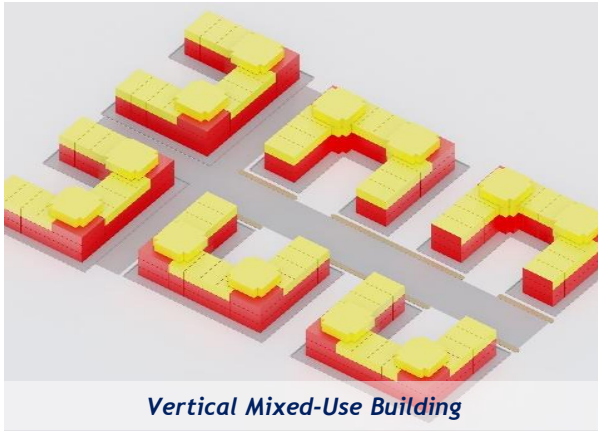
COMPONENTS



I. MIXED-USE OVERLAY DISTRICT

- ◆ For development or redevelopment in the TOD zone, mixed land use should be specified since it would minimize the need for travel by placing the majority of activities – Work/Office-live-play– within walking distance of the homes. ^[80]
- ◆ Instead of generating unidirectional peak-hour flows, this would enable better utilization of the transit fleet by dispersing loads in both directions. ^[80]
- ◆ Combining different land uses allows for the best use of available resources and physical infrastructure because everything from parking lots to roadways to water and sewer systems is always in working order. ^[80]

Example: Noida Metro Station 81, UP

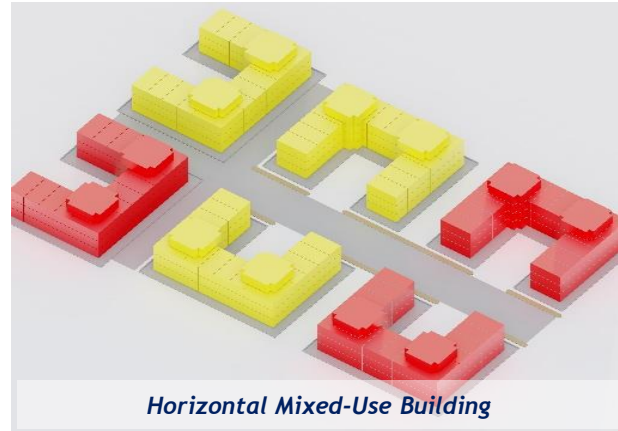


Vertical Mixed-Use Building

II. VERTICAL MIXED-USE BUILDING

- ◆ In all integrated schemes, the overall FAR may be distributed as follows:^[80]
 - Residential use: Minimum 30%
 - Commercial: Minimum 10%
 - Community facilities: Minimum 10%
- ◆ The distribution can also be different as per intensity of TOD zones (High influence to low influence zone)
- ◆ For the remaining 50% of the FAR, the mix of uses and FAR utilization shall correspond to the land use category specified in the Zonal Plan.^[53]

Example: The Shards, London, UK

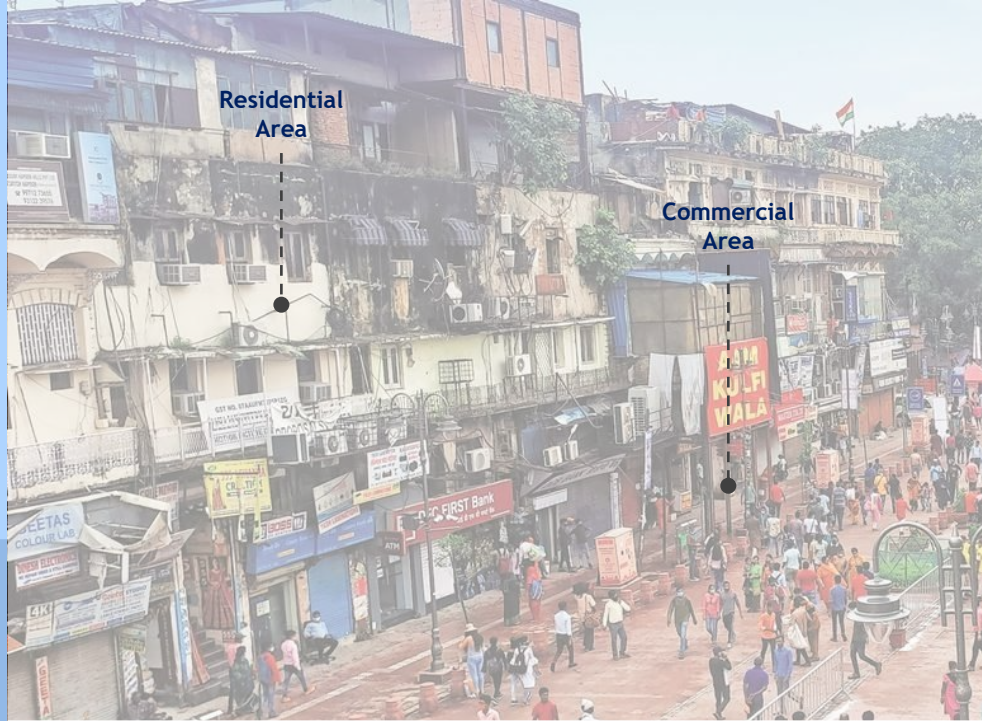


Horizontal Mixed-Use Building

III. HORIZONTAL MIXED-USE BLOCKS

- ◆ TOD zone shall be marked in all relevant Master Plan and Zonal Plans. This zone shall allow flexibility in giving the provision for various uses within the same plot, except for polluting and potentially hazardous uses.^[80]

Example: Monopolis Project, Lodz, Poland

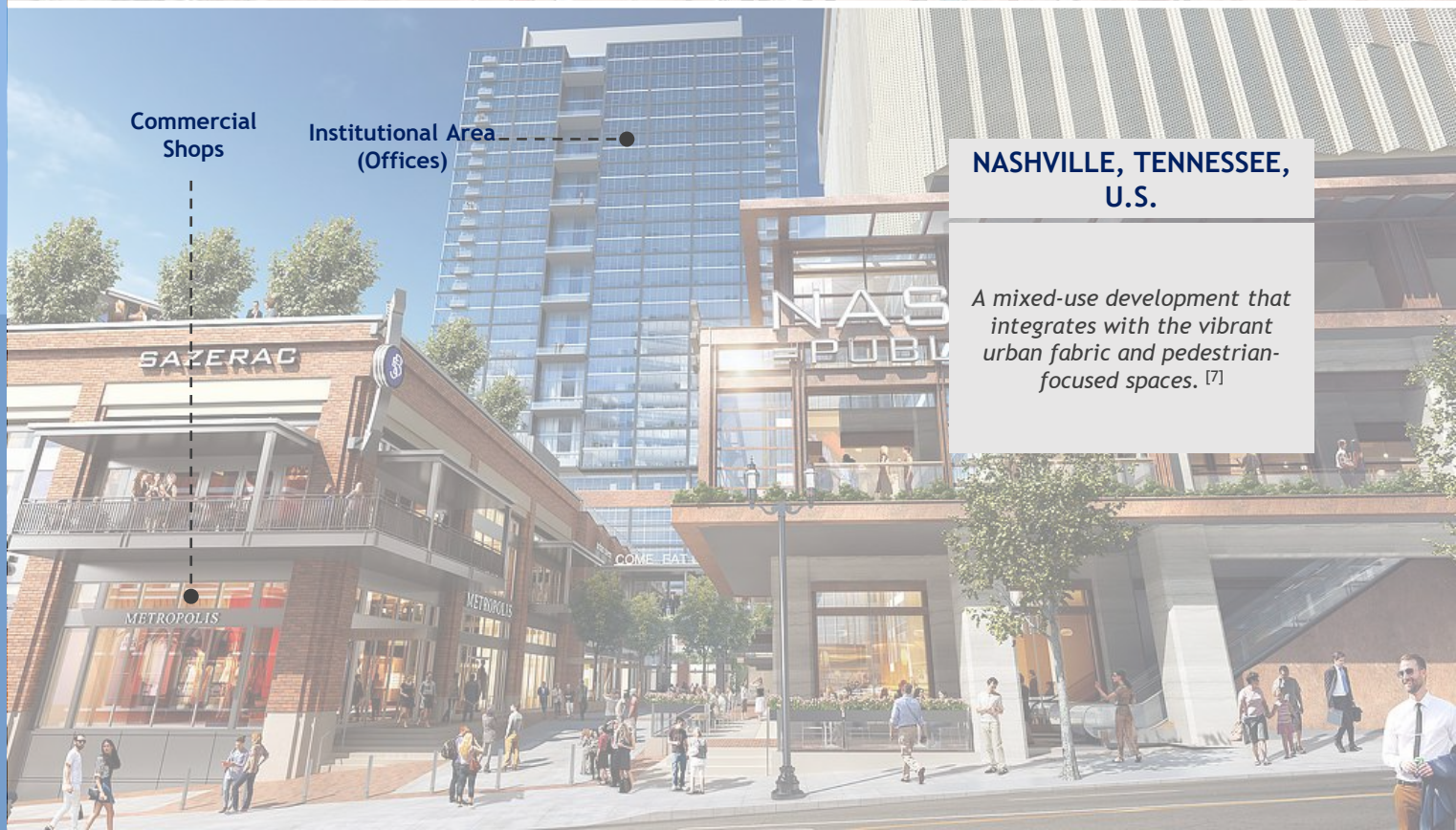


Residential Area

Commercial Area

CHANDNI CHOWK, NEW DELHI

Chandni Chowk has evolved from a marketplace and important buildings to a busy center of commerce and culture. High-density buildings can accommodate uses from street vending to commercial spillover and residential uses within the same locality. [18]



Commercial Shops

Institutional Area
(Offices)

NASHVILLE, TENNESSEE, U.S.

A mixed-use development that integrates with the vibrant urban fabric and pedestrian-focused spaces. [7]

B3.I. PROMOTE ACTIVE GROUND FLOOR AND STREET FRONTAGE OF BUILDING

Common for all stations

PURPOSE

Provide incentive based planning to have active frontage. For eg - discount on premium FSI if first two floors follow built to line and commercial front. This strategy improves walkability and user experience by cultivating a superior pedestrian environment.

GOALS

- ◆ Build mixed-use, walkable communities where people may get everyday necessities without using a car.
- ◆ Promote the conversion of low-density, single-use regions into mixed-use, higher-density buildings along transit routes.
- ◆ Encourage thriving, mixed-use development that promotes safe pedestrian traffic.

REFERENCE

- ◆ Consultancy Services For Developing Guidance Documents For Transit Oriented Development (TOD), Non-motorised Transport (NMT) And Public Bicycle Sharing (PBS) by IBI Group with iTrans, MoHUA ^[22]
- ◆ Transit Oriented Development (TOD) Policy and Implementation Framework by UTTIPEC^[53]



Active Street Frontage

I. ACTIVE STREET FRONTAGE

- ◆ Arcades, storefronts, entrance doors, access points, entry/exits, and transparent windows of active areas are examples of active frontages. These features provide a natural surveillance system and a safe and interesting pedestrian environment.
- ◆ No provisions (balconies, awnings, etc.) shall be allowed beyond the built-to line.
- ◆ To allow visual monitoring of streets, the primary building facade(s) for integrated TOD plans shall face the public street(s) without setback and have an active frontage in accordance with the following standards.^[22]

Examples: MG Road and Vidhana Soudha Metro Station, Bengaluru



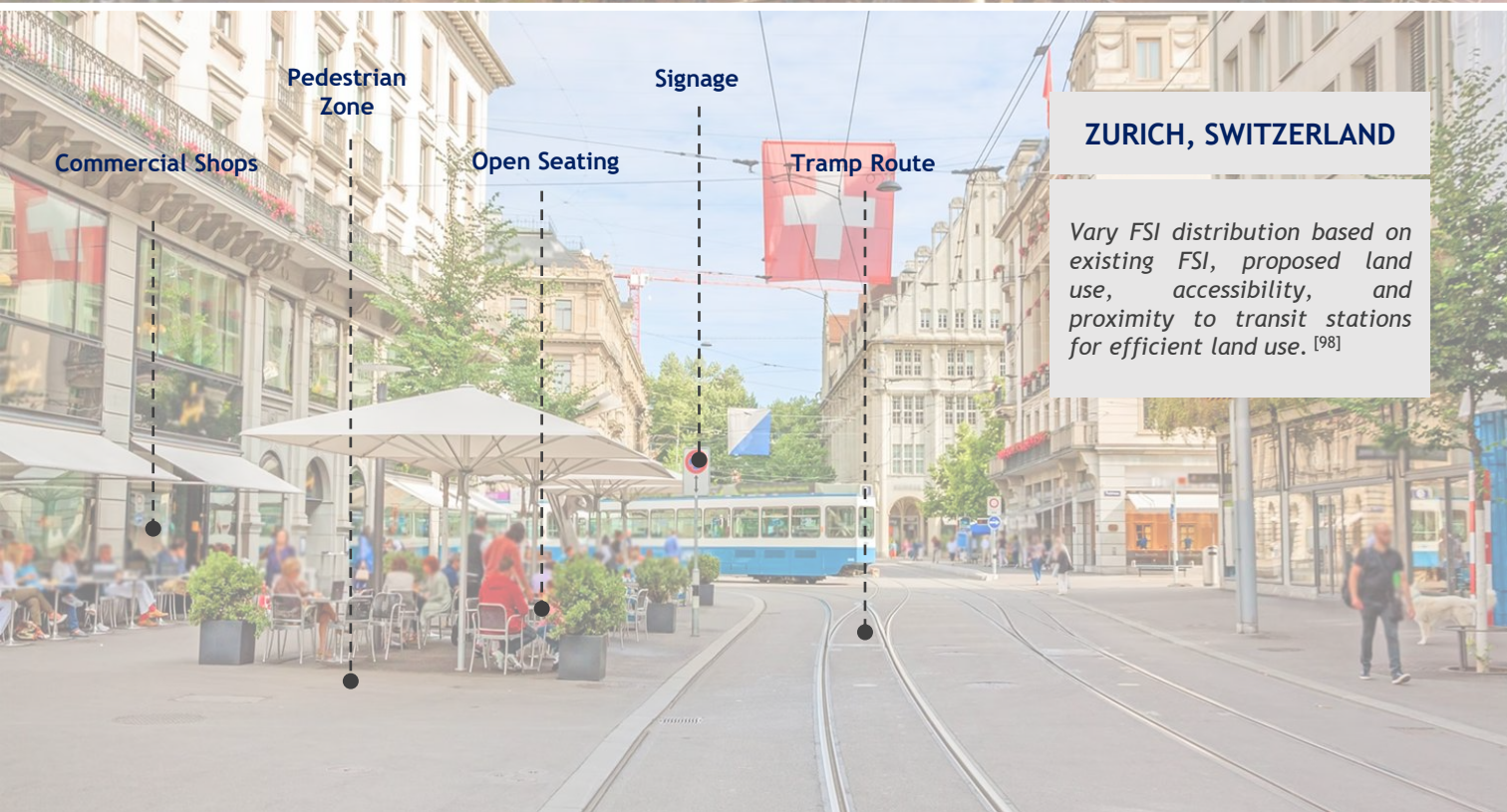
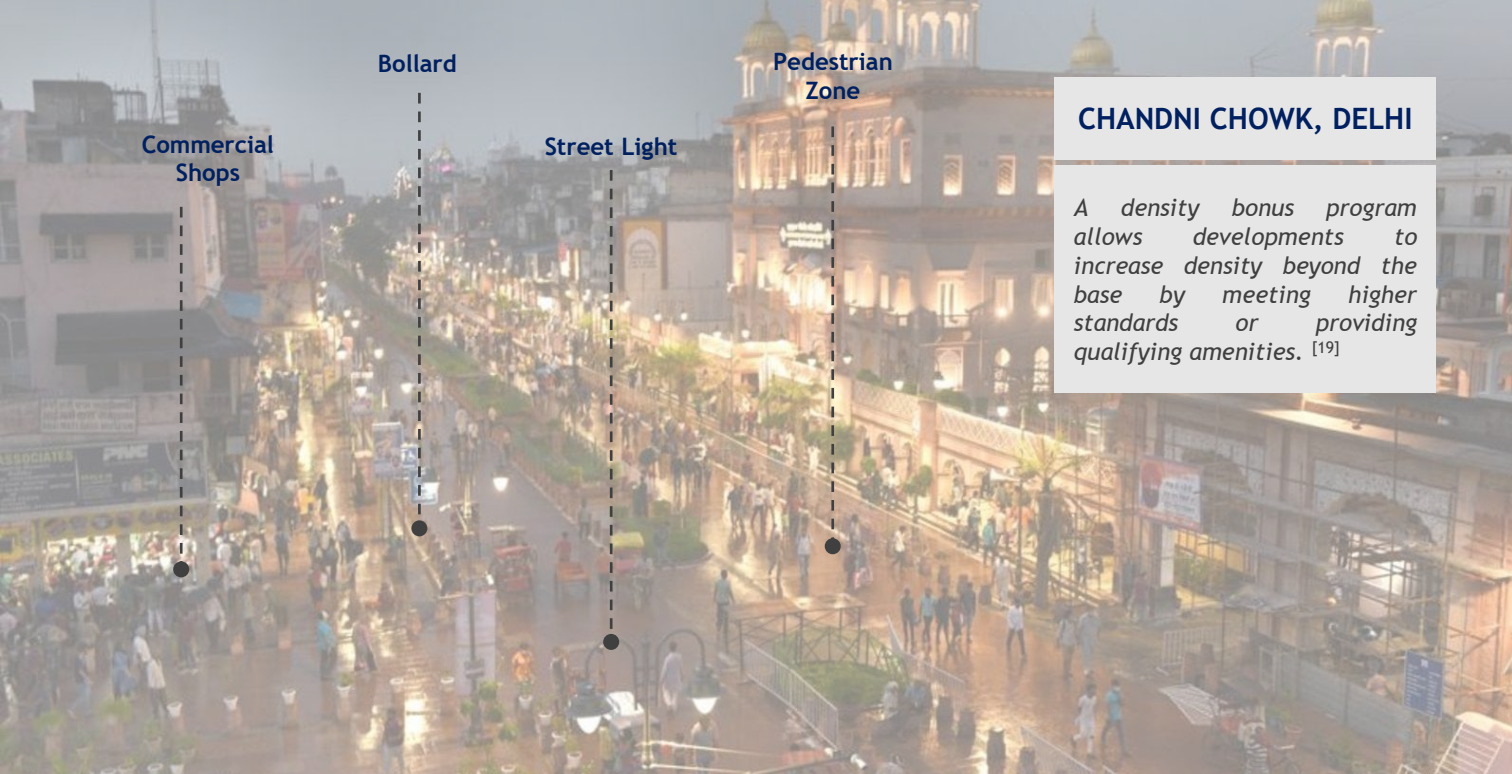
Facing Street RoW Frontage ^[7]	Min. percent of building frontage at built-to right of way line to have active frontage
Right of Way ≥ 18 m	- No front setback required - At least 90% of the building shall be built-to- edge with active frontage provisions
Right of Way < 18 m	6 m setbacks - The setback to be kept unblocked at all the times for public movement.
Shared edge with adjoining plots	Trees/plantations for noise reduction and utilities like fire hydrants shall be permitted.

- ◆ Incentives such as premium FSI shall be granted if the first two stories are constructed to line and have a commercial front.

II. BOUNDARY WALL

- ◆ Boundary walls along any border facing a public open space—such as a road, park, or pathway—must not be built in any TOD project. Transparent fencing must be utilized if site enclosure is necessary.^[53]
- ◆ If a compound wall is present, it shall be transparent above a height of 100 cm, with the exception of very secure government buildings.^[22]
- ◆ At least 50% of the ground floor's transparent, uncolored façade should be able to accommodate commercial activities.
- ◆ The desired wall-to-window ratio shall be maintained at 15-35%
- ◆ Commercial frontage shall have minimum of 50% transparency (un-tinted) at ground floor level.

Example: Bukit Bintang, Malaysia



B3.II. VIBRANT ACTIVE AND SAFE PUBLIC SPACES

Common for all stations

PURPOSE

Enhance transit accessibility: They encourage walking and bicycling by creating a friendly and secure environment. Open space should be accessible for everyone within 5-10 min walking distance

Community cohesion: By acting as hubs for activity, these spaces encourage a sense of community and bring people to the area around the train station.

GOALS

- ◆ Encouraging active travel on public transportation ultimately aims to increase ridership and promote sustainable mobility.
- ◆ Social movers: Well-designed public spaces attract locals by acting as social hubs.
- ◆ As a result, a lively and appealing environment will be created for living, working, and playing.

REFERENCE

- ◆ Urban And Regional Development Plans Formulation And Implementation (URDPFI) Guidelines by T&CP, MoUD Transit-Oriented Development ^[95]
- ◆ TOD Implementation Resources and Tools: Second Edition by The World Bank Group ^[67]



Urban Design and Place Making

I. URBAN DESIGN AND PLACE MAKING

- ◆ Place-making and intelligent urban planning can create a sense of community and place. To improve the neighbourhood's general quality of life and to promote interpersonal communication, provide visually beautiful parks, common places, and open areas.
- ◆ Within the TOD zone, each citizen should have access to 10-12 square m of open space at city level scale.^[95]
- ◆ 20% of the combined property must be developed as a publicly accessible green space.

Example: Cubbon Park Metro, Bengaluru



II. PUBLIC REALM

- ◆ Neighbourhood park: Accessible within 800 m by walking or bicycle ^[67]
- ◆ Public sports venue: Accessible within 1,200 m by walking or bicycle. ^[67]
- ◆ The public spaces should be connected through sidewalks, pedestrian paths, or cycling paths. ^[67]

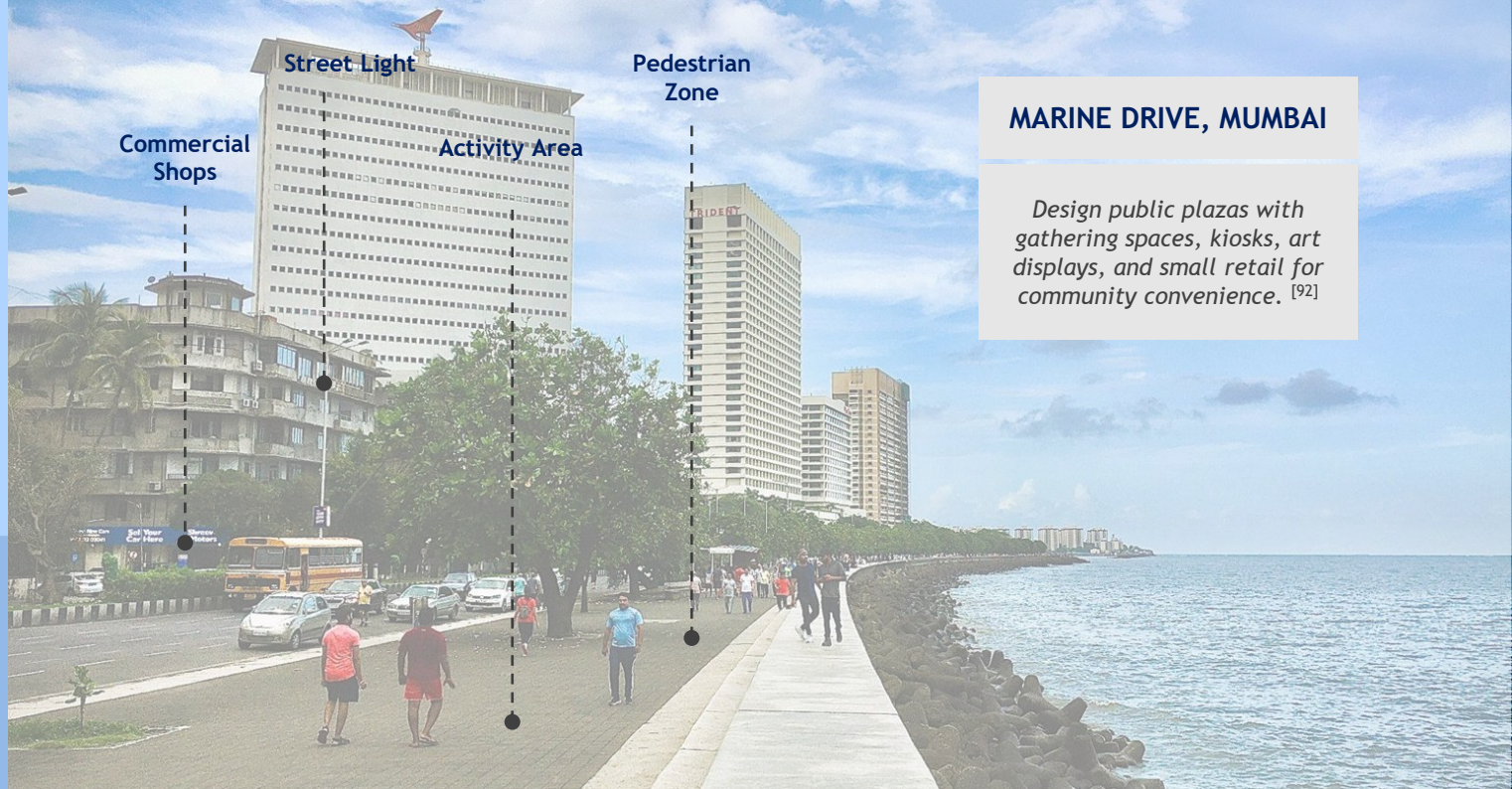
Example: Noida Biodiversity Park, Noida



III. PEDESTRIAN-FRIENDLY STREET

- ◆ Pedestrian-only streets are generally most appropriate in corridors with commercial activity on both sides of the street. They are strategically selected in areas where pedestrian volume is high and vehicular traffic can be restricted. Many street activities such as shopping, eating, promenades, and entertainment can be done on these streets. These streets can also become popular destinations that boost the local economy.

Example: Chandni Chowk, Delhi and Leh Market, Leh, Ladakh



Commercial
Shops

Street Light

Activity Area

Pedestrian
Zone

MARINE DRIVE, MUMBAI

Design public plazas with gathering spaces, kiosks, art displays, and small retail for community convenience. [92]



Children's Play
Area

Pedestrian
Zone

Public Gathering Space

Open Seating

WEST BUND, SHANGHAI

Encourage retail and cafes with 50% transparent facades along main streets for a safe, engaging pedestrian environment. [84]

B3.III. INCORPORATE DIVERSE USES AND INFORMAL ACTIVITIES

Common for all stations

PURPOSE

Prioritize active uses, such as retail, along ground floors of buildings in key areas like main streets, intersections, and station areas. Utilize transparent facades to enhance pedestrian engagement and create a vibrant public realm.

GOALS

- ◆ Enhance pedestrian safety by incorporating natural surveillance like ‘eyes on the street’.
- ◆ Establish design guidelines promoting the cohesive integration of public realm elements with private development at the street edge.
- ◆ Develop inclusive TOD strategies that integrate existing informal settlements.
- ◆ Formalize rickshaws and mini-buses as public transit feeders through designated stops, routes and management.

REFERENCE

- ◆ TOD Standard by ITDP^[34]
- ◆ National Transit Oriented Development (TOD) Policy by MoHUA^[48]
- ◆ The Street Vendors (Protection of Livelihood And Regulation of Street Vending) Act by MLJ GoI^[54]



Street Vendors

I. STREET VENDORS

- ◆ Prepare a plan for street vending within the influence zone of the transit station ^[54]
- ◆ Demarcate areas within the influence zone as:
 - Restriction-free vending zones
 - Restricted vending zones
 - No-vending zones
- ◆ Vending zones are to be provided within 50 m of walking distance from the exit of the station facility.
- ◆ All residences and workplaces to have vending zones within approximately 10-minute walking distance.^[54]
- ◆ Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas.^[48]

Example: Chattarpur Metro Station, Delhi

- Informal units for urban street vendors to be provided as follows:(URDPFI) ^[54]
 - Commercial areas: 3 to 4 retail units per 10 formal shops
 - Workplaces: 5 to 6 units per 1,000 government or office employees
 - Wholesale trade and freight complexes: 3 to 4 units per 10 formal shops
 - Hospitals: 3 to 4 units per 100 beds
 - Bus terminals: 1 unit per 2 bus bays
 - Regional or district parks: 8 to 10 units at each major entry
 - Neighborhood parks: 2 to 3 units.

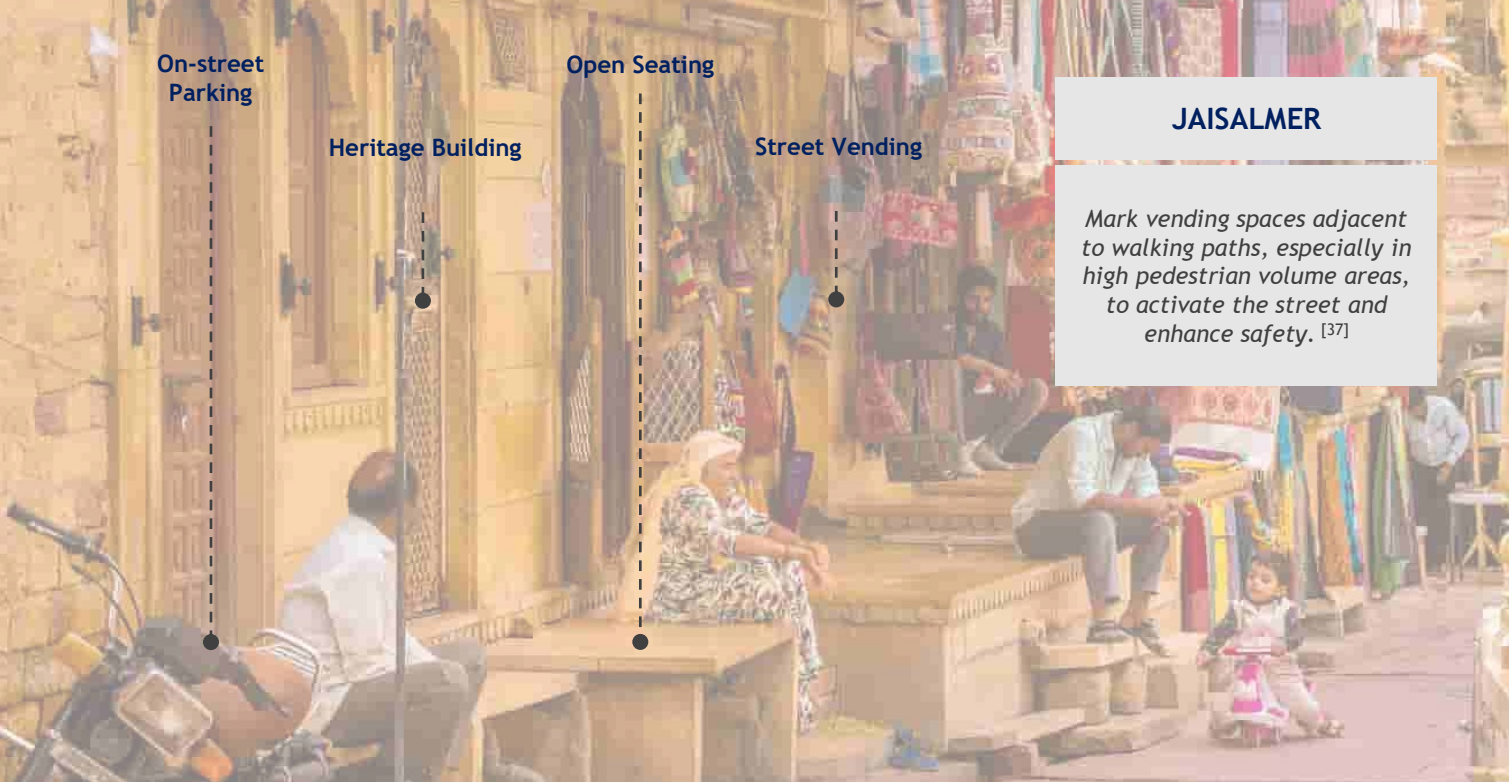
Road Width (in meters) ^[54]	Vending	Type of Vending	Exemption
= 3.5	Not allowed	Stationary	Vending maybe allowed if such road is declared as a no-vehicular road
> 6 < 9	Not allowed	Stationary	Street vending may be allowed if such road is declared as a one-way vehicular road.
> 12 < 24	Allowed	Stationary-one side	-
< 30	Allowed	Stationary-two side	-



II. DESIGN FOR INTEGRATED INTERMEDIATE PUBLIC TRANSPORT SYSTEM AT TRANSIT STOP/STATION

- ◆ Organize IPT and feeder bus systems within 800 m from the transit station facility through Dial-an-auto/rickshaw services, pre-paid booths, passenger pick-up and drop-off areas or remote IPT/taxi parking lots. (Refer to Chapter 4, B1.II)

Example: Tiger Circle, Manipal, Karnataka



On-street
Parking

Heritage Building

Open Seating

Street Vending

JAISALMER

Mark vending spaces adjacent to walking paths, especially in high pedestrian volume areas, to activate the street and enhance safety. ^[37]



Street Vending
Lane

Pedestrian Zone

RIPE MARKET, DUBAI

Establish vending zones categorized as restriction-free vending zones, restricted vending zones, and no-vending zones. ^[72]

B3.IV. INTEGRATE ARCHITECTURAL VARIETY

Common for all stations

PURPOSE

The aim is to provide equal opportunities for all individuals for accessing public and private spaces, ensuring that everyone can participate in community life. This will also help to maintain the cultural identity and character of the area.

GOALS

- ◆ Provide equal access to the built environment for everyone, including individuals with physical, sensory, and cognitive disabilities.
- ◆ Emphasize the importance of retaining historic features and architectural heritage.

REFERENCE

- ◆ Time-saver standards for architectural design by McGraw Hill ^[101]
- ◆ Part 3 Development Control Rules And General Building Requirements, 2016 by NBCI ^[61]



I. DESIGN FOR BARRIER-FREE ACCESSIBILITY

- ◆ Ensure that the design of buildings and public spaces in the TOD area is barrier-free, providing easy access for people with mobility impairments, the elderly, children and parents with baby strollers.
- ◆ Guidelines for accessibility standards:^[101]
 - Access aisle to be at least 1,500 mm wide by 600 mm long and placed adjacent and parallel to the vehicle pull-up space
 - The accessible aisle must be at the same level as the vehicle
 - The minimum clear width of an accessible route should be 1,500 mm to allow both a wheelchair and a walking person to pass. Additional manoeuvring space to be provided at the doorways.
 - Where space is required for two wheelchairs to pass, the minimum clear width should be 1,800 mm.



- ◆ On long travel paths, resting areas should be provided at maximum intervals of 30 m.
- ◆ The floor should be levelled or with a maximum slope of 1:20. If greater, the floor should be designed as a ramp. ^[101]
- ◆ Illumination level: Minimum 150 lux.
- ◆ Handrails should be slip-resistant with round ends. The circular sections should be 38 mm-45 mm. It should have a minimum clear space of 50 mm from the walls. The clear width of the ramps should be 1,200 mm. ^[101]
- ◆ Dimension of the accessible car parking: 5,000 mm x 3,600mm ^[61]

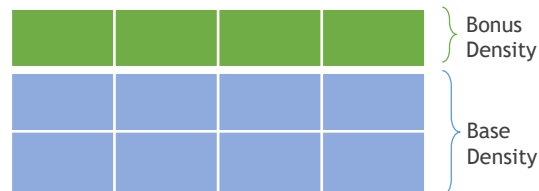
Example: Shibuya Station, Tokyo, Japan

Recommendation for Ramp Gradient ^[101]

Level Difference (mm)	Minimum gradient of Ramp	Ramp Width (mm)	Landing
$\geq 150 \leq 300$	1:12	1,200	
$\geq 300 \leq 750$	1:12	1,500	Every 5 m of ramp run.
$\geq 750 \leq 3,000$	1:15	1,800	Every 9 m of ramp run.
$\geq 3,000$	1:20	1,800	

II. INCENTIVIZE ARCHITECTURAL INNOVATION

- ◆ Provide development incentives such as density bonuses, expedited permitting, tax credits, or fee waivers for projects that incorporate innovative architectural design principles or contribute to architectural diversity within the TOD zone. Incentives can encourage developers to go beyond conventional design norms and explore creative solutions.



Example: Delhi TOD Policy, 2021



III. PROMOTE ADAPTIVE REUSE

- ◆ Encourage adaptive reuse of existing buildings and structures within TOD areas to preserve architectural heritage and add character to the built environment. Adaptive reuse projects can incorporate historic buildings, industrial facilities, or warehouses into mixed-use developments, contributing to architectural variety and cultural richness.

Example: Noida Metro Rail Corporation and Taj Mahal Metro Station, Agra

Metro Corridor

Heritage Building

Taj Mahal, Agra

Offer incentives for innovative designs or architectural diversity in TOD zones, such as density bonuses, expedited permitting, tax credits, or fee waivers. ^[69]

Metro Station

Connecting Street

Footpath

Kowloon Station, Hong Kong

Promote balanced design in TOD frameworks, emphasizing diversity, coherence, sensitivity, scale, continuity, and placemaking. ^[104]

B4.I. TRAFFIC MANAGEMENT MEASURES

Common for all stations

PURPOSE

Traffic management measures should be designed using speed data from non-peak hours to ensure effectiveness in various traffic conditions.

GOALS

- ◆ Prioritize pedestrian and cyclist safety/comfort for seamless transit access.
- ◆ Slow traffic near transit stations for safer pedestrian and cyclist access.
- ◆ Create safer streets with slower traffic for transit users.

REFERENCE

- ◆ Guidelines for Pedestrian Facilities (IRC 103:2022) [28]
- ◆ National Mission on Sustainable Habitat by MoHUA [49]
- ◆ Guidelines for Traffic Calming Measures in Urban and Rural Areas (IRC 99:2018) [27]
- ◆ Healthy Streets Design Workbook by NIUA, ITDP, MoHUA [64]
- ◆ Transit Oriented Development (TOD) Policy and Implementation Framework by UTTIPEC [53]



Pedestrian Crossing Enhancement

I. PEDESTRIAN CROSSING ENHANCEMENT

- ◆ The level of pedestrian-vehicle conflict should determine whether the pedestrian crossing facility is to be provided at a junction. [28]

	PV ² value ranges	2-lane undivided	4-lane divided	6-lane divided
Crossing facility	No facility	< 1.00 × 10 ⁸	< 2.00 × 10 ⁸	< 2.00 × 10 ⁸
	Zebra crossing	1.00 × 10 ⁸ - 6.41 × 10 ⁹	2.00 × 10 ⁸ - 1.14 × 10 ¹⁰	2.00 × 10 ⁸ - 2.78 × 10 ¹⁰
	Signalized crossing	6.41 × 10 ⁹ - 2.66 × 10 ¹⁰	1.14 × 10 ¹⁰ - 4.92 × 10 ¹⁰	2.78 × 10 ¹⁰ - 1.17 × 10 ¹¹
	Grade separated crossing	> 2.66 × 10 ¹⁰	> 4.92 × 10 ¹⁰	> 1.17 × 10 ¹¹

Example: Chattarpur Metro Station, New Delhi



Pedestrian Crossing Enhancement and Signal



Grade- Separated Structure

- ◆ **Mid-block pedestrian crossing interval:** ^[28]
 - Residential Areas: 80-250 m
 - Commercial/Mixed Use: 80-150 m
 - High-Intensity Commercial Areas: Pedestrianization if possible
- ◆ **Pedestrian refuge:** A pedestrian refuge that is at least 1 m wide at each street crossing point after crossing a motor vehicle carriageway that is 7-m-long in one direction or 10-m-long in both directions for non-signalized midblock crossings. ^[49]
- ◆ **Grade-separated structures:** Grade-separated structures should be provided wherever necessary. ^[49]
- ◆ **Pedestrian-friendly street:** Areas with high pedestrian activity zones should be limited to a maximum speed of 10 km/hr. ^[27]

- ◆ **Raised junctions:** By encouraging slower driving and better road interactions, the elevated platform lowers the chance of accidents. Because these intersections are elevated, vehicles are given a visual indication to be cautious in certain regions.
- ◆ **Speed breakers:** Speed breakers are cast-in-situ in the carriageway and provide a smooth reduction in motor vehicle speeds. The speed hump should be provided at a distance from the speed table (as per IRC:99-2018) for a smooth reduction in motor vehicle speeds. ^[64]
- ◆ **Table top crossing:** Tabletop crossing is a crossing raised at the footpath level, extending to the carriageway's full width. ^[46] Material differences on the carriageway can be provided up to a distance of 10-20 m from the speed tables to slow down traffic and ensure pedestrian safety.
- ◆ The typical four-arm junction is shown in Annexure A8.

Example: C.G. Road, Ahmedabad



III. TRAFFIC SIGNALIZATION

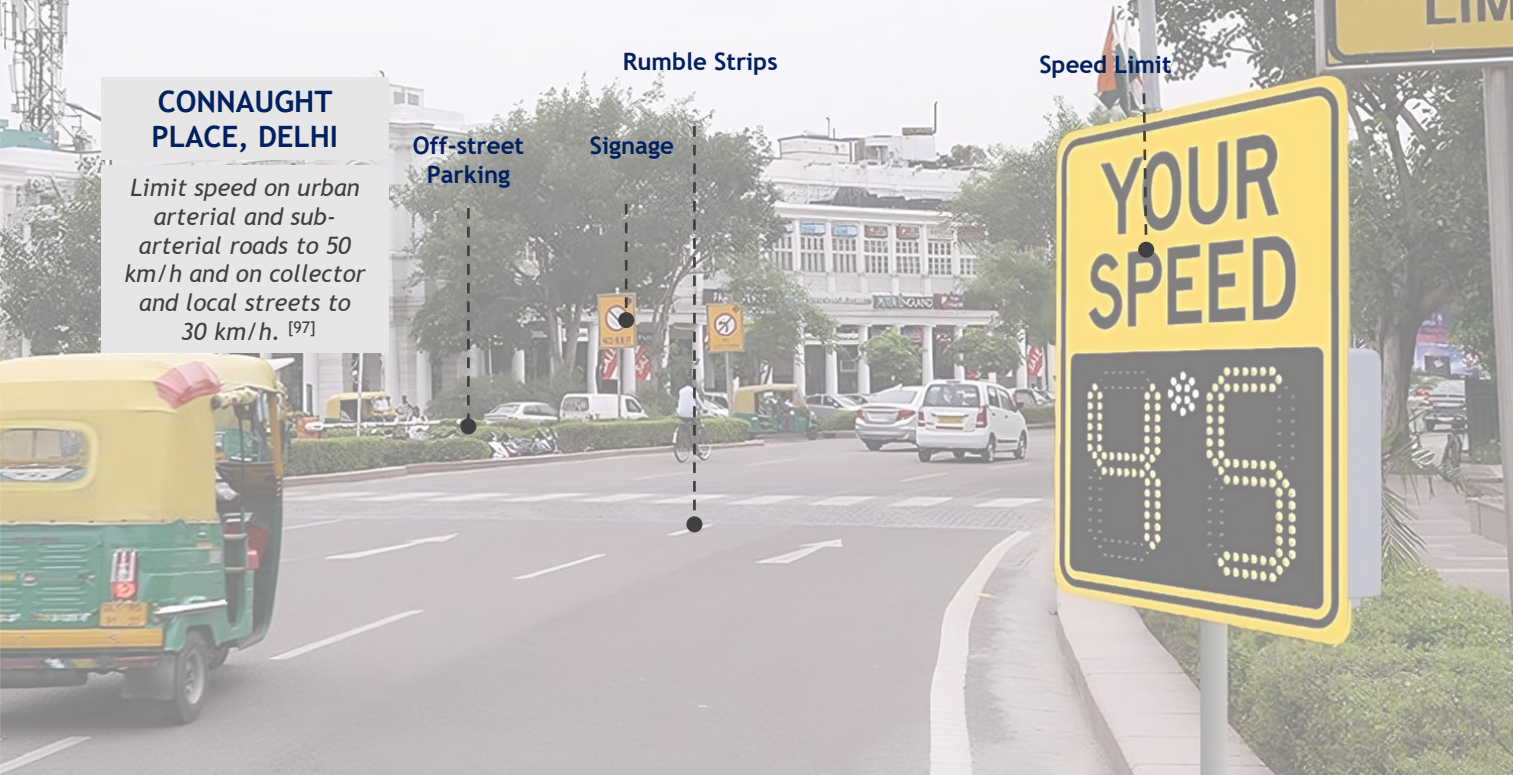
- ◆ The desired average waiting time for a pedestrian is not more than 45 seconds. ^[53]
- ◆ Auditory signals should be provided for the differently abled.

Example: C.G. Road, Ahmedabad

IV. REDUCED SPEED LIMITS

- ◆ Speed limits on urban roads are as follows:^[27]
 - Arterial Roads : 50km/h
 - Collector Roads: 30km/h
 - Residential Roads: <20km/h
 - High Pedestrian Activity Zones: 10km/h

Example: Smart Janpath, Bhubaneshwar



CONNAUGHT PLACE, DELHI

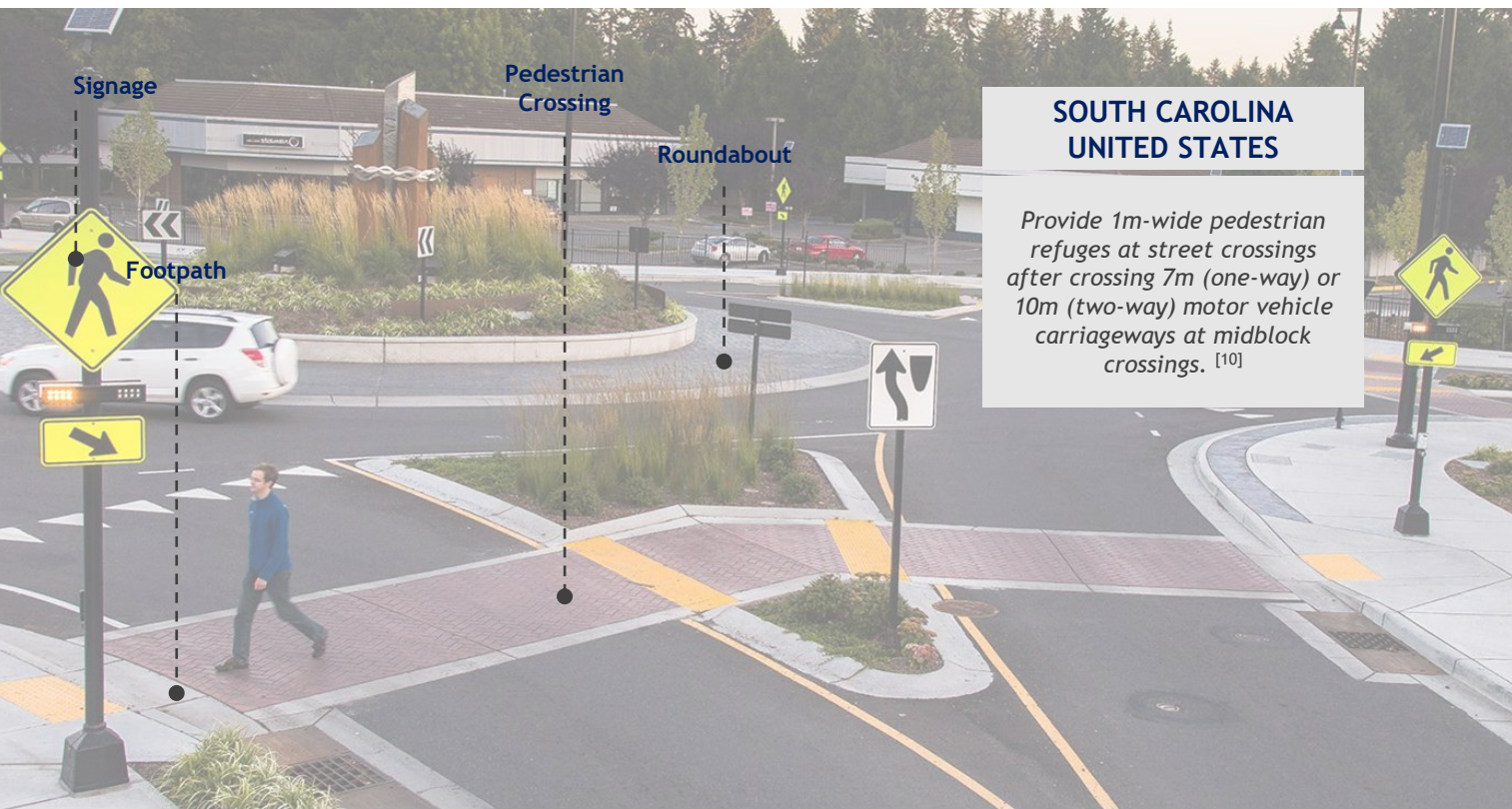
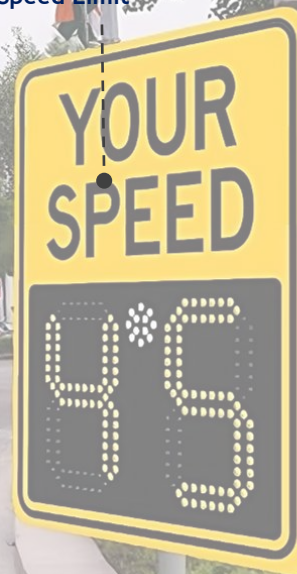
Limit speed on urban arterial and sub-arterial roads to 50 km/h and on collector and local streets to 30 km/h. ^[97]

Rumble Strips

Speed Limit

Off-street Parking

Signage



Signage

Pedestrian Crossing

Roundabout

Footpath

SOUTH CAROLINA UNITED STATES

Provide 1m-wide pedestrian refuges at street crossings after crossing 7m (one-way) or 10m (two-way) motor vehicle carriageways at midblock crossings. ^[10]

B4.II. MANAGE ON-STREET AND OFF-STREET PARKING FOR MOTORISED VEHICLES

Common for all stations

PURPOSE

Parking management is the systematic organization, optimization, and regulation of parking spaces to ensure smooth traffic flow, promote public transport, and encourage sustainable mobility options. It aims to maximize the efficient use of limited urban space, prioritizing equitable access for all road users.

GOALS

- ◆ Discourage the use of private vehicles, reduce dependency for private motors, encourage sustainable modes of transport.
- ◆ Reduce on-street parking and shift to off-street to utilize the road space effectively.
- ◆ Off-street parking management should be market-driven and be looked as a real estate issue.
- ◆ Reduce total land area dedicated for vehicles and increase area for people-centric activities.

REFERENCE

- ◆ Delhi Transit Oriented Development Policy by MoHUA [53]
- ◆ Time-saver standards for architectural design by McGraw Hill[101]
- ◆ Guidelines for Parking Management for Small & Medium Cities by IUT, MoHUA[29]
- ◆ Healthy Streets Design Workbook by NIUA, MoHUA[64]
- ◆ Part 3 Development Control Rules And General Building Requirements, 2016 by NBCI [61]



Parking Signages

I. REGULATIONS

- ◆ Cities can include the TOD parking regulations in the city's parking policy. Pan-city parking policy implementation should be prioritised.
- ◆ Parking provision: 1.33 Equivalent Car Space (ECS) per 100 sq m of covered area. [53]
- ◆ NMT parking: 10% of the parking area earmarked for bicycles and wheelchairs. [53]
- ◆ As above, special parking spaces should be designated on-street for the differently-abled. These parking spaces should have 1.2-m access zones.[61]
- ◆ Parking space dimensions:[101]

Vehicle type	Parking bay dimensions
4-wheeler	2.5 m X 5 m
2-wheeler and cycle	1 m X 2 m
Auto-rickshaw, e-rickshaw and cycle-rickshaw	1.5 m X 3 m

Example: C.G. Road, Ahmedabad

COMPONENTS



II. PARKING PRICING

- ◆ Minimum rates may be fixed but maximum rates be dynamic based on market forces (peak hour). The maximum and minimum parking fee difference should be more than twice (2:1).^[77]
- ◆ On-street private parking exponentially priced compared to off-street parking (5-20 times as per location).^[77]
- ◆ Increase fee exponentially with decreasing distance to BRTS/Metro Rail stations.^[77]
- ◆ Parking to be priced for hourly slots, increasing exponentially as per the formula $(2X+10)$, where X is the charge for the previous hour, up to a maximum of three hours.^[77]

Example: Proposed parking price for Ahmedabad.



III. PARKING HIERARCHY

- ◆ Approximately 70% of the total parking space/ slots capacity to be kept for short-term parking near the station.^[22]
- ◆ Approximately 30% of the total available parking spaces/capacity to be for long-term parking.^[22]
- ◆ Park-and-ride facilities for private modes may be provided only at terminal MRTS stations or major multimodal interchanges.^[22]

Example: Amsterdam, Netherlands



Electric Vehicle Parking

IV. PARKING FOR E-VEHICLE

- ◆ Cities: Charging stations every 3 km x 3 km grid.
- ◆ If necessary, 0.5 m of the existing buffer in the MUZ can be used to accommodate charging points at parking bays.^[64]
- ◆ Residential and commercial complexes will have to allot 20% of the all “vehicle-holding capacity” at the premises for electric vehicle parking and facility. ^[53]

Example: South Extension 2 Metro Station, Delhi



Differently Abled Parking

V. PARKING FOR DIFFERENTLY ABLED PERSON

- ◆ A minimum of 6 accessible parking spaces in the first 200 parking spaces and 1 for each additional 100 parking spaces to be demarcated for physically disabled users. ^[61]

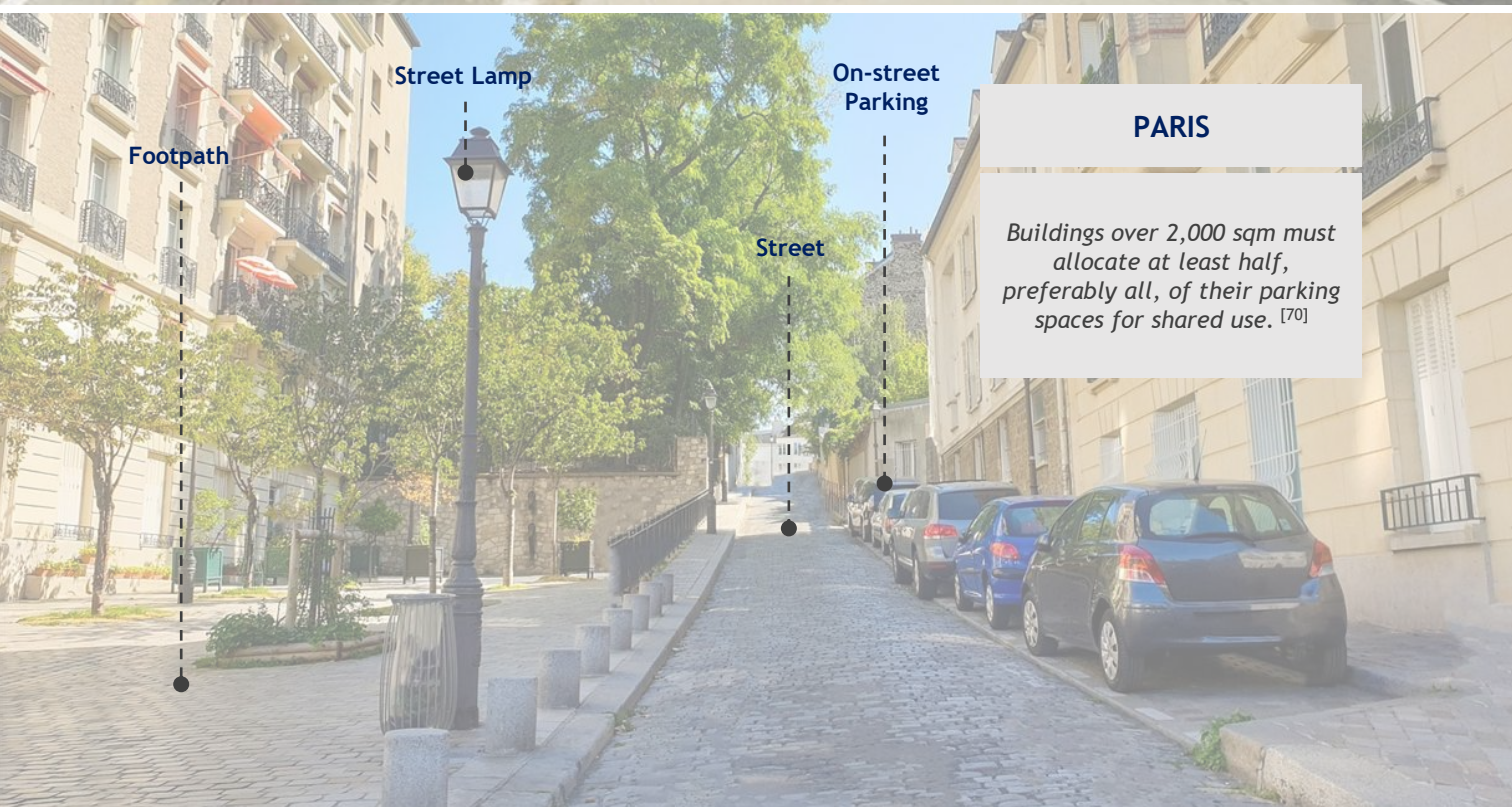


On-street Parking

Footpath

KASTURBA ROAD, BANGALORE

Park-and-Ride facilities for private modes may be provided only at Terminal MRTS Stations or major Multimodal Interchanges. ^[91]



Street Lamp

Footpath

On-street
Parking

Street

PARIS

Buildings over 2,000 sqm must allocate at least half, preferably all, of their parking spaces for shared use. ^[70]

SECTION C. PERFORMANCE MEASURE

4.3 Performance Measures

Performance measures are the tools public agencies use to make more informed decisions, internal and external comparisons, and continuously improve performance using the lessons learned through this comparative process.

The section is divided into 2 parts:

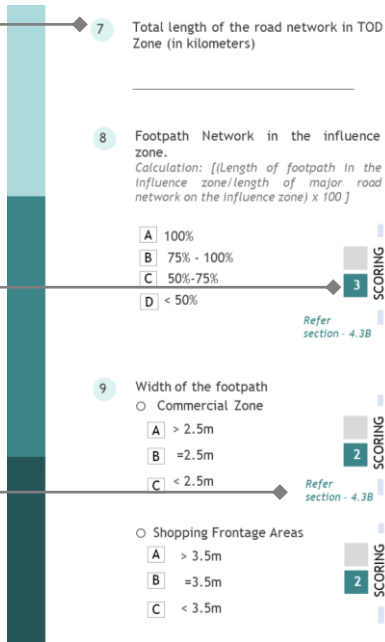
- ❖ **Performance Measure Section A:** Common for all Local Area Plans - The section covers parameters based on Transit Oriented Development that need to be addressed. It majorly analyze the present transit facilities in the city along urban road and street infrastructure for all type of people. *(Refer to Section 4.6)*
- ❖ **Performance Measure Section B:** Local Area Specific - The section covers parameters based on, urban planning regulations majorly in open green space, residential zone including the heritage building and FSI/ FAR that need to be addressed. *(Refer to Section 4.7)*

4.4 Design Layout of Each Step

PERFORMANCE MEASURE
Different Parameter to evaluate the Local area catchment zone.

SCORING
The total score on which the parameter is being evaluated.
Higher the value represents higher score

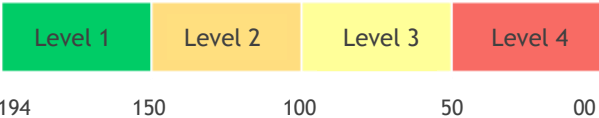
REFERENCE SECTION
It represents number to get more information based on that indicated parameter.



4.5 How to evaluate each performance measure

- Using these performance measure questions, any city can assess the TOD of its station areas. Certain marks have been assigned to each question, and the marks will be given in accordance with the current infrastructure.
- For example, if a question has two options, A and B, A will receive one mark and B will receive zero marks. Similarly, if a question has four options, A will receive three points, whereas the final option will receive zero points.

Level 1 represents the highest performance level whereas, Level 4 represents the lowest. Hence, the goal is to attain Level 1.



4.6 Performance Measures - Section A (Common for all Local Area Zones)

- 1 Intermediate Public Transport As % of the seating capacity of the Public Transport?
(Total Number of IPT x Seating Capacity/Total number of buses x Seating Capacity of buses)

- A <25%
B 25-70%
C 70-100%
D >100%

Refer Chapter 4, B1.I

If the share is <25%, the IPT acts as a feeder system.
If the share is 25-70% then there is a skeletal form of Public transport
If, the share is >70% then IPT acts as the main system

Seating Capacity:

- Bus - 40
- Tata Magic -8
- Auto Rickshaw - 3
- E-Rickshaw - 4

Source: Study to Improve and Upgrade IPT Vehicles and Services, 2014, IUT

SCORING

1

- 2 Service Coverage of Public Transport Transit System in the Influence Zone
Calculation: [(Network length of Transit System in the influence zone/ Total area of the influence zone) x 100]

- A < 30%
B 31-70%
C 71-100%
D >100%

Source: Service Level Benchmarks for Urban Transport (MoUD)

SCORING

4

- 3 Average waiting time for transit system?
Calculation: [average waiting time = Headway (time between departures)/ 2]

- A >10 min
B 6-10 min
C 4-6 min
D =<4 min

Source: Service Level Benchmarks for Urban Transport (MoUD)

SCORING

3

4 How well is the city transport network integrated?

Type of Integration	Elements	Integrated System	Partial Integration System	Independent System		
Physical Integration (from entry/ exit of the station)	Proximity to nearest transit station (Within 150m)	A	B	C		
	Accessibility with the interchange zone (within 100m)	A	B	C	6	SCORING
	Last-mile connectivity to the interchange zone (Within 100 to 250 meter)	A	B	C		
Fare Integration	Fare policy / structure	A	B	C		
	Fare technology	A	B	C	6	SCORING
	Smart ticking system on all public transport modes	A	B	C		
Information Integration	Information availability for commuters	A	B	C		
	Signage's and Way finding	A	B	C		
	Customer care service	A	B	C	8	SCORING
	Real time information for the user	A	B	C		

Type of Integration	Elements	Integrated System	Partial Integration System	Independent System		
Institution Integration	Decision making	A	B	C		SCORING
	Data at organizational level for operational facilities and integration	A	B	C	4	
Operational Integration	Planning of routes and services	A	B	C		SCORING
	Service headways and schedule coordination	A	B	C	4	

Refer Chapter 4, B1.I

Level of Integration:

- A Integrated System | Above 85%
- B Partial Integration System | 50-85%
- C Independent System | Below 50%

5 What is the approximate walking distance from station exits to facilities as listed below:-

		Yes	No		
Within 100m	Facilities/ Amenities	A	B	7	SCORING
	Bus Stop	A	B		
	Vendor Zone	A	B		
	Convenience Shopping	A	B		
	Cycle-Rental Station	A	B		
	High Occupancy feeder stop/ stand	A	B		
	Public Toilet	A	B		
	Pedestrian-only Plaza	A	B		
100-250m	Private car/ taxi “drop-off” location only	A	B	9	SCORING
	Car parking facility for metro users (park and ride)	A	B		
	Cycle-Rickshaw stand	A	B		
	Cycle-parking stand	A	B		
	Informal transit and ride-sharing service/auto	A	B		
	Proper signage	A	B		
	Improved lighting	A	B		
	Proper signage	A	B		
	Information for modal interchange and way-finding,	A	B		
Within 500m	Interchange between any two mass rapid transit modes (railways, Metro, RRTS, etc)	A	B	1	SCORING

Refer Chapter 4, B1.1

6

Footpath Network in the influence zone.

Calculation: $[(\text{Length of footpath in the influence zone} / \text{length of major road network on the influence zone}) \times 100]$

- A $\geq 75\%$
- B 50%-75%
- C 25%-50%
- D $< 25\%$

Refer Chapter 4, B1.II

3

SCORING

7

Width of the footpath as a percentage of the required width for LOS B of Design flow in the Number of Persons per Hour?

○ Residential Zone

- A $> 1.8\text{m}$
- B $=1.8\text{m}$
- C $< 1.8\text{m}$

2

SCORING

○ Commercial Zone

- A $> 2.5\text{m}$
- B $=2.5\text{m}$
- C $< 2.5\text{m}$

2

SCORING

○ Shopping Frontage Areas

- A $> 3.5\text{m}$
- B $=3.5\text{m}$
- C $< 3.5\text{m}$

2

SCORING

Refer Chapter 4, B1.II

○ Bus Stop

- A $<3\text{m}$
- B $=3\text{m}$
- C $>3\text{m}$

2

SCORING

○ High Intensity Commercial Areas

- A $<4\text{m}$
- B $=4\text{m}$
- C $>4\text{m}$

2

SCORING

8

Encroachment on Footpath in the influence zone (Vending, On-street parking, spillover of abutting shops)

Calculation: $[(\text{Length of encroachment on footpath} / \text{total length of footpath}) \times 100]$

- A $> 30\%$
- B 21-30%
- C 11-20%
- D $\leq 10\%$

3

SCORING

9

Cycle Network in the Influence Zone

Calculation: $[(\text{Length of cycle track in the influence zone} / \text{length of major road network on the influence zone}) \times 100]$

- A $< 15\%$
- B 16-25%
- C 26-50%
- D $> 50\%$

3

SCORING

Refer Chapter 4, B1.II

10 Width of the cycle track provided in the influence zone:

- For one way movement
 - A > 1.2m
 - B = 1.2m
 - C < 1.2m

2

SCORING

- For two way movement
 - A 2.2m
 - B = 2.2m
 - C < 2.2m

2

SCORING

Refer Chapter 4, B1.II

11 Encroachment on Cycle Track in the influence zone

Calculation: [(Length of encroachment on cycle track/ total length of cycle track) x 100]

- A <=10%
- B 11-20%
- C 21-30%
- D > 30%

3

SCORING

12 Does the influence zone consist of the following street design elements?

	Available	Under Implementation	Not Available
Bollards	A	B	C
Railing	A	B	C
Signages	A	B	C
Trees on Footpath	A	B	C
Street lighting	A	B	C
Street Furniture	A	B	C
Public Facilities	A	B	C

14

SCORING

Refer Chapter 4, B1.II

- 13 Number of trees on the footpath (per Km) w.r.t road width in influence zone?

- For RoW less than 35m:
200 trees (minimum)
- For RoW between 35m to 45m:
300 trees (minimum)
- For RoW between 45m to 65m:
500 trees (minimum)
- For RoW between 61m to 120m:
700 trees (minimum)

- A Yes
B No

Refer Chapter 4, B1.II



SCORING

- 14 Signal synchronization

Calculation: $[(\text{Total number of signalized signals that are synchronized in the influence zone} / \text{Total number of signalized intersection in influence zone}) \times 100]$

- A >75%
B 51-75%
C 26-50%
D <25%



SCORING

- 15 Are LUX levels on the road as per the IRC 103-2012 code?

- A For Mobility Lane
- 30 LUX
B For Local Lane
- 25 LUX
C For Pedestrian Lane
- 25-40 LUX

	Yes	No
A	☐	☐
B	☐	☐
C	☐	☐

Refer Chapter 4, B2.I



SCORING

- 16 Passenger information system (PIS)

Calculation: $[(\text{Total number of transit stops or stations or terminals having PIS in influence zone} / \text{Total number of transit stops or station or terminals in influence zone}) \times 100]$

- A >75%
B 51-75%
C 26-50%
D <25%



SCORING

Source: Service Level Benchmarks for Urban Transport, MoHUA

- 17 Does the city have integration ticketing system?

Calculation: $[(\text{Total Number of modes and operators have integrated ticketing system} / \text{Total Number of modes in city}) \times 100]$

- A >75%
B 51-75%
C 26-50%
D <25%



SCORING

Refer Chapter 4, B1.I

- 18 Does the city have traffic surveillance system?

Calculation: $[(\text{Calculate total no. of bus stops, terminals, metro stations and signalized intersections having CCTVs} / \text{Total Number in city}) \times 100]$

- A >75%
B 51-75%
C 26-50%
D <25%



SCORING

- 19 Intersection density in the influence zone (sq.km)?

Calculation: $[\text{The number of intersection} / \text{Area of influence zone}]$

- A More than 50
B Less than 50

1

SCORING

Refer Chapter 4, B1.III

- 20 Are the mid block pedestrian crossing as per IRC:103-2012 code

- In Residential Area - Within 80-250m
- In Commercial and Mixed Use area - Within 80-150m

- A Yes
B No

1

SCORING

Refer Chapter 4, B1.II

- 21 Average waiting time at pedestrian crossing

Calculation: $[(\text{Number of intersection having average pedestrian waiting time of } > 45 \text{ sec} / \text{Total number of signalized intersection}) \times 100]$

- A <25%
B 25-50%
C 50-75%
D $\geq 75\%$

3

SCORING

Refer Chapter 4, B4.I

- 22 Is the permissible vehicular speed (Km/hr) as per IRC 99- 2018 ?

Yes No

- A Arterial Road
- 60 km/h
B Collector Road
- 50 km/h
C Residential Road
- <20 km/h

☐	☐
☐	☐
☐	☐

3

SCORING

Refer Chapter 4, B4.I

- 23 Percentage of intersections with universally accessible crosswalks in all directions in the influence zone (Curb ramps, Lift, Tactile paving, Audible pedestrian signals, Adequate space for pedestrians) :

Calculation: $[(\text{Intersections with universally accessible crosswalks in all directions} / \text{Total the number of intersections in influence zone}) \times 100]$

- A > 80%
B 61-80%
C 41-60%
D 21-40%
E < 20%

4

SCORING

Refer Chapter 4, B4.I

- 24 Fatality rate for pedestrian and non-motorized vehicles?

Calculation: $[(\text{Fatalities of pedestrian (NMV)} / \text{Total fatalities recorded in road accidents}) \times 100]$

- A $\leq 20\%$
B 20-40%
C 40-60%
D > 60%

3

SCORING

- 25 Percentage of developed land within the influence zone:

Calculation: $[(\text{Total built-up} / \text{Total developable area}) \times 100]$

- A >90%
- B 81-90%
- C 71-80%
- D 61-70%
- E 51-60%
- F <50%

5

SCORING

Refer Chapter 4, B2.II

- 26 Percentage of walkway segments with a visual connection to interior building activity?

Calculation: $[(\text{Total length of public walkway segments with active frontage} / \text{Total length of public walkway segments}) \times 100]$

- A >50%
- B 51-60%
- C 61-70%
- D 71-80%
- E 81-90%
- F <90%

5

SCORING

Refer Chapter 4, B3.IV

- 27 Does the influence zone consist of the following street design components?

	Available	Under Implementation	Not Available
Pedestrian Zone	A	B	C
Street Furniture	A	B	C
Wayfinding/ Signages	A	B	C
Gathering Spaces	A	B	C
Plaza	A	B	C
Parks/ Garden	A	B	C
Public Facilities	A	B	C
Installation Art	A	B	C
Landscaping	A	B	C
Retail Spaces	A	B	C
Street Lighting	A	B	C

22

SCORING

Refer Chapter 4, B3.I

- 28 What is permissible height of the compound wall allowed in the influence zone?

- A 100 cm or above
B < 100 cm

1 SCORING

Refer Chapter 4, B3.IV

- 29 Is there any dedicated vending zone in the influence area

- A Yes
B No

1 SCORING

Refer Chapter 4, B3.III

- 30 Average number of shops and building entrances per 100 meters of block frontage in influence area :

Calculation: [The number of entrances along public walkways / (Total length of block frontage that abuts public walkways and divided by 100 meters)]

- A >5
B 3.1-5
C <3

2 SCORING

- 31 Average distance of schools and market place in the influence zone:

- A <1 km
B 1 km
C >1 km

2 SCORING

- 32 Percentage of available paid on-street parking spaces in the influence zone?

Calculation: [(Total available on-street paid parking spaces/ Total available on street parking spaces) x 100]

- A =>75%
B 50-75%
C 25-50%
D <25%

3 SCORING

Refer Chapter 4, B4.II

- 33 What is the ratio of parking fee in the influence zone to the maximum parking fee in the city(other than the TOD influence zone)?

Calculation: [Maximum parking fee being charged per 2 hr/ Minimum parking rates charged for 2 hr]

- A >4
B 2-4
C 1-2
D 1

3 SCORING

Refer Chapter 4, B4.II

- 34 Are 20% EV charging parking available in off-street/ on-street locations in catchment zone

	Yes	No
A Off Street Parking	☐	☐
B On- Street Parking	☐	☐

2 SCORING

Refer Chapter 4, B4.II

- 35 Are there parking available for differently abled person in off-street/ on-street in the catchment area.

	Yes	No
A Off Street Parking	☐	☐
B On- Street Parking	☐	☐

2 SCORING

Refer Chapter 4, B4.II

4.7 Performance Measures - Section B (Local Area Specific)

- 1 Job and Resident ratio
Calculation: $[\text{Total number of jobs} / \text{Total number of residents}]$

- A <0.4
B 0.4-0.6
C ≥ 0.4

2

SCORING

Refer Chapter 4, B2.II

- 2 Percentage of mixed development on the road abutting the transit station?

- A >85%
B 70-85%
C 55-70%
D 40-55%
E <40%

5

SCORING

Refer Chapter 4, B4.IV

- 3 What is the Floor Space Index (FSI) along the transit corridor in the influence zone:

Calculation: $[(\text{Floor space Index along transit corridor} / \text{Floor space Index as per the master plan/DP})]$

- A $\geq 500\%$
B 250-500%
C 150-250%
D < 150%

3

SCORING

Refer Chapter 4, B2.III

- 4 Does the influence zone have at least 20% recreational and open spaces

- A $\geq 20\%$
B 15-20%
C 10-15%
D <10%

3

SCORING

Refer Chapter 4, B2.IV

- 5 Percentage of residential units provided as affordable housing?

Calculation: $[(\text{The number of affordable residential units} / \text{Total the number of residential units}) \times 100]$

- A >30%
B 26-30%
C 21-25%
D 16-20%
E <15%

4

SCORING

Refer Chapter 4, B2.III

- 6 Percentage of all residential units occupied by economically weaker section(EWS) in the influence zone?

Calculation: $[(\text{The number of residential units occupied by economically weaker section(EWS)} / \text{Total the number of residential units}) \times 100]$

- A $\geq 15\%$
B 10%-15%
C 0-10%

2

SCORING

Refer Chapter 4, B2.III

7 Are there any buildings with traditional housing material

- A Yes
- B No



SCORING

Refer Chapter 4, B3.III

8 Are there any buildings designed with local styles (or elements)

- A Yes
- B No



SCORING

Refer Chapter 4, B3.III

9 Are there spaces in the influence zone that promotes activities/ community engagement in the outdoor spaces

- A Yes
- B No

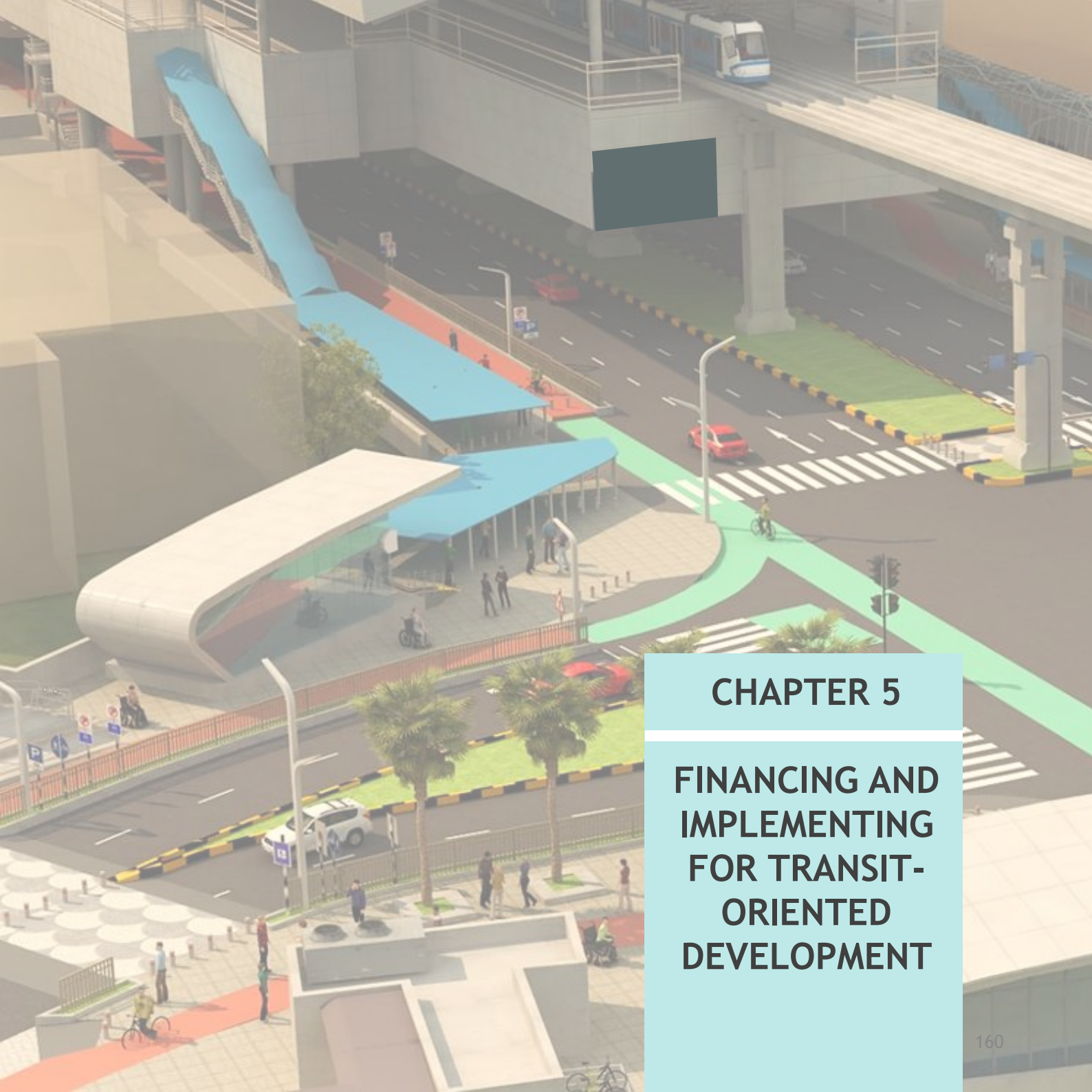


SCORING

Refer Chapter 4, B3.I

4.8 Summary of Planning and Design Principles of TOD

- *The scale and scope of Local Area TOD Plan based on existing or planned high-mobility corridors are defined.*
- *Checklist of the existing data source and gap assessment to be carried out.*
- *Through the gap assessment and by understanding the TOD principles Local Area Plan is to be formulated in three phases*
 - *Concept Plan (including alternatives, if any)*
 - *Draft TOD Plan (to be presented to stakeholders for review)*
 - *Final TOD Plan (based on stakeholder feedback)*
- *The Local Area Plan should integrate all the TOD Plan and Design Principles for effective TOD implementation.*
- *The TOD principles, which includes Accessibility Planning, Urban Planning, Urban Design and Area Management Plan should be integrated into various key urban planning and transportation to ensure that the development aligns with sustainable and efficient transportation system.*
- *The key experts to be included during the workshop are:*
 - *Central Government Agencies*
 - *State Agencies*
 - *Local Agencies*
 - *Transit Agencies*
 - *Real Estate Developers*
 - *IPT Operators*
 - *NGOs, Community Service Organizations, Advocacy Groups*
 - *Academic Institutions*
 - *General Public*
 - *Political Leadership and Elected Representative*
- *The DCR that may be required to be modified are:*
 - *Parking provisions*
 - *Building height regulations*
 - *FAR*
 - *Ground Coverage*
 - *Building Setback*
- *Performance Indicators are a set of tools for the cities to measure the performance of their TOD initiatives against global standards and outcomes. It should be evaluated at regular intervals. This shall help the city in improving the quality of the public transport network, pedestrian and cycling network etc.*



CHAPTER 5

FINANCING AND IMPLEMENTING FOR TRANSIT- ORIENTED DEVELOPMENT

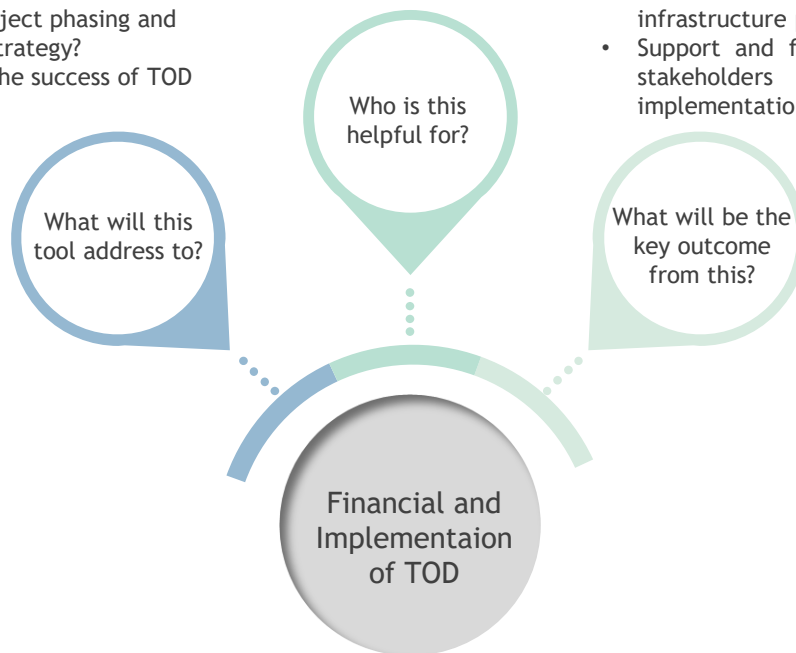
5.1 Making it Happen

This chapter outlines on how to implement TOD successfully in the city. For the implementation of TOD, a significant amount of investment is required from the public and private sectors through the creation of Public-Private Partnerships. In this partnership, the public sector acts as a facilitator while private players have easy access to the finance.

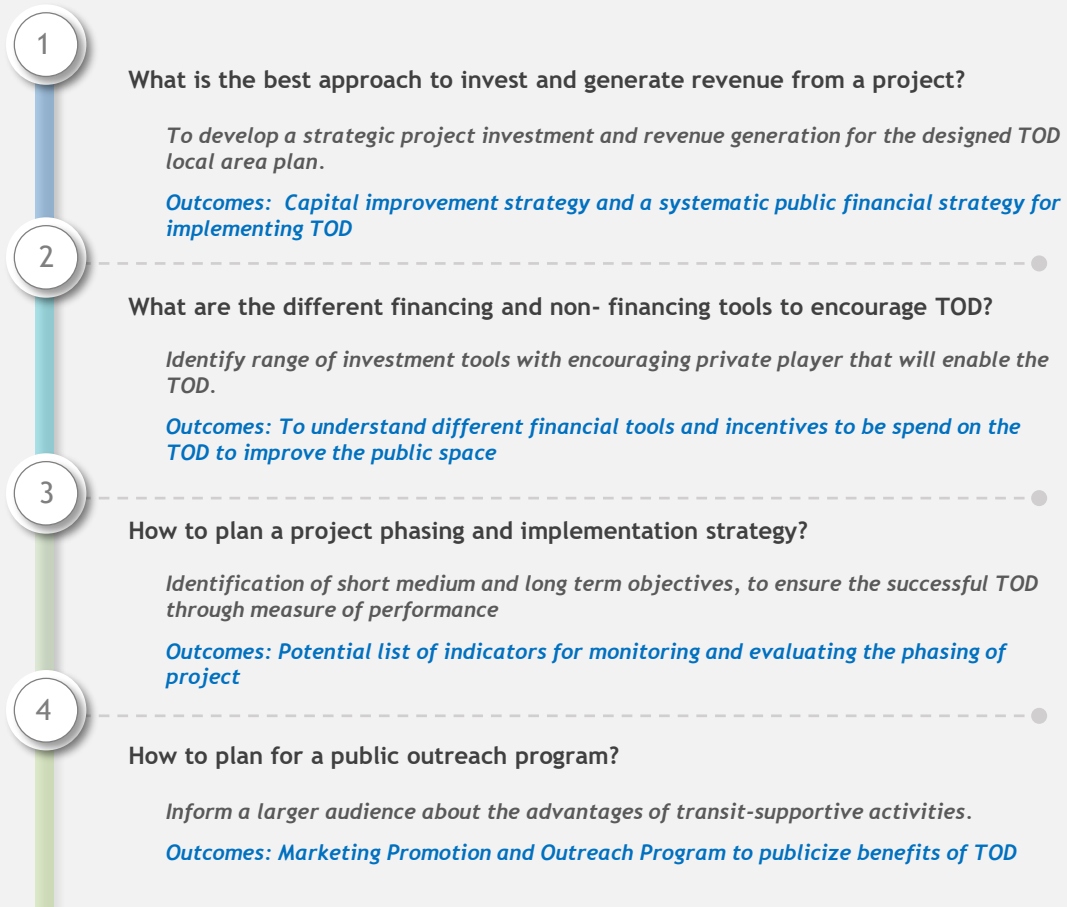
The chapter also elaborates on different municipal financing and non-financing tools that the city can use based on the local context.

Through the formation of SPV (*from Chapter 3*), the agency would promote the design and development of local area plans and oversee the implementation and coordination with planning guidelines and professionals from different levels of government and private sectors.

- What are the existing gaps?
 - What is policy framework?
 - Who will be involved in the decision making process to plan and execute TOD?
 - How to plan a project phasing and implementation strategy?
 - How to measure the success of TOD in the city?
- Urban Local Body, Urban and Transport Planner, Transit Agencies and Private developer
- The city can adopt different financial and non financial tools
 - The implementation strategy for success completion of TOD
 - Modification of building byelaws and infrastructure plan
 - Support and feedback from various stakeholders at all level of implementation.



FINANCING AND IMPLEMENTING FOR TRANSIT-ORIENTED DEVELOPMENT



5

What are the goals and objective of TOD?

To balance long- term goals and objectives with immediate development needs, and to make clear minimum requirements as outlined in the plan.

Outcomes: Building By-Laws, Transit Plans and Infrastructure Upgradation Plans

6

How to measure the success of TOD in the city?

To give guidance to the development industry regarding the essential elements and nature of developments; assess the degree to which plan goals, objectives, and policies are being met through both qualitative and quantitative performance metrics.

Outcomes: Potential list of performance indicators. Monitoring and Evaluation Framework

1. What is the best approach to invest and generate revenue from a project?

PURPOSE

To develop a strategic project investment and revenue generation for the designed TOD local area plan.

OUTCOMES

Capital improvement strategy and a systematic public financial strategy for implementing TOD

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 ^[43]
- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India ^[90]

- 1 Develop a Capital Improvement Strategy to phase and prioritize tools and strategic actions to finance incentives that encourage transit-oriented development. The principal elements of an investing strategy may be:

- A Real Estate Market Study including Socio-Economic Profile for TOD study area
- B List of broad infrastructure improvement proposals such as NMT improvements, utility upgrades, private sector development/ redevelopment opportunities and transit station joint development opportunities
- C Land Acquisition costs
- D Additional planning studies and DPRs to be prepared
- E Institutional Roles and Responsibilities
- F Resource Mobilization and Revenue Generation Strategy



The strategy will provide an outline of the sector-wise investment requirements and sources for investment generation both in public & private sectors. It will give a phasing plan for the investment required as well as identify agencies for implementation

- 2 Create plans for land assembly and banking to reserve land for development in the future and release it when earlier phases of development fulfill land use and transportation goals.

- A Using market analysis reports and development plans, identify possible development sites, then buy them as soon as they go up for sale.
- B On these purchased lands, lease back the land or permit temporary development to create a cash stream to help with land-carrying costs.
- C Give the ULBs and public sector organizations the chance to have more influence on the phasing and subsequent development to align with the master plan.

- 3 The best approach that can be opted to build a comprehensive grant-securing strategy for TOD projects from centre, state, local and any other source.

Multiple Choice

- A Require land development planning as an integral component of transportation plans
- B Collaborate with state agencies to dedicate funds for conducting TOD studies from infrastructure budgets
- C Transit agencies to conduct TOD planning as part of transit system planning and station design
- D Connect with international agencies, NGOs and academic institutions to provide technical assistance in undertaking TOD studies
- E 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 Funds (if established) for conducting TOD planning studies.



The city may explore and adopt one or more of these approaches for planning TOD around identified local area.

2. What are the different financing and non-financing tools to encourage TOD?

PURPOSE

To determine a range of investment tools that will enable the integration of TOD into city financial and urban management frameworks.

OUTCOMES

- Project financing models

REFERENCES

- Capturing the Value of Transit (CTOD)^[74]
- Existing and innovative financial measures have been elaborated in end of the section.
- Value Capture Finance Policy Framework by MoUD, GOI ^[109]

- 1 Financing tools that the local government and transit agencies have used globally:

- ☐ A Urban Transport Fund (UTF)
- ☐ B Land Value Capture
- ☐ D Tax Increment Financing (TIF)
- ☐ E Town Planning Scheme (TPS)
- ☐ F Developer Fees
- ☐ G Joint Development
- ☐ H Municipal bonds
- ☐ I Land leasing
- ☐ J Bank loans and financing
- ☐ K Direct fees through tools such as Congestion Pricing, Parking Fees and Advertising Fees
- ☐ L Grants



- 2 Utilise non-financing instruments in TOD districts to help defray the costs associated with project planning, development, and upkeep.

- ☐ A Land Pooling/ Land Banking
- ☐ B Land Swapping
- ☐ C Development Agreements
- ☐ D Density Bonuses
- ☐ E Transfer of Development Rights
- ☐ F Anchor Institution Partnership
- ☐ G Corridor-Wide Tax Increment Financing
- ☐ H Multi-Station Tax Increment Financing
- ☐ I Real Estate Investment Trust



The city may select the financing/ non-financing tools they have used successfully or they may be able to adopt. The details have been provided in the end of the section.

- 3 Public improvement strategies that could be employed for density exchange bonuses with the private sector include:

- A Infrastructure upgrades along the property edge or within 5-min walking distance of the transit stop facility *(Chapter 4, B2.I)*
- B Affordable housing in new developments near transit
- C At grade publicly *(Chapter 4, B2.III)*
- D Accessible pedestrian links between transit station and Other land uses *(Chapter 4, B1.II)*
- E Urban plazas or parks in the vicinity of the transit station facility. *(Chapter 4, B3.I)*
- F Pedestrian access routes to transit stations *(Chapter 4, B1.III)*



Mechanism to attract investors and increase development potential is elaborated at end of the section.

5.2 Existing Financial Strategy

The global practice of Value Capture operates on the principle that private land and buildings gain value from public infrastructure investments and governmental policy decisions. Utilizing suitable VCF tools enables the capture of a portion of this increased land and building value. Existing financing methods used in the Indian cities are as follows:

Premium on Additional FSI

- This tool grants additional development rights beyond set limits.
- It requires a two-tier FSI structure: a basic FSI is included with property rights, while the surplus FSI can be purchased for value capture.
- An efficient method is to set variable FSI limits across the city based on infrastructure, then auction the surplus FSIs in the market.

Transfer of Development Rights (TDR)

- This mechanism separates land development potential from the land itself, allowing transfer.
- Landowners receive extra FAR, usable on their property or in zones with proper infrastructure.
- TDR certificates enable redemption elsewhere, fostering a market for development rights trading.

Additional Stamp Duty

- Stamp duty is a one time fee imposed by the State to formalize property registration in the buyer's name.
- Through an extra charge on stamp duty, the government captures the appreciation in property value.

Land Value Tax

- The Land Value Tax (LVT) is an annual tax applied to the increase in land value over time.
- It serves as a prevalent method of finance-based value capture. By encouraging high-density development, the LVT promotes efficient land use.
- Additionally, it plays a role in stabilizing property prices and discouraging speculative investment.

Vacant Land Tax

- The vacant land tax serves as an extension of the Land Value Tax mechanism, incentivizing landowners to utilize or develop vacant or underused land while deterring speculative investment.
- It applies to landowners who have not yet commenced construction on their properties.

Property Development

- Property development around transit stations can boost financial viability in two ways: by developing adjacent properties and leasing space within the station itself for ventures like malls, hospitals, hotels, and residential projects.
- This synergy between transport and property development enhances transit experience while increasing property value through network connectivity.

Betterment Levy

- Regarded as the most straightforward method of value capture, it entails a one-time upfront fee imposed on the increase in land value resulting from public infrastructure investment.
- This levy serves as a revenue stream for improvement schemes and specific projects.

Change of Land use fee

- Within land revenue codes, there are established procedures for securing permission to convert land from agricultural to non-agricultural use.
- This fee is levied to regulate and manage changes in land use, ensuring that such conversions adhere to zoning regulations and land use plans.

Impact fees & Development Fee

- Development charges or Infrastructure Development Charges (IDC), finance specific large infrastructure projects and are collected when landowners apply for new construction permits.
- Impact fees are imposed on new constructions in areas where significant public investments are announced and are calculated based on the total project cost and development potential within the area.

Town Planning Scheme (TPS)

- TPS involves acquisition of plots by a public authority under the Land Acquisition Act.
- Compensation is paid to owners based on prevailing land prices. Serviced plots are sold at market rates.
- Public amenities and infrastructure are developed using government funds or loans.
- Increment in land value benefits the development agency, financing future infrastructure upgrades.

Joint Development

- Joint Development is an established financing mechanism utilized by transit agencies.
- It operates as a form of public-private partnership.
- Involves real estate development on public-owned land with private investment.

Municipal bonds

- Municipal bonds are debt obligations issued by municipalities to finance urban infrastructure projects.
- Purchasing municipal bonds involves lending money to the government body, which pays specified interest throughout the locking period and returns the principal amount at the end of the tenure.
- Municipal bonds come in both taxable and tax-exempt formats.
- Two types of bonds are General Obligation Bonds (GO) and Revenue Bonds.

Land Acquisition and Development

- Land Acquisition and Development, although a potentially valuable Value Capture method for resource mobilization, is not without drawbacks.
- While it may appear effective for establishing new streets, infrastructure, and public amenities in station areas, it is not the ideal solution due to its inequitable implementation nature..

Land pooling System (LPS)

- It involves pooling all land parcels in an area, converting them into a layout, developing infrastructure, and redistributing reconstituted parcels proportionally to the original owners.
- This ensures common amenities are provided from the collective pool, with each landowner surrendering an equal percentage of their property.
- It allows all landowners to retain a portion of their original ownership and benefit from new infrastructure developments.

Congestion Pricing and Parking Fees

- These are user charges for public amenities and infrastructure.
- They include fees for transit, toll roads, bridges, and parking facilities.
- Direct fees vary based on local conditions and demand.
- Public and private authorities collect these fees to cover capital and operation/maintenance costs.
- Congestion pricing manages demand for services based on usage or time of day to alleviate traffic congestion.

Real Estate Investment Trust (REIT)

- This is a company that owns and operates income-producing real estate or real estate-related assets.
- Assets include residential, commercial, warehouses, mortgages, or loans.
- REITs acquire, develop, and manage assets as part of their investment portfolio, unlike traditional real estate companies that sell developed assets.
- REIT shares are traded on major stock exchanges, making them accessible to investors.
- Similar to stocks, anyone can invest in REITs by purchasing shares.

5.3 Innovative Financial Strategy

To encourage sustainable urban growth, the Indian government advocates TOD and Local Area Planning, aiming to cultivate vibrant, liveable neighbourhoods around efficient public transit. Given the substantial investment requirements, exploring innovative alternative financing methods becomes crucial to complement traditional funding sources. Following are innovative financing instruments implemented or proposed globally for the development of TOD and Local Area Planning:

Congestion Charge

- Congestion pricing, also known as congestion charges, is a method of imposing additional fees on users of public services that experience congestion due to high demand.
- This can include peak charges for bus services, electricity, metros, railways, telephones, and road usage, aimed at alleviating traffic congestion.

Special Assessment Charge

- A Special Assessment Charge is imposed within a designated geographic area called a Special Assessment District (SAD).
- This charge is levied exclusively on real estate parcels that are identified as directly benefiting from a public project within the district.

Air Rights Sale

- Air rights represent a value capture method where development rights are granted above public utilities, typically transportation facilities, leading to increased land value.
- These rights are typically auctioned off, with the rationale that owners should contribute to infrastructure costs based on the extent of their air rights utilization, given that higher densities necessitate additional infrastructure investments.

Capital Gain Tax

- Capital gains tax is levied on the profit gained from the sale of land or property that has appreciated in value due to public investment.
- Serving as a partial value capture mechanism, this tax increases in tandem with the property's value. It is imposed at the time of sale..

Versement Tax

- The Versement Tax is based on the principle that transportation networks should be funded not only by users but also by employers, including businesses and administrative services.
- These entities benefit directly or indirectly from such networks, as they enable expanded recruiting opportunities and enhance transportation conditions for employees and customers.

Tax Increment Financing (TIF)

- Tax Increment Financing (TIF) involves directing incremental property tax revenue towards financing new investments in designated areas for a set period.
- TIF is particularly effective for funding developments in established urban areas, with some Smart City initiatives incorporating it into their Area-Based Developments (ABD).

3. How to plan a project phasing and implementation strategy?

PURPOSE

To suggest initial Sub-Tasks in the form of catalyst initiatives, short-, medium-, and long-term improvements, and quick wins in order to guarantee the effective execution of TODs.

OUTCOMES

- Implementation Strategy includes
 - ❖ Preliminary list of projects
 - ❖ List of additional studies/streetscape improvement projects/public- realm redevelopment projects
 - ❖ TOD Plans
- Phasing Strategy includes
 - ❖ Quick Wins (0-3 years)
 - ❖ Short- Term (3-5 years)
 - ❖ Mid- Term (5-10 years)
 - ❖ Long Term (10+ years)

- 1 Create a phased plan for implementing the short-, medium, and long-term interventions required to advance toward TOD-supportive changes throughout the city. Among the projects are:

Quick Wins (0-3 years)

- A TOD Policy Formulation
- B TOD policy as amendment in Master Plan including demarcation of TOD overlay districts
- C Local area planning including Accessibility
- D DCR modifications
- E Formation of SPV (*Chapter 5, 1.3*)
- F Identify staff resources for TOD planning TOD capacity building including training of staff (*Chapter 3, 3.2*)
- G Multimodal integration at station facility (*Chapter 4, B1.I*)
- H Signage and wayfinding (*Chapter 4, B1.II*)

Short- Term (3-5 years)

- A Master Plan shall include TOD principles (*Chapter 4, B 1,2,3,4*)
- B Zonal Development Plan/ Local Area Plan formulation with TOD principles
- C Station accessibility planning.
The plan should be formulated taking into consideration the modes identified under Chapter 4, A1. Also, Refer Chapter 4, B for TOD Principles.



- D Complete sidewalk network within a 5-minute walking radius of the station (*Chapter 4, B1.II*)
- E Traffic management measures (*Chapter 4, B4.I*)
- F Upgraded pedestrian infrastructure including footpaths, street furniture (*Chapter 4, B1.II*)
- G Improved station facilities including passenger amenities (*Chapter 4, B1.I*)
- H Bicycle rental or public bicycle-sharing systems near transit stations (*Chapter 4, B1.II*)
- I Park-and-ride near transit stations (*Chapter 4, B1.I*)
- J Multimodal integration for various modes (*Chapter 4, B1.I*)
- K Implement area-wide parking management plan (*Chapter 4, B4.II*)
- L Changes to state acts to include financing tools such as tax increment financing and FAR density bonus (*Chapter 5, 2*)

The LAP should be formulated taking into consideration the modes identified under Section Chapter 4, A.1.6 and following the TOD principles given in Chapter 4, Section B.

Medium- Term (5-10 years)

- A Land pooling (greenfield TODs) (*Chapter 5, 2*)
- B Infrastructure utility upgrades in TOD areas (*Chapter 4, B2.I*)
- C Streetscape improvements to achieve complete first and last-mile connectivity (*Chapter 4, B1.II*)
- D Redevelopment of government owned vacant lands as mixed use development (*Chapter 4, B2.IV*)
- E Formalize street vendors near transit stations (*Chapter 4, B3.I*)

Long- Term (10+ years)

- A Joint development of stations with the private sector
- B Land banking (urban TODs) (*Chapter 5, 2*)
- C Build mixed-use affordable housing near transit stations on government-owned vacant lands (*Chapter 4, B2.III*)
- D Redevelopment of underutilized sites near transit stations

The phasing plan given is only indicative in nature and in case the activities under any Term are completed, the cities may start implementing the next term.

- 2 To keep track of new construction and redevelopment in TOD regions, create a development checklist:

- A Ensure conformance to TOD principles through performance measures connected to phasing strategy (*It includes multi modal integration, improvement in first mile and last mile connectivity, non-motorized transport network, infrastructure planning etc.*)
- B In order to provide developers, planners, and other users with information, create a tracking database of development performance and specifics (a portal). (*Example: The Bhoonidhi portal is a comprehensive platform for users to browse, search, order, and download these datasets.*)

- 3 To help the city and the development and planning agency implement the TOD Plan's suggestions methodically, prepare a redevelopment handbook that includes preliminary recommendations. The redevelopment handbook ought to list:

- A Description of capital/catalyst public and private projects
- B Public-Private partnership opportunities
- C Plan phasing in the form of quick win projects, medium and long term
- D High-level cost estimates funding required for each phase of Plan implementation.
- E Technical capacity building recommendations. *(Chapter 3, 3)*
- F Indicative list of tenders required for private sector/public realm improvement projects



4. How to plan for a public outreach program?

PURPOSE

Inform a larger audience about the advantages of transit-supportive activities.

OUTCOMES

- Marketing Promotion and Outreach Program to publicize benefits of TOD

REFERENCES

- From Here to There: A creative guide to making public transport the way to go,' EMBARQ ^[102]

- 1 Use marketing promotion and outreach programs to publicize benefits of TOD:

- A As part of larger transportation demand management programs, conduct customized marketing campaigns at rapid transit stations as well as in homes and businesses along transit service routes in and around the TOD influence zone. *For instance, King Country Metro in Washington State ran a customized marketing campaign called "One Less Car" that offered incentives and individualized travel planning help to homes along transit routes. As a result, participants' vehicle kilometers driven decreased by 9%.*
- B Feeder service branding and marketing should highlight the advantages of using the service, such as the time and convenience saved by not having to search for a parking spot or being stuck in traffic. Social media, online advertising, local press, community events, campaigns, and billboards can all be used to put this into action.
- C Establish a consistent brand for the transportation system, the station buildings, and the nearby private development. *As an illustration, the Bellingham, Washington, transit system employs a unified graphic style in all of its stations and promotional materials. This consists of a consistent color palette, emblem, standardized color scheme, logo, and typography, which helps to create a cohesive brand image.*

- D Disseminate planned modifications in the vicinity of TOD stations using visual presentation approaches so that stakeholders may grasp the community's vision in real time. It can be portrayed using digital platforms, interactive displays, 3D modals, public art installations, and visual aids.

5. What are the goals and objectives of TOD?

PURPOSE

To balance long-term goals and objectives with immediate development needs, and to make clear the bare minimum requirements as outlined in the Plan.

OUTCOMES

- Building by-laws
- Transit plans
- Infrastructure upgradation plans

TOOLS AND RESOURCES

- Development Plans/ Master Plans/ Development Control Regulations

REFERENCES

- JnNURM CDP Toolkit (2013), Ministry of Urban Development ^[55]
- Urban and Regional Development Policy, Formulation and Implementation (URDPFI) Guidelines^[95]

- 1 Create building bylaws to include TOD ideas in the planning and development phase:

A Enable the filtering out of unfavorable land uses and developments that are incompatible with the TOD influence zone's vision during the early stages of development, such as large retail spaces, heavy industrial uses etc.

B On-street parking laws should be categorized as temporary uses with regular review periods (annually, but no more than three years). In the long term parking supply should be limited in the TOD zones as per the design principles (*Chapter 4, B4.II*)

C Establish regular review periods for building bylaws and requirements for them to respond to the context and demands of development.

Example: The master plan should be reviewed every after 10 years. Building by-laws should consider the TOD policy.

D To authorize uses that are necessary for the viability of the early stages of development but might not otherwise be allowed in the final phase of development.

6. How to measure the success of TOD in the city?

PURPOSE

To give guidance to the development industry regarding the essential elements and nature of development; assess the degree to which plan goals, objectives, and policies are being met through both qualitative and quantitative performance metrics.

OUTCOMES

- Monitoring and Evaluation Framework

- 1 Develop time-bound targets to be achieved through TOD planning. These targets may include performance measure to evaluate performance for: (*Chapter 4, 4.3*)
 - A Quality of the transportation network
 - B Pedestrian and cycling network
 - C Land Use and Economic goals
- 2 To keep track of new construction and redevelopment in TOD regions, create a development checklist:
 - A Ensure conformance to TOD principles through performance measures connected to phasing strategy (*It includes multi modal integration, improvement in first mile and last mile connectivity, non-motorized transport network, infrastructure planning etc.*)
 - B In order to provide developers, planners, and other users with information, create a tracking database of development performance and specifics (a portal). (*Example: The Bhoonidhi portal is a comprehensive platform for users to browse, search, order, and download these datasets.*)

5.4 Summary of Financing and Implementing for TOD

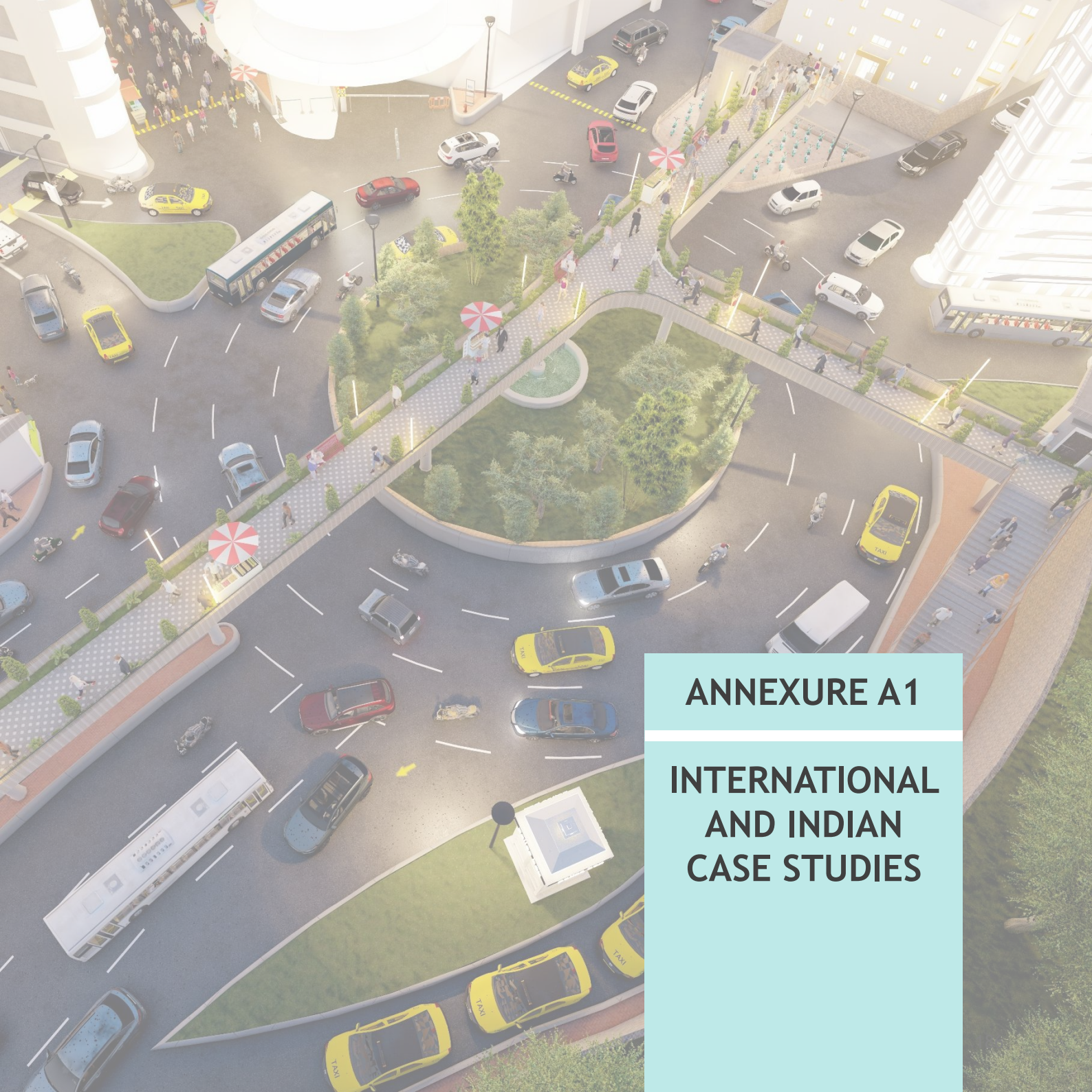
- *After the completion of the detailed planning stage (Final TOD Plan), the project typically takes place over 10-20 years to implement, with public and private sector partnerships.*
- *The city can adopt different financing and non-financing tools to attract investors and increase development potential in the Local Area Plan.*
- *For successful implementation of TOD, the implementation strategy needs to be divided into 4 categories: Quick Win, Short Term, Mid Term and Long Term.*
- *Continuous support and feedback from various stakeholders at all levels of implementation are essential. For the project to be executed successfully, a comprehensive consultant process and a strong public involvement strategy are required.*
- *Modification of building byelaws and infrastructure plan to be implemented.*



ANNEXURES

LIST OF ANNEXURES

1. Annexure A1 - International and National Case Studies
2. Annexure A2 - TOD Station Readiness Assessment Tools
3. Annexure A3 - Parameter for defining local area typologies
4. Annexure A4 - Pilot Station - Study Area Delineation
5. Annexure A5 - Pilot Station - Planning Framework of TOD
6. Annexure A6 - Pilot Station - Study for Multi-Modal Integration
7. Annexure A7 - Pilot Station - Impact Assessment of TOD
8. Annexure A8 - Detailed Cross Section
9. Annexure A9 - Survey Formats



ANNEXURE A1

INTERNATIONAL AND INDIAN CASE STUDIES

A.1 Case Studies

TOD as a tool has been adopted by many cities to shape the development, increase the share of public transport systems and provide for a better liveability to its citizens. Although the nature and the level of implementation varies from city to city, they provide key inferences and outcomes that can be replicated in other cities.

Further, the public transport system may also differ from city to city, for example TOD implementation in cities like Ahmedabad, Curitiba, Bogota are based on Bus Rapid Transit System while TOD in other cities such as Mumbai, Arlington, Tokyo, Hong Kong and Singapore rides on the backbone of the extensive network of rail based system.

The cities listed below highlights key inferences in further section:

International Case Studies:

1. Arlington
2. Bogota
3. Curitiba
4. Hong Kong
5. Singapore
6. Tokyo

Indian Case Studies:

1. Ahmedabad
2. New Delhi
3. Mumbai

Arlington, USA

INTERNATIONAL CASE STUDY



City Size
67 sq km



Population
0.2 million



Gross Density
3,497 people/sq km



Transit System
Mass Rapid Transit
System (MRTS)



Scale of TOD
Node Level

23%

Mode Share of PT in the
City

REFERENCE

- 40 Years of Smart Growth Arlington County's Experience with Transit-Oriented Development in the Rosslyn-Ballston Metro Corridor by Arlington County Development ^[3]
- TCRP Report 128, Effects of TOD on Housing, Parking, and Travel

Key principles adopted by the city:

1. Mixed use development: Range of FAR 3.8 to 10
2. Affordable housing along transit corridor
3. Provision of open space: Regulation of depleted open spaces caused by encroachment from new development and preservation of historic sites.
4. Zoning regulation and planning for high densities near transit station.

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- The goal of the TOD was to create a thorough policy framework for creating a General Land Use Plan (GLUP). The framework would include guiding decisions on development along the metro rail corridor. Additionally, the county created sector plans that addressed land use, urban planning, transportation, open space, and overlying zoning regulations.

2. IMPLEMENTATION

- Over the years, the Arlington County Planning Department has played a key role in the adoption of TOD.
- The independent regional transportation body known as the Washington Metropolitan Area Transit Authority (WMATA) is in charge of planning, constructing, and running the public bus and rail transit systems in the area.

3. STRATEGIES

- By permitting higher FAR constructions, permitting building heights to increase, and minimizing the amount of space dedicated to parking cars, Arlington promoted transit-friendly streets. This strategy encourages improvements for the public.
- Open Space Policy:
 - To regularize the depletion of open spaces caused by encroachment from new development
 - To preserve historic sites
- Housing Supportive Measures:
 - A Special Affordable Housing Protection District was established to prioritize affordable housing development along the transit corridor.
 - To encourage the inclusion of both market-rate and affordable housing within the same development, developers were provided with increased density bonuses, which ensured that the affordable housing where the quality of construction would not be compromised.

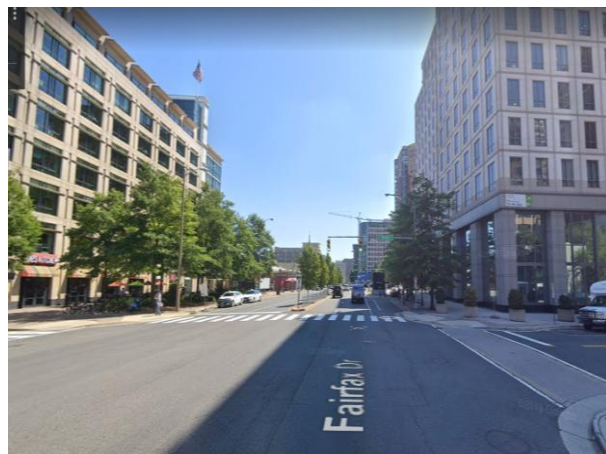


Figure 12: View of various streets with TOD in Arlington
Source: Google Street View

KEY TAKEAWAYS

Lessons from Arlington	Applicability in Indian Cities
Develop a General Land Use Plan (GLUP) and sectoral plans detailing land use and overlay zoning ordinances along with urban design, transportation and open space guidelines for individual stations.	- Master Plan is a mandatory document prepared by each city. - Additionally, Local Area Plans are also being prepared by some cities. The same needs to be institutionalized across cities
High density around stations as compared to other areas	Also proposed as part of National TOD Policy, 2017. Needs to be implemented at the city level.
Formulation of support policy such as the open space policy	Similar initiatives would also be required to enable a shift to public transport.
Arlington County Planning Department and WMATA involved in planning and implementation	- Various alternatives may be explored: - A new body to be established - A cell to be set up within the existing body - Multiple agencies with well-defined roles
Strong public housing policy programs that support housing for mixed income groups	The Pradhan Mantri Awas Yojna (PMAY) in urban areas may be concentrated around transit stations.
Extensive NMT network along the transit corridor	Should be included to promote last-mile connectivity using NMT.

Bogota, Columbia

INTERNATIONAL CASE STUDY



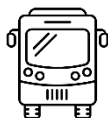
City Size
1,587 sq km



Population
7.7 Million



Gross Density
4,100 people/sq.km



Transit System
Bus Rapid Transit
System (BRTS)



Scale of TOD
Corridor Level

39%

**Mode Share of PT in the
City**

REFERENCE

- Finances of Bogota's Transportation System by Ardila, Arturo and Ortegón-Sánchez, Adriana. [4]
- Transportation Policies in Bogota, Colombia: Building a Transportation System for the People by Ardila and Menchhoff [2]
- TUMI E-Bus Mission, Deep Dive City Bogota, Colombia, Wuppertal Institut and Solution Plus, 2022

Key principles adopted by the city:

1. Expansion of NMT infrastructure network for pedestrian and cyclists.
2. Affordable housing (LIG Sector) along the transit corridor.
3. Construction of vibrant public spaces including parks, schools, and hospitals.
4. Integrated land use planning by increase in density.

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- The Bogota City Master Plan 2019 serves as the primary regulatory framework for urban development in Bogota. It outlines policies and regulations for land use, public transport, and other areas, emphasizing sustainable urban growth and integrating transportation systems.

2. IMPLEMENTATION

- The Secretaría de Movilidad (Mobility Secretariat) and the Instituto de Desarrollo Urbano (Urban Development Institute) are key agencies responsible for implementing TOD strategies.
- The capital and operational costs of BRT implementation was financed by national government grants, multilateral funding, public private partnerships, local fuel taxes and parking taxes. Also, a carbon credit mechanism was utilized to support BRTS development, which covered 12% of the initial investment.

3. STRATEGIES

- A number of traffic demand management strategies were put into place in Bogota, including the construction of a bicycle route (344 km), a pedestrian corridor (17 km), and the closing of certain road segments on weekends and holidays for specific hours.
- Bogota has introduced subsidies for low-income residents, allowing them to access public transport at reduced rates. This initiative helps make public transport more affordable and increases ridership among economically disadvantaged groups.
- Developers are incentivized to invest in areas near transit stations through additional development rights, which can be sold or utilized to enhance project feasibility.
- The peak hour and limited license program regulate private car use during the morning and evening peak hours, based on the last digit of the license plate. The city has implemented a fuel tax specifically earmarked for mass transit and road maintenance.



Figure 13: Public Transport of Bogota ^[68]

KEY TAKEAWAYS

Lessons from Bogota	Applicability in Indian Cities
• Innovative land value capture scheme, to receive about 30-50% of the increase in land value that results from public investment. • The funds are then used for the construction of affordable housing for low income households near stations, as well as access to social facilities like hospitals, schools and parks.	• To be explored.
• Extensive NMT network along the transit corridor	• Should be included to promote last-mile connectivity using NMT.
• Aggressive development around stations where vacant land was readily available	• To be explored.
• Multisource financing: National government grants, multilateral funding, public private partnerships, local fuel taxes, and parking taxes.	• To be explored.

Curitiba, Brazil

INTERNATIONAL CASE STUDY



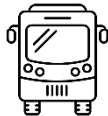
City Size
432 sq km



Population
2.0 Million



Gross Density
4,816 people/sq km



Transit System
Bus Rapid Transit
System (BRTS)



Scale of TOD
Corridor Level

45%

Mode Share of PT in the
City

REFERENCE

- A model for Transit Oriented Development - Curitiba, Brazil by ICLEI ^[23]
- <https://ecomobility.org/ecomobility-alliance/curitiba-brazil/>

Key principles adopted by the city:

1. Mixed-use development: Range of FAR Commercial- 5.0 (max.) and Residential- 4.0 (max.)
2. Affordable housing along the transit corridor.
3. High parking charges: Private off-street parking is strictly enforced, which drives up high parking charges.
4. Expanding transit accessibility

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- In 1965, the Institute for Research and Urban Planning of Curitiba (IPPUC) and Urbanização de Curitiba (URBS) were established as independent municipal authorities.
- In 1974, the Curitiba Metropolitan Region Coordination Body (COMEC) was established, facilitating the integration of transportation across Curitiba's 13 municipalities.
- Establishing a comprehensive legal framework (master plan, zoning laws and incentives) to encourage mixed, dense and high-rise construction.

2. IMPLEMENTATION

- URBS Role:
 - Privately funded and run by the government.
 - Oversees the infrastructure for public transport.
 - Serves as a contact for private businesses
 - Administers the bus terminals, monitors the performance of routes, collects and distributes revenues, and negotiates with concessionaires.

- Negotiates permissions with private bus companies.
- Responsible for regulating taxi services and public parking in the city.
- IPPUC roles:
 - Consolidates urban development plans, programs and projects of different administrative units of Curitiba and its metropolitan area
 - Designs the extension of the Curitiba Master Plan
 - Shape transportation and land use initiatives to complement each other
 - Coordinate planning and housing

3. STRATEGIES

- The development along Curitiba's BRT corridors varies depending on the type of BRT corridor, with differences in characteristics illustrated as follows:
 - Type 1 (Structural Axis) - Served by express BRT services: High-density development with high FAR/FSI. Promotion of mixed land use and covered galleries for pedestrian circulation.
 - Type 2 (Special Axis) - Focused as service zones: Development with 1.5 FSI/FAR for commercial/services activities and 1 FSI/FAR for residential activities. Promotes mixed land use with priority to commercial development.
 - Type 3 - Development with 2 FSI/FAR for residential land use and 1 FSI/FAR for commercial land use. Promotes mixed land use with priority to housing.

- The introduction of high parking charges has discouraged privately owned vehicles in the city.
- Zoning for car-free areas throughout the city has also been enacted.
- The city has restricted movement of heavy and long vehicle in the central traffic zone.



Figure 14: View of various streets with TOD in Arlington
Source: Google Street View accessed in December, 2023

KEY TAKEAWAYS

Lessons from Curitiba	Applicability in Indian Cities
Adoption of comprehensive legal framework (master plan, zoning regulations and incentives) to promote dense, high rise, and mixed development.	- TOD has also been incorporated in the Master Plans for some cities, such as Delhi and Ahmedabad. - Needs to be integrated in other Master Plans also.
Incentive/subsidy provided by employer for the use of public transport.	Similar initiatives may be explored to enable a shift to public transport.
Multiple agencies involved, however, each has a well-defined role.	- Various alternatives may be explored: - A new body to be established - A cell to be set up within the existing body - Multiple agencies with well-defined roles
Land use restrictions in the city, which promoted TOD along the corridor	To be explored.
- Incentives to transfer development rights - Incentives to developers to increase residential density close to the transit corridors	To be explored.
Well-defined FAR distribution, which is the same for all transit corridors.	May not be feasible due to varying market values in the city.
Extensive NMT network along the transit corridor	Should be included to promote last-mile connectivity using NMT.

Hong Kong

INTERNATIONAL CASE STUDY



City Size
1,104 sq km



Population
7.07 million



Gross Density
6,403 people/sq km



Transit System
Mass Rapid Transit
System (MRTS)



Scale of TOD
Node Level

80%

**Mode Share of PT in
the City**

REFERENCE

- Land value capture and TOD as a way of funding railway systems: The case of Hong Kong Rail + Property Model: Report for the "Inclusive and sustainable smart cities in the framework of the 2030 Agenda for Sustainable Development" Project by Jauregui Fung, F. [39]
- TOD Guidance Document, Consultancy Services for Developing Guidance Documents for TOD, NMT and (PBS)

Key principles adopted by the city:

1. Mixed use development - Range of FAR 3.5 (Residential); 14.84 (High Rise Commercial)
2. High fuel and registration taxes are policies aimed at curbing private vehicles.
3. Integrated transportation planning

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- The Mass Transit Railway Corporation (MTRC) operates the integrated railway network formed by the MTR-built and owned metro railway lines and the regional rail lines acquired by the Kowloon Canton Railway Corporation (KCRC).
- It operates as an independent company with clear purposes and responsibilities. The government has strict control and has the authority to appoint the board and chairperson.
- It has a very high degree of autonomy in setting up the ticketing fare structure, developing property, and dealing with financial issues.

2. IMPLEMENTATION

- Urban Renewal Authority: The legislative organisation responsible for implementing, promoting, and facilitating urban regeneration to improve the quality of life for people who live in older neighbourhoods.

- Hong Kong Housing Society: Hong Kong, is the second-biggest provider of public housing. As a key player in urban redevelopment, it uses the Urban Improvement Scheme to redevelop the modern housing blocks.

3. STRATEGIES

- Hong Kong's TOD policy of the "Rail + Property" development model is a cooperation between public and private interests to concentrate development around the MRTS station. The plan has allowed the city to creatively and aesthetically maximize development in the constrained region while also generating income for transit agencies to fund improvements in public realm architecture and transit infrastructure.
- Low car ownership levels have been maintained by high fuel and registration tax at exorbitant rates, which range from 35% to 100% of the vehicle's cost.



Figure 15: Public Transportation System of Hong Kong
[63]

KEY TAKEAWAYS

Lessons from Hong Kong	Applicability in Indian Cities
The TOD in Hong Kong is based on a strong plan.	- The national TOD Policy formulated in 2017 - City/State-level policy formulation at different stages across the country - Plans yet to be prepared by cities
Policy formulation was supported by amendments in the existing acts and the formulation of new acts.	Indian cities would also need to make necessary amendments in bye laws, acts and other planning and policy documents.
Formulation of support policy documents such as parking policy and high vehicle registration cost.	Similar initiatives would also be required or the existing policy documents would be required to be amended.
The MTR was established, which was given exclusive development rights.	A new body to be established or a cell to be set up within the existing body.
Joint ventures permitted in real estate development with private sector investment in TODs.	May be adopted.
Use of Transfer of Development Rights combined with commitment to encourage the redevelopment of existing areas rather than allowing for suburban development.	The applicability of the same may be evaluated.
Well-designed station area plans that ensure seamless integration with its surrounding neighbourhood.	To be taken up in cities.
The viability of the Rail + Property projects based on various parameters such as station locations, land values, density potential, financial returns, land use mix based on market demand, and zoning constraints.	‘One size fits all’ may not be possible and different specific station area plans need to be prepared.

Singapore

INTERNATIONAL CASE STUDY



City Size
735 sq km



Population
5.2 million



Gross Density
7,248 people/sq km



Transit System
Mass Rapid Transit
System (MRTS)



Scale of TOD
Node Level

44%

**Mode Share of PT in the
City**

REFERENCE

- Transit-Oriented Development in Emerging Cities: Principles from Singapore by Chye B. ^[9]
- Transit-Oriented Development by Tan S and Yi P. ^[88]
- Deloitte City Mobility Index, Singapore, Deloitte, 2018

Key principles adopted by the city:

1. Comprehensive Network of Mass Rapid Transit Systems
2. Strict measures to discourage private vehicles include the quota system, high car ownership costs, fuel taxes and parking fees, and congestion pricing.
3. Development control through the master plan with a focus on mixed land use development, articulated densities, access to public transport, walkability and expansion of public open space.

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- The Urban Redevelopment Authority (URA) is the statutory board responsible for land use planning and urban development in Singapore under the Ministry of National Development.
- These plans are supported by Development Control Regulations that dictate the allowable building heights, densities, and land uses in TOD zones, promoting efficient land utilization and sustainable urban growth.

2. IMPLEMENTATION

- The three primary agencies responsible for the implementation of concept plans under the guidance of Ministry of National Development are Urban Redevelopment Authority, Housing Development Board and Land Transport Authority.

- The development of large-scale properties, management of private sector involvement, and execution of the Government Land Sales program fall within the purview of URA and HDB.
- LTA is responsible for developing and preparing the city's transportation infrastructure for five years.

3. STRATEGIES

- Singapore has implemented strict regulations to limit the proliferation of private vehicles and has expanded the public transit network.
- A three-tier pricing system in Singapore is as follows:
 - 1st tier: High subscription fees for car ownership
 - 2nd tier: User fees in fuel taxes and parking fees
 - 3rd tier: Electronic Road Pricing as a congestion pricing tool
- Vehicle ownership quota system: The government allows an annual growth of 3% in the vehicle population
- Off-peak licensing scheme: Vehicles holding this license during off-peak hours.



Figure 16: Public Transportation System of Singapore [83]

KEY TAKEAWAYS

Lessons from Singapore	Applicability in Indian Cities
The Concept Plan incorporates the TOD components.	- TOD has also been incorporated in the Master Plans for some cities, such as Delhi and Ahmedabad. - Needs to be integrated in other Master Plans also.
Formulation of support policy such as vehicle quota system, ERP and high vehicle registration cost.	Similar initiatives would also be required to enable a shift to public transport.
Multiple agencies involved, however, each has a well-defined role.	- Various alternatives may be explored: - A new body to be established - A cell to be set up within the existing body - Multiple agencies with well-defined roles
New towns integrated and located around MRT stops, forming a constellation of satellite towns surrounding a central core, with diverse activities of local shopping, other commercial and community services and green spaces.	To be explored.
Strong public housing policy programs that support housing for mixed income group.	The Pradhan Mantri Awas Yojna (PMAY) in urban areas may be concentrated around transit stations.
Flexibility in applying FARs as articulated densities as opposed to uniform densities.	May be applicable in Indian cities.

Tokyo, Japan

INTERNATIONAL CASE STUDY



City Size
2,191 sq km



Population
13.4 million



Gross Density
6,158 people/sq km



Transit System
Mass Rapid Transit
System (MRTS)



Scale of TOD
Corridor Level

47%

**Mode Share of PT in the
City**

REFERENCE

- Transit Oriented Development TOD for Sustainable Urban Development by JICA ^[38]
- Transit-Oriented Development Policies and Station Area Development in Asian Cities. ADBI Working Paper 947, 2019 by Kidokoro, T. ^[42]
- Deloitte City Mobility Index, Tokyo, Deloitte, 2020

Key principles adopted by the city:

1. Comprehensive network of mass rapid transit systems
2. Land value and rail network integration
3. Land consolidation technique (high development in sub-urban for decongestion in the core area)
3. Mixed-use development, safe and pedestrian-friendly environment.

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- Metropolitan Level: Multi-Polar Patterns National Land Formation Promotion Act and Act on Special Measures concerning Promotion of Supply of Houses and Housing Lands in Urban Districts
- Corridor Level: Act on Special Measures concerning Comprehensive Advancement of Housing Development and Railway Construction in Metropolitan Areas.
- Local Area and Site Level: Utilization of special FAR, act on special measures concerning urban reconstruction and redevelopment, land readjustment, continuous grade separation.

2. POLICY PLAN

- Metropolitan Level: The fourth National Capital Region Development Plan (1986) to develop the suburban area and promote the relocation of population and urban functions from Tokyo to suburban areas.

- Local Area Level: Establishment of the Advisory Council for the Promotion of Urban Renewal (2000) for the special district for urban regeneration that promotes TOD.

3. IMPLEMENTATION

- Collaboration between urban transportation and urban development department.
- Support from organisations with know-how and expertise.
- Cooperation between industry, academia, government, and TOD promotion initiatives.

4. STRATEGIES

- The main principle was to promote the development of high-density suburbs by private operators along the transit lines to boost ridership and enhance accessibility by providing services at walkable distances.
- They used land consolidation techniques to assemble farmlands at cheap prices ahead of rail construction to finance neighbourhood infrastructure.
- The landowners formed cooperatives that consolidated land but developed and provided fully serviced parcels to the land owners.



Figure 17: Public Transportation System of Tokyo ^[105]

KEY TAKEAWAYS

Lessons from Tokyo	Applicability in Indian Cities
The TOD in Tokyo is based on a strong policy.	- The National TOD Policy formulated in 2017 - City/State-level policy formulation at different stages across the country
Policy formulation was supported by amendments in the existing acts and formulation of new acts.	Indian cities would also need to make necessary amendments in bye laws, acts and other planning and policy documents.
Formulation of support policy documents such as parking policy.	Similar initiatives would also be required or the existing policy documents would be required to be amended.
For smooth implementation of the TOD, a plan was formulated for the city.	To be prepared by cities.
The National Land Agency was established, which was responsible for the implementation of the plan.	A new body to be established or a cell to be set up within the existing body.
With the objective to decongest the city, multiple urban centres developed.	Already being done in most metropolitan areas.
The agency worked together with the private land owner and transit operators and developed an effective PPP model for developing high-density rail corridors.	To be taken up.
The strategy of allowing rail operators to venture into real estate helped the operators to make profits in spite of price control and thereby provide commuters with good-quality mobility options at affordable rates.	An effective PPP mode may be evolved on similar lines.

Ahmedabad, India

NATIONAL CASE STUDY



City Size
466 sq km



Population
5.5 million



Gross Density
9,900 people/sq km



Transit System
Bus rapid and Mass Rapid
Transit System (BRTS
and MRTS)



Scale of TOD
Corridor Level

12.4% Mode Share of PT in the
City

REFERENCE

- Towards an Inclusive and Low-carbon Transit Oriented Development in Indian Cities by CEPT University and Shakti Foundation ^[12]
- Local Area Planning for Transit Oriented Development by CEPT University, Shakti Foundation, TCPO, MoHUA ^[40]
- Revised Ahmedabad Parking Policy - 2023 by AMC ^[77]
- Metro DPR (Phase 2), Ahmedabad - 2019 by DMRC

Key principles adopted by the city:

1. Affordable housing zone: 76 sq km area encircling SP Ring Road.
2. Local Area Planning (LAP) for the overlay zones of the Central Business District (CBD).
3. Residential Affordable Housing Zone (RAH).

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- Ahmedabad Urban Development Authority (AUDA) is responsible for planning and development functions in its jurisdiction. It presents immense opportunities for inner-city densification and compact development centred on the BRT network in place and the proposed metro rail alignment.
- Local Area Planning (LAP) for Central Business District (CBD), Transit-Oriented Zones (TOZ) and Residential Affordable Housing Zone (RAH).

2. IMPLEMENTATION

- AMC and AUDA are the two key implementing agencies responsible for planning, development and enforcement of urban development policies.
- AUDA Jurisdiction - Metropolitan Region Role:
 - Formulate Development Plans for Ahmedabad Urban Agglomeration
 - Prepare and implement the draft Town Planning Schemes
 - Monitor development activities by the Revised Development Plan

- AMC Jurisdiction - Municipal Limit Role:
 - Provision of physical and social infrastructure
 - Construction and maintenance of roadways
 - Investment in public transportation systems planning, implementation and operation.

3. STRATEGIES

- Zoning regulations:
 - Encourage compact development in central areas, transit nodes and corridors.
 - Special planned development zones along the Walled City, Sabarmati Riverfront, Gandhi Ashram, etc.
- Promoting redevelopment:
 - Increasing FSI along transit corridors of BRTS and MRTS from 1.8 to 3.6 or 4 based on chargeable FSI with concessions for affordable housing.
 - Highest 5.4 FSI for 10 sq km area surrounding the Sabarmati riverfront.
 - 4.5 - 5 FSI provision for CBD area
- Intensification in land use through change in GDCR.
 - Height restrictions removed
 - 51% ground coverage instead of existing 30%
- Increased parking space from 5% of total utilizable space to 20% for residential areas.
- Improvement of green cover from 4% to 15%



Figure 18: Public Transportation System of Ahmedabad ^[60],
^[103]

KEY TAKEAWAYS

Lessons from Ahmedabad	Applicability in Indian Cities
• Comprehensive Draft Development Plan - 2021 (Second Revised) prepared which promoted redevelopment along transit corridors with higher FSI. • Further Local Area Plans were also formulated.	• The national TOD Policy formulated in 2017 • City/State-level policy formulation at different stages across the country
• Station-level TOD approach adopted.	• The same may be explored.
• Fiscal measures such as betterment levy and purchase of higher FSI used to generate revenue.	• Similar initiatives would also be explored by other cities after understanding the pros and cons of each.
• Multiple agencies involved, however, each has a well-defined role.	• Various alternatives may be explored: ○ A new body to be established ○ A cell to be set up within the existing body ○ Multiple agencies with well-defined roles
• TOD is hampered by an increase in property prices around stations, land fragmentation, informal land transactions, degraded buildings, etc.	• The same issues may crop up in other cities.

New Delhi, India

NATIONAL CASE STUDY



City Size
1,483 sq km



Population
33.8 million



Gross Density
11,312 people/sq km



Transit System
Mass Rapid Transit
System (MRTS)



Scale of TOD
Node Level

42%

**Mode Share of PT in the
City**

Key principles adopted by the city:

1. Mixed-use development: Range of FAR - 1.1 to 4 ranging from 300 to 800 dwelling units per hectare
2. Provision of LIG housing
3. Access to social facilities
4. Pedestrian and non-motorized transport-friendly environment
5. Multimodal integration
6. Facilitating public transport access and discouraging the usage of private motor vehicles in order to induce a modal shift
7. Place-making and ensuring safety
8. High-density and mixed-use development near stations.

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- Delhi Development Authority (DDA) is responsible for planning and development functions in its jurisdiction.
- The Delhi TOD policy of 2019 and 2021 lays out the legal and operational guidelines for TOD projects. The guidelines emphasize on creating pedestrian-friendly areas, integrating affordable housing, and promoting mixed-use developments to enhance accessibility to transit systems.

2. POLICY PLAN

- Land transfer

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.

REFERENCE

- Delhi Transit Oriented Development Policy - 2021 by MoHUA [53]
- Case Studies - Compilation Of Good And Innovative Practices by The World Bank Group, TOD [94]
- Assessment Of TOD Policies And Implementation Process - Cases Of Delhi - Ahmedabad by Singh P. [73]
- Presentation by PWC, Delhi for “Decongestion Strategies for Delhi Road”

- **Densification**
 - Underutilization of FAR (3.0) not permitted in redevelopment projects under TOD
 - Works on principle: High density is more important than increased FAR.
- **Land amalgamation and reconstitution of plots** (including Housing Area and Neighbourhood PSP) will be permitted for all TOD schemes.
- **Green public space:**
 - 20% of the area of the amalgamated plot shall be developed as green space for public use.
 - The Developer Entity shall develop an additional 10% green/recreational area for the exclusive use of the occupants. This may include plazas, tot-lots, green spaces, gardens, vertical gardens, common areas, etc., that can also be provided on top of basements, podiums, terraces, etc.
- **All sites within TOD influence zones** have a mix of different land uses, wherein the intensity and type of mix would vary by distance from the station, street hierarchy and network, and level of public transport and IPT service.
- **Public road network**
 - Road networks to be planned with a vehicular route network of approximately 250m c/c and pedestrian network of approximately 100m c/c.
 - Based on ground conditions, this may be relaxed up to a maximum of 10%.

The standard typologies as classified in Delhi are as shown below. The permissible mix of uses for each plot in a TOD scheme depending upon the assigned land use/ use premise shall be as per **Table A2**.

TOD Intensification Typologies	
Intense TOD Zone	• 300 m influence zone of all metro stations • 800 m influence zone of regional interchange station
Standard TOD Zone	• 800 m influence zone of all metro stations
Transition Zone	• 2,000 m influence zone of all regional interchange and metro stations 300 m influence zone of all bus rapid transit corridors • Zones within intense or standard TOD influence zones, which are not permitted for redevelopment but need enhancements in public realm

Table A1: TOD Typologies

Land use/use premise of plot as per ZDP/ Layout Plan	Permissible Mix of Uses (distribution of FAR in TOD Scheme)			
	Minimum FAR for residential uses	Minimum FAR for commercial uses	Minimum FAR for PSP and/or utilities	Other uses
Residential	50%	10%	20%	Other uses* are permitted up to 20%
Commercial	30%	50%	10%	Other uses* are permitted up to 10%.
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.
Transportation	30%	10%	10%	Remaining 50% of FAR may be for any use* after meeting all operational requirements for transportation facilities
PSP (only housing and neighbourhood level PSP plots allowed as per Clause 20.4.ii)	The FAR for such plots shall be entirely utilized for PSPs and/or utilities in the TOD Scheme.			

Table A2: Mix of Uses/ Distribution of FAR in TOD

* This remaining FAR can be utilised as a mix of residential, commercial and PSP in any proportion as per project requirement

3. IMPLEMENTATION

To address all issues such as mobility, congestion, traffic engineering/ management, capacity building, adopting transport planning policies, etc., the DDA set up a separate body called Unified Traffic and Transportation Infrastructure (Planning and Engineering) Centre (UTTIPEC).

Figure 19: Public Transportation System of Delhi ^[44]

KEY TAKEAWAYS

Lessons from Delhi	Applicability in Indian Cities
• Master Plan for Delhi 2021 instilled the thrust for redevelopment and re-densification of existing urban areas and stressed on the need for incorporating TOD. • Further Local Area Plans were also formulated.	• TOD has been incorporated in some Master Plans • Needs to be integrated in other Master Plans too.
• Land parcels available with different government agencies transferred to DMRC at defined rates for implementation.	• May be adopted by other cities to consolidate land.
• Area-level TOD approach	• The same may be explored.
• Strict norms, not a market-based approach.	• May be explored after evaluating the pros and cons.
• Fiscal measures such as betterment levy and purchase of higher FSI used to generate revenue.	• Similar initiatives would also be explored by other cities after understanding the pros and cons of each.
• The intensity and type of mix vary by distance from station, street hierarchy and network, and level of public transport and IPT service.	• The intensity and type of mix would vary by distance from station, street hierarchy and network, and level of public transport and IPT service.
• Funding: ○ 4.87 % of capital cost by property development ○ 30% of the net income through real estate ○ Provision of TOD cess in draft policy	• May be explored by other cities also.
• Extra and mandatory 15% EWS FAR is provided with fixed unit size to ensure affordable housing.	• The Pradhan Mantri Awas Yojna (PMAY) in urban areas may be concentrated around transit stations.
• Uniform FSI rates for commercial and residential in Delhi	• Needs to be evaluated before adoption.

Mumbai, India

NATIONAL CASE STUDY



City Size
437.71 sq km



Population
20.0 million



Gross Density
28,471 people/sq km



Transit System
Regional Railway and
Mass rapid Transit
System (MRTS)



Scale of TOD
Corridor Level

45%

Mode Share of PT in the
City

REFERENCE

- Mumbai Urban Transport Project: Urban Resettlement by The World Bank Group ^[58]
- Project Performance Assessment Report India Mumbai Urban Transport Project by IEG and The World bank Group ^[24]
- TUMI Management- E-Bus Mission, Deep Dive City Mumbai India, GIZ, 2022

Key principles adopted by the city:

1. The comprehensive network of the railway system.
2. Mixed-use development: Range of FAR - 2.5 to 4.0
3. Curdling the development through mandatory provisions such as DCPRs
4. Development of growth centres to decongest the city
5. High-rise commercial development

Key measures taken by the city towards the success of TOD:

1. LEGAL FRAMEWORK

- The Mumbai Metropolitan Region Development Authority (MMRDA) and Brihanmumbai Municipal Corporation (BMC) play a central role in implementing TOD in Mumbai. It is responsible for infrastructure development, land acquisition, and zoning regulations within the TOD framework, particularly along major transit corridors.

2. IMPLEMENTATION

- There are five implementing agencies involved in the project: MMRDA, Mumbai Railway Vikas Corporation Limited, Municipal Corporation of Greater Mumbai, Brihan Mumbai Electric Supply and Transport Company, and Maharashtra State Road Development Corporation.
- Recent amendments to the Development Plan allow for increased FSI for developments within 500 m of metro stations, incentivizing developers to create integrated projects that facilitate easy access to public transport.

3. STRATEGIES

- The policy states the maximum permissible total FSI in the TOD zone shall be 4, including the base permissible FSI, subject to the condition that the additional FSI over and above the base permissible FSI shall be allowed within the overall limit of maximum permissible FSI based on only one criteria, which is the right of way of the abutting road.
- In the TOD zone, the parking area is only reserved for the basement, i.e., 50% of the applicable parking requirements.



Figure 20: Suburban Rail of Mumbai [26]

KEY TAKEAWAYS

Lessons from Mumbai	Applicability in Indian Cities
- The Mumbai Metropolitan Regional Plan 2011 is a key tool in implementing the TOD around transit stations. - The revised TOD regulation was introduced in the Development Control and Promotion Regulation (DCPR) vide., Government notification dated 10/10/2022.	- TOD has also been incorporated in the Master Plans of some cities such as Delhi and Ahmedabad. - Needs to be integrated in other master plans also.
Station-level TOD approach	The same may be explored.
Market-based approach	May be explored after evaluating the pros and cons.
Fiscal measures such as the purchase of higher FSI used to generate revenue.	Similar initiatives may be explored by other cities after understanding the pros and cons of each.
DCPR regulates conducting an impact assessment and prepare the Local Area Plan and Integrated Mobility Plan in order to provide legal strength to the implementation works in and around influence zones.	The same is to be undertaken in other cities also. Pune has already completed an impact assessment study for TOD around metro stations.
Maximum permissible FSI is based only on the right of way of the abutting road.	The same may be explored.



ANNEXURE A2

TOD STATION READINESS ASSESSMENT TOOL

A.2.1 Introduction

The TOD Readiness Assessment Tool is designed to assess the existing TOD potential. The tool helps decision-makers evaluate the TOD readiness at the local area scale.

ASSUMPTIONS AND LIMITATIONS:

- The tool is applicable for city, corridor and station scales. It is not intended to be applied on individual TOD projects at the site level.
- The tool is applicable in multiple contexts- greenfield, urban infill and redevelopment.
- The tool is not intended to compare different station areas along a corridor but highlight each station area's TOD potential.
- The tool is a relative measure of a station compared to other stations, and of imbalances in terms of connectivity, urban space and market potential. It is used for planning purposes, not design purposes.
- This tool is applicable for municipalities, development agencies, transit agencies, private developers or any agency interested in getting their city ready for TOD.

REFERENCE

- Adapted from Tod Readiness Assessment Tool by TOD, GPSC and The World Bank Group. ^[93]

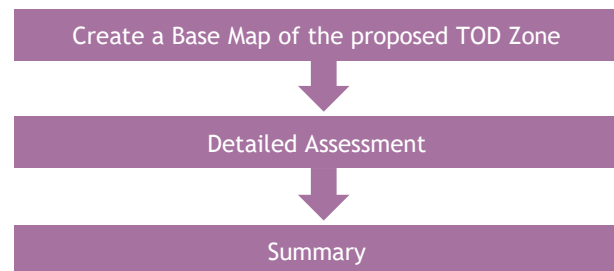
DATA SOURCE:

- *High-definition aerials/ satellite photography/ Google Earth/ Open Street*
- *Census information*
- *Local government GIS data*
- *Site Survey; Photos*
- *Local government transport data*
- *Secondary documents- applicable zoning codes; adopted master plans*
- *Field surveys*
- *Third-party reports*
- *Community mapping participatory planning exercises*
- *Open Source data*
- *Google Street view or other similar applications.*

INTENDED OUTCOMES:

- Develop a preliminary checklist to identify potential pitfalls early-on in the process that prioritizes interventions needed to enable and implement TOD.
- Gauge existing strengths and weaknesses of station areas to understand its full TOD potential and opportunities for improvement.

HOW TO USE THE TOD READINESS ASSESSMENT TOOL:



DETAILED ASSESSMENT

The Detailed Readiness Assessment tool is applicable at the corridor and station scales. It is a relative measure of a station compared to other stations as well as an evaluation of the station itself. It includes three categories of measures :

1. Node Value: It describes the importance of a station in the public transit network based on its passenger traffic volume, inter-modality, and centrality within the network.
2. Place Value: It describes the urban quality of a place and its attractiveness in terms of amenities including schools, plazas/open spaces representing the urban fabric around the station.
3. Market Potential Value: It refers to the unrealized market value of station areas. It is derived through market analysis measured analyzing major drivers of demand including current and future human densities (residential plus employment).

SCORING OF DETAILED ASSESSMENT:

- The result of the tool may be used to direct the city to draft a TOD vision and subsequently prepare detailed plans that enhance the value and economic potential of a local area.
- Each metric out of 3.
 - Low marking value stands for 1 mark,
 - Medium marking value score stands for 2 score
 - High marking value stands for 3 score
- The total score reveals several strengths and opportunities around the local area.

DETAILED ASSESSMENT

1. NODE VALUE

SNo.	Parameters	Station	
1	Number of other mass transit systems (such as BRTS, Metro, Metro Lite, MetroNeo, RRTS etc.) connected to the current station/ node		
	<i>Low = No connection to other mass transit lines</i> <i>Medium = Connection to two mass transit lines</i> <i>High = Connection to more than two mass transit lines</i>		
2	Average distance from the current station/ node to the station of other mass transit systems		
	<i>Low = Average distance is in the range of more than 2km</i> <i>Medium = Average distance is in the range of 800-2km</i> <i>High = Average distance is in the range of 400-800m</i>		
3	Current average daily weekday ridership measured against the ridership targets		
	<i>Low = <50% of the station with maximum ridership on the corridor</i> <i>Med = 50-75% of the station with maximum ridership on the corridor</i> <i>High = > 75% of the station with maximum ridership on the corridor</i>		
4	Number of complementary modes available within walking distance of the station (such as taxi, auto e-rickshaw etc.)		
	<i>Low = No connection to other transportation modes</i> <i>Medium = Connection to one other transportation modes</i> <i>High = Connection to more than one transportation modes</i>		

Score: 3 points for each parameter

2. PLACE VALUE

SNo.	Parameters	Station	
1	Number of intersections per square kilometer within the proposed TOD zone*		Low Medium High
Low = Intersection density less than 50 intersections per square kilometer Medium = Intersection density of 50-100 intersections per square kilometer High = Intersection density of more than 100 intersections per square kilometer			
2	Barriers in the area within the TOD Zone which are accessible by a 10 minute walk.		
Low = More than 50% of the footpaths are discontinuous, have poor condition and have significant accessibility barriers Medium = 20-50% of the footpaths are discontinuous, have poor condition and have significant accessibility barriers High = Less than 20% the footpaths are discontinuous, have poor condition and have significant accessibility barriers			
3	Number of cultural, educational, and health facilities within the proposed TOD zone		
Low = 1 type of facilities is accessible Medium = 2 type of facilities are accessible High = 3 type of facilities are accessible			

*For defining the TOD Zone refer to Section 2.1.1. III

Score: 3 points for each parameter

3. MARKET VALUE

SNo.	Parameters	Station	
1	Population and employment density per square kilometer in the proposed TOD Zone		Low
<i>Low = Less than city's average density</i> <i>Med = equal to city's average density</i> <i>High = Higher than city's average density</i>			
2	Average income in the proposed TOD Zone		
<i>Low = Less than the city's average median income</i> <i>Med = equal to the city's average median income</i> <i>High = Higher than the city's average median income</i>			Medium
3	Real estate opportunities (i.e. the difference between existing built floor space and maximum floor space that can be built within the existing FAR as per the development code regulations.)		High
<i>Low = less than 25%</i> <i>Med = less than 25-50%</i> <i>High = more than 50%</i>			

Score: 3 points for each parameter

ASSESSMENT FOR PUNE

Initial and Detailed assessment is carried out for Pune City. Two Stations were identified for carrying out the study i.e, Shivaji Nagar Metro Station and Mandai Metro Station. Both the station lies on PCMC to Swargate Metro Corridor.

1. NODE VALUE

SNo.	Parameters	Shivaji Nagar Metro Station		Mandai Metro Station	
1	Number of other mass transit systems (such as BRTS, Metro, Metro Lite, MetroNeo, RRTS etc.) connected to the current station/ node	High	Low Medium High	Low	Low
<i>Low = No connection to other mass transit lines</i> <i>Medium = Connection to two mass transit lines</i> <i>High = Connection to more than two mass transit lines</i>					
2	Average distance from the current station/ node to the station of other mass transit systems	High		High	
<i>Low = Average distance is in the range of more than 2km</i> <i>Medium = Average distance is in the range of 800-2km</i> <i>High = Average distance is in the range of 400-800m</i>					Medium
3	Current average daily weekday ridership measured against the ridership targets	NA		NA	High
<i>Low = <50% of the station with maximum ridership on the corridor</i> <i>Med = 50-75% of the station with maximum ridership on the corridor</i> <i>High = > 75% of the station with maximum ridership on the corridor</i>					
4	Number of complementary modes available within walking distance of the station (such as taxi, auto e-rickshaw etc.)	High		High	
<i>Low = No connection to other transportation modes</i> <i>Medium = Connection to one other transportation modes</i> <i>High = Connection to more than one transportation modes</i>					

2. PLACE VALUE

SNo.	Parameters	Shivaji Nagar Metro Station		Mandai Metro Station	
1	Number of intersections per square kilometer within the proposed TOD zone*	High		High	
<i>Low = Intersection density less than 50 intersections per square kilometer</i> <i>Medium = Intersection density of 50-100 intersections per square kilometer</i> <i>High = Intersection density of more than 100 intersections per square kilometer</i>					

SNo.	Parameters	Shivaji Nagar Metro Station		Mandai Metro Station	
2	Barriers in the area within the TOD Zone which are accessible by a 10 minute walk.	Medium	Low Medium High	Low	Low
Low = More than 50% of the footpaths are discontinuous, have poor condition and have significant accessibility barriers Medium = 20-50% of the footpaths are discontinuous, have poor condition and have significant accessibility barriers High = Less than 20% the footpaths are discontinuous, have poor condition and have significant accessibility barriers					
3	Number of cultural, educational, and health facilities within the proposed TOD zone	High		High	High
Low = 1 type of facilities is accessible Medium = 2 type of facilities are accessible High = 3 type of facilities are accessible					

*For defining the TOD Zone refer to Section 2.1.1. III

3. MARKET VALUE

SNo.	Parameters	Shivaji Nagar Metro Station		Mandai Metro Station	
1	Population and employment density per square kilometer in the proposed TOD Zone	High	Low Medium High	High	Low
Low = Less than city's average density Med = equal to city's average density High = Higher than city's average density					
2	Average income in the Proposed TOD Zone	Medium		High	Medium
Low = Less than the city's average median income Med = equal to the city's average median income High = Higher than the city's average median income					
3	Real estate opportunities (i.e. the difference between existing built floor space and maximum floor space that can be built within the existing FAR as per the development code regulations.)	High	High	Medium	High
Low = less than 25% Med = less than 25-50% High = more than 50%					

OVERALL SCORE: SHIVAJI NAGAR METRO STATION: 25/30- HIGH |
MANDAI METRO STATION: 22/30- MEDIUM

Conclusion: Based upon evaluation Shivaji Nagar Metro Station more than Mandai Metro Station.



ANNEXURE A3

PARAMETER FOR DEFINING LOCAL AREA TYPOLOGIES

A.3.1 Parameters for defining local area typologies

The parameters for comprehending local areas and enabling various classifications under each parameters are outlined below.

Functional Scale
Regional, City, Corridor, Local and Station Area Level

Development Context
Urban redevelopment, Urban Infill and Greenfield development

Connectivity
Typology based on development context - Core, Midline and Terminal Station

Land Use Characteristics
Commercial, Industrial, Mixed use, Public Semi-Public, Residential, Transportation and Recreational

Density (Population and Employment)
High Density, Medium Density and Low Density

Typology Based on Land use
Intermodal Gateway, Employment Centres, Destination/ Heritage Node, Transit Neighbourhood, Infill Neighbourhood

Potential Envisaged Use and Growth
High potential, Emerging potential and Low potential

Ecology/ Environment
High sensitive, Medium sensitive and Less sensitive

Functional Scale Parameter	Regional level	City level	Corridor level	Local level	Station area level
Land use Characteristics					
Density					
Connectivity					
Potential envisaged use and growth					
Cultural Character					
Ecology/ Environment					



ANNEXURE A4

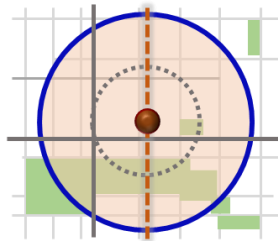
PILOT STATION - STUDY AREA DELINEATION

A.4.1 Demarcation of Local Area Planning Boundary and Influence Zone

Station Area Boundaries are defined by the distance people walk in a set duration of time. The alternate modes of transportation will consider the extend the boundary size.

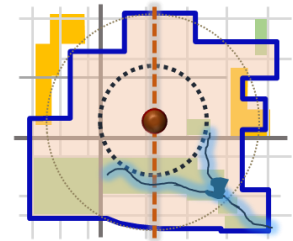
1 WALKING DISTANCE FROM TRANSIT STATION:

The station catchment area is defined by a 400-800 meter radius, encompassing locations reachable within a (5-10) minute walk at a speed of 5 kilometers per hour.



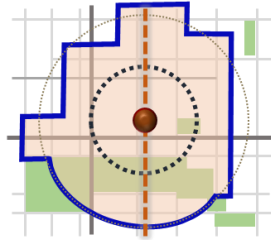
2 EXISTING ROAD NETWORK:

The boundary is impacted by gaps in the major networks and roadways.



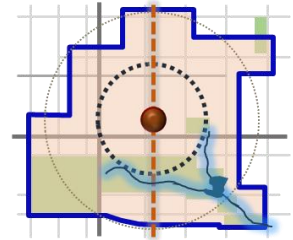
3 PED-SHED ANALYSIS:

Ped-shed maps walkable areas, considering actual walking paths (not straight lines), hence their irregular shapes.



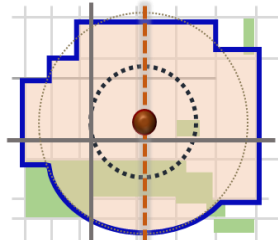
4 NATURAL ENVIRONMENT BOUNDARIES:

The local area boundary has been redrawn to incorporate open space, greenways, waterways, and natural system.



5 EXISTING BUILT ENVIRONMENT:

The parameter includes existing large developments areas and destinations beyond 10 minute walk*.



**Every plot boundary consisting of 50% or more area in the TOD influence zone will be considered.*

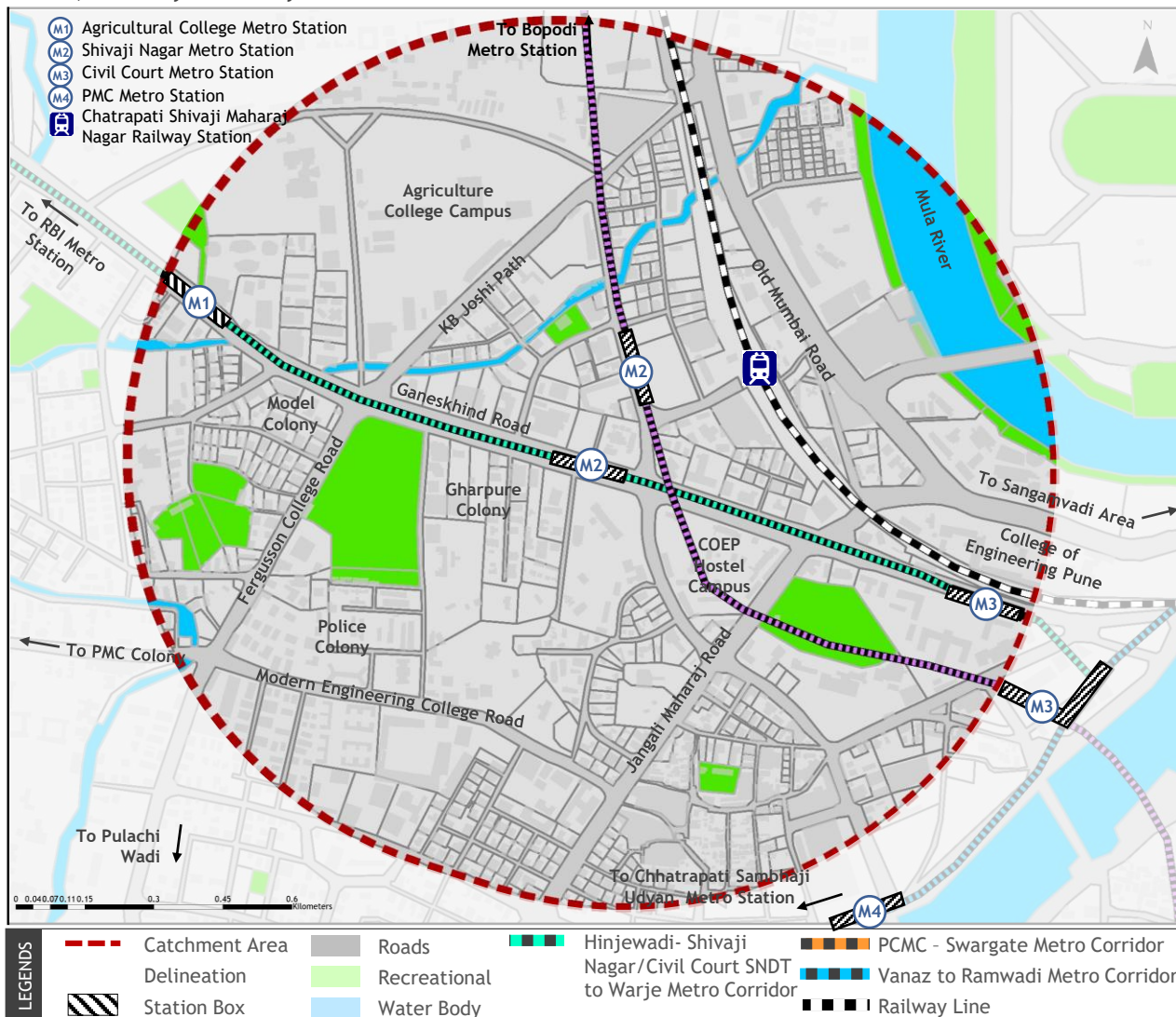
Data Source:

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

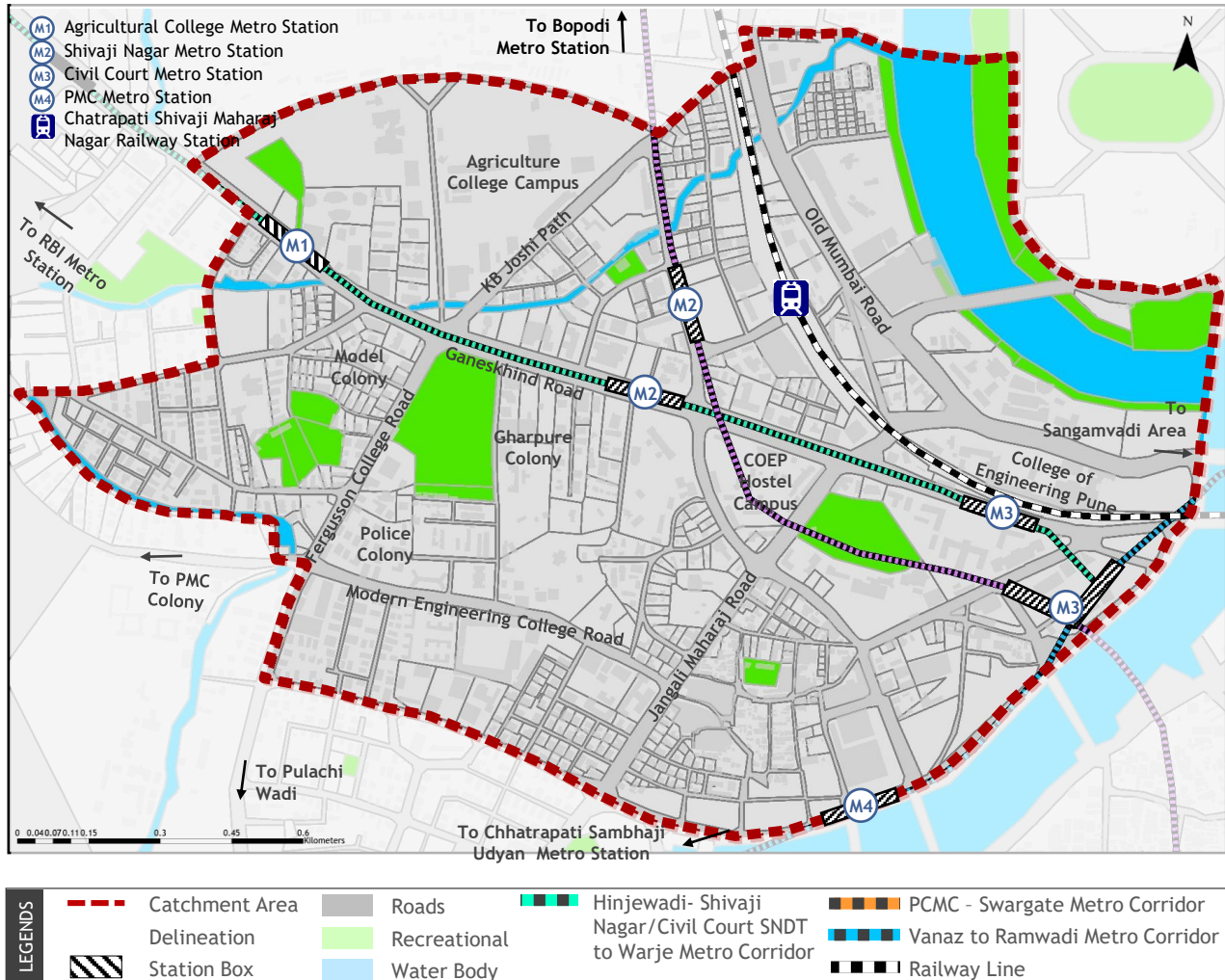


ASSESSMENT FOR SHIVAJI NAGAR METRO STATION- METHODOLOGY TO DEMARCATE STUDY AREA

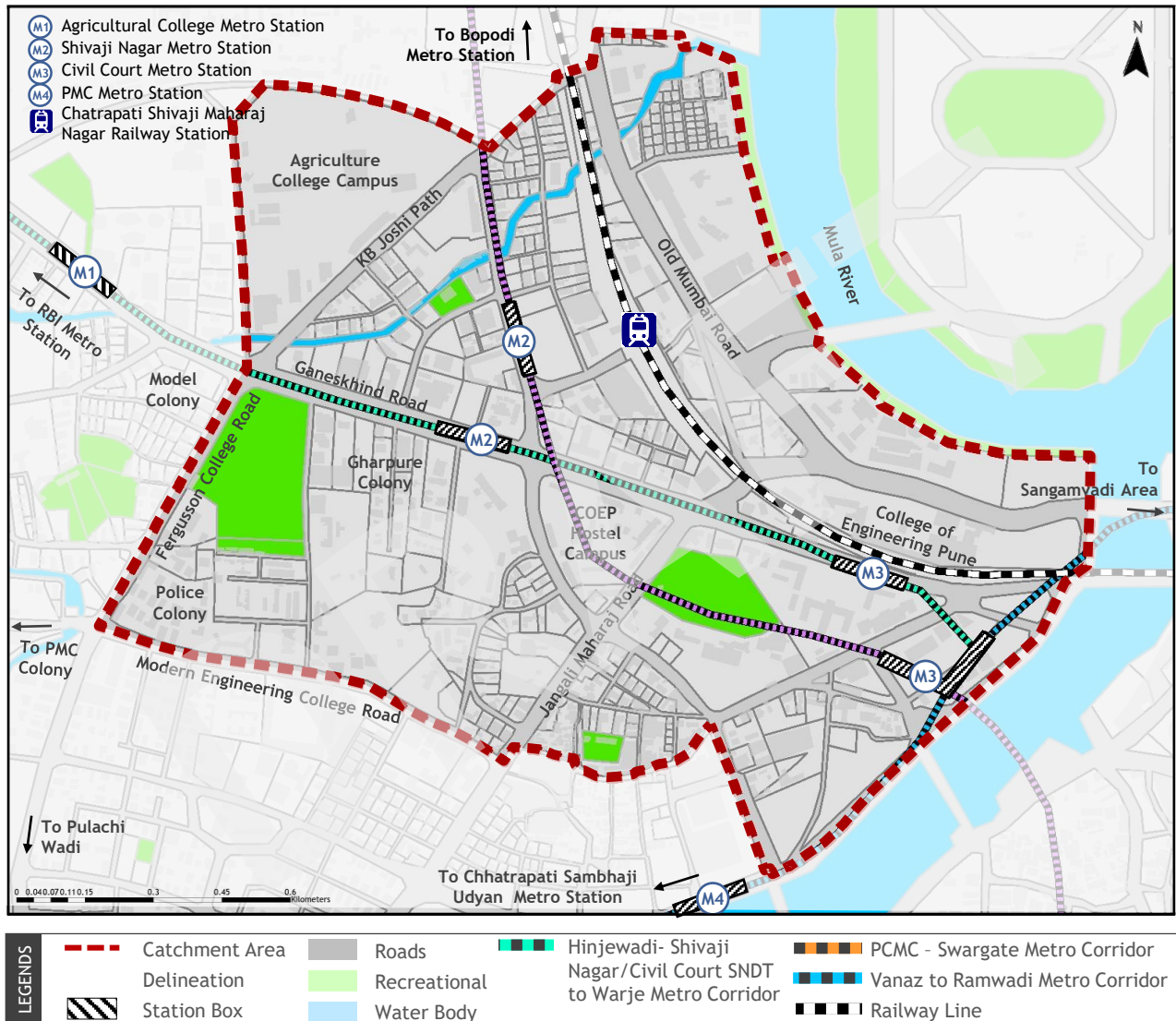
1. WALKING DISTANCE FROM THE TRANSIT STATION: Willingness to walk up to 10 minutes to a given station at 5km/h, boundary defined by 800m radial circle centred on the station.



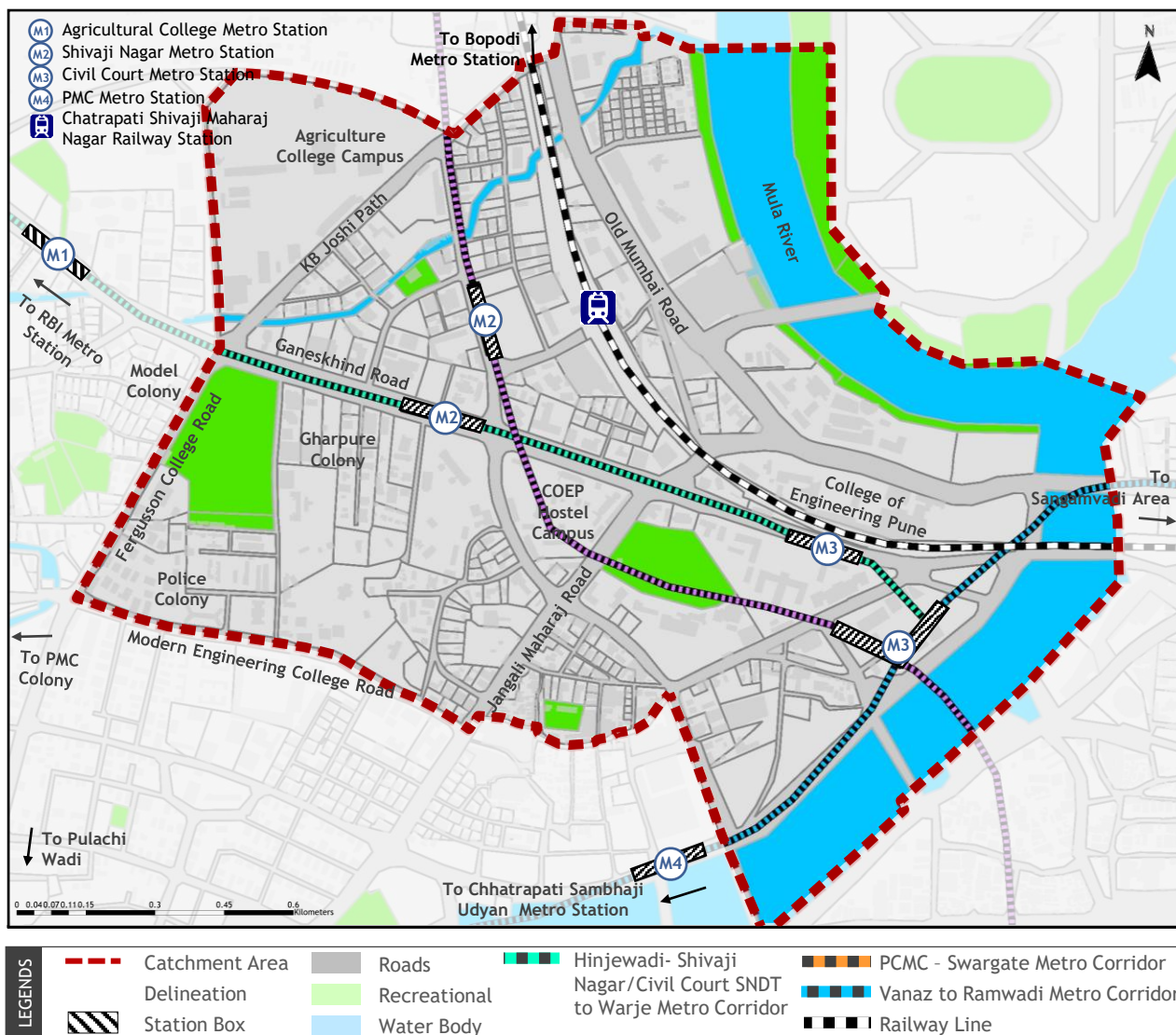
2. EXISTING ROAD NETWORK: The boundary is compromised by the road network breaks and major roadways.



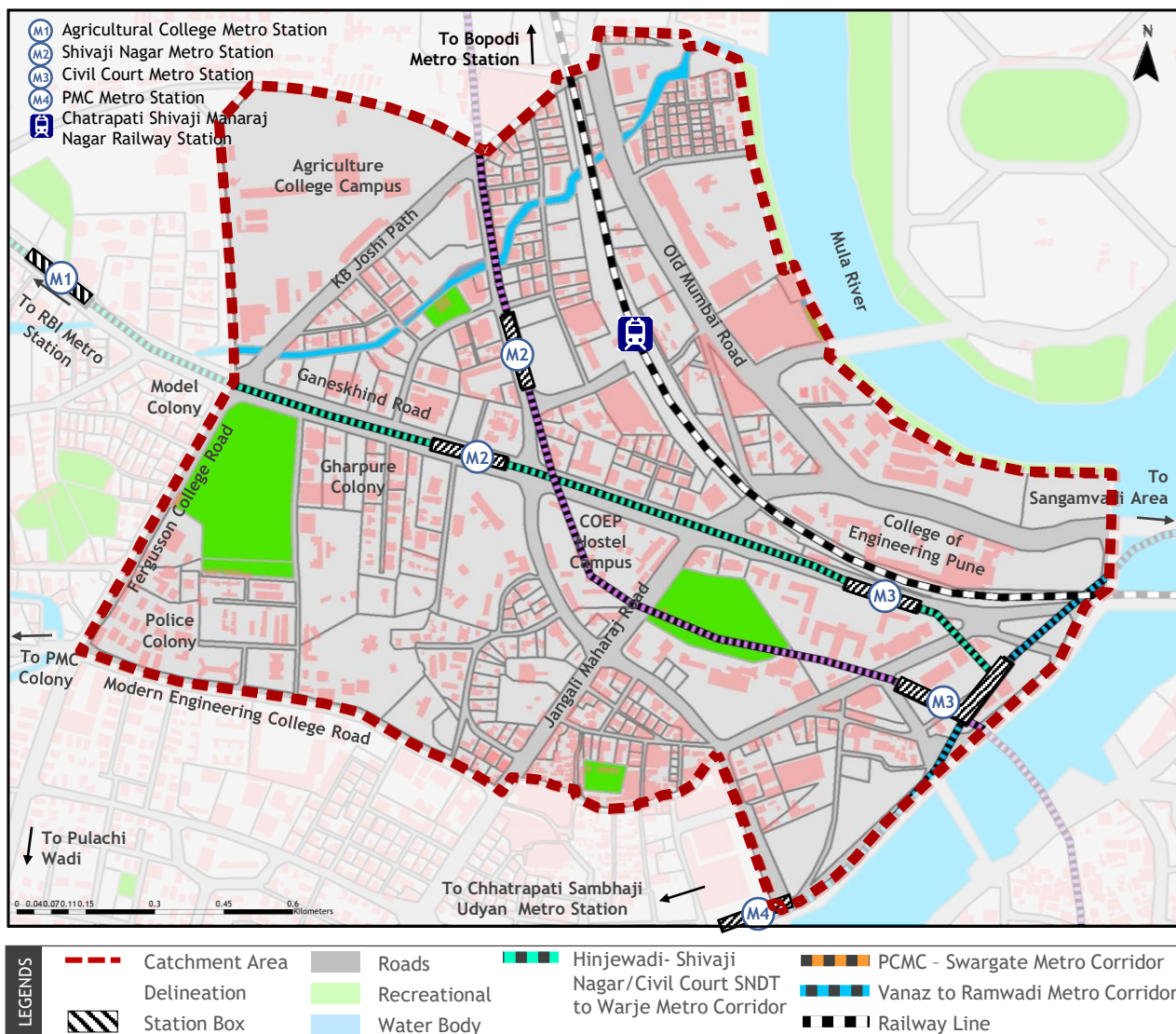
3. PED- SHED ANALYSIS: Ped shed is short for pedestrian shed. Ped sheds have irregular shapes because they cover the actual distance walked, not the linear (aerial) distance.



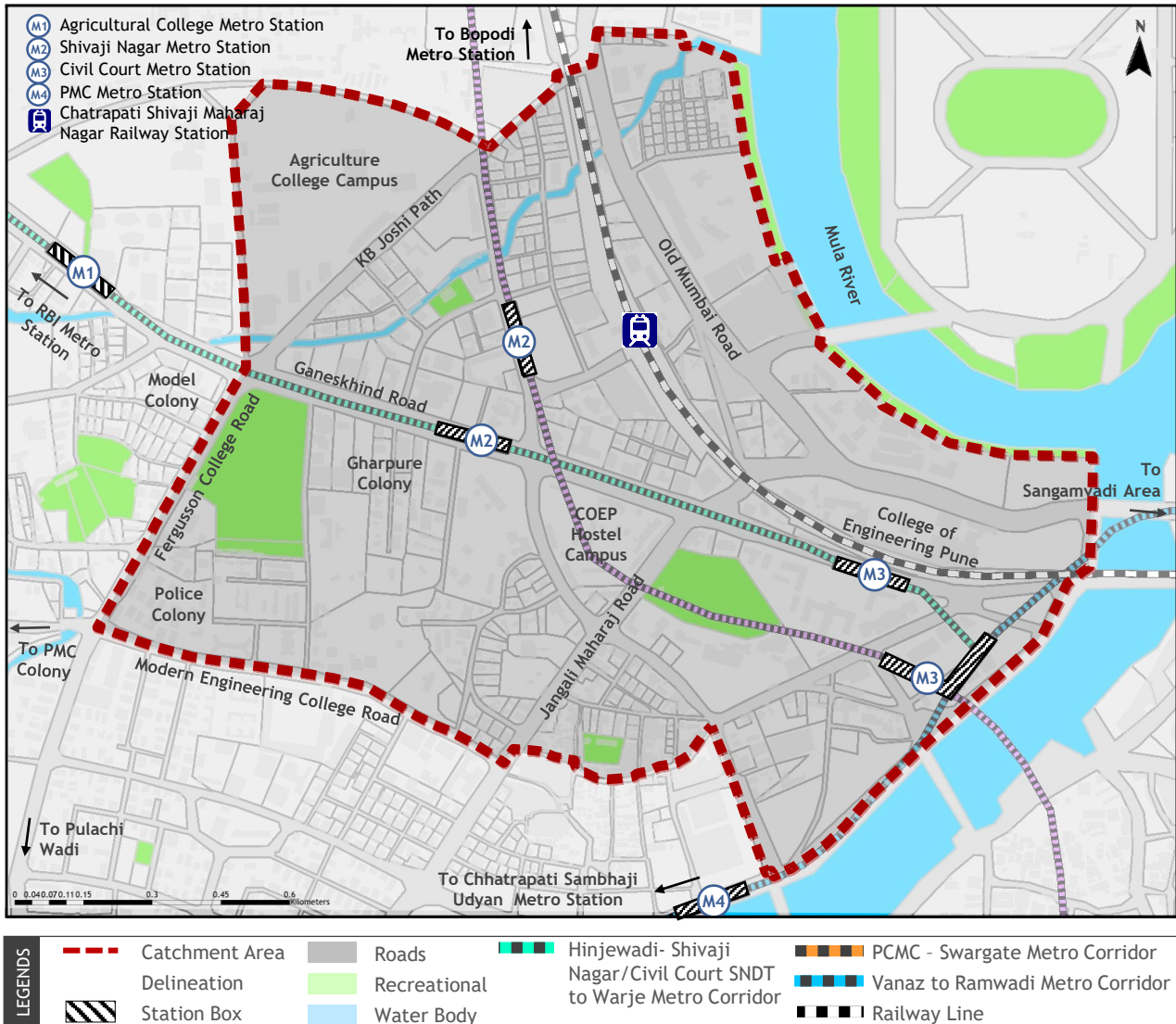
4. NATURAL ENVIRONMENT FEATURES: The boundary is remapped to include the natural systems, greenways, waterways, open space and barriers, such as major roadways and rail corridors.

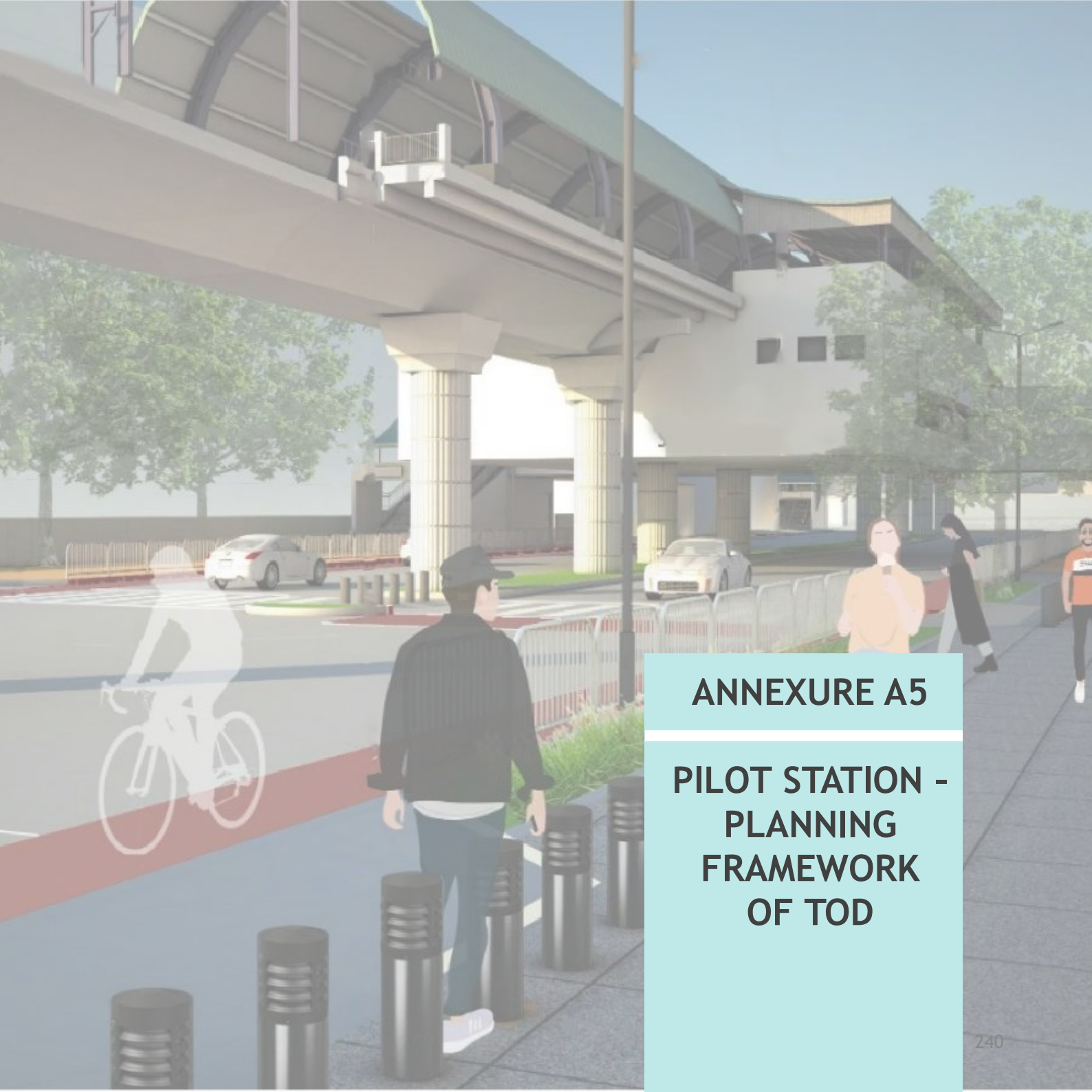


5. EXISTING BUILT ENVIRONMENT: The parameter includes existing large developments areas and destinations beyond 10 minute walk.



6. LOCAL AREA PLANNING BOUNDARY/ INFLUENCE ZONE: The alternate modes of transportation will consider the extend the boundary size.





ANNEXURE A5

PILOT STATION - PLANNING FRAMEWORK OF TOD

ASSESSMENT BEFORE PLANNING

1. What are the existing gaps?

PURPOSE

To evaluate the TOD readiness of the city with respect to the plans, policies, and developments.

OUTCOMES

Review of existing institutional and policy framework of the city and identifying gaps.

TOOLS AND RESOURCES

- Relevant Town and Country Planning Acts
- Zonal and Local area Development/Master Plans
- Comprehensive Mobility Plan
- TOD Policy
- Parking Policy
- Development Code Regulations

REFERENCES

- UMTA Toolkit^[87]
- Ecomobility Readiness Assessment - ICLEI South Asia^[81]
- Form Based Codes Guidebook URDPFI Guidelines^[65]
- MoHUA
- WRI

1 Plans and Policies available/ adopted by the city

Multiple Choice

- ☒ Master Plan / Development Plan
- ☒ Development Code Regulations (including Building By-Laws)
- ☒ Local Area Plans/ Zonal Development Plans
- ☒ Comprehensive Mobility Plans/ Comprehensive Traffic and Transportation Plans
- ☒ Transit Service Plan or Detailed Project Report (including future alignments)
- ☒ Traffic Improvement Plan
- ☒ TOD Policy*
- ☒ Parking Policy**
- ☒ Any Others Study (Describe)



* The policy can be separate or part of the Master Plan

** The policy can be separate or part of the CMP/ Master Plan

To create Local Area TOD Plans, Pune has embraced the plans and regulations mentioned above.

2 Status of existing Plans, Acts and Policies

- A - Completed
- B - Under Approval
- C - Draft Stage
- D - Under Preparation
- E - Needs Revision
- F - Not Prepared



Document Type	A	B	C	D	E	F
Master Plan/ Development Plan	☒	☐	☐	☐	☐	☐
Development Code Regulations (including Building By-Laws)	☒	☐	☐	☐	☐	☐
Local Area Plans/ Zonal Development Plans	☐	☐	☐	☒	☐	☐
CMP / CTPP/ LCMP at Regional and Municipal Level	☐	☒	☐	☐	☐	☐
Transit Service Plan or DPR (including future alignments)	☐	☒	☐	☐	☐	☐
Traffic Improvement Plan	☒	☐	☐	☐	☐	☐
TOD Policy	☒	☐	☐	☐	☐	☐
Parking Policy	☒	☐	☐	☐	☐	☐
NMT and Feeder Service Plan, Pedestrian Policy	☒	☐	☐	☐	☐	☐

3 Is High Demand/ Mass Transit Corridors have been identified in one of the following documents:

- ☒ Comprehensive Mobility Plan (CMP)
- ☐ Master Plan (MP)
- ☐ Development Plan (DP)



4 The Master Plan has incorporated the recommendations of Comprehensive Mobility Plans/ Comprehensive Traffic and Transportation Plans.

- ☒ Yes
- ☐ No



The Master Plan of Pune has adopted the proposed mobility interventions from the Comprehensive Mobility Plan.

5 The proposed master plan is available in GIS format or in a format that can be easily converted into GIS format.

- ☒ Yes
- ☐ No



The proposed plan of Pune is available in GIS Format

- 6 The master plan is less than 10 years old (based on the date it was drafted)

☒ A Yes
☐ B No



- 7 The Master Plan has incorporated the recommendations of the Transit Orient Development Policy and Plan prepared for the city.

☒ A Yes
☐ B No



The Master Plan of Pune has incorporated the proposed mobility interventions from the Transit Oriented Development Policy.

- 8 The Zonal Development Plans/ Local Area Plans around the identified stations are formulated taking into consideration the TOD principles

☒ A Yes
☐ B No



The Local Area Plans around the identified stations are formulated based on the TOD principles.

- 9 Is Master Plan being implemented within the identified TOD Local area?

☐ A Yes
☒ B No



If yes, what is the percentage of implementation in the Master Plan.

_____ %

- 10 Is Development Code Regulations (including Building By-Laws) city-specific, incorporated in the Development Plan (DP) or Master Plan (MP).

☒ A Yes
☐ B No



The Development Code Regulations have been determined by the city to ensure planned development.

- 11 The Development Code Regulations (including Building By-Laws) permit a mix of land uses and flexible activities with varying percentages of use around transit station.

☒ A Yes
☐ B No



The Development Control Regulations of Pune permit mix of land uses and flexible activities with varying percentage.

- 12 The Development Code Regulations (including Building By-Laws) incorporate Form-Based Codes.

☐ A Yes
☒ B No



The City needs to incorporate Form-Based Codes (refer Form-Based Codes Guidebook of MoHUA)

2. What is the policy framework?

PURPOSE

Identify the scope and scale of TOD in the city.

OUTCOMES

To understand if the city has adopted the National TOD policy in their statutory documents.

TOOLS AND RESOURCES

- Modifications to state-level laws and regulations
- Identify opportunities to implement TOD interventions within the existing policy framework.

REFERENCES

- TOD Tools for Metropolitan Planning Organizations ^[11]
- National Urban Transport Policy, 2006 (NUTP) ^[48]

1. Example: Accessibility Plan of Vancouver, 2023-2026

2. Example: Ahmedabad Metro Line (East to West) - High Court Metro Station, Doordarshan Metro Station and Thaltej Metro Station- Detailed Project Report (Draft Stage)

3. The master plan should be reviewed every after 10 years. Building by-laws should consider the TOD policy.

- 1 Acts/ Guidelines that are being referred to enable transit-supportive development:

Multiple Choice

- ☒ Motor Vehicles Act
- ☒ Metro Railways Act
- ☒ National Building Code
- ☒ Town and Country Planning Act
- ☒ Urban Land Ceiling Act
- ☐ Rent Control Act
- ☒ Land Acquisition Act
- ☒ Land Valuation Guidelines
- ☒ Building Bye-laws
- ☒ State Town and Country Planning Act
- ☒ Formulation and Implementation (URDPFI) guidelines



The city may also refer to the Rent Control Act for transit-supportive development.

- 2 Policy changes/ amendments required in support of transit-supportive development:

Multiple Choice

- ☒ Prioritize transit and non-motorized transportation modes in the development of the Master Plan and CDP in line with the National Urban Transport Policy, 2006 (NUTP)
- ☒ Mandatory accessibility improvements within 10-minute walking distance from all transit stations in the Master Plan, CMP or CDP ¹

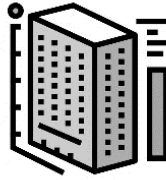


- ☐ C Legislation compelling local authorities to conduct planning in specific ways that support the containment of growth in urban areas²

3 The Acts and Policies that would be required to modify for planning and implementing TOD

Multiple Choice

- ☒ A State Town and Country Planning Act that includes conversion and land use amendments
- ☒ B Building By-Laws (state) including parking and enforcement
- ☒ C Town Planning Scheme



Pune has made necessary changes to the aforementioned Acts and rules to ensure mixed-use development, higher or graded FAR and parking restrictions in the influence zone of the station

4 Modify building bylaws to include TOD ideas in the planning and development phase:

- ☒ A Enable the filtering out of unfavorable land uses and developments that are incompatible with the TOD influence zone's vision during the early stages of development, such as large retail spaces, heavy industrial uses etc.

- ☒ B On-street parking laws should be categorized as temporary uses with regular review periods (annually, but no more than three years). In the long term parking supply should be limited in the TOD zones as per the TOD principles (Chapter 4)
- ☒ C Establish regular review periods for building bylaws and requirements for them to respond to the context and demands of development.³
- ☐ D To authorize uses that are necessary for the viability of the early stages of development but might not otherwise be allowed in the final phase of development.

3. Who will be involved in the decision-making process to plan and execute TOD?

PURPOSE

Identifying scope of work of each Organisation/ Authority and identification of Stakeholder

OUTCOMES

Formation of Organisation to plan and implement TOD in the city

List of stakeholder involvement such as Central Government, State Government, Local Agencies, private transit operators etc.

TOOLS AND RESOURCES

- Relevant Town and Country Planning Acts
- Zonal and Local area Development/Master Plans
- Comprehensive Mobility Plan
- TOD Policy
- Parking Policy
- Development Code Regulations

REFERENCES

- UMTA Toolkit^[87]
- Ecomobility Readiness Assessment - ICLEI South Asia ^[81]
- Form Based Codes Guidebook URDPFI Guidelines ^[65]
- MoHUA
- WRI
- JnNURM Toolkit for Comprehensive Capacity Building Programme ^[55]
- Report of Working Group on Capacity Building^[50]
- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets - IFC^[30]
- Good Practice Guide to Public Engagement in Development Schemes - RTPI UK ^[25]
- JnNURM CDP Toolkit (2013), Ministry of Urban Development ^[55]

- 1 The organisation in charge of the aforementioned plans and policies



- A Municipal Corporation
B Development Authority
C Transit Agency MAHA Metro
D Other: Maharashtra Metro Rail Corporation Limited (MAHA- Metro)

Document Type	A	B	C	D
Master Plan/ Development Plan	☒	☒	☐	☐
Development Code Regulations (including Building By-Laws)	☒	☒	☐	☐
Local Area Plans/ Zonal Development Plans	☒	☐	☐	☐
CMP / CTPP/ LCMP at Regional and Municipal Level	☐	☒	☐	☐
Transit Service Plan or DPR (including future alignments)	☐	☒	☒	☐
TOD Policy	☒	☐	☐	☐
Parking Policy	☒	☐	☐	☐
NMT and Feeder Service Plan, Pedestrian Policy	☐	☐	☐	☒

Municipal Corporations and Development Authorities overlook the Master Plan and Development Code Regulations. The Municipal Corporation also completes the Tod Policy and Parking Policy.

2 Umbrella Organization for planning and implementing TOD

- ☐ A Unified Metropolitan Transit Agency (UMTA)
- ☐ B Development Authority
- ☒ C Municipal Corporation
- ☐ D Transit Agencies
- ☐ E Others (Describe) _____



The Municipal Corporation of Pune is responsible for the planning and implementation of TOD.

3 An independent or private entity (such as SPV) identified/ set up to undertake TOD planning?

- ☐ A Yes
- ☒ B No

It is recommended to set up an SPV. Alternatively, the city may also set up a TOD Cell under the Umbrella Agency.



4 Roles that state government can typically play in facilitating TOD supportive policies for local government include:

Multiple Choice

- ☐ A Technical assistance in planning
- ☒ B Provide dedicated funding grants received from Central Government
- ☒ C Remove regulatory and statutory barriers to land use
- ☒ D Adopt “transit-first policies at State level and mandate for ULBs to adopt and implement these policies
- ☒ E Assist in forcing collaborations with state and central government agencies
- ☒ F Implement enabling policies such as land pooling, mandatory affordable housing provisions, joint development agreements, and land entitlement procedures



Technical assistance in planning is required for facilitating TOD- supportive policies for local government.

5 Stakeholders include

Multiple Choice

- ☒ A Central Government Agencies: Ministry of Housing and Urban Affairs (MoHUA), Ministry of Road Transportation and Highways (MoRTH), Ministry of Environment, Forests and Climate Change (MoEFCC).
- ☒ B State Agencies: State departments of urban development, housing, transportation and tourism
- ☐ C Local Agencies: Municipal Corporation/ Municipal Council, Town and Country Planning Departments, Development Authorities, Transit Agencies (Bus, rail etc), Housing Boards, Public Works Department, Traffic Police
- ☒ D Real Estate Developers
- ☐ E IPT Operators (Auto, Taxi, E-rickshaw etc.)
- ☒ F NGOs, Community Service Organizations, Advocacy Groups
- ☒ G Academic Institutions
- ☒ H General Public
- ☒ I Political Leadership and Elected Representatives



The stakeholder meetings should also include IPT operators and local agencies.

6 In house and external staff for TOD supportive activities and programs

	Activity	In-House	Outsourced
A	Land use planning along transit corridors	☐	☒
B	Station accessibility/NMT planning	☐	☒
C	Reviewing development projects and proposals at the site level	☒	☐
D	Preparing TOD supportive development guidelines/ DCR modifications	☐	☒
E	Infrastructure carrying capacity analysis	☐	☒
F	Traffic impact analysis	☐	☒
G	Planning future land uses for agency properties	☒	☐
H	Updation of GIS/ AutoCAD database	☐	☒
I	Preparing RFPs for joint development (PPP) projects	☒	☐
J	Negotiations of joint development projects	☒	☐
K	Funding of TOD studies and projects	☒	☐
L	Public outreach and education	☒	☐

- 7 Review of existing technical and professional staff available in the SPV to manage, implement and monitor TOD planning activities. The key resources required in the SPV:

- ☒ A Project Manager [Experience in TOD Planning/ integrating transport and land use planning]
(Min. 10 years of experience)
- ☒ B Urban Designer/ Urban Planner [Experience in street design/ walking and bicycle improvements]
(Min. 10 years of experience)
- ☒ C Transport Planner/ Engineer [Experience in transport sector, traffic modeling or relevant field]
(Min. 8 years of experience)
- ☒ D Infrastructure Planner/ Engineer [Experience in infrastructure demand management and planning]
(Min. 8 years of experience)
- ☒ E Real Estate and Housing Specialist [Experience in feasibility studies and real estate assessment]
(Min. 8 of years experience)
- ☒ F Finance Specialist
(Min. 10 years of experience)
- ☒ G Trainer [Experience of conducting trainings for government officials in urban transport sector and TOD]
(Min. 5 years of experience)



- ☒ H Gender Expert (Min. 8 years experience)
- ☐ I Procurement Specialist
(Min. 10 years experience)
- ☐ J Support Team (Min. 3 years experience)

Professional Staff identified from F to H are required in the SPV only if the activities I to L identified in Question 6 (above) are carried out in-house.

- 8 Gap Analysis of the resources available w.r.t. the TOD activities to determine the need for augmenting existing capacities through:

- ☒ A Training of existing professional staff in various agencies and departments
- ☒ B Recruiting new employees with requisite qualifications
- ☒ C Hiring external consultants to perform identified tasks if required



- 9 Mode of preparation of local area TOD Plans:

- ☐ A In-house by available resources in the SPV/ TOD Cell
- ☒ B External consultant appointed through a competitive and transparent bid process

10 Responsibilities for various stakeholders in a coordinated TOD implementation program includes:

-  **A** Local Governments:
- ☐ Master Planning (City and Corridor),
 - ☐ Local Area Planning (Station Area and Neighborhood),
 - ☐ Development Control Regulations
 - ☐ Building By-Laws,
 - ☐ Site Plan review and approvals
 - ☐ Infrastructure Upgradation,
 - ☐ Planning for Land Assemblage
 - ☐ Active Marketing of TOD opportunities to private attract developers
 - ☐ Developer Incentives
 - ☐ Secure Financing,
 - ☐ Enforcement (traffic police)
 - ☐ Public Outreach

-  **B** Transit Agencies:
- ☐ Transit development
 - ☐ Station design
 - ☐ Systems planning
 - ☐ Transit Service
 - ☐ Secure financing and joint development of stations with private sector

-  **C** Transit Agencies:
- ☐ Transit development
 - ☐ Station design
 - ☐ Systems planning
 - ☐ Transit Service
 - ☐ Secure financing and joint development of stations with private sector

-  **D** Regional Planning Agencies (UMTA/Metropolitan Authorities):
- ☐ CMP
 - ☐ Regional Transit Plan
 - ☐ Regional Growth Management Plan
 - ☐ Technical assistance to local agencies
 - ☐ Monitoring of Urban Transport Fund
 - ☐ Policy Formulation

-  **E** NGOs and Advocacy Groups
- ☐ Advocacy for NMT improvements
 - ☐ Community Participation in Planning and Design

-  **F** Elected officials:
- ☐ Developer and citizen awareness about benefits of TOD
 - ☐ Changing regulatory climate
 - ☐ Advocate transportation demand management policies and local economic development incentives

-  **G** Businesses/Real Estate Developers:
- ☐ Joint development with transit agencies Public Private Partnerships
 - ☐ Affordable housing construction
 - ☐ Private sector investment in real estate
 - ☐ Employee incentives

-  **H** State Government:
- ☐ Policy changes
 - ☐ Funding Assistance
 - ☐ Capacity Building
 - ☐ Technical Assistance
 - ☐ Land and Market Reforms

-  **I** Central Government:
- ☐ Policy changes,

- Guidelines Formulation Funding Assistance
- Capacity building

11 Set up a TOD Taskforce/ Steering Committee as the coordinating body, and assign it the following responsibilities:

- ☒ A Convene meetings to ensure that development in the local area is aligned with the principles, of TOD;
- ☒ B Facilitate approvals from local agencies and the state government;
- ☒ C Coordinate infrastructure investments between different agencies;
- ☒ D Promote education and awareness related to TOD projects;
- ☒ E Convene a meeting regularly to monitor the progress of implementation in each phase
- ☒ F Facilitate partnerships between public and private agencies
- ☒ G Ensure a participatory approach in TOD plan preparation and inclusive planning.
- ☒ H Facilitate necessary approvals from local agencies as well as the State
- ☒ I Monitor the implementation of each phase

12 Transit agencies can play an advisory role in:

- ☒ A Facility development such as feeder route service in station premises for multimodal integration (*Chapter 4, B1.I.*)
- ☒ B Reviewing walking distances to transit stops and design recommendations (*Section Chapter 4, B1.I.*)
- ☒ C Review of proposed developments in and around influence zone of the station.
- ☒ D Identification of modal split targets
- ☒ E Station facility design and joint development opportunities with private sector

13 Integration of TOD plans/Policies with existing statutory framework.

- ☒ A Master Plan/ Development Plan
- ☒ B Development Code Regulation (including Building By-Laws)
- ☒ C Local Area Plans/ Zonal Development Plans
- ☒ D CMP/ CTPP/ LCMP at Regional and Municipal Level
- ☒ E Transit Service Plan or DPR
- ☒ F TOD Policy
- ☒ G Parking Policy

PLANNING AND DESIGN PRINCIPLE OF TOD

1. How to define the TOD Local Area Plan?

PURPOSE

Understanding the TOD catchment area characteristics and the type of transit would help identify the appropriate scale of TOD. It will also help to identify the opportunities for multimodal integration.

OUTCOMES

- Identification of possible TOD activities, their scale and scope, based on existing or planned transit ridership

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.
- Pilot Station - Study Area Delineation - Refer to Annexure A4

REFERENCES

- Transit Corridors and TOD^[89]

- 1 Population Density in the influence area (Person per Hectare).

117 pph (2020)

- 2 Employment Density in the influence area (Person per Hectare).

127 pph (2020)

- 3 Does the city have Mass Transit Corridor

- ☒ A Yes
☐ B No



- 4 At least one corridor is either

- ☐ A Proposed
☐ B Under Implementation
☒ C Operational



- 5 If proposed, the timeline for commercial operations (in Months):

- ☐ A Less than 12
- ☐ B 12 to 18
- ☐ C 19 to 24
- ☐ D 25 to 30
- ☐ E 31 to 36
- ☐ F Greater than 36



- 6 Type of Mass Transit Modes:

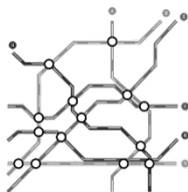
- ☐ A BRTS
- ☐ B Metro Neo
- ☐ C Metrolite
- ☒ D Metro
- ☐ E RRTS
- ☐ F Sub Urban Rail

Multiple Choice



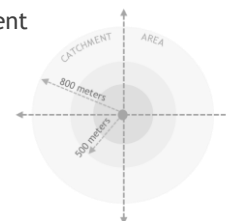
- 7 The number of stations that are to be taken up for planning and implementation of TOD

- ☐ A <5
- ☐ B 5-10
- ☐ C 11-15
- ☐ D 16-30
- ☐ E 31-50
- ☒ F >50



- 8 Transit Oriented Development Zone around the station; (in meters)

- ☐ A Less than 500
- ☒ B 500-800
- ☐ C More than 800



For defining TOD Zone refer Chapter 2, 2.1.5

- 9 Typology of Development Context

- ☐ A Urban Infill Areas
- ☒ B Urban Redevelopment Areas
- ☐ C Greenfield Areas



For identifying the development context refer Chapter 2, 2.1.2

- 10 Typology of the selected Local area based upon development context

- ☐ A Core City Station
- ☒ B Mid Line Stations
- ☐ C Terminal Stations



- 11 Local Area Typology based on Land Use

- ☒ A Intermodal Gateways
- ☐ B Employment Centres
- ☐ C Destination/ Heritage Nodes
- ☐ D Transit Neighborhoods
- ☐ E Infill Neighborhoods



Shivaji Nagar Metro Station lies under Intermodal Gateway Typology.

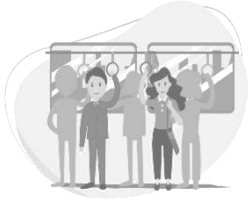
- 12
- Total Transit System Ridership boarding and alighting at the station selected for TOD
- 

Boarding: _____

Alighting: _____

In case, the corridor is proposed or under implementation, the boarding and alighting data as given in the DPR can be considered. If the corridor is operational, then the actual boarding and alighting numbers may be taken from the transit operating agency. This would provide an assessment of the facilities that need to be planned for feeder services (refer to Chapter 4, B1.I)

- 13
- Top three Predominant Land use in the Influence Zone
- | | | |
|------|--|-------|
| i. | Public Semi-Public Zone (PSP) | 25.9% |
| ii. | Mixed-Use (Residential and Commercial) | 19.2% |
| iii. | Residential | 18.4% |

- 14
- Modes that are connected to the station
- Multiple Choice
- | | | |
|-------------------------------------|---|--|
| ☐ | A | BRTS |
| ☐ | B | Metro Neo |
| ☐ | C | Metrolite |
| ☒ | F | Metro |
| ☐ | E | RRTS |
| ☒ | F | Suburban Rail |
| ☒ | G | City Bus Service |
| ☐ | H | Cable Car |
| ☐ | I | Public Bicycle Sharing System |
| ☒ | J | IPT (Taxi, Shared Taxi, Auto, Shared Auto, Two Wheeler Taxi, E-Rickshaw) |
| ☐ | K | Others |
- 

2. How to prepare a data inventory?

PURPOSE

To prepare a comprehensive database and assisting in documenting baseline conditions and analyzing restrictions

OUTCOMES

- Checklist of existing data source, and identification of gaps in the data
- Site inventory report with base map of physical conditions, visual and photographic surveys, and CAD/GIS database

TOOLS AND RESOURCES

- Secondary Data Source 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 source are not available
- Literature Review of Existing Documents and Studies
- Focus Group Meetings and Interviews
- Survey Formats- Refer to Annexure A8

1 Planning aspects that need to be taken into consideration while undertaking TOD study

- ☒ Zonal regulations
- ☒ Planning and regulatory context
- ☒ Regional context
- ☒ Mobility and Access
- ☒ Land Use Plans (Existing and Proposed)
- ☒ Existing and Proposed Key Developments
- ☒ Infrastructure Plans
- ☒ Transit Stations in the TOD Zone
- ☒ Major Intersections
- ☒ Activity Nodes
- ☒ Existing Natural Features such as Water body, forest and green areas



- 2 Inventory to be prepared through site visit to understand the planning and physical characteristics of the Study Area

- ☒ A Land Use Patterns (Residential, Commercial, Industrial, Recreational etc.)
- ☒ B Building type, FAR, FSI and heights
- ☒ C Road Network Inventory and Connectivity (FAR, Carriageway, Footpath, Junction type etc.)
- ☒ D Public Transportation Infrastructure (Stations, Stops, Terminal, Routes etc.)
- ☒ E Pedestrian and cyclist infrastructure
- ☒ F Parking availability and management (On-Street and Off-Street Parking, Parking Pricing)
- ☒ G Open spaces, green areas and natural features
- ☒ H Existing Infrastructure (water, electricity etc.)
- ☒ I Decadal Development activities (projects underway or recently completed)
- ☒ J Vacant Lands and buildings (size and ownership)



- 3 The information gathered for a site inventory such as physical condition and base map collected using GIS interface

- ☒ A Yes
- ☐ B No



1. How to formulate Local Area Plan?

PURPOSE

To translate the ideas of TOD into details that can be implemented through the identification of strategic actions and the modification of laws.

OUTCOMES

- TOD Plan
- DCR Modification

REFERENCES

- TOD Standard (ITDP) ^[22]
- Safe Access to Mass Transit Manual (Embarq) ^[85]

1 Preparation of TOD Plan/ Strategy in three phases:

- ☒ Concept Plan, including alternatives, if any
- ☒ Draft TOD Plan, to be presented to stakeholders for review
- ☒ Final TOD Plan, based on stakeholder feedback



2 Preparation of TOD Framework and Plans based on the Planning Principles:

(refer to Chapter 4, Section B)

- ☒ Accessibility Planning
- ☒ Urban Planning
- ☒ Urban Design
- ☒ Area Management Plan



3 Context-specific strategies formulated for the development of the area:

- ✓ **A** Land use and Development Concept, including identification of FARs, land uses, setbacks and marginal open space requirements
- ✓ **B** Accessibility Concept, Focusing on all Aspects and all modes of first and last mile connectivity
- ✓ **C** Infrastructural Impacts of the TOD Plan
- ✓ **D** Transit-supportive DCR modifications to be applied at a citywide scale or within delineated TOD Zones.



The section in the DCR that may be required to be modified are as follows:

- *Parking provision*
- *Building Height*
- *FAR*
- *Ground Coverage*
- *Building Setback*

2. Who will be involved during the planning and implementation stage of the project?

PURPOSE

To ensure availability of resources throughout the planning process and implementation stage.

OUTCOMES

An overview of the workshop's outcomes, shall include the innovative solutions found, the key concepts created, the feedback obtained, and the survey/questionnaire responses.

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 ^[25]
- The NCI Charrette System Guide for Transit Oriented Development ^[62]

1 Collaboration for Capacity Building

-  **A** Central Government agencies under MoHUA to design and implement training programs to augment existing capacities of political executives and urban managers to plan, monitor and evaluate TOD policies, plans and projects.
-  **B** State governments to provide technical/financial assistance and facilitate the creation of effective regional organizations that are focused on integrating land use and transportation planning implementation at the metropolitan scale such as the Unified Metropolitan Transportation Authority (UMTA)
-  **C** Municipal staff in monitoring preparation, implementation and evaluation of TOD plans and projects
-  **D** Study tours with assistance from central/state governments for experiential training
-  **E** Outsource capacity building and technical assistance activities to qualified consultants through a competitive bidding process

2 The subject experts to be included for the workshop:

- ☒ **A** Central Government Agencies: Ministry of Housing and Urban Affairs (MoHUA), Ministry of Road Transportation and Highways (MoRTH), Ministry of Environment, Forests and Climate Change (MoEFCC).
- ☒ **B** State Agencies: State departments of urban development, housing, transportation and tourism
- ☒ **C** Local Agencies: Municipal Corporation/ Municipal Council, Town and Country Planning Departments, Development Authorities,
- ☒ **D** Transit Agencies (Bus, rail etc), Housing Boards, Public Works Department, Traffic Police
- ☒ **E** Real Estate Developers
- ☒ **F** IPT Operators (Auto, Taxi, E-rickshaw etc.)
- ☒ **G** NGOs, Community Service Organizations, Advocacy Groups
- ☒ **H** Academic Institutions
- ☒ **I** General Public
- ☒ **J** Political Leadership and Elected Representatives



Phase 1 Workshop - Project Introduction & Initiation.

(the presentations should be illustrative.)

The workshop should be in three parts

- ☒ **A** Part One (Project Background and Education): focus on introductions, project background, project goals and vision, intended outcomes, analysis, baseline conditions and SWOT
- ☒ **F** Part Two (Stakeholder engagement - Concept Development)- Assemble stakeholders into several groups and assign them to create physical design concepts for land use, public realm, accessibility, and urban design. A facilitator (preferably from the consultant team), a rapporteur (ideally a stakeholder), an invited expert, and a planning/ development agency representative should be present in every group.
- ☒ **C** Part Three (Stakeholder engagement - Plan Implementation) - Focus on Q/A sessions, discussion on the concept plans prepared by each group and conducting a SWOT analysis of each.

Phase 2 Workshop - finalization of Concept Plan

(the presentations should be illustrative.)

The workshop should be in three parts

-  **A** Part One - Present the Comprehensive TOD Concept Plan prepared along with its SWOT analysis and intended outcome and get feedback on the same.
-  **B** Part Two - (Stakeholder engagement - Components of Concept Plan) Divide the stakeholders into minimum - groups as done in Workshop 1. Each group to be assigned one component of the concept plan that they are required to detail out. A brief note is to be provided to the group which gives them an understanding of the component to be addressed and the expected inputs to be provided by the group.
-  **C** Part Three - (Stakeholder engagement - Draft Plan Outline) - discussion on the Components detailed by each group and conducting a SWOT analysis of each.

Phase 3 Workshop - Feedback on the Draft TOD Plan (the presentations should be illustrative.)

The workshop should be in three parts

-  **A** Part One - Present the Draft TOD Plan prepared along with its SWOT analysis.
-  **B** Part Two - (Stakeholder engagement - Plan Implementation) - Focus on Q/A sessions, discussion on the Draft TOD Plan
-  **C** Part Three - Final TOD plan presentation

3 Collaborate- with local professional associations to reach a broader audience and stakeholder base. Potential partners may include:

-  **A** Confederation of Real Estate Developer's Association of India (CREDAI);
-  **B** Indian Institute of Architects (IIA);
-  **C** Institute of Town Planners of India (ITPI);
-  **D** The Institution of Engineers (India);
-  **E** Institute of Urban Transport (IUT),
-  **F** National Institute of Urban Affairs (NIUA)
-  **G** Indian National Trust for Art and Cultural Heritage

- 4 Aspects to be included while conducting the workshop.

- A ✓ Project Background
- B ✓ Agenda of the Meeting
- C ✓ Questionnaires/ Surveys focusing on issues that are required to be addressed, alternatives for consideration and intended outcomes



The questionnaire to the extent possible should be in multiple-choice question (MCQ) format for focused responses from the participants

FINANCING AND IMPLEMENTING FOR TOD

1. What is the best approach to invest and generate revenue from a project?

PURPOSE

To develop a strategic project investment and revenue generation for the designed TOD local area plan.

OUTCOMES

Capital improvement strategy and a systematic public financial strategy for implementing TOD

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 ^[43]
- Interim Report of the High Level Committee: Financing of Infrastructure, Government of India ^[90]

1 Develop a Capital Improvement Strategy to phase and prioritize tools and strategic actions to finance incentives that encourage transit-oriented development. The principal elements of an investing strategy may be:

- ☒ Real Estate Market Study including Socio-Economic Profile for TOD study area
- ☒ List of broad infrastructure improvement proposals such as NMT improvements, utility upgrades, private sector development/ redevelopment opportunities and transit station joint development opportunities
- ☐ Land Acquisition costs
- ☐ Additional planning studies and DPRs to be prepared
- ☒ Institutional Roles and Responsibilities
- ☒ Resource Mobilization and Revenue Generation Strategy



- 2 Create plans for land assembly and banking to reserve land for development in the future and release it when earlier phases of development fulfill land use and transportation goals.

- ☒ A Using market analysis reports and development plans, identify possible development sites, then buy them as soon as they go up for sale.
- ☒ B On these purchased lands, lease back the land or permit temporary development to create a cash stream to help with land-carrying costs.
- ☒ C Give the ULBs and public sector organizations the chance to have more influence on the phasing and subsequent development to align with the master plan.

- 3 The best approach that can be opted to build a comprehensive grant-securing strategy for TOD projects from centre, state, local and any other source.

Multiple Choice

- ☒ A Require land development planning as an integral component of transportation plans
- ☒ B Collaborate with state agencies to dedicate funds for conducting TOD studies from infrastructure budgets
- ☒ C Transit agencies to conduct TOD planning as part of transit system planning and station design
- ☒ D Connect with international agencies, NGOs and academic institutions to provide technical assistance in undertaking TOD studies
- ☐ E 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 Funds (if established) for conducting TOD planning studies.



2. What are the different financing and non-financing tools to encourage TOD?

PURPOSE

To determine a range of investment tools that will enable the integration of TOD into city financial and urban management frameworks.

OUTCOMES

- Project financing models

REFERENCES

- Capturing the Value of Transit (CTOD)^[74]
- Existing and innovative financial measures have been elaborated in end of the section above.
- Value Capture Finance Policy Framework by MoUD, GOI ^[109]

- 1 Financing tools that the local government and transit agencies have used globally:

- ☒ A Urban Transport Fund (UTF)
- ☒ B Land Value Capture
- ☒ C Tax Increment Financing (TIF)
- ☒ D Town Planning Scheme (TPS)
- ☒ E Developer Fees
- ☒ F Joint Development
- ☒ G Municipal bonds
- ☒ H Land leasing
- ☒ I Bank loans and financing
- ☒ J Direct fees through tools such as Congestion Pricing, Parking Fees and Advertising Fees
- ☒ K Grants



- 2 Utilise non-financing instruments in TOD districts to help defray the costs associated with project planning, development, and upkeep.

- ☒ A Land Pooling/ Land Banking
- ☐ B Land Swapping
- ☐ C Development Agreements
- ☐ D Density Bonuses
- ☒ E Transfer of Development Rights
- ☐ F Anchor Institution Partnership
- ☐ G Corridor-Wide Tax Increment Financing
- ☐ H Multi-Station Tax Increment Financing
- ☒ I Real Estate Investment Trust



- 3 Public improvement strategies that could be employed for density exchange bonuses with the private sector include:

- ☒ A Infrastructure upgrades along the property edge or within 5-min walking distance of the transit stop facility *(Chapter 4, B2.I)*
- ☒ B Affordable housing in new developments near transit
- ☒ C At grade publicly *(Chapter 4, B2.III)*
- ☒ D Accessible pedestrian links between transit station and Other land uses *(Chapter 4, B1.II)*
- ☒ E Urban plazas or parks in the vicinity of the transit station facility. *(Chapter 4, B3.I)*
- ☒ F Pedestrian access routes to transit stations *(Chapter 4, B1.III)*



3. How to plan a project phasing and implementation strategy?

PURPOSE

To suggest initial Sub-Tasks in the form of catalyst initiatives, short-, medium-, and long-term improvements, and quick wins in order to guarantee the effective execution of TODs.

OUTCOMES

- Implementation Strategy includes
 - ❖ Preliminary list of projects
 - ❖ List of additional studies/streetscape improvement projects/public- realm redevelopment projects
 - ❖ TOD Plans
- Phasing Strategy includes
 - ❖ Quick Wins (0-3 years)
 - ❖ Short- Term (3-5 years)
 - ❖ Mid- Term (5-10 years)
 - ❖ Long Term (10+ years)

- 1 Create a phased plan for implementing the short-, medium, and long-term interventions required to advance toward TOD-supportive changes throughout the city. Among the projects are:

Quick Wins (0-3 years)

- ✓ ☒ TOD Policy Formulation
- ✓ ☒ TOD policy as amendment in Master Plan including demarcation of TOD overlay districts
- ✓ ☒ Local area planning including Accessibility
- ✓ ☒ DCR modifications
- ✓ ☒ Formation of SPV ([Chapter 5, 1.3](#))
- ✓ ☒ Identify staff resources for TOD planning
- ✓ ☒ TOD capacity building including training of staff ([Chapter 3, 3.2](#))
- ✓ ☒ Multimodal integration at station facility ([Chapter 4, B1.I](#))
- ✓ ☒ Signage and wayfinding ([Chapter 4, B1.II](#))

Short- Term (3-5 years)

- ✓ ☒ Master Plan shall include TOD principles ([Chapter 4, B 1,2,3,4](#))
- ✓ ☒ Zonal Development Plan/ Local Area Plan formulation with TOD principles
- ✓ ☒ Station accessibility planning.



- ☒ **D** Complete sidewalk network within a 5-minute walking radius of the station
(Chapter 4, B1.II)
- ☒ **E** Traffic management measures (Chapter 4, B4.I)
- ☒ **F** Upgraded pedestrian infrastructure including footpaths, street furniture (Chapter 4, B1.II)
- ☒ **G** Improved station facilities including passenger amenities (Chapter 4, B1.I)
- ☒ **H** Bicycle rental or public bicycle-sharing systems near transit stations (Chapter 4, B1.II)
- ☒ **I** Park-and-ride near transit stations (Chapter 4, B1.I)
- ☒ **J** Multimodal integration for various modes (Chapter 4, B1.I)
- ☒ **K** Implement area-wide parking management plan (Chapter 4, B4.II)
- ☒ **L** Changes to state acts to include financing tools such as tax increment financing and FAR density bonus (Chapter 5, 2)

Medium- Term (5-10 years)

- ☒ **A** Land pooling (greenfield TODs) (Chapter 5, 2)
- ☒ **B** Infrastructure utility upgrades in TOD areas (Chapter 4, B2.I)
- ☒ **C** Streetscape improvements to achieve complete first and last-mile connectivity (Chapter 4, B1.II)
- ☒ **D** Redevelopment of government owned vacant lands as mixed use development (Chapter 4, B2.IV)
- ☒ **E** Formalize street vendors near transit stations (Chapter 4, B3.I)

Long- Term (10+ years)

- ☒ **A** Joint development of stations with the private sector
- ☒ **B** Land banking (urban TODs) (Chapter 5, 2)
- ☒ **C** Build mixed-use affordable housing near transit stations on government-owned vacant lands (Chapter 4, B2.III)
- ☒ **D** Redevelopment of underutilized sites near transit stations

- 2 To keep track of new construction and redevelopment in TOD regions, create a development checklist:

- ☒ **A** Ensure conformance to TOD principles through performance measures connected to phasing strategy (*It includes multi modal integration, improvement in first mile and last mile connectivity, non-motorized transport network, infrastructure planning etc.*)
- ☒ **B** In order to provide developers, planners, and other users with information, create a tracking database of development performance and specifics (a portal). (*Example: The Bhoonidhi portal is a comprehensive platform for users to browse, search, order, and download these datasets.*)

- 3 To help the city and the development and planning agency implement the TOD Plan's suggestions methodically, prepare a redevelopment handbook that includes preliminary recommendations. The redevelopment handbook ought to list:

- ☒ A Description of capital/catalyst public and private projects
- ☒ B Public-Private partnership opportunities
- ☒ C Plan phasing in the form of quick win projects, medium and long term
- ☐ D High-level cost estimates funding required for each phase of Plan implementation.
- ☒ E Technical capacity building recommendations. (*Chapter 3, 3*)
- ☒ F Indicative list of tenders required for private sector/public realm improvement projects



4. How to plan for a public outreach program?

PURPOSE

Inform a larger audience about the advantages of transit-supportive activities.

OUTCOMES

- Marketing Promotion and Outreach Program to publicize benefits of TOD

REFERENCES

- From Here to There: A creative guide to making public transport the way to go,' EMBARQ ^[102]

- 1 Use marketing promotion and outreach programs to publicize benefits of TOD:



As part of larger transportation demand management programs, conduct customized marketing campaigns at rapid transit stations as well as in homes and businesses along transit service routes in and around the TOD influence zone. *For instance, King Country Metro in Washington State ran a customized marketing campaign called "One Less Car" that offered incentives and individualized travel planning help to homes along transit routes. As a result, participants' vehicle kilometers driven decreased by 9%.*



Feeder service branding and marketing should highlight the advantages of using the service, such as the time and convenience saved by not having to search for a parking spot or being stuck in traffic. Social media, online advertising, local press, community events, campaigns, and billboards can all be used to put this into action.



Establish a consistent brand for the transportation system, the station buildings, and the nearby private development. *As an illustration, the Bellingham, Washington, transit system employs a unified graphic style in all of its stations and promotional materials. This consists of a consistent color palette, emblem, standardized color scheme, logo, and typography, which helps to create a cohesive brand image.*

-  **D** Disseminate planned modifications in the vicinity of TOD stations using visual presentation approaches so that stakeholders may grasp the community's vision in real time. It can be portrayed using digital platforms, interactive displays, 3D modals, public art installations, and visual aids.

5. What are the goals and objectives of TOD?

PURPOSE

To balance long-term goals and objectives with immediate development needs, and to make clear the bare minimum requirements as outlined in the Plan.

OUTCOMES

- Building by-laws
- Transit plans
- Infrastructure upgradation plans

TOOLS AND RESOURCES

- Development Plans/ Master Plans/ Development Control Regulations

REFERENCES

- JnNURM CDP Toolkit (2013), Ministry of Urban Development ^[55]
- Urban and Regional Development Policy, Formulation and Implementation (URDPFI) Guidelines^[95]

- 1 Create building bylaws to include TOD ideas in the planning and development phase:

A ✓ Enable the filtering out of unfavorable land uses and developments that are incompatible with the TOD influence zone's vision during the early stages of development, such as large retail spaces, heavy industrial uses etc.

B ✓ On-street parking laws should be categorized as temporary uses with regular review periods (annually, but no more than three years). In the long term parking supply should be limited in the TOD zones as per the design principles (*Chapter 4, B4.II*)

C ✓ Establish regular review periods for building bylaws and requirements for them to respond to the context and demands of development.

Example: The master plan should be reviewed every after 10 years. Building by-laws should consider the TOD policy.

D To authorize uses that are necessary for the viability of the early stages of development but might not otherwise be allowed in the final phase of development.

6. How to measure the success of TOD in the city?

PURPOSE

To give guidance to the development industry regarding the essential elements and nature of development; assess the degree to which plan goals, objectives, and policies are being met through both qualitative and quantitative performance metrics.

OUTCOMES

- Monitoring and Evaluation Framework

- 1 Develop time-bound targets to be achieved through TOD planning. These targets may include performance measure to evaluate performance for: *(Chapter 4, 4.3)*
 - ☒ A Quality of the transportation network
 - ☒ B Pedestrian and cycling network
 - ☒ C Land Use and Economic goals
- 2 To keep track of new construction and redevelopment in TOD regions, create a development checklist:
 - ☒ A Ensure conformance to TOD principles through performance measures connected to phasing strategy *(It includes multi modal integration, improvement in first mile and last mile connectivity, non-motorized transport network, infrastructure planning etc.)*
 - ☒ B In order to provide developers, planners, and other users with information, create a tracking database of development performance and specifics (a portal). *(Example: The Bhoonidhi portal is a comprehensive platform for users to browse, search, order, and download these datasets.)*



ANNEXURE A6

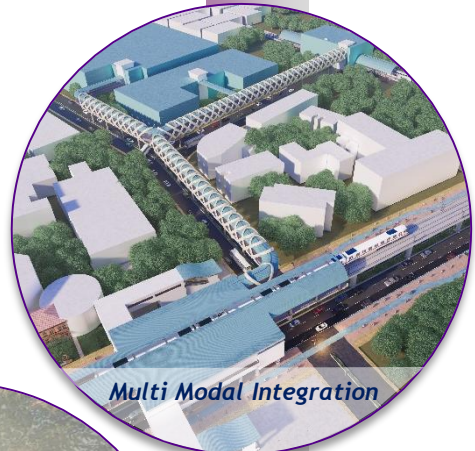
PILOT STATION - STUDY FOR MULTI MODAL INTEGRATION

MULTI MODAL INTEGRATION

Integrated Transit, Unified Travel

Integrate Shivajinagar Metro Stations to the lines and Railway station along with the adjoining bus stops.

1. Seamless connection between underground and above-ground Shivajinagar Metro stations (at grade and underground).
2. Foot over bridge to access the eastern side of Shivajinagar railway station.
3. Direct access to bus stops on both ends of Shivajinagar metro station and bus depot.
4. Direct connection with Shivaji Nagar Railway Station parking area



Multi Modal Integration



CASE STUDIES

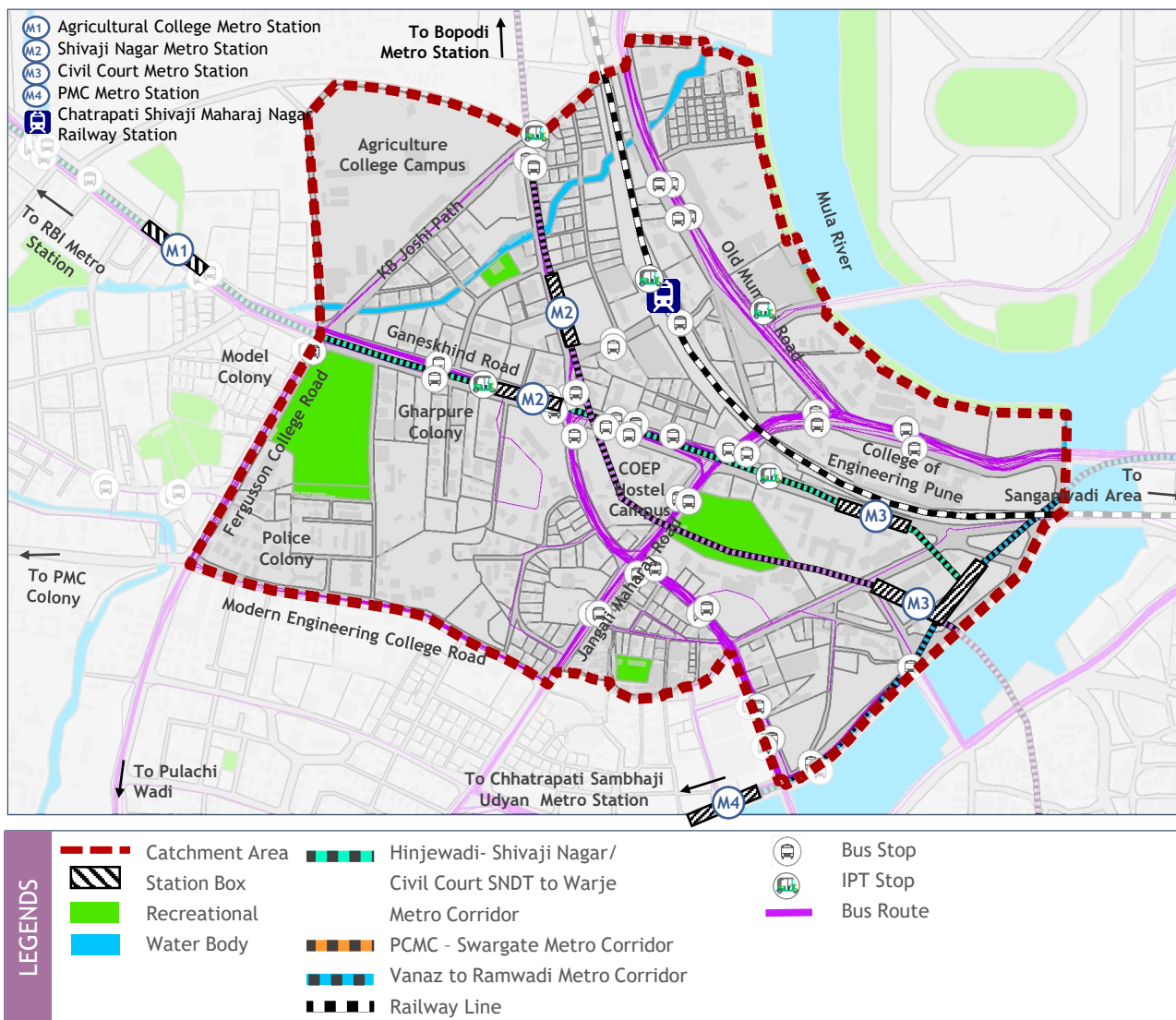


Airport connectivity, New Delhi



Seamless Connectivity, Dhaula Kuan Metro Station, New Delhi

MULTI MODAL INTEGRATION



Disclaimer: This map is provided for representation purposes only. For official purposes, please consult relevant authorities or official resources.

FIRST AND LAST MILE CONNECTIVITY

Bridging the Gaps in Your Commute

Pedestrian and Cycle friendly streets provide safe and comfortable mobility for all the citizens through walking, cycling, and public transport.

Such streets are characterized by features that encourage physical activity, social interaction and environmental sustainability. Elements like wide sidewalks, bike lanes, greenery, and public spaces contribute to a sense of community.

CASE STUDIES



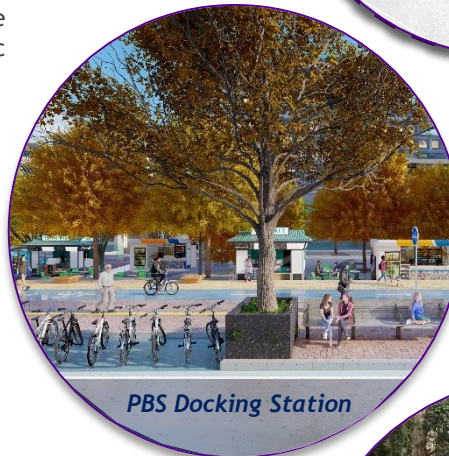
Organized IPT System, Chhatarpur Metro Station, New Delhi



Footpath Infrastructure, Moti Bagh, New Delhi



IPT Stand



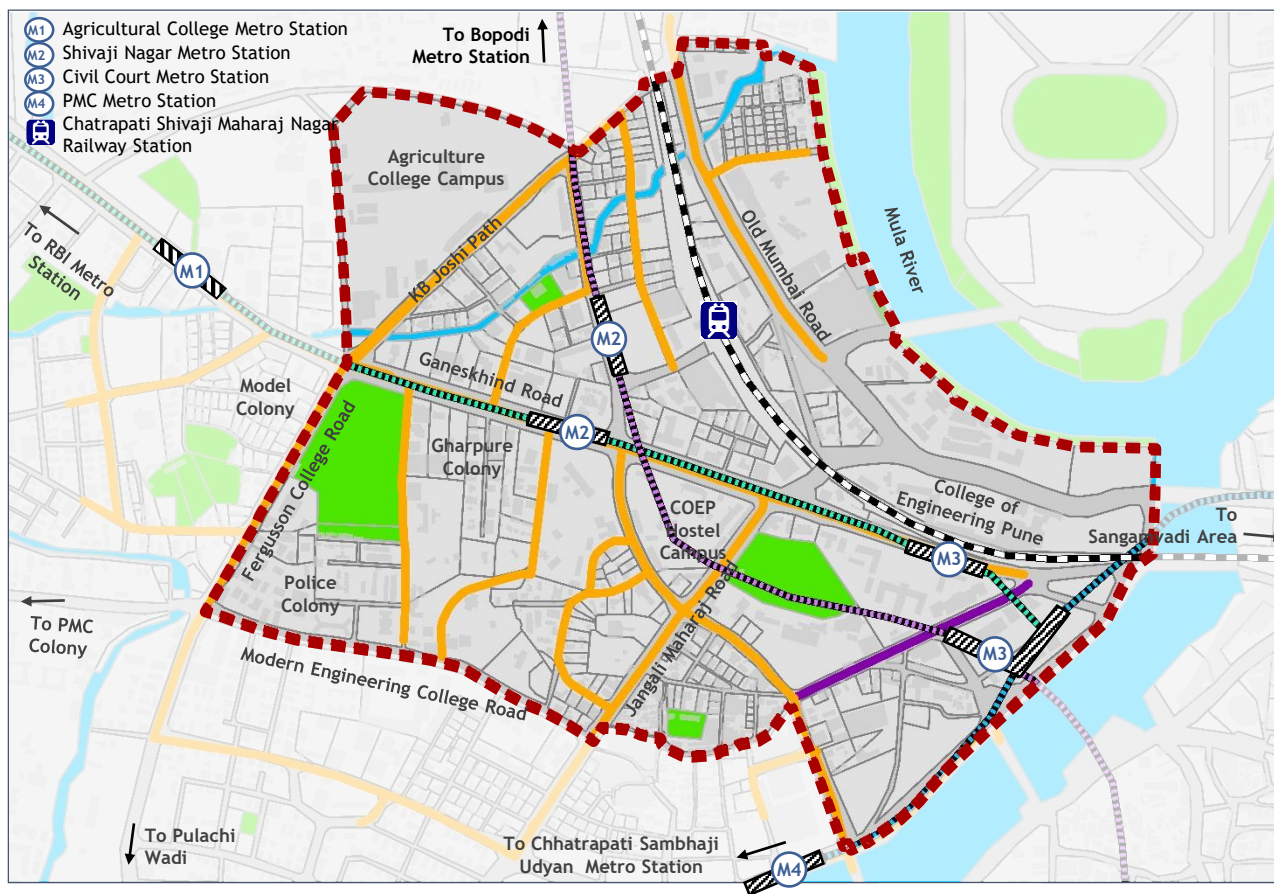
PBS Docking Station



Segregated Bicycle Lane

First and Last Mile Connectivity

FOOTPATH INFRASTRUCTURE

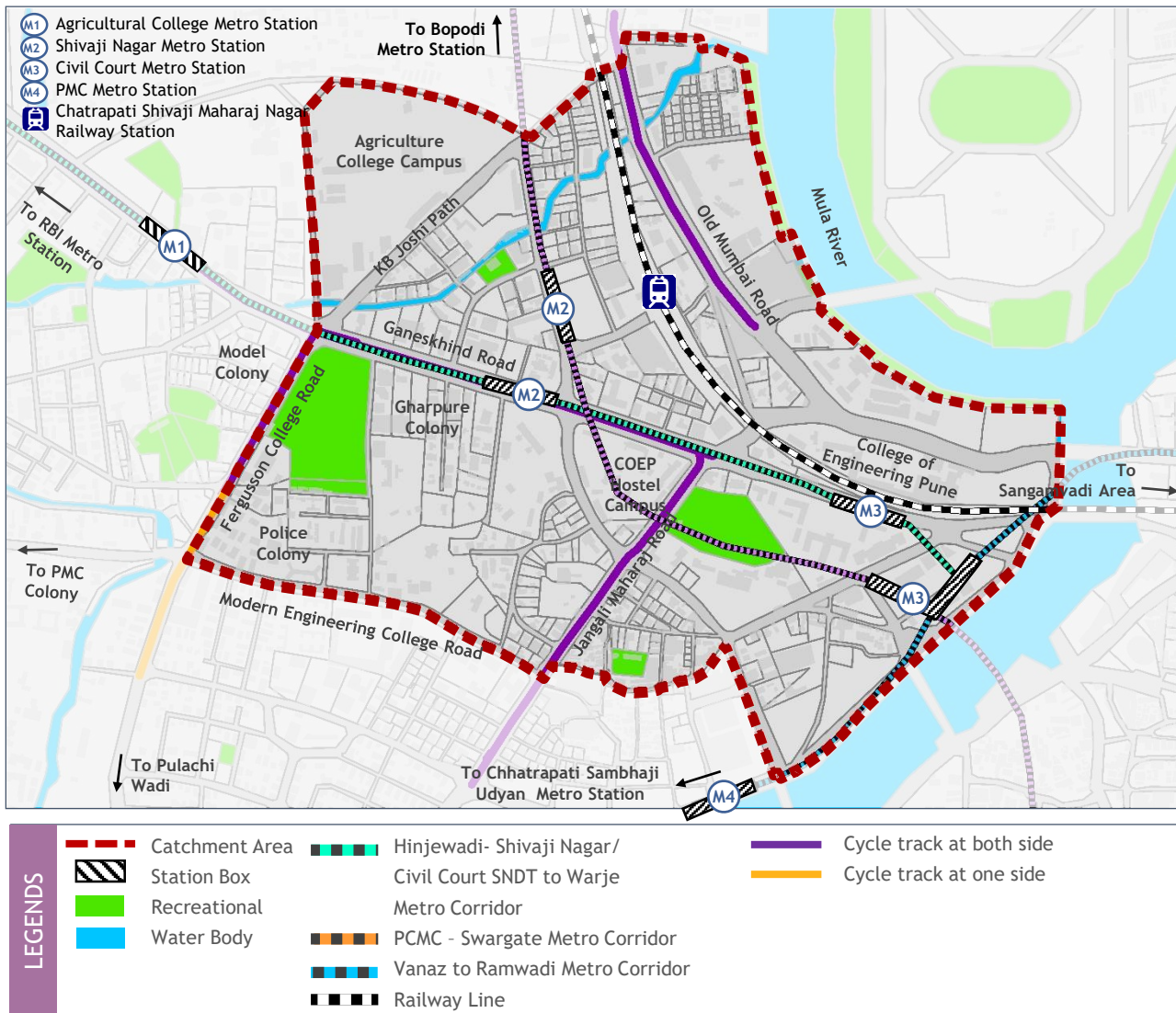


LEGENDS

- | | | | | | |
|--|----------------|--|--|--|--|
| | Catchment Area | | Hinjewadi- Shivaji Nagar/
Civil Court SNTD to Warje
Metro Corridor | | Footpath on both the sides of the road |
| | Station Box | | PCMC - Swargate Metro Corridor | | Footpath on one side of the road |
| | Recreational | | Vanaz to Ramwadi Metro Corridor | | |
| | Water Body | | Railway Line | | |

Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

CYCLE TRACK INFRASTRUCTURE



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

INTERCONNECTED STREET NETWORK

*Bridging Neighbourhoods,
Enhancing Mobility*

An interconnected street network aims to create a more efficient, accessible, and safer transportation system, benefiting both vehicular and NMT users.



Multi Utility Zone

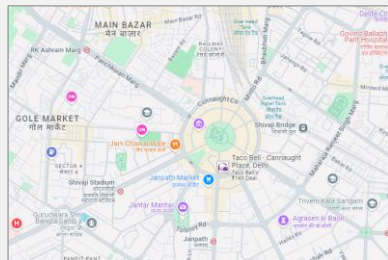


*Interconnected Street
Network*

Interconnected Street
Network



Grid Iron Pattern, Chandigarh



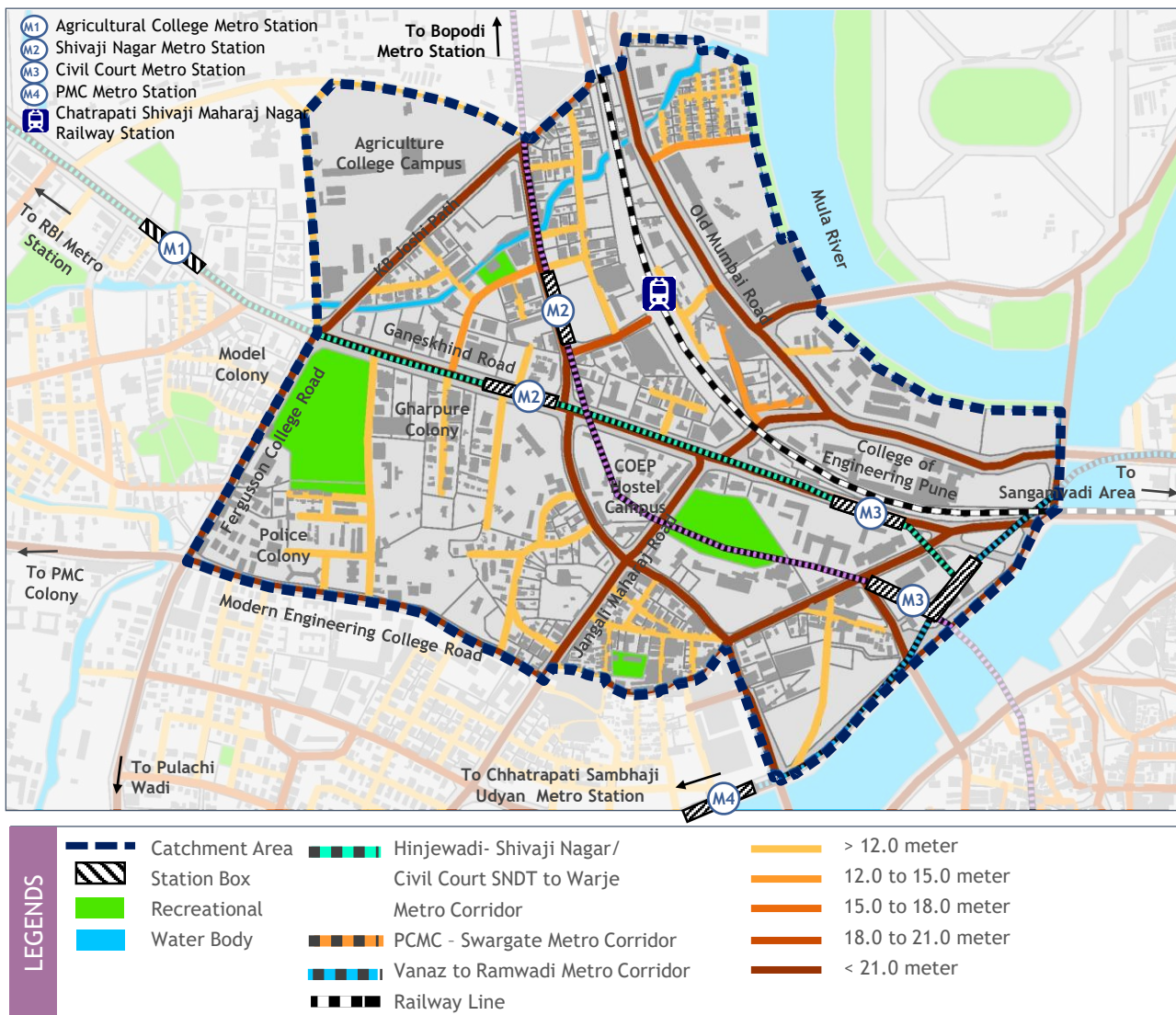
Ring and Radial Pattern, Delhi



Multi Utility Zone

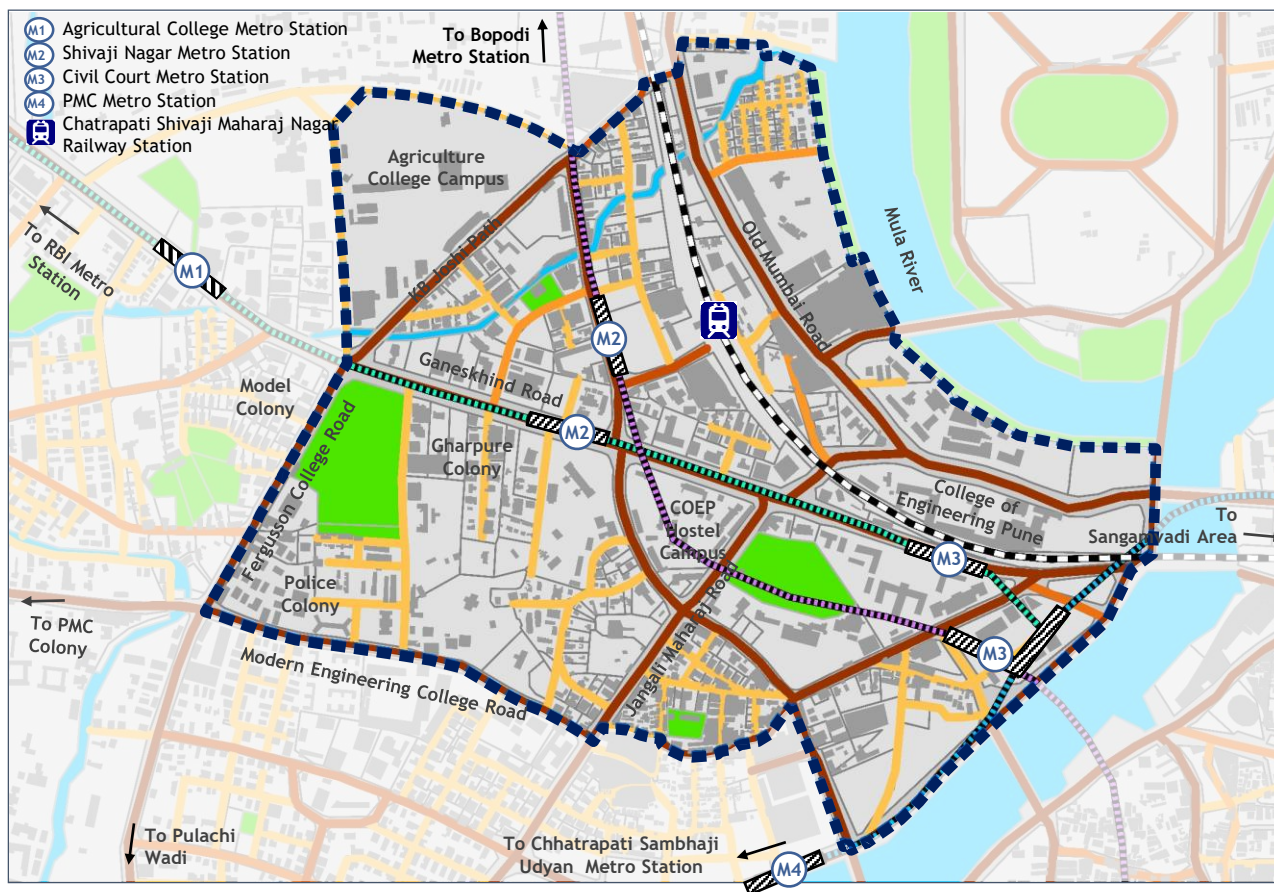
EXAMPLES

EXISTING ROAD NETWORK



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

PROPOSED ROAD NETWORK

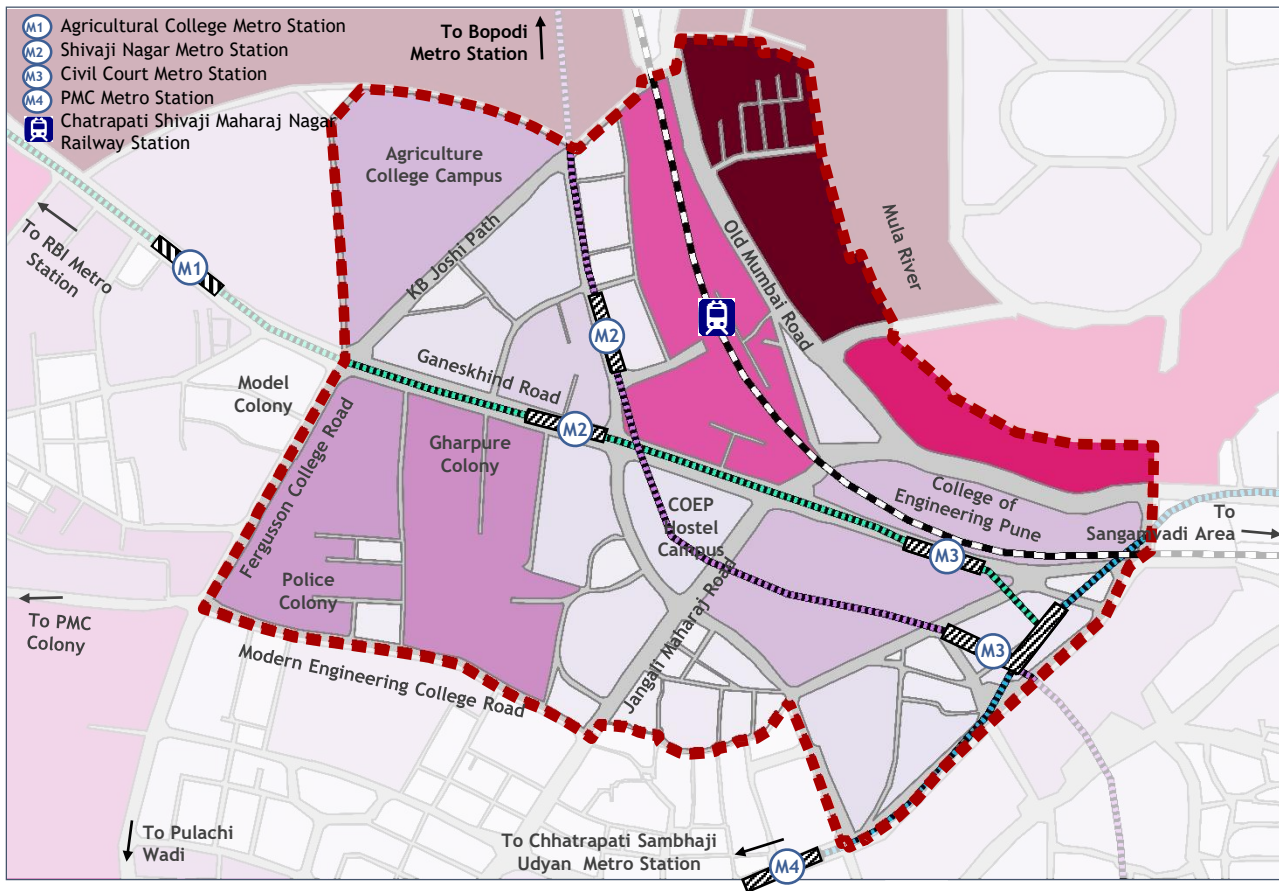


LEGENDS

	Catchment Area		Hinjewadi- Shivaji Nagar/ Civil Court SNTD to Warje Metro Corridor		> 12.0 meter
	Station Box		PCMC - Swargate Metro Corridor		12.0 to 15.0 meter
	Recreational		Vanaz to Ramwadi Metro Corridor		15.0 to 18.0 meter
	Water Body		Railway Line		18.0 to 21.0 meter
					< 21.0 meter

Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

URBAN BLOCK



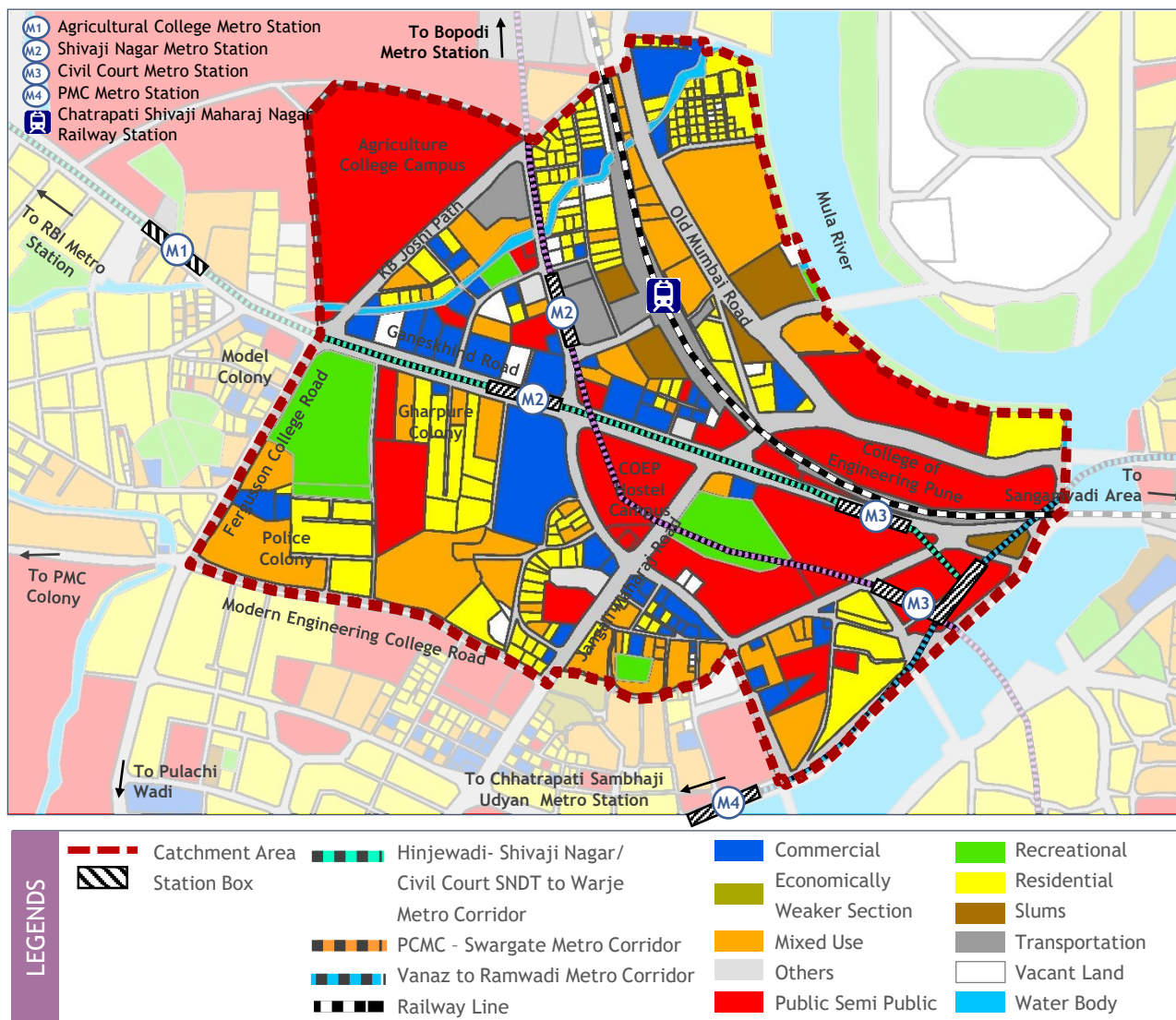
LEGENDS

- Catchment Area
- Station Box
- Recreational
- Water Body
- Hinjewadi- Shivaji Nagar/ Civil Court SNTD to Warje Metro Corridor
- PCMC - Swargate Metro Corridor
- Vanaz to Ramwadi Metro Corridor
- Railway Line

0 Meter

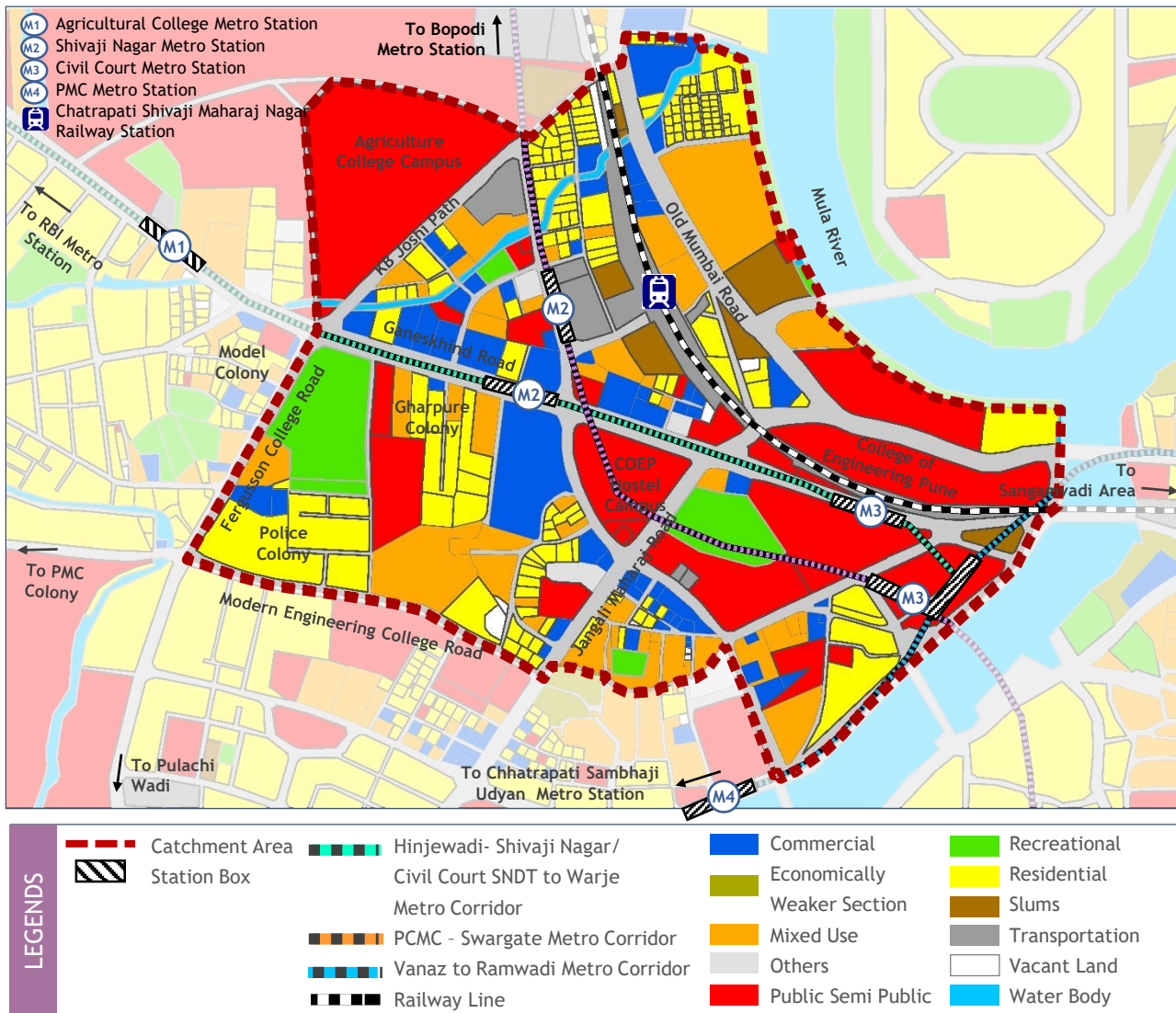
Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

EXISTING LAND USE



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

PROPOSED LAND USE



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

INFRASTRUCTURE PLANNING

Designing Infrastructure for Efficient Movement

Effective infrastructure planning is crucial for enhancing urban mobility, particularly concerning bus stops, footpaths, cycle tracks, street lighting, and dustbins.

Public amenities such as dustbins, public toilets etc. should be provided at regular intervals.

Each component plays a vital role in creating a safe, efficient, and inclusive environment for all users.

EXAMPLES



Footpath Infrastructure, JM Road, Pune



Smart City Bus Stop, Bhubaneswar



Dedicated Cycle Track



Pedestrian Flow



Bus Stand Infrastructure

Infrastructure Planning

EXAMPLES FOR THE CITIES FROM ACROSS THE GLOBE



TRAFFIC CALMING MEASURES

Increasing Safety

Well-designed midblock and intersection crossings provide a safe and convenient way for pedestrians and cyclists to cross streets, discouraging them from risking their lives on urban streets.

Pedestrian foot- over bridges should be considered only on urban expressways where vehicle speeds are above 60kmph.

EXAMPLES



Skywalk at ITO, New Delhi



Pedestrian Crossing at Connaught Place, New Delhi



Raised Pedestrian Crossing



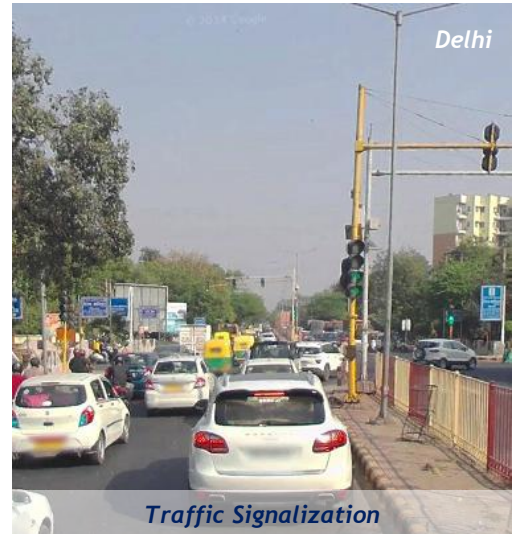
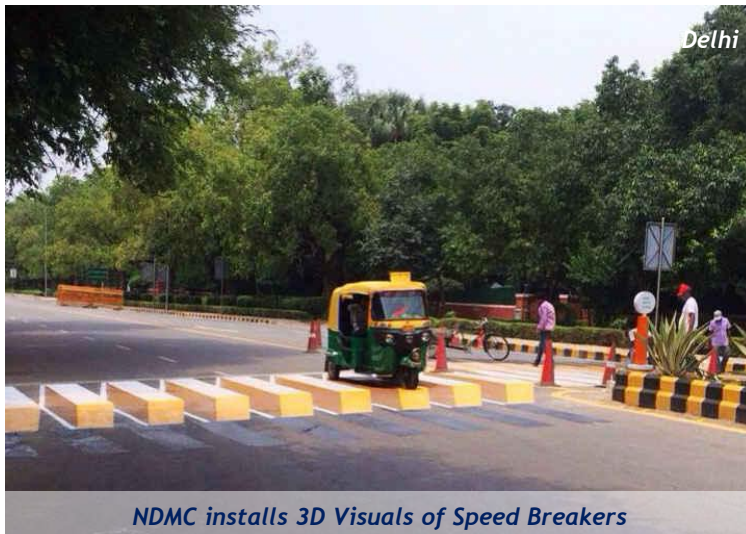
Roundabout Intersection



Pedestrian Crossing at Signalized Junction

Traffic calming Measure

EXAMPLES FOR THE CITIES FROM ACROSS THE GLOBE



ADOPT OPTIMAL DENSE DEVELOPMENT

Compact Living, Connected Communities

TOD focuses on compact, mixed-use growth around transit hubs, promoting higher population and employment density.

Concentrating residential units and job opportunities within walkable distances reduces car dependence, curbs urban sprawl, and increases public transport use.

This approach creates vibrant, sustainable communities with efficient land use, enhanced accessibility, and minimized traffic.

EXAMPLES



A Transit Plaza in Singapore



Bandra- Kurla Complex, Mumbai



Employment Density



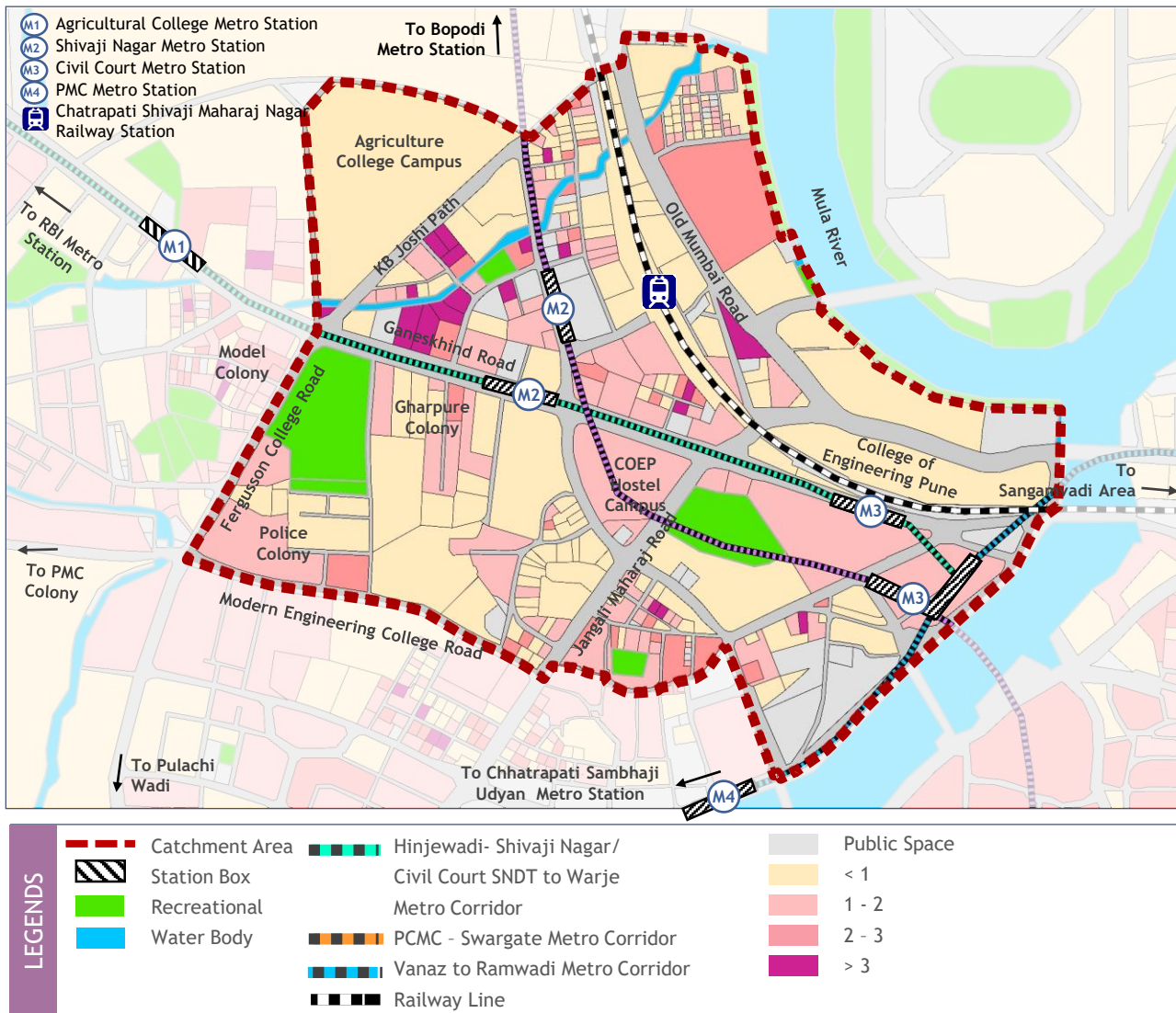
Population/ Housing Density



Employment Density

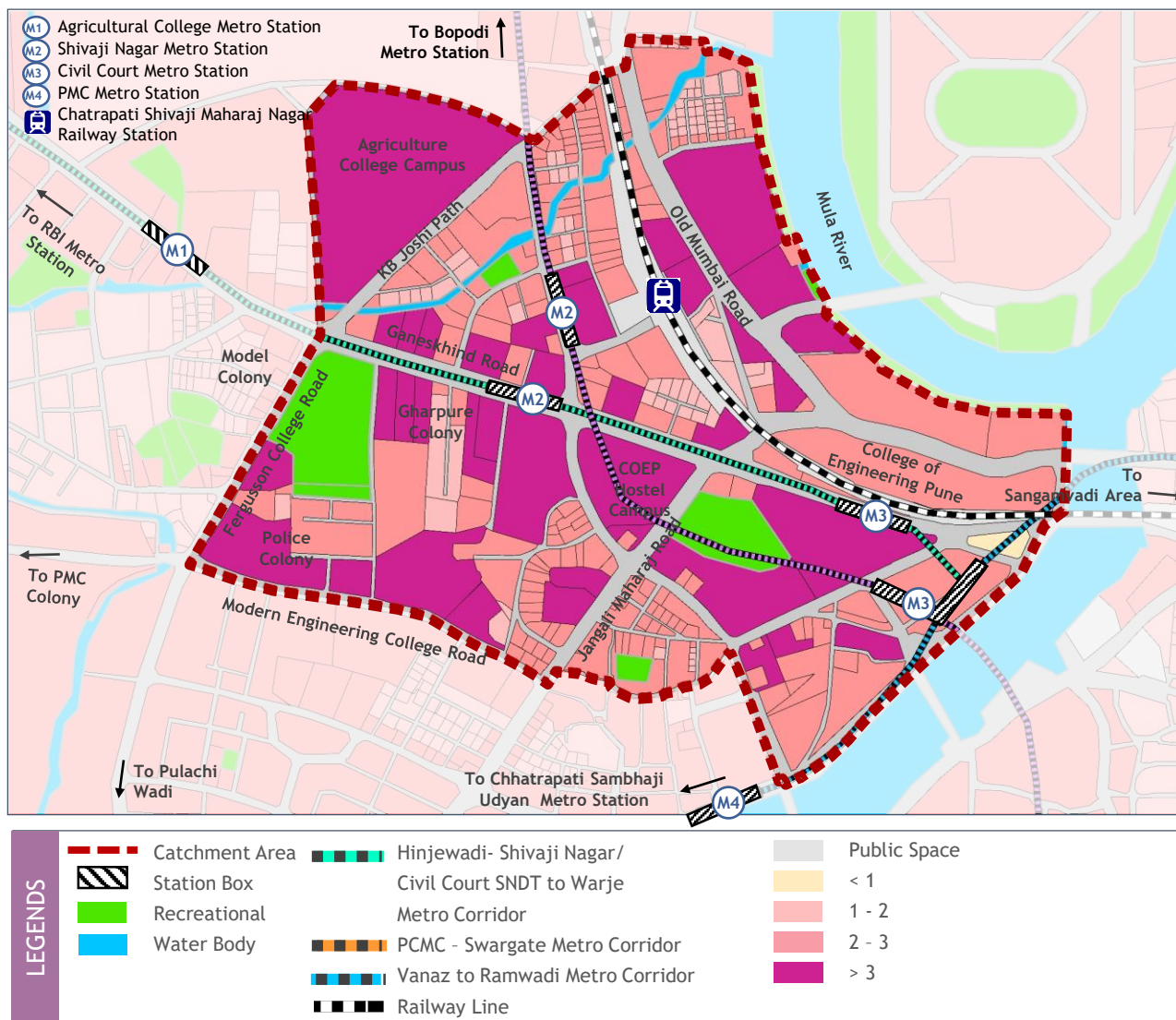
*Adopt Optimal
Dense Development*

EXISTING FLOOR SPACE INDEX (FSI)



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

PROPOSED FLOOR SPACE INDEX (FSI)



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

PROMOTE ACTIVE GROUND FLOOR AND STREET FRONTAGE OF BUILDING

Lively Streets, Lively Cities

Promoting active ground floors and street frontages enhances urban vibrancy by encouraging pedestrian activity through shops, informal activity, and public spaces.

Engaging street-level design supports local businesses, improves safety with increased foot traffic, and fosters social interaction, creating lively, walkable communities.

EXAMPLES



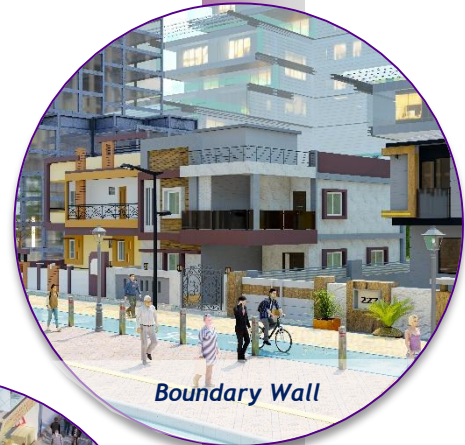
JM Road, Pune



Pondy Bazaar Plaza, Chennai



Active Street Frontage



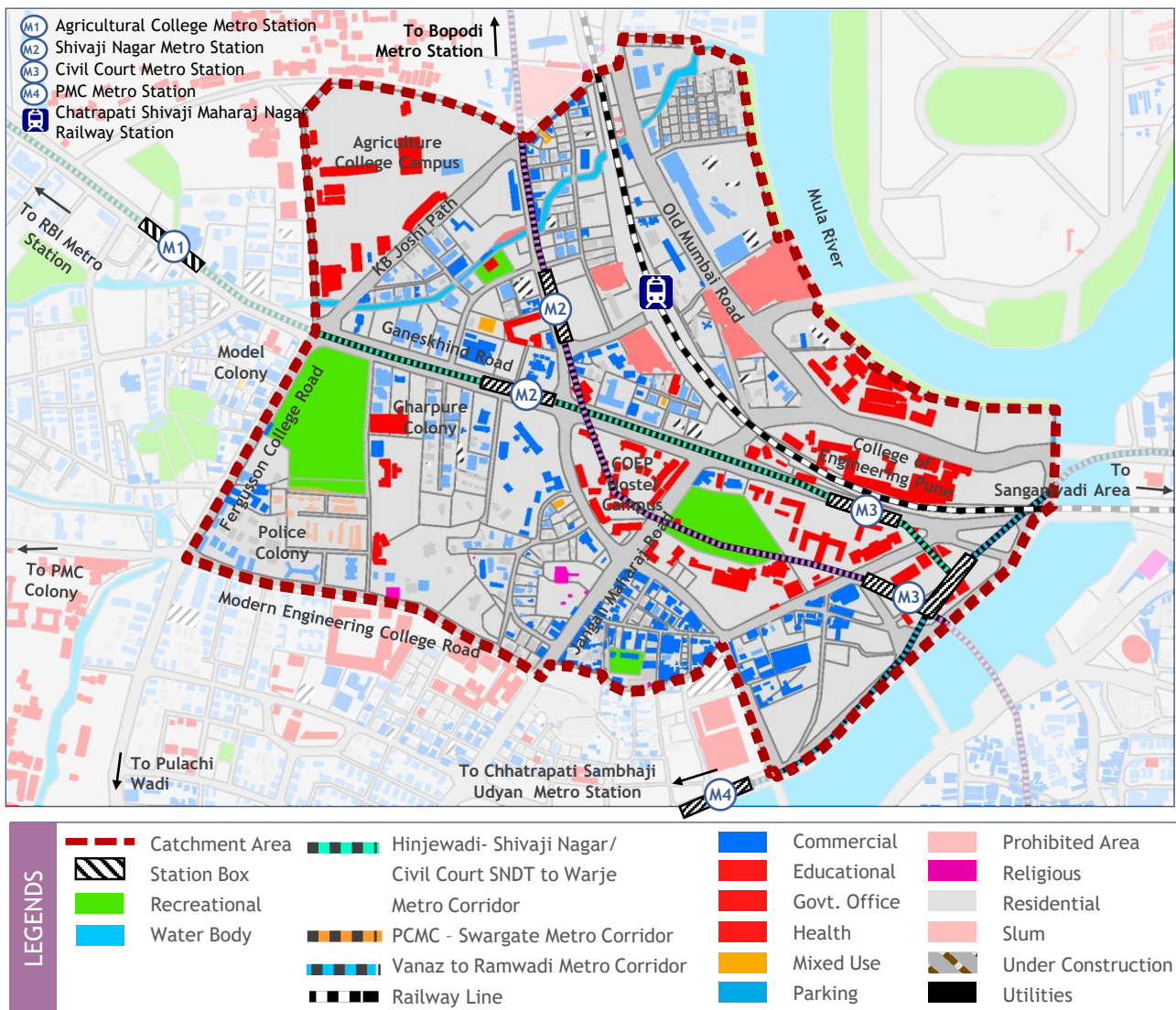
Boundary Wall



Active Street Frontage

Promote Active Ground Floor and Street Frontage of Building

GROUND FLOOR USE



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

VIBRANT, ACTIVE AND SAFE PUBLIC SPACES

*Where Activity Meets
Safety in Public Spaces*

Vibrant, active, safe public spaces, promote walkability, social interaction, and recreation. Wide sidewalks and accessible riverfronts enhance safety, connectivity, and public enjoyment.

These spaces foster community engagement, support local economies, and create sustainable, inclusive environments for residents and visitors.

EXAMPLES



Sabarmati Riverfront, Ahmedabad



Cyber Hub, Gurgaon



*Riverfront
Development*



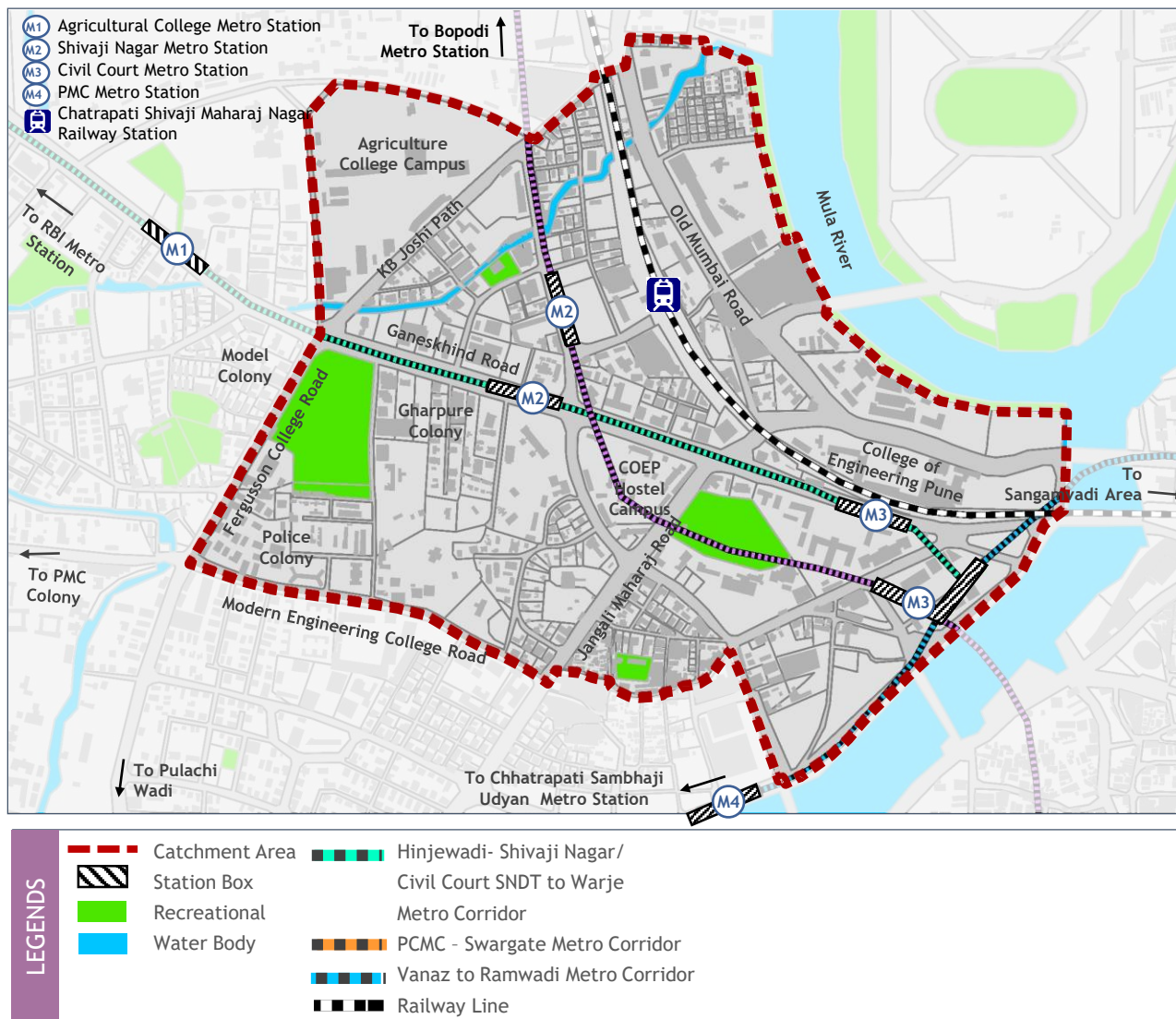
*Pedestrian Friendly
Street*



*Pedestrian Friendly
Street*

*Vibrant, Active and
Safe Public Space*

VIBRANT, ACTIVE AND SAFE SPACES



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

AFFORDABLE HOUSING

*Affordable Living Meets
Accessible Transit*

Diversity of housing choices that includes a mixture of types, styles and price ranges within a 10-minute walking distance from a transit station.

EXAMPLES



Housing Scheme, DDA Delhi



Housing Scheme, PMAY Ahmedabad



Affordable Housing



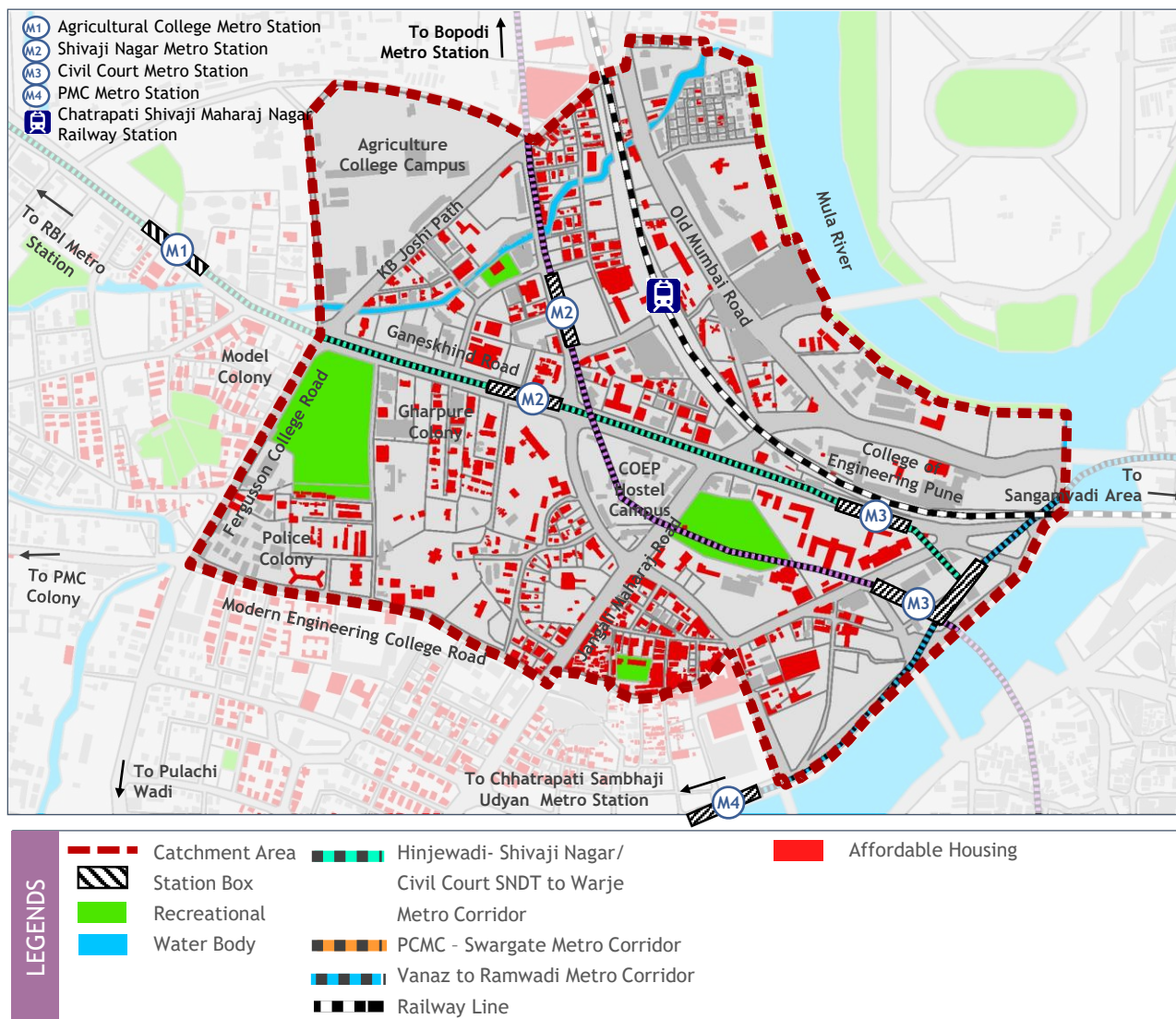
Affordable Housing

Affordable Housing



Affordable Housing

AFFORDABLE HOUSING



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

PROMOTE MIX USE

*Unified Spaces for a
Connected Communities*

Optimize employment and residential densities along Transit corridors or local area based on carrying capacities of transit and NMT infrastructure.

1. Horizontal land use mix and
2. Vertical land use mix

Use both, to achieve the desired density and diversity /land use mix.

EXAMPLES



Amar colony, Delhi

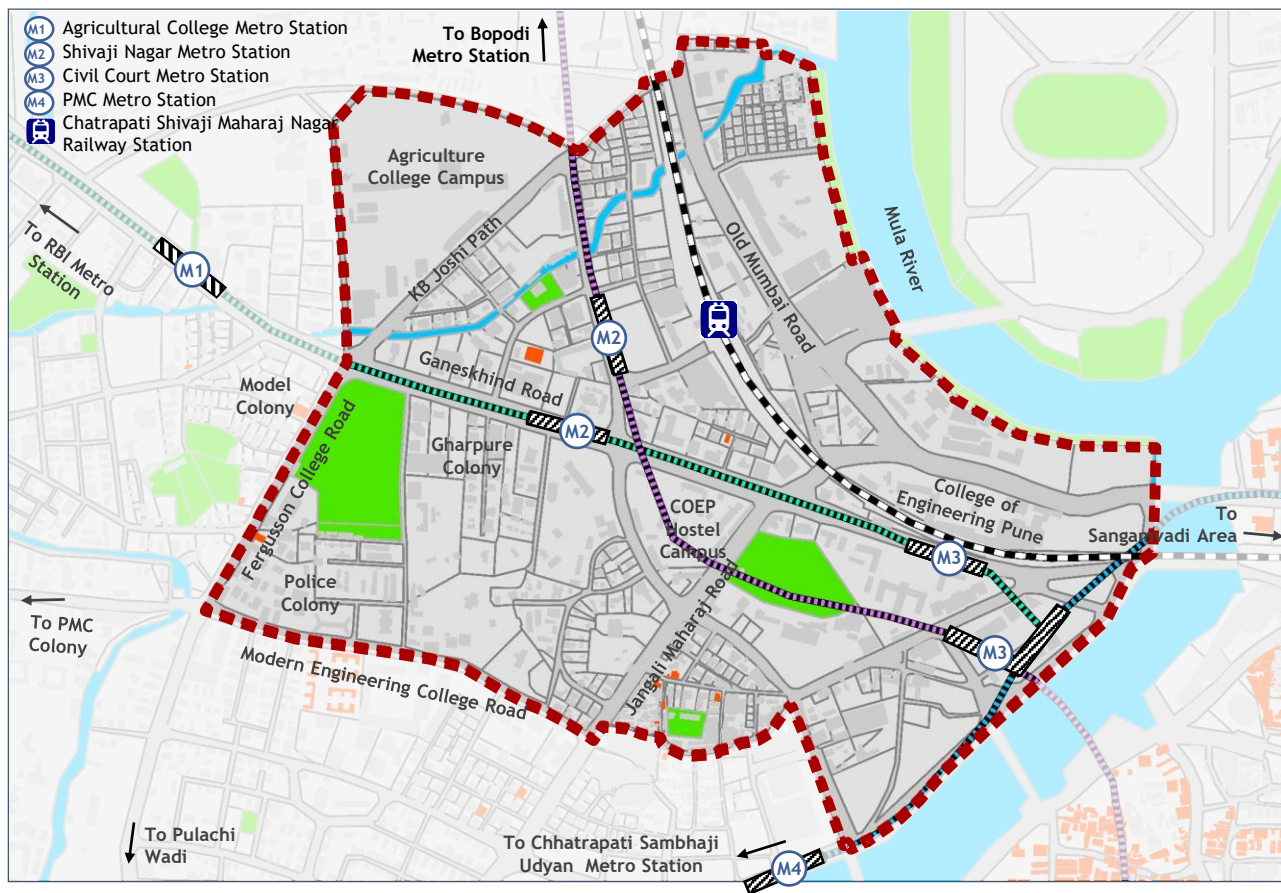


Manipal, Karnataka



Promote Mix Use

MIXED-USE DEVELOPMENT



LEGENDS

- | | | | | | |
|--|----------------|--|--|--|---------------------|
| | Catchment Area | | Hinjewadi- Shivaji Nagar/
Civil Court SNTD to Warje
Metro Corridor | | Mixed Use Buildings |
| | Station Box | | PCMC - Swargate Metro Corridor | | |
| | Recreational | | Vanaz to Ramwadi Metro Corridor | | |
| | Water Body | | Railway Line | | |

Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.

INCORPORATE DIVERSE USE AND INFORMAL ACTIVITY

Dynamic Spaces

Incorporating diversity enhances urban spaces by improving accessibility and fostering vibrant street life.

These informal activities support last-mile connectivity, boost local economies, and create dynamic, lively public spaces that encourage social interaction, promoting mobility and inclusivity in urban environments.

EXAMPLES



Law Garden Market, Ahmedabad



Janpath Market, Delhi



Street Vendors



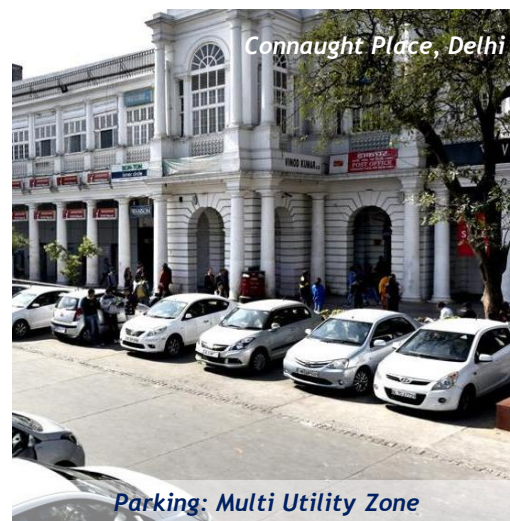
IPT Stand near Transit Station



Street Vendors

*Incorporate Diverse Use
and Informal Activity*

EXAMPLES FOR THE CITIES FROM ACROSS THE GLOBE



INTEGRATE ARCHITECTURAL VARIETY

*Blending Diverse Spaces
with Smooth Journey*

Integrate architectural variety on different streets and junctions to manifest the rich diversity and local culture.

EXAMPLES



Taj Mahal Metro Station, Agra



Hauz Khas Metro Station, Delhi



*Barrier Free
Accessibility*



*Signage's and Barrier
free access*



*Architectural Entry
Structure*

*Integrate Architectural
Variety*

EXAMPLES FOR THE CITIES FROM ACROSS THE GLOBE



Connaught Place, New Delhi



Hauz Khas, Delhi

Interior of Hauz Khas Metro Station



Agra

Agra Metro

MANAGE ON-STREET AND OFF-STREET PARKING FOR MOTORIZED VEHICLE

Streamlining Parking Solutions for Surroundings

Adopt an area-based approach to parking management and reduction with a priority placed on NMT/ IPT/ feeder bus/ service vehicles. Discourage on-street parking within the local area (but pick-up and drop areas should be demarcated). Restrict car parking requirements in buildings by modifying the building codes.

EXAMPLES



Connaught Place, Delhi



Botanical Garden MLCP, Noida



On-Street Parking



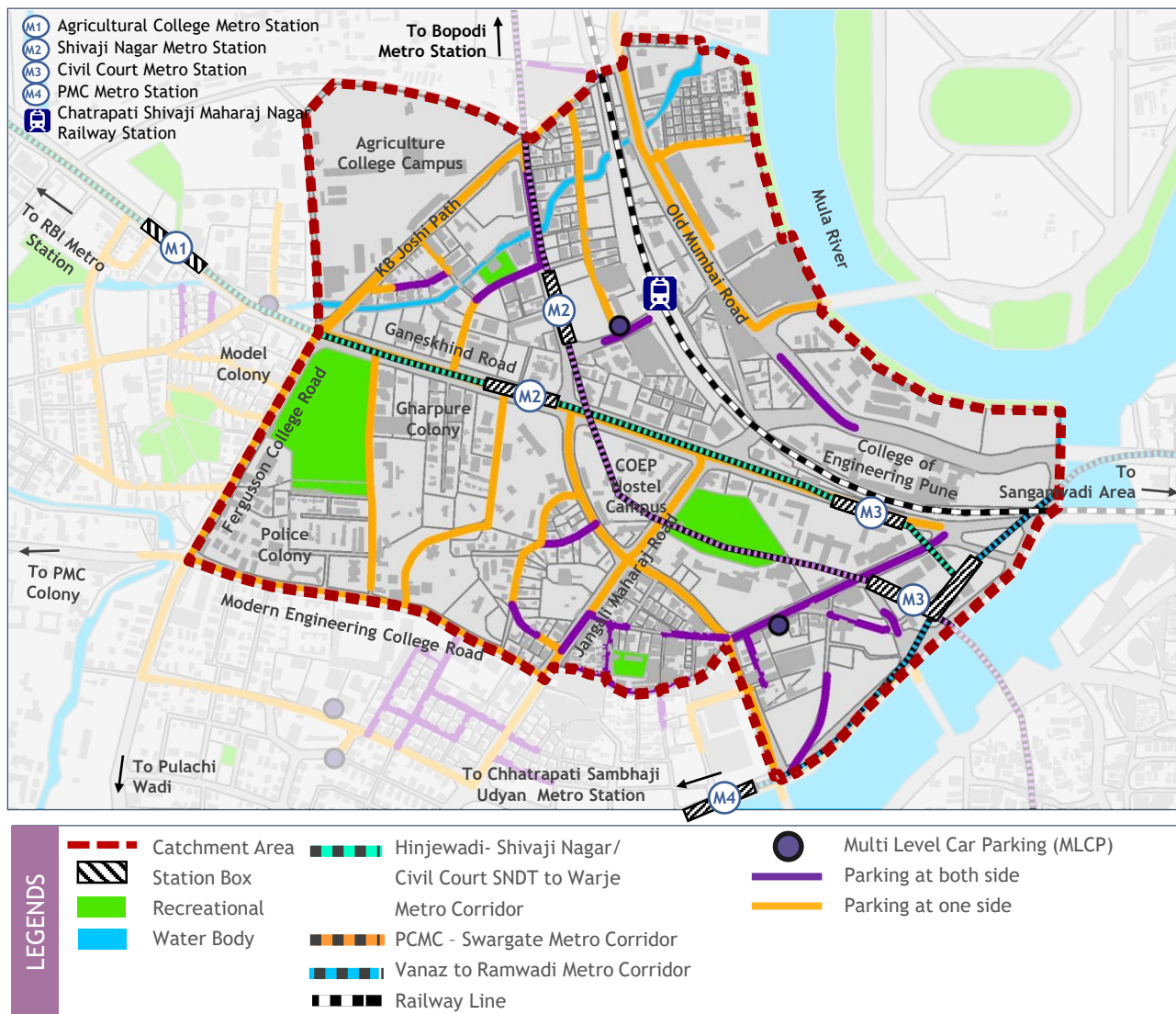
Off-Street Parking

Manage On-Street and
Off-Street Parking for
Motorized Vehicle



Multi Level Car Parking

ON STREET AND OFF STREET PARKING



Disclaimer: This map is provided for informational purposes only. For official purposes, please consult relevant authorities or official resources.



ANNEXURE A7

PILOT STATION - IMPACT ASSESSMENT OF TOD

A7.1 INTRODUCTION

A comprehensive site analysis is the foundational step in Transit-Oriented Development (TOD). To accommodate a higher population density in the local area, existing underground utilities must be upgraded to meet increased demand.

This annexure calculated the forecasted capacity of the utility capacity required to support a high density population.

REFERENCE

- Adapted from Impact Assessment of Transit Oriented Development zone in Pune City by UMTC. ^[110]

A7.2 Pune City

The maximum FSI of Pune is 4 (as per Development Control Regulations and TOD Policy of Pune). At Shivaji Nagar Metro Station the existing FSI consumed falls in the range ≤ 0.5 , closely followed by the ranges 0.5-1 (16%) and 1-1.5 (14%). The maximum of FSI 2.5 is achievable due to small plot size and lesser RoW. Accordingly, the forecasted population of pilot station in 2030 is 14,192 while 16,951 in 2040. The employment is 13,337 in 2030 and 13,609 in 2040. The existing and forecasted population and employment of the pilot station is shown in **Table A3**.

A7.3 Water Supply

As per Manual of Water Supply and Treatment for residential land use 150 Liter Per Capita Per Day (LPCD) and for non- residential land use 50 LPCD is estimated for water supply demand. ^[110]

A7.4 Storm Water and Sewerage

As per Manual of Sewerage and Sewage Treatment Central Public Health and Environmental Engineering Organisation (CPHEEO), 80% of water supply or minimum 100 LPCD is expected to reach the sewers.

Table A3: Population and Employment of Pilot Station in 2030 and 2040

Parameter	2020	Additional forecast in 2030		Total forecast in 2033	Additional forecast in 2040		Total forecast in 2040
		Vacant Plot	Redevelopm ent		Vacant Plot	Redevelopm ent	
Population	12,122	1,876	194	14,192	2,501	258	16,951
Employment	13,167	129	41	13,337	206	66	13,609

A7.5 Solid Waste Management

For the calculation of per capita of municipal solid waste, Manual on Municipal solid waste management by CPHEEO has been used.

Land Use	Estimated Waste Generated
Residential Land Use	0.3 - 0.6 kg/cap/day
Non Residential Land Use	0.1 - 0.2 kg/cap/day
Street Sweeping	0.05 - 0.2 kg/cap/day

A7.6 Electricity

As per the National Electricity Policy, 2005 for electricity estimation, 2.74 Kwh per capita per day is considered.

A7.7 Utilities Estimation for Pilot Station

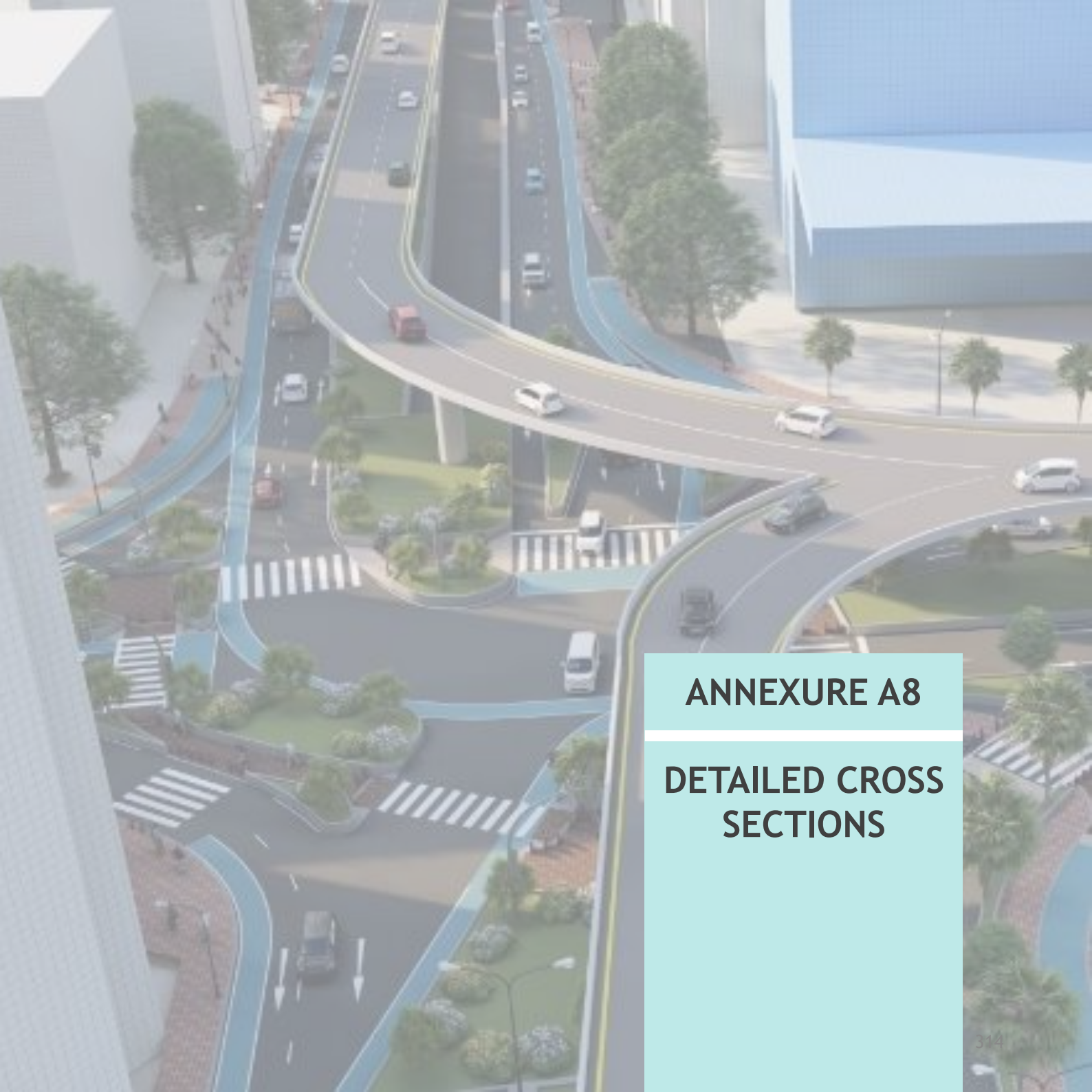
The utilities required for the year 2030 and 2040 of pilot station - Shivaji Nagar has been shown in Table A4.

Table A4: Utilities required for Pilot Station in 2030 and 2040

Utilities	2030	2040
Water Supply Demand	2.80 MLD	3.22 MLD
Storm Water and Sewerage	1.7 MLD	2.03 MLD
Solid Waste Management	13.99 Tonnes	15.94 Tonnes
Electricity Demand	75.43 MWh	83.73 MWh

MLD - Million Litres Per Day

MWh - Mega Watt Hour



ANNEXURE A8

DETAILED CROSS SECTIONS

A8.1 INTRODUCTION

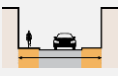
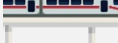
A thorough site analysis is the first step in street design in order to comprehend the context, which includes the road width, the condition of the footpath, crossings, and other features, the volume of traffic, and the behavior of different road users, such as cyclists and pedestrians etc.

Furthermore, a suitable street template has been contextualised based on the city's goal of establishing transit-oriented development.

REFERENCE

- Adapted from Healthy Street Design Workbook by ITDP, NIUA and MoHUA. ^[64]

A6.2 PLANNING STREET ELEMENTS

 Right of Way	Pedestrian Friendly Street	<9 m	9	9.1-12m	12.1-15m	15.1-18m
 Road Classification	—	Local Road				
 Carriage Way Width	3.5	3	6	7	7	7
 Segregated Footpath						
 At-Grade Footpath						
 Dedicated Cycle Lane						
 Shared Cycle Lane						
 Multi Utility Zone						
 On- Street Parking						
 At- Grade Crossing						
 Table Top Crossing						
 High Transit Corridor						
 Bus Stops						
 Dedicated Bus Lane						
 Service Lane						
 Speed Limit (km/h)	—	15-30	15-30	15-30	15-30	30-50
 Green Belt						

18.1-21m 21.1-24m 24.1-30m 30.1-36m 36.1-40m 40.1-46m 46.1-60m > 60.1m

Collector Road		Sub- Arterial Road				Arterial Road	
13	13	15	21	21	21	21	28
✓	✓	✓	✓	✓	✓	✓	✓
✗	✗	✗	✗	✗	✗	✗	✗
✓	✓	✓	✓	✓	✓	✓	+
+	+	✗	✗	✗	✗	✗	✗
+	+	✓	✓	✓	✓	✓	✓
✗	✗	✗	+	+	✓	✓	✓
✗	✗	✗	✗	✗	✗	✗	✗
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓
✓	✓	✓	✓	✓	✓	✓	✓
✗	✗	✗	✓	✓	✓	✓	✓
✗	✗	✗	✗	✗	+	✓	✓
30-50	30-50	50	50	50	50	50	50
✗	✗	✗	+	✓	✓	✓	✓



Should be present

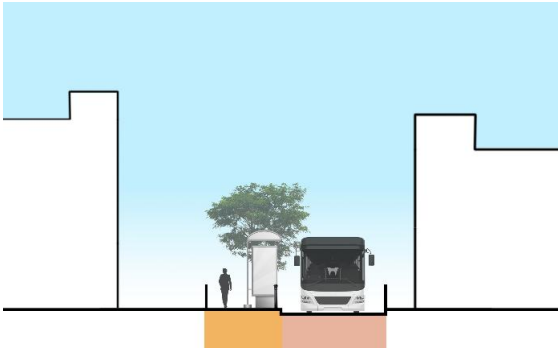


May be present



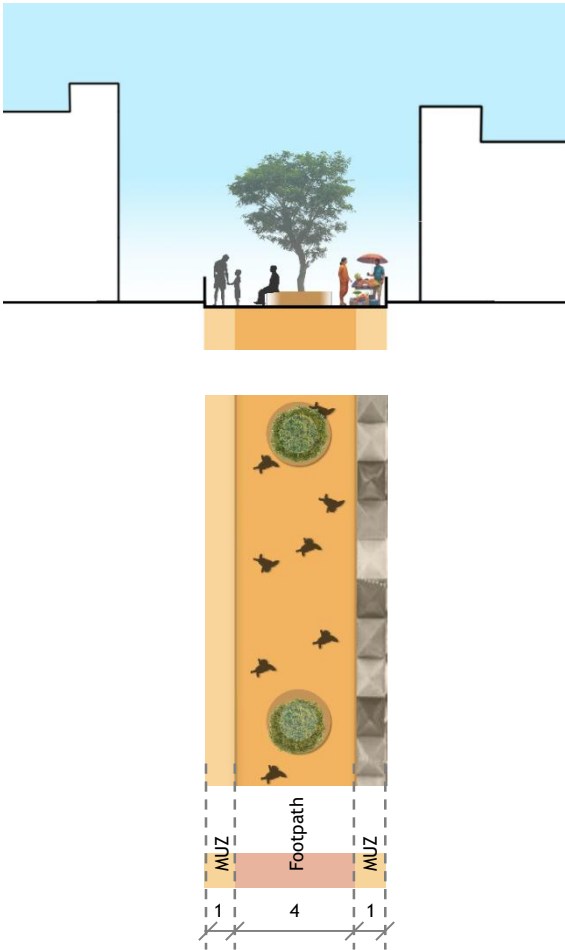
Should not be present

6 METER ROW- PEDESTRAIN FRIENDLY STREET



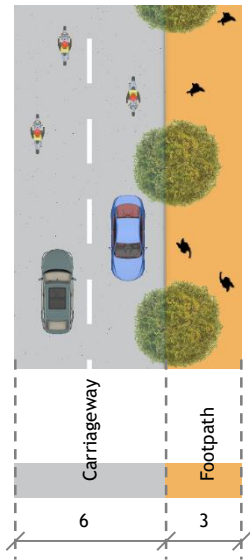
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

6 METER ROW- PREDESTRIAN ONLY STREET



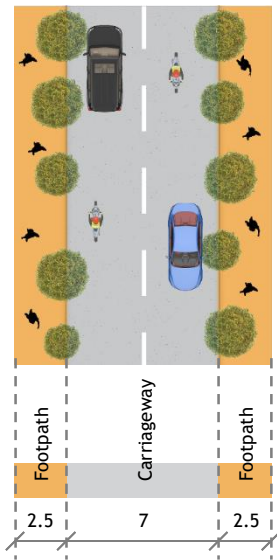
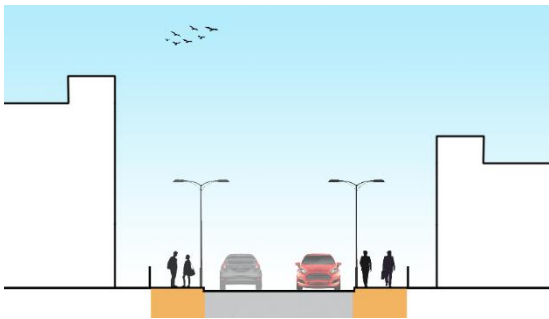
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

9 METER ROW



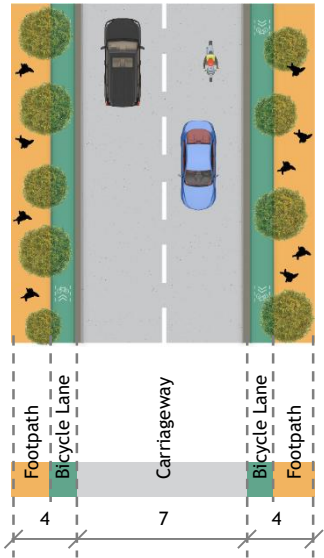
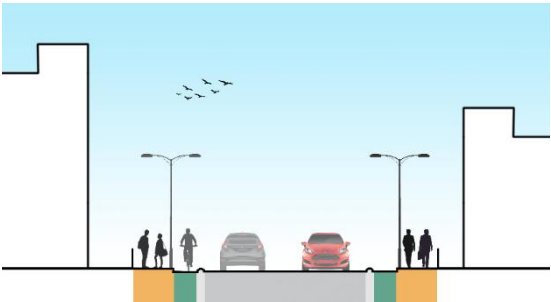
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

12 METER ROW



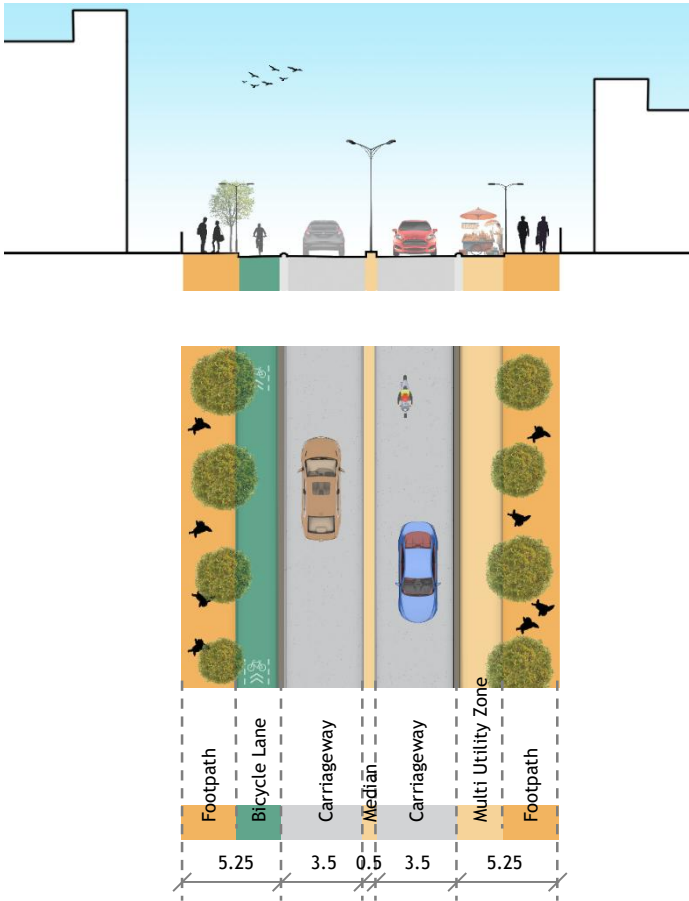
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

15 METER ROW



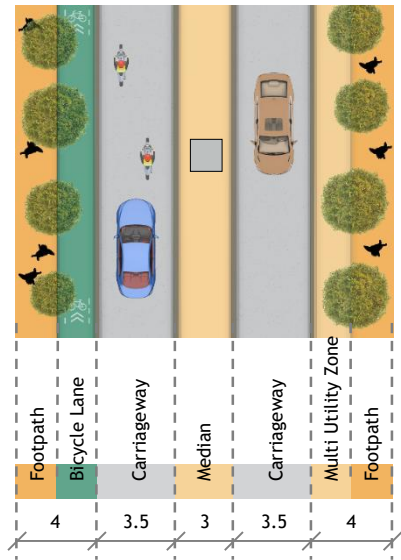
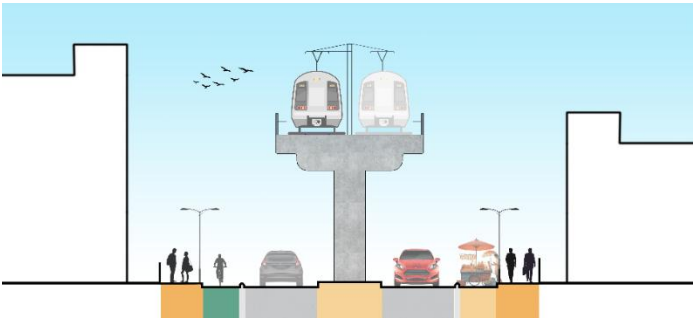
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

18 METER ROW - OPTION A



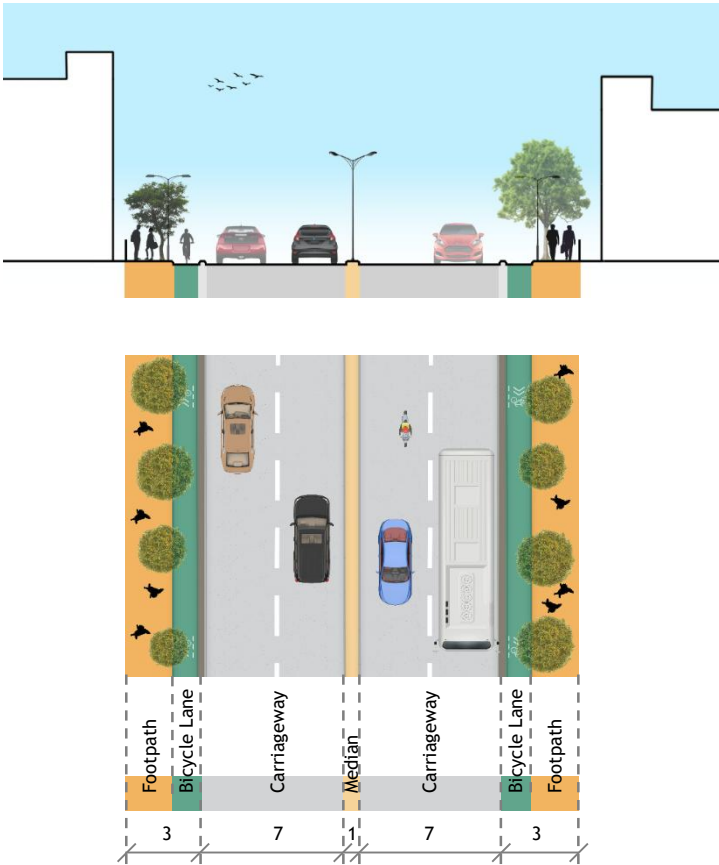
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

18 METER ROW - OPTION B



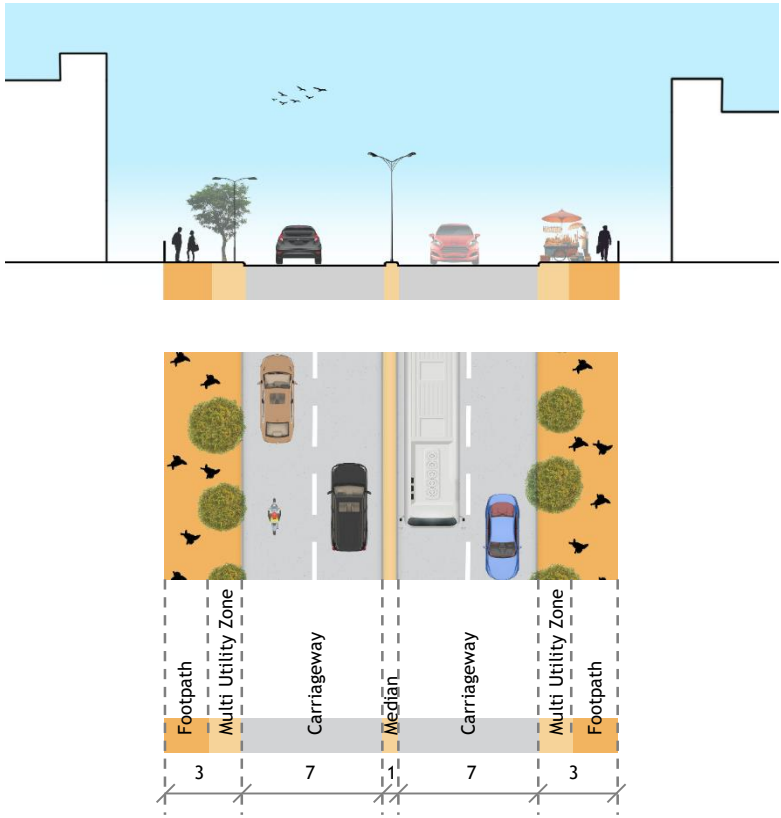
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

21 METER ROW - OPTION A



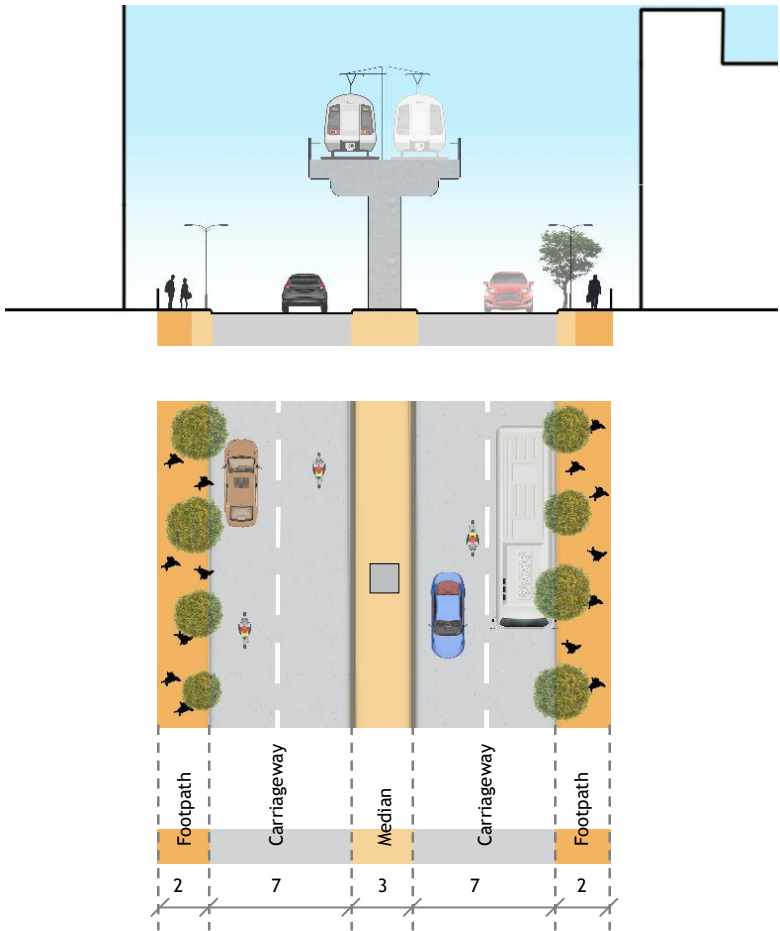
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

21 METER ROW - OPTION B



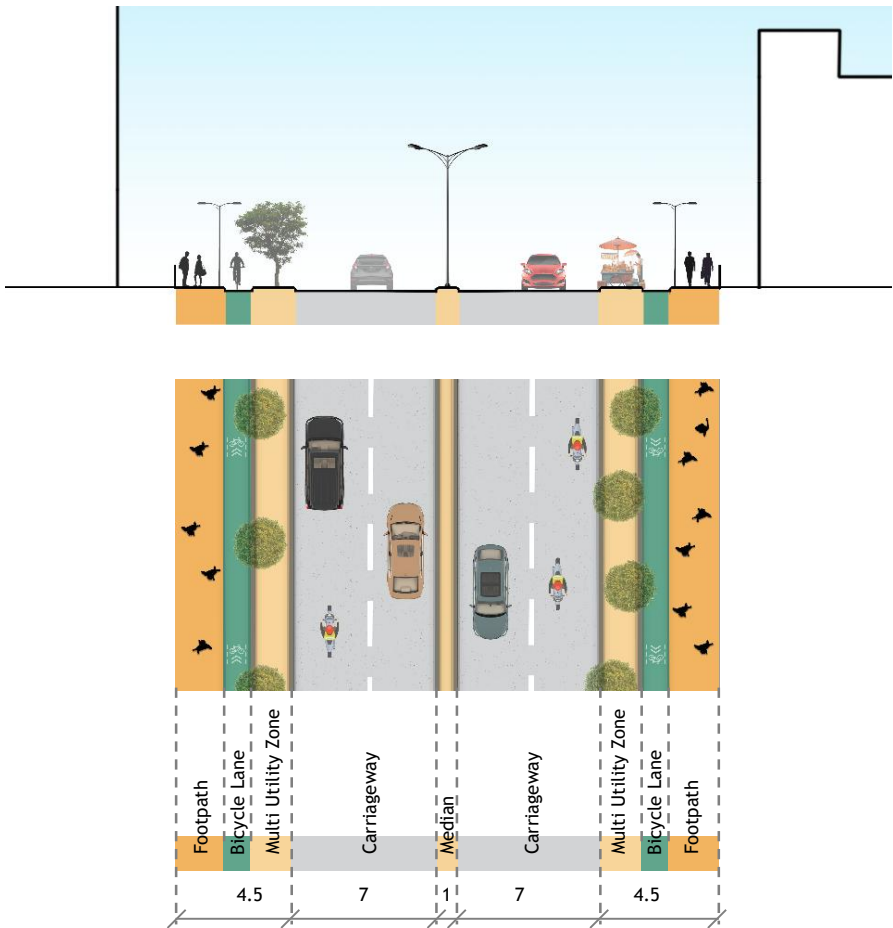
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

21 METER ROW - OPTION C



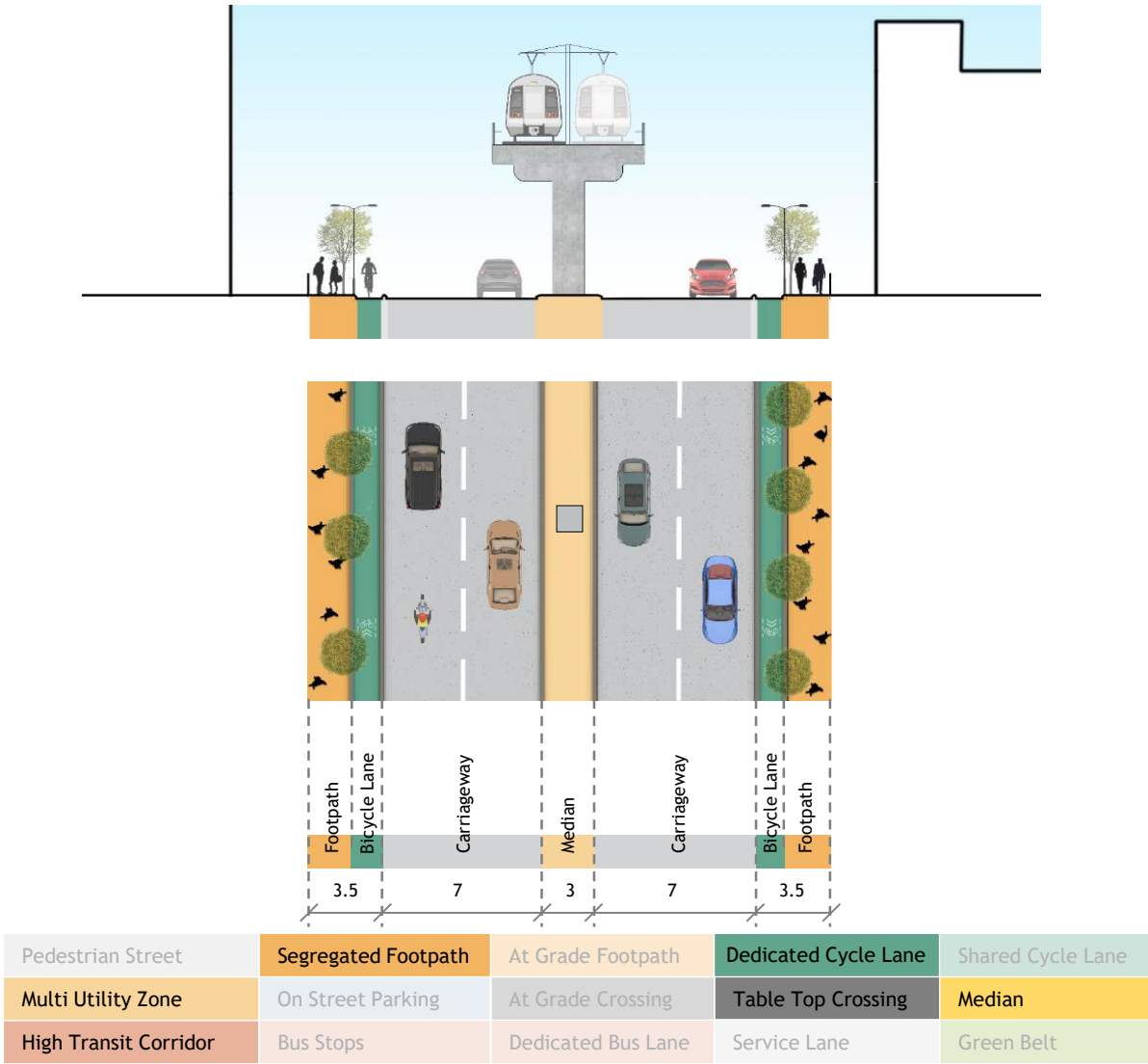
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

24 METER ROW - OPTION A

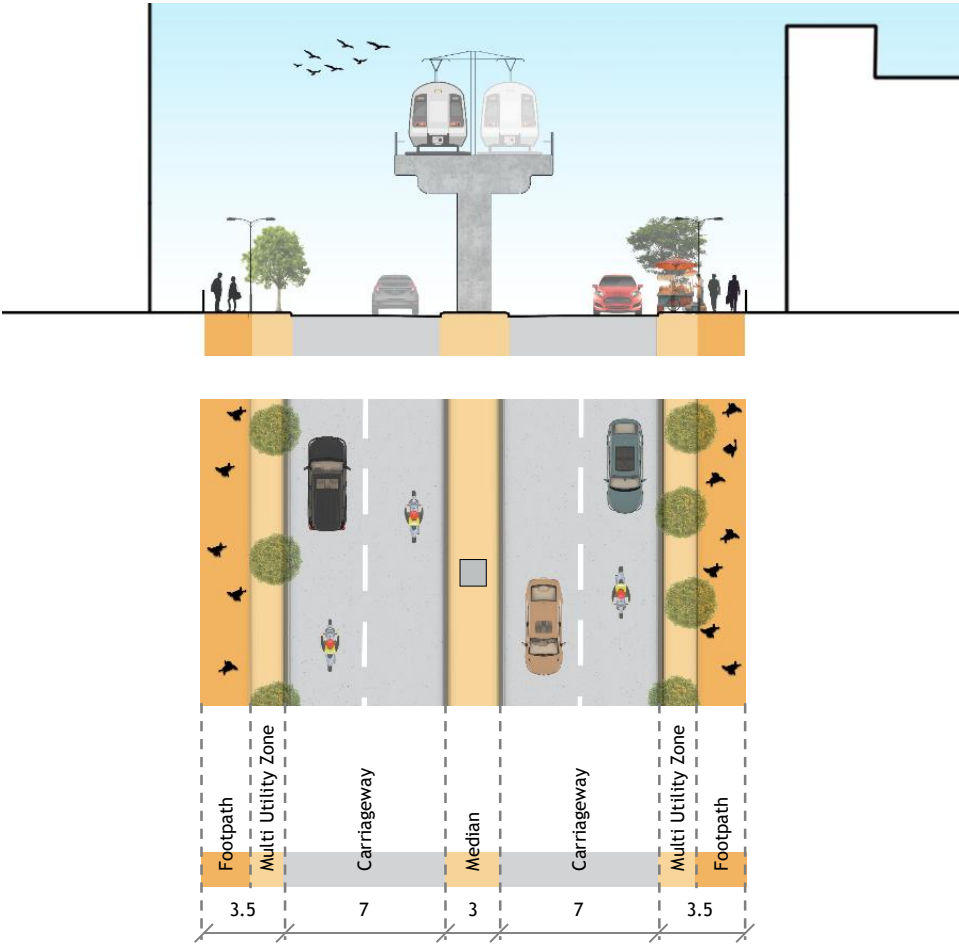


Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

24 METER ROW - OPTION B

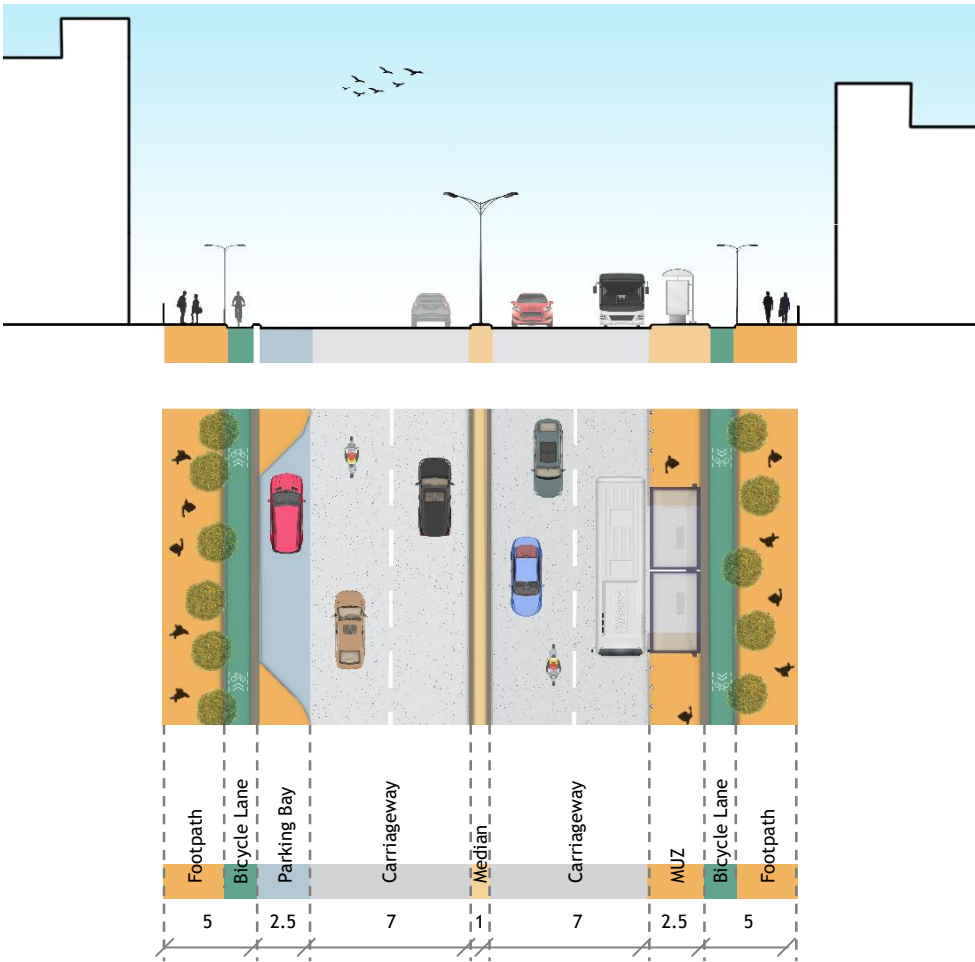


24 METER ROW - OPTION C



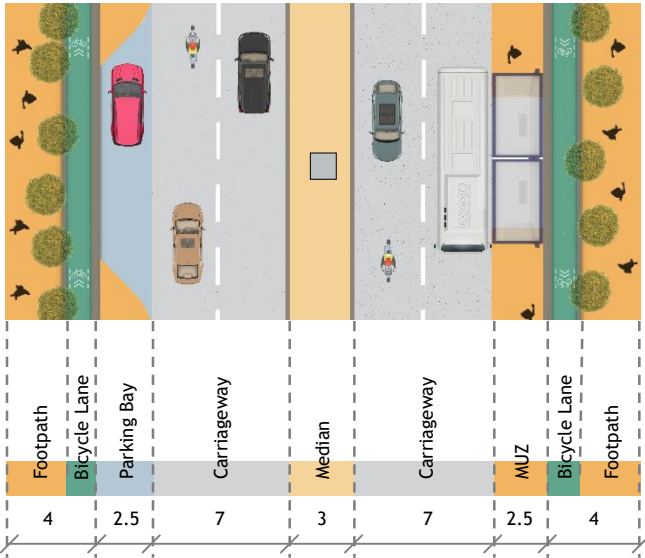
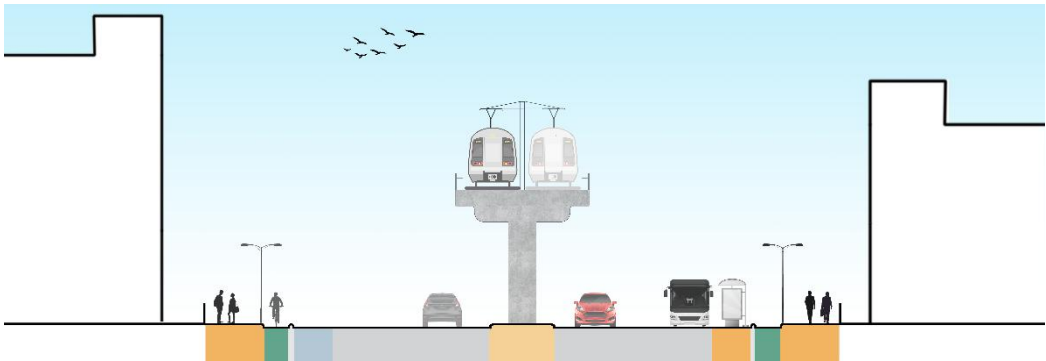
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

30 METER ROW - OPTION A



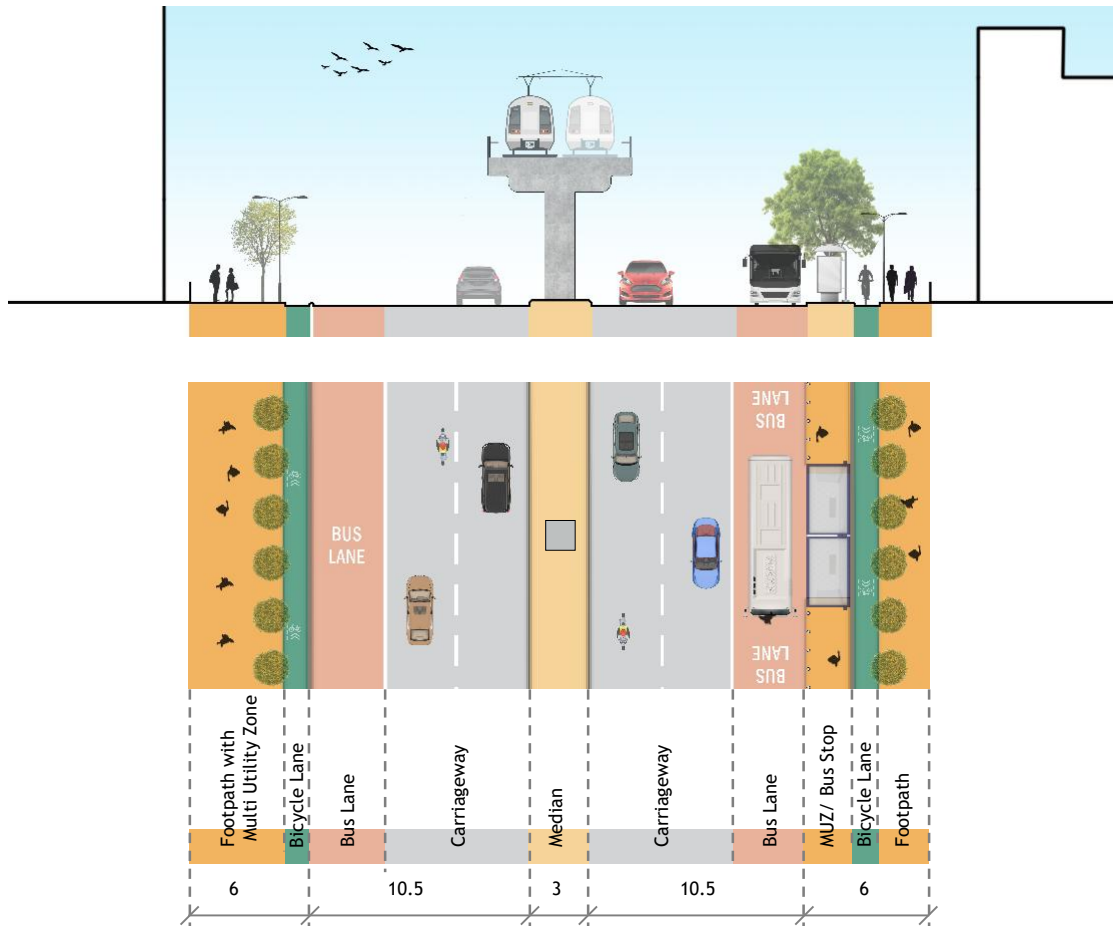
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

30 METER ROW - OPTION B



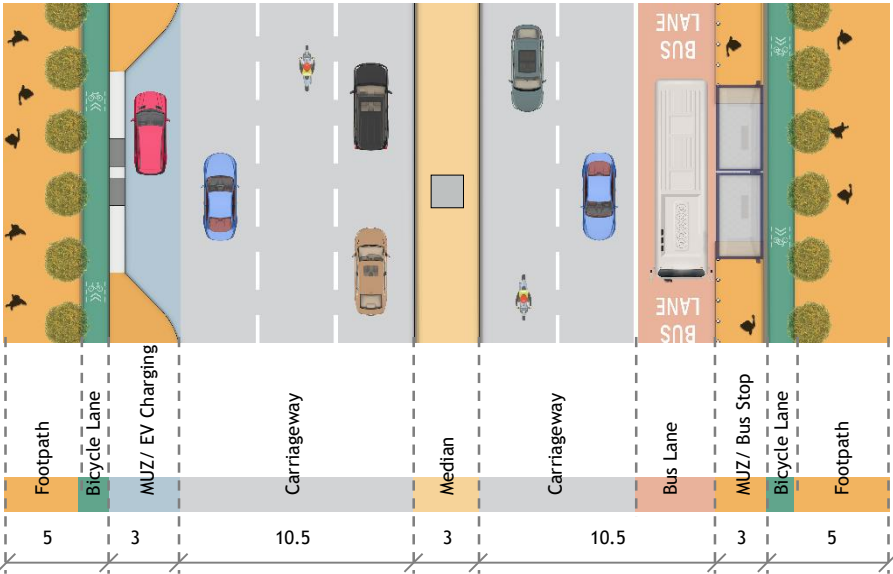
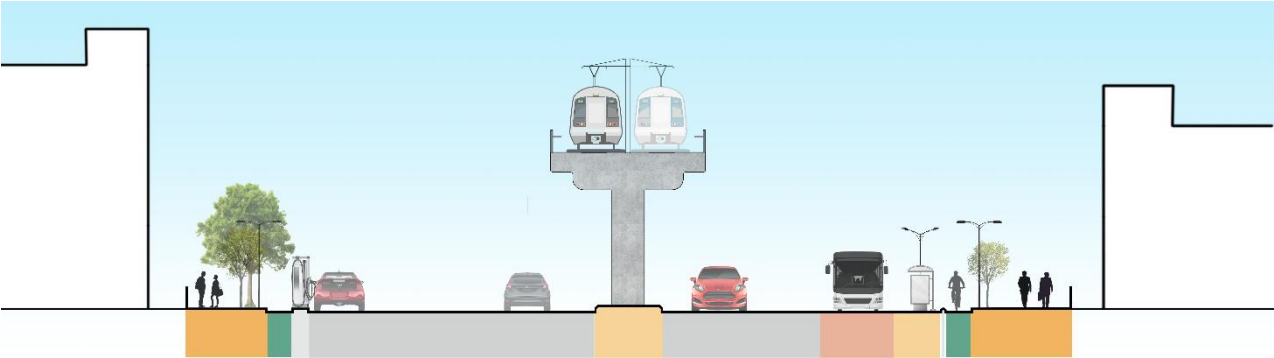
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

36 METER ROW



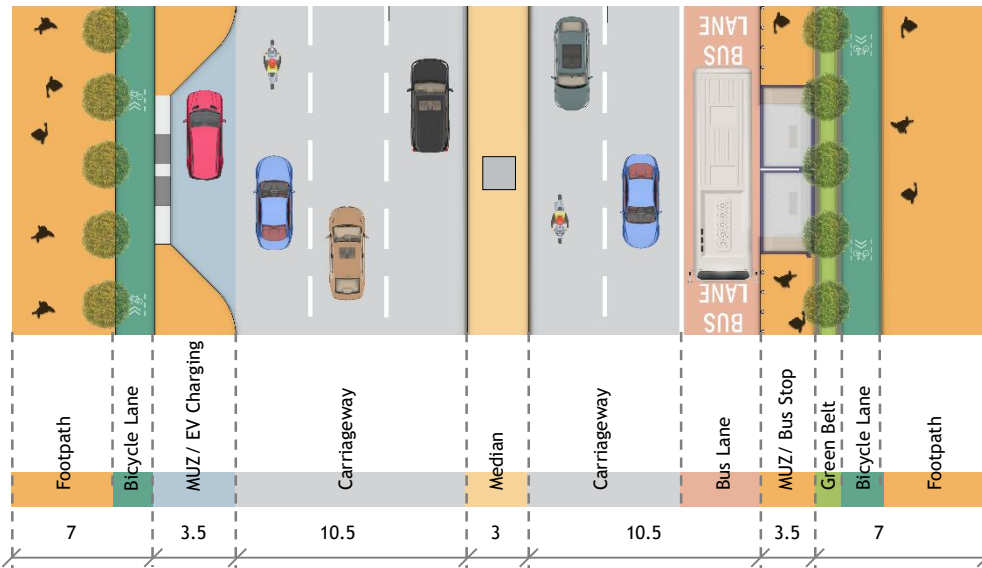
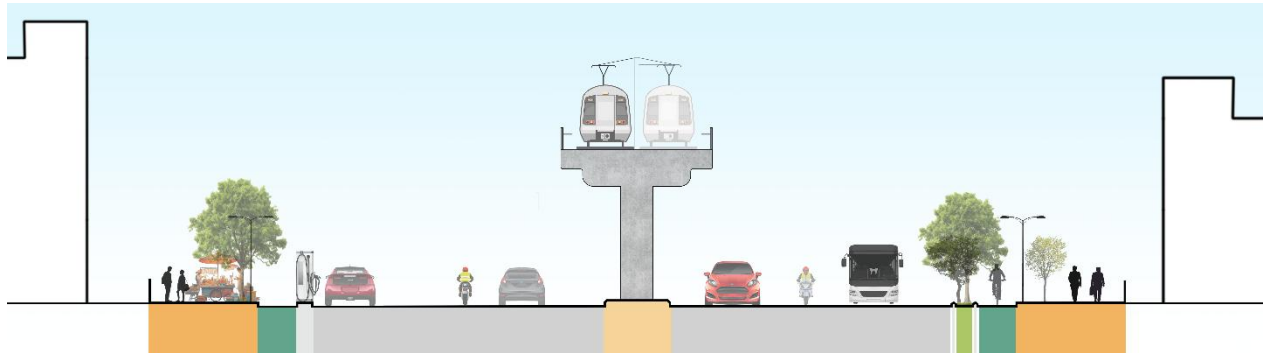
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

40 METER ROW



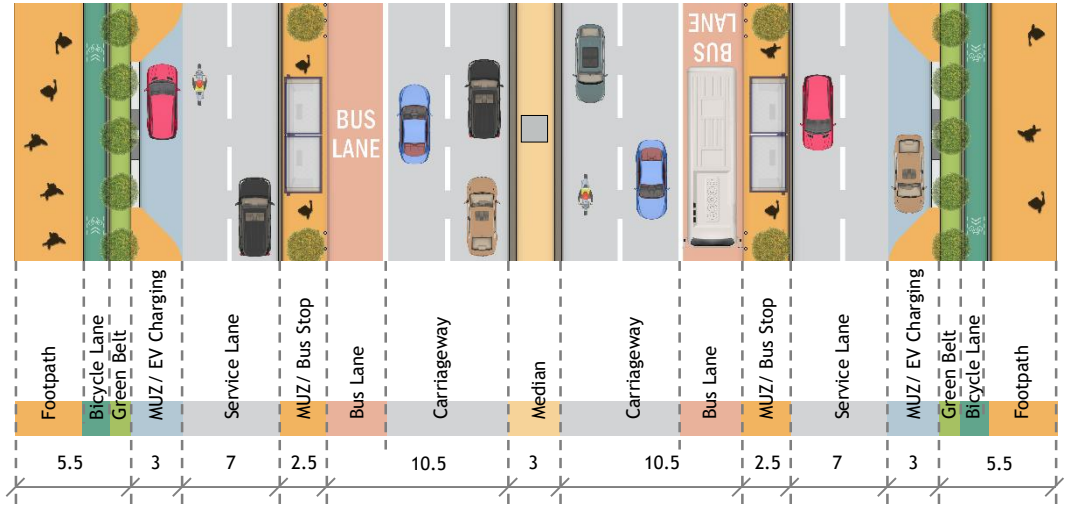
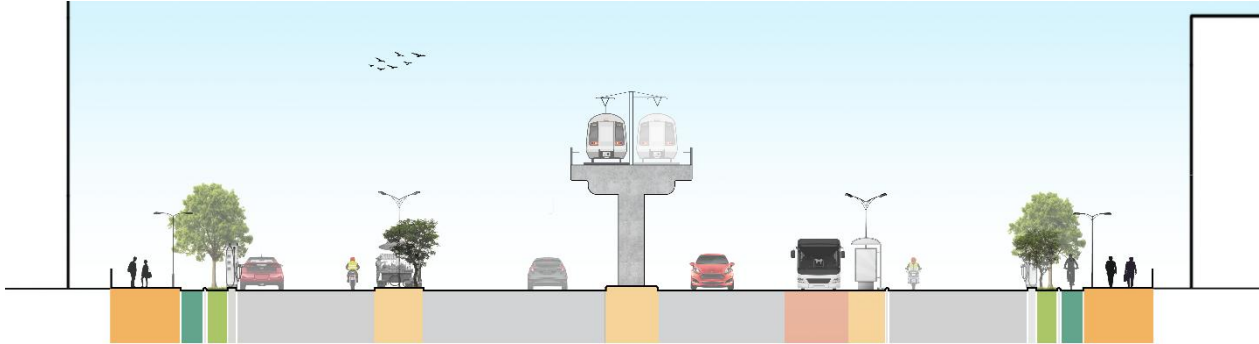
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

45 METER ROW



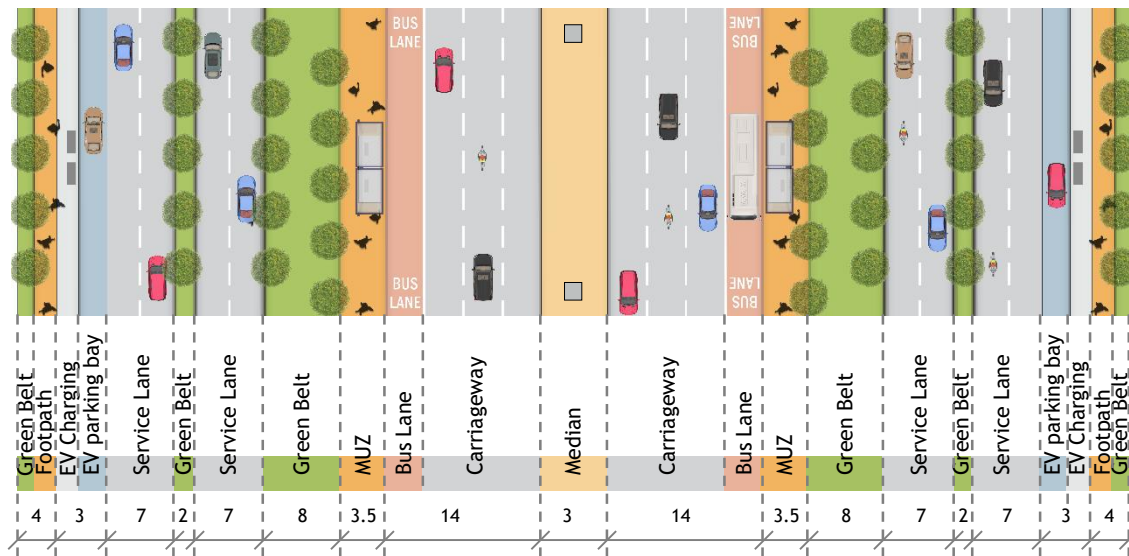
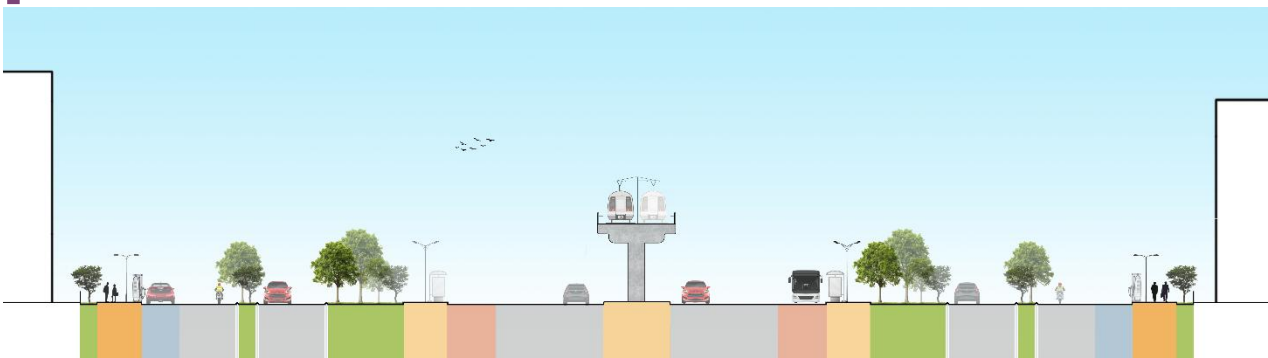
Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

60 METER ROW



Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

100 METER ROW



Pedestrian Street	Segregated Footpath	At Grade Footpath	Dedicated Cycle Lane	Shared Cycle Lane
Multi Utility Zone	On Street Parking	At Grade Crossing	Table Top Crossing	Median
High Transit Corridor	Bus Stops	Dedicated Bus Lane	Service Lane	Green Belt

FOOTPATHS

WIDTH

Footpaths are vital to ensure people can walk safely and comfortably. Segregated footpaths enhance connectivity, improve safety & comfort and ensure accessibility for all pedestrians, including all genders, ages, abilities.



Residential Street

Frontage Zone: **Min. 0.5m**

Walking Zone: **Min. 2m**

MUZ: **Min. 0.5m**



Commercial Street

Frontage Zone: **Min. 0.5m**

Walking Zone: **Min. 2.5m**

MUZ: **Min. 2m**



High-Intensity Pedestrian Footfall

Frontage Zone: **Min. 1m**

Walking Zone: **Min. 4m**

MUZ: **Min. 2m**

HEIGHT

The top of the kerb should be **150mm high** from the finished carriageway surface to prevent the mounting of vehicles and ensure comfortable walking for all users.



GRADIENT

Recommended gradient of **1:50** should be maintained for surface runoff.



LANDSCAPE

Active street edge, featuring shop façade and vendors, or transparent walls, contribute to a sense of safety. The “eyes on street” aspect offers informal urban surveillance.

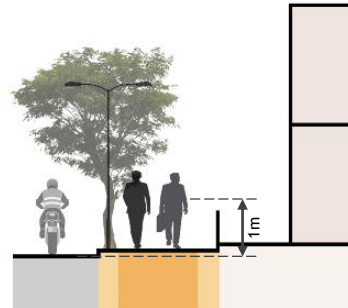


PUBLIC BUILDING USE

Landscape elements should be placed in the MUZ to serve shade for walking, cycling, seating, vending, and other activities. Trees can be used as a protective buffer between various modes of transport.

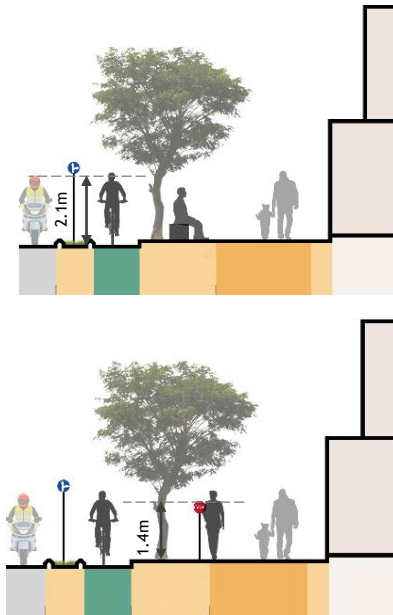
PRIVATE BUILDING USE

Private buildings should have boundary walls that are transparent above the height of 1m or brightened with graffiti if opaque.



STREET FURNITURE

SIGNAGE



Orientation:

Signage should be located at 0.25m from the kerb edge with minimum 2.1 m vertical clearance from the finished footpath level to the bottom of the signage board. All signage's shall adhere to the specifications mentioned in IRC: 67 - 2021.

Braille:

Braille sign boards should be located between 1.4-1.6m from finished footpath level. For signage design details, please refer to IRC:SP:117

STREET VENDING

Street vending provides for an important social space and serves as a form of security for those walking on the street, especially women.



Orientation:

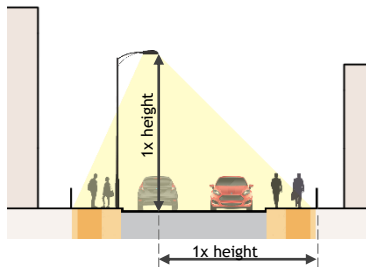
A typical vendor space of 1.8m x 1.8m (including spillover space) should be clearly demarcated in the MUZ.

LIGHT FIXTURES

LED light fixtures are recommended for low energy consumption. Warm white LED light is preferred. 25-30 lux levels of lighting should be available on the footpath as per IRC 103.

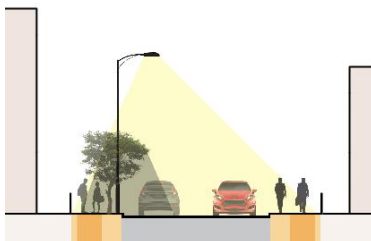
Fixtures:

Street lights should be placed in a way to illuminate the street surface, minimizing glare and light pollution.



Landscape and Lighting:

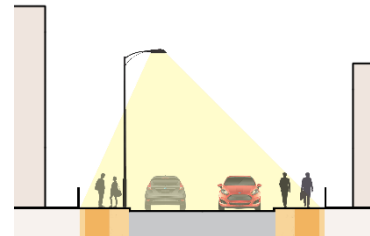
An integrated plan of street lights and trees should be prepared to avoid any obstruction to streetlight.



Light poles should not be higher than 12m as to avoid undesirable illumination to private properties. Spacing between two light poles should be about 3 times the height of the fixtures.

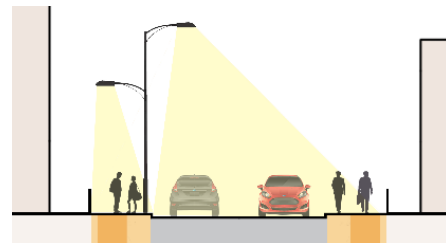
Placement on RoW $\leq 12\text{m}$:

A single light in the MUZ can be used if it illuminates the entire RoW.



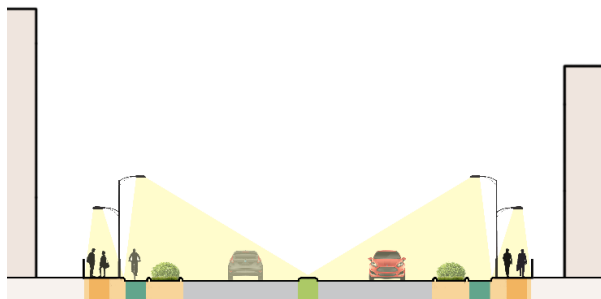
Placement on RoW $\leq 12\text{m}$:

Else, a pedestrian light should be fixed at a lower level to illuminate the entire edge.



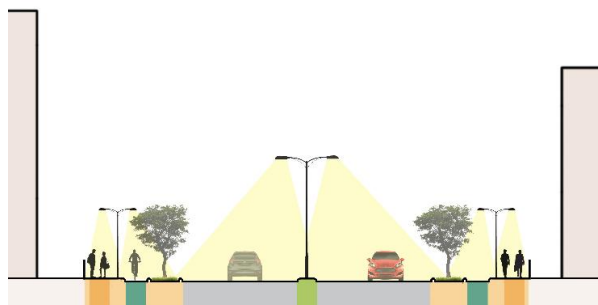
Placement on wide streets:

Pedestrian and street lights can be combined in a single pole in the MUZ to avoid clutter, provided there is proper illumination.



Placement on wide streets:

Median poles can be used for the carriageway and pedestrian lights should be provided separately



BUS STOP

Bus stops provide safe and comfortable waiting spaces. They should be located such that they are easy to identify and do not obstruct the walking zone.

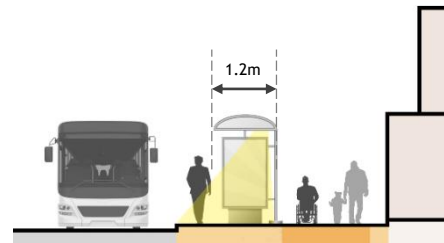
Footpaths >4.5m wide:

For footpaths > 4.5m wide, bus stops should be in the MUZ.



Comfort and Safety:

There should be sufficient shade and light with a clear waiting space of 1.2m wide in front of the shelter, having a seating to ensure comfort. The back panel of the bus stop should be transparent to ensure safety.



Footpaths <4.5m wide:

For footpaths < 4.5m wide, bus stops should be pushed to the wall to ensure sufficient space in the front for walking zone.



CYCLE TRACK

PHYSICALLY SEGREGATED CYCLE TRACKS

Physically segregated cycle tracks ensure safety and reduce the possibility of encroachment by moving motor vehicles and parking.

Buffer:

In streets with parking along cycle track, a buffer of minimum 0.5m should be provided to protect the cyclists from dooring.



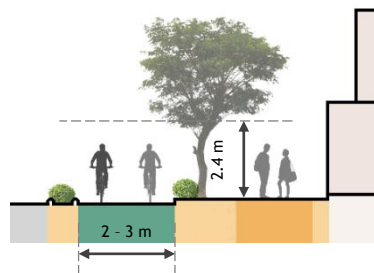
At carriageway level:

Cycle tracks at road level have lower construction and maintenance costs.



Width and Vertical Clearance:

Cycle tracks should be minimum 2m wide for one-way movement and minimum 3m wide for two-way movement. Vertical clearance of 2.4m should be maintained at all points.



PUBLIC AMENITIES

Integrating public amenities, like bicycle parking, dustbins, drinking water facilities, toilets and garbage containers enhances the attractiveness of the street, making it more comfortable for the users.

Public Bicycle Sharing Stations:

For streets with MUZ >2m - Public Bicycle Sharing Stations should be located within the MUZ.

For streets with MUZ <2m - Public Bicycle Sharing Stations should be located in parking bays.



Trash bins:

Opening of the bins should preferably be at a height of 0.8m from the finished floor level.



Public Toilets:

It is recommended that public toilets should be provided in off-street locations. However, if it is provided as on-street, it should be placed at a minimum of 0.6m clear distance from the kerb edge with a minimum of 2m clear walking zone in front of it.



PEDESTRIAN AND CYCLIST CROSSINGS

Well-designed midblock and intersection crossings provide a safe and convenient way for pedestrians and cyclists to cross streets, discouraging them from risking their lives on urban streets.

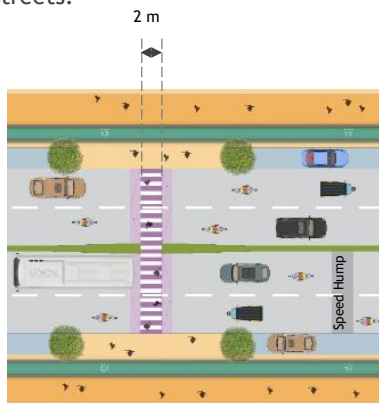


Table Top Crossing:

Location

Tabletop crossings are recommended to be provided at all un-signalized locations. They are also ideal for footpaths of narrow widths where providing ramps is not feasible.

Height

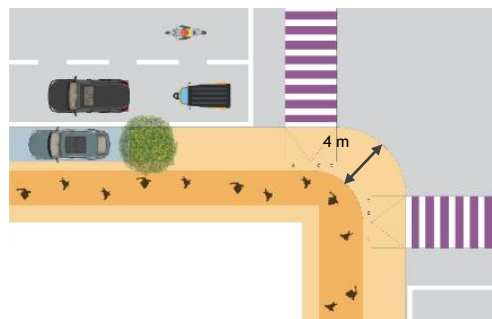
Raised to the level of the adjacent footpath with the vehicular ramps of 1:8 slope provides wheelchair access too.

Intervals

Every 80-150m in urban areas

Width

At least 2m wide and 4m in front of schools, hospitals, markets and other high footfall areas as per IRC:103



Zebra Crossing with Ramps:

Location

Zebra crossings recommended at signalized crossings.

Height

Footpath should be ramped down to the level of the carriageway.

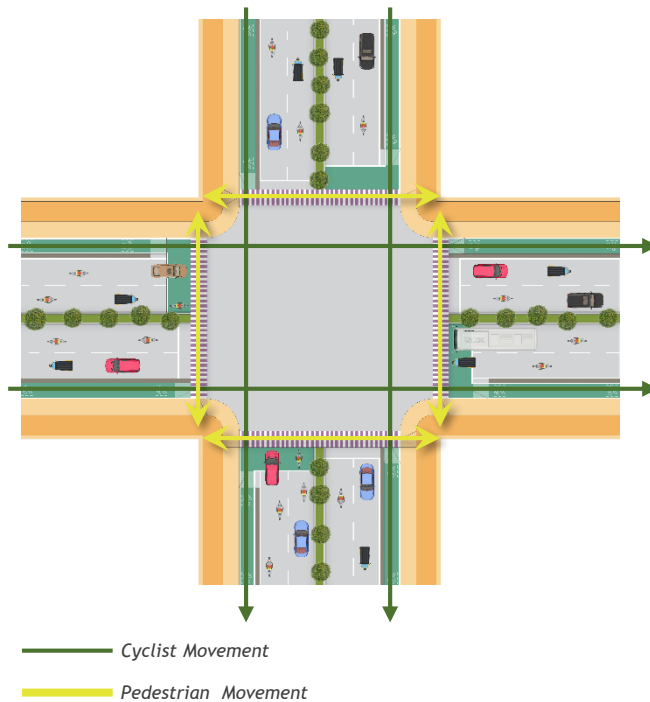
Width

At least 2m of width should be provided.

Turning radius

Small turning radius slows down vehicles and increases pedestrian safety while crossing. Turning radii at intersections should be 4m on local and collector streets, and maximum 9m on arterial streets.

ACROSS INTERSECTIONS

Streets with segregated cycle tracks:

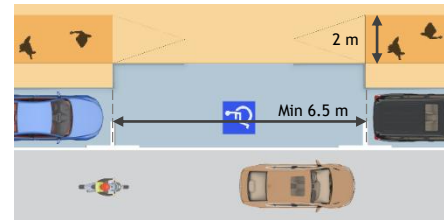
Continuity of cycle tracks should be maintained on intersections. Bike box should be added to allow cyclists to wait at the signals.

Pedestrian crossings should be located at all corners of the intersection, such that there is minimum deviation from the path of the walking zone.

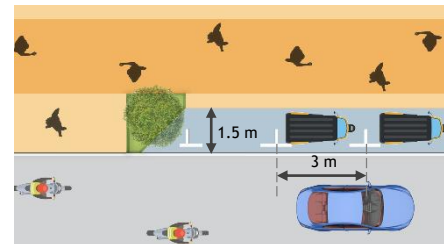
Streets without segregated cycle tracks:

In case of narrow streets where segregated cycle tracks are not provided, the intersection can be raised to reduce the traffic speeds and enhance safety for cyclists.

ON-STREET PARKING

Accessible Parking Bay:

It is recommended to provide wheelchair accessible parking spaces in off-street locations. Where provided, on-street accessible parking bays must be clearly demarcated with signage.

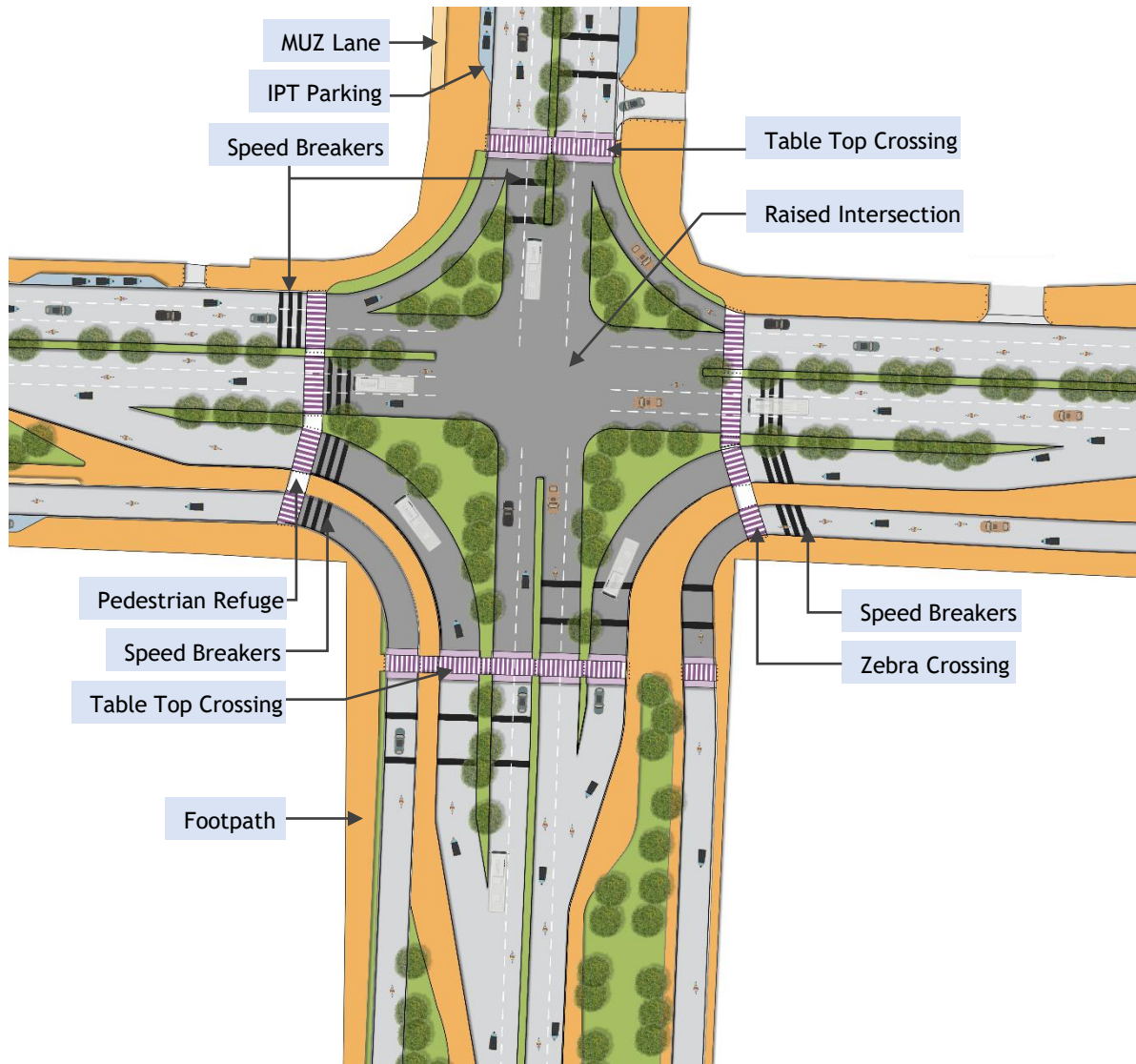
Intermediate Public Transport (IPT):Orientation

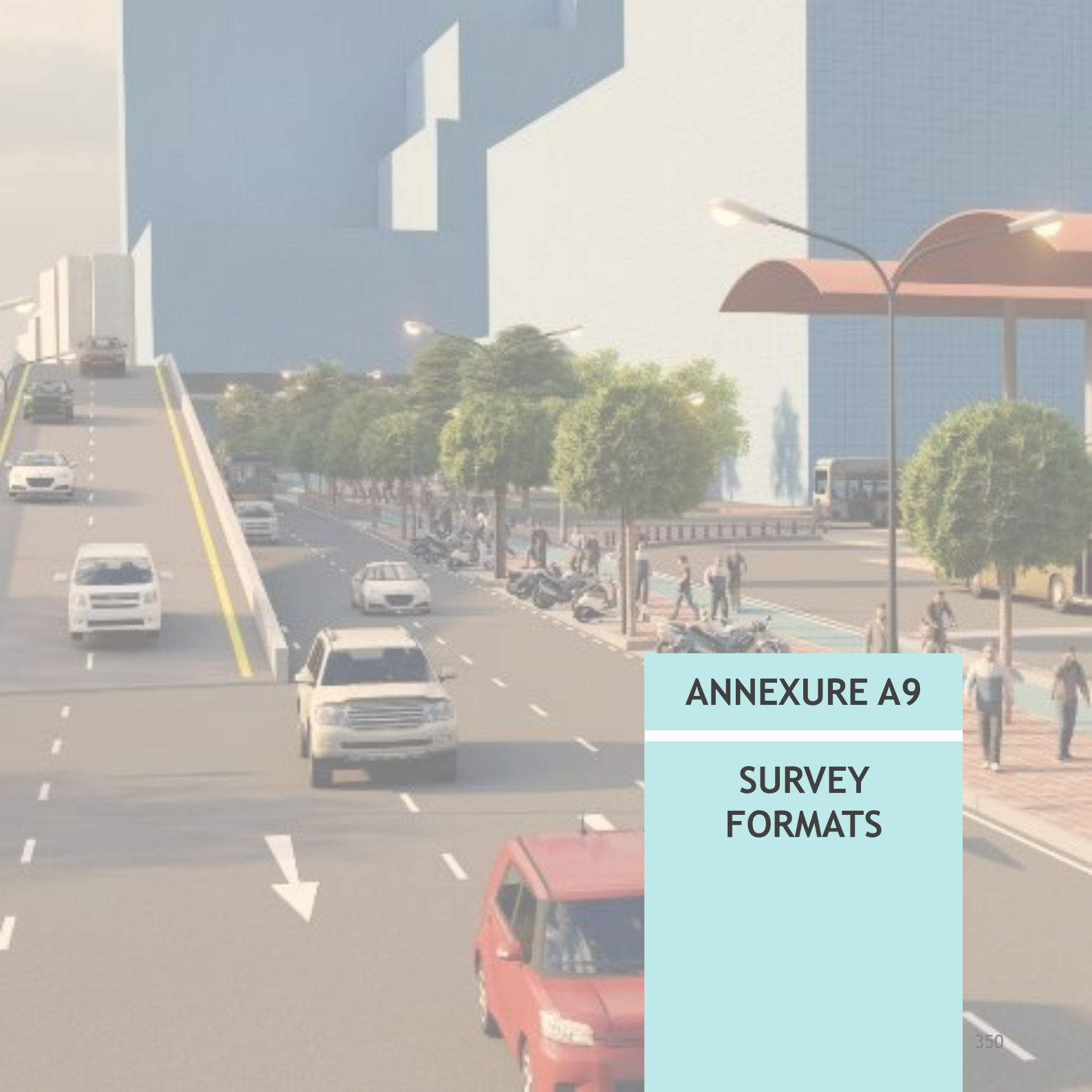
IPT stands should accommodate parallel parked auto-rickshaws to ensure ease of maneuvering and to occupy less space.

Kerb Edge

The kerb edge might be positioned at a 45-degree angle to emphasize the distinction between IPT stands and on-street parking.

TYPICAL FOUR ARM JUNCTION DESIGN





ANNEXURE A9

SURVEY FORMATS

SAMPLE SURVEY FORMATS

The survey formats provided are listed below:

- A. Road Inventory for Motorised Vehicle
- B. Footpath Inventory
- C. Non-Motorized Vehicle Lane Inventory
- D. Infrastructure Facility
- E. Junction Inventory
- F. Turning Volume Count at Junction, Screen Line and Mid Block
- G. Average Vehicle Occupancy at Junction, Screen Line and Mid Block
- H. On-Street Parking
- I. Off-Street Parking
- J. IPT Operator Survey
- K. Pedestrian Volume Count Survey
- L. Bus Terminal Count
- M. Establishment Survey
- N. Interchange Survey
- O. Land and Building Use Survey

REFERENCE

- Adapted from Toolkit for Comprehensive Mobility Plan Revised by IUT and MoUD. ^[36]

A. Road Inventory for Motorised Vehicle

Road Name	Node Number		Length (m)	Number of Lanes	Divided/ Undivided	Carriage Way (Kerb to Kerb)			Service Lane Width (m)		Street Light (Y/N)	Right of Way (m)
	From Node	To Node				LHS (m)	Median (m)	RHS (m)	LHS	RHS		

B. Footpath Inventory

LHS					
Type (Paved/ Unpaved)	Length (m)	Width	Encroachment*	Lighting (Y/N)	Barrier Free Design**
RHS					
Type (Paved/ Unpaved)	Length (km)	Width	Encroachment*	Lighting (Y/N)	Barrier Free Design**
NOTE: * Parking/ Vendors/Trees/ Electric Poles/ Other Obstacles ** Access at entry/Guiding Tiles/Audible/Ramp/Bollards/Railing/None					

C. Non-Motorized Lane Inventory

Length (m)	Width (m)	Pavement Condition*	Segregation tools to separate NMV lane from other mode**	Encroachment***
Length (m)	Width (m)	Pavement Condition*	Segregation tools to separate NMV lane from other mode**	Encroachment***
NOTE:	* Good/Poor Bad			
	**Painted Marking/ Kerbed/ None			
	*** Parking/Vendors			

D. Infrastructure Facilities and Enforcement along Road

Any IPT Stand			Is it a bus route? (Y/N)	bus Stop availability (Y/N)	No. of on-street parking		Encroachment on Road						Vehicle Restriction		
LHS (Y/N)	RHS (Y/N)	IPT Mode			LHS	RHS	LHS			RHS			PMV	NMV	IPT
							(Y/N)	Road Width encroachment (m)	Type of Encroachment	(Y/N)	Road Width encroachment (m)	Type of Encroachment			

E. Junction Inventory

Junction Name	Type of Intersection*	Type of traffic operation**	Traffic Calming Tools***	Barrier Free Access (Y/N)	Other NMV Facilities (NMV box etc.)

Note:
 * 1. Un-Signalised 2. Signalised 3. Roundabout 4. Signalised Roundabout
 ** M- Manual A- Automated
 *** 1. Zebra Crossing 2. Pedestrian crossing Signal 3. Foot-over bridge 4. Pedestrian Refuge

F. Turning Volume Count at Junction, Mid-Block and Screen Line

Name of the Junction	Location		Direction		From	Date	Day	Weather (Sunny/ Cloudy/ Rainy)													
					To																
Time	Private Vehicles & IPT						Buses				Slow Moving Vehicles			Others							
	2-Wheeler	Car/Jeep/Van (white board)	Taxi (Car/Jeep/Van)(yellow board)	E-Rickshaw	Auto-Rickshaw (3 seater)	Vikrams/Tempos	Tata Magic	Intercity bus / Inter-state (Govt. Buses)	Intercity bus / Inter-state (Private)	Mini/Midi Buses (private)	Intra-city buses	Chartered Buses/School Buses	LCV	Trucks/2 Axle	MAV	Tractor	Cycles	Carts	Cycle Rickshaw	Tonnage	JCB/Excavator/Other construction equipment
XX :00 to XX :15																					
XX :15 to XX :30																					
XX :30 to XX :45																					
XX :45 to XX :00																					

G. Average Occupancy at Junction, Mid-Block and Screen Line

Name of the Junction	Location		Direction		From	Date	Day	Weather (Sunny/ Cloudy/ Rainy)													
					To																
Time	Private Vehicles & IPT						Buses				Slow Moving Vehicles			Others							
	2-Wheeler	Car/Jeep/Van (white board)	Taxi (Car/Jeep/Van)(yellow board)	E-Rickshaw	Auto-Rickshaw (3 seater)	Vikrams/Tempos	Tata Magic	Intercity bus / Inter-state (Govt. Buses)	Intercity bus / Inter-state (Private)	Mini/Midi Buses (private)	Intra-city buses	Chartered Buses/School Buses	LCV		Trucks/2 Axle	MAV	Tractor	Cycles	Carts	Cycle Rickshaw	Tonnage
:00 to :15																					
No. of Samples																					
No. of Passengers																					
:15 to :30																					
No. of Samples																					
No. of Passengers																					
:30 to :45																					
No. of Samples																					
No. of Passengers																					
:45 to :00																					
No. of Samples																					
No. of Passengers																					

H. On-Street Parking

1	Day:							
2	Date:							
3	Location:							
4	Start Node:							
5	End Node:							
6	Road name:							
7	Length (Approx)							
8	Type of Parking							
9	Parking Charges (If any)	If yes, ask / understand fee structure						
	Time: XX:00 to XX:15		Time: XX:15 to XX:30		Time: XX:30 to XX:45		Time: XX:45 to YY:00	
	Vehicle Type	Vehicle No	Vehicle Type	Vehicle No	Vehicle Type	Vehicle No	Vehicle Type	Vehicle No

Code	VehicleType
1	2-Wheeler
2	Car/Jeep/Van (white board)
3	Taxi (Car/Jeep/Van)
4	E-Rickshaw
5	Auto-Rickshaw (3 seater)
6	Tata Magics
7	Intercity bus / Inter-state (Govt. Buses)
8	Intercity bus / Inter-state (Pvt. Buses)
9	Intra-City buses
10	Institutional/Company Bus
11	Goods Auto
12	LCV
13	Trucks/2 Axle
14	MAV
15	Tractor
16	Cycle

I. Off-Street Parking

1	Day:												
2	Date:												
3	Location:												
4	Area (Approx)												
5	Number of Bays:												
6	Type of Parking												
7	Parking fee structure												
8	Parking plot timings (if any)	eg. 6 am to 10 pm											
		TIME: XX:00 to XX:15			TIME: XX:15 to XX:30			TIME: XX:30 to XX:45			TIME: XX:45 to YY:00		
	Vehicle Type	Vehicle No (Registration plate)	Existing / In/Out	Vehicle Type	Vehicle No (Registration plate)	Existing / In/Out	Vehicle Type	Vehicle No (Registration plate)	Existing / In/Out	Vehicle Type	Vehicle No (Registration plate)	Existing / In/Out	

Code	VehicleType
1	2-Wheeler
2	Car/Jeep/Van (white board)
3	Taxi (Car/Jeep/Van)
4	E-Rickshaw
5	Auto-Rickshaw (3 seater)
6	Tata Magics
7	Intercity bus / Inter-state (Govt. Buses)
8	Intercity bus / Inter-state (Pvt. Buses)
9	Intra-City buses
10	Institutional/Company Bus

Code	VehicleType
11	Goods Auto
12	LCV
13	Trucks/2 Axle
14	MAV
15	Tractor
16	Cycle

J. IPT Operator Survey

Name of the Road:		Location:		Weather (Sunny/ Cloudy/ Rainy):								Date :						
		Direction:										Day:						
S.no	Time of Interview	Name of the vehicle operator	Type of mode	Occupancy	Make/Model	Ownership*	Fuel Type*	Routes/Areas of Operation in the city (with kilometers)	No of Hours Operated (Previous day)	No of Trips	Average number of riders	Trip Frequency*	Average waiting time to get trips (non peak hours)	Kilometres travelled (previous day)	Expenditure (in RS.)	Revenue in Rs. (Previous Day)	Average waiting time to get trips (peak hours)	Parking location
							1.											
							2.											
							3.											
							1.											
							2.											
							3.											

Code	Gender	Code	Type of IPT Mode	Code	Ownership	Code	Fuel	Code	Trip Frequency
M	Male	1	Taxi (Car)	1	Self-owned	1	Petrol	1	Daily
F	Female	2	E- Rickshaw	2	Hired/Rent	2	Diesel	2	Weekly
		3	Auto rickshaw (3 seater)			3	LPG	3	Occasionally
		4	Vikram/Tempo			4	CNG		
		5	Tata Magic			5	Electric		
		6	Car (Goods)						

K. Pedestrian Volume Survey

Location :			Date:		
Junction type	3 Arm/ 4 Arm / 5 Arm / 6 Arm / 7 Arms				
Road name :			Direction :		
	Please draw the junction map(Crossing the road)		Please draw the junction map (Along the road)		
Time	Crossing the road		Along the road/Foot path		
	Towards:-----	Towards:-----	LHS	RHS	
:00 - :15					
:15 - :30					
:30 - :45					
:45 - :00					

L. Bus Terminal Count

Location:			Date:			Gate Number:		
Name of Terminal:			Day:					
Direction:			Weather (Sunny/Cloudy/Rainy):					
Time period	Buses		Total Buses	Passengers		Total passengers		
	In	Out		In	Out			

M. Establishment Survey

Establishment Name:			Name of the Respondent:							
Location/ Address:			Respondent Phone no:							
			Taz no:							
1) Activity of the Establishment	2) Total no. of employees/ workers/ students/ teachers									
3) Approx. no. of Visitors per day	4) No. Of trips made (deliveries, etc. if any)		5) Quantum of goods (tonnes)		6) Mode of Transport (goods)					
			Incoming	Outgoing						
7) Occupancy Status of the Premises			8) Total Built up area covered by the establishment (sq.m)		9) Total Land area covered (sq.m)					
			By Single establishment	By Multiple establishment						
01 Entire premises occupied by single establishment										
02 Shared by Multiple establishment										
10.How do you commute to work place										
11. Do you provide transport facilities to employees/ students: Yes_____ /No_____										
12. Do you have Parking Arrangement for visitors? Yes_____ /No_____										

13. Are you satisfied with the way you travel in the city?	Yes	No							
14. what kind of improvement is required in terms of Transport ,specify				Parking	Road Condition	Pedestrian Infra	Connectivity	Safety	PT maintenance and Quality

1) Activity of the Establishment			
01 RETAIL	02 WHOLESALE	03 OFFICES	04 MANUFACTURING
Multi Brand-Multi Product Retail / Department Stores		Back Office / Operations Support	Automobiles / Mechanical /Engineering Goods
Single Brand / Product Retail		Government / Administration	Consumer Goods
Vegetable / Fruit / Milk (Mandi)		Municipal Services / Water / Electricity	Electronics
Construction Material / Hardware			Chemicals / Pharmaceutical
Fuels (Petrol / Diesel / LPG)		Corporate Office	Others
Others		Others	
05 SERVICES			
Education		Restaurants / Food Shop /	Utilities & Services (Water, Electricity, Sewage, Solid Waste, Police Station, Roads & Civil Works)
Health / Medical		Takeaways	
Personal / Lifestyle / Saloon / Gym		Hotel / Lodge / Guest House	
Entertainment / Theatre / Multiplex		Repair / Maintenance / Workshops	Banks / ATM / Financial Services
Administration & Management		Phone / Internet (Telecom)	Transport & Logistics
Historical / Cultural / Tourist Place		Trading / Exports / Imports	Religious

Mode of transport (goods)	1	Goods Auto
	2	LCV
	3	Trucks/2 Axle
	4	MAV
	5	Tractor
	6	Car (Goods)

N. Interchange Survey

Type of Interchange	Name of Interchange	CCTV		Passenger Information System (PIS)		Is there any interchange available within 250 to 500 m		Parking Available for IPT within 250m	
		Y/N	Count	Y/N	Count	Y/N	Count	Y/N	Count

Docking Station Available within 250 m		Are informatory signage's available within 250m
Y/N	Count	

O. Land and Building use Survey

SNo.	Road Name	From Node	To Node	Abutting Road RoW (m)	Building Name	Floors	Frontage Length (m)	Building Use	Residential Typology (if any)	Basement

Floor Usage					Building Condition	Building Age	Building Amenities	Plot Size (sqm)	Ground Coverage	Existing Land use	Building Ownership	Status of Building
Ground	G+1	G+2	G+3	G+4								

Code	Building Condition	Code	Building Amenities	Code	Building Ownership	Code	Status of Building
1	Good	1	Electricity	1	Public	1	Under Construction
2	Fair	2	Parking	2	Private	2	Vacant
3	Poor	3	Drainage			3	Built up
		4	Water Line				
		5	Internet				
		6	Gas Pipeline				

DEFINITIONS

- **Affordable Housing:** Housing for individuals or families with what are considered “low” incomes. Definitions of what counts as “affordable” housing vary widely and, when defined by local governments, are typically dependent on multiple local factors.
- **Anchor Institution Partnership:** A collaborative effort between large, place-based organizations and their surrounding communities.
- **Activity Node:** A concentrated area around transit hubs where diverse activities like work, shopping, and recreation are integrated.
- **Building By-laws :** A standard made by appropriate authority for approval of plan for construction, completion/occupation of building.
- **Catalyst Public:** They cause things to happen or they increase the speed at which things happen.
- **City Development Plan:** It is a comprehensive document that outlines the vision and strategies for the future development of a city.
- **Commuters:** Generally serves only one major activity center- typically Central Business District (CBD) area.
- **Comprehensive Development Plan:** It is a medium-term sectoral plan for local government to develop the land allocated for different uses through priority programs, projects and activities.(Physical, Institutional, economic, Social and infrastructure).
- **Comprehensive Mobility Plan:** CMP is a long-term strategic document that provides an integrated approach to urban transport planning, focusing on the mobility of people rather than vehicles.
- **Concept Plan:** A Concept Plan is a supporting high-level plan that illustrates the initial long-term vision for development of a neighborhood, urban block or site.
- **Core City Station:** These stations are located in high density employment areas and mixed-use destinations.
- **Corridor-Wide tax Increment Financing:** A public financing method used to subsidize redevelopment, infrastructure, and other community improvement projects. It involves designating a defined geographic area or “corridor” as a TIF district.
- **Density Bonus:** Density increase over the otherwise maximum allowable residential density under the applicable zoning code provisions and the land use element of the general plan as of the date of application by the applicant to the city.
- **Density exchange bonus:** More specific type of incentive that involves transferring development rights or density from one site to another.
- **Destination Connector:** Connectors that link residential neighborhoods to multiple activity centers, including employment and commercial centers.
- **Destination Node:** Station which provide access to unique destinations
- **Developer Fees:** Are charges imposed on developers for managing the development process for another principal.

- **Development Agreement:** A legally binding contract between a property owner or developer and a local government, often including terms not otherwise required through existing regulations.
- **Detailed Project Report (DPR):** a comprehensive document that provides a detailed plan and blueprint for executing a project.
- **Development Code Regulations:** A Development Code is a set of regulations and standards that guide the development and use of land within a city or municipality.
- **District Circulator:** Facilitate movement within and activity node- typically a commercial, medical or educational center
- **Employment Centers:** Significant center of economic and community activity. Stations serve the main public/ semi-public amenities and offices of the city.
- **Floor Area Ratio (FAR):** the quotient of the ratio of the combined gross floor area of all floors, excepting areas specially, exempted under the Zonal Regulations, to the total area of the plot.
- **First and Last Mile Connectivity:** the beginning or end of an individual trip made primarily on foot and/or public transportation.
- **Floodplain:** Generally flat area of land next to a river or stream.
- **Floor Space Index (FSI):** The quotient obtained by dividing the total Built- Up Area (BUA) of all floors by the plot area.
- **Grants:** A sum of money provided by a government, local authority, or public fund to finance educational study, overseas aid, building repairs, etc.
- **Greenfield:** an area of land that has never previously had buildings on it or been used for industry
- **High Mobility Demand Corridor:** It typically refers to transportation route where there is significant demand for mobility services due to factors such as population density, employment centers or activity nodes.
- **Infill Neighborhoods:** Predominantly residential districts located just outside the core/old city.
- **Informal Activities:** Informal activities on the road typically refer to economic activities conducted outside the formal regulatory framework, often by individuals who lack access to formal employment opportunities.
- **Infrastructure Plan:** Strategically outlines the development and maintenance of essential systems like transport, utilities, and public services.
- **Interim Control By-laws:** Interim control by-laws put a temporary hold on some land uses while the municipality is reviewing its policies. The hold can be imposed for only one year, with a maximum extension of another year.
- **Interim Development:** A temporary plan for the development of a site or area, often used to manage the development process until a more comprehensive plan is implemented.
- **Intermodal Gateways:** Significant hubs of transport activity with supporting commercial and informal activities.

- **Intermediate Public Transport:** modes of transportation that fill the gap between individual/private transport (such as cars and motorcycles) and mass public transport (like buses and trains). IPT typically includes vehicles like auto-rickshaws, shared taxis, mini busses, and vans that cater to a smaller number of passengers compared to buses and trains but are more flexible and accessible than private vehicles.
- **Joint Development Agreement (JDA):** outlines collaboration between landowner and builder for property development.
- **Kilometer Travelled:** The distance covered by a vehicle or individual in a specific time interval, typically measured in kilometers.
- **Land Acquisition Act, 1894:** An Act of the Indian Parliament that regulates the acquisition of land for public purposes and for companies, ensuring fair compensation and rehabilitation for those affected by land acquisition.
- **Land Acquisition costs:** the total expenses incurred by a party (such as a government, organization, or individual) in acquiring a piece of land.
- **Land Assemblage:** a collection of two or more land parcels that have been combined into one larger piece of property. This may be done for a variety of reasons, such as to expand the size of the property or make it simpler to develop.
- **Land Banking:** Involves the purchase of land now for future uses.
- **Land Entitlement Procedures:** The legal procedures for obtaining approval to alter a property's designated use.
- **Land Lease:** The tenant owns any vertical construction while a landlord holds title to the dirt underneath.
- **Land Pooling:** It is a concept where a group of landowners collectively hand over their land parcels to the government for infrastructure development.
- **Land swapping:** The exchange of land between two parties, typically a private owner and a government.
- **Land Use:** The plan outlines how land is allocated for residential, commercial, industrial, and recreational purposes, ensuring balanced growth.
- **Land valuation guideline:** Are guidelines for the amount of money that a piece of land is worth. This value can be arrived at by an independent real estate appraiser.
- **Land Value Capture:** Type of public financing that recovers some or all of the value that public infrastructure generates for private landowners
- **Local Area Plan (LAP):** sets out a strategy for the proper planning and sustainable development of a specific area within a local authority and for a timescale as specified by the authority.
- **Master Plan:** a dynamic long-term planning document that provides a conceptual layout to guide future growth and development. Master planning is about making the connection between buildings, social settings, and their surrounding environments.
- **Marginal Open Space(MOS):** Minimum distance required to be left open to sky between the boundary of the building plot and the building excluding court yard/ chowk, which is an integral part of the plot and excluding access roads.

- **Metro Railways Act, 2002:** Provides the legal framework for the operation, maintenance, and safety of metro rail systems in India.
- **Metro Vehicles Act:** India governs the operation, maintenance, safety, and security of metro rail systems, including the acquisition of land, fare fixation, and penalties for violations.
- **Mid-Line Station:** These stations are typically located in areas with low to medium density area.
- **Mobility and Access:** the ability of individuals to move efficiently and conveniently within urban areas and access essential services and amenities.
- **Multi-Modal Integration:** It is transportation system that offers various options for travel, such as combining walking, cycling, buses, trains, and other modes.
- **Municipal Bonds:** Also, known as a "muni bond", is a debt security issued by a state, city, county, or other governmental entity to fund public projects and day-to-day operations. These projects can include schools, hospitals, universities, highways, bridges, and sewer systems.
- **National Building Code:** a comprehensive building Code, is a national instrument providing guidelines for regulating the building construction activities across the country.
- **New Residential Areas:** Predominantly residential district outside the core/ old city areas with good access to the core city.
- **Non-Motorized Transport Network:** Active transport, refers to modes of transport which are powered by human power rather than other forms of energy like fossil fuels.
- **Park-and-ride lots:** A place in or near a town or city where you can park your car cheaply and take a bus or other form of public transport into the center.
- **Ped shad Analysis:** A walkable catchment (also known as a 'ped shed') analysis is a tool to assess the walkability of a neighborhood.
- **Performance Metrics and Monitoring:** Monitoring and analyzing city Planning's workload and performance metrics. The staff assigned to this Unit advises management on implementing new strategies that aim to improve case processing timeframes, data collection, and analysis around policy outcomes.
- **Planning and Regulatory context:** The planning and regulatory context refers to the legal, policy, and institutional framework that governs and shapes the planning and development processes for a given area or project.
- **Public Realm:** It comprises spaces and places that are open and freely accessible to everyone, regardless of their economic or social conditions. These spaces can include streets, laneways and roads, parks, public plazas, waterways and foreshores.
- **Public-Private partnership:** Relationships among public and private entities in the context of infrastructure and other services.
- **Real Estate Investment Trust:** Allow individuals to invest in large-scale, income-producing real estate.
- **Real Estate Market:** the buying, selling, and renting of land, residential and commercial properties, and other real estate.
- **Redevelopment:** the act or process of changing an area of a town by replacing old buildings, roads, etc. with new ones.

- **Regional Context:** The broader geographical, economic, social, and environmental factors that influence urban planning and development within a specific area.
- **Regional And Urban Development Formulation And Implementation (RUDPFI) Guideline:** A provide framework for preparing spatial development plans at various levels from regional to local.
- **Rent Control Act (1948):** It controls the guidelines for renting out a property and makes sure neither the rights of the landlords nor the tenants are violated by the other.
- **Revenue Generation strategy:** The process enables the sales team to know how best to go about increasing the business' profit and income.
- **Request for Proposal (RFP):** A formal document outlining a business project and inviting qualified vendors to submit tailored proposals for its completion.
- **Road Network and Connectivity:** Highways and Freeways, Arterial Roads, Collector Roads, Local Streets, Intersections and Interchanges, Bridges and Tunnels.
- **Road Network inventory:** Comprehensive survey that studies the profile of roads, like Road/Pavement Widths, Road/Pavement types, street lighting, Luminosity, Drain types, speed, Encroachments, Presence of vendors/street furniture, Auto/Bus stops.
- **Secure Finance:** A business loan backed by collateral. Collateral can be any business asset—cash, accounts receivable, inventory, machinery, equipment, real estate and even intangibles such as patents, copywriter and trademarks. The value of the collateral is most important in determining the amount of the loan.
- **Set backs:** the open space prescribed under these Zonal Regulations between the plot boundary and the plinth of the building.
- **Special Area Plan:** a detailed development plan for a specific geographic area, which is designed to ensure sustainable and inclusive development.
- **Spatial Planning:** Public policy intervention related to the ordering and regulation of land use in an efficient, sustainable and ethical way.
- **Special Purpose Vehicle:** A Special Purpose Vehicle (SPVs) is a legal entity typically created to undertake a particular project. It is a subsidiary of a parent company and has its own assets, liabilities and legal identity.
- **State Town and Country Planning Act:** It is a comprehensive legislation that aims to regulate the development and use of land in a state.
- **Station Area Plan:** A planning process of incorporating the principles of TOD and implementing them as per the need and uniqueness of different areas around metro stations in a city.
- **Statutory Barrier:** Statutory barriers refer to legal barriers that are enforced by law and can only be removed or amended through the proper legal process.
- **Steering Committee:** The comprised of various people, including board officers, senior stakeholders, experts, executives, department employees and client representatives.
- **Streetscapes:** Urban Forest, Storm water Management, Lighting, Paving, Site Furniture, Utilities and Driveways, Sidewalks, Landscaping, Street Design **Tax Increment Financing(TIF):** financing tool that local governments can use to fund public infrastructure in targeted areas to encourage private development and investment.

- **Terminus Station:** These stations are located at end of the metro rail lines.
- **Terms of Reference (TOR):** The objectives, scope of work, activities, and tasks to be performed, respective responsibilities of the Procuring Entity and the Tenderer, and expected results and deliverables of the assignment.
- **Town and Country Planning Act:** The Act provides for the preparation of development plans, the control of development, and the protection of the environment. It also includes provisions for the compulsory acquisition of land, the regulation of construction, and the management of special areas.
- **Town Planning Schemes:** A town planning scheme is a joint land development project undertaken by landowners, with the planning authority acting as an agent on their behalf.
- **Traffic Management Measures:** A variety of physical design and other measures implemented on existing roads to reduce vehicle speeds and improve safety for all road users, especially pedestrians and cyclists.
- **Transfer of Development Rights:** The term "transfer of development rights" (TDR) refers to a mechanism where the development rights of a property are transferred from one location to another. This transfer allows the owner of the property to build over and beyond the permissible floor space index (FSI) in the new location, based on the rules prevalent in that area.
- **Transit Corridor:** A transit corridor typically refers to a designated route or pathway used for public transportation such as Buses, BRTS or MRTS.
- **Transit Station:** A facility where passengers can access various modes of public transportation, such as buses, trains, subways, or trams.
- **Transit Mode:** Transit mode refers to the type of transportation used within the transit corridor.
- **Transit Neighborhoods:** Predominantly residential district with good access to regional and sub regional centers.
- **Transit Service Plan:** A transit service plan is a comprehensive document that outlines the details of public transportation services, including the routes, frequencies, and schedules of buses, trains, or other modes of public transit.
- **Transit-First Policies:** prioritizes public transit, pedestrian, and cycling infrastructure to create a more efficient, sustainable, and equitable urban transportation system.
- **Urban Core (CBD- Central business district):** Significant center of economic, community and cultural activity with regional-scale retail destination.
- **Urban Infill:** The development of vacant parcels in otherwise built-up areas where public facilities such as sewer systems, roads, schools, and other infrastructure are already available.
- **Urban land Ceiling Act:** Aimed to prevent the concentration of urban land in the hands of a few individuals and to promote an equitable distribution of land in urban areas.
- **Urban Local Bodies (ULBs) :** The small local bodies that administers or governs a city or a town of specified population. Urban Local Bodies are vested with a long list of functions delegated to them by the state governments.

- **Wetlands:** An area where water covers the soil, or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season.
- **Zonal Development Plan:** A plan for each Zone (Division) containing information regarding the provision of social infrastructure, parks and open spaces, circulation system etc.
- **Zonal Regulations:** The uses permissible in different land use zones, set back around buildings, plot coverage, floor area ratio, height of the building, building lines, parking, etc.

BIBLIOGRAPHY

1. Anannya Das (2015) 'PLANNING FOR FIRST & LAST MILE CONNECTIVITY FOR MASS TRANSIT USERS'.
2. Ardila, A. and Menckhoff, G. (2002) 'Transportation Policies in Bogota, Colombia: Building a Transportation System for the People', *Transportation Research Record: Journal of the Transportation Research Board*, 1817(1), pp. 130-136. Available at: <https://doi.org/10.3141/1817-16>.
3. Arlington County Department of Community Planning (2012) '40 Years of Smart Growth Arlington County's Experience with Transit Oriented Development in the Rosslyn-Ballston Metro Corridor', December.
4. Arturo Ardila-Gomez and Adriana Ortegón (2013) 'Finances of Bogota's Transportation System', in: WCTR, World Bank, Washington, DC, p. 16.
5. Ashik, F.R., Rahman, M.H. and Kamruzzaman, M. (2022) Investigating the impacts of transit-oriented development on transport-related CO2 emissions, p. 103227. Available at: <https://linkinghub.elsevier.com/retrieve/pii/S1361920922000578> (Accessed: 5 September 2024).
6. Asian Development Bank (2022) Realizing India's Potential for Transit-Oriented Development and Land Value Capture: A Qualitative and Quantitative Approach. Asian Development Bank. Available at: <https://doi.org/10.22617/SPR220271-2>.
7. Beatriz De Paz and J.F. Finn (2021) Trends Shaping the Future of Mixed Use and Retail Centers. Available at: <https://www.gensler.com/blog/trends-shaping-the-future-of-mixed-use-and-retail-centers>.
8. Bhatt, C., Paradkar, P. and Fliert, N. van de (2012) 'STATION AREA PLANNING'. Institute for Transportation and Development Policy. Available at: <https://www.itdp.in/wp-content/uploads/2013/01/Station-area-panning.pdf>.
9. Brandon Chye (2019) 'Transit-Oriented Development in Emerging Cities: Principles from Singapore', *Oxford Urbanist*, 2 April. Available at: <https://www.oxfordurbanists.com/magazine/2019/3/9/transit-oriented-development-in-emerging-cities-principles-from-singapore>.
10. Carmanah (2018) What Is Traffic Calming? Available at: <https://carmanah.com/resources/traffic-calming/>.
11. Center for Transit Oriented Development (2010) Transit-Oriented Development Tools for Metropolitan Planning Organizations. Washington, D.C.: Center for Transit Oriented Development, p. 33. Available at: <http://ctod.org/pdfs/2010TODToolsMPOs.pdf>.
12. Centre for Urban Equity, CEPT University (no date) Towards an Inclusive and Low-carbon Transit Oriented Development in Indian Cities. New Delhi, India: Shakti Sustainable Energy Foundation.
13. Christopher Kost and Matthias Nohn (2011) Better streets, better cities. ITDP, EPC, p. 188. Available at: <https://www.itdp.in/wp-content/uploads/2014/04/07.-Better-Streets-Better-Cities-EN.pdf>.
14. Civil Engineering Consortium IIT Roorkee (2021) SINGAPORE'S TRANSPORTATION SYSTEM. Available at: <https://cec-iitr.medium.com/singapores-transportation-system-4a414caf7b34>.
15. Oasis Design (no date) PONDY BAZAAR PEDESTRIANIZATION, Chennai. Available at: <https://oasisdesigns.org/pondybazar.asp>
16. Fehr & Peers Associates and Michael Kiesling (no date) Ped SHeds. California, SF, USA: Congress for the New Urbanism, p. 2. Available at: http://archive.cnu.org/sites/www.cnu.org/files/CNU_Ped_Sheds.pdf.
17. Global Platform for Sustainable Cities and World Bank (2018) TOD Implementation Resources and Tools. World Bank, Washington, DC. Available at: <https://doi.org/10.1596/31121>.

18. Urban Design Lab (2024): A Pinnacle of Connectivity and Luxury in the Heart of Delhi. Available at: <https://urbandesignlab.in/chandni-chowk-redevelopment/#:-:text=Chandni%20Chowk%20redesign%20involves%20five,2>
19. Hindustan Times (2021) revamped section of the Chandni Chowk. Available at: <https://www.hindustantimes.com/cities/delhi-news/delhis-heritage-chandni-chowk-market-gets-new-lease-of-life-kejriwal-inaugurates-revamped-stretch-101631471246151.html>.
20. Hindustan Times (2024) DDA Housing Scheme 2024. Available at: <https://www.hindustantimes.com/real-estate/dda-housing-scheme-2024-around-40-000-flats-on-sale-in-delhi-check-prices-how-to-apply-and-other-details-101724138593652.html>.
21. H.M.Shivanand Swamy et al. (2013) Development of Toolkits under the ‘Sustainable Urban Transport Plan’. New Delhi, India: Ministry of Housing and Urban Affairs, Government of India.
22. IBI Group with iTrans (2016) TOD GUIDANCE DOCUMENT - CONSULTANCY SERVICES FOR DEVELOPING GUIDANCE DOCUMENTS FOR TRANSIT ORIENTED DEVELOPMENT (TOD), NON-MOTORISED TRANSPORT (NMT) AND PUBLIC BICYCLE SHARING (PBS). India: Ministry of Urban Development, Government of India, p. 180. Available at: <https://smartnet.niua.org/sites/default/files/resources/nmtguidancefinal.pdf>.
23. ICLEI and IPPUC (2016) A model for Transit Oriented Development - Curitiba, Brazil, p. 8.
24. IEG Sustainable Development (2016) PROJECT PERFORMANCE ASSESSMENT REPORT INDIA MUMBAI URBAN TRANSPORT PROJECT. 106391. The World Bank Group, p. 59.
25. IFC (2007) Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets. Washington, D.C.: INTERNATIONAL FINANCE CORPORATION, p. 201. Available at: <https://www.ifc.org/content/dam/ifc/doc/mgrt/ifc-stakeholderengagement1.pdf>.
26. India Times (2024) Mumbai Suburban Train. Available at: <https://www.indiatimes.com/news/india/these-eight-mumbai-stations-are-set-to-shed-british-era-names-629775.html>.
27. INDIAN ROADS CONGRESS (2018) Guidelines for Traffic Calming Measures in Urban and Rural Areas. INDIAN ROADS CONGRESS.
28. INDIAN ROADS CONGRESS (2022) Guidelines for Pedestrian Facilities. New Delhi, India: INDIAN ROADS CONGRESS, p. 76. Available at: <https://roadsafetynetwork.in/wp-content/uploads/2023/12/IRC103-2022-Guidelines-for-pedestrian-facilities-Second-Revision-IRC.pdf>.
29. Institute of Urban Transport (2020) Guidelines for Parking Management for Small & Medium Cities. New Delhi, India: Ministry of Housing and Urban Affairs, Government of India.
30. International Finance Corporation (2007) A Good Practice Handbook for Companies Doing Business in Emerging Markets. USA: INTERNATIONAL FINANCE CORPORATION. Available at: <https://www.ifc.org/content/dam/ifc/doc/mgrt/ifc-stakeholderengagement1.pdf>.
31. iStock (no date a) Aerial view of London skyline over Kings Cross railway station and St Pancras. Available at: <https://www.istockphoto.com/photo/kings-cross-st-pancras-cityscape-gm1168375794-322580063?searchscope=image%2Cfilm>.
32. iStock (no date b) Cyclists, pedestrians and cars in a street of Paris, France. Available at: <https://www.istockphoto.com/photo/street-scenery-in-paris-france-gm1392483346-448708227?searchscope=image%2Cfilm>.
33. ITDP (no date a) Janmarg paves the way for a new phase of BRT. Available at: <https://itdp.in/growth-of-bus-rapid-transit-in-India/>.

34. ITDP (no date b) TOD Standard. Institute for Transportation & Development Policy, p. 78. Available at: https://www.itdp.in/wp-content/uploads/2014/04/01.TOD-Standard_Final.pdf.
35. IUT and Ministry of Urban Development, Government of India (2012) Code of Practice (Part -1) Cross Section. new: Ministry of Urban Development, Government of India, p. 78. Available at: <http://164.100.161.224/upload/uploadfiles/files/IUT-1.pdf>.
36. IUT and Sustainable Urban Transport Project (SUTP) (2014) Toolkit for Comprehensive Mobility Plan Revised. New Delhi, India: Ministry of Urban Development, Government of India. Available at: <https://mohua.gov.in/upload/uploadfiles/files/CMP%20Report%20Revised.pdf>.
37. Jaisalkot (no date) Manak Chowk Jaisalmer. Available at: <https://www.jaisalkot.com/shopping-markets-in-jaisalmer/manak-chowk-jaisalmer/>.
38. Japan International Cooperation Agency (no date) Transit Oriented Development TOD for Sustainable Urban Development. Tokyo, Japan: Japan International Cooperation Agency.
39. Jauregui-Fung, F. (2022) 'Land value capture and transit oriented development as a way of funding railway systems: The case of Hong Kong Rail + Property Model: Report for the "Inclusive and sustainable smart cities in the framework of the 2030 Agenda for Sustainable Development" Project', IDOS Non-Paper [Preprint]. Available at: <https://doi.org/10.23661/R3.2022>.
40. Joshi, R. et al. (2020) Local Area Planning for Transit Oriented Development. New Delhi, India: MoHUA, TCPO, Shakti Foundation, CEPT University.
41. Juma, M. and King, R. (2017) 'Overcoming the Knowledge Gaps for Transit-Oriented Development: What's Lacking?', World Resource Institute, 28 March. Available at: <https://thecityfix.com/blog/overcoming-the-knowledge-gaps-for-transit-oriented-development-whats-lacking-michelle-juma-robin-king/>.
42. Kidokoro, T. (2019) Transit-Oriented Development Policies and Station Area Development in Asian Cities. ADBI Working Paper 947. Tokyo, Japan: Asian Development Bank Institute, p. 14. Available at: <https://www.adb.org/publications/transit-oriented-development-policies-asian-cities>.
43. Lee Sobel and Melissa Kramer (2013) Infrastructure Financing Options for Transit-Oriented Development. United States Environmental Protection Agency, p. 251. Available at: https://www.epa.gov/sites/default/files/2014-02/documents/infrastructure_financing_options_for_transit-oriented_development.pdf.
44. livemint (no date) Delhi Metro. Available at: <https://www.livemint.com/news/india/delhi-metro-this-is-the-story-behind-dmrc-s-logo-11631496032008.html>.
45. Marc tey (no date) One Raffles Place Tower 2. Available at: <https://www.archdaily.com/275514/one-raffles-place-tower-2-tange-associates>.
46. Mayor of London (no date) London Living Rent. Available at: <https://www.london.gov.uk/programmes-strategies/housing-and-land/homes-londoners/london-living-rent>.
47. Ministry of Housing & Urban P Ministry of Housing & Urban Poverty Alleviation erty Alleviation (2011) Rajiv Awas Yojana - Guidelines for Slum-free City Planning. Ministry of Housing & Urban P Ministry of Housing & Urban Poverty Alleviation erty Alleviation. Available at: <https://mohua.gov.in/upload/uploadfiles/files/RAYGuidelines.pdf>.
48. Ministry of Housing and Urban Affairs (2006) National Urban Transport Policy. New Delhi, India. Available at: <https://mohua.gov.in/upload/uploadfiles/files/TransportPolicy.pdf>.

49. Ministry of Housing and Urban Affairs (2011a) National Mission on Sustainable Habitat. New Delhi, India: Ministry of Housing and Urban Affairs, Government of India, p. 80.
50. Ministry of Housing and Urban Affairs (2011b) Report of the Working Group on Capacity Building. Ministry of Housing and Urban Affairs, Government of India.
51. Ministry of Housing and Urban Affairs (2013) Urban Road Code of Practice. New Delhi, India: Ministry of Housing and Urban Affairs, Government of India. Available at:
<https://mohua.gov.in/upload/uploadfiles/files/Urban%20Road%20Code%20of%20Practice.pdf>.
52. Ministry of Housing and Urban Affairs (2017) National Transit Oriented Development (TOD) Policy. Ministry of Housing and Urban Affairs, Government of India. Available at:
https://mohua.gov.in/upload/whatsnew/59a4070e85256Transit_Oriented_Development_Policy.pdf.
53. Ministry of Housing and Urban Affairs (2021) 'Delhi TRANSIT ORIENTED DEVELOPMENT (TOD) POLICY'. Available at: <https://dda.gov.in/sites/default/files/2022-02/Notified%20TOD%20Policy%2030%20July%20202109022022.pdf>.
54. MINISTRY OF LAW AND JUSTICE (2014) 'THE STREET VENDORS (PROTECTION OF LIVELIHOOD AND REGULATION OF STREET VENDING) ACT'. MINISTRY OF LAW AND JUSTICE. Available at:
[https://mohua.gov.in/upload/uploadfiles/files/StreetVendorAct2014_English\(1\).pdf](https://mohua.gov.in/upload/uploadfiles/files/StreetVendorAct2014_English(1).pdf).
55. Ministry of Urban Development, Government of India (2013a) JnNURM - Toolkit for Preparation of City Development Plan, Second Revision. India: Ministry of Urban Development, Government of India, p. 100. Available at: <http://www.cmamp.com/CP/FDocument/ToolkitforpreparationofCDP.pdf>.
56. Ministry of Urban Development, Government of India (2013b) JnNURM Toolkit for Comprehensive Capacity Building Programme. Ministry of Urban Development, Government of India, p. 53. Available at:
<http://164.100.87.10/writereaddata/Toolkit-for-CCBP.pdf>.
57. Ministry of Urban Development, Government of India and Asian Development Bank (no date) Guidelines and Toolkits for Urban Transport Development in India. IUT. Available at:
<https://iutindia.org/CapacityBuilding/Toolkits.aspx>.
58. Mishra, S.N. and Srinivas, S.V.R. (2012) Mumbai Urban Transport Project : urban resettlement. Brief 71479. India: The World Bank Group. Available at:
<http://documents.worldbank.org/curated/en/438861468260119746/Mumbai-Urban-Transport-Project-urban-resettlement>.
59. Nair, J.V. (no date) MAKING TOD IMPLEMENTABLE IN INDIAN CITIES - From Theory to Practice. ISOCARP. Available at: https://isocarp.org/app/uploads/2021/04/ISOCARP_2019_Nair_2064.pdf.
60. Naomi Pandya (2020) Ahmedabad Metro. Available at:
<https://urbantransportnews.com/article/ahmedabad-metro-project-information-tenders-stations-routes-and-updates>.
61. NATIONAL BUILDING CODE OF INDIA (2016) PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIRMENTS. New Delhi, India. Available at:
<https://hsiidc.org.in/uploads/assets/170202029704170101891503NBCCChapter3.pdf>.
62. National Charrette Institute and Reconnecting America's Center for Transit-Oriented Development (2013) NCI CHARRETTE SYSTEM GUIDE FOR TRANSIT ORIENTED DEVELOPMENT, p. 65. Available at:
https://www.transit.dot.gov/sites/fta.dot.gov/files/NCI_Guide_8-14-13sm_0.pdf.

63. Nicolas Hoizey (2022) The Star Ferry in Victoria Harbour, Hong Kong. Available at: <https://www.flickr.com/photos/nicolas-hoizey/51811370252>.
64. NIUA et al. (2024) Healthy Streets Design Workbook. New Delhi, India. Available at: <https://itdp.in/wp-content/uploads/2024/03/Healthy-Streets-Design-Workbook.pdf>.
65. NIUA (no date) Guidebook for adoption of Form Based Codes. New Delhi, India. Available at: <https://niua.in/intranet/sites/default/files/2938.pdf>.
66. Business Today (2022) Skywalk linking New Delhi railway station, metro station to be opened soon: DMRC. Available at: <https://www.businesstoday.in/latest/story/skywalk-linking-new-delhi-railway-station-metro-station-to-be-opened-soon-dmrc-322219-2022-02-10>.
67. Ollivier, G. et al. (2021) Transit-Oriented Development Implementation Resources and Tools : Second Edition. 133001. Washington, D.C.: The World Bank Group. Available at: <http://documents.worldbank.org/curated/en/261041545071842767/Transit-Oriented-Development-Implementation-Resources-and-Tools-Second-Edition>.
68. Oscar Amaya (2017) A typical station in Bogota's Transmilenio system. Available at: <https://ggwash.org/view/62869/bogota-has-a-world-renowned-brt-what-would-it-take-to-replicate-it>.
69. Pawan Sharma (2024) agra metro. Available at: <https://www.livehindustan.com/photos/uttar-pradesh/agra-metro-now-you-can-see-taj-mahal-by-metro-also-pm-modi-will-inaugurate-it-see-photo-1-9468977>.
70. pixabay (2020) Paris street. Available at: <https://pixabay.com/photos/paris-street-cars-trees-building-5066689/>.
71. Planetizen (2024) Bikes in Brussels, Belgium. Available at: <https://www.planetizen.com/features/126996-paris-great-heres-where-green-mobility-revolution-happening>.
72. Platinumlist Guide (2023) The Ripe Market. Available at: <https://platinumlist.net/guide/ripe-market-is-returning-for-its-winter-season/>.
73. Pratibha Singh (no date) 'ASSESSMENT OF TOD POLICIES AND IMPLEMENTATION PROCESS CASES OF DELHI - AHMEDABAD'.
74. Reconnecting America's Center for Transit-Oriented Development (2008a) Capturing the Value of Transit. Oakland, CA, USA: United States Department of Transportation Federal Transit Administration, p. 38. Available at: <http://ctod.org/pdfs/2008ValueCapture.pdf>.
75. Reconnecting America's Center for Transit-Oriented Development (2008b) Station Area Planning: How To Make Great Transit-Oriented Places. Oakland, CA, USA: Reconnecting America's Center for Transit-Oriented Development, p. 28. Available at: <http://reconnectingamerica.org/assets/Uploads/tod202.pdf>.
76. Reconnecting America's Center for Transit-Oriented Development (2008c) Station Area Planning: How To Make Great Transit-Oriented Places. Oakland, CA, USA: Reconnecting America and the Center for Transit-Oriented Development, p. 28. Available at: <http://ctod.org/pdfs/tod202stations.pdf>.
77. 'REVISED AHMEDABAD PARKING POLICY' (2023). Amdavad municipal Corporation.
78. RTPI Uk (2010) Good Practice Guide to Public Engagement in Development Schemes. London, Uk: RTPI Uk, p. 24. Available at: <http://www.camdencen.org.uk/Resources/Planning/Communities/Good%20Practice%20Guide%20to%20Public%20Engagement%20Development%20Schemes.pdf>.
79. Rutul Joshi et al. (2017) Ahmedabad's TOD zones as part of the development plan. Available at: https://www.researchgate.net/figure/Ahmedabads-TOD-zones-as-part-of-the-development-plan_fig11_317580217.

80. Salat, S. and Ollivier, G. (2017) Transforming the Urban Space through Transit-Oriented Development. World Bank, Washington, DC. Available at: <https://doi.org/10.1596/26405>.
81. Shakti Sustainable Energy Foundation (2021) Ecomobility Readiness Assessment. India: Ministry of Urban Development, Government of India, p. 36. Available at: <https://southasia.iclei.org/wp-content/uploads/2021/09/Ecomobility-Readiness-Assessment-Project-outcomes-and-Documentation-Report.pdf>.
82. Shutterstock (2022) Leh city walking street market with many shop at main bazaar. Available at: <https://www.shutterstock.com/image-photo/leh-ladakh-india-septemer-27-2022-2283797489>.
83. SK Santhosh (2020) Volvo Bus in Singapore. Available at: <https://www.volvobuses.com/sg/news/2020/feb/40-successful-years-of-volvo-bus-in-singapore.html>.
84. smile4travel (no date) Between art and bouldering: Getting active at West Bund. Available at: <https://smile4travel.de/en/asia/china/parks-of-shanghai/>.
85. Sonal Shah et al. (2014) Safe access to mass transit stations in Indian cities. Bangalore: Embarq India, p. 210. Available at: <https://www.wricitiesindia.org/sites/default/files/Safe%20Access%20Manual%20Safe%20Access%20to%20Mass%20Transit%20Stations%20in%20Indian%20Cities.pdf>.
86. Sudarsan, V. (2018) 'Implementation challenges for transit oriented development', Fortune India, 28 May. Available at: <https://www.fortuneindia.com/opinion/implementation-challenges-for-transit-oriented-development/101917>.
87. Sustainable Urban Transport Project (SUTP) and Deloitte (2016) OPERATIONS DOCUMENT FOR UNIFIED METROPOLITAN TRANSPORT AUTHORITY. India: Ministry of Urban Development, Government of India, p. 105. Available at: https://smartnet.niua.org/sites/default/files/resources/umta_v13.pdf.
88. Tan, S. and Yi, P.M. (no date) 'Transit-Oriented Development'. Available at: <https://www.infrastructureasia.org/Insights/Transit-Oriented-Development#:~:text=Singapore%E2%80%99s%20TOD%20is%20primarily%20focused,parks%20and%20the%20city%20centre>.
89. The Center for Transit Oriented Development (2010) Transit Corridors and TOD Connecting The Dots Is Important. Washington DC, p. 24. Available at: <https://ctod.org/pdfs/tod203.pdf>.
90. The High Level Committee on Financing Infrastructure, Governmet of India (2012) Interim Report of the High Level Committee on Financing Infrastructure. Planning Commission, Government of India, p. 40. Available at: <http://www.gajendrahaldea.in/download/Interim-Reprt-of-the-High-Level-Committee-on-Financing-Infratructure.pdf>.
91. The Hindu (2019) Smart parking slots on Kasturba Road on Monday. Available at: <https://www.thehindu.com/news/cities/bangalore/kasturba-road-gets-smart-parking-system/article30323537.ece>.
92. Theory9 (no date) Business Trip to Mumbai. Available at: <https://www.theory9.in/blog/business-trip-to-mumbai.html>.
93. TOD et al. (2018) TOD READINESS ASSESSMENT TOOL. AS-A01. The World Bank Group. Available at: <https://www.thegpsc.org/tod/knowledge/tod-readiness-assessment-tool>.
94. TOD et al. (2021) CASE STUDIES - COMPILATION OF GOOD AND INNOVATIVE PRACTICES. The World Bank Group, p. 180.

95. Town and Country Planning Organisation (2015a) URBAN AND REGIONAL DEVELOPMENT PLANS FORMULATION AND IMPLEMENTATION (URDPFI) GUIDELINES. India: Ministry of Urban Development, Government of India, p. 447. Available at: [https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I\(2\).pdf](https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I(2).pdf).
96. Town and Country Planning Organisation (2015b) URBAN AND REGIONAL DEVELOPMENT PLANS FORMULATION AND IMPLEMENTATION (URDPFI) GUIDELINES - Volume IIA and IIB Appendices to URDPFI Guidelines, 2014. India: Ministry of Urban Development, Government of India, p. 250. Available at: [https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20IIA-IIB\(1\)\(1\).pdf](https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20IIA-IIB(1)(1).pdf).
97. Trafficlogix (no date) Revolutionizing Road Safety in India with Radar Speed Signs. Available at: <https://trafficlogix.in/improving-road-safety-in-india-speed-management-with-radar-signs-traffic-logix/>.
98. Tripoto (no date) Bahnhofstrasse. Available at: <https://www.tripoto.com/zurich/places-to-visit/lindenhof>.
99. Unified Traffic, Transportation and Infrastructure Planning and Engineering Centre (2010) Transit Oriented Development (TOD) Policy and Implementation Framework. New Delhi, India, p. 16. Available at: <https://uttipec.org.in/PDF/Transit%20Oriented%20Development%20%28TOD%29.pdf>.
100. Washington Metropolitan Area Transit Authority, AECOM, and Foursquare Integrated Transportation Planning (2017) STATION AREA PLANNING GUIDE. Washington Metropolitan Area Transit Authority, p. 116.
101. Watson, D. and Crosbie, M.J. (2005) Time-saver standards for architectural design. 8th ed. New York: McGraw-Hill.
102. Weber, E., Arpi, E. and Carrigan, A. (no date) From Here to There - A creative guide to making public transport the way to go. Embarq India, p. 29. Available at: <https://environmentaldocuments.com/embarq/From-Here-to-There-EMBARQ.pdf>.
103. Wikipedia (2009) Bus, station and dedicated corridor near Shivranjani Cross Roads. Available at: https://en.wikipedia.org/wiki/Ahmedabad_Bus_Rapid_Transit_System#/media/File:A Ahmedabad_BRTS.jpg.
104. Wikipedia (2013) Kowloon Waterfront, Hong Kong. Available at: https://en.m.wikipedia.org/wiki/File:Kowloon_Waterfront,_Hong_Kong,_2013-08-09,_DD_03.jpg.
105. Wikipedia (no date) Ochanomizu Station crossing. Available at: [https://upload.wikimedia.org/wikipedia/commons/7/70/Ochanomizu_Station_crossing_\(20267975743\).jpg](https://upload.wikimedia.org/wikipedia/commons/7/70/Ochanomizu_Station_crossing_(20267975743).jpg).
106. World Bank (2013) Planning, Connecting, and Financing Cities Now: Priorities for City Leaders. The World Bank. Available at: <https://doi.org/10.1596/978-0-8213-9839-5>.
107. World Bank (2014) Guidelines : selection and employment of consultants under IBRD loans and IDA credits and grants by World Bank Borrowers. Publication 95664. The World Bank. Available at: <http://documents.worldbank.org/curated/en/796061468126898713/Guidelines-selection-and-employment-of-consultants-under-IBRD-loans-and-IDA-credits-and-grants-by-World-Bank-Borrowers>.
108. Zimbabwe, S. and Anderson, A. (2011) Planning for TOD at the Regional Scale: The Big Picture. Washington, D.C., p. 28. Available at: <http://reconnectingamerica.org/assets/Uploads/RA204REGIONS.pdf>.
109. Value Capture Finance Policy Framework by MoUD, GOI Available at: https://mohua.gov.in/upload/whatsnew/59c0bb2d8f11bVCF_Policy_Book_FINAL.pdf
110. Impact Assessment of Transit Oriented Development zone in Pune City by UMTC
111. Central Public Health and Environmental Engineering Organisation and MoUD, GOI (1999) Manual on Water Supply and Treatment. Available at: https://jalshakti-ddws.gov.in/sites/default/files/Manual_on_Water_Supply_and_Treatment_CPHEEO_MoUD_1999.pdf



