

# PD-R02

## TOD PLANNING PRINCIPLES

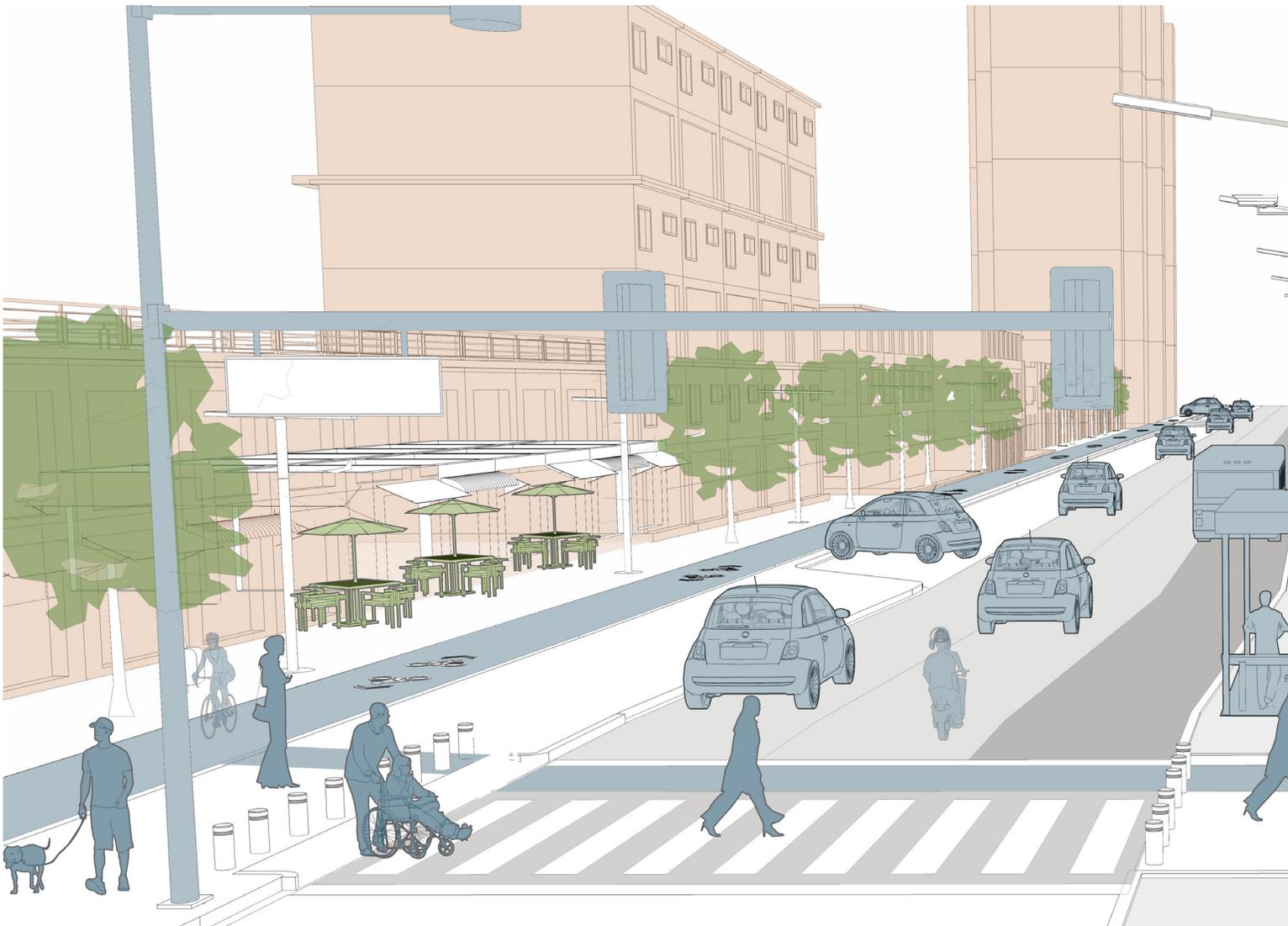


A series of detailed planning principles and design components to formulate TOD plans at various scales of intervention

*Type: Reference Document*



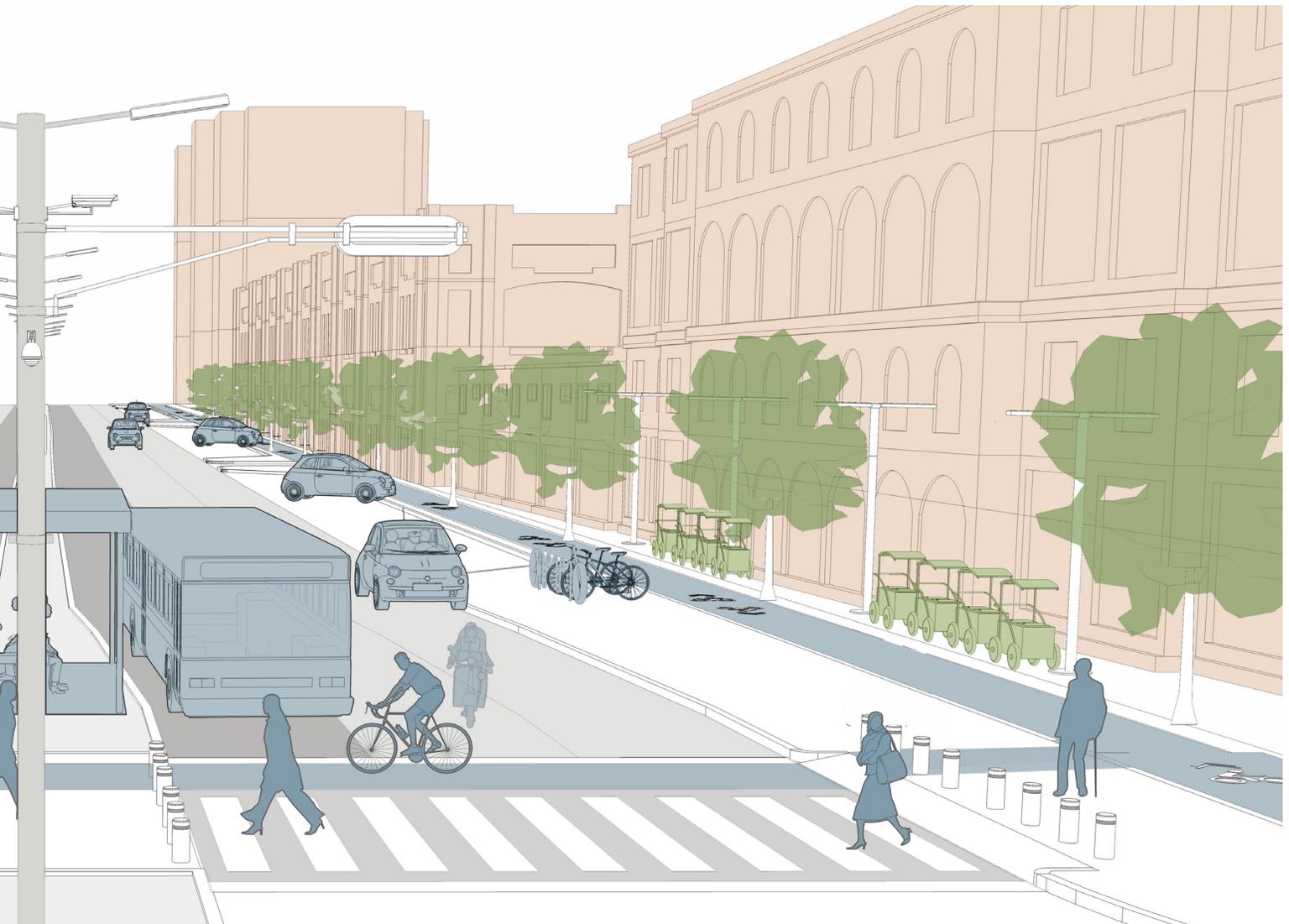
# TOD DESIGN PRINCIPLES



## TRANSIT (TRANSPORTATION)

The different transportation modes (transit, walking, bicycle, cars, taxis, etc.) and the infrastructure and amenities (lanes, parking spots, transit stops, stations, sidewalks, etc.) that allow residents to travel safely, conveniently, and comfortably, whichever mode they choose.

## ORIENTED (OPEN SPACE)



The public spaces (plazas, patios, parks, sidewalks, etc.) that form the transition between transportation facilities and buildings, also known as ‘the spaces between’ where the life of the city plays out. Can be public or private property, but should be designed to be accessible, friendly, and fun for all.

## DEVELOPMENT (BUILT ENVIRONMENT)

The built-up areas, primarily private parcels, where different human activities occur that support varied housing, employment, shipping, and other uses. In the TOD model, buildings should relate to and activate surrounding open spaces and support transit ridership by adequate density.

# TRANSIT (TRANSPORTATION) COMPONENTS



**WELL DESIGNED  
TRANSIT SYSTEM**

T1

Encourage high-quality station architecture and public realm that is sensitive to the surrounding built context and must provide amenities, including retail, to ensure a comfortable and seamless commuter experience.



**MULTI-MODAL  
INTEGRATION**

T2

Seamless integration of transit modes, systems, and routes must be ensured, while considering efficient links to all modes of access, users and abilities, to and from the station.



**COMPLETE STREETS**

T3

Enable street design that ensures safe access for all users, including pedestrians, cyclists, motorists and transit riders, by providing equitable distribution of road space.



**TRAFFIC MANAGEMENT**

T4

Incorporate safe speed strategies for traffic around transit stops along with measures on traffic demand management and reduced parking demand to promote sustainable mobility choices.

# ORIENTED (OPEN SPACE) COMPONENTS



TRANSIT PLAZA

01

Promote congregational activities through inclusive and context-sensitive variety in architecture and landscaping around transit stations.



WALKABILITY

02

Focus on providing an attractive pedestrian environment that is continuous, forms a network and offers an array of experiences and amenities.



PUBLIC REALM

03

Provide visual interest at the pedestrian scale through thoughtful landscaping and building design, which will encourage people to use the public realm and help contribute to an active street life.



URBAN PARKS & OPEN  
SPACES

04

Create open areas such as amenity spaces, green spaces, playgrounds, parks and natural areas, plazas, civic squares, etc. within a five-minute walking radius of residents.

# DEVELOPMENT (BUILT ENVIRONMENT) COMPONENTS



D1

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



D2

Promote more efficient land use patterns by providing residents with access to retail, commercial and civic services, employment and recreational facilities without needing to travel by automobile.



D3

Provide a diversity of housing choices, which includes a mixture of types, styles, price ranges and tenure, within a 10-minute walking distance from a transit station, to foster the creation of equitable TODs.



D4

Strive to achieve inclusive development in TODs by addressing the needs of the informal sector in all aspects of policy, planning and design for street vendors, settlements and transportation services

# TOD SUPPORTIVE PRINCIPLES

## CLIMATE RESILIENCE

S1

Identify high-risk areas to design TOD projects in consideration with the anticipated hazards and failures associated with climate change & environmental variations.

**Reference:** *Climate resilient development index: theoretical framework, selection criteria & fit-for-purpose indicators*, European Commission ([https://ec.europa.eu/jrc/sites/jrcsh/files/ReqNo\\_JRC94771\\_lb-na-27126-en-n.pdf](https://ec.europa.eu/jrc/sites/jrcsh/files/ReqNo_JRC94771_lb-na-27126-en-n.pdf))

## INCLUSIVENESS

S2

Adopt inclusive development of TOD areas at all stages & scales by means of incorporating the needs of diverse user groups including gender, age, abilities & socio-economic segments.

**Reference:** *Towards an Inclusive and Low Carbon Transit Oriented development in Indian Cities*, Shakti Foundation (<http://shaktifoundation.in/wp-content/uploads/2017/11/TOD-India.pdf>)

## LAND VALUE CAPTURE

S3

Adopt development based land value capture as a financial mechanism for upgrading infrastructure along TOD corridors and station areas.

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

## UNIVERSAL ACCESSIBILITY

S4

Meet and exceed the requirements of accessibility guidelines and standards of all users with different abilities in building or retrofitting pedestrian environments.

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

## SUSTAINABLE INFRASTRUCTURE

S5

Prioritize and implement innovative green building practices in all aspects of providing or upgrading infrastructure including, energy, water, landscape and waste management.

**Reference:** *LEED for Neighbourhood Development* ([https://www.nrdc.org/cities/smartgrowth/files/citizens\\_guide\\_LEED-ND.pdf](https://www.nrdc.org/cities/smartgrowth/files/citizens_guide_LEED-ND.pdf))

## BICYCLE FRIENDLY

S6

Expand accessibility in TOD areas by promoting bicycles as an alternate or preferred sustainable and healthy mode of choice.

**Reference:** *National Guidance Document on Public Bicycle Sharing, MoHUA* (<http://mohua.gov.in/cms/sustain-sutp-PBS.php>)

## TECHNOLOGY INTEGRATION

S7

Adopt smart technologies within TOD projects such as fare integration, smart parking, real-time information, to provide public transit service an edge over automobiles.

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

T1



# WELL DESIGNED TRANSIT SYSTEM

Encourage high-quality station architecture and public realm that is sensitive to the surrounding built context and must provide amenities, including retail, to ensure a comfortable and seamless commuter experience.

## RISK & MITIGATION

- Transit agencies have a strong say on where the transit infrastructure is built, and hence influence the potential of TOD. Often, the transit stops are planned in less expensive locations, far from jobs and housing areas, which diminish the outcomes early on. Transit station designs are many times planned by transit agencies without considering options for joint developments or other mechanisms to improve integration at the station area scale.
- Placement of transit stops has to be in concurrence with the emerging locations that foster private development.



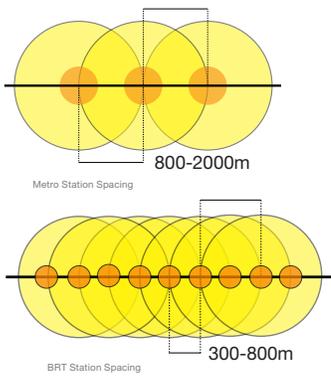
Recreio Shopping BRT station, Rio de Janeiro, Brazil

## 1. DESIGN CONTEXT-SPECIFIC TRANSIT SYSTEMS

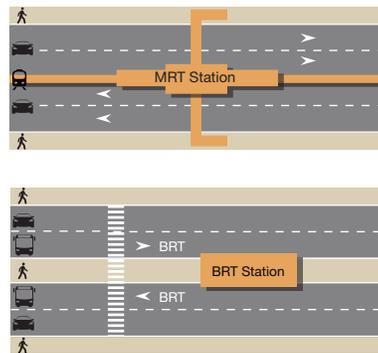
- Transit corridors must be located in proximity to a city’s current or planned urban footprint. City officials must assess where enough transit demand exists to sustain public transportation, or where there is potential for future development (based on integrated land use and transportation plans), and route primary and secondary transit systems to these areas in order to accommodate and create demand.
  - Module 4: Design Components of TOD, WRI, 2015
- A TOD corridor should be designed with the goal of incorporating and connecting as many types of transit systems to one other to create a more robust transit network, but not all stations across a corridor will demand the same variety and capacity of transit options. The types of transit options will depend on various factors including proximity to the urban core, and to dense residential and economic hubs.
  - Module 4: Design Components of TOD, WRI, 2015
- When planning a TOD corridor, it is necessary to understand the existing demand at each station, based on existing and projected economic conditions. This will help to prioritize the stations that should plan for the greatest hierarchy of public transit systems.
  - Module 4: Design Components of TOD, WRI, 2015
- Consider a transit alternative analysis to determine the most effective and cost-efficient mode for the context.
  - Bus Rapid Transit System should be considered for demand greater than 2000 passengers per hour per direction.
    - TOD Guidance Document, MOUD, 2016
  - Metro Rail should be considered for demand greater than 15000 passengers per hour per direction.
    - TOD Guidance Document, MOUD, 2016

+ REFER OTHER PRINCIPLES

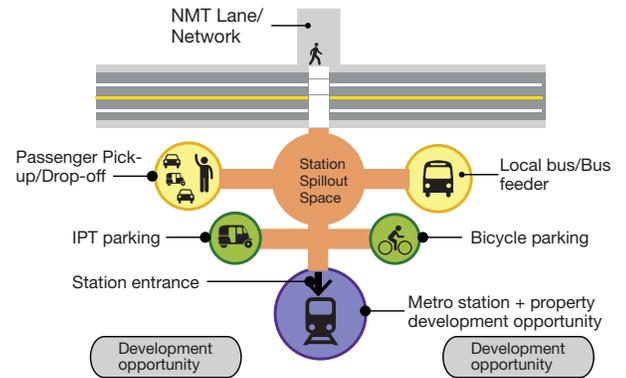
- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Station Spacing | source: MOUD, 2016



Station Placement | source: MOUD, 2016



Multi-modal integration at transit station | source: MOUD, 2016

## 2. CREATE BARRIER FREE MOVEMENT SPACES

- The maximum acceptable walking distance to the nearest rapid transit station is defined as 1,000m and 500m for a frequent local bus service that connects to a rapid transit network within less than 5 kilometers.

-Adapted from TOD Standard, ITDP, 2017

- The transfer station should be designed for short, convenient and all-accessible connections with the rapid transit service.

-Adapted from TOD Standard, ITDP, 2017

- In addition to variety, efforts should be made to integrate the various forms of public transit. This can be achieved through measures such as integrated fare systems across the different systems; easy access to transfer between systems, and combined operations to ensure higher quality, complementary and complete public transit system network.

-Module 4: Design Components of TOD, WRI

## 3. PROVIDE CUSTOMER AMENITY TO ENHANCE COMFORT, SAFETY AND INFORMATION

- Convenience:** Provide retail opportunities at transit stations to offer food, drink and services such as banks or dry cleaners.
- Comfort and Safety:** Transit stations should provide comfortable and secure places to sit and wait with amenities such as washrooms and secure bike storage.
- Information:** Provide a high level of customer service at stations, including staffed customer service kiosks, real-time and static information displays, wireless internet and pay telephones.

-Adapted from Mobility Hub Guidelines, Metrolinx, 2011

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, H02, P02

**EN** C01, C02, H01, R01, P01

**PD** H01, H02, H03, R03, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

T2



# MULTI-MODAL INTEGRATION

Seamless integration of transit modes, systems, and routes must be ensured, while considering efficient links to all modes of access, users and abilities, to and from the station.

## RISK & MITIGATION

- Different agencies for various modes of transit, with lack of inter-agency coordination, hinders the seamless and efficient integration of transit for users.
- A multi-agency task force could be set up to address the interdependent needs of multi-modal integration at various levels from planning routes to provision of PPU DO at transit stops.



Informal transit at MG road metro station, Delhi, India

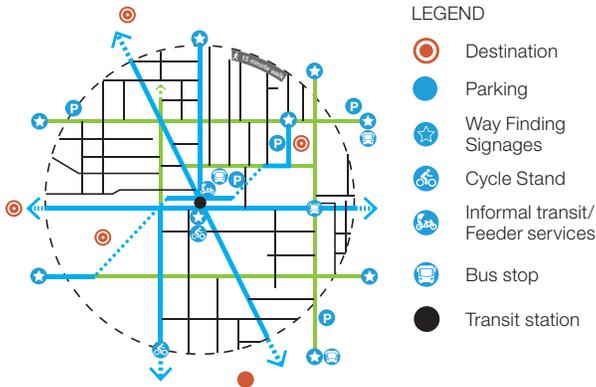
### 1. DESIGN FOR EFFICIENT INTER-MODAL TRANSFERS TO CREATE A SEAMLESS TRANSIT EXPERIENCE

- Coordinate local feeder transit service schedules and routes to provide seamless connectivity between local, regional, and rapid transit services by reducing waiting times.
- Adopt transit priority measures to ensure the efficient movement of surface transit to and from the station area. Intermodal integration of formal public transport, paratransit and cycle sharing should be within 200m from each other.

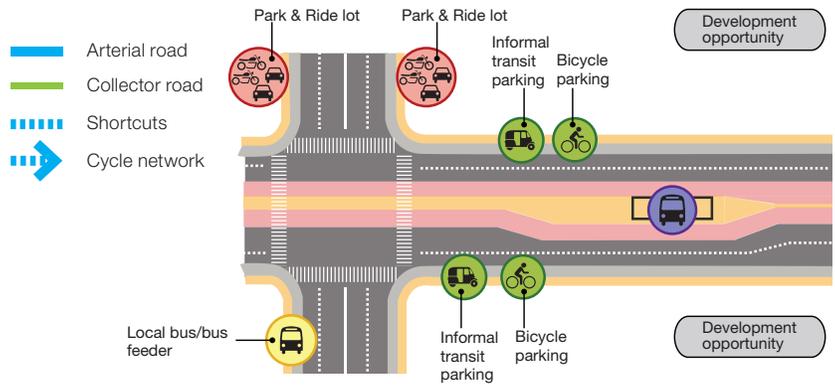
APPROX. WALKING DISTANCE FROM EXITS	FACILITY/AMENITY AND PREFERRED LOCATION:
Within 100 m	Bus stops; vendor zones; convenience shopping; cycle-rental station, high occupancy feeder stop/stand, public toilets; pedestrian-only plazas.
Beyond 100 m	Private car/taxi "drop-off" location only; validated car parking facility for metro users (park & ride) may be provided.
Within 500m	Cycle-rickshaw stand; cycle-parking stand; informal transit and ride-sharing services/auto-rickshaw stand, improved lighting, proper signage, information for modal interchange and way-finding; interchange between any two mass rapid transit modes (Railway, Metro, RRTS, etc.)

+ REFER OTHER PRINCIPLES

- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Different access and mobility solutions around transit station | source: MOUD, 2016



Multi-modal options at transit station | source: MOUD, 2016

## 2. FOCUS ON THE NEEDS OF FIRST N LAST MILE CONNECTIVITY

- Dedicated and physically segregated bicycle tracks with width of 2m or more, one in each direction, should be provided on all streets with total motor vehicle carriageway larger than 10m (not ROW) after providing adequately sized footpaths in each direction based on pedestrian traffic.
- Cycle rickshaw parking and three-wheeler parking bays of 1.5m width should be provided near the junctions.
- Desired average waiting time for a pedestrian is not more than 45 seconds.

-Adapted from TOD Guidance Document, MOUD, 2016

-Adapted from TOD Guidance Document, MOUD, 2016

- Provide designated parking for informal transit within 150m of walking distance from the station exit.

-Adapted from TOD Guidance Document, MOUD, 2016

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, A04, H02, P02

**EN** C01, C02, H01, R01, P01

**PD** H01, H02, H03, R03, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

T3



COMPLETE STREETS

Enable street design that ensures safe access for all users, including pedestrians, cyclists, motorists and transit riders, by providing equitable distribution of road space.

RISK & MITIGATION

- Addressing competing needs of space from diverse user groups in an existing built context deters the objective of designing complete streets due to lack of available space.
- Street upgrades within various agencies and different timelines hinders the implementation of complete streets.
- Prioritizing other initiatives that help support the complete streets objective including traffic management, promoting walking & bicycling culture to be addressed in parallel.
- Inter-agency coordination and institutional support to bring the agencies together mitigates the risks on differing timelines.



W Pender Street & Hornby Street, Vancouver, Canada

1. DESIGN THE STREETS FOR THE ENTIRE RIGHT OF WAY

- Multi-Utility Zone (MUZ) of minimum 1.8 m width should be provided on all Collector and Arterial Roads, to accommodate bus stops, street utilities, trees, street furniture, planting for stormwater management; informal transit and ride-sharing services/ NMT stands, paid idle parking, etc.

-Adapted from TOD Guidance Document, MOUD, 2016

2. CREATE A BALANCE BETWEEN NEEDS OF ALL USERS AND MODES OF TRAVEL

- No vehicular street R/W within 500m of TOD station shall be more than 30m unless already notified in the Master Plan.

-Adapted from TOD Guidance Document, MOUD, 2016

- In a slow-speed local street (below 30 km/h), the optimum width for a carriageway is 3 m for one-way movement and 4.5 m for two-way movement.

-Adapted from TOD Guidance Document, MOUD, 2016

- Create dedicated and protected bike lanes, at least 3 meters wide in each direction, on all streets except low-speed local streets.

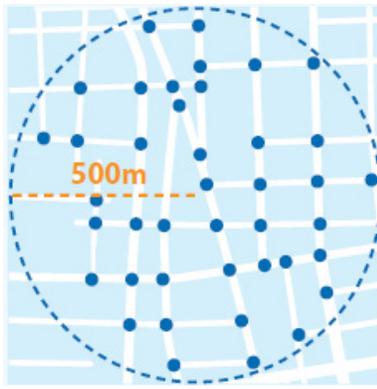
-Adapted from The Energy Foundation, 2012

+ REFER OTHER PRINCIPLES

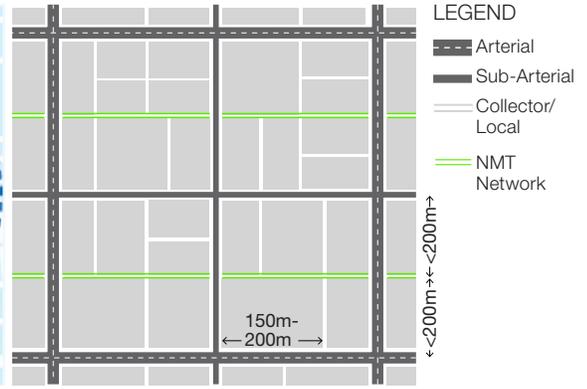
- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Building Edge-to-Edge Design | source: MOUD, 2016



Intersection Density | source: MOUD, 2016



Block Sizes & Street Hierarchy | source: MOUD, 2016

### 3. DESIGN STREETS IN CONTEXT TO ITS ABUTTING LAND USES

- A continuous unobstructed footpath on each side of all streets with ROW wider than 12m. Commercial/Mixed Use- 2.0m, Shopping frontages- 2.5m, Bus Stops- 3m, High-Intensity Commercial Areas-4m.

-Adapted from TOD Guidance Document, MOUD, 2016

- Building edges and building frontages should be incorporated in the street design.
- Building frontages should be accessible to the public as far as possible.

### 4. DEVELOP AN INTERCONNECTED STREET NETWORK TO PROVIDE DIRECT CONNECTIONS TO THE TRANSIT STATION

- Block sizes should be minimized to avoid the creation of inhospitable superblocks. These types of long blocks can deter walking, as they increase the perceived distance between locations. Recommended block size: 150-200m (WRI +MOUD)

-Adapted from TOD Guidance Document, MOUD, 2016

-Module 4: Design Components of TOD, WRI, 2015

- Area of blocks surrounded by public access pedestrian/cyclist streets or pathways not to exceed 2 ha. In existing built-up areas, statutory planning to be done for breaking up blocks with an area of more than 2 Ha, to provide publicly accessible pedestrian thoroughfare.

-Adapted from TOD Guidance Document, MOUD, 2016

- Preferred density of pedestrian-friendly intersections: 50 intersections per square km.

-Adapted from TOD Guidance Document, MOUD, 2016

- Hierarchy of street network:
  - Arterial - 50m to 80m - 50km/hr
  - Sub-Arterial - 30m to 50m - 50km/hr
  - Distributor - 12m to 30m - 30km/hr
  - Access - 6m to 15m - 15km/hr

#### + REFER OTHER KNOWLEDGE PRODUCTS

AS H03, P03

EN C01, C02, H01, R01, P01

PD H01, H02, H03, R03, P01

FI A01, A02, H01, H02, R01, R02, R03

IM A01, A02, H01, H02, P01

T4



# TRAFFIC MANAGEMENT

Incorporate safe speed strategies for traffic around transit stops along with measures on traffic demand management and reduced parking demand to promote sustainable mobility choices.

## RISK & MITIGATION

- Growing dependency on automobile coupled with the tendency to sprawled development.
- Lack of appropriate parking policies and provision of distinct parking supply to address the needs for parking.
- Sensitizing officials in charge of traffic and transportation towards the needs of transit and NMT users.
- Adequate measures on updating policies and enforcement of traffic rules to focus on NMT users and their needs.



Park and Ride facility at Chattarpur Metro Station Parking, Delhi, India

### 1. REDUCE VEHICULAR TRIPS IN THE STATION AREA

- Vehicle Demand Management (VDM): Adopt strategies and policies to reduce or redistribute travel demand for private vehicles. Discouraging use of private vehicles by means of congestion pricing, registration fee, alongside with provision of high-quality public transit facilities are some of the means to address VDM.
 

*-Module 4: Design Components of TOD, WRI, 2015*
- Streets meant primarily for NMT movement as well as all streets of ROW 12m or below, should be limited to a maximum speed of 20km/hr by design.
 

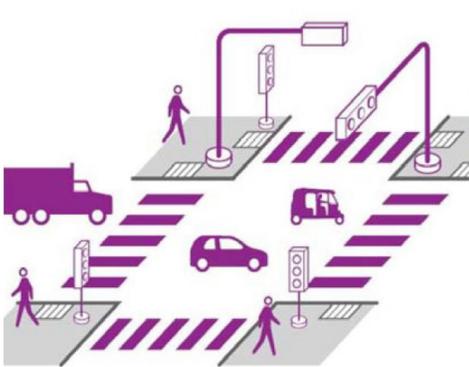
*-Adapted from TOD Guidance Document, MOUD, 2016*
- Narrow streets that allow one-way motor traffic, as well as bicycles and pedestrians, will significantly reduce congestion. Replace major arterials wider than 45m with efficient one-way couples (two narrower one-way couples).
 

*-Adapted from The Energy Foundation, 2012*
- On streets with ROW of 18m or less, if pedestrian traffic is greater than 8000 per hour in both directions together, the entire ROW should be notified for pedestrianization.
 

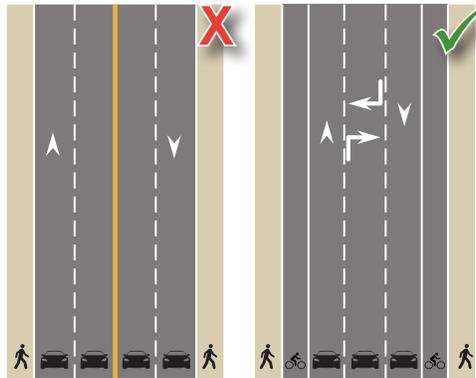
*-Adapted from TOD Guidance Document, MOUD, 2016*

+ REFER OTHER PRINCIPLES

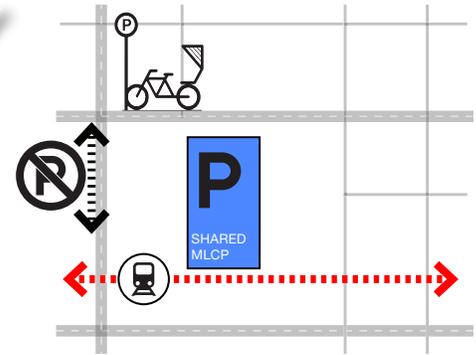
- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Traffic calming | source: WRI, 2015



Appropriate allocation of road space | source: MOUD, 2016



Station Parking | source: MOUD, 2016

## 2. OPTIMIZE TRAFFIC SPEEDS ON HEAVY TRAFFIC ROADS TO PROTECT MULTI-MODAL USERS AT TRANSIT STATIONS

- Disperse high traffic volumes over multiple parallel human-scale streets rather than concentrating traffic on fewer major arterial streets.

-Adapted from TOD Guidance Document, MOUD, 2016

- Limit speed on urban arterial roads and sub-arterial streets to 50kmph and on collector and local streets to 30kmph.

-Adapted from TOD Guidance Document, MOUD, 2016

- Traffic calming of all streets with ROW of 12m or less through the narrowing of driveways and meandering path with the use of trees, islands and street furniture.

-Adapted from TOD Guidance Document, MOUD, 2016

- Mid-block crossings every 250m on average. Min: 5 safe street-level crossings/km.

## 3. REGULATE PARKING NEEDS AROUND THE STATION AREA

- Short-Term Parking (on-street & off-street): Approximately 70% of the total parking space/slots capacity to be kept for short-term parking near the station.

-Adapted from TOD Guidance Document, MOUD, 2016

- Park-and-Ride Lots: Park-and-Ride facilities for private modes may be provided only at Terminal MRTS Stations or major Multimodal Interchanges.

-Adapted from TOD Guidance Document, MOUD, 2016

- Special parking spaces should be designated on-street for differently abled, at a ratio of 1 for every 25 parking spaces. These parking spaces should have 1.2m access zones.

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

- Minimum parking rates may be fixed but maximum rates be variable based on market forces, similar to all real estate space in the city.

- Increase fee exponentially with decreasing distance to BRTS/Metro Rail stations.

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, A04, H02, P02

**EN** C01, C02, H01, R01, P01

**PD** H01, H02, H03, R03, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

01



TRANSIT PLAZA

Promote congregational activities through inclusive and context-sensitive variety in architecture and landscaping around transit stations.

RISK & MITIGATION

- Transit route planning involves alignments passing through various contexts and space constraints, risking the provision of transit plazas at stops. Provision of standardized transit stop designs that lack distinguished character prohibits consideration of transit plaza. Lack of sufficient land ownership by the transit agency.
- Station area plans should be made along with transit plans so that appropriate plazas are also designed. Space for transit plaza could be created through urban design guidelines or regulations over private properties.



Transit Plaza at centre square MRT, Raffles Place, Singapore

1. ADOPT MEASURES TO CREATE EFFICIENT AND DISTINCT CIRCULATION AREAS THAT CATER TO INTER-MODAL TRANSFER AROUND TRANSIT STOPS

- Adopt transit priority measures to ensure the efficient movement of surface transit to and from the station area.

-Adapted from Mobility Hub Guidelines, Metrolinx, 2011

- Provide clearly marked and protected access for pedestrians and cyclists at station areas to minimize conflicts, particularly at passenger pick-up and drop-offs (PPUDO), bus facilities, and parking access points.

-Adapted from Mobility Hub Guidelines, Metrolinx, 2011

- Provide secure and plentiful bicycle parking at station entrances with additional cycling amenities at high volume locations.

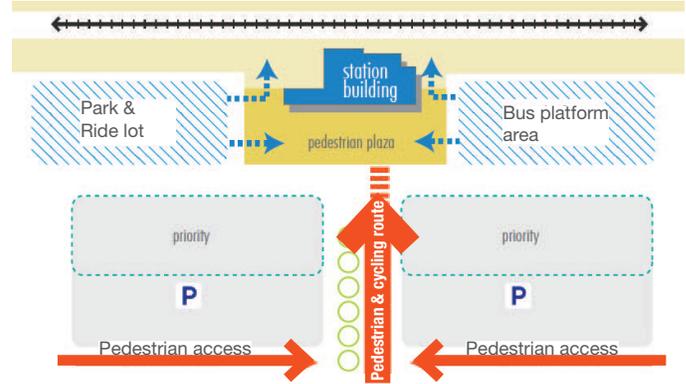
-Adapted from Mobility Hub Guidelines, Metrolinx, 2011

+ REFER OTHER PRINCIPLES





Protected pedestrian zone at transit station | source: MOUD, 2016



Transit plaza connections | source: Metrolinx, 2011

## 2. PEDESTRIAN FIRST MEASURES HAVE TO BE PRIORITIZED AROUND THE TRANSIT PLAZA

- Provide an attractive pedestrian environment with a high level of priority, safety, and amenities.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- Ensure the plazas respond to local needs both functional and architectural.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- Public plazas with community amenities such as gathering places, public information kiosks, public art displays and opportunities for small convenience-oriented retail uses.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- In waiting areas, include a variety of comfortable seating types and locations.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- Use fountains, landscaping and building elements (such as low walls) to buffer traffic noise.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- Incorporate natural landscape elements and other green design features such as drought-resistant plantings, permeable surfaces and recycled/able materials.  
-Adapted from *Mobility Hub Guidelines, Metrolinx, 2011*
- Recommended area of pedestrian spill out space > 1.9 sqm/ped.  
-Adapted from *TOD Guidance Document, MOUD, 2016*

### + REFER OTHER KNOWLEDGE PRODUCTS

AS

EN C01, C02

PD H03, H04, H05, H06, P01

FI A02, H02, R01, R03

IM A01, A02, H01, H02, P01

02



WALKABILITY

Focus on providing an attractive pedestrian environment that is continuous, forms a network and offers an array of experiences and amenities.

RISK & MITIGATION

- Lack of technical capacities and sensitivity towards pedestrian needs.  
Lack of a walkable mix of uses because of discordant land use regulations.
- Consider formulation of NMT cells within at relevant levels within the local authorities to address the needs of walking.



Public realm amenities, Delhi, India

1. PROVIDE APPROPRIATE NETWORK AND WIDTH OF CONTINUOUS FOOTPATHS

- A concerted effort to create connected & contiguous networks for cycling & walking must be made at the corridor level, detailed to the level of each station area.
- Adopt sidewalks to be designed using a three-section strategy:
  - Service zone: contains space allocation for urban furniture, vegetation, stormwater management and infrastructure
  - Pedestrian flow zone: strictly dedicated to pedestrian movement, free of all obstructions. This zone must cater to all users with different abilities and age groups moving in both directions.
  - Front-f-building zone: transition zone from public to private property, could be utilized for outdoor seating, signage, porches, planting etc.
  - Additionally, a fourth zone could be added, if space permits for bicycles, as an additional section of the sidewalk of as part of the street.

+ REFER OTHER PRINCIPLES

- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Pedestrian environment | source: MOUD, 2016



Active street edge | source: MOUD, 2016

## 2. MAKE WALKING A COMFORTABLE CHOICE

- Street trees:
  - At least 125 trees per km for streets with ROW smaller than 12m.
  - At least 125 trees per km per footpath on streets with ROW greater than 12m.
- Street Lighting: Spacing should be uniform with the distance based on the minimum illumination required.
- Street Furniture: Benches, trash, receptacles, bollards, vending kiosks, signage to be provided adequately.
- Public Facilities: Provide Accessible Public Toilets at every 500-800m distance – preferably located close to bus stops for easy access by pedestrians and public transport users.

*-Adapted from TOD Guidance Document, MOUD, 2016*

## 3. MAINTAIN ACTIVE STREET EDGES TO CREATE SAFE WALKING

- Active frontages include arcades, shopfronts, entrance doorways, access points, entry/exits and transparent windows of active areas facing the primary access street.
  - Adapted from TOD Guidance Document, MOUD, 2016*
- Vehicular/service access should be from secondary street wherever access to the building is possible from multiple streets.
  - Adapted from TOD Guidance Document, MOUD, 2016*
- Compound walls, if present, should be transparent above a height of 100cm. High-security government buildings may apply for an exemption.
  - Adapted from TOD Guidance Document, MOUD, 2016*

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, A04, P02

**EN** C01, C02, H01

**PD** H03, H04, H05, H06, P01

**FI** A02, H02, R01, R03

**IM** A01, A02, H01, H02, P01

03



**PUBLIC REALM**

Provide visual interest at the pedestrian scale through thoughtful landscaping and building design, which will encourage people to use the public realm and help contribute to an active street life.

**RISK & MITIGATION**

- Lack of micro-planning mechanisms or allocation of budgets with public agencies hinders the investments in public realm improvement projects.
- Investments in infrastructure to support the quantum of development envisioned for a particular place is critical to TOD. The public sector needs to invest in infrastructure to alleviate the cost burden from prospective private developments.



Public Realm, Sao Paulo, Brazil

**1. INCORPORATE PROVISION OF PUBLIC REALM AT ALL SCALES OF TOD PLANNING**

- A neighborhood park accessible by 800m walking or bicycle trip, and a public sports venue accessible by 1,200m walking or bicycle trip.

*-Module 4: Design Components of TOD, WRI*

- Public spaces must be designed to integrate with existing urban space and meet the needs of local residents. To properly integrate a public space network, the public spaces within the network should connect with each other and with a neighborhood’s primary leisure spaces. This network can be connected through a system of sidewalks, pedestrian paths, or cycling paths.

*-Module 4: Design Components of TOD, WRI, 2015*

- When streets are thought of as public spaces, opportunities for community enhancement are created. Community streets can be used for a variety of purposes, including such events as food fairs, festivals, games, and parades.

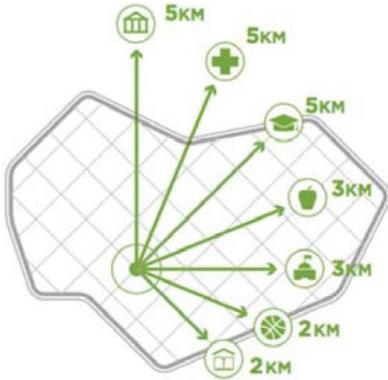
*-Module 4: Design Components of TOD, WRI, 2015*

- Through the establishment of mixed-use districts, encouragement of streetscapes that are created for all user experiences (not just vehicles), sidewalks that are built for multiple purposes including green space, pedestrian experience, and aesthetic transitioning to adjacent businesses and residences, zoning codes can be powerful tools.

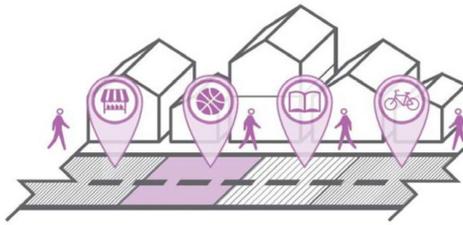
*-Module 4: Design Components of TOD, WRI, 2015*

**+ REFER OTHER PRINCIPLES**

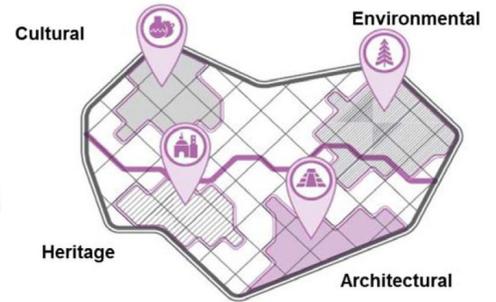
- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Regional facilities | source: WRI, 2015



Shared community streets | source: WRI, 2015



Place identity | source: WRI, 2015

## 2. PROVISION OF PUBLIC SPACES IMPROVES QUALITY OF LIFE

- Provision of public and green spaces can seem in direct conflict with TOD's density goals; however, the two design components must be thought of as complementary. Balancing the two design components to achieve high density and green and public space is not only possible, but necessary.

-Module 4: Design Components of TOD, WRI, 2015

- Important local landmarks, including heritage buildings, churches, and monuments, must be preserved to keep a community's history alive. TOD design can serve to increase access to historical locations; for example, pedestrian zones can be created around important monuments and buildings, improving connectivity between important historical sites.

-Module 4: Design Components of TOD, WRI, 2015

-Adapted from TOD Guidance Document, MOUD, 2016

## 3. DESIGN OF PUBLIC SPACES MUST BE SENSITIVE TO LOCAL HERITAGE AND CONTEXT

- Preservation of local identity is key in defining unique places and creating a sense of belonging among residents, which are central for TOD projects. Effort should be made to recognize local assets when planning a TOD project. TOD design can serve to complement, enhance, and reflect local cultural, heritage/historical, and environmental features.

-Module 4: Design Components of TOD, WRI, 2015

- The architectural features of a TOD project should take local context into consideration. Existing buildings can be used as prototypes, and properties of local architecture, including construction materials and facade colors, can influence TOD design.

-Module 4: Design Components of TOD, WRI, 2015

- TOD projects should also take a community's cultural traditions into consideration when designing development for a neighborhood. If a community has traditional festivals, parades, or weekly markets, these customs must be accommodated through design.

-Module 4: Design Components of TOD, WRI, 2015

### + REFER OTHER KNOWLEDGE PRODUCTS

AS

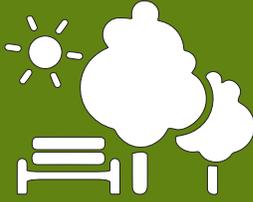
EN C01, C02

PD H03, H04, H05, H06, P01

FI A02, H02, R01, R03

IM A01, A02, H01, H02, P01

04



## URBAN PARKS & OPEN SPACES

Create open areas such as amenity spaces, green spaces, playgrounds, parks and natural areas, plazas, civic squares, etc. within a five-minute walking radius of residents.

### RISK & MITIGATION

- Lack of focus on open spaces in planning, along with an inappropriate allocation of funds towards upgrading facilities in parks and open spaces. Open spaces as potential areas for encroachments requires adequate measures on design and enforcement.



Public open space, Curitiba, Brazil

### 1. PROVIDE OPTIONS FOR OUTDOOR RECREATION, LEISURE AND PLAY AREAS TO PROMOTE HEALTHY COMMUNITIES WITHIN TOD AREAS

- Access to parks and playgrounds is particularly important to the urban poor, who have little access to private facilities and few opportunities to break away temporarily from urban life.

*-Adapted from TOD Standard, ITDP, 2017*

- A TOD project's designed green spaces should be open to the general public, and access to these areas should be prioritized for non-motorized means of transit.

*-Module 4: Design Components of TOD, WRI, 2015*

#### + REFER OTHER PRINCIPLES

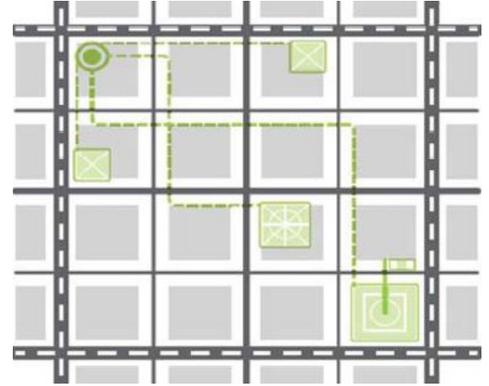
T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Open space within TOD area | source: MOUD, 2016



Strategic green areas | source: WRI, 2015



Public space networks | source: WRI, 2015

## 2. IMPROVE ECOLOGICAL FOOTPRINT OF TOD AREAS

- Public parks and playgrounds have multiple benefits—from improved air quality, to reduced heat island effects, to the increased physical and mental health and comfort of residents.

-Adapted from *TOD Standard*, ITDP, 2017

- TOD design can be integrated with the local environment, including such features as rivers, cliffs, agri-cultural lands, forests, and regional fauna and floral. Natural areas should be protected from development for the capturing of CO<sub>2</sub>, aquifer replenishment, and maintenance of biodiversity.

-Module 4: *Design Components of TOD*, WRI, 2015

- Public and green spaces also provide opportunities for city officials to incorporate risk and natural resource management into city planning.

-Module 4: *Design Components of TOD*, WRI, 2015

- Preservation of sensitive or critical ecosystems and creation of buffers along waterways protect against habitat loss and species extinction, while at the same time improving aesthetics, access to green space, and natural resource production.

-Module 4: *Design Components of TOD*, WRI, 2015

## 3. PROMOTE ENHANCED CONNECTIVITY TO TRANSIT THROUGH PARKS

- While retail and playgrounds should, ideally, be no further than 600 meters away from any point within a neighborhood, schools and markets should be less than a 1 km trip.

-Module 4: *Design Components of TOD*, WRI, 2015

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

-Adapted from *TOD Guidance Document*, MOUD, 2016

### + REFER OTHER KNOWLEDGE PRODUCTS

AS

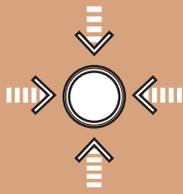
EN C01, C02

PD H03, H04, H05, H06, P01

FI A02, H02, R01, R03

IM A01, A02, H01, H02, P01

D1



## COMPACT DEVELOPMENT

Optimize employment and residential densities along a transit corridor or station area, based on carrying capacities of transit and informal transit infrastructure, to promote walking and transit use.

### RISK & MITIGATION

- Undue focus on increasing FARs and densities independent of market forces and absorption capacity fails the objective of achieving compact development. On the contrary, highly compact built up environments would result in deteriorating quality of life with lack of appropriate public open spaces.
- Engaging with private sector early on to create awareness and capacity building would benefit to promote TOD.



City development, Bogota, Colombia

### 1. ADOPT DIFFERENTIAL LAND USE DENSITIES AS PART OF STATUTORY PLANS

- Incorporate varying densities based on the development potential of different areas.

*-Adapted from TOD Guidance Document, MOUD, 2016*

- Distribution of FSI has to be varied depending upon the FSI already consumed, proposed land use zoning, and accessibility, particularly, areas in proximity to public transit stations, in order to ensure efficiency of use of land.

*-Adapted from TOD Guidance Document, MOUD, 2016*

- To establish articulated densities along transit corridors, Building codes can be changed to increase the maximum floor-area-ratio (FAR) permitted and allow for development on smaller plot sizes.

*-Module 4: Design Components of TOD, WRI, 2015*

- Land consolidation can be facilitated for larger developments.

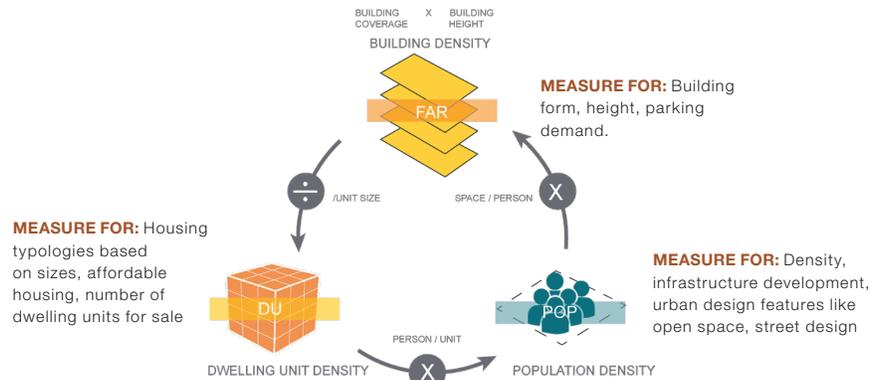
*-Module 4: Design Components of TOD, WRI, 2015*

### + REFER OTHER PRINCIPLES

T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Transition between built form | source: Metrolinx, 2011



Quantitative measurements of density | source: MOUD, 2016

## 2. CREATE HIGH-DENSITY NODES BY MEANS OF PREMIUM FARs OR BONUSING

- A typical density bonus program sets a base density that a development may achieve ‘by right’ and a maximum density that can be achieved by conformance to higher standards or through the provision of qualifying amenities/benefits/premium paid.
- High-quality design, improved infrastructure, and high-quality amenities also attract and support additional density without producing the sensation of congestion.

-Module 4: Design Components of TOD, WRI, 2015

- Planning should take into account the level of connectivity of a station, to align human and economic densities, mass transit capacity and network characteristics for greater accessibility.

-Module 4: Design Components of TOD, WRI, 2015

## 3. ENSURE OPTIMUM POPULATION AND HOUSING DENSITIES

- Design for buildings and unit sizes can also be adopted to increase density. On smaller size 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.

-Module 4: Design Components of TOD, WRI, 2015

- Minimum standards must be prescribed for urban areas that begin to be transit supportive developments.

-Adapted from TOD Guidance Document, MOUD, 2016

- New development in the peripheral zone should be allowed only if it abuts existing developed areas with prescribed minimum density and mix of uses.

-Adapted from TOD Guidance Document, MOUD, 2016

- Both residential & commercial density should be designed to match the area’s peak-hour transit, walk and bike capacity.

-Adapted from The Energy Foundation, 2012

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, A03, H01, R01, P01

**EN** C01, C02

**PD** H01, H02, H03, H04, H05, H06, R02, R03, R04, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

D2



MIX OF USES

Promote more efficient land use patterns by providing residents access to retail, commercial and civic services, employment and recreational facilities without needing to travel by automobile.

RISK & MITIGATION

- Miscalculation in feasibility studies of development projects due to added risks associated by working with the public sector, specific TOD requirements of projects on providing street-facing buildings, a mix of uses or green building techniques, hamper the success rates of TOD projects.
- Lack of market acceptance for mixed-use properties.



Mix of uses at Burnaby, Vancouver, Canada

1. RESIDENTIAL AND NON-RESIDENTIAL USES COMBINED WITHIN THE SAME OR ADJACENT BLOCKS

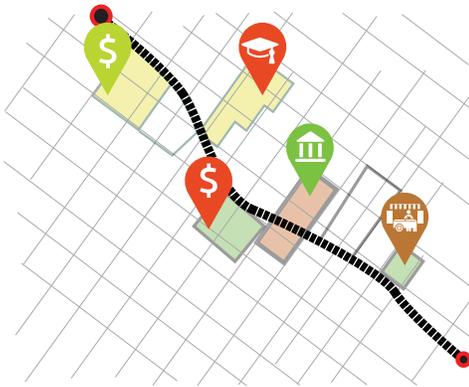
- **Internally Complementary:** residential and nonresidential uses form a complementary mix within the development. A development is defined as internally complementary if residential uses account for no less than 15% and no more than 85% of the total developed floor area.
- **Contextually Complementary:** the project's predominant share of floor area is dedicated to uses complementary to the uses predominant in the surrounding station catchment area. A development is defined as contextually complementary if either: more than half of its floor area is dedicated to uses that balance the category of uses predominant in the station catchment area, or the development is internally complementary and located in a station area with a residential use balance between 40% and 60%.

*-Adapted from TOD Standard, ITDP, 2017*

*-Adapted from TOD Standard, ITDP, 2017*

+ REFER OTHER PRINCIPLES

- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Land ownership | source: MOUD, 2016



Use setbacks in some areas to create plazas



View of building maintained through transparency



Commercial or mixed-use street frontages

Various types of active building frontages | source: MOUD, 2016

## 2. ACCESS TO LOCAL SERVICES

- Entrances within a 500m walking distance of fresh food sources and a 1,000m walking distance of primary or elementary schools and a healthcare service or a pharmacy.

-Adapted from *TOD Standard, ITDP, 2017*

- Provide effective basic accessibility from the residences to facilities and commerce.
  - Retail that is, at most, a 600m trip
  - A playground that is, at most, a 600m trip.
  - A pre-school and an elementary school that are, at most, a 1km trip.
  - A space destined for open or movable markets that is, at most, a 1km trip.

-Module 4: *Design Components of TOD, WRI, 2015*

## 3. ACTIVE GROUND FLOOR

- **Boundary Walls:** In all TOD projects, boundary walls along any edge facing a public open space, pathway, road, park, etc. shall be prohibited. In case enclosure of sites is required, translucent fencing shall be used.

-Adapted from *TOD Guidance Document, MOUD, 2016*

- **Active Frontage:** Active frontages include arcades, shop-fronts, entrance doorways, access points, entry/exits and transparent windows of active areas facing the primary access street. It is considered visually active if 20% or more of the length of its abutting building frontage is visually active.

-Adapted from *TOD Standard, ITDP, 2017*

-Adapted from *TOD Guidance Document, MOUD, 2016*

- **Setbacks:** For Integrated TOD Schemes, provide zero front setback and other setbacks no greater than 5 meters for private buildings and 10 meters for public buildings, and for any of the other façades.

-Module 4: *Design Components of TOD, WRI, 2015*

-Adapted from *TOD Guidance Document, MOUD, 2016*

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, H01, R01, P01

**EN** C01, C02

**PD** H01, H02, H03, H04, H05, H06, R02, R03, R04, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

D3



## HOUSING DIVERSITY

Provide a diversity of housing choices, which includes a mixture of types, styles, price ranges and tenure, within a 10-minute walking distance from a transit station, to foster the creation of equitable TODs.

### RISK & MITIGATION

- High standards of development burden the project with additional costs, coupled with hampered financial returns due to affordability, provision of services & amenities. Land speculation at the onset of transit infrastructure implementation burdens the affordability of housing demand.
- Incorporating opportunities for zoning code exceptions, re-scaling projects, identifying new funding sources are a few measures that could help successful provision of housing supply.



Neighborhood of Copacabana Beach, Rio de Janeiro, Brazil

### 1. PROVIDE FORMAL SUPPLY OF AFFORDABLE HOUSING STOCK WITHIN TOD AREAS

- All apartments/group housing private and government scheme with a plot size exceeding 2000 sqm must compulsorily reserve a minimum FAR for affordable housing units, as mandated by local acts or policies.
- Ensure all TOD projects provide for the needs of diverse income groups including EWS, LIG & MIG as an integral component of the housing units with relevant unit sizes.

+ REFER OTHER PRINCIPLES

T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Housing typologies | source: MOUD, 2016



Balanced mix of housing choices along transit corridor | source: MOUD, 2016

## 2. ENSURE MINIMUM SUPPLY OF AFFORDABLE HOUSING OPTIONS FOR LOW & MIDDLE-INCOME GROUPS

- Minimum percentage of FAR for all TOD projects to be allocated to rental or for sale housing or low-income families.
- Housing options should accommodate a mix of income levels and age groups. (China)
- Mix housing, shops and services within commercial districts to create 24-hour communities.

-Adapted from *The Energy Foundation, 2012*

## 3. ADOPT INCENTIVES IN PROMOTING HOUSING FOR ALL IN TOD AREAS

- The developer may be entitled to receive additional FAR equivalent to 100% of the built-up area utilized for EWS and 50% of the built-up area utilized for LIG units.
- Projects providing affordable housing within TOD areas shall be eligible for following incentives to the extent of EWS and Housing mix by units LIG housing in terms of FAR used, over and above the mandatory reservations:
  - Fast track approval process
  - Exemption from Building Plan sanction fee

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A03, H01, R01, P01

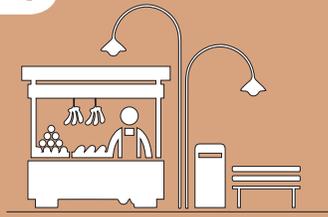
**EN** C01, C02

**PD** H01, H02, H03, H04, H05, H06, R02, R03, R04, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

D4

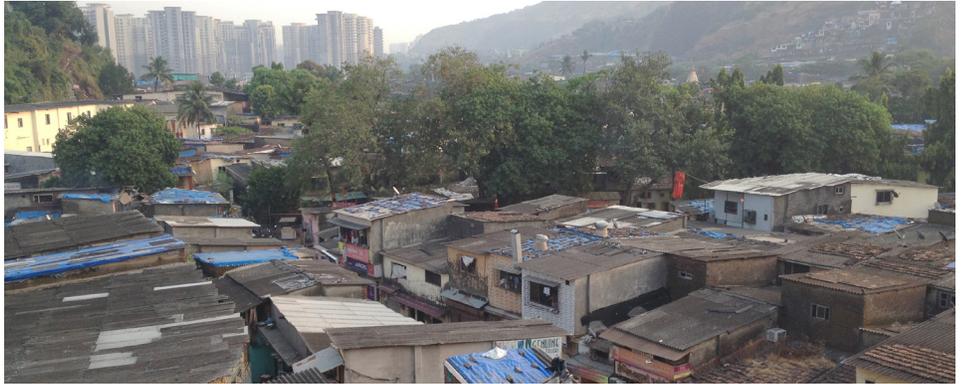


## INFORMAL SECTOR INTEGRATION

Strive to achieve inclusive development in TODs by addressing the needs of the informal sector in all aspects of policy, planning and design for street vendors, settlements and transportation services

### RISK & MITIGATION

- Lack of detailed inventory and dynamic variations that require continuous updates on the inventory hinders the provision of space and facilities
- Lack of a comprehensive policy for incorporating informal sector in planning processes.
- Creation of a digital inventory of the informal sector with regular updates resonates with the provision of space and amenities
- Incorporate the informal sector in all planning and infrastructure interventions to work in conjunction to with them.



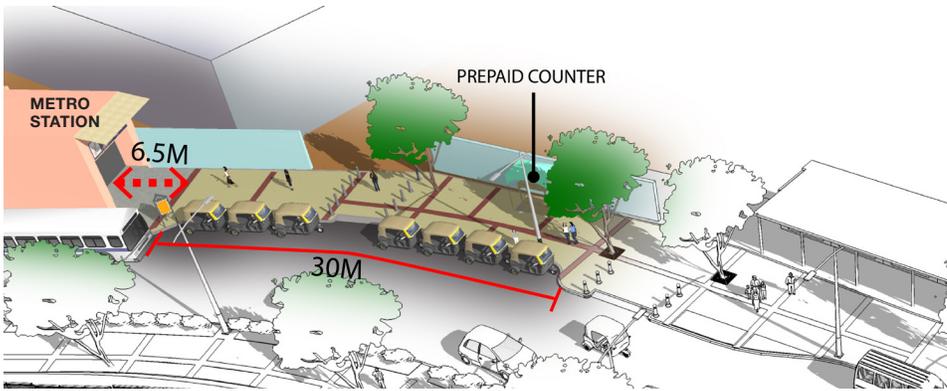
Slum development at Asalpha metro station housing diversity, Mumbai, India

### 1. INCORPORATE STREET VENDORS AND THEIR NEEDS IN PUBLIC REALM

- Vending zones shall be provided at regular intervals (approx. 10-minute walk from every home/workplace).  
*-Adapted from TOD Standard, ITDP, 2017*
- Determination of vending zones as restriction-free-vending zones, restricted vending zones and no-vending zones.  
*-Adapted from TOD Guidance Document, MOUD, 2016*
- Vending spaces should be marked in addition and adjacent to the walking path, especially along high pedestrian volume areas to activate the street and make it safe.  
*-Adapted from TOD Guidance Document, MOUD, 2016*

#### + REFER OTHER PRINCIPLES

- T1 T2 T3 T4 | O1 O2 O3 O4 | D1 D2 D3 D4



Designated informal transit zone | source: MOUD, 2016



Designated vending zones | source: MOUD, 2016

## 2. DESIGN FOR INTEGRATED INFORMAL TRANSPORT SECTOR NEEDS AT TRANSIT STOPS AND STATION AREAS

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

-Adapted from TOD Guidance Document, MOUD, 2016

-Adapted from TOD Guidance Document, MOUD, 2016

## 3. INFORMAL SETTLEMENTS HAVE TO BE CONSIDERED IN REDEVELOPMENT PROPOSALS

- Preparation of Slum Redevelopment Plan as per relevant Guidelines; or Slum Redevelopment with private sector participation; or Town Planning Schemes for land pooling and plot reconstruction in greenfield areas.

-Adapted from TOD Guidance Document, MOUD, 2016

### + REFER OTHER KNOWLEDGE PRODUCTS

**AS** A01, A02, A03, H01, R01, P01

**EN** C01, C02, H01

**PD** H03, H04, H05, H06, P01

**FI** A01, A02, H01, H02, R01, R02, R03

**IM** A01, A02, H01, H02, P01

