



WRI INDIA
— ROSS CENTER

WEBINAR SERIES ON TRANSIT ORIENTED DEVELOPMENT IN INDIAN CITIES

Understanding the concept, TOD principles, and Design interventions

PRERNA V MEHTA, LEAD – URBAN DEVELOPMENT

A product of WRI Ross Center for Sustainable Cities

COMPONENTS

- Institutional Setup
- Regulatory Framework
- Mapping
- Design Interventions *(Planning & Design and implementation)*
- Financing
- Monitoring and Evaluation

WEBINAR GOAL

To impart understanding of the concept of Transit Oriented Development, principles of TOD, Scales and categories of TOD, various planning & Design processes required to plan and implement TOD in cities.

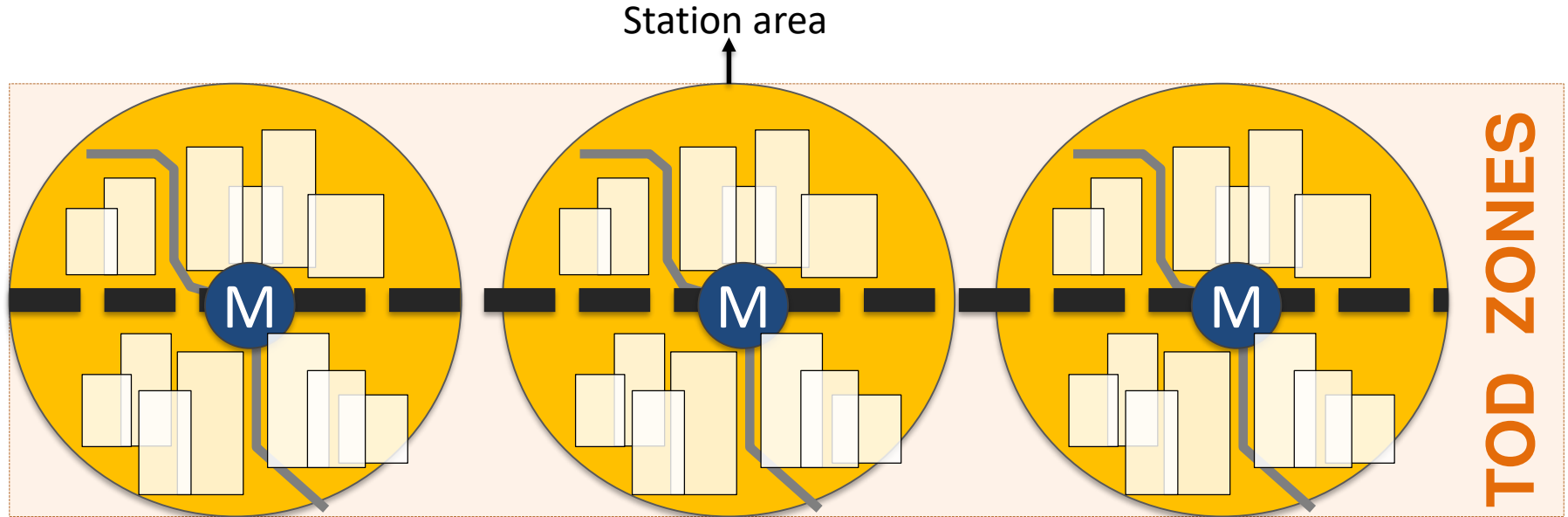
TRANSIT ORIENTED DEVELOPMENT (TOD) CONCEPT

“Moderate and high-density housing, along with complementary public uses, jobs, retails and services, are concentrated in mixed-use developments at strategic points along the regional transit system.”

- Peter Calthorpe, The Next American Metropolis, 1993

WHAT IS TOD?

Transit Oriented Development, involves **creating concentrated nodes** of moderate-to-high density developments supporting a balanced mix of land uses around **transit stations** ideally within 500 – 800 mts from the station or 5 -10 minutes walking distance



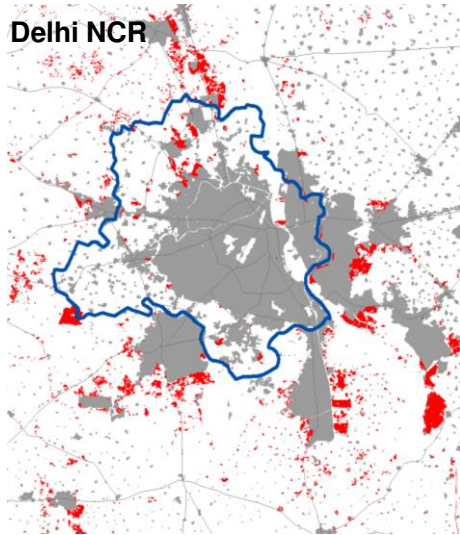
CONTINUED.....

Adopting TOD is a complex task considering the following:

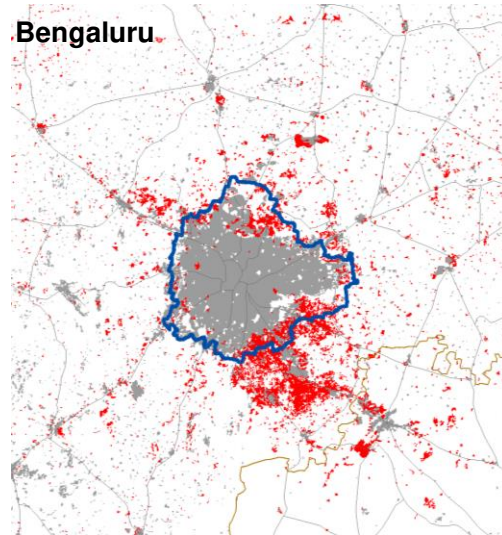
- Involves **MULTIPLE Stakeholders**
- It is **COST** Intensive
- Requires **LONG term** vision
- Have **MULTIPLE Components**
- It is **NOT homogenous** i.e. One size doesn't fit all
- Should respond to **LOCAL context**

URBANISATION CHALLENGES IN INDIAN CITIES

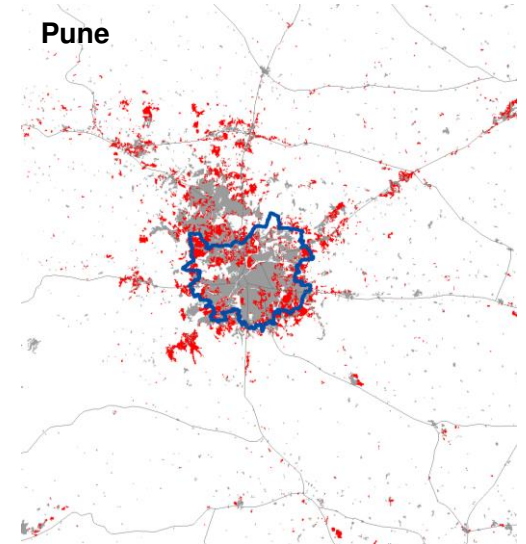
URBAN SPRAWL




54 sqkm/ year or 20.85 Sq.miles/ yr.



39 sqkm/year or 15.058 Sq.miles/ yr



42 sqkm/year or 16.22 Sq. miles/ yr

-  Municipal Boundary
-  Urban Area (2005-06)
-  Urban Area (2011-12)

- Rapid growth in satellite towns of Delhi (Gurgaon, Noida, Grt Noida, Faridabad etc.)
- Bengaluru is witnessing high-tech and IT/ ITES offices proliferating and clustering at the peripheries
- Pune capitalising on Mumbai's slow down, attracting new economies like IT/ ITES

SPRAWL, CONGESTION, POLLUTION & HEALTH



Sprawl Will Cost
India \$1.8 Trillion
Per Year by 2050



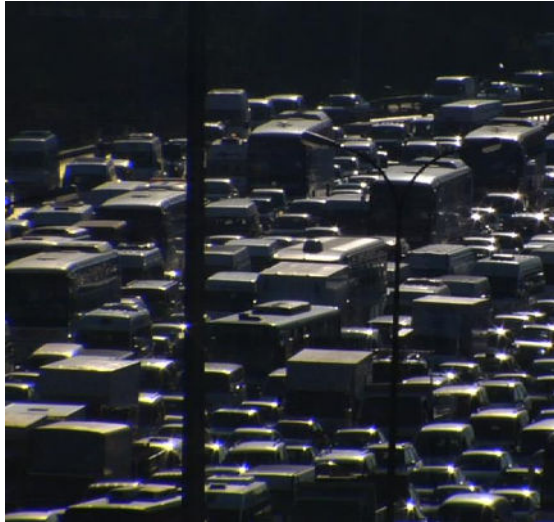
India suffers loss of
\$21.3 billion
annually due to
traffic jams



25,000,000
premature
deaths/year in India
due to air pollution

3 PROBLEMS RISKING LOCK-IN

Congestion



Sprawl



Inefficiency



BUSINESS-AS-USUAL IS UNSUSTAINABLE

CHOICES MATTER: ATLANTA AND BARCELONA HAVE SIMILAR POPULATIONS AND WEALTH LEVELS BUT VERY DIFFERENT SPRAWL

ATLANTA

Atlanta's built-up area



Population: **2.5 million**
Urban area: **4,280 km²**(1652.517 Sq.mi.)

BARCELONA

Barcelona's built-up area



Population: **2.8 million**
Urban area: **162 km²**(62.55 Sq. mi.)

NEW PARADIGMS

Compact urban growth

- Managed expansion, mixed-use urban form, good quality urban design

Connected infrastructure

- Smarter transport systems, smarter utilities, smart grids

Coordinated governance

- Integrated land use and transport authorities, integrated planning, PPPs

URBAN GROWTH STRATEGY

To ensure sustainable development, the Ministry of Housing and Urban Affairs (MoHUA) has recognized Transit Oriented Development (TOD) as the urban growth strategy of choice; for creating vibrant, liveable neighbourhoods along efficient public transit systems.

NATIONAL POLICIES AIDING CHOSEN STRATEGY

Both the **National TOD Policy** and the **Metro Rail Policy** **mandates** to adopt **TOD** as implementation strategy and leverage the benefits it offers..

GLOBAL TOD MODELS

Arlington County, United States

TOD as a **ECONOMIC** model to improve productivity

High Density Mixed Use around Transit Stops (Greenfield)

Rosslyn-Ballston corridor
2.5 miles, 5 metro stations

Mixed Land Use—

Commercial: Office, retail, hotels
Residential: Single-family, townhouse, condos, high-rise

26% of the county population lives in the Metro corridor.

Metro corridor takes up **8%** of county land

Image Courtesy: Reconnecting America Flickr Stream

The North American Model: High Density, Mixed Use around Transit (focused on better productivity)

Curitiba, Brazil

TOD as means to **INTEGRATE LAND USE AND TRANSPORT** to improve connectivity

Integrated land use and transit
Mixed land use
Inclusion of affordable housing
Protect historic city center
Contain urban sprawl

Passengers per day on the BRT system **2.7 million**

The South American Model: High Density corridors connecting parts of the city (focus on Integrate land use and transport).

Copenhagen, Denmark

Mode share of bicycle trips for work or education trips **52%**

TOD as a **LIVABILITY and ACCESSIBILITY** model to improve QoL

Regional transport system
Green fingers
Decentralised concentration along transport corridors
Pedestrian and bicycling priority

Image Courtesy: Amsterdamed, Flickr Stream

The European Model: Mid Density, Mixed Use around public spaces connected with Transit, Biking and Pedestrian facilities (focused on better livability).

Hong Kong SAR, China

TOD as a **CO-DEVELOPMENT** model to create funding for development

High quality pedestrian infrastructure in R+P developments

2001-2005 property development accounted for **52%** of MTRC revenues

41% of population lived within 500 m of a rail station in 2002

Image Courtesy: Design for Health, Flickr stream

The Asian Model: Co-development model to begin with, focused on leveraging real estate around transit to create funds for development.

INFERENCE?

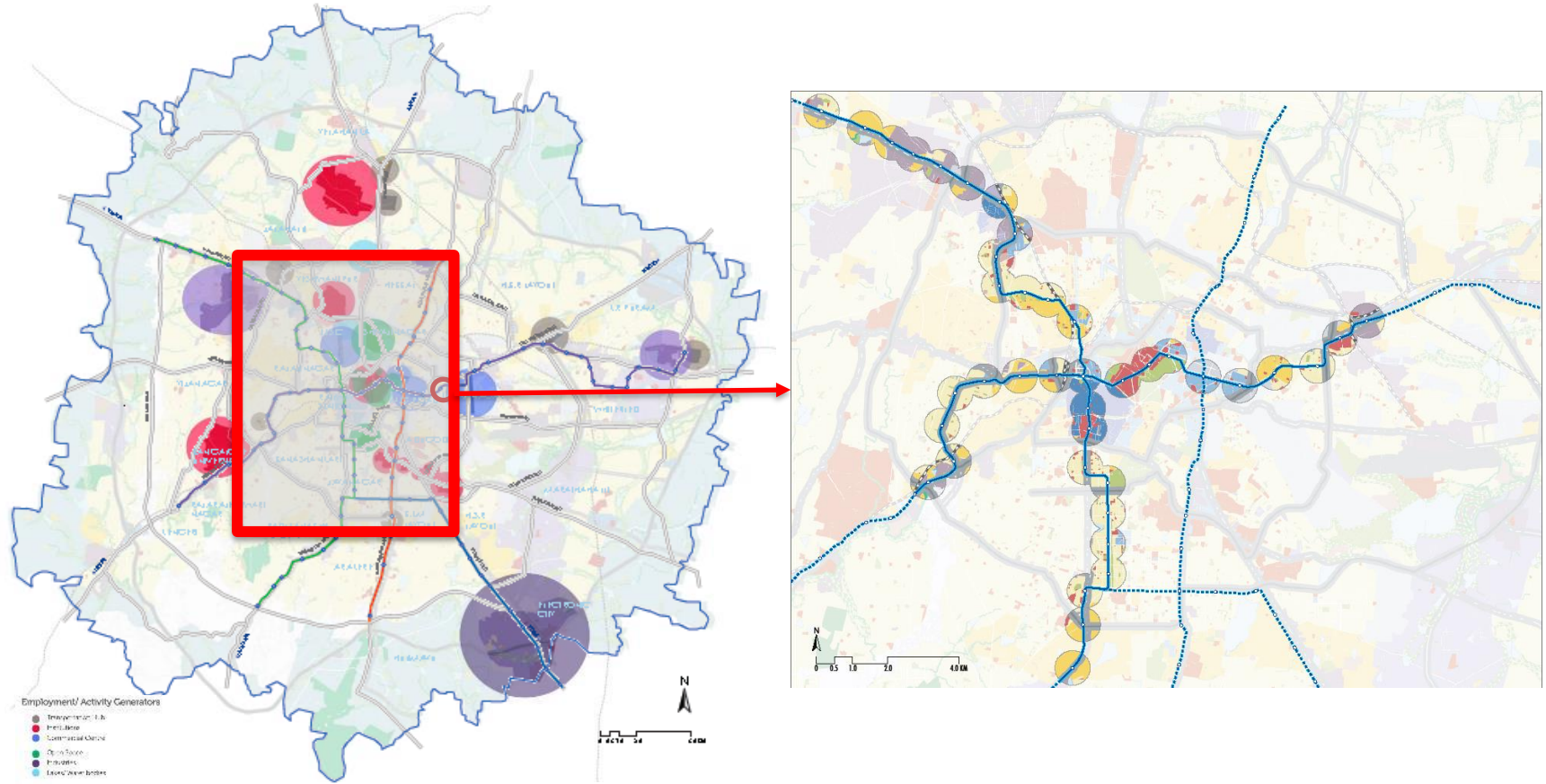
TOD

- **Is NOT homogenous** i.e. One size doesn't fit all
- Should respond to **LOCAL context**
- Requires **LONG term** vision
- Land use and transit integration is **CRITICAL**
- Means to **IMPROVE** productivity
- Must address **LIVEABILITY**
- **EQUITY** is critical

Hence Customize for Indian context.....But How?

ASSESSMENT OF EXISTING SCENARIO

OVERLAY – LAND USE, ACTIVITY GENERATORS AND METRO ALIGNMENT



REGION/CITY LEVEL CLASSIFICATION

STATION AREA TYPOLOGIES

Type 1a: Regional Level Employment Centres

Type 1b: Regional Level Commercial Hub

Type 1c: Regional Level Recreational Hub

Type 1d: Regional Level Transportation Hub

Type 2a: City Level Employment Centres

Type 2b: City Level Transportation Hub

Type 3a: Sub Centre Level Commercial Hub

Type 4a: Neighbourhood Level –Mixed Residential Zone

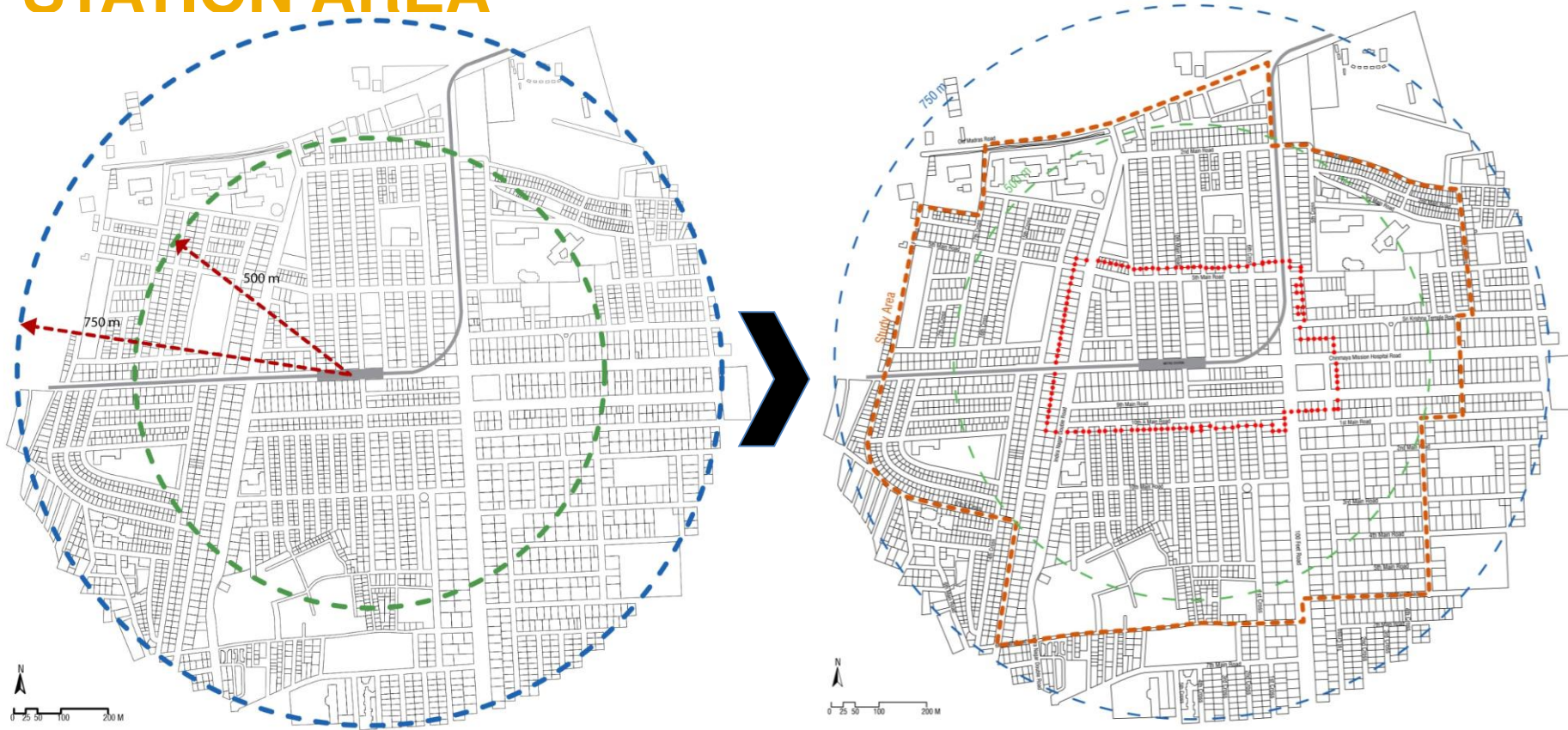
Type 4b: Neighbourhood Level –Residential Zone

STATION AREA TYPOLOGIES

	Station Names	Scale of Influence	Predominant Land Use	Significant Landmarks	Typology	Ecological Factors	Cultural Factors
01	Baiyappanahalli	Regional	Industrial	Last Stop of Phase I + Railway Station	1D		
02	Basavanahalli	City	Public/ Semi-Public		2A		
03	Indiranagar	Sub-Centre	Residential	100 Feet Road	3A		Traditional Fabric
04	Indira Nagar	Sub-Centre	Mixed Use		3A		Historical Structure
05	Trinity	Regional	Commercial		1B	Natural Feature	Historical Structure
06	Mahatma Gandhi Road	Regional	Commercial		1B		Historical Structure
07	Cubbon Park	Regional	Public/ Semi-Public and Green Space		1C	Natural Feature	Traditional Fabric + Historical Structure
08	Vidhana Soudha	Regional	Public/ Semi-Public	Administrative Centre	1A	Natural Feature	Traditional Fabric + Historical Structure
09	Sir M. Visveshwaraya	Regional	Public/ Semi-Public	Administrative Centre	1A	Natural Feature	Traditional Fabric + Historical Structure
10	Kempegowda Interchange	Regional	Transportation	Bus and Metro Interchange	1D		Traditional Fabric
11	City Railway Station	Regional	Transportation	Railway Station	1D		
12	Magadi Road	Neighbourhood	Mixed Use		4A	Eco System	
13	Hosahalli	Neighbourhood	Residential		4B		
14	Vijayanagar	Neighbourhood	Residential	TTMC	2B		
15	Attiguppe	Neighbourhood	Residential		4B		
16	Deeparjali Nagar	City	Mixed Residential	TTMC	2B	Natural Feature	
17	Mysore Road	City	Industrial	Last Stop of Phase I	2A	Natural Feature	
01	Nagasandra	City	Industrial	Last Stop of Phase I	2A		
02	Dasarahalli	Neighbourhood	Mixed Use		4A	Natural Feature	
03	Jalahalli	City	Industrial		2A		
04	Peenya Industry	City	Industrial		2A		
05	Peenya	City	Industrial		2A		
06	Yeshwanthpur Industry	City	Industrial		2A		
07	Yeshwanthpur	Regional	Commercial	TTMC + Railway Station	1D		
08	Sandal Soap Factory	City	Industrial	Orion Mall + ISKCON Temple	3A		
09	Mahalakshmi	Neighbourhood	Residential		4B		
10	Rajajinagar	Neighbourhood	Residential		4B	Eco System	
11	Kuvempu Road	Neighbourhood	Residential		4B	Eco System	
12	Srirampura	Neighbourhood	Residential		4B		Traditional Fabric
13	Sampige Road	Sub-Centre	Residential	Mantri Mall	3A		
14	Kempegowda Interchange	Regional	Transportation	Bus and Metro Interchange	1D		
15	Chickpete	Regional	Commercial		1B		Traditional Fabric + Historical Structure
16	Krishna Rajendra Market	Regional	Commercial		1B		Traditional Fabric + Historical Structure
17	National College	Neighbourhood	Residential		4B		Historical Structure
18	Lalbagh	Regional	Residential and Green Space		1C	Natural Feature	
19	South End Circle	Neighbourhood	Residential		4B		Historical Structure
20	Jayanagar	Sub-Centre	Residential	TTMC + 4th Block Complex	3A		
21	Rashtrreeya Vidyalaya Road	Neighbourhood	Residential		4B		
22	Banashankari	City	Residential	TTMC	2B		Traditional Fabric + Religious Structure
23	Jaya Prakash Nagar	Neighbourhood	Mixed Use		4A		
24	Puttanhalli	Neighbourhood	Mixed Use	Last Stop of Phase I	4A	Natural Feature	



STATION AREA



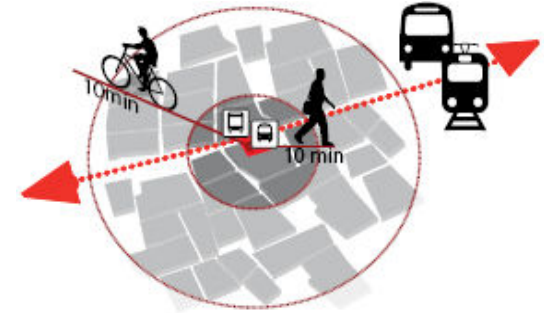
HOW TO APPROACH DESIGN FOR THE CONTEXT?

THROUGH PRINCIPLES

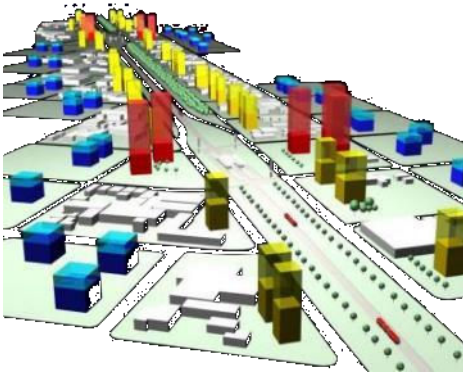
WALKING & BICYCLING (COMPLETE STREETS)



MIXED USE & DENSITY (COMPACT DEVELOPMENT)



Densify around transport nodes according to pedestrian and cycling 10-minute catchment areas; 800 meters for pedestrians and 3 km for cyclists



Densified horizontally along a wide area, becoming denser towards the transit nodes



PUBLIC TRANSPORT (INTEGRATED TRANSPORT)



Weather protected stations with seating and real time

Level



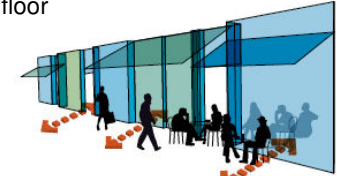
Dedicated priority lanes for public transport



ACTIVE EDGES (TRANSIT SUPPORTIVE USES)



Vertical diversity—mix of functions and uses from floor to floor



Permeable frontages



Horizontal diversity



PUBLIC SPACES/ PUBLIC REALM



Local markets reduce need for transport, while creating local jobs and a social forum.

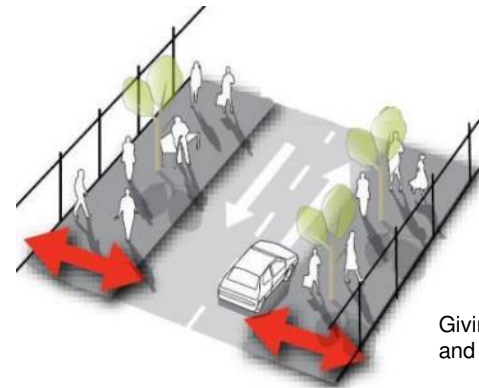
A meeting place for all. A place for all kinds of activities



ENVIRONMENTAL & CULTURAL LANDSCAPES



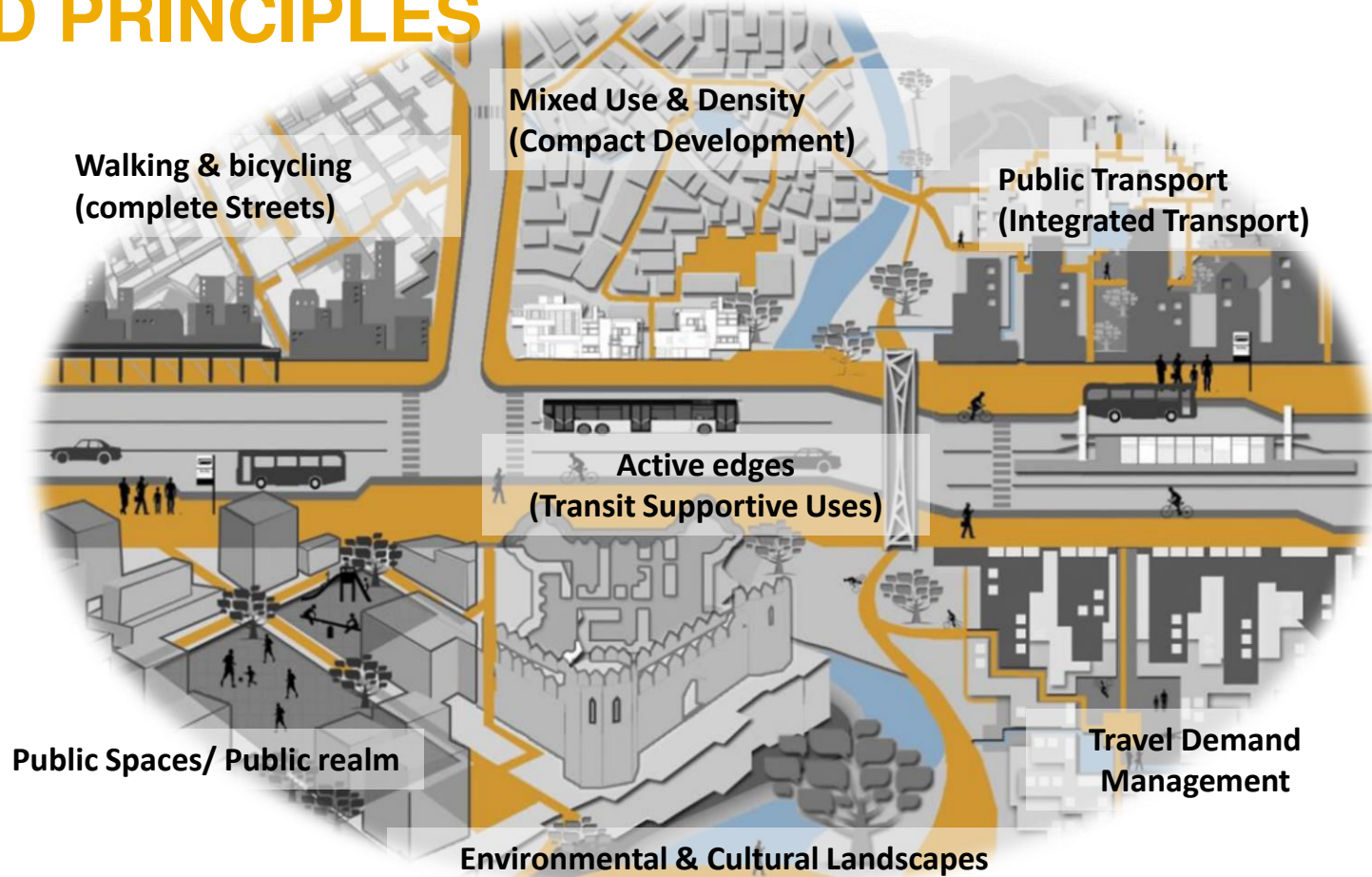
TRAVEL DEMAND MANAGEMENT



Giving priority to pedestrians and cyclists



TOD PRINCIPLES



DEMONSTRATION PROJECTS



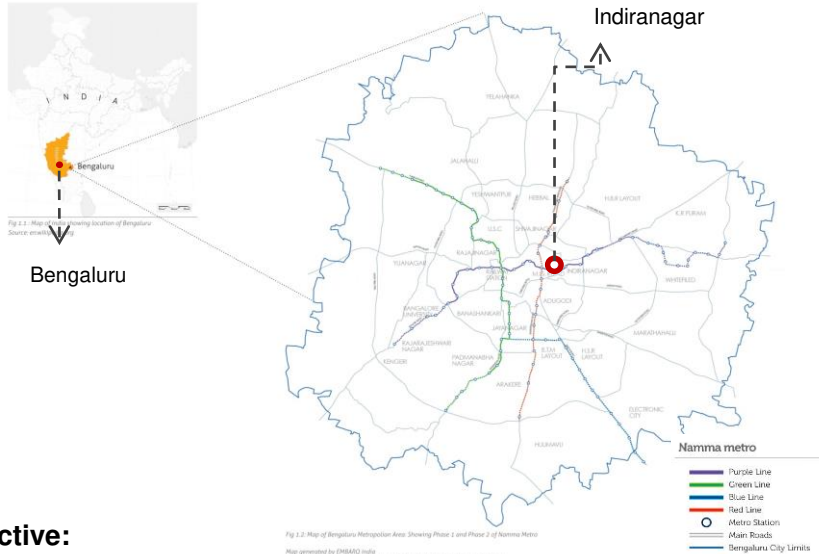
INDIRANAGAR METRO SAFE ACCESS AND DCR

SCALE OF TOD: STATION AREA LEVEL

CATEGORY: RETROFITTING



BACKGROUND & OBJECTIVE

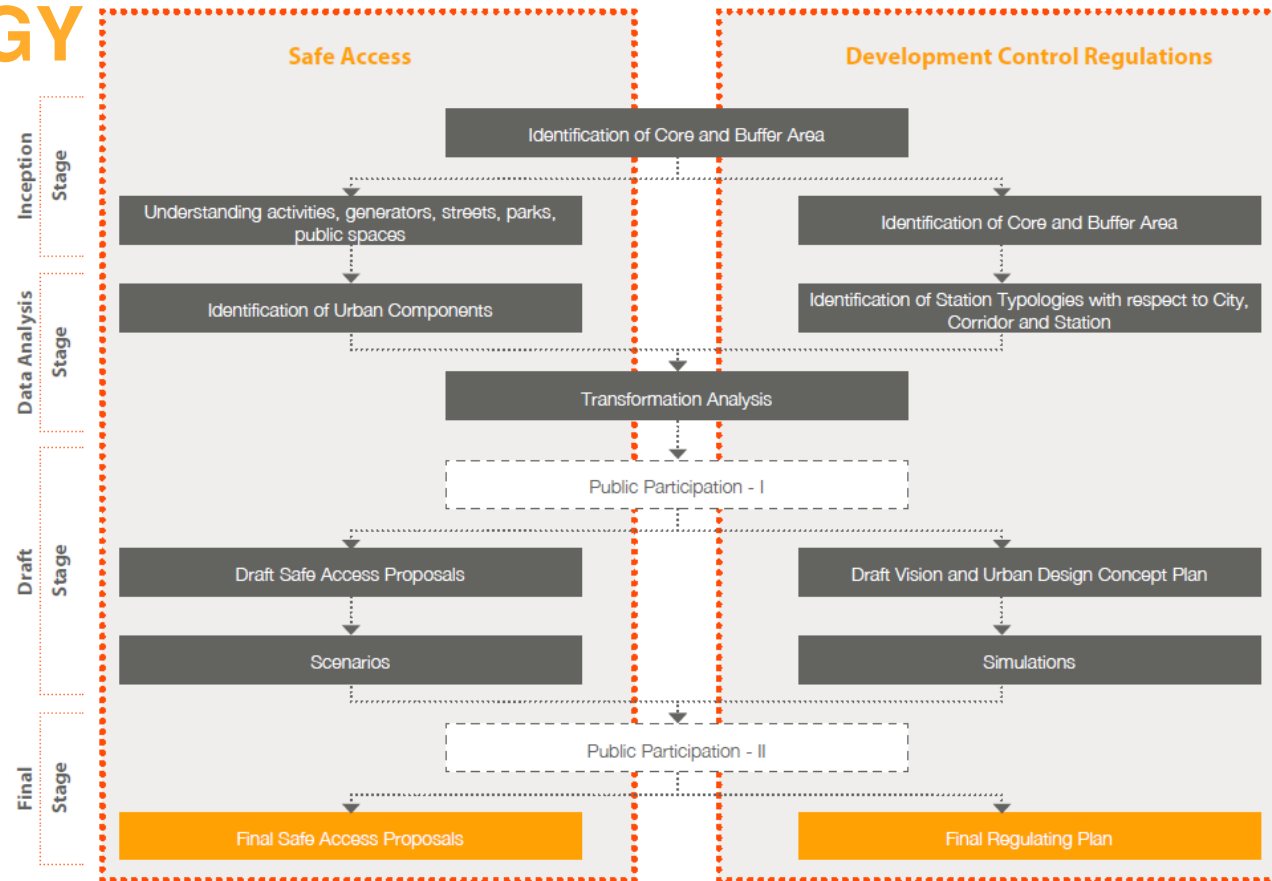


- 2003: DPR prepared
- 2006: Metro construction begins
- 2011: Reach 1 operational
- 2014: Reach 3 and 3A operational
- 2015: Complete Phase I expected to be operational
- 2019: Phase II expected to be operational

Objective:

- To facilitate a development trend that **discourages automobile dependent activities and encourages public transport** around the station area.
- To make the area **investment friendly** as well as inclusive
- To guide the design of built form to improve the street interface thereby creating a **more pedestrian friendly and safe environment.**
- To develop a station area analysis and **development plan methodology that can be applied to stations across the city** while ensuring that each **DCR proposal** caters to the needs of the context (ecological, historical, development) in which the station is set.

METHODOLOGY



TRANSFORMATION ANALYSIS

Safe Access Proposals

- Existing Landuse (compared to RMP 2015)
- Landuse mix (Floor wise)
- FAR (Achieved & Proposed)
- Building Heights (Achieved & Proposed)
- Road Hierarchy
- Natural Features
- Activities & Generators
- Street Rating

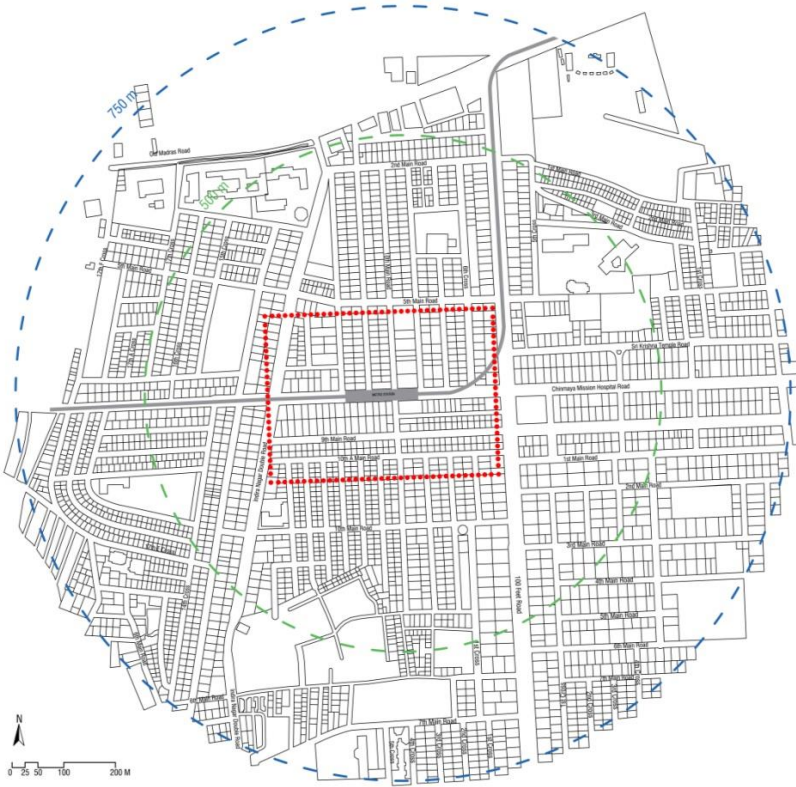
The aim of these analyses is to predict the transformations in these areas

Development Control Regulations

- Station Typology - Influence @ City, Corridor & Local levels
- Ecological Network
- Historical / Cultural Significance
- Plot Size
- Street Network
- Building Typology (Single Family, Apartment, Informal)
- Density
- Existing Landuse (compared to RMP 2015)
- Building Heights (Achieved & Proposed)
- Construction Activity
- FAR (Achieved and Proposed)
- Activity Generators and Informal Activities
- Pedestrian Movement Patterns & LOS
- Infrastructure Capacities



IDENTIFICATION OF STATION AREA



KEY PROPOSALS

Key Strategies - SAP

Traffic Management	Provide traffic calming measures such as surface treatment, table top crossing
IPT & PT	Integrate bus stops and rickshaw stands with metro station
Continuity	Create complete and continuous pedestrian and NMT networks (from entry and exit of metro station)
Parking	Parking demand management, multi-level parking beyond core area
Street Design Guidelines	Safer intersections, reduced vehicular speeds, wider pavements, street furniture

Key Strategies - DCRs

Landuse	Enforcing mixed-use, minimum % for residential and ancillary uses
Ground Coverage	Increasing ground coverage to ensure maximum utilization of FAR
FAR	Redistributing the FAR over a 500m
Parking	Controlled parking regulations, encourage metro ridership -Parking maximums established -Parking included in FAR in Core Area -Restricted on-street parking
Street Design Guidelines	DCRs dovetail with Safe Access proposals to ensure a safe and walkable neighbourhood

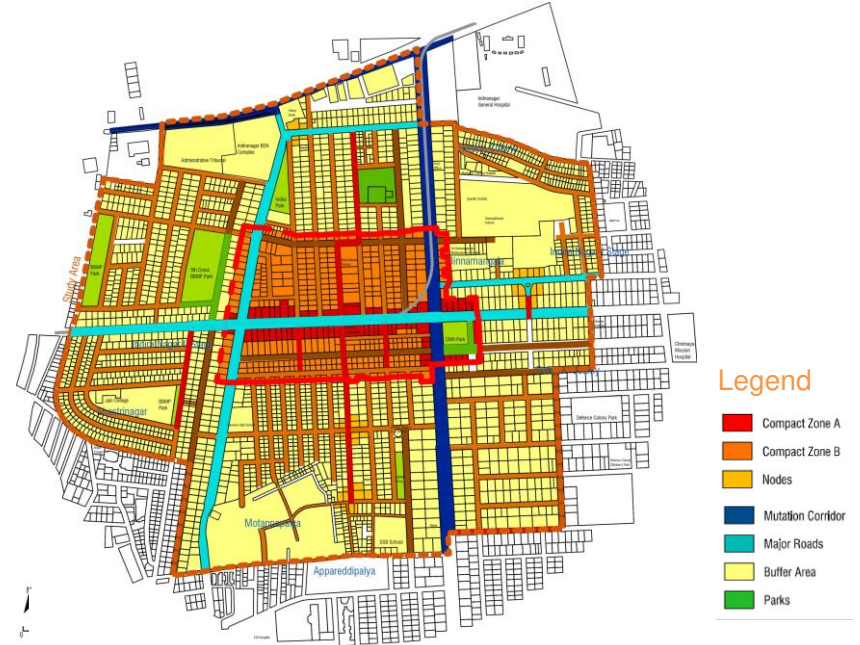


PROPOSALS

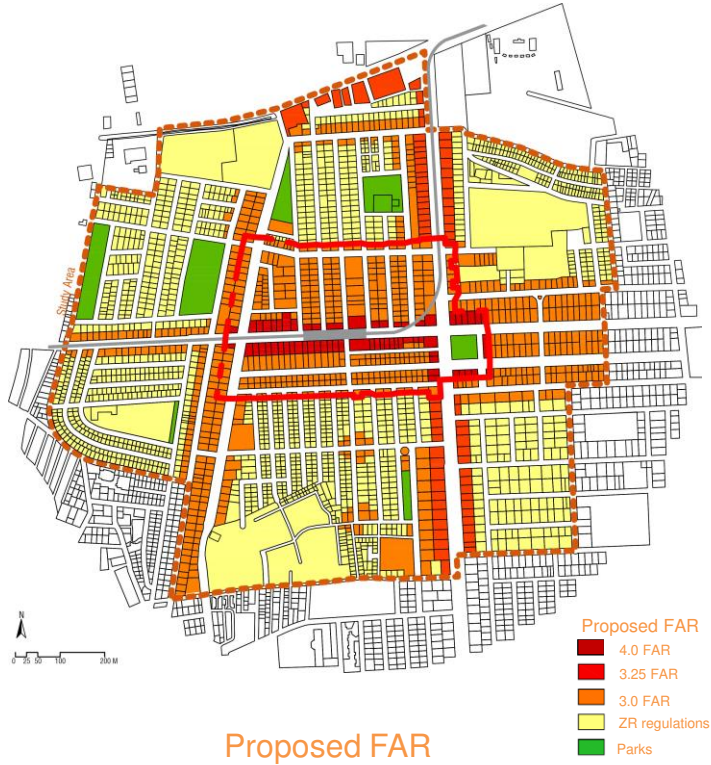
Safe Access Proposals



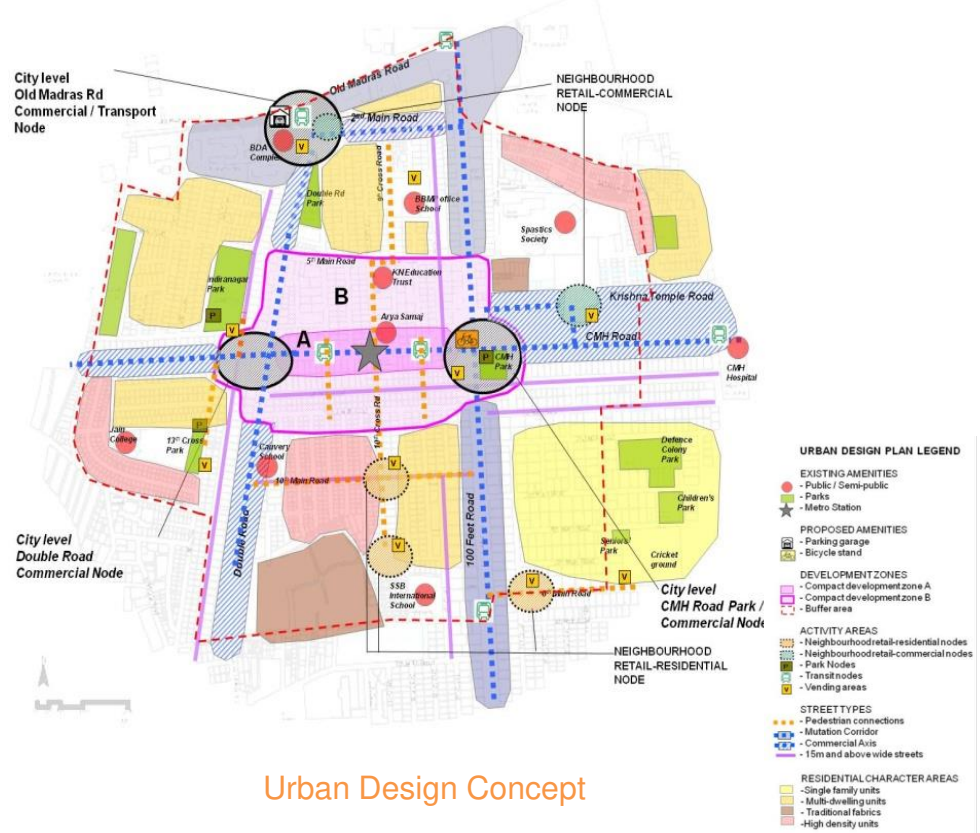
Development Control Regulations



PROPOSALS: URBAN DESIGN



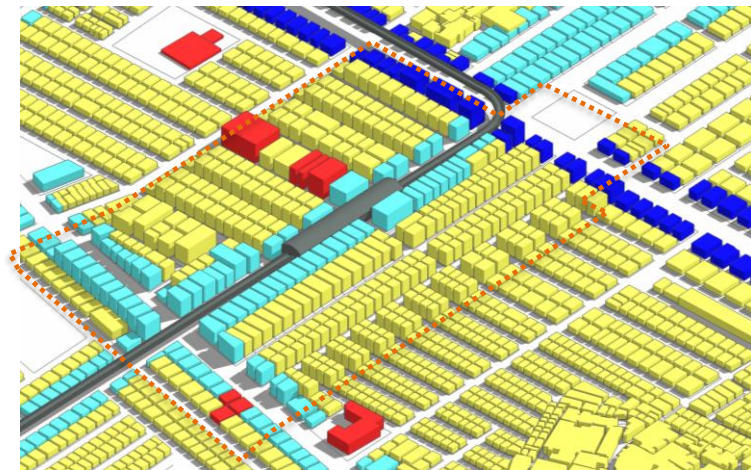
Proposed FAR



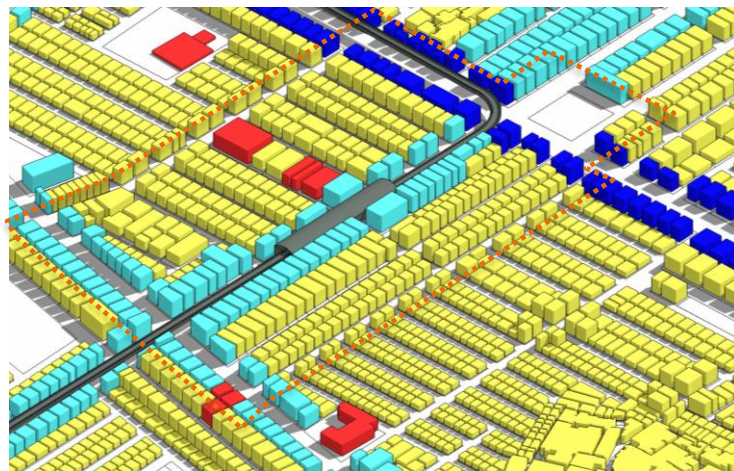
Urban Design Concept



Scenario 1: **RMP 2015**



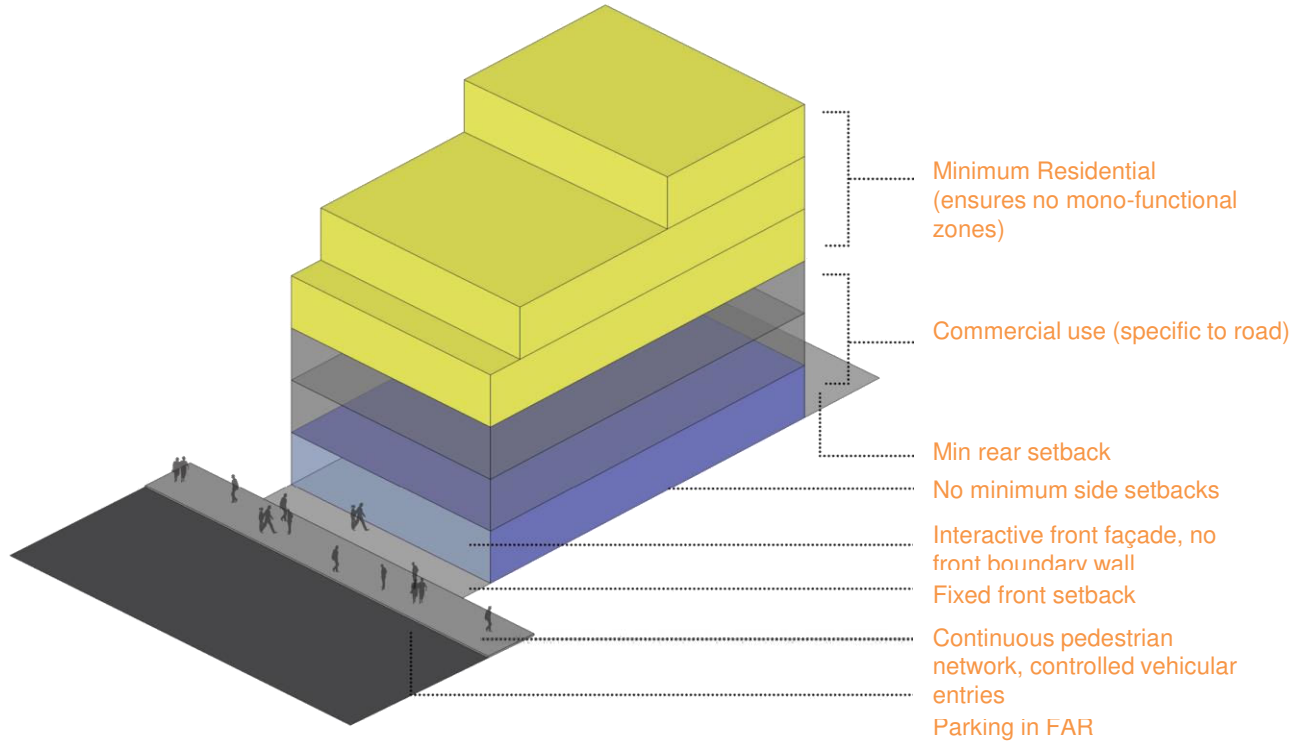
Scenario 2: **RMP 2015 + UDD**



Scenario 3: **PROPOSAL**



DETAILED PROPOSALS: COMPACT ZONE A



IMPACT

	UDD Notification	Proposal
Total estimated population	48,707	49,633
Estimated population within 150 m zone	10,999	8,906
Total Station Area built-up (sqm)	19,24,230	19,85,328
Total built-up area within 150 m zone (sqm)	4,39,948	3,56,237
Per capita footpath space in 150 m zone (sqm)	2.41	2.98
* Population of station area is 37,219 according to 2011 census data		



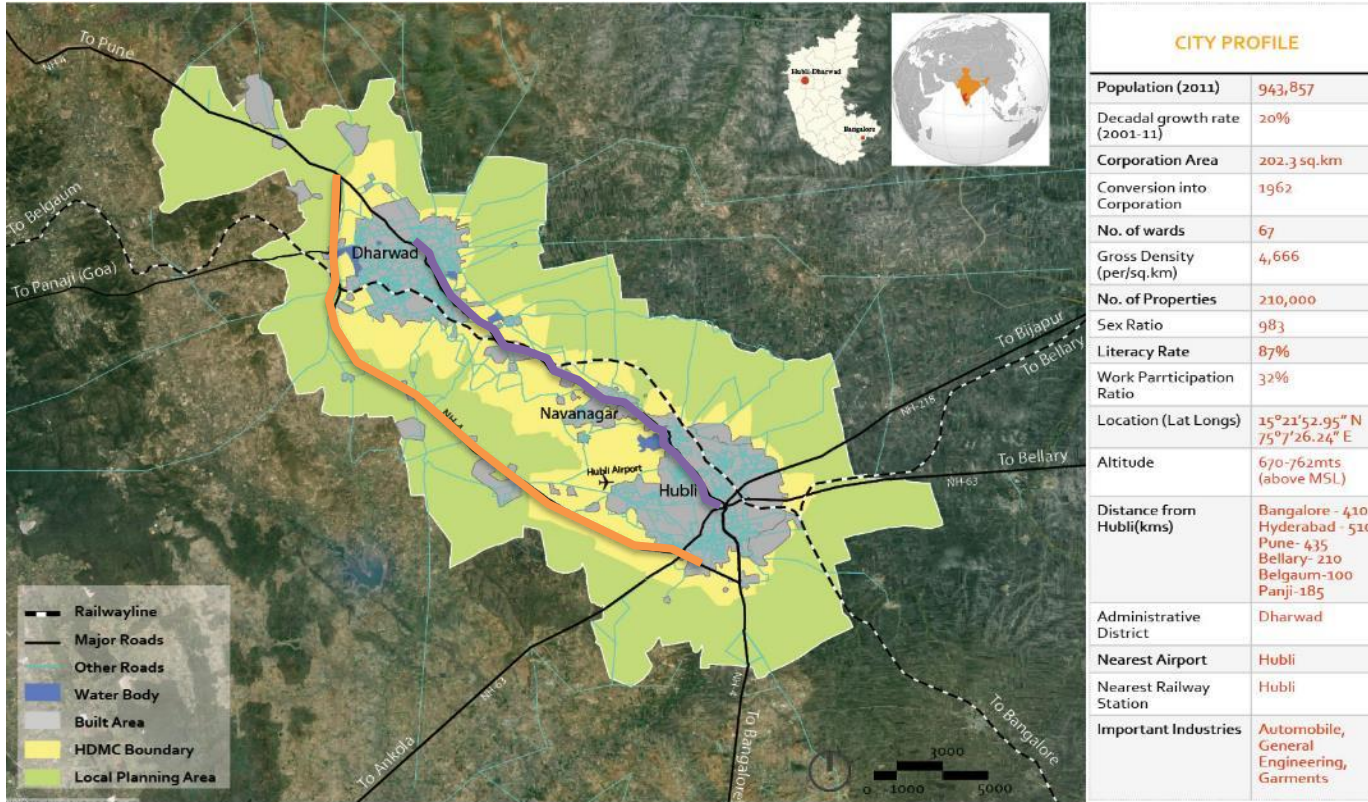
HUBLI- DHARWAD TOD PROPOSAL FOR NAVANAGAR

SCALE OF TOD: CORRIDOR LEVEL

CATEGORY: URBAN INFILL



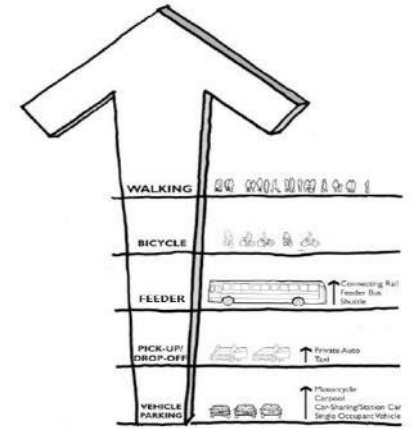
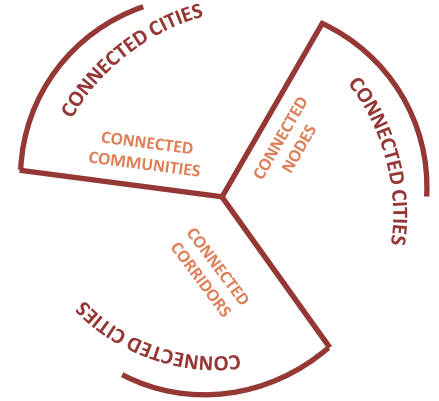
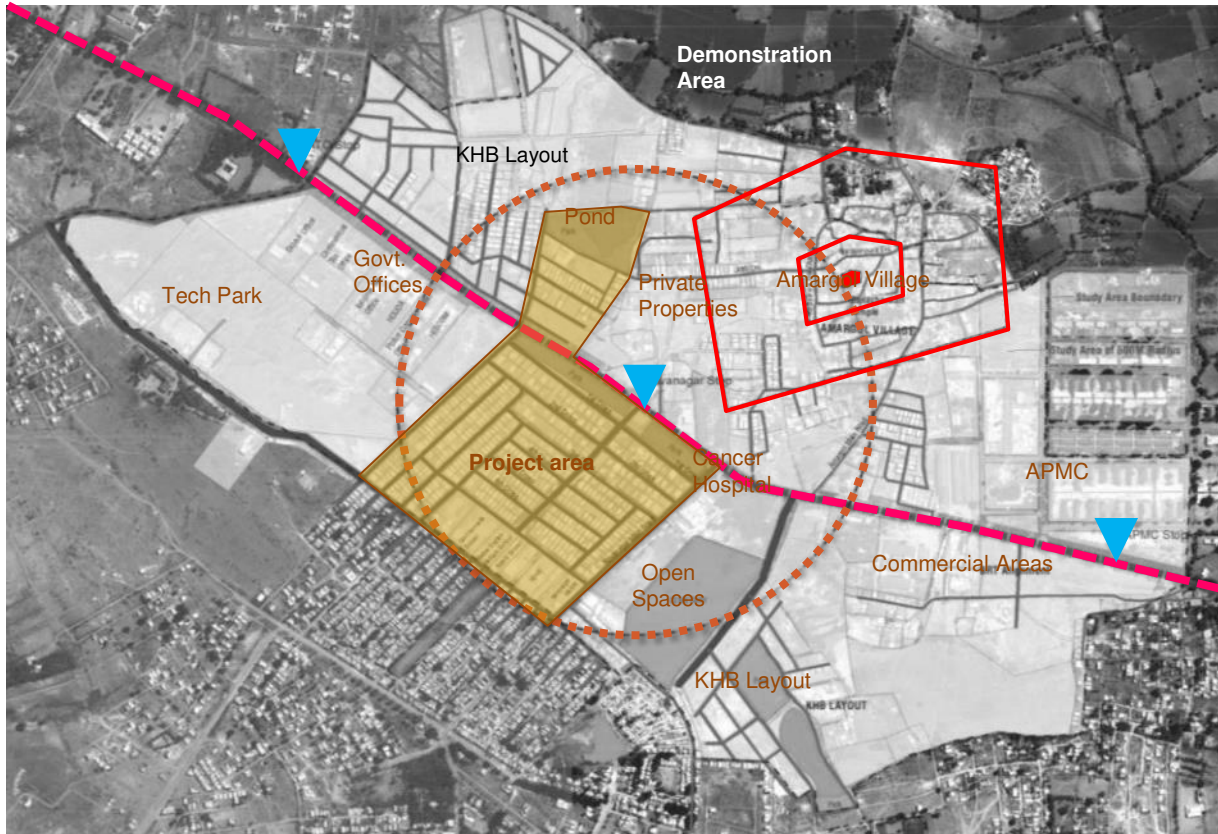
BACKGROUND AND OBJECTIVE



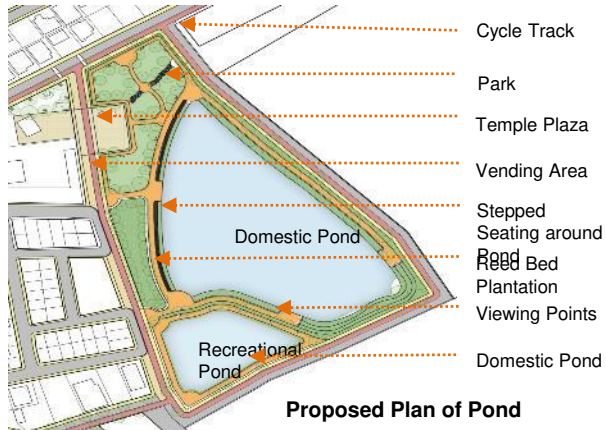
Demonstrate TOD around BRT station in Navanagar area and scale it to the rest of the stations along the entire corridor of BRT in Hubli-Dharwad.



PROJECT AREA AND APPLIED CONCEPT



PROPOSALS



Existing View of Street adjacent to Park



Proposed View of Street adjacent to Park



IMPACT

	PROPOSALS
Public spaces	<p>At Neighbourhood level:</p> <ul style="list-style-type: none">• Developing 8,000 sqm of dedicated Public spaces which includes children play area, parks, activity areas and resting spaces.• Developing 2,300 sqm of Central plaza area adjacent to the proposed Navanagar Express stop, with provision of resting spaces, activity areas, cycle stands, public and private vehicular drop off points, and toilet facilities.• Development of 15,000 sqm of public area around the pond with provision of footpaths and public activity areas, dedicated area of pond for domestic use.
Cycling track & Footpaths	<ul style="list-style-type: none">• Developing 2.3 rkm of streets with dedicated cycle track, with provision of footpaths
Footpaths	<ul style="list-style-type: none">• Developing 2.8 rkm of streets without dedicated cycle track (mixed traffic), with provision of footpaths



ACCESSIBLE, SAFE AND INCLUSIVE NEIGHBOURHOOD DESIGN IN A GREEN-FIELD SCENARIO

CASE – NAYA RAIPUR, SECTOR 31

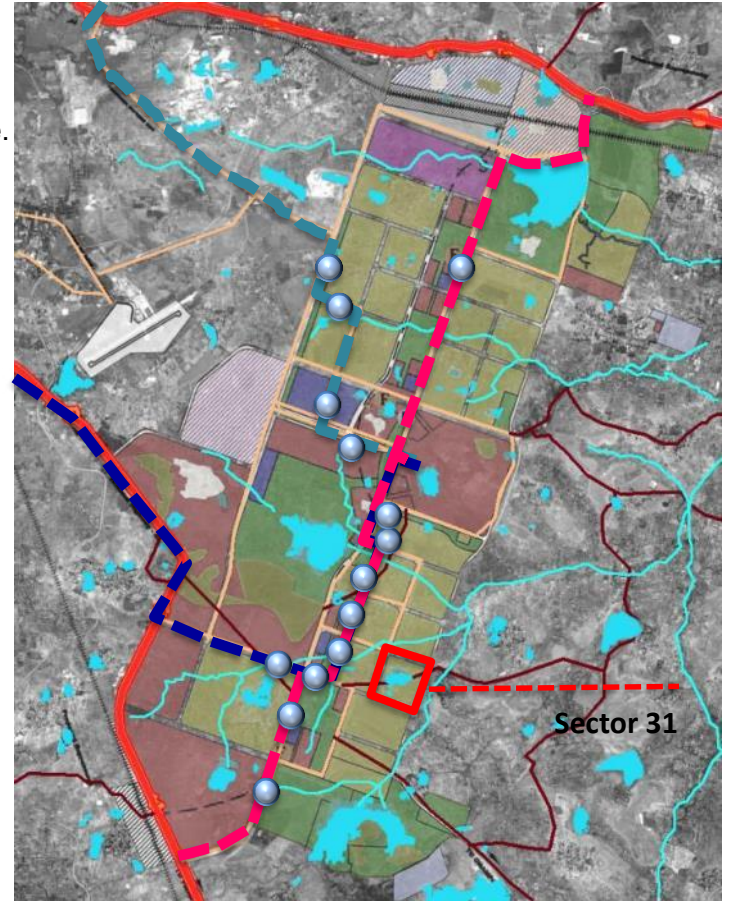
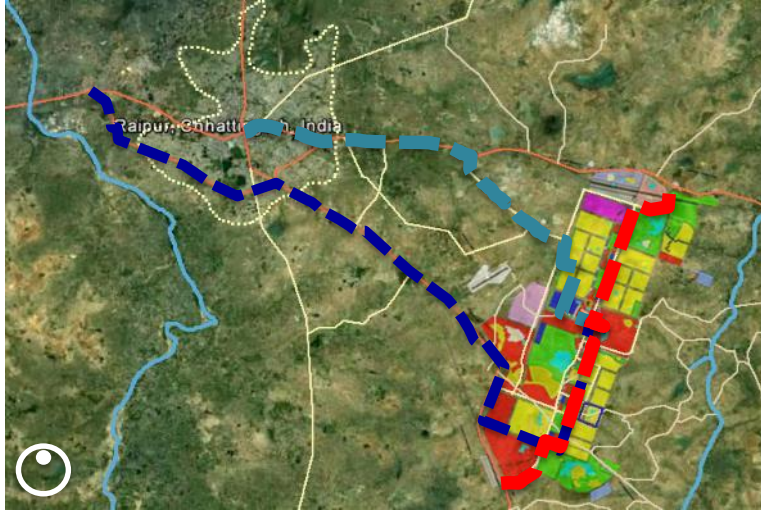
SCALE OF TOD: CITY AND SITE LEVEL

CATEGORY: GREENFIELD



BACKGROUND & OBJECTIVE

- Project type: Green field
- Demonstration Site : Sector 31 - Residential Site admeasuring 60.3 hectare.
- 16,000 population as per proposed Master Plan.
- Project worth is INR 300 Crore.

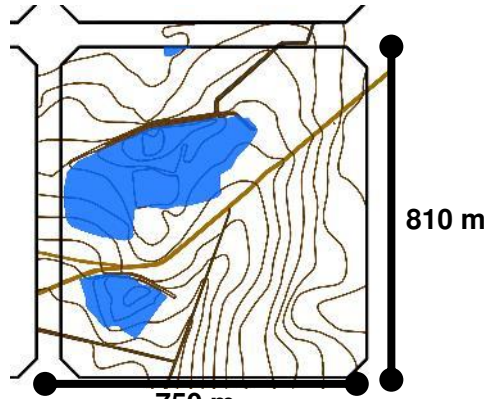


Need for the project:

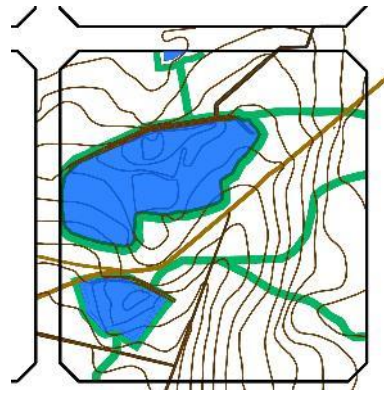
- To integrate TOD principles in Designing the city.
- To preserve natural terrain and water networks.



LAYERED APPROACH TO SECTOR DESIGN



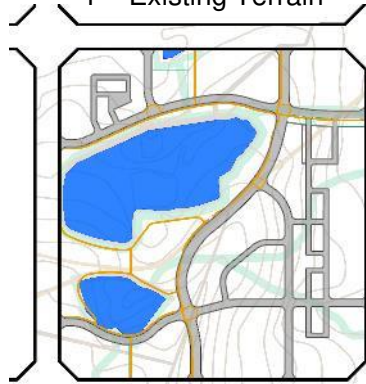
750 m
1 – Existing Terrain



2 – Riparian Corridors



3 – Road network



4 – NMT Network



5 – Amenities and Commercial Areas aligned to the NMT and open spaces



6 – Final layout



IMPACT

TOD PRINCIPLES	PROPOSALS
Complete streets (Walking and cycling)	Walking Grid of 150m x 150 m ¹ , Connected Greens, Safe Junctions, Bicycle Paths
Transit Supportive Uses (Active Edges)	Shared uses along the transit corridors, Mixed/Commercial Uses on the ground floor, Permeable edges.
Integrated Transport (Public Transit)	The design integrates the feeder bus stops, thus making the transit stations accessible to both housing and public open spaces.
Public Spaces (Open Spaces)	Varied hierarchy, Inclusive greens, Inter-connected
Cultural Landscapes (Historic and Environmental)	The design respects the natural terrain. The valleys are retained. The traditional routes connecting the existing villages are also retained thus helping to preserve the memory of the place.
Compact development (Mixed Use and Density)	Tiered Density along the transit routes. Mixed-uses proposed at the junctions

1 - A Connectivity Index measures how well a road network connects destinations (VTPI 2012). One measure is the number of surface street intersections within a given area, such as a square kilometre; the more intersections, the greater the degree of connectivity. Generally 50 intersections per square kilometre is considered acceptable (Ewing and Cervero 2010) (MoUD n.d., 28). An Accessibility Index is a ratio of actual travelled distances to the direct travel distance. An index of 1.0 is considered best and an average of 1.5 is considered acceptable (UN Habitat 2013).



REIMAGING MIDC MAROL, MUMBAI

SCALE OF TOD: STATION AREA LEVEL

CATEGORY: RETROFITTING

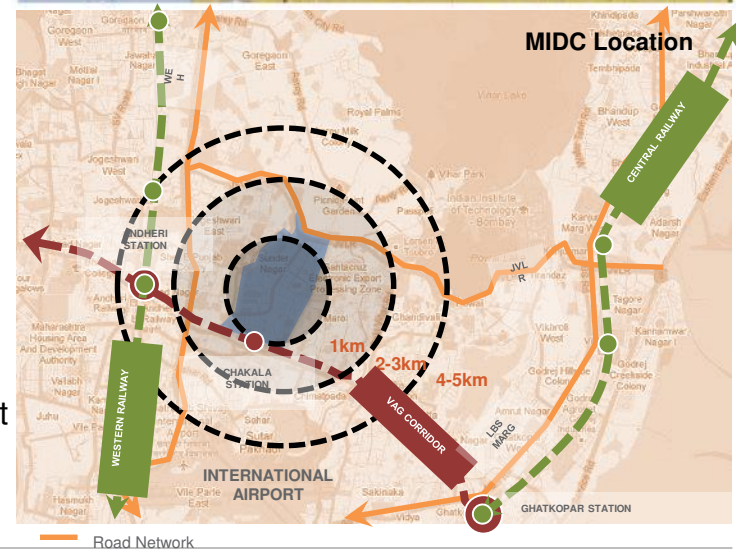
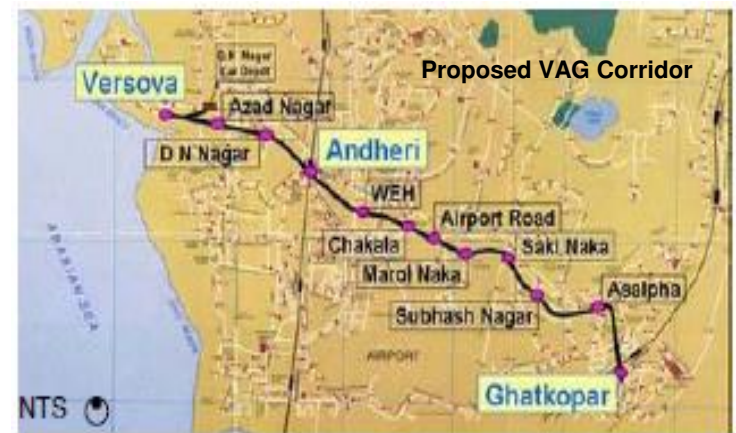


BACKGROUND

- Location : MIDC Marol is adjacent to Chakala Metro Station located on the VAG corridor.
- MIDC Marol is a planned industrial area in 1961 with an area of 127.52 Ha.
- Floating Population: ~ 1.8 lakh people (2012)
- As per DPR Mumbai MRTS Project: VAG Corridor, (Feb 2005) the area is expected to have 2700 persons/ hr (45 p/min) in the year 2021.

Need for the Project:

- Industrial to business district with excellent public transport connectivity
- Affordable real estate compared to CBD's.
- Main mode of transport: 56% walk, bicycle and use public transport
- Estimated number of pedestrians during a peak hour = 1,05,000*



*Includes predominant mode of transport, last mile connectivity and stage of trip i.e. from bus stop or train to the office; does not include SEEPZ and residential areas



OBJECTIVE

- To provide a safe, comfortable and convenient environment for pedestrians within MIDC Marol .
- Improve pedestrian access to Chakala metro station.
- Act as a pilot for improving pedestrian access and mobility, providing amenities, regulating street vending and parking in other areas.



Main mode of transport to and from MIDC Marol



EXISTING SCENARIO OF STREETS



MIDC: Insufficient footpath widths and large pedestrian volumes



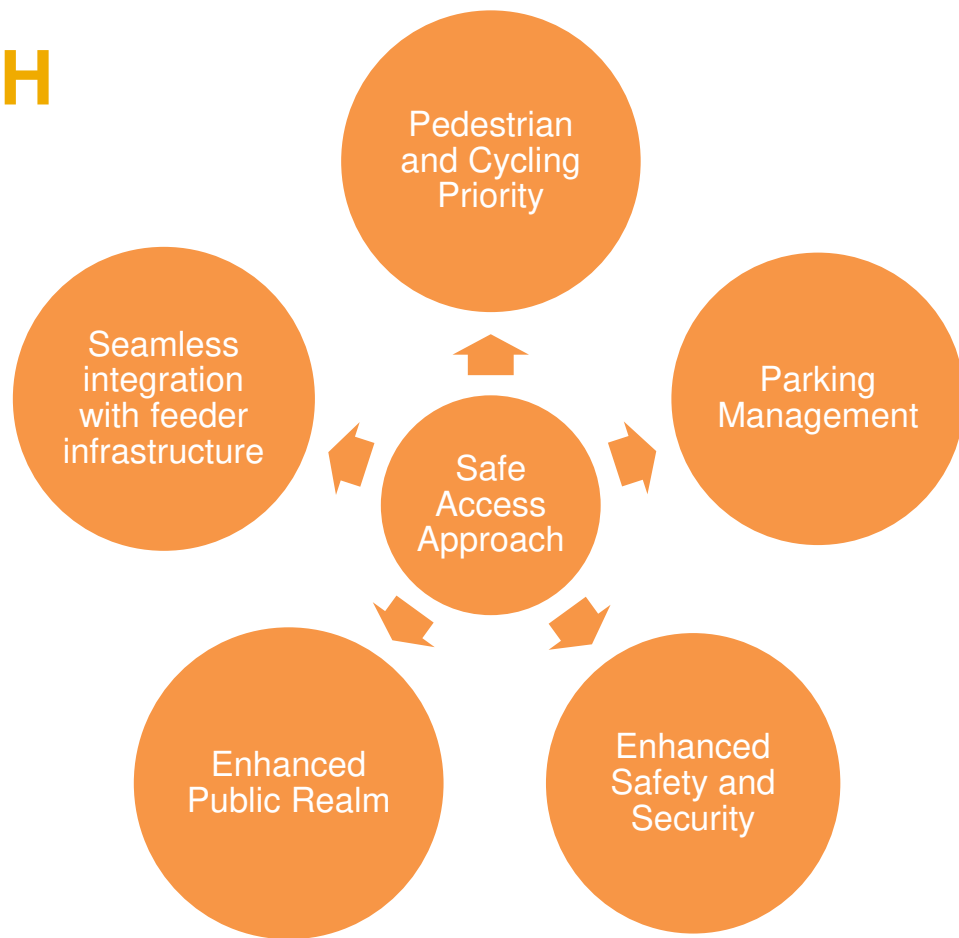
MIDC: Poorly maintained walkways



MIDC: Inaccessible and unclean walkways



APPROACH



APPROACH

- Streets as Public Spaces
- Plan for Women's Safety, Universal Access & Vendors in Street Design



Opaque edges



Semi-porous and porous edges draw people



PROPOSALS

Pedestrian Priority: Complete Streets

◄-----► Introducing pedestrian networks

Parking Management: TDM

PP Parking management strategy

■ Parking private vehicles in depots

Enhanced Safety and Security: Complete Streets

— Road Safety in Street Design

● Intersection geometry corrections

An Enhanced Public Realm: Public Spaces

Design Streets as Public Spaces

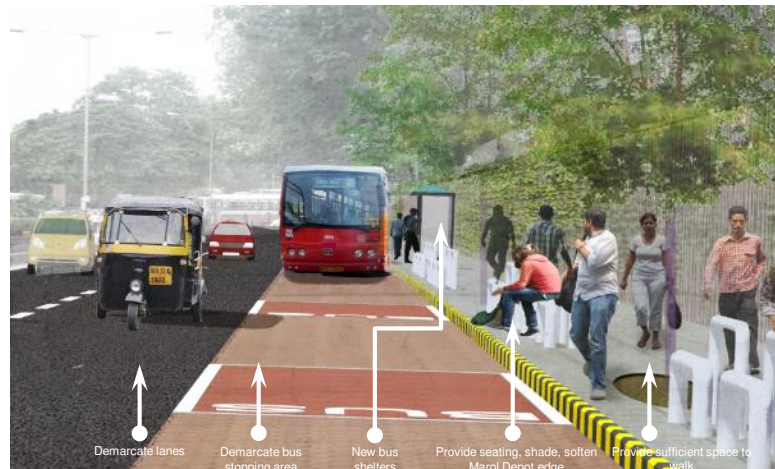
○ Creating Nodes / Place markers

SV Street Vending Strategy

SS Street Furniture and Signage guidelines



PROPOSALS



CONTINUED...

- Coordinated Signage System
- Nodes or Place Markers



Signage at major, minor nodes, streets

Signage at bus shelters

Source: Andrew Collins : <http://aavtravel.about.com/od/gaydestinationgalleries/ig/Photos-of-Gay-Asheville/Flat-Iron-Sculpture.htm>

Source: EMBARQ India



WRI INDIA

IMPACT

- Improved walking conditions ensuring safe access along 3 kms of road length
- Improved accessibility for around 2 lakh people
- Expected to scale up to 10 kms in MIDC Marol
- Pilot for improving business districts



SCALES OF TOD



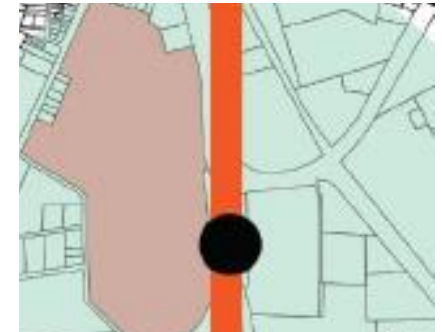
Region/City Level



Corridor level



Station area level



Site level

CATEGORIES OF TOD



Urban Infill or Redevelopment

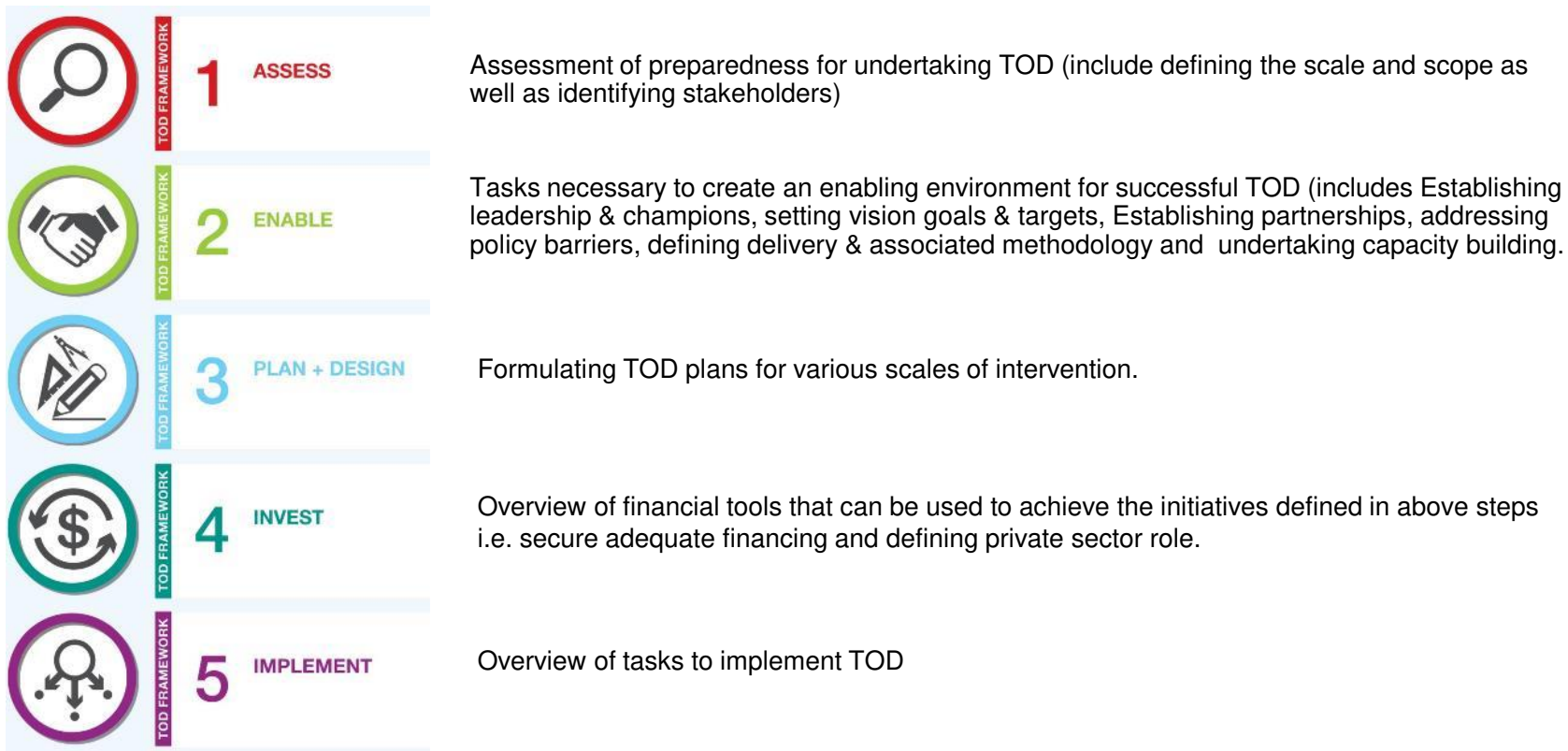


Retrofitting



Greenfield

STEP-BY-STEP APPROACH TO TOD



PROCESS FOR PREPARING TOD FOR VARIOUS SCALES

Steps	Stages	Scales of TOD			
		City level	Corridor Level	Station area level	Site level
Assess	Mapping.	<ul style="list-style-type: none"> Map land uses and key developments. Identify activity generators. Identify priority transit demand corridors. 	Map transit alignment and station locations.	<ul style="list-style-type: none"> Identify station area Planning boundary and influence zone. Map available data for station area. 	Identify site context.
	Delineation of area.	Delineate influence zone of Transit.	Delineate influence zone along corridor.		
	SWOT Analysis.	<ul style="list-style-type: none"> Determine development context. Identify goals and targets. 	<ul style="list-style-type: none"> Analyse development opportunities. Assess infrastructure carrying capacities. Evaluate connectivity alternatives. 	Conduct SWOT analysis.	<ul style="list-style-type: none"> Review of Planning documents followed by existing conditions baseline assessment. Conduct an opportunities and constraint analysis.
Plans + Design	Classification/Typologies.		Develop station area typologies.	Develop Station area programming alternatives.	Prepare site development program alternatives.
	Proposals.	Draft city wide TOD Plan.	Prepare corridor TOD strategic plan.	Prepare station are concept plan.	Develop conceptual site master plan and Urban Design scheme.
Enable Invest Implement	Statutory alignment and Implementation strategy	Establish statutory/ Planning relevance.	Establish statutory/ Planning relevance.		Financial Viability and Implementation strategy.

THANK YOU!



<https://thecityfixlearn.org/>

PRERNA V MEHTA
LEAD – URBAN DEVELOPMENT
EMAIL: prerna.mehta@wri.org