ASSESSING TOD
A LIST OF INDICATORS

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FOREWORD

The Smart City Mission has directed the attention of the urban sector in India to the need and benefits of following an integrated approach to the formulation of city development strategies and the preparation of purposeful projects which can be implemented with efficiency. The Mission has also made us highly conscious of the interrelationships between planning, governance, finance and capacity; the fact that all these aspects must be addressed while envisaging a project or a development strategy. The outcomes that are expected from such an integrated and holistic approach are an improved quality of life, better quality of assets and enhanced efficiency and sustainability.

One of the fundamental principles of smart cities is the integration between land use and transportation. Urban historians will remind us that this integration is at the heart of city planning. Even a cursory glance at the oldest cities, which we admire for their streets and public places as much as their buildings, reveals the inherent bond between the spaces for movement and the spaces for rest. However, this bond became weak during the late 20th century because of proliferating modes of personal transportation and rampant unplanned urbanisation, which skewed the balance between density of population and land use and provision of basic services. The 'smart' city is one that aims to restore the balance and to reclaim the public purpose of cities, which is expected to result in improved economic and social performance.

Over the last several months, NIUA was engaged in a research project on Transit Oriented Development in Indian Smart Cities. As a part of this project, NIUA published *'Transit Oriented Development for Indian Smart Cities — A Global Review of Transportation-Land-Use Integration'* in September 2016. This publication established five constructs-Urban Density, Urban Diversity, Urban Design, Housing and Mobility — as the core themes in a TOD. This publication was followed up by interactions with over 10 Indian smart cities through national, international workshops and an international immersion visit. NIUA is now pleased to published the final set of deliverables in this project. It includes three Guidance Documents with the purpose of helping Indian smart cities in the process of implementing TOD. The three Guidance Documents are:

- ***A Smart(er) TOD — Learnings from MoUD's TOD Guidance Document and Smart City Plans*** is a study of TODs in 21 Smart Cities with respect to the Ministry of Urban Developments' TOD Guidance document.
- ***Game Changers in Transit Oriented Development*** discuss two important tools in operationalising TOD- Value Capture Financing for financial sustainability and Form-Based Codes for community-driven urban design.
- ***Assessing TOD — A List of Indicators*** compiles indicators of TOD within the five constructs established in *Transit Oriented Development for Indian Smart Cities — A Global Review of Transportation-Land-Use Integration.*

These publications illustrate the opportunity, role and scope of TOD in Indian Smart Cities.

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Prof. Jagan Shah

Director, NIUA

ABBREVIATIONS

ABD	Area Based Development
AH	Affordable Housing
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
BRTS	Bus Rapid Transit System
CDP	City Development Plan
CIDCO	City and Industrial Development Corporation
DCR	Development Control Regulation
DDA	Delhi Development Authority
DU	Dwelling Unit
ECS	Equivalent Car Space
EWS	Economically Weaker Section
FAR	Floor Area Ratio
FSI	Floor Space Index
ha	Hectare
HH	Household
HIG	High Income Group
ICT	Information & Communication Technology
IPT	Intermediate Para-Transit
IUT	Institute of Urban Transport
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
km	Kilometer
LIG	Lower Income Group
LoS	Level of Service
LPCD	Liters Per Capita per Day
LRT	Light Rail Transit
m	Meter
MIG	Middle Income Group
MoHUPA	Ministry of Housing and Urban Poverty Alleviation
MoUD	Ministry of Urban Development
NMSH	National Mission on Sustainable Habitat
NMT	Non-motorised Transport
PBS	Public Bicycle Sharing
PMAY	Pradhan Mantri Awas Yojana
PPH	Person Per Hectare
PPHPD	Passengers Per Hour Per Direction
PPP	Public-Private Partnership
RAY	Rajiv Awas Yojna
ROW	Right of Way
SCM	Smart City Mission
SCP	Smart City Plan
SFCPoA	Slum Free City Plan of Action
SLB	Service Level Benchmark
sq.ft.	Square Feet
sq.km.	Square Kilometer
sq.m.	Square meter
SUTP	Sustainable Urban Transport System Project
TOD	Transit Oriented Development
UDD	Urban Development Department
ULB	Urban Local Body
URDPFI Guidelines	Urban and Regional Development Plans Formulation & Implementation Guidelines

CONTENT

INTRODUCTION

Under the Smart City Mission, out of 60 selected cities (Light House, Fast Track and Round 2 cities) 41 cities have TOD as a part of their Smart City Plan (24 cities proposed TOD as strategy, while 17 cities have land-use-transportation integration as development strategy). Global examples shows that successful TODs are a result of coordinated planning initiatives implemented and monitored over a period of time. Any TOD planning broadly involves five constructs - Urban Density, Urban Diversity, Urban Design, Mobility and Housing - as discussed in NIUA's *Transit Oriented Development Framework for Indian Smart Cities: Global Review of Land-use-Transportation Integration.*

Indicators are important for assessing and monitoring TOD's implementation, this publication compiles a list of indicators from various sources under the five constructs. The idea is to help the decision makers in the city to remain informed about the major TOD constructs and indicators/standards that address these constructs at various planning and implementation stages. Structured in two parts, the publication provides an opportunity to establish a measurable/ quantitative understanding of various parameters that helps in achieving the desired outcomes of any TOD plan.

1. **Indicators for Constructs of TOD** – TOD implementation is based on an integrated approach towards land-use and transportation planning. This section enlists the indicators under TOD constructs of Urban Density, Urban Diversity, Urban Design, Housing and Mobility. It provides a list of 71 indicators along with thresholds/targets that a city needs to acheive/aim for in a successful TOD.

2. **City Dossier** - In order to understand the context within which interventions can have an impact on TOD, it is important for the cities to look at statistics related to existing growth and transit scenario. This section provides the city level information/data which is required to *think* TOD. Based on the indicators discussed in part I, Gwalior and Bhopal are documented. A greater detail about TOD in these cities is available in the publication *A Smart(er) TOD.*

This publication will help cities to start visualising their TOD portfolio by building the database of indicators, projects and policies. This is highly necessary since a TOD has a long term implementation period and therefore risk can be minimised by investing significant time and resource during planning stage. The breadth and depth of the indicator attest to the challenging yet exciting prospect of developing a TOD portfolio for a city and this publication hopefully will help the cities to build their own.

These indicators and their values are based on the list provided by the MoUD in their TOD Guidance Document.

INDICATORS
FOR CONSTRUCTS OF TOD

DENSITY / DIVERSITY / DESIGN

BENEFITS

- Centre for Transit Oriented Development (CTOD) estimates placing jobs near transit results in 7.7% fewer miles per year.
- For every 1% increase in number of residents driving to work leads to a 73% decrease in the odds that a randomly selected individual would have a neighborhood social tie. (1142 Measuring TOD benefits)
- American Housing Survey suggests the presence of retail near rail stations can boost transit's commute mode share by as much as 4%. (TCRP report 128 TOD)
- Every 100,000 sq.ft of additional office and retail floor space near an Arlington County Metrorail station increased average daily boarding and alighting at that station by around 50 customers, all else being equal. (TCRP report 102)
- Every 1,000 additional residential units around a station, when combined with 100 additional railcar passenger spaces per day passing through the station, led to more than 50 additional daily station boarding and alighting. (TCRP report 102)
- In California, on average, every addition of 100 employees per acre was associated with a 2.2% increase in rail commuting. (TCRP report 102)
- A study of six large suburban employment centers found that the existence of a retail component in an office building increases transit commute shares by 3%. (TCRP report 102)

URBAN DENSITY

Indicators		Standards/Targets	Source	

Densities along the transit corridor / TOD zone (800 m)	Land-use Density (FSI/ FAR)	Ahmedabad
		• Maximum 4 FAR in TOD influence area
		• 5.4 FAR in CBD area
		• Citywide maximum
		  • Residential – 2
		  • Non-residential – 2.5
			Ahmedabad Development Plan 2021	◆

	Minimum Population Density	175 PPH	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆
	Minimum Dwelling Unit	250 DUs per ha	MoUD TOD Guidance Document, 2016	◆
	Minimum Job Density	Neighborhood Centers with BRT/Bus • 10 - 15 jobs per acre (25-37 jobs per ha) Regional Centers with Heavy Rail • 200 – 250 jobs per acre (494 – 618 jobs per ha) King's cross - 926 jobs per ha Canary Wharf - 2700 jobs per ha	Florida DOT	◆
Citywide compared to that along transit corridor	Land-use Density (FSI/ FAR) of development		MoUD TOD Guidance Document, 2016	◆
	Population Density		MoUD TOD Guidance Document, 2016	◆
	Dwelling Unit Densities (Housing Targets)		MoUD TOD Guidance Document, 2016	◆
	Jobs to Household ratio	Neighborhood Center with BRT/Bus: 1:1 Regional Center with Heavy Rail: 6:1	Florida DOT	◆
Citywide (%)	Population living at densities greater than TOD standards		NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆
	Total residential population, jobs and visitors higher than baseline density		MoUD TOD Guidance Document, 2016	◆

STANDARD - Threshold value ◆
EXAMPLE - Existing/Proposed case ◆
INDICATOR - indicative status of the parameter ◆

URBAN DIVERSITY

Indicators		Standards/Targets	Source	
Citywide	Preparation of a street vending plan		Street Vendors act, 2014	◆
	Streets having mixed use development	85%	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆
Jobs	Earmarking of space or area for Vending Zone near Transit Stations	3000 sq.m. reserved for hawking zone near multimodal transit station	Smart City Proposal Ujjain, 2015	◆
	Area per Employee (for formal/informal jobs)	15 sq.m.	Knoll Workplace research, March, 2013	◆
	Informal units for urban street vendors	• Commercial (retail/wholesale) - 3 to 4 units per 10 formal shops • Bus Terminal - 1 unit per 2 bus bays • Residential – 1 unit per 1000 population	URDPFI guidelines, 2014	◆
Housing Mix (Within TOD)	Household Type	Male Headed | Female Headed Un-married | Married | Widow | Divorced Tenure - Owned | Rented Income Group – EWS | LIG | MIG | HIG	Census classification MoHUPA	◆
	Percentage of all residential units occupied by EWS	20%	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆

STANDARD ◆ **EXAMPLE** ◆ **INDICATOR** ◆

URBAN DESIGN

Indicators		Standards/Targets	Source	
Existence of statutory provision of creating public access through large blocks		Provision under DCR/Zoning regulations		◆
Percentage of developed versus undeveloped land within the development area boundary		• 2/3rds of the projected growth in population is housed within existing developed lands • Densification through redevelopment/ infill of existing Urban Areas is to be prioritised over expansion • New development in peripheral zone to abuts existing developed areas with density of 175 PPH	NMSH, 2009 Parameters	◆
Adoption of street design guideline for the transit corridor with an emphasis on NMT infrastructure		☐	NMSH, 2009 Parameters	◆
Land-use Management (within TOD)	Percentage of land area zoned for mixed use	**internally complementary** – residential use of minimum 25% to maximum 85% of the total developed floor area **contextually complementary –** • in predominantly residential - minimum 50% or more of floor area is non-residential uses • in predominantly non-residential - minimum 50% or more of floor area is residential uses TOD should be both internally and contextually complementary	TOD standards v1.0 ITDP	◆
	Per capita green/open space within existing development	10 - 12 sq.m. per person	URDPFI Guideline 2014, Service Level Benchmark MoUD	◆ ◆
Buildings (within TOD)	Average number of shops and pedestrian building entrances per 100 m of block frontage	5 or more	TOD standards v1.0 ITDP	◆ ◆
	Percentage of block frontage that abuts public walkways and provides visual connection to building interior activity	75% or more *(Total length of the building frontages that qualify as visually active/total length of building frontage that abuts public walkways)*	TOD standards v1.0 ITDP	◆ ◆
	Urban Form – Height to Width Proportion (a predictor of degree of enclosure)	For all Urban Area: 1:1 Minimum In Urban Core: 3:1 or higher In Urban Core Residential: 3:2 For Urban street place making: 1:2	GREAT STREETS San Diego – Changing the Conversation: From Building Heights to Place Making - Walter Chambers, 2011	◆ ◆

Indicators		Standards/Targets	Source	
Street Design	Percentage of intersections with complete, wheel chair-accessible crosswalks in all directions	100% *(For development standards refer to CPWD – Guidelines & space standards for barrier free built environment for disabled and elderly person)*	TOD standards v1.0 ITDP	◆
	Shading of footpaths	Trees along the street no more than 12 m apart except at intersections.	NMSH, 2009 Parameter - 3.1.1 Walkability Parameter	◆
	Percentage of length of streets > 12 m ROW with trees as per standards	More than 75%	TOD standards v1.0 ITDP	◆ ◆
	Percentage of length of streets < 12 m ROW with trees as per standards		NMSH, 2009 Parameter - 3.1.1 Walkability Parameter	◆

STANDARD ◆ **EXAMPLE** ◆ **INDICATOR** ◆

HOUSING

BENEFITS

- Residents living near transit are 5 to 6 times more likely to commute by transit than other residents in their region. (TCRP report 128 TOD)
- A California study found that among those who drove to work when they lived away from transit, 52.3% switched to transit commuting on moving within a 1⁄2 mile walking distance of a rail station. (TCRP report 102)
- EPA estimates TOD housing generated 45% fewer Vehicle Miles Travelled than traditional housing in US.

HOUSING

Indicators		Standards/Targets	Source	
Automated Building Plan Approval System		☐	AMRUT Reform (MoUD)	◆
Location	Percentage of residential and commercial/ institutional use within 800 m of transit station	30% Residential, 30% Commercial	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆ ◆
	Percentage of population resettled or rehabilitated within 800 m of transit station			◆
	Percentage of residences in TOD zones that have daily needs retail, parks, primary schools and recreational areas accessible within 400m walking distances	95%	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆
	Percentage of informal settlements redevelopment in-situ	100%	PMAY (MoHUPA)	◆
Typology	Total number of government housing units created for mixed-incomes	At-least 20% of all residential units to be occupied by EWS LIG - 20% MIG I- 35% MIG II- 25% HIG - 20% LIG >= 20% MIG >= 20% HIG <= 50%	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters Vashi - CIDCO - socioeconomic profile household in planned nodes in Navi Mumbai – 2010 West Bengal Housing Board, 2015	◆ ◆
	Percentage of housing units less than 40 sq.m. provided	50% units – 32-40 sq.m. 50% <= 65 sq.m.	MoUD TOD Guidance Document, 2016 (TOD policy as part of MPD-2021, DDA, 2015)	◆ ◆
	Percentage of residential units provided as affordable housing in market rate development	Minimum 15% of the FAR as affordable housing for housing developments on plots > 2000 sq.m.	MoUD TOD Guidance Document, 2016 - Housing for All Odisha, 2015	◆ ◆

Indicators		Standards/Targets	Source	
Typology	Percentage of group housing units, duplexes, and older housing stock out of total housing	11.12% of total residential land-use under group housing	Noida Development Plan 2031	◆ ◆
	Size of the Dwelling Unit	50% units of 32 - 40 sq.m. 50% < = 65 sq.m. 15% of FAR for all TOD projects to be allocated to rental or for sale housing with unit sizes < 25 sq.m. Carpet size - EWS: 25 – 30 sq.m. LIG: 48 – 65 sq.m. MIG I: 65 – 85 sq.m. MIG II: 85 – 100 sq.m. HIG: 100 sq.m. above	MoUD TOD Guidance Document, 2016 West Bengal Housing Board	◆
Percentage of rental housing provided			MoUD TOD Guidance Document, 2016	◆
Percentage of housing units built on PPP mode				◆

STANDARD ◆ **EXAMPLE** ◆ **INDICATOR** ◆

MOBILITY

BENEFITS

Savings:

- New Jersey - Daily benefits for introducing TOD were savings of $20,000 to $30,000 for congestion costs, $1,100 for vehicle operating costs, $200 for air pollution costs, $14 for noise costs and a loss of $5 for maintenance costs. (1142 Measuring TOD benefits)
- $1500 to $8800 per person per year saving when commute is done in train instead of highway in case of New York agglomeration area.
- In the US, average family spending is about 32% of income on housing, 19% on transportation. TOD can reduce transportation costs up to 9%.
- In a compact development close to transit - costs of daily travel in the top 20 travel-demand states are reduced from $769.2 million to $750.5 million. This is an overall saving of $18.7 million daily or 2.4%.(TCRP report 74 TOD)

Health:

- New Jersey – 78% of riders living near a station met daily physical activity recommendations. (1142 Measuring TOD benefits)

Resources:

- Regional TODs can reduce (1142 Measuring TOD benefits):
  - need for road construction by 1,88,300 lane-miles
  - long-term maintenance costs.
- Average Car Ownership (TCRP report 128 TOD):
  - Household living in a TOD - 0.9 cars
  - Comparable households not living in a TOD - 1.6 cars
- California TOD study- upto 20% to 40% lower annual rates of driving in people living working and shopping near major transit station
- In a compact development close to transit– daily miles travelled by public transit increased by 5.8 million or 21.3% (TCRP report 74 TOD)
- In a compact development close to transit - daily miles traveled for private vehicles decreased by nearly 56 million or 4.7% (TCRP report 74 TOD)

MOBILITY

Indicators		Standards/Targets	Source	
Mode share targets		Target set in Transportation/Mobility Plans for walking, cycling and other modes	MoUD TOD Guidance Document, 2016	◆
Trip Per Capita			MoUD TOD Guidance Document, 2016	◆
Vehicle kilometers traveled/trip lengths (how far and how frequent travel is required)		Average Trip Length by purpose - (Commute to work and other trips) Average Trip Length by Modes	MoUD TOD Guidance Document, 2016	◆
Percentage mode share of public transport and para transit versus private vehicles			NMSH, 2009 - 3.4.1 Transit Parameter	◆
Housing Mix (Within TOD)	Ridership statistics for public transport	BRTS – Minimum 4000 to 45000 passengers per hour per direction	URDPFI Guideline, 2015, Table 8.19	◆
	Public Transit Mode Share	Public transport and NMT (excluding walk) - 80% of all vehicular trips Based on population • below 1.5 million: 30 – 40% • 1.5 to 6 million: 40 – 70% • 9 million and above: 75%	NMSH, 2009 - 3.4.1 Transit Parameter URDPFI Guideline, 2015 Table 8.18.	◆
	Fleet size	0.4 Buses per 1000 population in metro cities	IUT SLB for urban transport	◆
	Percentage of buses that adhere to Urban Bus Specification	75 - 100%	LoS 1 - IUT SLB for urban transport	◆
	Percentage of stops with frequency of service > 15 buses per hour		IUT SLB for urban transport	◆
	Percentage of residents within 800 m (10 minute walking distance) of high quality public transport stations	80% of the population	NMSH, 2009 - 3.4.1 Transit Parameter	◆ ◆
	Percentage of residences in TOD zones connected to employment and public and institutional services by public transport/bicycle/walk/combination of two or more	95%	NMSH, 2009 - 3.5.1 Density, Diversity and Compactness Parameters	◆ ◆
	Percentage of IPT modes organised under formal management system		MoUD TOD Guidance Document, 2016	◆
Street Design	Percentage of total length of streets with motor vehicle carriageway >=10 m having dedicated & segregated cycle tracks.	100% Street with speeds above 30 km/hr must have exclusive/protected cycle track in both directions.	NMSH, 2009 - 3.2.1 Cycling Parameter URDPFI Guideline, 2015	◆ ◆
	Percentage of total length of streets with motor-vehicle carriageway >= 10 m equipped with cycle tracks to standards.	50% of the network should have NMT facilities	for LoS 1 - IUT SLB for urban transport - Table 8.3.1	◆ ◆
	Crossings per sq.km.	At least 5 safe streets crossing for bicycles not more than 250 m apart.	NMSH, 2009 - 3.2.1 Cycling Parameter	◆
	Percentage of total length of streets with streets crossing per sq.km. as per standards	100%	NMSH, 2009 - 3.2.1 Cycling Parameter	◆
	Number of Intersections of public pedestrian and cyclist network per sq.km	50 intersections per sq.km 55 to 80 pedestrian intersections per sq.km	NMSH, 2009 - 3.3.1 Connect: Create dense networks of streets and paths TOD Standards v1.0 ITDP	◆
	Percentage of street with carriageway width for one way motor-vehicle traffic of over 10 m.	Nil	NMSH, 2009 - 3.3.1 Connect: Create dense networks of streets and paths	◆ ◆
	Percentage of streets with total carriageway> 10 m having 5 or more traffic calmed or signalised crossing per km	Target 100%	NMSH, 2009 - 3.1.1 Walkability Parameter	◆ ◆

Indicators		Standards/Targets	Source	
Street Design	Percentage of intersections that have pedestrian crossings and refuges in all directions	Every crossing should be universally accessible. (55 to 80 pedestrian crossing density per sq.km)	NMSH, 2009 - 3.1.1 Walkability Parameter TOD standard v1.0 ITDP	◆ ◆
	Total length of 12+ m streets with unobstructed footpaths as a percentage of the total length of streets in the city	A continuous unobstructed footpath on each side of all streets with ROW > 12 m.	NMSH, 2009 - 3.1.1 Walkability Parameter	◆
Parking	Percentage of on-street parking that is charged	Minimum 50%,Target 100%	NMSH, 2009 - 3.6.2 Shift Parameter	◆
	Total road area used for motor vehicle travel and on-street parking as percentage of total development land area	Between 12% to 21% *(Total area of traffic lanes + intersection space - marked crosswalk space + area of parking lanes)/Total land area of the development sites up to the centerline of peripheral streets*	TOD Standard v1.0 ITDP	◆
	Number of on-street parking spaces converted to public transport and NMT	Can be reclaimed for – open spaces/ green spaces/public amenities etc	NMSH, 2009 - 3.6.2 Shift Parameter	◆
	Average off-street parking requirement for an average residential unit	Mixed use development - Parking @ 2.0 ECS per 100 sq.m. built up area Floor spaces provided for parking spaces are included as part of FSI 1. within 250 m a. 0.35 Residential b. 0.45 Commercial 2. within 500 m a. 0.70 Residential b. 0.90 Commercial 5% of parking space needs to be dedicated for bicycle parking in TOD areas. 0.2 space per worker - at job centers	URDPFI Guideline, 2015 - Table 8.11 and Table 8.12 Mumbai TOD plan - WRI Report NMSH - 3.6.2 Shift Parameter	◆
	Total off-street area dedicated to parking as a percentage of total development land area	*(cumulative area of all off-street parking areas + driveways)/total land area of the development site*	TOD Standard v1.0 ITDP	◆
	Shared parking space	Plots with mixed uses share a common parking lot - minimum requirement of number of parking spaces shall be reduced by 40% of the total requirement as per the regulations	NMSH, 2009 - 3.6.2 Shift Parameter	◆
	Ratio of parking required within 800 m of a transit station versus all other areas		MoUD TOD Guidance Document, 2016	◆
Public Bike Sharing system		At least one cycle sharing system with ≥ 5,000 cycles and automated payment in cities with a population of over 5 lakh (benchmark census year 2011). • Minimum System coverage: 10 sq.km • 10 - 16 stations per sq.km. • 10 - 30 bicycle per 1000 residents within coverage area • 2 - 2.5 docking spaces per bicycle 5% of parking dedicated for bicycle in public buildings in TOD areas	NMSH, 2009 - 3.2.1 Cycling Parameter ITDP, MoUD TOD Guidance Document, 2016	◆
Daily trips (or users) per bicycle		4 - 8 daily users per bicycle 1 daily trip per 20 - 40 residents	ITDP, MoUD TOD Guidance Document, 2016	◆
Inter modal integration of formal public transport, para transit and cycle sharing		Within 200 m from each other	NMSH, 2009 Parameter	◆

STANDARD ◆ **EXAMPLE** ◆ **INDICATOR** ◆

ECONOMIC

BENEFITS

- **Savings in Infrastructure Costs -** TOD can reduce fiscal outlays for water, sewage, and roads by as much as 25% (About $10 billion annually in case of US). (TCRP report 74 TOD)
- **Efficient use of Land -** TOD compact development could save 2.5 million acres of land by 2025 in the case of US. (TCRP report 74 TOD)
- **Increased retail sales-** Chicago union station generated $12.5 million in annual sales. (TCRP report 74 TOD)
- In California, addition of TOD reduced Vehicular Miles Travel by up to 9% compared with baseline conditions, resulting in an economic benefit of $0.15 per trip. (TCRP report 102)
- In Arlington county, Ballston Metro TOD corridor.
  - Generated 32. 8% of county's real estate tax revenue with a development covering 7.6% of land (TCRP report 102)
- 55 acre La Mesa village plaza in San Diego has generated $3.2 million in additional tax revenues due to higher retail activities
- Portland TOD – savings of $1.1 billion per year due to a 4 mile per person reduction in the daily commute
- TOD generated 40% - 100% premium on property values in compact development as compared to nearby single use subdivisions in US
- TOD in Hong Kong combines rail + property development. From 1980 to 2005, it led to a net direct financial return of $140 billion (land premiums, market capitalisation, value of injected equity capital)
- $3.127 billion raised by sale of TDR along rail properties in Singapore rail + property development

CITY DOSSIER

BHOPAL

City-General overview	Bhopal	Source
Population	1,795,648	Census 2011
Area	285.88 sq.km	Census 2011
Population Density	62.81 PPH	Census 2011
Decadal population growth rate	24.00%	Census 2011
Share of ULB population in District Urban Population (%)	93.80%	Census 2011
Percentage change in municipal area/Area (2001 – 2011)	Nil	
Average trip length	7 km	A Review on Urban Public Transport System of Bhopal City International Journal of Advanced Engineering Technology E-ISSN 0976-3945
Percentage share of Public Transit in mode share	Public transport – 48.6% IPT – 5.7% Private mode – 37.4% NMT – 8.3%	Bus Rapid Transit System in Bhopal City: A Review
Whether the city has a Master Plan | Development Plan | Comprehensive Development Plan	Master Plan/DP 2005	
Whether the State has a TOD policy	No	
Whether the State has a affordable housing policy/on-going scheme	Draft M.P affordable housing policy 2015	UDD, GoMP
Percentage of population living in slums	52%	MoHUPA-RAY- SFCPoA
Existing mode of Public Transit – City bus | BRT | Metro | Rail | any other	City Bus, BRTS, Rail	
Proposed Investment in public transport sector	95 Crore	Smart City Plan, Bhopal, 2015

AMRUT - Physical Infrastructure Indicators		MoUD standard	Bhopal
Water Supply	Household level coverage of direct water supply connections	100%	49.40%
	Per capita quantum of water supplied (LPCD)	135 LPCD	125 LPCD
Sewerage & Septage Management	Quality of water supplied	100%	99.00%
	Coverage of latrines (individual or community)	100%	92.00%
	Coverage of sewerage network services	100%	24.00%
	Efficiency of Collection of Sewerage	100%	31.85%
	Efficiency in treatment	100%	80.00%
Drainage	Coverage of storm water drainage network	100%	23%
Urban Transport	Service coverage of urban transport in the city	>=1	
	Availability of urban transport per 1000 population	>=0.60	
Green and Open Spaces	Per person park area (in sq.m.)	10-12 (sq.m.)	

URBAN DENSITY

Indicators		Bhopal		Source
		City	ABD	
Citywide compared to that along transit corridor	Land-use Density (FSI/ FAR) of development	Residential - 0 .75-1.33 FAR Commercial - 1.5 - 2.5 FAR Mixed use - 0.75 FAR		IBI group Study - SUTP
	Population Density	Citywide Gross – 62.81 PPH Mandate 125 PPH – 600 PPH	439.5 PPH	Smart City Plan, Bhopal, 2015 Bhumi Vikas Niyam 2012
	Dwelling Unit densities (housing Targets)	Citywide Net Residential density – 87 DUs per ha		CDP_JnNURM
	Jobs Density	Commercial – 391 Jobs per ha Industrial – 119 Jobs per ha		CDP_JnNURM

URBAN DIVERSITY

Indicators		Bhopal		Source
		City	ABD	
Preparation of a street vending plan Indicators		No		
Jobs	Earmarking of space or area for vending zone near transit stations		Dedicated zone for hawkers near open spaces	Smart City Plan, Bhopal, 2015
Housing Mix (Within TOD)	Household Type		Government houses from Type C-I (carpet- 28 sq.m. to 40 sq.m.)	Smart City Plan, Bhopal, 2015
	Percentage of all residential units occupied by EWS		1.70%	Smart City Plan, Bhopal, 2015

URBAN DESIGN

Indicators		Bhopal		Source
		City	ABD	
Adoption of street design guideline for the transit corridor with an emphasis on NMT infrastructure		Yes		BRTS phasing report
Land - use Management (within TOD)	Percentage of Land area zoned for mixed use		300 Acres of Shivajinagar for redevelopment	Smart City Plan, Bhopal, 2015
Buildings (within TOD)	Urban Form – Height to Width proportion (a predictor of degree of enclosure)	as per Bhumi Vikas Niyam 2012		

HOUSING

Indicators		Bhopal		Source
		City	ABD	
Automated Building Plan approval system		Yes		
Location	Percentage of informal settlements redevelopment in-situ	1204 House under RAY 13000 - PMAY		MoHUPA
Typology	Total number of government housing units created for mixed-incomes		LIG: 2.4% (carpet area 30-49 sq.m.) MIG I: 3.1% (carpet area 50-79 sq.m.) MIG II: 36% (carpet area 80-99 sq.m.) HIG: 53% (carpet area larger than 100 sq.m.) AH: 5.5%	Smart City Plan, Bhopal, 2015
	Percentage of housing units less than 40 sq.m. provided		5.1% units of less than 40 sq.m., out of this 4.1% is EWS and LIG housing , Affordable housing 5.5% with carpet area of 60 sq.m.	Smart City Plan, Bhopal, 2015
	Percentage of residential units provided as affordable housing in market rate development		5.5% of total housing proposed	Smart City Plan, Bhopal, 2015
	Percentage of group housing units, duplexes, and older housing stock out of total housing	Provision of duplex houses and group housing is a part of MP draft Affordable Housing Policy, 2015		RAY -SFCPoA - HUPA
	Size of the dwelling unit		5.1% units of less than 40 sq.m., out of this 4.1% is EWS and LIG housing , Affordable housing 5.5% with carpet area of 60 sq.m.	Smart City Plan, Bhopal, 2015
	Percentage of rental housing provided		Rental Housing for International Affiliates in residential zone	Smart City Plan, Bhopal, 2015
Percentage of housing units built on PPP mode			2700 houses	Smart City Plan, Bhopal, 2015

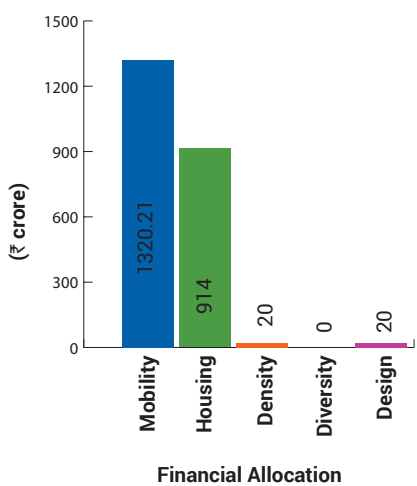
MOBILITY

	Indicators	Bhopal		Source
		City	ABD	
Citywide Parameters	Mode share targets	74% targeted mode share for Public Transit		IBI Group Study - SUTP
	Vehicle kilometers traveled/ trip lengths (how far and how frequent travel is required)	7 Km		A Review on Urban Public Transport System of Bhopal City International Journal of Advanced Engineering Technology E-ISSN 0976-3945
Public Transit	Ridership statistics for public transport	14.7% uses Public Transit to work		Smart Cities Handbook - CII
	Percentage of residences in TOD zones connected to employment and public and institutional services by public transport/ bicycle/walk/combination of two or more		ABD to be developed as mixed use land along 3 proposed LRT stations	Smart City Plan, Bhopal, 2015
Street Design	Number of intersections of public pedestrian and cyclist network per sq.km	at every 600 m at BRTS route and 150 m in other routes		A Review on Urban Public Transport System of Bhopal City International Journal of Advanced Engineering Technology E-ISSN 0976-3945
Parking	Average off-street parking requirement for an average residential unit	Multi-Family residential - 1 ECS per 100 sq.m. Commercial - 1 ECS per 50 sq.m. where shop size is more than 20 sq.m. Commercial- 1 ECS per 100 sq.m. of floor Space in other areas. Govt. semi-public and private offices - 1 ECS per 100 sq.m. of Built up area	Basement parking with high premium charges to dissuade car ownership	Development control Regulation (DCR) and IBI group study on SUTP Smart City Plan, Bhopal, 2015
Public Bike sharing	Public Bike Sharing System	Introduction of 500 bicycles at 50 stations		RFP - Cycle sharing programme
	Inter modal integration of formal public transport, para transit and cycle sharing		Intermodal hub at Shivajinagar and all the BRTS and LRTS station will be having cycle sharing stand.	Smart City Plan, Bhopal, 2015 and RFP Cycle sharing implementation

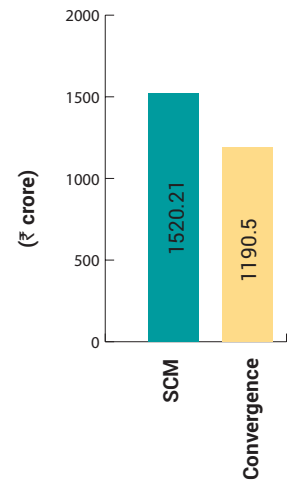
BHOPAL SMART CITY PROJECTS

Projects	Application	Cost (in ₹ cr.)
Area Improvement	ABD	20
Housing	ABD	914
Intelligent Street Lighting	Pan city	448.21
Miscellaneous (Site drilling, Landscaping, Flyovers to approach site, Development of public utilities)	ABD	627
Mobility	ABD	95
ICT	ABD	150
Sanitation	ABD	50.5
Electricity provision and Energy Efficiency	ABD	120
Smart Unified Governance	Pan city	200
Water supply	ABD	86

Smart City Plan, Bhopal, 2015



Financial Allocation



Source of Funding

SMART CITY PLAN - FINANCIAL PROPOSAL

₹ 456.5 crore for infrastructure development and up-gradation.

Note – the projects are not mutually exclusive. For example, Area Improvement project is mapped across Density and Design constructs.

ADDITIONAL INDICATORS THAT BHOPAL NEEDS TO ADDRESS

URBAN DENSITY

Densities along the transit corridor/TOD zone (800 m)

- Land-use Density (FSI/FAR)
- Minimum Population Density
- Minimum Dwelling Unit
- Minimum Job Density

Citywide (%)

- Population living at densities greater than TOD standards
- Total residential population, jobs and visitors higher than baseline density

URBAN DIVERSITY

Citywide -

- Streets having mixed use development

Jobs –

- Area per Employee (for formal/informal jobs)
- Informal units for urban street vendors

URBAN DESIGN

- Existence of statutory provision of creating public access through large blocks
- Percentage of developed versus undeveloped land within the development area boundary

Land Management (within TOD) -

- Per capita green/open space within existing development

Buildings (within TOD) -

- Average number of shops and pedestrian building entrances per 100 m of block frontage
- Percentage of block frontage that abuts public walkways and provides visual connection to building interior activity

Street Design -

- Percentage of intersections with complete, wheel chair-accessible crosswalks in all directions
- Shading of footpaths
- Percentage of length of streets > 12 m ROW with trees as per standards
- Percentage of length of streets < 12 m ROW with trees as per standards

HOUSING

Location

- Percentage of informal settlements redevelopment in-situ

MOBILITY

Citywide Parameters

- Trip Per Capita
- Percentage mode share of public transport and para transit versus private vehicles

Public Transit

- Public Transit Mode Share
- Fleet size
- Percentage of buses that adhere to Urban Bus Specification
- Percentage of stops with frequency of service > 15 buses per hour
- Percentage of residents within 800 m (10 minute walking distance) of high quality public transport stations
- Percentage of IPT modes organised under formal management system

Street Design

- Percentage of total length of streets with motor vehicle carriageway >=10 m having dedicated & segregated cycle tracks.
- Percentage of total length of streets with motor-vehicle carriageway >= 10 m equipped with cycle tracks to standards.
- Crossings per sq.km.
- Percentage of total length of streets with streets crossing per sq.km. as per standards

- Percentage of street with carriageway width for one way motor-vehicle traffic of over 10 m.
- Percentage of streets with total carriageway> 10 m having 5 or more traffic calmed or signalised crossing per km
- Percentage of intersections that have pedestrian crossings and refuges in all directions
- Total length of 12+ m streets with unobstructed footpaths as a percentage of the total length of streets in the city

Parking

- Percentage of on-street parking that is charged
- Total road area used for motor vehicle travel and on-street parking as percentage of total development land area
- Number of on-street parking spaces converted to public transport and NMT
- Total off-street area dedicated to parking as a percentage of total development land area
- Shared parking space
- Ratio of parking required within 800 m of a transit station versus all other areas

Public Bike sharing

- Public Bike Sharing system
- Daily trips (or users) per bicycle

GWALIOR

City-General overview	Gwalior	Source
Population	1,069,276	Census 2011
Area	173.68 sq.km.	Census 2011
Population Density	62 PPH	
Decadal population growth rate	40%	Census 2011
Share of ULB population in District Urban Population (%)	84%	District Census Handbook
Percentage change in municipal area (2011 - 2015)	144% (Current Municipal Area, 2015 – 423.35 sq.km.)	Smart City Plan, Gwalior, 2015
Average trip length		
Percentage share of Public Transit in mode share	Public Transport - 3% IPT – 4% Private Mode – 93%	Estimates from Vehicles registered as per Master Plan 2021
Whether the city has a Master Plan | Development Plan | Comprehensive Development Plan	Master Plan 2021	
Whether the State has a TOD policy	No	
Whether the State has a affordable housing policy/on-going scheme	Draft M.P Affordable Housing Policy 2015	UDD, GoMP
Percentage of population living in slums	20%	Smart City Plan, Gwalior, 2015
Existing mode of Public Transit – City bus | BRT | Metro | Rail | any other	Bus	Smart City Plan, Gwalior, 2015
Proposed Investment in public transport sector	339.3 crore	Smart City Plan, Gwalior, 2015

AMRUT - Physical Infrastructure Indicators		MoUD standard	Gwalior
Water Supply	Household Level Coverage of Direct Water Supply Connections	100%	74.08%
	Per Capita Quantum of Water Supplied (LPCD)	135 LPCD	123 LPCD
	Quality of Water Supplied	100 %	74%
Sewerage & Septage Management	Coverage of Latrines (individual or community)	100 %	93%
	Coverage of Sewerage Network Services	100 %	60%
	Efficiency of Collection of Sewerage	100 %	40%
	Efficiency in Treatment	100 %	25%
Drainage	Coverage of Storm Water Drainage Network	100 %	30%
Urban Transport	Service Coverage of Urban Transport in the city	>=1	
	Availability of Urban Transport Per 1000 Population	>=0.60	0.58
Green and Open Spaces	Per Person Park Area (buses)	10-12 (sq.m.)	1.83 sq.m.

URBAN DENSITY

Indicators	Gwalior		Source
	City	ABD	
Land-use Density (FSI/ FAR) of Development	Existing – 1.5 for residential, 1.75 for core commercial	Intent to increase along the TOD corridor	Smart City Plan, Gwalior, 2015
Population Density	Developed area density - 158 PPH	Developed area density - 320 PPH	Smart City Plan, Gwalior, 2015
Dwelling Unit Densities (Housing Targets)	11.6 DUs per ha (Gross)	24 DUs per ha (Gross)	Smart City Plan, Gwalior, 2015
Population Living at Densities greater than TOD Standards		100% of ABD population	Smart City Plan, Gwalior, 2015

URBAN DIVERSITY

Indicators	Gwalior	Source
	ABD	
Area Per Employee (for formal/ informal jobs)	12.14 sq.m. per employee (14000 jobs for 1.83 million sq.ft. proposed commercial)	Smart City Plan, Gwalior, 2015
Household Type	600 rental DUs	Smart City Plan, Gwalior, 2015

URBAN DESIGN

Indicators		Gwalior		Source
		City	ABD	
Existence of statutory provision of creating public access through large blocks		No		
Percentage of developed versus undeveloped land within the development area boundary		13.7% of the planning area		Master Plan 2021
Adoption of street design guideline for the transit corridor with an emphasis on NMT infrastructure			Target to develop 80% of the stretch using street design guidelines (details unavailable)	Smart City Plan, Gwalior, 2015
Land-use Management	Percentage of land area zoned for mixed use		23.9% of ABD area (TOD area of 192 acres is mixed use)	Smart City Plan, Gwalior, 2015
	Per Capita Green/Open Space within existing development	1.83 sq.m.	1.83 sq.m.	Smart City Plan, Gwalior, 2015
Street Design	Percentage of intersections with complete, wheel chair-accessible crosswalks in all directions		27 minor + 12 major + 12 mid block to have table top junctions and pelican crossing	Smart City Plan, Gwalior, 2015

HOUSING

Indicators		Gwalior		Source
		City	ABD	
Automated Building Plan Approval System		yes		Smart City Plan, Gwalior, 2015
Location	Percentage of population resettled or rehabilitated within 800 m of transit station		Proposed slum rehabilitation site within ABD is near the transit station.	Smart City Plan, Gwalior, 2015
	Percentage of residences in TOD zones that have daily needs retail, parks, primary schools and recreational areas accessible within 400 m walking distances		Mixed use development along the TOD corridor	Smart City Plan, Gwalior, 2015
	Percentage of informal settlements redevelopment in-situ		3686 DU - rehab as the existing slum is on the bank of river	Smart City Plan, Gwalior, 2015
Typology	Total number of Government Housing Units created for mixed-incomes		EWS - 4298 DU LIG - 2235 DU Rental - 600 DU	Smart City Plan, Gwalior, 2015
	Percentage of Residential Units provided as affordable housing in market rate development		TOD - 1493 DU GHTC - 709 DU	Smart City Plan, Gwalior, 2015
	Percentage of Rental Housing provided		600 DU	Smart City Plan, Gwalior, 2015
Percentage of Housing Units built on PPP mode			GHTC development on PPP mode	Smart City Plan, Gwalior, 2015

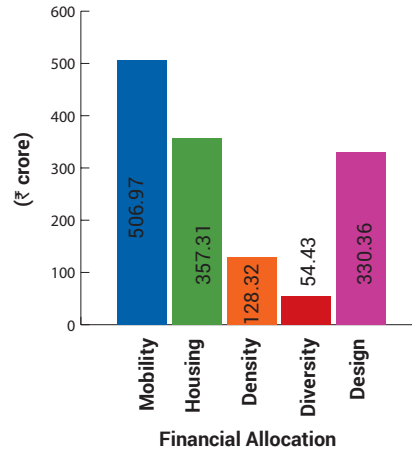
MOBILITY

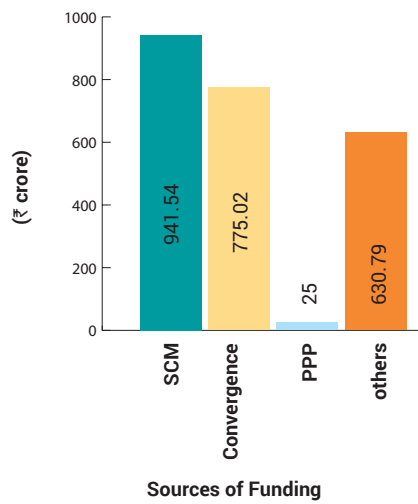
Indicators		Gwalior		Source
		City	ABD	
Citywide Parameters	Percentage Mode Share of Public Transport and para transit versus private vehicles	45% - pedestrian 20% - bicycle 3% - Public Transit		Master Plan 2021
Public Transit	Ridership statistics for Public Transport	11.1% uses PT for travel to work		Smart Cities Handbook - CII
	Fleet Size	0.58 buses per 1000 population additional 144 buses to be procured		Master plan 2021 and Smart City Plan, Gwalior, 2015
	Percentage of buses that adhere to Urban Bus Specification	None		Smart City Plan, Gwalior, 2015
	Percentage of residents within 800 m (10 minute walking distance) of high quality public transport stations		TOD area under ABD is mixed use (details unavailable)	Smart City Plan, Gwalior, 2015
Street Design	Percentage of total length of streets with motor vehicle carriageway >= 10 m having dedicated & segregated cycle tracks.	2%	33%	Smart City Plan, Gwalior, 2015
	Percentage of street with carriageway width for one way motor-vehicle traffic > 10 m.		12.2 km streets proposed to be one-way within ABD	Smart City Plan, Gwalior, 2015
	Total length of > 12 m streets with unobstructed footpaths as a percentage of the total length of streets in the city	4.67% existing footpath coverage	100% (82 km length) coverage is proposed	Smart City Plan, Gwalior, 2015
Parking	Percentage of on-street parking that is charged		14 streets to have charged on-street parking	Smart City Plan, Gwalior, 2015
	Average off-street parking requirement for an average residential unit		Proposed 1000 ECS in 2 Multi level car parking	Smart City Plan, Gwalior, 2015
Public Bike sharing	Public Bike Sharing System	100 docking stations 2000 bikes 534 persons per bicycle	Public Bike stations at 3 BRT bus stops	Smart City Plan, Gwalior, 2015
	Inter modal integration of formal public transport, para transit and cycle sharing		Bike docking stations at 3 BRT bus stops along 5.2 km corridor	Smart City Plan, Gwalior,2015

GWALIOR SMART CITY PROJECTS

Projects	Application	Cost (in ₹ cr.)
24x7 power supply	ABD	180.53
Affordable Housing as a Residential Component of Mixed Use TOD Development in AHP - 1493 Units	ABD	
Air Quality Monitoring Sensors	ABD	0.25
Automated Public Toilets with Water ATMs	ABD	3.2
Capacity Building Programmes	Pan city	2
CCTV Surveillance for the entire area	ABD	5.61
City Dash Board	Pan city	2
City Gas Distribution Network	ABD	49.32
Collection and Transportation Infrastructure	Pan city	30.87
Command and Control Center	Pan city	30
Computer Aided Dispatch (CAD) & AVL of Emergency and Police Vehicles - Hardware & Software	ABD	3
Creating Brand Gwalior	ABD	50
Development of 3686 Affordable Housing Units on PPP under PMAY	ABD	294.88
Development of BRT Corridor	ABD	16
Development of Night Shelters with Basic Amenities	ABD	1
Development of Rental Housing for Floating Population (600 Units)	ABD	45
Digital Literacy Campaigns	ABD	1
Disaster Management Center	ABD	3
Emergency Health Care Response System for Vulnerable	ABD	26
e-Rickshaw as IPT	ABD	5
Fire Hydrant Network with Pumps and Water Storage	ABD	22.33
GIS Based Asset Management	Pan city	10.5
GIS Mapping of Properties and Utilities Data Visualisation and Analytics	ABD	2
Gwalior Habitat and Trade Center (GHTC)	ABD	9.43
Hawker's and Vending Zones with Dedicated Smart Card for Hawkers	ABD	10
Heritage Hotel on PPP at Maharaj Bada	ABD	25
Heritage Network Trail	ABD	20.75
Hostels for Working Women	ABD	4
Housing Component in Gwalior Habitat and Trade Center - 1984 Units	ABD	
ICT Components	Pan city	26
IEC Campaign for Citizens	Pan city	2
Incubation centers for Startups	ABD	11.25
ITS with Traffic Surveillance and Analytics	ABD	5
Katora Tal Tank Development including Water Show	ABD	2
LED Street Lights on Unified Poles with Multiple Facilities	ABD	54.8

Projects	Application	Cost (in ₹ cr.)
Market Improvement of other 3 Markets in Bada Area	ABD	53.22
Mixed Use TOD Development PPP	ABD	
Multipurpose Backbone Communication Infrastructure (OFC)	Pan city	60
Multi-Utility ducting and shifting of utilities	ABD	71.85
One City One App	Pan city	5
Parking Management	Pan city	10
Parking Management - on street and other sites	ABD	10
Pedestrian Only Zone at Bada	ABD	12.5
Place Making on Raj Path	ABD	1
Public Art & Smart Street Signage and Interactive Public Dashboards	ABD	25
Public Facilitation centers	ABD	9
Public Transport Components integrated with Pan City Proposal	ABD	
Rain Water Harvesting System	ABD	2.5
Redevelopment of Amkho Bus Stand	ABD	5
Redevelopment of Exiting Mandis	ABD	7.27
Rejuvenation and Riverfront Development of Swarnarekha River including Aerators	ABD	40.34
Residential Care Homes	ABD	3
Revitalising Maharaj Bada	ABD	120
Rolling Stock	Pan city	127.4
Skill Development centers for Handloom and Handicraft Workers	ABD	11.25
Smart Class Rooms in Existing Schools	ABD	12.68
Smart Multi-level Car Parking at 2 Locations	ABD	29.43
Solar Panels on Roof Tops of Public Buildings Facilities	ABD	151.92
Solid Waste management	ABD	3.52
Street Sweeping Machines	Pan city	4.5
Strengthening of Existing Bridges on Swarnarekha River	ABD	24
Tourist Facility center - 2 Nos.	ABD	1
Transit Infrastructure	Pan city	24
Up-gradation of Central Library as Digital Library including Façade Restoration	ABD	2
Up-gradation of Existing Road Network to Full Section Development	ABD	132.09
Up-gradation of Nehru Park, Ladies Park and Shivaji Park	ABD	18.4
Up-gradation of Play Grounds	ABD	41.63
Waste Water Management System Including DEWATS	ABD	198.45
Water Quality Monitoring Sensors	ABD	2
Water Supply - 24x7	ABD	69.28
Wi-Fi Hotspots	ABD	8





SMART CITY PLAN - FINANCIAL PROPOSAL

₹ 982.69 crore for infrastructure development and up-gradation.

Note – the projects mapped under various constructs are not mutually exclusive. For example Affordable Housing as a Residential Component of Mixed Use TOD Development in AHP addresses both Housing and Diversity constructs.

ADDITIONAL INDICATORS THAT GWALIOR NEEDS TO ADDRESS

URBAN DENSITY

Densities along the transit corridor/TOD zone (800 m)
- Land-use Density (FSI/FAR)
- Minimum Population Density
- Minimum Dwelling Unit
- Minimum Job Density

Jobs –
- Jobs to Household ratio (Citywide compared to that along transit corridor)

Citywide (%) –
- Population living at densities greater than TOD standards
- Total residential population, jobs and visitors higher than baseline density

URBAN DIVERSITY

- Preparation of a street vending plan
- Citywide streets having mixed use development

Jobs –
- Earmarking of space or area for Vending Zone near Transit Stations
- Informal units for urban street vendors

Housing Mix (Within TOD) –
- Percentage of all residential units occupied by EWS

URBAN DESIGN

Buildings (within TOD) -
- Average number of shops and pedestrian building entrances per 100 m of block frontage
- Percentage of block frontage that abuts public walkways and provides visual connection to building interior activity

- Urban Form – Height to Width Proportion (a predictor of degree of enclosure)

Street Design -
- Shading of footpaths
- Percentage of length of streets > 12 m ROW with trees as per standards
- Percentage of length of streets < 12 m ROW with trees as per standards

HOUSING

Location
- Percentage of residential and commercial/ institutional use within 800 m of transit station

Typology
- Percentage of housing units less than 40 sq.m. provided
- Percentage of group housing units, duplexes, and older housing stock out of total housing
- Size of the Dwelling Unit

MOBILITY

Citywide Parameters
- Mode share targets
- Trip Per Capita
- Vehicle kilometers traveled/trip lengths (how far and how frequent travel is required)

Public Transit
- Public Transit Mode Share
- Percentage of stops with frequency of service > 15 buses per hour
- Percentage of residences in TOD zones connected to employment and public and institutional services by public transport/bicycle/walk/combination of two or more
- Percentage of IPT modes organised under formal management system

Street Design
- Percentage of total length of streets with motor-vehicle carriageway >= 10 m equipped with cycle tracks to standards.
- Crossings per sq.km.

- Percentage of total length of streets with streets crossing per sq.km. as per standards
- Number of Intersections of public pedestrian and cyclist network per sq.km
- Percentage of streets with total carriageway > 10 m having 5 or more traffic calmed or signalised crossing per km
  Percentage of intersections that have pedestrian crossings and refuges in all directions

Parking
- Total road area used for motor vehicle travel and on-street parking as percentage of total development land area
- Number of on-street parking spaces converted to public transport and NMT
- Total off-street area dedicated to parking as a percentage of total development land area
- Shared parking space
- Ratio of parking required within 800 m of a transit station versus all other areas

Public Bike sharing
- Daily trips (or users) per bicycle

This study has been supported by generous grant from Prosperity Programme,
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