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Analysing City Urban Transport System and Impact of TOD Proposal

Case Study of Satna City

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Abstract: **With the arrival of new state level TOD policy, city planning bodies of MP can now integrate the generic planning goals of the policy with the specific goals of their cities. The concept of TOD has been gaining strongly in countries like India where cities are densely populated and the scope of horizontal growth is now limited. The new TOD policy seeks to (a) cater to the need to manage urban and regional growth, (b) revitalise declining centres and suburbs, and (c) integrate land use with balanced transport to reduce automobile dependence. This would be done by creating compact, transit supportive uses, pedestrian-friendly zones and densification and mixed income development around transit stations and corridors. What remains to be seen is how far does the new policy responds to the requirements of unplanned smaller towns of MP.**
In the context of these developments, the paper attempts to identify Transit corridor having high traffic capacity in Satna city , identify indicators for corridor level interventions and strategify the process to allow compact development near the corridor.

Key words: Transit Oriented Development (TOD), Transit station/corridor, Mixed income development

1. INTRODUCTION

In India around there exists a ratio of 1.2 buses per 1000 person which is quite below the national benchmark ,with a huge disparity and diversity among states like 3.9 in Karnataka to that of 0.02 in Bihar . Also there are only 63 cities out of 458 Indian cities where city busses are opera table. It is a necessity of cities in Madhya Pradesh that Public transport becomes a preferred mode of transport and therefore recognition of the challenges of such transport facility is important. Transit oriented development is one of the methods to reduce the adverse effects of congestions in the cities through promoting ridership of public transport . Rationalization of routes and their fares will not only promote use of public transport but all enhance safety and better wages to informal sectors that operate them.

2. WHAT IS TRANSIT ORIENTED DEVELOPMENT?

Transit Oriented Development, commonly abbreviated as TOD, is a concept of planning that deals with supporting a balanced mix of land use around transit stations by creating concentrated nodes of moderate to high-density developments. It focuses on the encouragement of public transportation such as walking and cycling as a primary one. This is done by combining the basic physical features of a city such as its land uses and transportation and infrastructure systems with the real estate market dynamics through the collaboration of various stakeholders. In other words, TOD basically holds onto the principle of bringing together people, jobs and services connected with each other primarily by walking, cycling, or transportation.
"**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 Calthrope , the Next American metropolis , 1993)

1.1 Definition in " National TOD Policy Of India"—
Transit oriented development consists of , developing concentrated nodes , of moderate to high density neighborhoods supporting a balance mix of uses , developed around transit stations ideally within 500-800 meters from major nodes /station or 5-10 minutes walking distance.

1.2 Definition In " Tod Policy Of Madhya Pradesh"
Smart and liveable development in urban areas by making urban public transport a preferred mode to travel, creating high density, mixed-use development and at the same time ,to ensure pedestrian safety, comfort and convenience.

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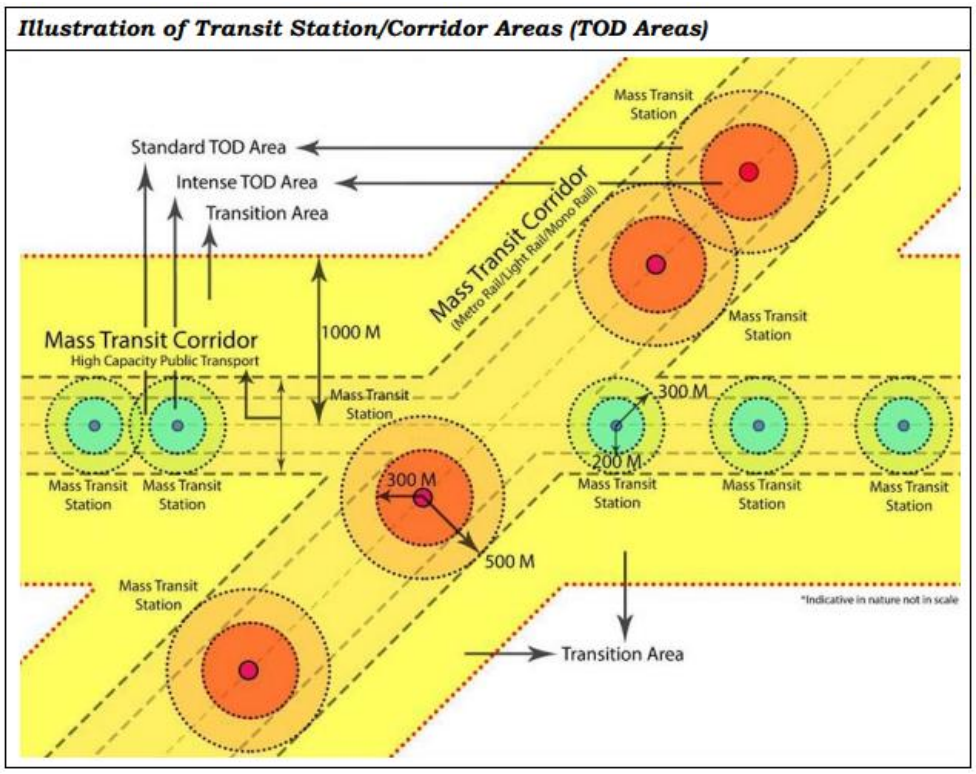

SOURCE: Diagram based on M.P. TOD POLICY

3. RELEVANCE OF T.O.D. IN INDIA

In a country like India, a multitude of issues are arising currently, such as severe congestion, degrading air quality, increase in Greenhouse gas emission from transportations, increase in road accidents and exploding growth in the number of private vehicles. A possible cause of these problems may be the automobile-centered planning which focuses on making a beneficial infrastructure for the vehicles such as the construction of wide roadways, minimizing the pedestrian and cycling groundwork, and development of singular use areas. Moreover, a majority of people do not use public transport because of the mere absence of the right number and quality of this transport and the inaccessibility to the transit. Also, it is has been reported that the transport sector in India is extremely energy intensive. Consequently, it is crucial for India to include TOD as its development and planning procedures, in order to achieve greater public vehicle ownership hence promoting public transportation and non-motorised transportation (NMT) usage.

Local busways if designed to function as good quality transit systems may attract various successful TOD projects at strategic locations such as **multimodal interchanges.**

A good example of TOD is seen in some Indian cities where connections have been made for mass transportation such as the **Janmarg BRT in Ahmedabad** and the **Metro Rail in Delhi and Bengaluru**. TOD offers an alternative way to resolve the conflicts of lack of connectivity to transit stations and BRT stops through careful planning and design of public spaces.

The overarching goal of TOD development is to increase transit ridership and reduce auto-dependency. Hence quantifying the potential benefits of TOD development in terms of ridership is vital.

Evidence from transit-rich cities such as Curitiba and Singapore, confirm that rapid transit (using BRT or Metro rail) has a significant impact on attracting TODs. However, in these cases, the real estate investment not only is driven by transit quality but also by several factors such as land availability, ownership, infrastructure quality, and market demand. This high-capacity mass rapid transit system with reliable and frequent services encourages efficient mobility patterns for the residents and workers residing in close proximity to the transit corridors.

4. VARIOUS SCALES OF TOD PLANNING

There is no “one size fits all” approach to TOD planning. TOD plans are prepared mainly at four scales:

1.) **Region or city level**
2.) **Corridor level**
3.) **Station area level**
4.) **Project site level**

Amongst the four, **corridor scale is the most recommended scale** for TOD planning, as it offers an advantage of integrating citywide transportation systems with the local level and use patterns. Also, planning at transit corridor scale helps in identifying the development potential of stations as origins or destinations, and the role of different nodes alone one single corridor. Again,

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it is notable that the transit development at the station area or the project site is most likely to be successful when there is an understanding of market dynamics and street connectivity at the corridor level.

5. LEGALIZATION AND FRAMEWORK OF TOD PLANS

TOD policies can be incorporated into statutory documents such as the comprehensive development plan, master plan or development control regulation. However, it is hard to define a single solution including the TODs in statutory documents, that can be applicable to all cities. Depending upon the planning and the regulatory context of the City and the respective State Town and Country Planning Acts, incorporating TOD policies may take alternative forms, including the following:

(i) As **Master Plan Update** processes that happen typically every ten years
(ii) As **a separate TOD chapter** introduced as an amendment to the existing Master Plan
(iii) As a modification to specific elements of the **Development Control Regulations (DCRs)**, such as parking requirements, building heights, Floor Area Ratio (FARs), public realm improvements along priority transit corridors
(iv) As **urban design guidelines**, supporting the DCRs.
(v)

6. FLOOR AREA RATIOS (F.A.R.) AND TOD

While the fact is true that the population density of Indian cities is increasing, they are not always concentrated in close proximity to transit corridors or stations. This has resulted in an expanded automobile-dependent development with limited accessibility to transit facilities for pedestrians and cyclists. In addition, the high-density areas in Indian cities are symbolized by singular uses instead of mixed land uses, including an incongruity between jobs and housing development density near the transit stops and stations. The application of uniform Floor Area Ratios (FARs) or the Floor Area Index (FSI) to land uses at the city level, irrespective of the existing infrastructure capacities or local context. A fundamental premise of TOD is the application of context-sensitive design standards, including building densities, based on variables surrounding the stations' area such as transit capacity, plot sizes, street widths, or infrastructure capacities.

MEASURES TAKEN BY VARIOUS CITIES IN THEIR DEVELOPMENT PLANS FOR TRANSIT ORIENTED DEVELOPMENT

CITY	INFLUENCE ZONE	FSI	AREA TYPOLOGY
NAYA RAIPUR	500	4	ALONG TRANSIT CORRIDOR
DELHI	500	4	ALONG METRO
NAVI MUMBAI	500	2.5 to 4	ALONG METRO
MADHYA PRADESH	500	3	ALONG TRANSIT CORRIDOR
AHMEDABAD	----------	FSI - 1.8 to 3.6/ 4 Additional 2.2 FSI To Be Purchased From ULB	----------

7. SOME QUICK WINS THROUGH TOD PLANNING

TOD projects may include some quick results such as Multimodal integration for various modes including direct access between feeder buses, autorickshaws, cycle rickshaws, and transit stations; upgraded pedestrian infrastructure including footpaths, street furniture, designated waiting areas; improved station facilities and passenger amenities; bicycle rental or public bicycle sharing systems near transit stations; park-and-ride lots at strategic transit locations; or identify staff resources for managing TOD projects.

8. TOD – A POSITIVE PLANNING APPROACH IN URBAN AREAS

TOD can be the most effective in urban areas where investments in transportations are generally initiated to ease the evolving issues of traffic congestion. Indian cities may be dense, but safe, secure and efficient pedestrian connections within the developments and to adjacent development and Public transport are not always there. As cities continue to experience rapid population growth, urban areas expand towards the outskirts greenfield lands requiring investment in new infrastructure rather than better utilization of the existing infrastructure.

TODs promote this development of the existing infrastructure with an intentional mixing of land uses (such as educational, commercial, recreational and residential). This land uses are in close proximity to each other and citizens can easily gain access to these services by simple public transport and non-motorised transportation modes of walking, cycling and by cycle-rickshaws.

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9. TOD – PRINCIPLES AND THEIR COMPONENTS FOR AT CORRIDOR LEVEL

PRINCIPLES	COMPONENTS
MULTIMODAL INTEGRATION	1. Bus Feeder Route Network Planning 2. Intermodal Facilities
FIRST & LAST MILE CONNECTIVITY	1. Crossing Enhancements 2. Connections: Cut-Throughs And Shortcuts 3. Organized Ipt 4. Sidewalk Widening 5. Bicycle Lanes 6. Public Bicycle Sharing
INTERCONNECTED STREET NETWORK	1. Block Sizes 2. Intersection Density 3. Street Spacing and Hierarchy
COMPLETE STREETS	1. Reduced Lane (Carriageway) Widths 2. Enhanced Bicycle Facilities 3. Transport Enhancements 4. Sidewalk Widening 5. Vending Zone 6. Building Edge-To-Edge Design
NMT NETWORK	1. Appropriately Scaled Sidewalk Widths 2. Streetscape Amenities 3. Active Street Edges
MIXED LAND USES	1. Mixed Use Overlay District 2. Mixed Use As A Land Use Category 3. Horizontal Mixed-Use Blocks
OPTIMIZED DENSITIES	1. Differential Land Use Densities 2. Density Bonusing Or Premium FSI/ FAR 3. Population And Housing Densities

SOURCE: SUTP , TOD Guidance Document ,MoUD

10. INTRODUCTION TO SATNA DISTRICT

Satna is one of the third tier city with population around 4.6 lakhs in the state of Madhya Pradesh . Satna lies in the Baghelkhand region which also comprises other districts like Rewa, Shahdol, Siddhi, Singruali and Chitrakoot.

8.1 Strategic Location & Connectivity

1. Located on the rail & road cross junction of NH-75 & Howrah-Allahabad-Mumbai rail line (with scheduled stoppage of all trains). Since Satna Railway station shells out maximum income due to its high degree of loading & unloading of cement, petroleum & raw material.
2. Satna acts as tourist transit centre for places like Khajuraho, Maihar & Chitrakoot
3. Air-strip of Satna further increases and strengthens its connectivity with other cities.

10.2 Existing growth directions of Satna District

Satna is famous for its cement factory and supplies around cement to various part in the region. It is bounded by Satna river at its south therefore it has grown in the North-Eastern and North Western side .

While the residential growth potential is directed towards the western side, the industrial growth is directed towards the North Eastern due to presence of industrial producing units such as Birla Cement Factory, etc. The current growth potential is towards the south western end where Greenfield proposal under smart city mission has been made to develop The PULSE–ABD area while acting as "Engine of Economic Diversification" targets incremental development & investment for a period of 15 years.

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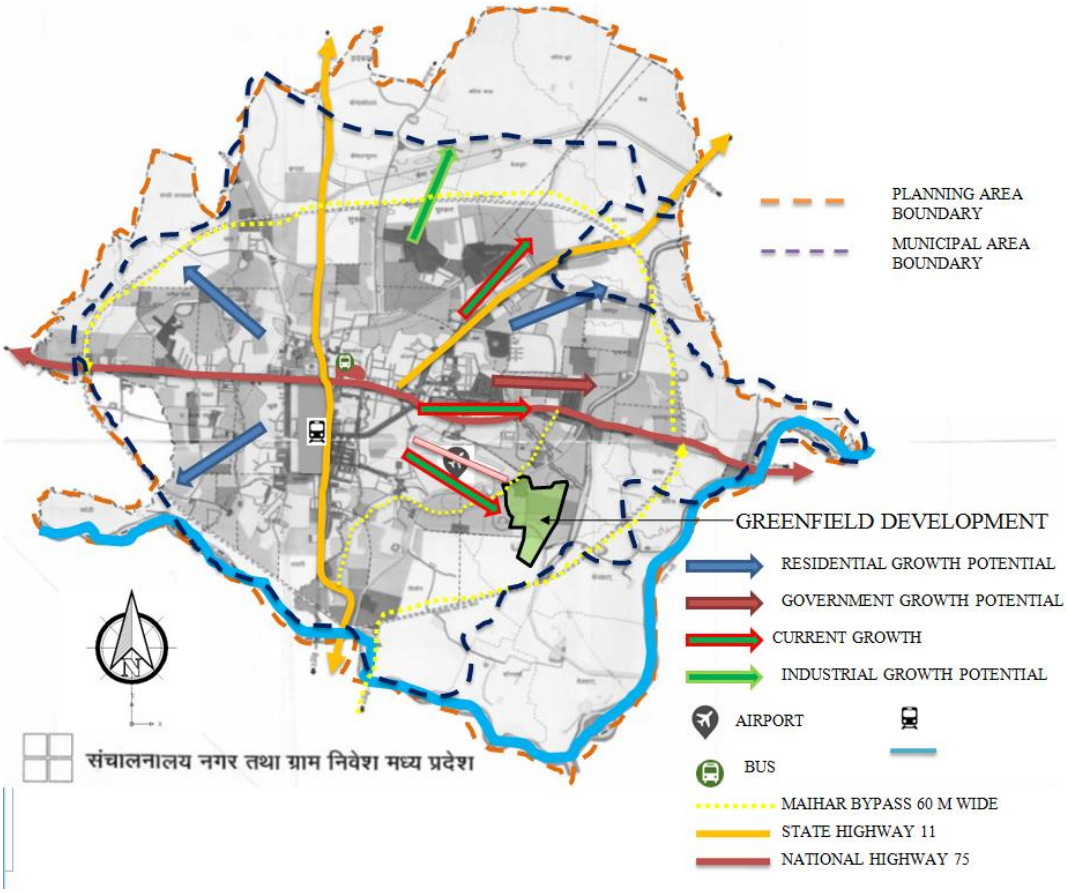

10.3Greenfield Proposals

Proposal comprises of following 7 components:

1. **Core Precinct** :Compact, walkable, mixed-use, mixed-income, **high density transit oriented development (TOD) communities** along the project spine .
2. **Base Precinct** :Multi-product industrial park for small and medium scale non-polluting industries ,plots on subsidy in agro, pharmacy, garments, mechanical, electronics, electrical & gems/jewellery.
3. **Senses Precinct** : **Medium-density, walkable, residential neighbourhoods in transition zone**
4. **Soul Precinct** : City level green networks piercing the ABD area between various precincts comprising of Baghelkhand art & craft centre, lake "Nectar" & canal buffer development, "Synthesis" - a fitness & wellness center with sports complex, botanical garden & urban forest.
5. **Life Cells Precinct**: Economic, Institutional & Social infrastructure comprising vocational training & industrial training institute ,skill development centres ,smart primary & secondary schools, community rooms/halls and libraries and bed health facility
6. **Project Spine** – **Development of transit corridor & intersections for high capacity bus system, NMV lanes, pedestrian pathways in-line with code of practice for urban roads.**
7. **Project Nerves** – Smart infrastructure comprising 24X7 SCADA enabled water supply with smart meters ensuring re-use of treated wastewater, 100% coverage of sewerage system with decentralised wastewater treatment effecting re-use, 100% coverage of underground storm water drainage, door-to-door collection, transportation & disposal of solid waste, 24X7 SCADA enabled power supply with smart meters, smart grid, solar power generation on roof top of buildings and canal top, distribution network for processed natural gas, solar powered energy efficient street lighting, safety and security surveillance, air quality & environment monitoring, fire hydrant system, public Wi-Fi hotspots, telecom lines & underground utility ducts for all utilities.

While Smart City Satna Ltd. considers core city area for pan city solutions, it has yet not focused on transit oriented development along the major corridor of the city.

10. Strategic process for implementation of TOD in the city

1. Delineate boundaries for TOD study area
2. Conduct stakeholder workshop to revalidate vision, issues and opportunities.
3. Formulate context-specific plan and strategic priorities.
4. Identify a pilot/demonstration project and develop design sub-Tasks
5. Identify a phasing and implementation strategy including catalyst projects

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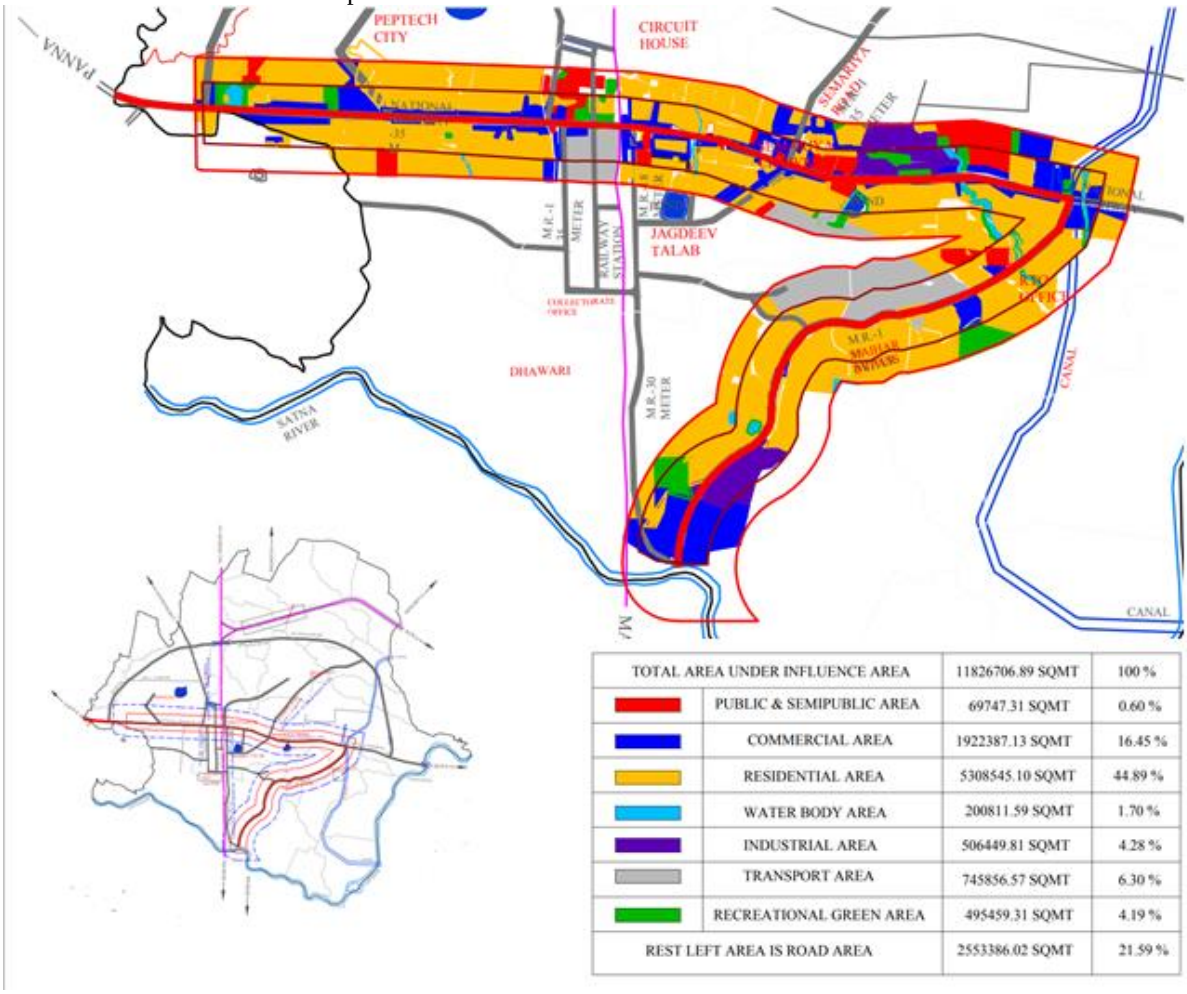
11. CONCLUSION

NH75 Highway passes through the mid of Satna city which is the central spine of the city. It also connects the greenfield development proposed by Satna Smart city Ltd. This national highway can be converted into transit corridor of the city to allow compact development and avoid urban sprawl .Also some city level interventions can be taken to promote public transportation in the city such as implementation of city bus services , optimisation of densities and mixed use development.



TOTAL AREA UNDER INFLUENCE AREA		11826706.89 SQMT	100 %
	PUBLIC & SEMIPUBLIC AREA	69747.31 SQMT	0.60 %
	COMMERCIAL AREA	1922387.13 SQMT	16.45 %
	RESIDENTIAL AREA	5308545.10 SQMT	44.89 %
	WATER BODY AREA	200811.59 SQMT	1.70 %
	INDUSTRIAL AREA	506449.81 SQMT	4.28 %
	TRANSPORT AREA	745856.57 SQMT	6.30 %
	RECREATIONAL GREEN AREA	495459.31 SQMT	4.19 %
REST LEFT AREA IS ROAD AREA		2553386.02 SQMT	21.59 %

TRANSIT CORRIDOR ALONG THE CITY AND ITS LAND USE CALCULATIONS