Infrastructure financing strategies for Transit-Oriented Development for Indian cities: A Value Capture Framework for TOD implementation

A THESIS

Submitted in partial fulfillment of the

requirements for the award of the degree

of

Master of Planning (Urban Planning)

in

Department of Architecture and Planning

by

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July, 2026

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in the thesis entitled **"Infrastructure financing strategies for Transit-Oriented Development for Indian cities: A Value Capture Framework for TOD implementation."** in partial fulfillment of the requirements for the award of the Master of Planning (2024-2026) and submitted in the Department of Architecture and Planning of Maulana Azad National Institute of Technology, Bhopal is an authentic record of my own work carried out during the period from July, 2025 to July, 2026 under the supervision of **Dr. Navneet Munoth**, Associate Professor Department of Architecture and Planning of Maulana Azad National Institute of Technology, Bhopal (M.P.).

The matter presented in this thesis has not been submitted by me for the award of any other degree of this or any other institution.

Bhawani Shankar Tamrakar

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

Dr. Navneet Munoth

Date:

Abstract

Transit-Oriented Development (TOD) has emerged as a transformative planning strategy to address rapid urbanization, mobility challenges, and the growing demand for sustainable infrastructure in Indian cities. While national policies such as the National TOD Policy (2017) encourage compact, mixed-use, transit-integrated urban form, the implementation of TOD remains constrained by the high capital cost of rail-based mass transit systems and the limited fiscal capacity of Urban Local Bodies (ULBs). Indian cities continue to face widening infrastructure investment gaps, dependence on intergovernmental transfers, and underperforming property tax systems, thereby necessitating innovative financing mechanisms such as Value Capture Financing (VCF). International and Asian experiences—such as the Jakarta MRT, Taipei's TOD-based FAR incentive system, and Chinese metro development—demonstrate that public investments in transit infrastructure generate measurable land value uplift, creating opportunities for systematic land value capture. Empirical studies show that improved accessibility from rail transit significantly increases residential, commercial, and retail property values due to proximity benefits, mixed-use intensity, and enhanced walkability (Berawi et al., 2019; Li & Huang, 2020; Yen et al., 2023). Evidence from India also highlights the growing relevance of VCF mechanisms—such as impact fees, betterment levies, joint development, land pooling, and development rights—as adopted in cities like Mumbai, Hyderabad, and Ahmedabad (Jillella & Newman, 2016).

Despite this potential, the institutional complexity of land markets, fragmented governance, and weak integration of land-use and transport planning limit the effectiveness of TOD-led value capture in India. Research further shows that the magnitude of land value uplift and the success of capture mechanisms depend on station-area density, land-use diversity, TOD-supportive regulations, and coordinated stakeholder arrangements (Das & Roy, 2023; Mathur, 2019). Therefore, this dissertation aims to examine the financing challenges of TOD in Indian cities and develop a Value Capture Framework (VCF) for TOD implementation tailored to Indian institutional, spatial, and fiscal contexts. Using secondary literature, global case analyses, and the methodological foundation outlined in the synopsis, the study identifies the nature and extent of land value uplift around transit nodes, evaluates the applicability of various VCF

instruments, and proposes a structured, multi-actor framework linking urban planning, transit development, and municipal finance.

The outcomes of this research contribute to strengthening TOD implementation in India by - demonstrating evidence-based links between transit investment and land value uplift, identifying factors that shape the feasibility of value capture tools and proposing an integrated financing framework that enables ULBs to mobilize land-based revenues for sustainable transit infrastructure.

Overall, the study positions Value Capture Financing as a critical instrument to bridge India's urban infrastructure funding gap and to enable the long-term financial viability of TOD development.

सारांश

पारगमन-उन्मुख विकास (TOD) भारतीय शहरों में तेज़ी से बढ़ते शहरीकरण, गतिशीलता की चुनौतियों और टिकाऊ बुनियादी ढाँचे की बढ़ती माँग को पूरा करने के लिए एक परिवर्तनकारी नियोजन रणनीति के रूप में उभरा है। राष्ट्रीय TOD नीति (2017) जैसी राष्ट्रीय नीतियाँ सघन, मिश्रित-उपयोग, पारगमन-एकीकृत शहरी स्वरूप को प्रोत्साहित करती हैं, लेकिन रेल-आधारित जन परिवहन प्रणालियों की उच्च पूँजीगत लागत और शहरी स्थानीय निकायों (ULB) की सीमित वित्तीय क्षमता के कारण TOD का कार्यान्वयन अभी भी बाधित है। भारतीय शहरों को बुनियादी ढाँचे में निवेश की बढ़ती कमी, अंतर-सरकारी हस्तांतरणों पर निर्भरता और संपत्ति कर प्रणालियों के कमज़ोर प्रदर्शन का सामना करना पड़ रहा है, जिसके कारण मूल्य अधिग्रहण वित्तपोषण (VCF) जैसे नवीन वित्तपोषण तंत्रों की आवश्यकता है। अंतर्राष्ट्रीय और एशियाई अनुभव–जैसे जकार्ता MRT, ताइपे की TOD-आधारित FAR प्रोत्साहन प्रणाली, और चीनी मेट्रो विकास–दर्शाते हैं कि पारगमन बुनियादी ढाँचे में सार्वजनिक निवेश से भूमि मूल्य में मापनीय वृद्धि होती है, जिससे व्यवस्थित भूमि मूल्य अधिग्रहण के अवसर पैदा होते हैं। अनुभवजन्य अध्ययनों से पता चलता है कि रेल परिवहन से बेहतर पहुंच से निकटता लाभ, मिश्रित उपयोग की तीव्रता और बढ़ी हुई पैदल चलने की क्षमता के कारण आवासीय, वाणिज्यिक और खुदरा संपत्ति के मूल्यों में उल्लेखनीय वृद्धि होती है। भारत से प्राप्त साक्ष्य वीसीएफ तंत्रों की बढ़ती प्रासंगिकता को भी उजागर करते हैं - जैसे कि प्रभाव शुल्क, बेहतरी शुल्क, संयुक्त विकास, भूमि पूलिंग और विकास अधिकार - जैसा कि मुंबई, हैदराबाद और अहमदाबाद जैसे शहरों में अपनाया गया है।

इस क्षमता के बावजूद, भूमि बाज़ारों की संस्थागत जटिलता, खंडित शासन, और भूमि-उपयोग एवं परिवहन नियोजन का कमज़ोर एकीकरण भारत में TOD-आधारित मूल्य अधिग्रहण की प्रभावशीलता को सीमित करता है। शोध से यह भी पता चलता है कि भूमि मूल्य वृद्धि का परिमाण और अधिग्रहण तंत्र की सफलता स्टेशन-क्षेत्र घनत्व, भूमि-उपयोग विविधता, TOD-समर्थक विनियमों और समन्वित हितधारक व्यवस्थाओं पर निर्भर करती है। इसलिए, इस शोध

प्रबंध का उद्देश्य भारतीय शहरों में TOD की वित्तीय चुनौतियों का परीक्षण करना और TOD के कार्यान्वयन के लिए एक मूल्य अधिग्रहण ढाँचा (VCF) विकसित करना है जो भारतीय संस्थागत, स्थानिक और वित्तीय संदर्भों के अनुरूप हो। द्वितीयक साहित्य, वैश्विक मामलों के विश्लेषण और सारांश में उल्लिखित पद्धतिगत आधार का उपयोग करते हुए, यह अध्ययन पारगमन नोड्स के आसपास भूमि मूल्य वृद्धि की प्रकृति और सीमा की पहचान करता है, विभिन्न VCF उपकरणों की प्रयोज्यता का मूल्यांकन करता है, और शहरी नियोजन, पारगमन विकास और नगरपालिका वित्त को जोड़ने वाला एक संरचित, बहु-अभिनेता ढाँचा प्रस्तावित करता है।

इस शोध के परिणाम भारत में TOD कार्यान्वयन को मजबूत करने में योगदान देते हैं - पारगमन निवेश और भूमि मूल्य वृद्धि के बीच साक्ष्य-आधारित संबंधों को प्रदर्शित करके, मूल्य अधिग्रहण उपकरणों की व्यवहार्यता को आकार देने वाले कारकों की पहचान करके और एक एकीकृत वित्तपोषण ढांचे का प्रस्ताव करके जो यूएलबी को टिकाऊ पारगमन बुनियादी ढांचे के लिए भूमि-आधारित राजस्व जुटाने में सक्षम बनाता है।

कुल मिलाकर, अध्ययन में वैल्यू कैप्चर फाइनेंसिंग को भारत के शहरी बुनियादी ढांचे के वित्तपोषण अंतर को पाटने और टीओडी विकास की दीर्घकालिक वित्तीय व्यवहार्यता को सक्षम करने के लिए एक महत्वपूर्ण साधन के रूप में स्थान दिया गया है।

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CERTIFICATE OF PLAGIARISM

This is to certify that the Thesis entitled "**Infrastructure financing strategies for Transit-Oriented Development for Indian cities: A Value Capture Framework for TOD implementation**" is a piece of research work carried out by Bhawani Shankar Tamrakar, Scholar No. 24209011124 under my guidance and supervision for the degree of Master of Planning (Urban Planning) from the Department of Architecture and Planning of Maulana Azad National Institute of Technology, Bhopal (M.P.) India.

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Acknowledgement

First of all, I would like to thank my God in helping me from the beginning to the end of my thesis period.

I extend my supreme gratitude to Department of Architecture and Planning, Maulana Azad National Institute of Technology, Bhopal for providing such kind of opportunity for students to broaden their perception on how the field of planning looks like by designing the curriculum of this degree and its effort to study deeper in the field of interest in the subject of urban planning through thesis.

I would sincerely like to express my special thanks to Dr. Navneet Munoth, Associate Professor, Department of Architecture and Planning, Maulana Azad National Institute of Technology, Bhopal my thesis guide and Dr. Seemi Ahmed, Associate Professor, Department of Architecture and Planning, Maulana Azad National Institute of Technology, Bhopal subject coordinator for always helping & guiding me in my day-to-day activities during the study time.

I extend my thanks to other faculties, students & staffs in the institute for sharing me their knowledge to improve my thesis works.

Finally, I would like to express my special thanks to my parents, my wife, Directorate of T&CP Chhattisgarh, Department of Housing and environment government of Chhattisgarh, colleagues, batchmates and friends helping me in all aspects and supported me complete the research work.

Bhawani Shankar Tamrakar

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List of abbreviations

BBMP - Bruhat Bengaluru Mahanagara Palike
BDA - Bangalore Development Authority
BMTC - Bangalore Metropolitan Transport Corporation
BKC - Bandra-Kurla Complex
BMC – Brihanmumbai Municipal Corporation
BMRCL - Bangalore Metro Rail Corporation Limited
BRTS - Bus Rapid Transit System
CIDCO - City and Industrial Development Corporation Limited
CTOD - Center for Transit-Oriented Development
DCR - Development Control Regulations
DMRC – Delhi Metro Rail Corporation
DULT - Directorate of Urban Land Transport
FAR/ FSI -Floor Area Ratio/ Floor Space Index
LVU – Land Value Uplift
MHADA - Maharashtra Housing and Area Development Authority
MMRDA – Mumbai Metropolitan Region Development Authority
MRT – Mass Rapid Transit
NDO - Negotiable Developer Obligations
NMT – Non-Motorised Transport
PWD – Public Works Department
SLR - Systematic Review Literature
SRA – Slum Rehabilitation Authority
TDR - Transfer of Development Rights
TOD - Transit-Oriented Development
TPS - Town Planning Schemes
ULB - Urban Local Body
UMTA - Unified Metropolitan Transport Authorities
UTTIPEC - Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre
VCF - Value Capture Finance

Chapter I

INTRODUCTION

Rapid urbanization in India has placed unprecedented pressure on cities to expand mobility infrastructure, ensure sustainable land development, and accommodate growing populations within limited spatial and fiscal capacities. As urban areas continue to account for a rising share of national economic output, the demand for efficient, environmentally sustainable, and financially viable transportation systems has intensified. Public transportation particularly rail-based mass transit has emerged as a critical enabler of compact urban growth, reduced congestion, improved accessibility, and enhanced agglomeration economies (Mishra, 2019). However, the financial challenges associated with constructing, operating, and maintaining metro and rail transit systems remain a structural barrier for most Indian cities, especially those with constrained fiscal autonomy and limited revenue mobilization capacities.

Transit-Oriented Development (TOD) has gained prominence as an integrative planning paradigm that promotes high-density, mixed-use, pedestrian-friendly development within walking proximity of transit stations. The adoption of TOD is expected to generate significant societal and economic benefits, including increased transit ridership, reduced automobile dependency, improved land-use efficiency, and enhanced livability. International evidence from Taipei, Jakarta, Sydney, Ningbo, Singapore, and North American cities demonstrates that rail-based transit investments exert measurable positive impacts on adjacent property values—termed land value uplift—through increased accessibility and improved urban amenities (Berawi et al., 2019; Lin et al., 2022; Zhu & Diao, 2024). In many cases, this uplift has been monetized through structured Value Capture Financing (VCF) mechanisms to fund transit infrastructure.

In India, the TOD concept has evolved from its early articulation by the Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC) of the Delhi Development Authority to national-level recognition in the **National TOD Policy (2017)**. Several cities—including Delhi, Ahmedabad, Mumbai, Nagpur, and Naya Raipur—have initiated TOD-based regulations within their development plans. Nevertheless, the financing of TOD-related infrastructure remains a major challenge. Metro rail projects are capital-intensive, and conventional municipal revenue sources—property tax, user charges, and state

transfers—are inadequate to meet expanding infrastructure needs. India faces significant infrastructure investment deficits, with urban transport requiring an estimated annual investment of ₹1.5–2 lakh crore against much lower actual allocations (MoUD, 2022).

Given this financial gap, **Value Capture Financing** presents a promising avenue for Indian cities. VCF mechanisms—including betterment levies, impact fees, land value increment taxes, premium FAR charges, joint development, sale of development rights, land pooling, and public–private participation—offer the potential to recycle a portion of the value created by public investment back into infrastructure funding (Kumar Jillella & Newman, 2016; Mathur, 2019). Cities such as Mumbai, Hyderabad, and Ahmedabad have already experimented with innovative VCF-based tools such as development charges, TOD premiums, Transit Impact Fees, and transit-linked development rights. Despite these early efforts, the adoption of VCF in India remains nascent and inconsistent across regions due to fragmented governance structures, limited institutional capacities, unclear regulatory frameworks, and insufficient integration between land-use and transport planning (Das & Roy, 2023).

Moreover, empirical research indicates that the magnitude of land value uplift around transit stations is highly context-dependent, varying with built environment characteristics such as density, land-use mix, walkability, and the quality of urban design(Li & Huang, 2020). These determinants are particularly relevant for India, where heterogeneous urban morphologies and socio-economic disparities shape the spatial patterns of TOD implementation.

This dissertation is motivated by the need to address the financial sustainability of transit infrastructure in Indian cities through a structured, evidence-based, and context-sensitive Value Capture Framework. By synthesizing global best practices, analyzing existing policy and institutional conditions, and reviewing the theoretical and empirical literature on TOD and VCF, the study aims to propose a framework that enables Indian cities to systematically harness land value uplift to support TOD related infrastructure.

1.1. Need of the study

Despite growing policy interest in TOD implementation across Indian cities, significant research gaps persist in understanding effective infrastructure financing strategies. Current literature indicates that while international land value capture mechanisms show promise (Mathur, 2019) (Higgins & Kanaroglou, 2016), their adaptation to Indian urban contexts requires comprehensive investigation.

The McKinsey report has estimated that around Rs. 325,000 crores of urban infrastructure investments are required annually. The High-Power Expert Committee Report 2011 projects urban infrastructure requirement at 0.75%, which will increase to 1.5% of the GDP by 2032 (Rs. 97,500 crores to Rs. 195,000 crores annually). Presently, national urban missions are investing about Rs. 32,500 crores annually leading to an investment gap of nearly Rs. 65,000 crores (MoUD, 2022).

Ordinarily, own sources of revenue in ULBs can be classified into three categories, (a) taxes levied by the municipality, (b) user charges levied for provision of civic services, and (c) fees and fines levied for performance of regulatory and other statutory functions. The main source of revenue is the 'property tax' which has narrow tax base and is not being utilized and managed efficiently and thus ULBs are mostly dependent on the funds from state governments.

Land is the most fundamental resources used to generate revenues, conventionally the ULBs have relied on direct sale of land which generates less revenue in comparison to value capture. States and ULBs had used different methods of value capture such as impact fee, betterment levies etc. viz. - the Mumbai Metropolitan Region Development Authority (MMRDA) and City and Industrial Development Corporation Limited (CIDCO) of Maharashtra have used different Value Capture methods to finance infrastructure development, Haryana and Gujarat have successfully used land pooling schemes, where owners agree to exchange their lands for infrastructure services (MoUD, 2022).

Indian cities face unique challenges including fragmented governance structures, limited fiscal capacity of Urban Local Bodies (ULBs), and complex land acquisition processes. The need for innovative financing mechanisms is particularly acute for mid-sized cities like Raipur, which lack the fiscal resources of metropolitan areas but require sustainable transportation infrastructure for planned urban expansion.

Thus, Value capture finance has a great potential over direct sale of land when, the public investments are made, provision of infrastructure is done, the public policy such as change of land use, increase in FAR/FSI etc. are made, the value of private land increases which can be used directly for the development of infrastructure. It can bridge the financial gaps for development of infrastructure. The Table 1 shows the requirement and usefulness of the study across the profession of urban planner, academicians, and policy makers.

Table 1: Need of the study across various professions *Source: Author*

Academic Contribution	• Provides a comprehensive, methodologically rigorous SLR. • Integrates TOD and VCF research, which are rarely examined together. • Advances theory on institutional frameworks and land value capture in developing cities.
Policy Contribution	• Offers actionable, evidence-based guidance for TOD implementation. • Supports India's national TOD and VCF agendas. • Helps policymakers design financing tools aligned with market realities.
Practice Contribution	• Provides planners and transit agencies with a roadmap for station-area development. • Identifies barriers and opportunities for PPPs and land acquisition. • Helps cities plan financially sustainable transit systems.

1.2. Transit-Oriented Development

TOD includes high-density, mixed-use developments located within close proximity to public transportation infrastructure. The term "transit- oriented development" was coined by Peter Calthorpe and detailed in his seminal volume The Next American Metropolis: Ecology, Community, and the American Dream (1993). The US-based Center for Transit-Oriented Development, a national clearinghouse on the topic, is the result of a collaboration with the Center for Neighborhood Technology and Strategic Economics and is funded by the US government. The CTOD definition of the concept is: "a type of community development that includes a mixture of housing, office, retail and/or other commercial development and amenities integrated into a walkable neighborhood and located within a half-mile of quality public transportation.". After many years of building our communities around the automobile, city planners came up with the modern concept of TOD. It's essentially a plan to reverse course by focusing new, dense development specifically near transit stops (like train stations). The

central idea is simple: by growing upward and along transit lines instead of outward, we can protect open land, reduce traffic, stop endless sprawl, and make room for more people. The concept of Transit-Oriented Development (TOD) has grown beyond just big train stations. It now also focuses on smaller, local improvements like walking paths, bike trails, public parks, and bike parking. This supports not only major city transit (like subways and light rail) but also local transportation such as buses, streetcars, walking, and cycling (Thomas & Bertolini, 2020). There are many benefits of TOD such as following shown in Table 2,Table 3, and Table 4:

Table 2: Environmental & Health Benefits of TOD *Source: Author*

Necessity	Why TOD Helps?
Curbing Sprawl & Saving Land	Instead of building single-family homes far out into the countryside (sprawl), TOD focuses development near transit. This **saves forests, farmland, and open space** from being paved over.
Cleaner Air & Less Pollution	When people live closer to transit, shops, and work, they **drive less**. Less driving means fewer greenhouse gases and less smog, leading to **better air quality** in the city.
Healthier Lifestyles	TOD is designed to be **walkable and bikeable**. This encourages residents to get out, move their bodies, and be more physically active every day, which is great for **public health**.
Fewer Car Needs	TOD can significantly **reduce a family's need to own multiple cars** (or even one car). This saves money and reduces the overall impact of vehicles on the environment.

Table 3: Economic & Financial Benefits of TOD *Source: Author*

Necessity	Why TOD Helps?
Lower Cost of Living	The biggest expense for many families is housing and transportation. By making it easy to live **without relying on a car**, TOD dramatically **cuts down transportation costs** (gas, insurance, payments).
Increased Property Value	Land and buildings near high-quality public transit often become **more valuable** over time, providing a solid return on investment for the community and property owners.
Efficient Use of Infrastructure	It's much cheaper for a city to provide services (like water, power, and sewer lines) to a **dense, concentrated area** than to scattered, far-flung suburbs.
New Business Opportunities	Placing businesses near transit stations gives them **access to a large pool of employees and customers** who arrive easily without needing to drive.

Table 4: Social & Community Benefits of TOD *Source: Author*

Necessity	Why TOD Helps?
Better Access for Everyone	TOD ensures that people who can't drive (like seniors, children, people with disabilities, or low-income residents) still have **easy, reliable access to jobs, healthcare, and schools.**
Stronger Community Feel	TOD neighbourhoods often include **public plazas and parks** where people gather, leading to more social interaction, a **stronger sense of community**, and greater neighbourhood safety.
More Housing Choices	By encouraging dense development, TOD helps create a **mix of housing types** (apartments, condos, town homes) at various price points, making the neighbourhood **more diverse and inclusive.**

1.3. Value capture framework

The Value Capture framework is a set of tools used by the government to recoup, or "capture," a portion of that unearned private profit and redirect it back to the public sector. This money is then used to pay for the initial infrastructure project itself, or for its ongoing maintenance. This increase in property value is a "windfall gain"—it is the profit, the private landowner or developer gets, not because of their own hard work, but because the taxpayers paid for the public improvement. When a government builds a major piece of infrastructure (a new train station, a better road, a massive bridge), the land and buildings around that project suddenly become much more valuable. The core concept of VCF rests on the difference between **earned** and **unearned** value; **Earned Value:** the profit a developer makes by building a beautiful, high-quality apartment complex, for example, a house that used to be a long drive from the city center is now right next to a train, making it far more desirable and increasing its sale price. VCF has a great potential to compensate the expenditure costs of any infrastructure including robust, cost-intensive TOD infrastructure. Table 5 below shows various types of Value capture tools, its applicability, frequency of collection and scale of intervention.

$$\text{Public Investment} \xrightarrow{\text{Increases Value}} \text{Private Gain} \xrightarrow{\text{VCF Recoups}} \text{Public Project Funding}$$

Value Capture Mechanisms: Land Value Capture (LVC), Transfer of Development Rights (TDR), Premium Floor Space Index (FSI/FAR), impact fees etc. The value capture finance is a result of public investment or it is induced by the strategies government that generates additional values for the private land owners other than the investment by the land owners themselves. Value capture is different from the user fees which is being collected in lieu of services. It enables government to develop new projects with less resource base and the private land owners get an opportunity to earn more with less risks due to the involvement of government authorities. Instead of relying solely on general sales taxes or income taxes (which fund everything from schools to police), VCF dedicates the money generated by the project's success back to the project itself. The various tools and types of Value Capture are documented in Table 5 below.

Table 5: Types of Value Capture Methods and Scale of Intervention

Source: VCF Policy Framework (MoUD, 2017)

S. No.	Value Capture Method	Frequency of Incidence	Scale of Intervention
1	Land value tax	Annual rates based on gain in land value uniformly	Area-based
2	Fees for changing land use (agricultural to non-agricultural)	One-time at the time of giving permission for change of land use	Area/Project-based
3	Betterment levy	One-time while applying for project development rights	Area/Project-based
4	Development charges (Impact fees)	One-time	Area-based
5	Transfer of Development Rights (TDR)	Transaction-based	Area/Project-based
6	Premium on relaxation of rules or additional FSI	One-time	Area (Roads, Railways) / Project (Metro)
7	Vacant land tax	Recurring	Area-based
8	Tax increment financing	Recurring and for a fixed period	Area-based
9	Land Acquisition and Development	One-time upfront before project initiation	Area/Project-based
10	Land Pooling System	One-time upfront before project initiation	Area/Project-based

Chapter II

LITERATURE STUDY

The systematic review of the literature for TOD and VCF has been done and the SLR is attached as Annexure with this report. The methodology adopted for SLR follows the search, appraisal, synthesis, and analysis (SALSA) framework and the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement.

The methodology consists of six stages:

1. Search Strategy
2. Identification of Records
3. Screening and Eligibility (PRISMA)
4. Appraisal and Quality Assessment (SALSA)
5. Data Extraction and Coding
6. Synthesis and Analysis

The method was followed intensively and the screening of literature was done to develop a conceptual and theoritical understanding of the subject.

2.1. Literature Search and Selection Criteria

The research works were searched in Scopus database by following search criteria as given in the INCLUSIONS criteria are: “Infrastructure development", "Transit oriented development", "Infrastructure Planning", "Value capture finance", "Land value capture", "Policy for Value capture finance", "Policy for Public Transport", "Policy for Transit oriented development", "Policy for Mass Transit", "Mass Transit", "Public Transport", "Metro rail", "Bus rapid transit system". “Year = 2005-2025”, and EXCLUSION criteria are: "computer science", "Energy sciences", "Mathematics", "Medical sciences", "Material sciences", "Agriculture", "Physics", "Psychology", "Biological sciences", "Chemistry", "Neurological sciences", “Medicine”, and "Veterinary sciences".

Table 6: Search criteria (inclusion & exclusion) *Source: Author*

Criterion Type	Description	Rationale
Inclusion	Studies focusing on transit-oriented development (TOD) and Value Capture Framework	Ensures relevance to the research question by including studies that comprehensively assess TOD & VCF.
Inclusion	Peer-reviewed journal articles, conference papers, and government reports	Ensures that the sources used are credible and rigorously evaluated
Inclusion	Studies published between 2005 and 2025	Captures contemporary perspectives and excludes outdated findings
Inclusion	Empirical studies with quantitative or qualitative methodologies.	Ensures a balanced mix of methodological approaches.
Exclusion	Studies not directly related to TOD (e.g., general urban development without a transit component)	Ensures the review remains focused on TOD-specific impacts.
Exclusion	Non-English language studies	Limits language barriers and ensures accessibility.
Exclusion	Studies without full-text availability	Ensures thorough analysis by including only studies with complete data.
Exclusion	Opinion pieces, editorials, and non-peer-reviewed sources	Excludes sources that lack academic rigor.

The Table 6 above lists the criteria of searching and shortlisting of the literature.

2.2. SALSA Framework

The SALSA framework - **Search, Appraisal, Synthesis,** and **Analysis** is an established methodological structure for systematic literature reviews involving large, diverse, and multi-disciplinary evidence bases. It is particularly suited for research topics such as Transit-Oriented Development (TOD) and Value Capture Finance (VCF), which span across urban planning, transport economics, real estate studies, governance, fiscal policy, and institutional theory. TOD–VCF research incorporates varied methodological traditions—hedonic price models, accessibility modelling, GIS spatial analysis, simulations, institutional economics, and stakeholder assessment. Therefore it provides methodological clarity, inclusivity, and comparability across studies that differ in scale, tools, and concepts.

2.2.1. Search

The Search phase involves the identification and collection of all relevant literature across global geographies and methodological approaches thorugh scopus database and PRISMA which fetched 197 results eligible for this review. The literatures offered various case examples of TOD-VCF.

2.2.2. Appraisal

The Appraisal stage evaluates the methodological and conceptual quality of each study to ensure only relevant, credible, and robust evidence contributes to the synthesis.

There were four criteria used for selection of papers for appraisal.

a) Relevance to TOD, VCF, LVC, or transport-land use integration. - TOD design and performance (Abdullah et al., 2023), Transit-induced property value changes (Li & Huang, 2020), Value capture mechanisms (Berawi et al., 2020), Institutional barriers (Son & Duong, 2025).
b) Theoritical frameworks for conceptual clarity - institutional economics (Das & Roy, 2023), (Cervero & Kockelman, 1997; Yen et al., 2023).
c) Methodological frameworks - Hedonic Pricing Models (Abidoye et al., 2022), Difference-in-Differences(Shimizutani et al., 2025), Geographically Weighted Regression(Li & Huang, 2020), Accessibility Modelling (Arku et al., 2025), Institutional analysis (Das & Roy, 2023).
d) Challenges and barriers - governance challenges in Vietnam (Son & Duong, 2025), institutional fragmentation in case of china (Arku et al., 2025), agglomeration and transit effects in India (Mishra, 2019).

2.2.3. Synthesis

The Synthesis stage integrates findings into coherent Bibliometric pattern contributions using the help of VOS viewer tool and scopus analyses. The analysis has been done to examine the research work done yearwise, countrywise, and douments type.

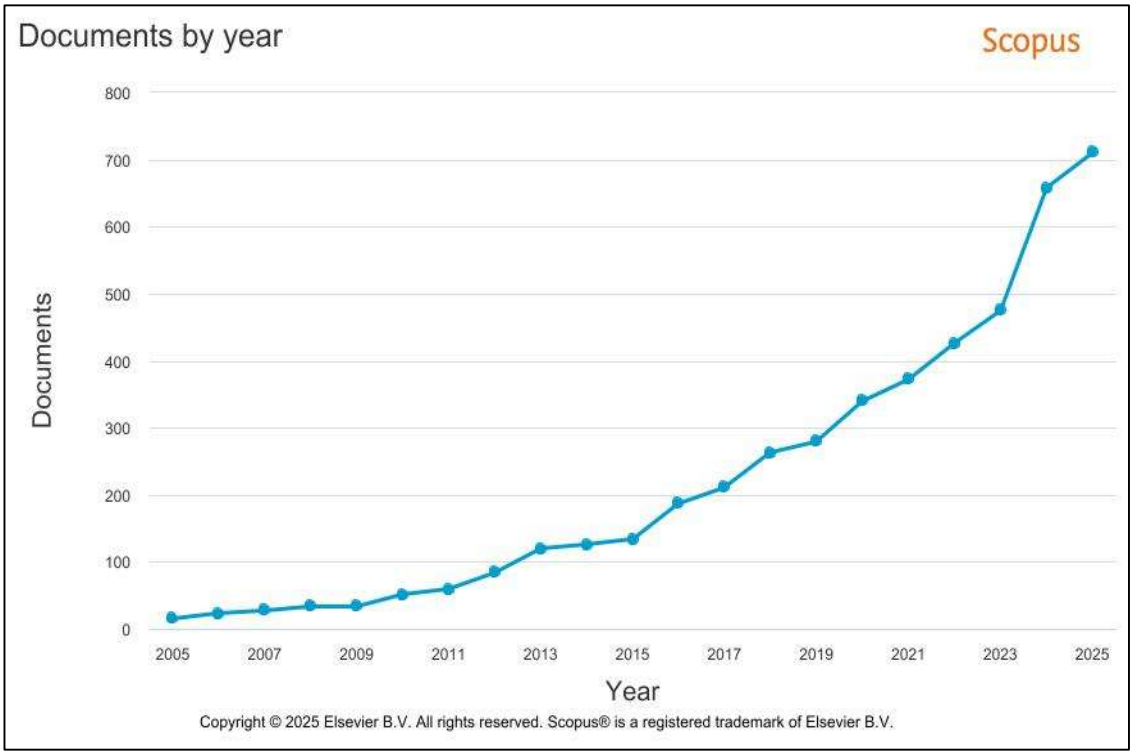


Figure 1: Studies done year wise *Source: Scopus*

The Figure 1 illustrates the annual publication trend on **Transit-Oriented Development (TOD)** and **Value Capture Financing (VCF)** indexed in the Scopus database between **2005 and 2025**. The publication trend demonstrates a steady increase in scholarly interest during the initial years, followed by a rapid acceleration after 2015 and an exponential rise from 2020 onwards. This growth reflects the increasing global recognition of TOD as a sustainable urban development strategy and VCF as an innovative mechanism for financing transport infrastructure. The sharp rise in publications in recent years indicates expanding research on integrating land use, transportation, and infrastructure financing to address rapid urbanization, climate change, and fiscal constraints. Overall, the trend signifies that TOD and VCF have emerged as prominent research domains, receiving considerable attention from researchers, policymakers, and planning practitioners seeking sustainable and financially resilient urban development solutions.

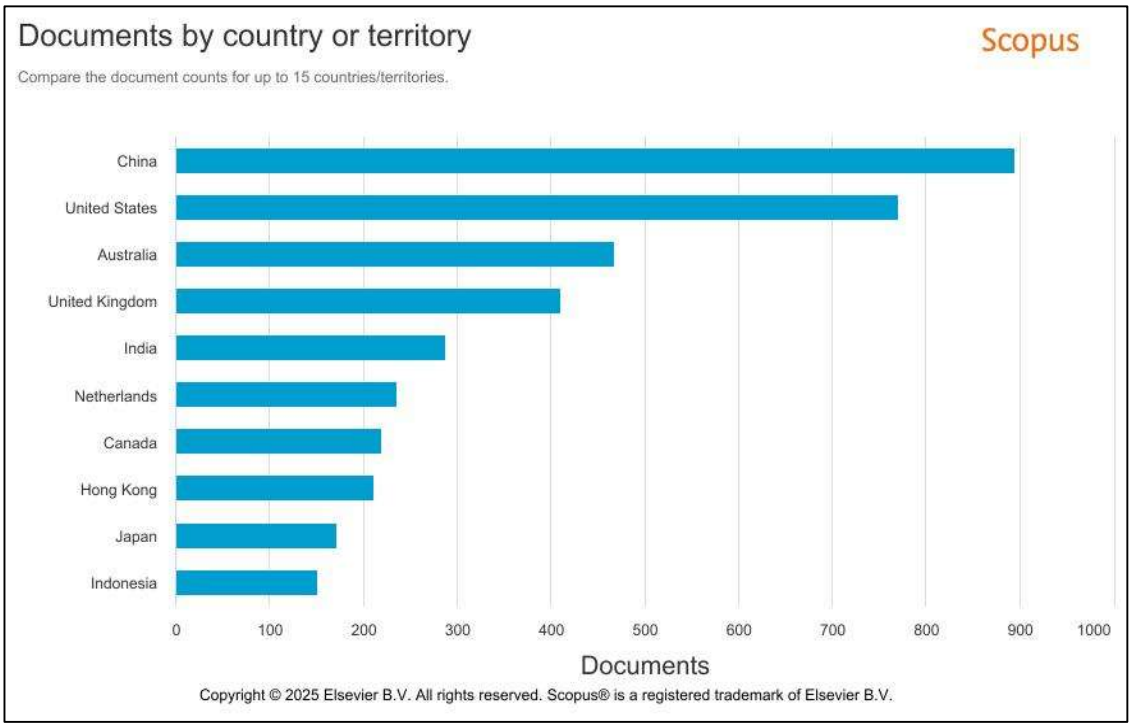


Figure 2: Studies done by countries *Source: Scopus*

The data in Figure 2 presents the country-wise distribution of publications on **Transit-Oriented Development (TOD)** and **Value Capture Financing (VCF)** indexed in the Scopus database. The results indicate that **China** has emerged as the leading contributor, followed by the **United States**, **Australia**, and the **United Kingdom**, reflecting their extensive investments in urban rail transit, integrated land-use planning, and innovative infrastructure financing mechanisms. China's dominant research output is closely associated with its rapid urbanization, large-scale metro expansion, and active implementation of land value capture policies. Meanwhile, countries such as **India**, **Indonesia**, **Japan**, and **Hong Kong** are increasingly contributing to the growing body of literature, demonstrating the expanding relevance of TOD and VCF in emerging economies. India's growing research output highlights increasing policy attention towards sustainable urban mobility, transit-oriented planning, and alternative financing mechanisms in response to rapid urbanization and infrastructure investment requirements. Overall, the geographical distribution of publications illustrates that TOD and VCF have evolved into globally significant research themes, with increasing collaboration between developed and developing nations to address contemporary urban transport and financing challenges..

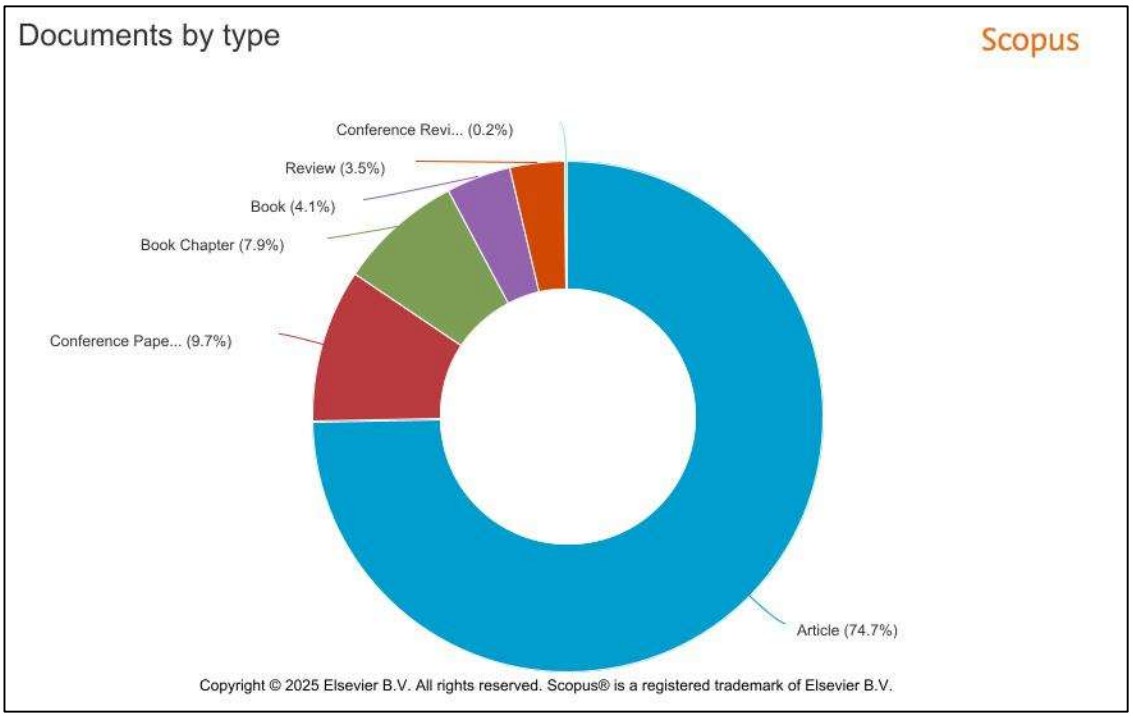


Figure 3: Types of documents published *Source: Scopus*

The Figure 3 illustrates the distribution of publications on **Transit-Oriented Development (TOD)** and **Value Capture Financing (VCF)** by document type. The analysis reveals that **journal articles constitute the largest share (74.7%)** of the total publications, indicating that research in this domain is well-established and predominantly disseminated through peer-reviewed scholarly journals. This dominance reflects the maturity of TOD and VCF as interdisciplinary research fields encompassing urban planning, transportation, economics, public finance, and land policy. **Conference papers (9.7%)** represent the second-largest category, highlighting the importance of academic conferences in presenting emerging ideas, innovative methodologies, and ongoing research. **Book chapters (7.9%)**, **books (4.1%)**, and **review articles (3.5%)** further demonstrate the consolidation and synthesis of knowledge within the field. The relatively small proportion of conference reviews indicates that the emphasis remains on original empirical and conceptual contributions. Overall, the diversity of publication formats reflects a vibrant and evolving research community that effectively disseminates knowledge to researchers, practitioners, policymakers, and academic institutions, thereby supporting the continued advancement of TOD and Value Capture Financing research worldwide.

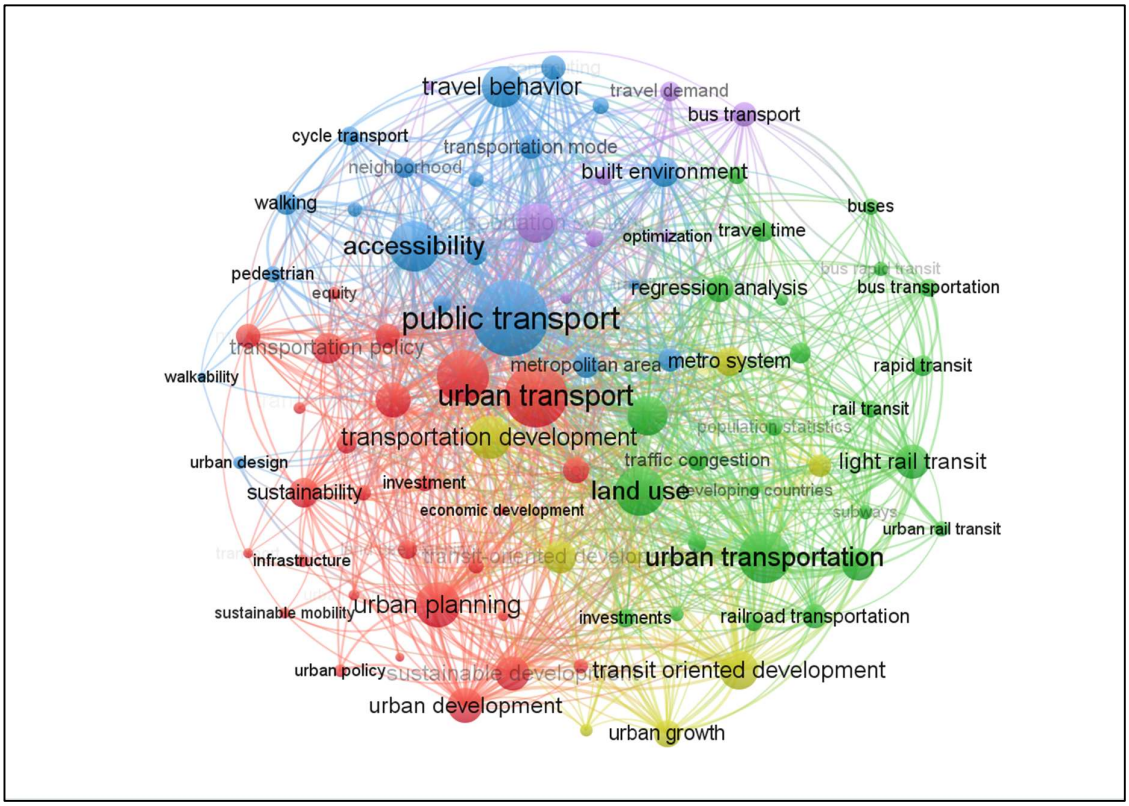


Figure 4: Network visualization of 'all keywords' *Source: VOS viewer*

The VOS viewer keyword co-occurrence network Figure 4 reveals the thematic structure of the reviewed literature. Central keywords—*public transport, urban transport, accessibility, land use,* and *urban planning*—form a dense core, indicating strong interconnections among transport, land use, and planning research. Distinct color clusters highlight major themes: mobility behavior (blue), sustainability and urban planning (red), rail and transit systems (green), and transit-oriented development and investment (yellow). The numerous interlinking lines illustrate interdisciplinary overlap, while smaller nodes such as *regression analysis* and *travel time* reflect emerging methodological interests. Overall, the visualization captures an integrated, multi-dimensional research landscape.

2.2.4 Analysis

a) Empirical Outcomes - Land value uplift (Higgins & Kanaroglou, 2016; Lin et al., 2022), Accessibility premiums (Arku et al., 2025), Construction-phase effects (Abidoye et al., 2022), Network effects (Zhu & Diao, 2024).
b) Policy – {[Drivers - FAR bonuses (Taiwan), Joint development (Hong Kong model), Long-term urban regeneration cycles (Ningbo; Lin 2022)] and [Barriers - High transaction costs (Das & Roy, 2023), Absence of enabling legislation (Son & Duong, 2025), Political economy of land (India).
c) TOD planning frameworks: Western design-oriented TOD (US, Europe), Asian density-oriented TOD (Taiwan, Japan, Singapore), Infrastructure-led TOD (China, Gulf)
d) Financing Mechanisms - Betterment levies, Premium FAR auctions, Tax increment financing, Developer obligations, and Land lease revenues.

2.3. Results of SALSA

2.3.1. Temporal development (2005-2025)

Research on TOD and Value Capture mechanisms shows clear growth over the two decades. Early work (2005–2010) focused on rail investment impacts on land values, especially in North America and Europe. Foundational empirical studies during this period established the significance of LVU in rail contexts (e.g., hedonic models, accessibility theory).

A second wave (2011–2016) aligned with increased adoption of **urban rail systems in Asia**, especially China and India. Evidence of the land–transport feedback loop strengthened through metropolitan case studies. For example, (Loo & Li, 2006) highlighted urban rail financing gaps in Chinese cities and the need for sustainable non-fare revenue streams, framing the challenges that TOD-based land value capture would later address. Post-2016 scholarship surged with India's metro expansion (over 50 cities planning MRT systems), and increased attention to **VCF as a financing solution**. (Kumar Jillella & Newman, 2016) documented the early evolution of value capture practices in India, noting that despite being in an "embryonic stage," results were promising, with significant untapped potential.

By 2020–2025, there was a strong emphasis on: Impact measurement using big data and GIS, Network effects of transit (beyond station proximity), Institutional economics, Inclusive TOD, Policy frameworks for developing countries.

Studies such as (Abidoye et al., 2022) in Sydney and (Zhu & Diao, 2024) in Singapore strengthen methodological sophistication through repeat-sales models, DiD, and network accessibility metrics.

2.3.1.1. TOD, Accessibility, and Urban Form Transformation

Across the literature, TOD is consistently conceptualized as a land use–transport integration strategy. Indian planning frameworks (e.g., TOD Guidance Document by MoHUA) emphasize high-density mixed land use, multimodal integration, and reduction of private vehicle dependence. International cases reinforce TOD as a key lever for: Efficient land markets (Taiwan's FAR incentives) (Yen et al., 2023), Agglomeration benefits(Mishra, 2019), on India's mobility challenges and economic clustering around transit nodes, Compact, connected, coordinated growth, Market-led redevelopment (Hong Kong, Tokyo).

A dominant finding is that TOD amplifies accessibility effects—but with strong spatial heterogeneity. For instance, (Li & Huang, 2020) showed TOD's moderating role in Wuhan, where mixed-use and density significantly increased housing price premiums near rail stations, validating the synergistic TOD–transit hypothesis in Chinese contexts.

Similarly, (Higgins & Kanaroglou, 2016a) demonstrated that LVU patterns vary widely with accessibility, urban design, and network connectivity, urging a shift from "proximity-only" TOD models to multi-dimensional accessibility measures.

2.3.1.2. Land Value Capture and Transit Financing

Frameworks and Instruments - Across contexts, LVC emerges as a critical financing strategy for mass transit, especially in developing countries struggling with fiscal constraints. (Mathur, 2019) provides a comprehensive evaluation framework linking success factors—including zoning flexibility, coordinated land use planning, and institutional autonomy—with LVC effectiveness, drawing insights from Delhi Metro. The Government of India's Value Capture Finance Policy Framework (MoUD) outlines major tools such as: Betterment levies, Development charges, Impact fees, Joint development, Transferable Development Rights (TDR), Land pooling and reconstitution, and Sale of FAR/FSI premiums.

Empirical Evidence of LVU - Multiple studies confirm that transit generates significant land value uplift:

- Jakarta MRT: (Shimizutani et al., 2025) show that MRT opening affected rents heterogeneously—negative for commercial offices due to oversupply, with no significant impact yet on residential values.
- Ningbo (China): (Lin et al., 2022) demonstrate strong URT-driven land premium effects and propose LVC, public–private cooperation, and urban regeneration as key policy pathways.
- Sydney light rail: (Abidoye et al., 2022) report a consistent premium (3–3.3%) within 400 m of stations during both pre-construction and operation phases
- Big data LVU models: (Berawi et al., 2019, 2020) use web scraping and hedonic models to quantify accessibility-driven price increments along Jakarta LRT corridors, showing how data-driven approaches can support LVC implementation.

Governance and Institutional Economics - Institutional capacity is a recurring barrier. (Das & Roy, 2023) highlight that TOD requires efficient institutional arrangements to minimize transaction costs, manage multiple stakeholders, and align incentives across public/private actors. (Wang et al., 2020) emphasize that **negotiable developer obligations (NDOs)** can improve LVC outcomes, but feasibility in China is limited by regulatory constraints, anti-corruption policies, and unclear institutional mandates.

2.3.1.3. TOD Barriers and Implementation Challenges

A wide range of studies identify barriers - especially in developing contexts.

- Vietnam: Institutional fragmentation and coordination challenges are the most significant barriers, as shown by (Son & Duong, 2025) who rank TOD barriers using BWM–TOPSIS methods.
- Malaysia: Early-built stations struggle to retroactively achieve TOD standards due to high-density built form and land ownership complexities(Abdullah et al., 2023).
- India: According to the TOD Guidance Document and LVC Policy Framework, major constraints include weak ULB finances, outdated planning laws, limited capacity for local plan-making, and fragmented governance.

- Indonesia (Toll Roads): (Kurnia et al., 2024) show that LVC for transport requires a supportive regulatory framework; current SOE-based toll road development models struggle without clear revenue capture mechanisms.

2.3.1.4. Inclusion, Equity, and Social Dimensions

Recent researchers had stressed on the risk of TOD-induced gentrification and affordability loss.

- (Ling et al., 2025) develop an "inclusive TOD (iTOD) framework" integrating location affordability metrics using DEA across 302 TOD sites in Shenzhen, finding many high-performance TODs failing in inclusivity metrics due to rising housing costs and lack of workforce housing.
- A parallel SLR by (Sharma & Dehalwar, 2025) also confirms that while TOD boosts economic development, it may inadvertently undermine social equity without safeguards, especially in rapidly urbanizing Global South cities.

2.3.2. Cross-Regional Empirical Patterns

2.3.2.1. LVU Magnitudes

Across regions, LVU varies widely:

- North America: LVU effects range from negligible to substantial (up to 40%), with proximity-only models often overestimating impacts (Higgins & Kanaroglou, 2016).
- East and Southeast Asia: LVU is generally strong due to high densities and pronounced accessibility improvements (Taipei, Wuhan, Ningbo).(Li & Huang, 2020; Lin et al., 2022)
- India: Evidence indicates potential for LVU but limited capture efficiency due to institutional barriers (Mathur, 2019; MoUD, 2017).

2.3.2.2. Network Effects vs. Proximity Effects

(Zhu & Diao, 2024) show that expanding a transit network creates network-level spillovers, influencing retail property values along both new and existing lines—a finding often missed in proximity-based analyses .

(Arku et al., 2025) further emphasize that accessibility-based treatment measures outperform proximity-only metrics in capturing true transit impacts, suggesting necessary methodological refinement for future TOD–VCF research.

2.3.3. Synthesis: Key Observations

- TOD–VCF linkage is globally validated but context-dependent - High-density Asian cities capture more value than low-density Western contexts, but Western cities provide clearer institutional frameworks.
- Institutional capacity determines success more than technical design - Most failures in TOD and VCF are governance failures—not design failures.
- Accessibility—not just proximity—drives land values.
- Inclusivity remains the weakest TOD dimension - few TOD projects incorporate affordable housing or protections against displacement.
- India has significant potential but needs deeper reforms in planning laws, land governance, and ULB finances.

2.4. Key takeaways from literature study

Table 7: Summary of the literature study *Source: Author*

Section	Key Content	Take aways
1. Temporal Evolution of TOD–VCF Research (2005–2025)	**2005–2010:** Rail LVU evidence, hedonic models, accessibility theory (North America, Europe).**2011–2016:** Asian metro expansion (China, India), land–transport feedback loop strengthening. **2016–2025:** Growth of India's metro systems, big data valuation, network effects, institutional economics, inclusive TOD.	Research broadened from rail-property linkages to advanced, multi-dimensional TOD–VCF frameworks.
2. Major Themes Identified in Literature	**A. TOD–Accessibility–Urban Form:** Mixed-use density, multimodal integration, walkability. **B. Land Value Capture & Transit Financing:** FAR premiums, betterment levies, joint development, impact fees. **C. Governance & Institutional Economics:** Fragmentation, transaction costs, regulatory gaps. **D. Inclusion & Equity:** Gentrification risks, iTOD frameworks, location affordability.	TOD research now spans planning, economics, finance, governance, and equity - not just transport.

3. Key Empirical Insights	**LVU Variability:** - High in East/Southeast Asia (Ningbo, Wuhan, Taipei), Moderate/varied in North America (0–40%), Under-realized in India due to institutional barriers. **Network Effects vs. Proximity:** - Network accessibility yields stronger predictive value than distance-based measures. - Major datasets reveal spillover effects across interconnected lines.	Transit value uplift depends on context, accessibility, and governance—not only proximity.
4. Key Institutional Barriers	**Vietnam:** Severe fragmentation (BWM–TOPSIS evidence). **Malaysia:** Difficulty retrofitting TOD in built-up areas. **India:** Weak ULB finances, outdated planning laws, limited VCF uptake. **Indonesia:** Regulatory challenges in toll/rail corridor LVC.	Institutional capacity—not design—is the biggest TOD implementation barrier.
5. Social & Equity Dimensions	**Inclusive TOD (iTOD):** Low scores in Shenzhen despite high urban form performance. **SLR evidence:** TOD can raise prices and reduce affordability without safeguards. **Displacement Risks:** Increasingly documented in Global South cities.	TOD must integrate affordability, workforce housing, and equity safeguards to avoid exclusion.
6. Synthesis: Universal Trends	TOD–VCF synergy is globally validated. Accessibility is the strongest LVU driver. Institutional clarity determines success. Inclusivity is chronically least-addressed. India requires major institutional and planning reforms.	Effective TOD–VCF depends on strong governance, accessibility-led design, and social inclusion.

The Table 7 summarises the important points to be highlighted in the report about the subject. Temporal Evolution of TOD–VCF Research (2005–2025), Major Themes Identified in Literature i.e. (TOD–Accessibility–Urban Form, Land Value Capture & Transit Financing, Governance & Institutional Economics, Inclusion & Equity), Key Empirical Insights - LVU Variability & Network Effects vs. Proximity, Institutional Barriers etc. later it highlights the Social and Equity about how inclusiveness & risks of displacement affects the land values, then it validates the importance of synergy of TOD – VCF in effective implementation.

Chapter III

RESEARCH DESIGN

3.1. Aim

To explore and evaluate the innovative financing strategies and mechanisms particularly value capture finance in facilitating the implementation and development of TOD infrastructure in Indian cities, by analyzing the evolution of TOD policies, identifying financing gaps, and evaluating land-based instruments such as land value capture, land pooling, impact fees, property taxation etc. the study seeks to develop a contextual framework for sustainable TOD financing, with focus on Raipur, the research aims to assess the applicability and scalability of these mechanisms in mid-sized Indian cities, and to provide strategic recommendations for urban local bodies (ULBs) and policymakers to leverage land value enhancement for bridging infrastructure investment gaps.

3.2. Objectives

Phase I - Systematic literature review, case study & SWOT analysis

- To explore the TOD principles, components, design, current policies, institutional and financial framework.
- To examine the value capture tools – types of VCF, scope and applicability in the context of Indian urban governance and land markets for TOD implementation.
- To analyze case studies of Indian cities (e.g., Delhi, Mumbai, Ahmedabad, Naya Raipur) where TOD and value capture financing have been implemented.
- To do SWOT analysis of the current financial and institutional provisions to build TOD infrastructure in Indian cities and determine appropriate VCF tools for TOD.

Phase II – Implementation strategy & framework for TOD corridor

- To select case and delineate the TOD influence zone.
- To study land inventory and current land values around the selected corridor for TOD and evaluate their potential after provisioning of TOD infrastructure.
- To examine the relevancy & selection of appropriate VCF tools.
- Propose the design of TOD with integration of VCF tool and provide final recommendations, framework & implementation strategy for selected TOD corridor.

3.3. Research questions

Primary Research Question: How can innovative infrastructure financing strategies through land value capture mechanisms be effectively implemented for Transit-Oriented Development and Indian cities?

Secondary Research Questions: What are the key institutional barriers and enablers to implementing land value capture for TOD financing in Indian urban contexts?

What financing models from international TOD implementations can be successfully adapted for Indian cities, and what modifications are required?

How can land value enhancement around transit corridors be quantified and captured effectively and how can this be optimized?

3.4. Methodology

The research adopts a **mixed-method approach** integrating both **qualitative** and **quantitative** analyses to explore infrastructure financing strategies for Transit-Oriented Development (TOD) with special reference to the selected case. The study is exploratory, analytical, and prescriptive in nature.

Phase I (Figure 5)- Systematic literature review and conceptual understanding – Literature and policy analysis on TOD and Value Capture Financing (VCF) – evolution and current policies, institutional and financial challenges, various types and methods of VCF's and applicability and effectiveness of VCF method.

Comparative case study analysis – Examination and assessment of TOD–VCF practices in Indian and global cities.

SWOT analysis of current trends of infrastructure financing in India.

Phase II (Figure 6)- Selection of the case and delineation of study area.

Empirical Analysis for– Spatial and financial assessment of TOD potential and value capture feasibility. – examine the current land values and increased values in the influence zone.

Framework Formulation and Validation – Development of a contextual framework for integrating VCF in TOD for selected case.

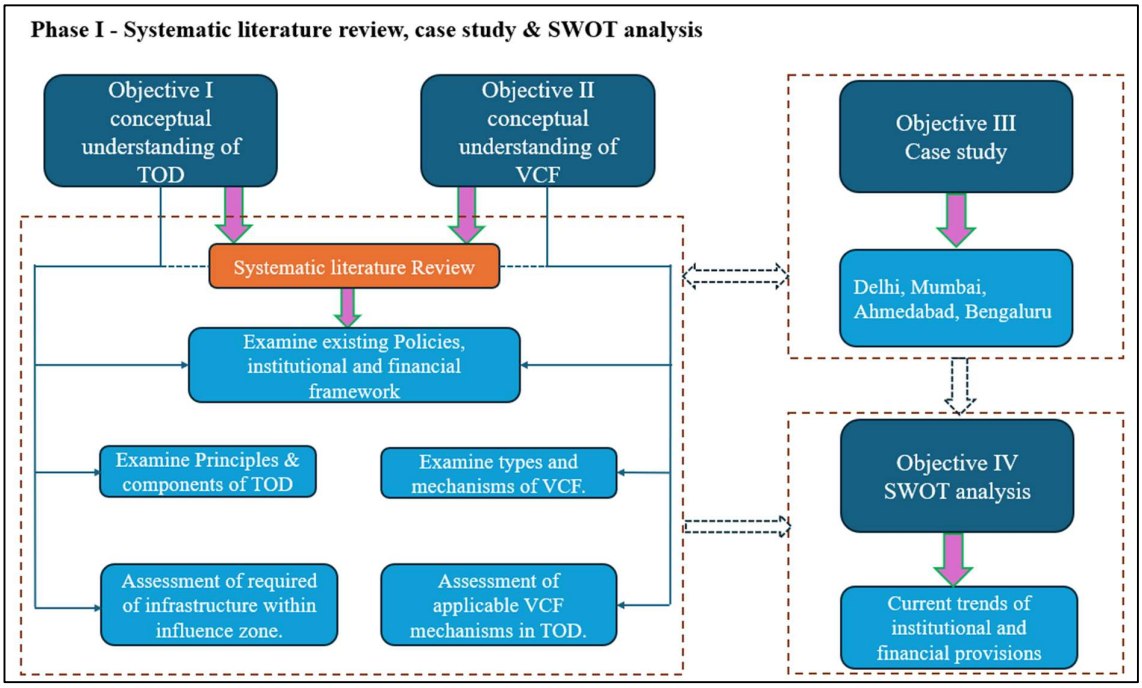


Figure 5: Methodology adopted for phase – I *Source: Author*

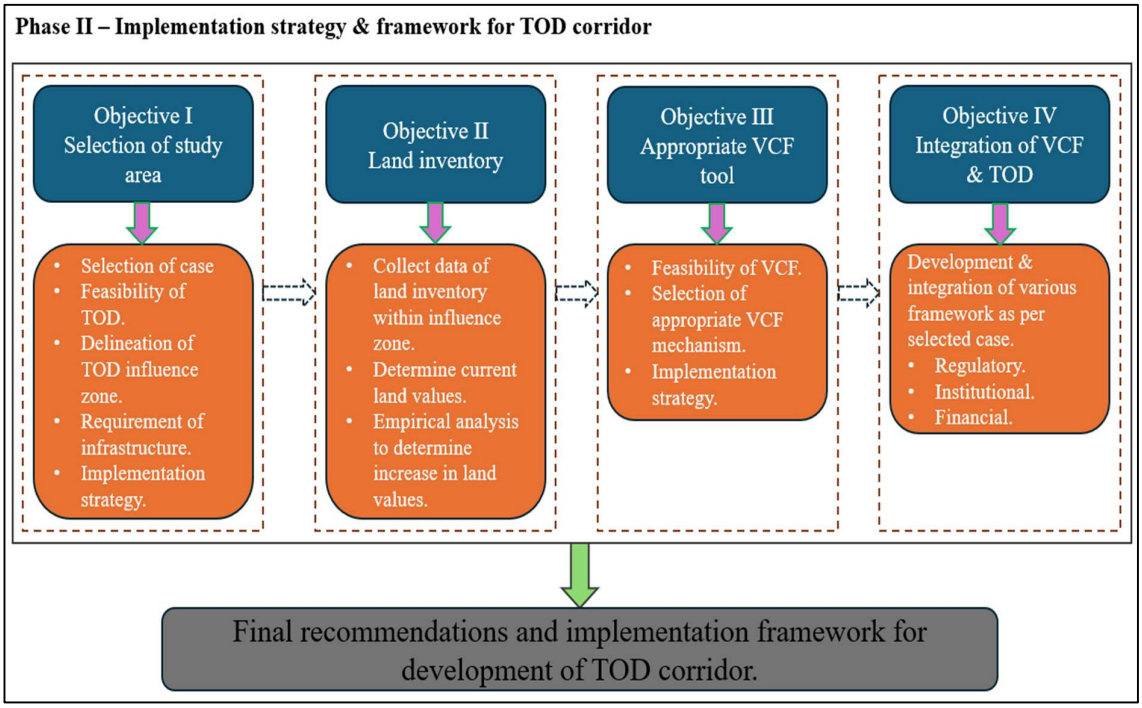


Figure 6: Methodology adopted for phase - II *Source: Author*

3.4.1. Requirement of Data/ information

Table 8: Data requirement and sources *Source: Author*

Data Required	Data collection sources
• Base map of selected case/planning area. • Development plan proposals and maps. • Land use and transportation network maps.	Secondary source
• Demographic and socio-economic characteristics. • Economic activities.	Secondary source
• Land inventory of study area. • Government notified Land values at the time of study. • Market values of land other than government notified land values.	Secondary source Primary survey
• Existing transport connectivity and important transit centres. • Connectivity with railways, National & State highways.	Secondary source & Primary source
• Requirement of essential and other infrastructure. • Lump-sum estimations and costing of various infrastructure related to TOD.	Secondary source & Primary source
• Planning and financial institutions.	Secondary source

The Table 8 shows the requirement of various data that have to be used in the study along with their sources from where they have to be collected.

3.5. Scope

The study will enable to implement the TOD infrastructure, objectives of TOD by applying the use of appropriate value capture financing methods in cities in India that can accommodate TOD and its benefits within the catchment area of radius of 2KM from a transit station.

The Figure 7 shows the built-up density, height and mixed land uses around the mass transit station of Jakarta, Indonesia depicting the influence zone of TOD. The range of distances from transit stations to delineate the internal zone, intermediate zone and outer zones may differ from one urban area to other depending on their policy.

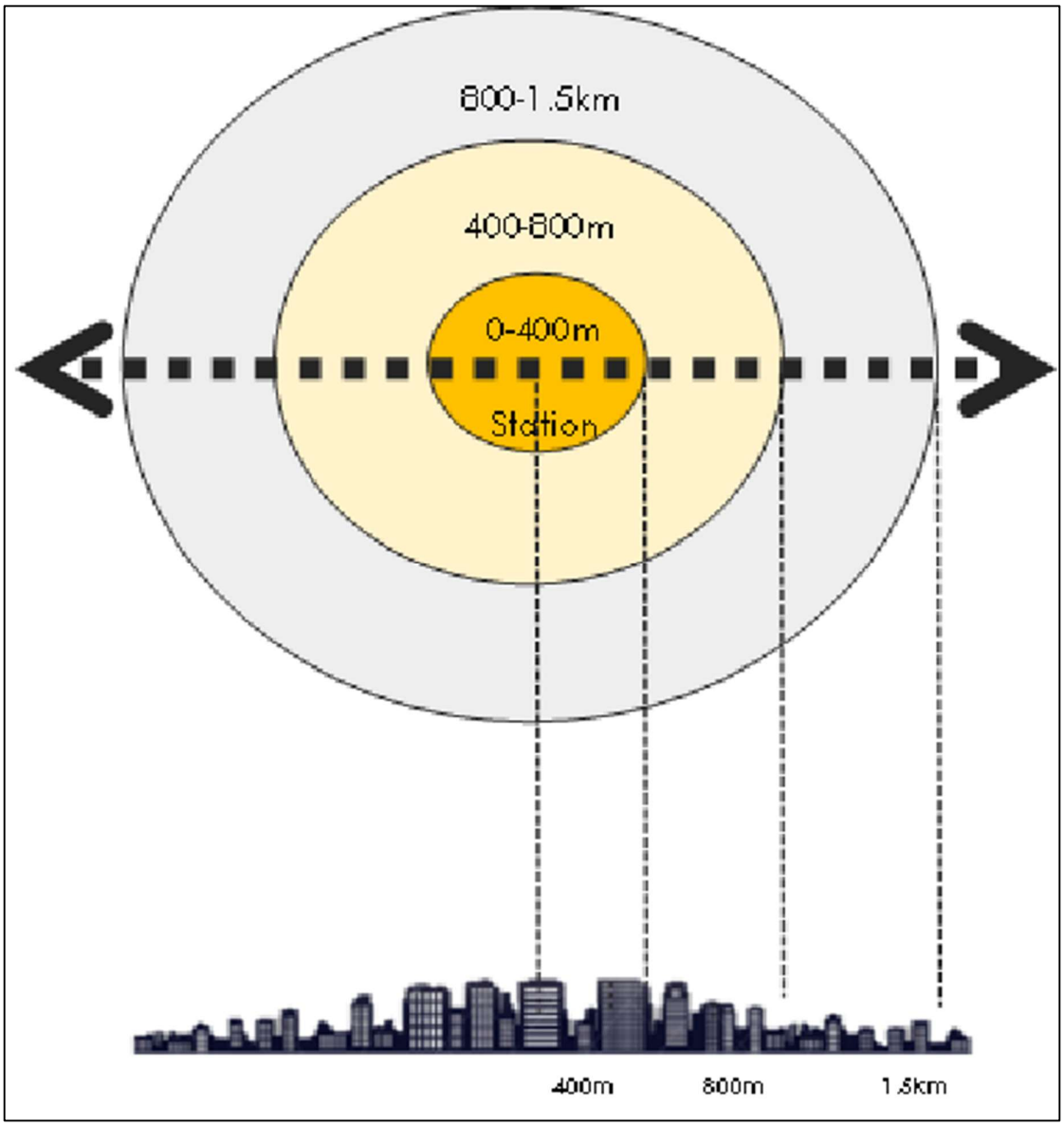


Figure 7: Transit Influence Zone. *Source: (Abdullah et al., 2023)*

- Value Capture Mechanisms: Land Value Capture (LVC), Transfer of Development Rights (TDR), Premium Floor Space Index (FSI), impact fees etc.
- Institutional Analysis: Governance frameworks, Development control regulations & Policy frameworks
- Historical Analysis: TOD policy evolution and implementation experiences.
- Current Assessment: existing policies and land market dynamics.
- Prospective Analysis: projected scenarios of the various components of TOD and its financing.

Table 9: TOD station area zones for Naya Raipur *Source: Naya Raipur development plan 2031*

TOD Zone	Primary Station Area	Secondary Area	Catchment Area
Radius	0–400m / 5-minute walk	400–800m / 10-minute walk	800m–2km
Description	The primary zone includes the rapid transit station and associated facilities as well as the immediately surrounding area.	The secondary zone extends between 400 and 800 metres from the rapid transit station.	The catchment area is the broader area of influence outside of the station area. Most of the people who access the regional rapid transit system will come from the catchment area.
Transportation Considerations	• Prioritize high levels of pedestrian and NMT (Non-Motorized Transport) activity. • Balance other modes of access to the stations e.g., IPT, MVs, cell-phone waiting areas, etc. • Reduction in parking.	• Prioritize direct and safe walking & cycling connections to the rapid transit station. • Heavy reliance on non-motorized IPT as walking distance increases.	• Prioritize direct and quick connections for motorized IPT. • Reliance on transit feeder services as distance increases.
Land Use Considerations	• Highest density and mixed uses to encourage high ridership and provide a mixed-use, vibrant activity spine. • High level of amenities – retail, bike parking, businesses, traffic calming, etc.	• Medium densities and mix of uses to benefit from the high level of transit accessibility • Density and height of development should be stepped down gradually towards the periphery.	• Medium to lower density developments. • Create open space linkages and green connections.

The Table 9 depicts the appropriate development proposals on the three categories of TOD influence zones viz. Primary Station Area, Secondary Area & Catchment Area in case of Naya Raipur.

As seen in Figure 7 & Table 9 the influence zone may be categorized and classified as per convenience of planning institutions of different cities.

3.6. Limitations

- The planning interventions will be limited to the delineated influence zone of TOD.
- Data Availability: Limited access to comprehensive property transaction records in Indian cities, particularly disaggregated data for small-scale transactions.
- Normalization of data: Case-specific findings may have limited applicability to cities with different socio-economic profiles, governance structures, or market conditions.
- Time constraints: Study duration may not capture long-term land value appreciation patterns and market cycles.
- Market dynamics: Rapid changes in real estate markets and policies during study period.

Chapter IV

CASE STUDIES

Case studies of TOD implementation in India: Delhi, Mumbai, Ahmedabad & Bengaluru.

Transit-Oriented Development (TOD) in India has gained policy recognition through the **National TOD Policy (2017)** and increased investments in metro rail systems. Four Indian cities - Delhi, Mumbai, Ahmedabad, and Bengaluru - provide valuable insights into the opportunities and challenges of implementing TOD in complex institutional and market environments. This chapter presents a detailed analysis of TOD initiatives in these cities, focusing on **planning frameworks, regulatory mechanisms, financing strategies (including VCF), institutional arrangements, and key implementation outcomes**.

4.1. Case study 1: Delhi – India's pioneering citywide TOD policy

4.1.1. Background

Delhi was the **first Indian city** to formally incorporate TOD into its statutory planning framework through the Delhi Master Plan (MPD–2021 and MPD–2041), with the **Transit-Oriented Development chapter introduced as a key strategy for compact, mixed-use development**. The Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC) played a central role in formulating early TOD design guidelines.

4.1.2. TOD Policy Framework

Delhi's TOD Policy identifies 500–800 m influence zones along metro corridors as Intensification Areas where higher FAR, mixed-use zoning, and people-centric design principles are permitted.

- FAR up to 400% in TOD zones.
- Minimum 30% residential component with mixed-income housing.
- Mandatory 20% EWS housing.
- Emphasis on walkability, NMT, and multimodal integration.
- Incentivised redevelopment through land pooling and assembly.

4.1.3. Financing and VCF Integration

Delhi has used several VCF instruments:

- **Betterment levy** and **impact fees** along metro corridors.
- **Premium FAR charges** in TOD zones.
- **Joint development** and commercial real estate integration with DMRC.

The VCF Policy Framework identifies Delhi as a leading example of using fiscal tools to monetise metro-induced land value uplift.

4.1.4. Challenges

- Fragmented institutional roles among DDA, UTTIPEC, PWD, DMRC.
- Limited capacity for land assembly.
- Existing dense built fabric complicates redevelopment.
- Market hesitation in adopting higher FAR without guaranteed infrastructure upgrades.

4.1.5. Lessons Learned

- Strong statutory anchoring of TOD offers clarity for implementation.
- Metro expansion drives redevelopment prospects.
- VCF can support infrastructure upgrading in densified nodes.
- Integration of EWS housing supports inclusive TOD principles.

4.2. Case study 2: Mumbai - density-driven TOD with market-oriented value capture

4.2.1. Background

Mumbai's extremely high urban density and transit dependency make it a natural candidate for TOD. The city has experimented with land value capture for decades—particularly through the **Bandra-Kurla Complex (BKC)** land auctions and **premium FAR charges**, both documented as national best practices.

4.2.2. TOD Integration in Planning

Mumbai's Development Plan (DP–2034) includes:

- **Higher permissible FSI (up to 5–8)** in transit influence zones.
- TOD overlays along metro, suburban rail, and monorail corridors.
- Public open space mandates.
- Mixed land use and rental housing promotion.

TOD planning builds on the city's strong tradition of **rail-based mobility**, with 88% of commuters relying on public transport.

4.2.3. VCF Instruments and Financing Innovations

Mumbai is one of India's most advanced cities in using land-based financing:

- **FSI Premiums.**
- **TDR (Transfer of Development Rights).**
- **Road and Metro Cess.**
- **Auction of Public Lands (e.g., BKC).**
- **Public–Private Partnership for station area development**

These mechanisms have generated substantial revenues for metro expansion and trunk infrastructure upgrading.

4.2.4. Key Outcomes

- Increased private-sector participation in station-led development.
- Successful monetisation of publicly owned land.
- Improved multimodal integration along new metro lines.

4.2.5. Challenges

- High land prices restrict affordable housing in TOD zones.
- Redevelopment complexities due to slums and informal settlements.
- Excessive density pressures on infrastructure.
- Fragmented governance (MMRDA, BMC, SRA, MHADA, etc.).

4.2.6. Lessons for TOD

- Market-oriented VCF tools can significantly finance transit.
- TOD must address affordability to prevent displacement.
- Strong coordination mechanisms are essential in multi-agency regions.

4.3. Case study 3: Ahmedabad – India's most successful BRT-led TOD

4.3.1. Background

Ahmedabad is globally recognised for its **Janmarg Bus Rapid Transit System (BRTS)**, one of the earliest full-featured BRT networks in India. The city integrated TOD principles early, using **Development Control Regulations (DCR) amendments** to permit higher FSI and mixed-use development along BRT corridors.

4.3.2. TOD Regulatory Framework

- **DCR amendments allowing 4+ FSI** along BRT corridors
- Mixed-use TOD zones with pedestrian-friendly streets
- Multimodal integration at BRT stations
- City-level Street redesign and NMT prioritisation

4.3.3. Value Capture and Land Management Tools

Ahmedabad is a national leader in land-based financing through:

- **Town Planning Schemes (TPS)**
- **Sale of development rights**
- **Impact fees for incremental FSI**
- **Land readjustment mechanisms**

TPS has been internationally recognised as a scalable land pooling and value capture model.

4.3.4. Key Outcomes

- Substantial real estate uplift along BRT corridors.
- Improved last-mile connectivity and public realm quality.
- Efficient utilisation of land pooling mechanisms.
- Replicable model for mid-tier Indian cities.

4.3.5. Challenges

- Slower adoption of high-density development by private developers.
- Limited affordable housing integration into TOD zones.
- BRT overcrowding due to rising demand.

4.3.6. Lessons Learned

- BRT systems can effectively anchor TOD (contrary to misconceptions).
- TPS offers a powerful instrument for value capture.
- TOD implementation is smoother where land assembly tools are mature.

4.4. Case study 4: Bengaluru – transit expansion and emerging TOD strategy

4.4.1. Background

Bengaluru's rapid urban growth, IT-driven economic expansion, and severe congestion have pushed significant investments into the **Namma Metro**, making TOD essential for long-term sustainability.

4.4.2. TOD and Land Use Integration

The Directorate of Urban Land Transport (DULT) has piloted **Station Accessibility Plans (SAPs)** to improve first/last-mile connectivity around metro stations. Elements include:

- Pedestrian improvements.
- Cycle lanes and bike-sharing.
- Public space activation.
- Feeder services integration.

4.4.3. Institutional Setting

- **BMRCL** (metro operations)
- **DULT** (multimodal integration)
- **BBMP**, **BDA**, **BMTC**, and multiple parastatals

This multiplicity of institutions complicates TOD coordination.

4.4.4. Value Capture in Bengaluru

While still emerging, Bengaluru has begun exploring VCF methods:

- **Betterment charges in new layouts**
- **Premium FAR along metro corridors**
- **Joint development of station areas**

However, these are not yet systematised like in Mumbai or Ahmedabad.

4.4.5. Challenges

- Fragmented urban governance and weak metropolitan coordination.
- Limited statutory TOD policy.
- Land constraints and high real estate prices.
- Inadequate last-mile infrastructure in many metro catchments.

4.4.6. Lessons Learned

- SAPs demonstrate effective micro-scale TOD implementation.
- TOD requires a unified metropolitan governance structure.
- Premium FAR must be supported with infrastructure upgrades.

4.5. Comparative synthesis of the cases of four cities.

Table 10: Comparison of highlights of the four cities. *Source: Author*

Parameter	**Delhi**	**Mumbai**	**Ahmedabad**	**Bengaluru**
Transit Backbone	Metro	Metro + Suburban Rail	BRT	Metro
TOD Anchoring	Statutory TOD chapter	Density-driven FSI strategy	Corridor-based TOD along BRT	Station Accessibility Plans
VCF Maturity	Moderate–High	Very High	High (TPS-led)	Low–Moderate
Land Assembly Tools	Mixed (land pooling)	TDR, redevelopment	TPS land pooling	Limited
Governance	Better integrated (DDA/UTTIPEC)	Fragmented	Strong AUDA leadership	Highly fragmented
Affordability Integration	Strong (mandatory EWS)	Weak	Moderate	Limited

4.6. Key takeaways for Indian cities

1. TOD must be anchored in statutory planning frameworks.
2. VCF works best where land instruments (TPS, TDR, FAR premiums) are legally mature.
3. TOD must address affordability to prevent displacement and promote inclusion.
4. Governance integration is as important as design or infrastructure.
5. BRT-based TOD can be as effective as metro-led TOD when supported by policy and land management tools.

Chapter V

LVU ANALYSIS AROUND TRANSIT SYSTEMS

Transit infrastructure has long been recognized as a catalyst for urban transformation, reshaping land values, influencing market behavior, and guiding development patterns. The concept of **land value uplift (LVU)** refers to the **incremental rise in land and property prices attributable to improvements in transport accessibility**, especially around mass rapid transit systems such as Metro, BRT, and commuter rail.

Across global and Asian cities, LVU is used strategically to fund transport infrastructure through **Value Capture Financing (VCF)**. This chapter synthesizes international and Indian evidence from the uploaded literature to examine the determinants, magnitude, and spatial variations of LVU around transit systems.

5.1. Theoretical framework for Transit-Induced LVU

According to classic urban economics models (Alonso, 1964), accessibility is a key determinant of land values: properties closer to key employment and service nodes benefit from reduced transport costs and thus command higher prices. Transit systems expand effective accessibility by:

- shortening travel time,
- reducing congestion,
- increasing connectivity, and
- improving the attractiveness of station influence zones.

Evidence from Canada, China, Australia, Indonesia, and the U.S. confirms that improved transit accessibility is systematically capitalised into land and property prices (Debrezion et al., 2007; Higgins & Kanaroglou, 2016).

5.2. Empirical Evidence of LVU from Global Case Studies

Empirical studies from across the world demonstrate that investments in mass transit infrastructure generate LVU, although the magnitude varies across cities and market contexts. Factors such as accessibility, land-use intensity, urban design, network connectivity, and prevailing economic conditions significantly influence the extent of value appreciation, highlighting the importance of context-specific approaches for integrating TOD - VCF.

5.2.1. North America: Mixed but Mostly Positive Impacts

A major meta-analysis covering 40 years of rapid transit systems in North America shows robust yet heterogeneous LVU outcomes (Higgins & Kanaroglou, 2016).

Key findings include:

- Transit-accessible residential properties can experience uplift ranging from **2% to 10%**.
- Commercial and retail uplift varies more widely due to market cycles and network effects.

This indicates that LVU depends not only on proximity to stations but also on complementary factors such as land use mix, walkability, and overall system connectivity.

5.2.2. Australia: Light Rail Transit (LRT) and Housing Value Premiums

Research in Sydney found that residential properties within **0–400 m** of new LRT stations experienced a **3.1%–3.3% premium** both during announcement and construction phases (Abidoye et al., 2022).

- Market anticipates accessibility improvements early.
- Proximity remains a dominant factor in property valuation.
- LRT yields measurable benefits comparable with heavy metro systems.

5.2.3. China: Strong LVU Moderated by Built Environment Features

Several uploaded studies demonstrate the dynamic and spatially heterogeneous LVU effects of metro rail systems in Chinese cities:

(a) Wuhan, China – TOD as an Amplifier of LVU

Housing prices show stronger premiums in areas with high mixed-use intensity and pedestrian-oriented design.

(b) Ningbo, China – Land Premium Effects of Urban Rail Transit

Findings show that metro-induced LVU is significant, and cities have capitalised this through LVC, PPPs, and urban regeneration.

(c) Network and Spillover Effects (Singapore Case Study)

Retail property values rose not only along new lines but also within existing lines due to network expansion, demonstrating strong network effects.

These cases highlight that LVU is not solely a function of station proximity but also network effects, connectivity improvements, and urban design quality.

5.2.4. Indonesia: LRT and Big-Data-Based LVU Modelling

Large-scale data mining studies in Jakarta illustrate significant LVU around LRT stations, with variables such as building density, institutional proximity, and CBD location influencing price elasticity.

5.2.5. Indonesia (Jakarta MRT): Unexpected Negative Uplift

A rare but important finding is the **negative LVU for commercial offices** near the Jakarta MRT due to **oversupply**, while residential rents remained unaffected.

This shows market maturity and economic conditions strongly modify LVU outcomes.

5.3. Proximity-Based vs. Accessibility-Based LVU Effects

A key advancement in the literature is distinguishing between:

1. Proximity-Based LVU - Increase in land value due to physical closeness to transit stations.

2. Accessibility-Based LVU - The value created by improved access to the entire transit **network**, captured through:

- gravity-based accessibility scores,
- cumulative opportunities,
- improved travel times.

Studies from Vancouver show that **accessibility-based LVU extends far beyond 800m catchment areas**, capturing regional connectivity improvements that proximity-based models miss.

5.4. Determinants of Land Value Uplift

Analysis of the uploaded research reveals that LVU magnitude is shaped by the following clusters of factors:

5.4.1. Built Environment Features (TOD Attributes)

Studies consistently identify the "3Ds" as strong modifiers of LVU:

Density: Higher built-up density amplifies LVU due to development potential.

Diversity (Mixed Use): Mixed land use increases property attractiveness and transit ridership, boosting LVU.

Design: Pedestrian-friendly environments increase effective accessibility.

Evidence: Wuhan TOD study shows LVU is **significantly higher in mixed-use zones**.

5.4.2. Institutional and Governance Factors

Research on institutional economics stresses that LVU realisation depends heavily on **transaction costs, governance coordination, and regulatory clarity**. In cities with fragmented governance structures (Vietnam, Jakarta), LVU is often underutilized.

5.4.3. Economic Conditions and Market Behaviour

The success of Land Value Uplift (LVU) and Value Capture Financing (VCF) is highly dependent on prevailing economic conditions and real estate market dynamics. During periods of economic slowdown, recession, or weak investor confidence, demand for residential, commercial, and mixed-use developments declines, reducing property transactions and limiting appreciation in land values. Similarly, an oversupply of commercial or office space can suppress rental income and property prices, thereby diminishing the expected value uplift from transit investments. For example, studies on the Jakarta Mass Rapid Transit (MRT) found that despite substantial improvements in accessibility, commercial office rents near MRT stations declined because of an oversupplied office market, demonstrating that transit infrastructure alone cannot guarantee higher land values. Such market conditions reduce the revenue potential of value capture mechanisms such as betterment levies, development charges, and land sales, ultimately affecting the financial viability of TOD projects. Therefore, economic cycles, market absorption capacity, and demand forecasts must be carefully assessed before implementing land value capture strategies.

5.4.4. Transit System Type and Service Quality

- Heavy metro generates the strongest LVU, since it has higher capacity to move larger population at once.
- There can be metro neo or light metro rail which has potential to provide LVU gradually over years, as it has the required infrastructure for heavy metro which can later be upgraded in an easy manner and when upgraded it will produce another land value uplift.
- LRT and BRT corridors can produce **comparable uplift** when supported by TOD zoning and urban design.

5.5. Spatial Extent of Land Value Uplift

The spatial areas where the effect of transit nodes would be observed are shown below as – Proximity from the station and the areas beyond the influence zones.

5.5.1. Station Proximity Zones

LVU effects typically extend to the influence zones of TOD stations:

- **400–800 m** for metros
- **300–500 m** for LRT
- **500–1000 m** for BRT (due to street-based permeability)

5.5.2. Beyond Catchment: Network Spillovers

Singapore case study confirms that LVU can occur even in **areas not directly adjacent** to the new line due to enhanced system-wide accessibility, as such areas are not very far from the stations but are very well connected by other modes of public transportation & feeder services, which makes the rise in land & property values even in the outer areas.

5.6. LVU Evidence in Indian Cities

There are cases of Delhi, Ahmedabad, Mumbai & Bengaluru where LVU is observed when TOD was implemented.

5.6.1. Delhi Metro

- Significant uplift in commercial and residential properties around stations.
- Basis for DDA to introduce **premium FAR**, **impact fees**, and **joint development**.

5.6.2. Ahmedabad BRT (Janmarg)

- Studies show strong LVU along BRT corridors where land pooling (TPS) improved urban form.

5.6.3. Mumbai Metro/Suburban Rail

- Highest LVU in India due to extreme transit dependence.
- Key revenue tool: **FSI premiums and TDR**

5.6.4. Bengaluru's Metro (Namma Metro)

- Early patterns show uplift primarily at interchange stations and IT corridors.
- Station Accessibility Plans (SAPs) improving last-mile connectivity help unlock LVU.

5.7. Challenges in Harnessing Land Value Uplift

1. Weak integration of land-use and mobility planning: Multiple agencies without clear coordination reduce LVU realization.
2. Unsystematic application of VCF tools: Premium FAR, TDR, impact fees are inconsistently applied.
3. Land ownership fragmentation: Makes redevelopment and densification around stations difficult.
4. Lack of valuation frameworks: Urban local bodies often lack tools to estimate LVU scientifically.
5. Socio-economic impacts: Unregulated LVU can lead to **gentrification and displacement**, undermining inclusive TOD.

5.8. Implications for Indian TOD Implementation

- **LVU is real, measurable, and substantial** around transit systems.
- **TOD amplifies LVU**, especially when built environment conditions support walkability and mixed use.
- **VCF mechanisms can effectively harness LVU** and finance transit infrastructure.
- Indian cities lag due to governance fragmentation, weak valuation methods, and limited affordable housing integration.

These insights form the foundation for the next chapter on **TOD Financing Challenges** and the final chapter proposing an **India-specific Value Capture Framework for TOD**.

5.9. Conclusion (LVU)

This chapter demonstrated that LVU around transit systems is influenced by a range of spatial, economic, institutional, and built-environment factors. Empirical evidence from global and Indian cities confirms that the accessibility benefits of metro, LRT, and BRT systems are capitalised into land and property values—making LVU a powerful basis for VCF strategies. To unlock this potential, Indian cities require stronger institutional capacity, regulatory reforms, and integrated TOD-VCF implementation frameworks.

Chapter VI

TOD FINANCING CHALLENGES IN INDIAN CITIES

Transit-Oriented Development (TOD) in India has emerged as a transformative planning strategy intended to shift urban growth towards compact, accessible, and sustainable patterns. However, despite progressive policies—such as the National TOD Policy (2017), the MoHUA TOD Guidance Document, and the Value Capture Finance (VCF) Policy Framework—TOD implementation across Indian cities remains constrained by chronic financing limitations, weak institutional capacities, fragmented governance, and slow integration of land-use and transport systems.

This chapter identifies, analyses, and synthesizes the **financial, regulatory, institutional, and governance-related challenges** that undermine India's ability to leverage TOD and Value Capture Financing (VCF) as sustainable infrastructure financing tools.

6.1. Structural Financial Limitations of Urban Local Bodies

Urban local bodies in India are created to perform the functions led by the constitution of India through 74th constitution amendment act, but there formation and structural functioning are governed by the state governments, there fore there is lack of uniformity in their structure and functioning.

6.1.1. Limited Revenue Sources and Weak Financial Autonomy

Indian ULBs have **narrow tax bases**, low user charges, and limited autonomy in raising new revenue streams. Property tax—the largest revenue source—is significantly underutilised due to outdated valuation systems, exemptions, and weak enforcement. The MoHUA VCF Policy Framework highlights that urban infrastructure investment requirements are around **₹1.5–2 lakh crore annually**, whereas actual capacities remain far lower, leading to persistent fiscal gaps.

6.1.2. Dependence on State and Central Transfers

ULBs rely heavily on intergovernmental transfers, which are unpredictable and often tied to specific schemes. This reduces their capacity to undertake long-term TOD or transit-linked land development.

6.1.3. Inadequate Capital Budgeting for TOD

High-capital transit investments, such as metro systems, require significant upfront financing and long-term revenue visibility. Most ULBs cannot support such commitments, thereby depending heavily on:

- State government guarantees
- Multilateral loans
- Special Purpose Vehicles (SPVs)

This reduces financial flexibility for integrated TOD implementation.

6.2. High Capital Costs of Transit Infrastructure

The substantial capital investment required for developing transit infrastructure like metro rail and BRT poses a major financial pressure & challenge for Indian cities, limiting the timely implementation of Transit-Oriented Development (TOD) and associated urban infrastructure upgradation and improvements.

6.2.1. Metro and BRT Investment Burden

Metro rail projects typically cost **₹300–450 crore per km**, while BRTS can cost **₹10–40 crore per km**, depending on design quality. These capital-intensive requirements strain municipal budgets and delay complementary TOD investments such as:

- Station accessibility enhancements
- Public realm upgrades
- NMT infrastructure
- Mixed-use redevelopment

6.2.2. Operating Subsidies and Long-Term Liabilities

Even after construction, most Indian metros operate under financial stress. Farebox revenues seldom cover operational costs, necessitating cross-subsidies or commercial development - mechanisms not yet systematically integrated into TOD planning.

6.3. Fragmented Urban Governance and Institutional Coordination

One of the most cited challenges in TOD implementation across the world—and especially in India - is institutional fragmentation.

6.3.1. Multiple Agencies with Conflicting Mandates

The MoHUA TOD Guidance Document highlights that transportation, land-use planning, infrastructure, and service delivery are governed by different agencies at local, state, and central levels.

Key actors include:

- Development Authorities (e.g., DDA, BDA)
- Municipal Corporations (e.g., MCGM, BBMP)
- Transit Agencies (e.g., DMRC, BMRCL)
- State Urban Transport Departments
- Parastatals (housing, slum rehabilitation, water utilities)

This creates **coordination failures** in:

- station-area planning,
- land redevelopment,
- infrastructure phasing,
- revenue sharing, and
- data integration.

6.3.2. Absence of Metropolitan-Level Planning Bodies

Cities such as Bengaluru and Mumbai lack empowered **Unified Metropolitan Transport Authorities (UMTAs)**, resulting in fragmented mobility and TOD decision-making.

6.3.3. Transaction Costs and Institutional Inefficiencies

Institutional economics research highlights that transaction costs arising from negotiations, approvals, and enforcement significantly hinder integrated land–transport development.

6.4. Weak Integration of Land Use and Transport Planning

The lack of coordinated integration between land use planning and transport infrastructure remains a significant barrier to TOD implementation in India. Inadequate policy integration, limited statutory provisions, and insufficient planning capacity often result in fragmented urban development and underutilization of transit investments.

6.4.1. Policy–Practice Gap

Although TOD is embedded in national guidelines, India's planning regime remains dominated by **land-use zoning**, often disconnected from transit planning. Development Plans and Master Plans are updated infrequently and do not always incorporate real-time transit expansions.

6.4.2. Inadequate Statutory Backing for TOD

Only a few cities (Delhi, Ahmedabad, Mumbai) have begun embedding TOD in statutory documents; most rely on pilot interventions. The TOD Guidance Document stresses that **TOD must be embedded into DCRs, zoning overlays, and statutory plans** to be effective.

6.4.3. Limited Micro-Level Planning

TOD demands intensive station-area planning (SAPs), land assembly, and street network restructuring tasks for which many ULBs lack:

- technical staff,
- GIS capability,
- urban design expertise.

This results in poor implementation even where TOD policy exists.

6.5. Regulatory and Land Market Constraints

The effectiveness of Transit-Oriented Development and Value Capture Financing is strongly influenced by the regulatory environment and land market conditions. Fragmented land ownership, inflexible development control regulations, and inadequate land valuation practices constrain redevelopment opportunities, complicate land-based financing mechanisms, and limit the realization of transit-induced land value gains.

6.5.1. Fragmented Land Ownership

Indian cities have highly fragmented land parcels, making land pooling, consolidation, and redevelopment difficult.

- Negotiations are slow,
- Compensation is contested,
- In-situ redevelopment is complex.

6.5.2. Outdated Development Control Regulations

Most Indian DCRs still rely on blanket FAR/FSI norms, parking requirements, and rigid zoning, limiting the flexibility essential for TOD.

6.5.3. Weak Land Valuation Systems

VCF tools rely on accurate estimation of land value uplift—yet most ULBs lack the valuation methodologies, GIS tools, and market data necessary for:

- Impact fee assessment
- Betterment levy determination
- FAR premium pricing
- Joint development valuation

6.6. Limited Use of Value Capture Financing (VCF) Tools

The VCF Policy Framework notes that Indian cities use only a small subset of potential mechanisms, mostly in piecemeal form.

6.6.1. Underuse of High-Yield VCF Instruments

High-performing instruments such as **land value tax, TDR markets, joint development, and impact fees** are not yet systematically applied.

6.6.2. Weak Enabling Legislation

Land is a subject matter of State government; many states have not enacted enabling VCF laws. ULBs therefore cannot independently levy:

- Betterment charges,
- Development impact fees,
- Transit impact fees,
- Development right premiums.

6.6.3. Challenges in Implementing Joint Development

Transit agencies (e.g., DMRC, BMRCL) often pursue joint development, but challenges include:

- Unclear development rights,
- Long approval cycles,
- Uncertain PPP interest,
- Market risk.

6.6.4. Inconsistent Application of FAR/FSI Premiums

While cities like Mumbai have implemented FAR premiums successfully, others struggle due to:

- Weak market demand,
- Infrastructure deficits,
- Legal uncertainties.

6.7. Socio-Economic Challenges: Affordability and Equity

While Transit-Oriented Development promotes sustainable urban growth and improved accessibility, it can also create socio-economic challenges related to affordability and social equity. Rising land and housing values around transit corridors may lead to gentrification, displacement of low-income communities, and reduced access to affordable housing. Ensuring inclusive TOD therefore requires policies that balance economic development with social equity through affordable housing, inclusionary zoning, and equitable access to transit-oriented neighborhoods.

6.7.1. Risk of Gentrification and Displacement

TOD tends to increase land and housing prices, potentially displacing vulnerable residents. Research on inclusive TOD shows that **TOD without affordability safeguards can intensify inequality.**

6.7.2. Lack of Affordable Housing Policies in TOD Zones

Only Delhi has mandatory EWS housing in TOD regulations; most cities lack explicit inclusionary zoning.

6.7.3. Limited Rental or Workforce Housing Supply

TOD areas often attract luxury development, reducing workforce access to transit-rich zones.

6.8. Technical and Capacity Constraints

The successful implementation of Transit-Oriented Development depends on strong institutional capacity, technical expertise, and data-driven planning. However, many Urban Local Bodies (ULBs) in India face shortages of skilled professionals, limited adoption of GIS and analytical tools, and inadequate monitoring systems. These constraints hinder evidence-based decision-making, effective station-area planning, and the long-term evaluation of TOD performance and value capture initiatives.

6.8.1. Shortage of Skilled Urban Planners and Designers

Indian ULBs lack the staff required to undertake:

- Station-area design,
- Pedestrian network planning,
- Multi-modal integration planning.

6.8.2. Limited Use of Data Analytics for TOD

Many cities lack:

- GIS-based planning tools,
- Accessibility modelling expertise,
- GIS cadastral data for valuation.

6.8.3. Monitoring and Evaluation Gaps

Performance-based TOD development, as recommended in the TOD Guidance Document, requires ongoing data tracking—largely missing in ULBs

6.9. Behavioural and Market-Driven Challenges

The implementation of Transit-Oriented Development is influenced not only by planning and policy frameworks but also by market behavior and stakeholder perceptions. Developers often favor conventional greenfield projects over TOD due to lower risks and regulatory complexities, while uncertain market demand for high-density mixed-use development and fluctuations in real estate cycles can reduce the effectiveness of Value Capture Financing instruments and delay investment in transit-oriented projects.

6.9.1. Developer Reluctance Toward TOD Zones

Developers often prefer greenfield areas due to:

- lower transaction costs,
- flexible regulations,
- fewer land assembly challenges.

6.9.2. Market Perceptions on High-Density Development

In many Tier II Indian cities, demand for high-density mixed-use TOD is still emerging.

6.9.3. Disjunction Between Real Estate Cycles and Transit Investments

Market downturns can reduce the feasibility of VCF tools such as:

- Auctions,
- FAR premiums,
- Impact fees.

6.10. Conclusion

TOD in India is hindered by deep-rooted financial, institutional, and market-based challenges. While transit systems generate significant land value uplift, Indian cities lack the governance capacity, valuation frameworks, and legislative support required to systematically harness this uplift for infrastructure financing. Addressing these constraints requires a comprehensive Value Capture Framework tailored to India's unique planning environment - forming the focus of Chapter VII

Chapter VII

A VALUE CAPTURE FRAMEWORK FOR TOD IN INDIAN CITIES

As demonstrated in Chapters 5 and 6, Transit-Oriented Development (TOD) in India generates significant land value uplift (LVU) but faces structural financing barriers due to:

- Limited fiscal autonomy of ULBs,
- Fragmented governance,
- Weak land-use–transport integration,
- Inconsistent regulatory frameworks, and
- Under-utilisation of Value Capture Financing (VCF) tools.

Despite TOD's potential to reshape Indian urban form, it remains financially constrained because cities lack a coherent **Value Capture Framework (VCF)** to translate transit-induced value creation into investment capital. Drawing from global TOD experiences, MoHUA's VCF Policy Framework, TOD Guidance Document, and institutional economics literature, this chapter proposes a **comprehensive VCF Framework** tailored for Indian cities.

7.1. Rationale for a Value Capture Framework

A structured VCF framework is essential in India because:

1. Transit creates measurable land value uplift: Global and Indian evidence shows metro, LRT, and BRT investments significantly increase property values near stations (Higgins & Kanaroglou, 2016; Li & Huang, 2020)

2. Without systematic mechanisms, uplift benefits only private landowners: VCF ensures public infrastructure investments generate public revenue.

3. Indian ULBs lack sustainable revenue streams: Property taxes and conventional funding are insufficient to support large-scale TOD.

4. TOD requires substantial capital investment: TOD is not just transit construction: it includes public realm redevelopment, pedestrian networks, mixed-use areas, multimodal hubs, affordable housing, and densification—demanding long-term financing.

5. VCF aligns with India's planning structure: Tools such as land pooling, TPS, FAR premiums, joint development, and impact fees are legally and administratively compatible, but underused.

7.2. Principles underlying the proposed VCF Framework

The proposed framework relies on the following core principles:

1. Public Investment Creates Private Gains: VCF captures a share of land value appreciation resulting from public action.

2. Integrated Land-Use–Transport Planning: TOD and VCF must be planned together, not sequentially

3. Equity and Inclusion: VCF proceeds must support affordable housing, public transport subsidies, and inclusive TOD.

4. Financial Sustainability: VCF should reduce dependence on central/state grants.

5. Multi-Stakeholder Governance: Successful VCF requires coordination among development authorities, municipalities, transit agencies, and private developers.

6. Transparent and Predictable Regulations: Clear policies encourage developer participation and reduce transaction costs.

7.3. Conclusion

The proposed Value Capture Framework integrates institutional coordination, regulatory reform, land value assessment, financial structuring, and social equity to create a robust TOD financing model tailored to Indian conditions. It aligns with India's planning context, leverages proven global and national practices, and responds directly to the core challenges identified in Chapter vi.

This framework provides policymakers, development authorities, metro agencies, and municipal corporations with a structured pathway to systematically harness transit-induced land value uplift and direct it toward sustainable, inclusive, and transit-supportive urban transformation.

Chapter VIII

SELECTION OF CASE

The study requires strong evidence of an implementation of TOD using VCF tools to demonstrate the relevance of this research work.

8.1. Parameters for selection of case

The study has to demonstrate the importance of value capture framework through implementation plan in any suitable city of India, therefore parameters of selection of cities across India are listed on the basis of which the cities are shortlisted and then case was selected.

- Tier 2 cities that have planned/operational metro/BRTS/TOD corridors.
- Cities that have relevance and potential for Value Capture Financing (VCF).
- Laws/regulatory framework pertaining to TDR, premium FAR, impact fees, betterment levies etc.
- Availability of land for mixed and high-density development along TOD corridor and influence zone.

8.2. Shortlisted cities

On the basis of parameters mentioned above in chapter 8.1. the following Table 11 contains the Transit system – it denotes the level of transit infrastructure eg. Heavy metro rail & BRTS, population – it supports the feasibility and relevance of implementing TOD, population density – to ensure the further availability of spatial re-densification along the TOD influence zone, potential to generate and harness the land value uplift – it denotes the market conditions (demand and supply) of transit and associated infrastructure, stage of implementation of TOD – that will give an insight of the project implementation status and more space for suggesting proposals, and year the TOD infrastructure was provisioned – so that the timelines and maturity of the TOD implementation can be assessed. The details of shortlisted cities are provided below in comparable manner in Table 11:

Table 11 : Shortlisted cities for case selection Source: Census 2011, website of upmetrorail & mpmetrorail

City	Transit System	Population (2011)	Density (persons /km²)	LVU Potential	TOD implementation Stage	Provisioning year
Lucknow	Metro	2,817,105	6,921	Already partially realized	Post-transit implementation	2017
Kanpur	Metro	2,765,348	1,443	Moderate	Post-transit implementation	2021
Indore	BRTS + Proposed Metro	1,994,397	9,742	Low–Moderate	Partially implemented TOD	2025
Bhopal	BRTS + Proposed Metro	1,798,218	3,836	Moderate	Partially implemented TOD	2025
Raipur	Proposed Metro + BRTS	1,010,087 / 2.3M UA	4,543	High (untapped)	Pre-TOD implementation	At conceptual stage

8.3. Raipur as the selected case

- Raipur is an emerging capital city of that shows TOD in its development plan, where TOD and VCF can be designed proactively rather than retrofitted thus making it a suitable case for developing a framework.
- 4 TOD corridors selected in development plan of Raipur.
- Proposed mixed land use and high FAR along selected TOD corridors.
- Provision of Transferable Development Rights and premium FAR in development plan.
- Approval of formation of Chhattisgarh State Capital Regional Authority.
- Proposed metro rail to connect Naya Raipur, Raipur, Bhilai and Durg cities in state's budget.

Chapter IX

TRANSIT PROFILE OF RAIPUR

9.1. Need for TOD

Raipur, the capital city of Raipur, is undergoing rapid urbanization and spatial expansion due to increasing population, industrial growth, and the development of Nava Raipur as the new administrative capital. Over the last two decades, the city has transformed from a medium-sized regional center into an emerging metropolitan region comprising Raipur, Bhilai, Durg, and Nava Raipur. This rapid growth has generated significant pressure on urban infrastructure, transportation systems, land resources, and environmental quality. In this context, Transit-Oriented Development (TOD) has emerged as an essential planning strategy for ensuring sustainable, efficient, and inclusive urban growth in Raipur.

One of the primary reasons for the need for TOD in Raipur is the increasing dependence on private vehicles. Rising income levels and dispersed urban development have led to a substantial increase in two-wheelers and private cars, resulting in traffic congestion, longer travel times, air pollution, and road safety issues. Major corridors such as GE Road, VIP Road, Ring Road, and the Raipur–Nava Raipur corridor already experience high traffic volumes during peak hours. Without a structured transit-oriented growth model, future urban expansion may further intensify congestion and reduce mobility efficiency.

The development of Nava Raipur provides a unique opportunity to implement TOD principles at an early stage of urban growth. Unlike older Indian cities constrained by unplanned development, Raipur and Nava Raipur possess comparatively wider roads, planned sectors, and available land parcels that can support high-density mixed-use development around major transit corridors. Planned transit systems such as the proposed Raipur–Durg metro corridor and Bus Rapid Transit (BRT)-oriented corridors can become catalysts for compact urban development if integrated with land use planning through TOD principles.

TOD is also necessary to improve public transport ridership and reduce urban sprawl. Presently, much of the urban growth around Raipur is low-density and automobile-oriented, causing inefficient utilization of land and infrastructure. TOD encourages higher-density mixed land use development within walking distance of transit stations, thereby reducing trip lengths and promoting walking, cycling, and public transport usage. This approach can significantly reduce fuel consumption, greenhouse gas emissions, and infrastructure costs associated with scattered development.

Another important reason for adopting TOD in Raipur is its potential to support economic growth and land value enhancement. Transit investments often lead to increased land values around station areas due to improved accessibility. By implementing TOD alongside Value Capture Finance (VCF) mechanisms such as premium FAR, impact fees, land pooling, and development charges, local authorities can generate sustainable revenue for financing urban infrastructure and transit projects. This is particularly relevant for rapidly developing corridors between Raipur and Nava Raipur, where future land appreciation potential is high.

TOD is equally important from a social and environmental perspective. A well-planned TOD framework can provide affordable housing, equitable access to jobs and services, and better public spaces. It can help reduce socio-spatial segregation by improving mobility access for economically weaker sections who depend heavily on public transport. Furthermore, compact transit-oriented growth can reduce encroachment on agricultural land and environmentally sensitive areas surrounding the city.

In conclusion, TOD is essential for Raipur to achieve sustainable urban growth, efficient mobility, economic competitiveness, and environmental resilience. As the city continues to evolve into a regional metropolitan hub connecting Durg, Bhilai, Raipur, and Nava Raipur, integrating land use planning with high-capacity public transport systems through TOD principles will be critical for shaping a more liveable and future-ready urban region.

9.2. Requirement of transit modes

As the city is experiencing rapid urban growth due to increasing population, industrial development, and the emergence of Nava Raipur as a planned administrative capital. This growth has led to rising travel demand across the Raipur–Durg–Bhilai–Nava Raipur urban region. At present, the city is heavily dependent on private vehicles and intermediate public transport such as auto-rickshaws, resulting in traffic congestion, air pollution, longer travel times, and road safety concerns. Existing road infrastructure alone is insufficient to meet future mobility requirements, creating an urgent need for efficient and sustainable transit modes.

The requirement for modern transit systems in Raipur is driven by the need to provide high-capacity, affordable, and reliable public transport connectivity. Transit modes such as Bus Rapid Transit (BRT), metro rail, city bus systems, and suburban transit corridors can help reduce dependence on private vehicles while improving regional accessibility. Major corridors connecting Raipur with Bhilai, Durg, and Nava Raipur have high potential for transit-based commuting due to increasing daily work, education, and administrative trips.

Efficient transit systems are also necessary to support Transit-Oriented Development (TOD), promote compact urban growth, reduce urban sprawl, and improve environmental sustainability. Therefore, developing integrated multimodal transit infrastructure is essential for transforming Raipur into a sustainable and well-connected metropolitan region.

The Chhattisgarh government approved the Raipur-Durg Metro Rail project at an estimated cost of about Rs 11,000 crore. Planned as a **Metro Neo system** spanning over 60 km, it will link Raipur, Nava Raipur Atal Nagar, industrial town of Bhilai and Durg. The project is part of a broader vision to create a State Capital Region (SCR) modelled on Delhi's NCR, integrating Raipur, Nava Raipur and the Durg-Bhilai belt to serve a projected population of over 5 million by 2031. The project is in the advanced stages of detailed project reporting (DPR), land mapping and funding alignment.

9.3. TOD corridors in Raipur Development Plan 2031

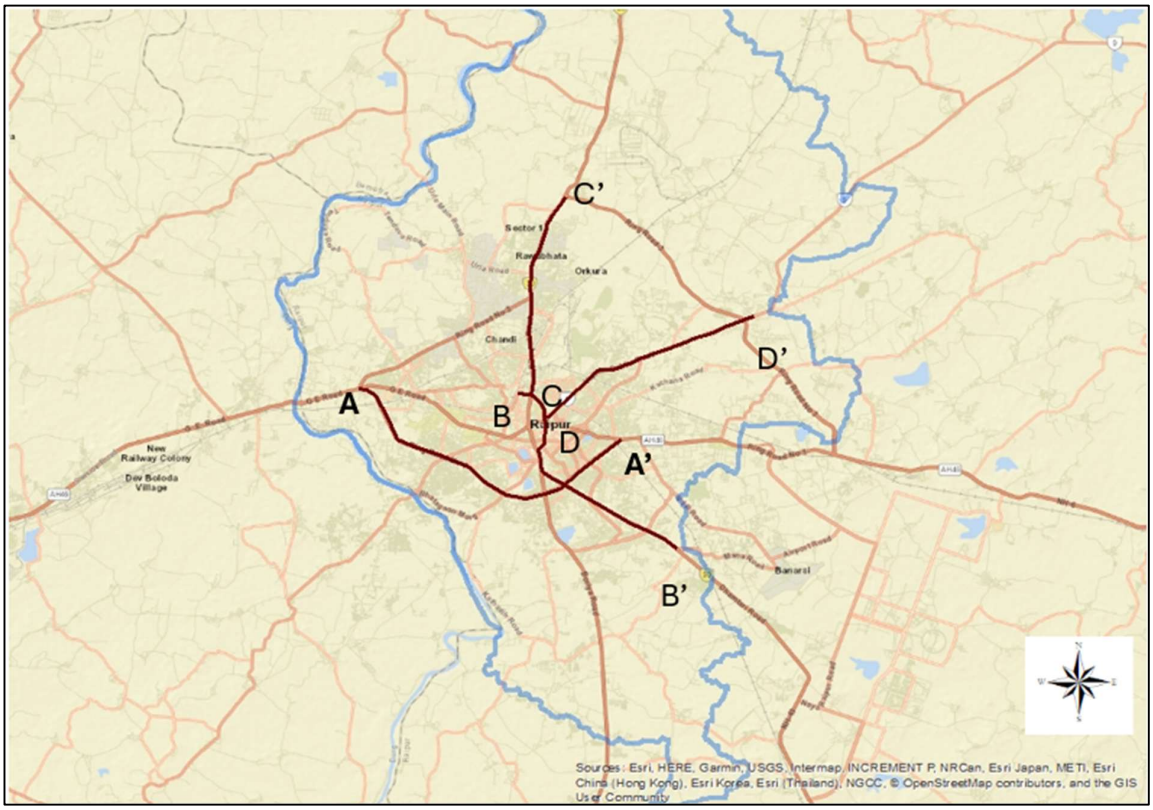


Figure 8 : Selected corridors of TOD *Source: Raipur DP 2031*

1. **[A-A'] Ring Road 1 (Tatibandh chowk to Telibandha Chowk) [13.8km].**
2. [B-B'] Railway station to Dumartarai mandi via shastri chowk & Pachpedi naka chowk [10.9km].
3. [C-C'] Fafadih Chowk to junction of Bilaspur Road & ring road 3 [9.2km].
4. [D-D'] Balodabazar road (from shastri chowk to Old Vidhan sabha) [10.2km].

The corridor **[A-A'] Ring Road 1 (Tatibandh chowk to Telibandha Chowk)** has been selected for the proposed BRTS of Naya Raipur to Raipur by Naya Raipur Development Authority for the connectivity of BRTS.

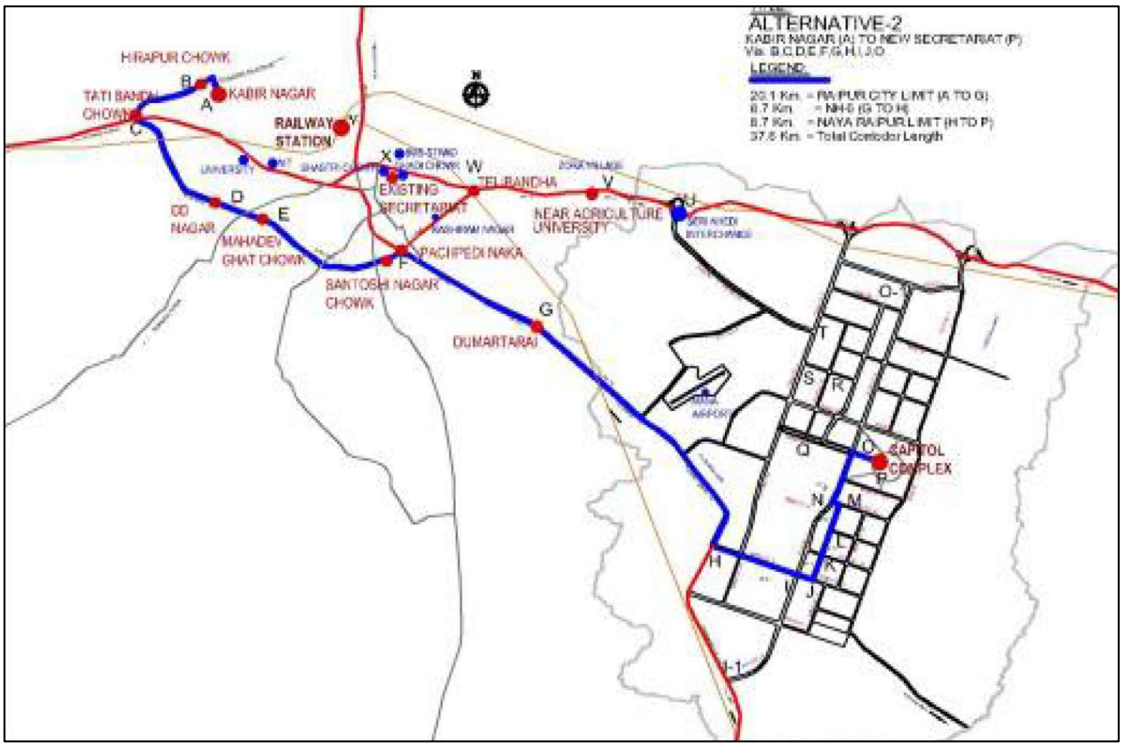


Figure 9 : Proposed corridor for BRTS in Naya Raipur's plan *Source: EIA BRT, NRDA, 2013*

On the basis of the above Figure 8 & Figure 9 the corridor **[A-A'] Ring Road 1 (Tatibandh chowk to Telibandha Chowk)** of length 13.8km is being selected for the case study in this research because this corridor is the only existing major road connectivity from Raipur to Bhilai and Durg cities and is also a 2nd alternative route for proposal of BRTS for connectivity of Raipur and Nawa Raipur. In view of the above, the project for metro neo declared in the state's budget is deemed fit to be developed along the selected corridor that will cater the population of Durg, Bhilai, Raipur & Nawa Raipur Atal nagar collectively which is around 19.04 lakhs and is estimated to have been increased to 26 – 27 lakhs in 2025 as per records of respective municipal corporations of Durg, Bhilai & Raipur, and Nava Raipur Atal Nagar's planning documents as well as state's growth trends & population projections (Directorate of Economics and Statistics, Government of Chhattisgarh, 2025).

9.4. Dileneation of transit nodes along the selected corridor.

The important transit nodes along the have not been demarcated yet by any authority as the project for is at the conceptual stage and is sanctioned in the state's budget. Important transit nodes/stations have to demarcated along the corridor keeping in mind the parameters listed below as per TOD guidance Document MoUD, 2016.

- Accessibility, Transit integration
- The optimal station spacing is determined based on the average transit speed and walking distance (BRTS – 300-800m, Metro rail 800-2000m).
- Provision of park and ride, passenger pick up and drop off facilities.
- NMT Accessibility
- IPT integration
- Cycle and pedestrian
- Safety and Security

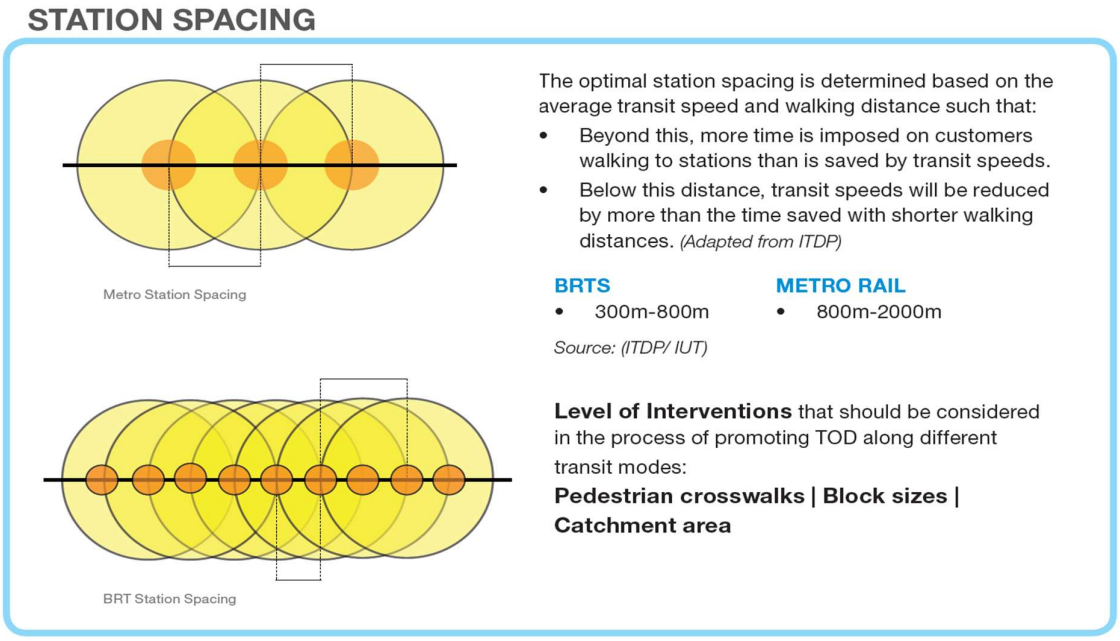


Figure 10 : Station spacing *Source: TOD Guidance Document MoUD, 2016*

The important transit nodes have been demarcated based on the guidelines as shown in Figure 10 so that the influence zone can be delineated and the objective of the study to demonstrate the portion of land value capture that can be used for funding the cost of infrastructure be achieved.

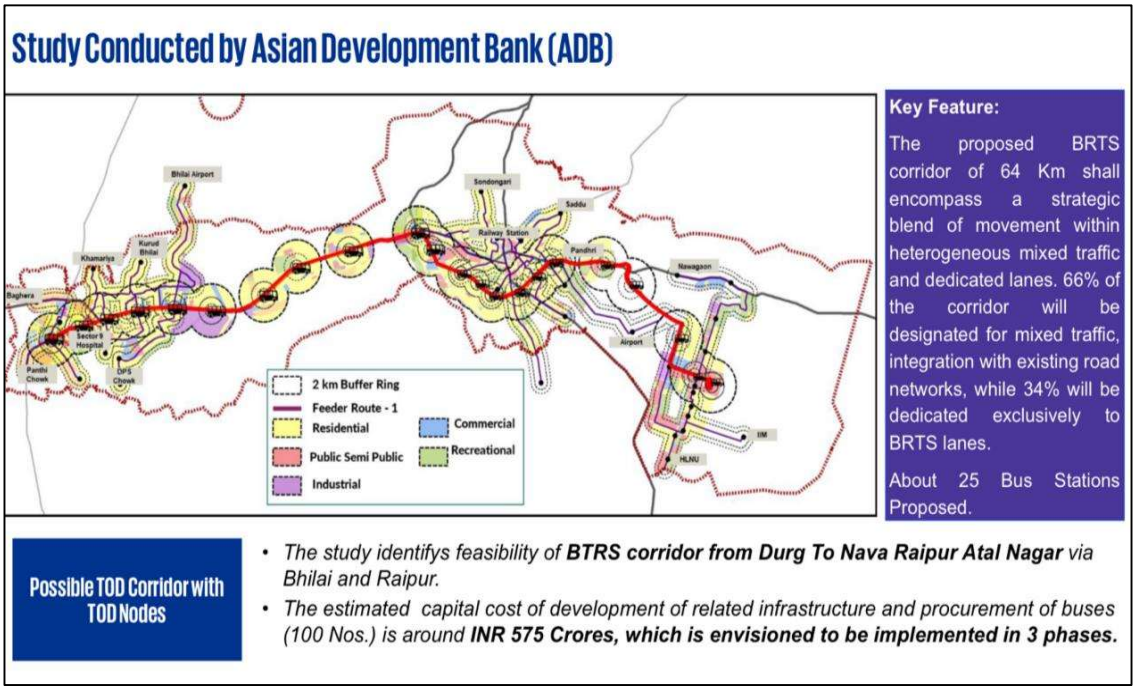


Figure 11: Study by ADB for BRTS feasibility from Durg to Nava Raipur. *Source: ADB, 2025*

The Figure 11 shows the study of Asian Development Bank's report "Strengthening Transit-Oriented Development (TOD) for Urban Resilience" in which they had attempted to show the possible transit corridor with transit nodes along the selected corridor to connect Durg, Bhilai, Raipur and Nava Raipur Atal Nagar cities through BRTS. The proposed BRTS corridor is of 64km in length and shall encompass a strategic blend of movement within heterogenous mixed traffic and dedicated lanes for BRT. This study has proposed about 25 bus stations from Nava Raipur Atal Nagar to Durg.

The proposed route of 64km fully coincides with the selected corridor in this study and to demonstrate the objectives of the study the important nodes have been shortlisted in the Figure 12 below.

The four important transit nodes selected are:

1. Tatibandh Chowk
2. Raipura Chowk
3. ISBT Bhatagaon Chowk
4. Pachpedi Naka Chowk

9.5. Dileneation of influence zone of transit nodes and land use

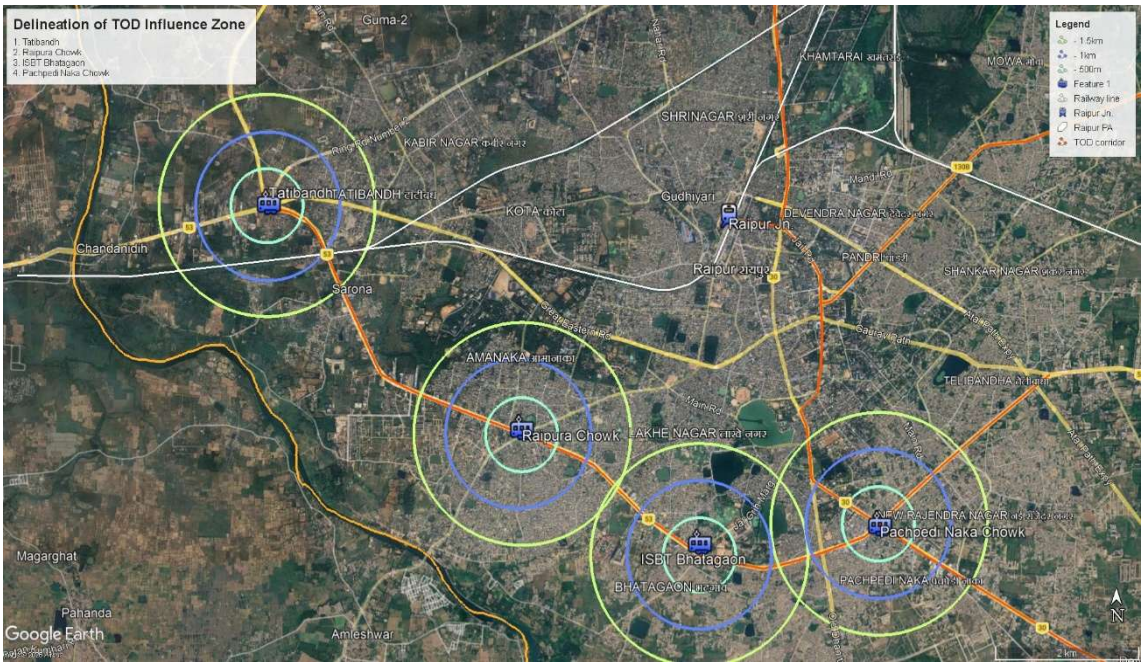


Figure 12 : Delineation of Transit Nodes and influence zone *Source: Author*

The Figure 12 displays the transit nodes which are important traffic junctions and urban centres that have been selected and their influence zones of radius 0-500m primary zone is shown in cyan colour, 500m-1km secondary zone shown in blue colour & 1-1.5km tertiary zone shown in neon colour are delineated.

1. **Tatibandh Chowk** – It has important junction of NH 130 & NH 43 that connects cities of Bilaspur, Dhamtari, Jagdalpur, Bhilai & Durg. It also comprises of AIIMS hospital and Bhanpuri industrial area.
2. **Raipura Chowk** – It is a major junction that connects to the important educational centres viz. Rajkumar college & NIT Raipur, it also connects the state highway that goes to Balod district.
3. **ISBT Bhatagaon Chowk** – This gives an opportunity for the multi-modal integration as it has inter-state bus terminus and has commercial centres within the influence zone.
4. **Pachpedi Naka Chowk** – this connects to the main city and then NH 130 & NH 43 that goes to Dhamtari & Aarang respectively.

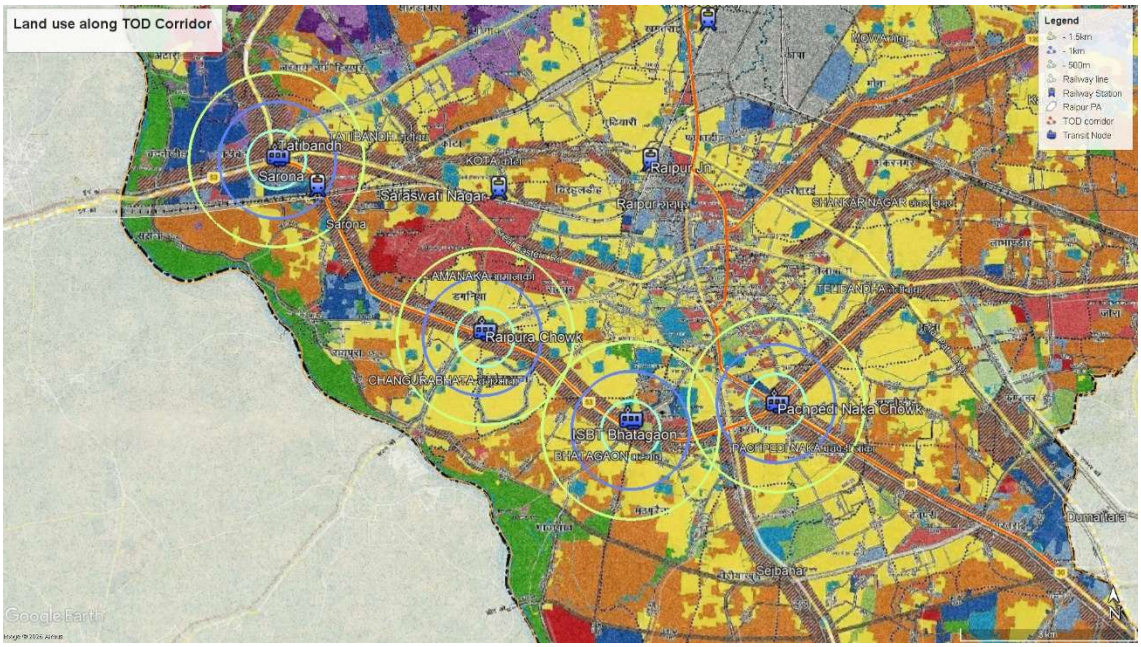


Figure 13 : Proposed land use withn influence zones *Source: Raipur DP 2031*

The Figure 13 shows the selected transit nodes and its influence zone along with the proposed land use as per Raipur's revised development Plan 2031. The major land uses proposed along the corridor is mixed (Orange hatched), existing residential (yellow), proposed residential (Orange), Commercial (Blue), Traffic and transportation (Grey) and public -semi public (red).

1. **Tatibandh Chowk** – It has mixed along the major roads, existing & proposed residential towards north & southern side, Commercial towards west, & public- semi-public for AIIMS hospital at the east.
2. **Raipura Chowk** – It has mixed along the TOD corridor, & public- semi-public due to existing important educational centres viz. Rajkumar college & NIT Raipur, and rest of it is existing residential land uses.
3. **ISBT Bhatagaon Chowk** – It has mixed land use along the TOD corridor, Traffic and transportation for the Inter-state bus terminus and majorly it comprises of the existing & proposed residential withing its influence zone.
4. **Pachpedi Naka Chowk** – It has mixed along the major roads and at junction it has commercial land use, the majority of the influence zone has existing & proposed residential withing its influence zone.

CHAPTER X

RAIPUR'S LAND VALUE PROFILE

10.1. Land values within influence zone

Table 12 : Land Values around Pachpedi Naka *Source: collector guideline rate 2018-19*

Ward No.	Ward name	Area/colony/Society/Road	within 20m from main road (Rs./sq.m.) ß0	beyond 20m from main road (Rs./sq.m.) ß0
59	Moreshwar rao Gadre ward	Ring Road 1 to filter plant golden marbles	25000	
				8500
		Ring Road 1 to Mathpurena	13000	
				8000
55/	Rabindra Nath Tagore ward	Pachpedi naka to Santoshi nagar chowk along ring road 1 (South of road)	50000	
				22500
		Pachpedi naka to fruit mandi	45000	
				21000
		Pachepedi naka to canal link road at junction of NH 43	36000	
56	Lt. Arvind Dixit ward	Budhi mata chowk to ring road	54000	
				40000
		Hotel sapphire to Pachpedi Naka	50000	
				40000
		Shailendra Nagar/ Tagore Nagar	60000	
				45000
58	Shaheed Pankaj Vikram Ward	Devik laxmi nursing home till Vivekanand Complex along ring road	54000	
				40000
		Pachpedi naka to Santoshi nagar chowk along ring road 1	50000	
				32000
		Santoshi nagar to Siddharth chowk	50000	
				22500
63	Brig Usman ward	Nandi Chowk, RDA colony, Tikrapara		8500
62	Shaheed Rajiv Pandey ward	Santoshi nagar chowk to bhatagaon chowk along ring road	26000	
				7000
45	Motilal Nehru ward	Siddharth Chowk to Pachpedi naka chowk	50000	
				22500

Table 13 : Land Values around ISBT Bhatagaon *Source: collector guideline rate 2018-19*

Ward No.	Ward name	Area/colony/Society/Road	within 20m from main road (Rs./sq.m.) ß0	beyond 20m from main road (Rs./sq.m.) ß0
61	Dr. Shyama Prasad Mukehrjee ward	bhatagaon chowk to walfort city gate	30000	
				12000
		bhatagaon chowk to Shitla mata mandir	21000	
				12000
66	Vaaman rao Lakhe ward	Ring road 1 Kushaalpur chowk to Tiranga Chowk	15000	
				12000
		Kushaalpur chowk to Bhatagaon Chowk	30000	
				12000
64	Dr. Vipin Bihari Sur ward	Hanuman Nagar, Math para, Kailashpuri, Adarsh Nagar	21000	
				8500
65	Mahamaya Mandir ward	Lakhe Nagar Chowk to Purani Basti lily chowk	48000	
				16100
		Bajrang Chowk to Dudhadhari math	25000	
				10000
63	Brig Usman ward	Nandi Chowk, RDA colony, Tikrapara		8500
62	Shaheed Rajiv Pandey ward	Santoshi nagar chowk to bhatagaon chowk along ring road	26000	
				7000
60	Chandrashekhar Azad ward	Ring road 1 to Mathpurena Village	13000	
				8000
59	Moreshwar Rao Gadre ward	Ring Road 1 to filter plant golden marbles	25000	
				8500

Table 14 : Land Values around Raipura chowk *Source: collector guideline rate 2018-19*

Ward No.	Ward name	Area/colony/Society/Road	within 20m from main road (Rs./sq.m.) ß0	beyond 20m from main road (Rs./sq.m.) ß0
69	Pt. Deen Dayal ward	Raipura chowk to TATA motors via DD Nagar thana	28000	
		Raipura Chowk to Sundar Nagar Chowk	40000	
				20000
		Rohinipuram Gol chowk to ring road 1	24000	
				18500
68	Madhav Rao Spare ward	Raipura Chowk to Kharun river along Mahadev ghat road (both sides of road)	20000	
				9500
		Raipura Chowk to Manuas Reality	26000	
				11000
39	Thakur Pyarelal ward	Uttarayan Bhawan to Mahadev ghat road	21000	
				15000
67	Dr.Khhobchand Baghel ward	Walfort city gate to Raipura Chowk	32000	
				12000
41	Pt. Sundar Lal Sharma ward	Ring raod 1 Changurabhata chowk to Santoshi chowk	15000	
				12000
		Sundar nagar Society		20000
		Maitri nagar (Changurabhata)		20000

Table 15 : Land Values around Tatibandh chowk *Source: collector guideline rate 2018-19*

Ward No.	Ward name	Area/colony/Society/Road	within 20m from main road (Rs./sq.m.) ß0	beyond 20m from main road (Rs./sq.m.) ß0
1	Veer Sawarkar ward	Kharun river bridge to Tatibandh Chowk	22000	
				10000
		Tatibandh Chowk to Hirapur Chowk	22000	
				10000
20	Shaheed Bhagat Singh ward	Tatibandh Chowk to Picadily hotel (G.E.Road)	32000	
				19000
		Tatibandh chowk to arihant nagar along ring road 1	23000	
				12000
		Tatibandh chowk to Hirapur Chowk (Ring Road 2) right side	22000	
				16000
22	Pt. Ishwari Charan Shukla ward	Aamanaka thana to G.K.Ford till junction of ring road 1	14000	
				9500
70	Sant Ravidas ward	Tatibandh chowk to arihant nagar along ring road 1	23000	
				12000
		Manuas reality to sarona bridge along ring road 1	20000	
				11000
69	Pt. Deen Dayal ward	Raipura chowk to TATA motors via DD Nagar thana	28000	

The Table 12, Table 13, Table 14, & Table 15 has the details consisting of the existing prevalent prices as per collector guideline rates of Raipur district, the market prices are usually higher that these rates, but when the property transaction takes place the guideline rates are the base rates at which tax/duties etc. are calculated. This figures gives us insight of the values of properties situated within the influence zone and in the next this prices will be used to forecast the land value uplift on the basis of distance to station, accessibility, CBD distance, social infrastructure, plot size, density, FAR, TOD zoning, applicability of TDR.

10.2. Indicators affecting land values in TOD influence zone

Key parameters - transit accessibility, distance to stations, land use, and regulatory such as FAR and TDR.

Application of Hedonic pricing method to project the land value uplift when provisioning of TOD takes place.

General equation: *P = f(T,L,O,R)*

Where:

- **P** = Property/Land price
- **T** = Transit variables (**distance to station**, **accessibility**)
- **L** = Location variables (**CBD distance**, **social infrastructure**)
- **O** = Other variables (**plot size, density**)
- **R** = Regulatory variables (**FAR, TOD zoning, applicability of TDR**)

Log-linear formula :

- $\ln(P_i) = \beta_0 + \beta_1 Distance_i + \beta_2 Accessibility_i + \beta_3 FAR_i + \beta_4 X_i + \epsilon_i$
- β_0 – Base price of land/property
- β_1 - distance to station [*0-500m – 20%, 500m-1km – 15%, 1-1.5km – 10%, (Son & Duong, 2025)*]
- β_2 – Accessibility [*10–20%, (Yen et al., 2023)*]
- β_3 – FAR + TDR (varies with zones) [*10–30%, (Yen et al., 2023) & (TOD Guidance Document MoUD, 2016)*]
- β_4 – Land use [*10-20%, (Li & Huang, 2020)*] + distance of CBD & social infrastructure [*10-20%, (Yen et al., 2023)*]
- ϵ_i – Errors/random effects

Note*: The assigned weights of the variables are proxy values derived from the referenced literature. The values were to be derived through regression analysis but the variables considered here were non-existent previously.*

10.3. Calculation of Land value uplift within influence zones

Table 16 : Land Value Uplift around Pachpedi Naka chowk *Source: Author*

Ward No.	Ward Name	Area/Colony/Society/Road	Property Situated Within 20m From Main Road (Rs./Sq. M.) $ß_0$	Property Situated Beyond 20m From Main Road (Rs./Sq. M.) $ß_0$	$ß_1$	$ß_2$	$ß_3$	$ß_4$	Sum Of Coefficients	Increased Value Of Land (Rs./Sq.M.)	Land Value Uplift (Rs./Sq.M.)
59	Moreshwar rao Gadre ward	Ring Road 1 to filter plant golden marbles	25000		0.15	0.2	0.2	0.2	0.75	43750	**18750**
				8500	0.1	0.15	0.2	0.15	0.6	13600	**5100**
		Ring Road 1 to Mathpurena	13000		0.15	0.2	0.2	0.2	0.75	22750	**9750**
				8000	0.1	0.1	0.2	0.15	0.55	12400	**4400**
55	Rabindra Nath Tagore ward	Pachpedi naka to Santoshi nagar chowk along ring road 1 (South of road)	50000		0.2	0.2	0.2	0.2	0.8	90000	**40000**
				22500	0.2	0.2	0.2	0.2	0.8	40500	**18000**
		Pachpedi naka to fruit mandi	45000		0.2	0.2	0.2	0.2	0.8	81000	**36000**
				21000	0.2	0.2	0.2	0.2	0.8	37800	**16800**
		Pachepedi naka to canal link road at junction of NH 43	36000		0.2	0.2	0.2	0.2	0.8	64800	**28800**
56	Lt. Arvind Dixit ward	Budhi mata chowk to ring road	54000		0.1	0.15	0.2	0.15	0.6	86400	**32400**
				40000	0.1	0.1	0.2	0.15	0.55	62000	**22000**
		Hotel sapphire to Pachpedi Naka	50000		0.2	0.2	0.2	0.2	0.8	90000	**40000**
				40000	0.2	0.2	0.2	0.2	0.8	72000	**32000**
		Shailendra Nagar/ Tagore Nagar	60000		0.15	0.15	0.2	0.1	0.6	96000	**36000**
				45000	0.15	0.15	0.2	0.1	0.6	72000	**27000**
58	Shaheed Pankaj Vikram Ward	Devik laxmi nursing home till Vivekanand Complex along ring road	54000		0.2	0.2	0.2	0.2	0.8	97200	**43200**
				40000	0.2	0.2	0.2	0.2	0.8	72000	**32000**
		Pachpedi naka to Santoshi nagar chowk along ring road 1	50000		0.2	0.2	0.2	0.2	0.8	90000	**40000**
				32000	0.2	0.2	0.2	0.2	0.8	57600	**25600**
		Santoshi nagar to Siddharth chowk	50000		0.15	0.1	0.2	0.2	0.65	82500	**32500**
				22500	0.2	0.1	0.2	0.2	0.7	38250	**15750**
63	Brig Usman ward	Nandi Chowk, RDA colony, Tikrapara		8500	0.1	0.1	0.2	0.2	0.6	13600	**5100**
62	Shaheed Rajiv Pandey ward	Santoshi nagar chowk to bhatagaon chowk along ring road	26000		0.1	0.2	0.2	0.2	0.7	44200	**18200**
				7000	0.1	0.1	0.2	0.2	0.6	11200	**4200**
45	Motilal Nehru ward	Siddharth Chowk to Pachpedi naka chowk	50000		0.2	0.2	0.2	0.2	0.8	90000	**40000**
				22500	0.2	0.1	0.2	0.2	0.7	38250	**15750**

Table 17 : Land Value Uplift around ISBT Bhatagaon Chowk *Source: Author*

Ward No.	Ward Name	Area/Colony/Society/Road	Property Situated Within 20m From Main Road (Rs./Sq. M.) ß0	Property Situated Beyond 20m From Main Road (Rs./Sq. M.) ß0	ß1	ß2	ß3	ß4	Sum Of Coefficients	Increased Value Of Land (Rs./Sq.M.)	Land Value Uplift (Rs./Sq.M.)
61	Dr. Shyama Prasad Mukehrjee ward	Bhatagaon chowk to walfort city gate	30000		0.2	0.2	0.2	0.1	0.7	51000	**21000**
				12000	0.15	0.1	0.2	0.1	0.55	18600	**6600**
		Bhatagaon chowk to Shitla mata mandir	21000		0.2	0.2	0.2	0.1	0.7	35700	**14700**
				12000	0.15	0.1	0.2	0.1	0.55	18600	**6600**
66	Vaaman rao Lakhe ward	Ring road 1 Kushaalpur chowk to Tiranga Chowk	15000		0.2	0.2	0.2	0.1	0.7	25500	**10500**
				12000	0.15	0.15	0.2	0.15	0.65	19800	**7800**
		Kushaalpur chowk to Bhatagaon Chowk	30000		0.2	0.2	0.2	0.1	0.7	51000	**21000**
				12000	0.15	0.15	0.2	0.15	0.65	19800	**7800**
64	Dr. Vipin Bihari Sur ward	Hanuman Nagar, Math para, Kailashpuri, Adarsh Nagar	21000		0.15	0.15	0.2	0.1	0.6	33600	**12600**
				8500	0.1	0.1	0.2	0.1	0.4	11900	**3400**
65	Mahamaya Mandir ward	Lakhe Nagar Chowk to Purani Basti lily chowk	48000		0.1	0.1	0.2	0.15	0.55	74400	**26400**
				16100	0.5	0.5	0.2	0.15	0.45	23345	**7245**
		Bajrang Chowk to Dudhadhari math	25000		0.2	0.2	0.2	0.1	0.7	42500	**17500**
				10000	0.15	0.1	0.2	0.1	0.55	15500	**5500**
63	Brig Usman ward	Nandi Chowk, RDA colony, Tikrapara		8500	0.1	0.1	0.2	0.2	0.6	13600	**5100**
62	Shaheed Rajiv Pandey ward	Santoshi nagar chowk to bhatagaon chowk along ring road	26000		0.1	0.2	0.2	0.2	0.7	44200	**18200**
				7000	0.1	0.1	0.2	0.2	0.6	11200	**4200**
60	Chandrashekhar Azad ward	Ring road 1 to Mathpurena Village	13000		0.15	0.2	0.2	0.2	0.75	22750	**9750**
				8000	0.1	0.1	0.2	0.15	0.55	12400	**4400**
59	Moreshwar rao Gadre ward	Ring Road 1 to filter plant golden marbles	25000		0.15	0.2	0.2	0.2	0.75	43750	**18750**
				8500	0.1	0.15	0.2	0.15	0.6	13600	**5100**

Table 18 : Land Value Uplift around Raipura Chowk *Source: Author*

Ward No.	Ward Name	Area/Colony/Society/Road	Property Situated Within 20m From Main Road (Rs./Sq. M.) ß0	Property Situated Beyond 20m From Main Road (Rs./Sq. M.) ß0	ß1	ß2	ß3	ß4	Sum Of Coefficients	Increased Value Of Land (Rs./Sq.M.)	Land Value Uplift (Rs./Sq.M.)
69	Pt. Deen Dayal ward	Raipura chowk to TATA motors via DD Nagar thana	28000		0.2	0.2	0.2	0.2	0.8	50400	**22400**
		Raipura Chowk to Sundar Nagar Chowk	40000		0.2	0.2	0.2	0.2	0.8	72000	**32000**
				20000	0.15	0.15	0.2	0.2	0.7	34000	**14000**
		Rohinipuram Gol chowk to ring road 1	24000		0.2	0.15	0.2	0.2	0.75	42000	**18000**
				18500	0.2	0.1	0.2	0.2	0.7	31450	**12950**
68	Madhav Rao Spare ward	Raipura Chowk to Kharun river along Mahadev ghat road (both sides of road)	20000		0.2	0.2	0.2	0.1	0.7	34000	**14000**
				9500	0.15	0.15	0.2	0.1	0.6	15200	**5700**
		Raipura Chowk to Manuas Reality	26000		0.2	0.2	0.2	0.2	0.8	46800	**20800**
				11000	0.2	0.15	0.2	0.2	0.75	19250	**8250**
39	Thakur Pyarelal ward	Uttarayan Bhawan to Mahadev ghat road	21000		0.2	0.15	0.2	0.2	0.75	36750	**15750**
				15000	0.15	0.1	0.2	0.2	0.65	24750	**9750**
67	Dr.Khhobchand Baghel ward	Walfort city gate to Raipura Chowk	32000		0.2	0.2	0.2	0.15	0.75	56000	**24000**
				12000	0.15	0.1	0.2	0.15	0.6	19200	**7200**
41	Pt. Sundar Lal Sharma ward	Ring raod 1 Changurabhata chowk to Santoshi chowk	15000		0.15	0.15	0.2	0.15	0.65	24750	**9750**
				12000	0.1	0.15	0.2	0.15	0.6	19200	**7200**
		Sundar nagar Society		20000	0.15	0.15	0.2	0.2	0.7	34000	**14000**
		Maitri nagar (Changurabhata)		20000	0.2	0.2	0.2	0.15	0.75	35000	**15000**

Table 19 : Land Value Uplift around Tatibandh Chowk *Source: Author*

Ward No.	Ward Name	Area/Colony/Society/Road	Property Situated Within 20m From Main Road (Rs./Sq. M.) ß0	Property Situated Beyond 20m From Main Road (Rs./Sq. M.) ß0	ß1	ß2	ß3	ß4	Sum Of Coeffici ents	Increased Value Of Land (Rs./Sq.M.)	Land Value Uplift (Rs./Sq. M.)
1	Veer Sawarkar ward	Kharun river bridge to Tatibandh Chowk	22000		0.2	0.2	0.2	0.15	0.75	38500	**16500**
				10000	0.15	0.15	0.1	0.15	0.55	15500	**5500**
		Tatibandh Chowk to Hirapur Chowk	22000		0.2	0.2	0.2	0.2	0.8	39600	**17600**
				10000	0.15	0.15	0.2	0.15	0.65	16500	**6500**
20	Shaheed Bhagat Singh ward	Tatibandh Chowk to Picadily hotel (G.E.Road)	32000		0.2	0.2	0.2	0.2	0.8	57600	**25600**
				19000	0.2	0.2	0.2	0.2	0.8	34200	**15200**
		Tatibandh chowk to arihant nagar along ring road 1	23000		0.2	0.2	0.2	0.2	0.8	41400	**18400**
				12000	0.2	0.15	0.2	0.2	0.75	21000	**9000**
		Tatibandh chowk to Hirapur Chowk (Ring Road 2) right side	22000		0.2	0.2	0.2	0.15	0.75	38500	**16500**
				16000	0.2	0.15	0.2	0.15	0.7	27200	**11200**
22	Pt. Ishwari Charan Shukla ward	Aamanaka thana to G.K.Ford till junction of ring road 1	14000		0.2	0.2	0.2	0.2	0.8	25200	**11200**
				9500	0.2	0.2	0.2	0.2	0.8	17100	**7600**
70	Sant Ravidas ward	Tatibandh chowk to arihant nagar along ring road 1	23000		0.2	0.2	0.2	0.2	0.8	41400	**18400**
				12000	0.2	0.15	0.2	0.2	0.75	21000	**9000**
		Manuas reality to sarona bridge along ring road 1	20000		0.2	0.2	0.2	0.2	0.8	36000	**16000**
				11000	0.15	0.15	0.2	0.2	0.7	18700	**7700**
69	Pt. Deen Dayal ward	Raipura chowk to TATA motors via DD Nagar thana	28000		0.2	0.2	0.2	0.2	0.8	50400	**22400**

The Table 16, Table 17, Table 18, and Table 19 denotes the results of the land value uplift within the influence zones with respect to their current prevalent prices, using Hedonic price models. These results can be used further to determine the LVU's of the plots situated within this areas/colonies/societies etc.

10.4. Land value uplift within influence zones

The results show the average land value uplift within the influence zones of transit nodes derived from adding all the LVUs of the areas/societies/colonies and taking their averages in order to demonstrate the lump sum potential of the land value uplift created.

Table 20 : Results of total land value uplift that can be captured as VCF *Source: Author*

Transit station	LVU (Rs. per sq.m.)	Total amount (in bn Rs.)	When 25% is captured (in bn Rs.)	When 33.33% is captured (in bn Rs.)
Pachpedi Naka Chowk	24588	173.872	43.468	57.95
ISBT Bhatagaon Chowk	11150	78.846	19.7115	26.282
Raipura Chowk	14750	104.303	26.076	34.76
Tatibandh Chowk	13782	97.458	24.364	32.486

Note: *The total area of influence zone of radius 1500m is taken into calculation without considering any existing built-up area.*

The Table 20 shows the average land value uplift generated for all the influence zones of all four transit stations. The results show highest land value uplift in Pachepdi Naka chowk, followed by Raipura chowk, Tatibandh chowk and least at Bhatagaon Chowk. However the value capture can be done only when there is transfer of ownership of property which doesn't happen all at once but with due course of the implementation of the transit project such transactions would take place which can overall compensate and mitigate the cost incurred by any governing body/ implementing authority. The over all project cost of metro neo declared by the Chhattisgarh state government is estimated to be of Rs. 110 billion (Rs11,000 crores) which will connect four cities and can have around 25 stations as stated in Figure 11 the study done by Asian Development Bank, as an objective of this study the case of only four stations were taken in to account which estimates Value capture of around Rs.43 billion if only 25% is captured and Rs.58 billion if 33% is captured from influence zone of Pachpedi Naka Chowk similarly from ISBT Bhatagaon chowk Rs. 19.7 billion when 25 % and Rs. 26.3 billion when 33%, from Raipura Chowk Rs. 26.1 billion when 25 % and Rs. 34.7 billion when 33%, and from Tatibandh Chowk Rs. 24.4 billion when 25 % and Rs. 32.45 billion when 33% is captured.

CHAPTER XI

PROPOSALS FOR TOD & VCF FRAMEWORK

To develop the Tatibandh–Telibandha TOD corridor as an inclusive, transit-oriented urban growth corridor supported by sustainable value capture financing mechanisms, promoting high density development, economic viability, accessibility and environmentally responsible infrastructure development. This study has come to proposals on the basis of literatures, case studies, guidelines, & assessment of land value uplift with planning objectives of

- Promote compact mixed-use development
- Increase public transport ridership & decrease dependency on personal vehicle.
- Optimise land utilisation
- Capture transit-induced land value
- Improve financial sustainability & encourage private investment
- Improve urban design & aesthetics.

11.1. Proposed TOD & VCF Planning Structure

As the government of Chhattisgarh has approved the metro neo project for the connectivity of cities of Nava Raipur Atal Nagar, Raipur, Bhilai & Durg of estimated cost of Rs.11,000 crore (Rs.110 billion) and formation of **Chhattisgarh State Capital Regional Authority** which should have **dedicated cell for TOD & VCF** separately. The Government of Chhattisgarh allocated ₹5 crore in the 2024–25 state budget to undertake a feasibility survey for the proposed Raipur–Durg Metro Rail Project. The article also notes that the Raipur Municipal Corporation signed an MoU with the Ministry of Transport of the Russian Federation in August 2024 to explore the implementation of a light metro system in Raipur. (Metro Rail News, 2025).

11.2. Proposed TOD station influence zones

Table 21: Proposed activities around station influence zone. *Source: Author*

TOD Zone	Primary Station Area	Secondary Area	Catchment Area
Radius	0–500m / 5-minute walk	500–1.0km / 10-minute walk	1.0km–1.5km
Description	The primary zone includes the rapid transit station and associated facilities as well as the immediately surrounding area.	The secondary zone extends between 500 and 1000 metres from the transit station.	The catchment area is the broader area of influence outside of the station area. Most of the people who access the regional rapid transit system will come from the catchment area.
Transportation Considerations	• Prioritize high levels of pedestrian and NMT (Non-Motorized Transport) activity. • Balance other modes of access to the stations e.g., IPT, MVs, cell-phone waiting areas, etc. • Reduction in parking.	• Prioritize direct and safe walking & cycling connections to the rapid transit station. • Heavy reliance on non-motorized IPT as walking distance increases.	• Prioritize direct and quick connections for motorized IPT. • Reliance on transit feeder services as distance increases.
Land Use Considerations	• Highest density and mixed uses to encourage high ridership and provide a mixed-use, vibrant activity spine. • High level of amenities – retail, bike parking, businesses, traffic calming, etc.	• Medium densities and mix of uses to benefit from the high level of transit accessibility • Density and height of development should be stepped down gradually towards the periphery.	• Medium to lower density developments. • Create open space linkages and green connections.

The Table 21 & Figure 14 shows the activities to be earmarked for the influence zones of transit stations.

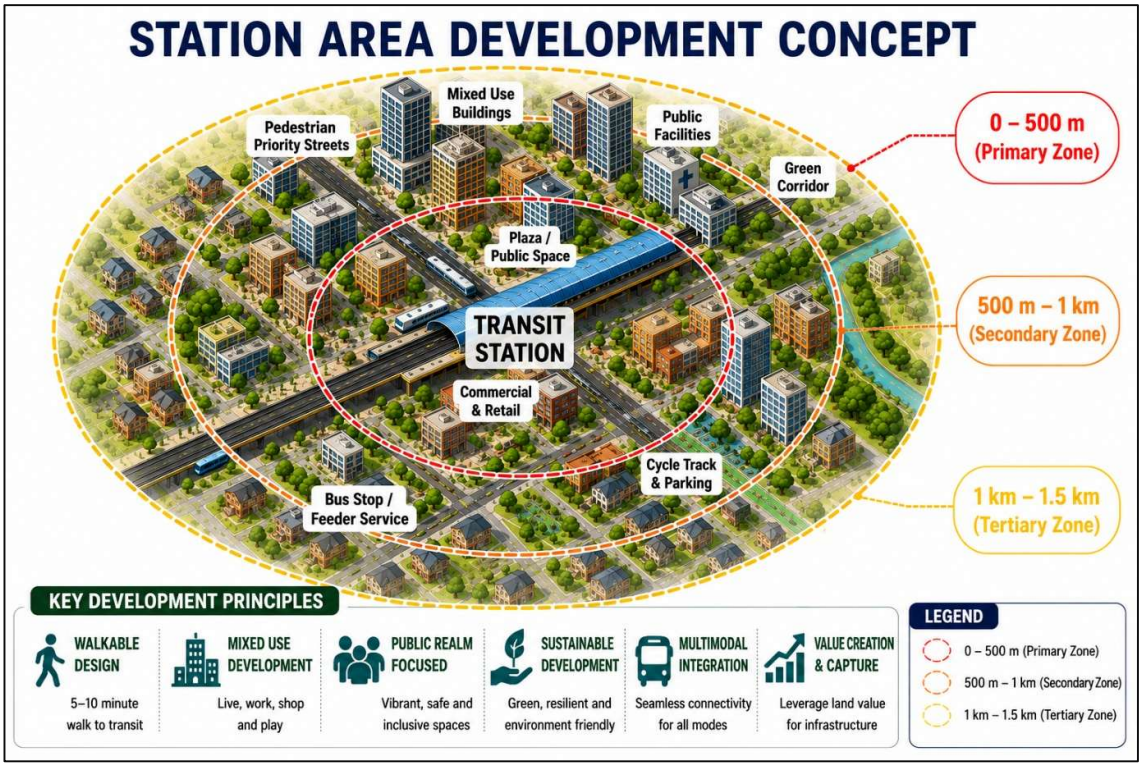


Figure 14: Station area development concept *Source: Author*

Primary Station Area:

- 0–500 m
- High-density mixed-use
- Commercial
- Retail
- Offices
- High FAR, Premium FAR & TDR

Secondary Area:

- 500m –1.0km
- Medium density
- Residential
- Mixed use
- Affordable housing

Catchment Area:

- 1.0km –1.5km
- Neighbourhood development
- Feeder transport
- Public facilities

11.2.1. Proposed land use strategy

Instead of the existing land use the influence zone should be redeveloped specially the primary station area of 500m. into Commercial, Mixed-use, Institutional establishments & infrastructure for parking, NMT's, feeder transport services.

The secondary area of 500m –1.0km should contain Residential & affordable housing, green zones, Public Spaces, infrastructure for walking, cycling, NMT's, feeder transport services.

The catchment area of 1.0km –1.5km should be medium - low density Residential, Green Buffers, Public Spaces, infrastructure for walking, cycling, NMT's, feeder transport services.

11.2.2. Proposed Urban Design Framework

The influence zones should be developed by keeping components of urban design in mind to add to attractiveness and aesthetics of the built environment.

- Complete Streets
- Universal Accessibility
- Footpaths
- Street Trees
- Street Furniture
- Cycling
- Plazas
- TOD Squares
- Active Frontages
- Lighting

11.2.3. Proposed Mobility Framework

The main stations have to be connected to the periphery and in order to achieve that there should be adequate integration of mobility infrastructure such as.

- Metro
- Feeder Buses
- NMT
- Bicycle
- E-rickshaw
- Parking
- Park & Ride
- Multimodal Integration

11.3. Proposals for Value Capture Financing Framework

The findings of this study indicate that although Transit-Oriented Development (TOD) creates substantial land value uplift around transit corridors, Indian cities have not yet developed institutional mechanisms to systematically capture and reinvest this value into urban infrastructure. The literature review, global case studies, analysis of Indian practices, and empirical assessment of the selected Raipur corridor collectively demonstrate that Value Capture Financing (VCF) can serve as an effective mechanism for financing transit infrastructure while simultaneously promoting compact, mixed-use and sustainable urban development. However, successful implementation requires much more than selecting a financing instrument; it requires integration of planning, governance, land management, financial administration and stakeholder participation.

Accordingly, this study proposes a comprehensive Value Capture Financing Framework specifically designed for Indian cities. The framework builds upon the conceptual principles presented in Chapter VII and translates them into an implementation-oriented strategy suitable for cities with varying levels of transit infrastructure, institutional capacity and real estate market maturity. The proposed framework recognises that land value uplift is generated through public investment in transit infrastructure and should therefore be partially captured and reinvested into transport systems, public amenities and affordable housing. It further recognises that different VCF tools are appropriate at different stages of project implementation

and that their effectiveness depends on legal provisions, market conditions and governance arrangements.

The proposed framework adopts an integrated approach comprising policy integration, transit investment planning, land value assessment, selection of appropriate value capture instruments, revenue collection, infrastructure reinvestment and continuous monitoring. Rather than relying on a single financing mechanism, the framework recommends a portfolio of complementary Value Capture Financing tools that can be implemented sequentially according to local conditions. This implementation strategy aims to improve financial sustainability, reduce dependence on conventional government grants and create a self-reinforcing cycle of transit investment and urban development.

11.3.1. Proposed Value Capture Financing Mechanism

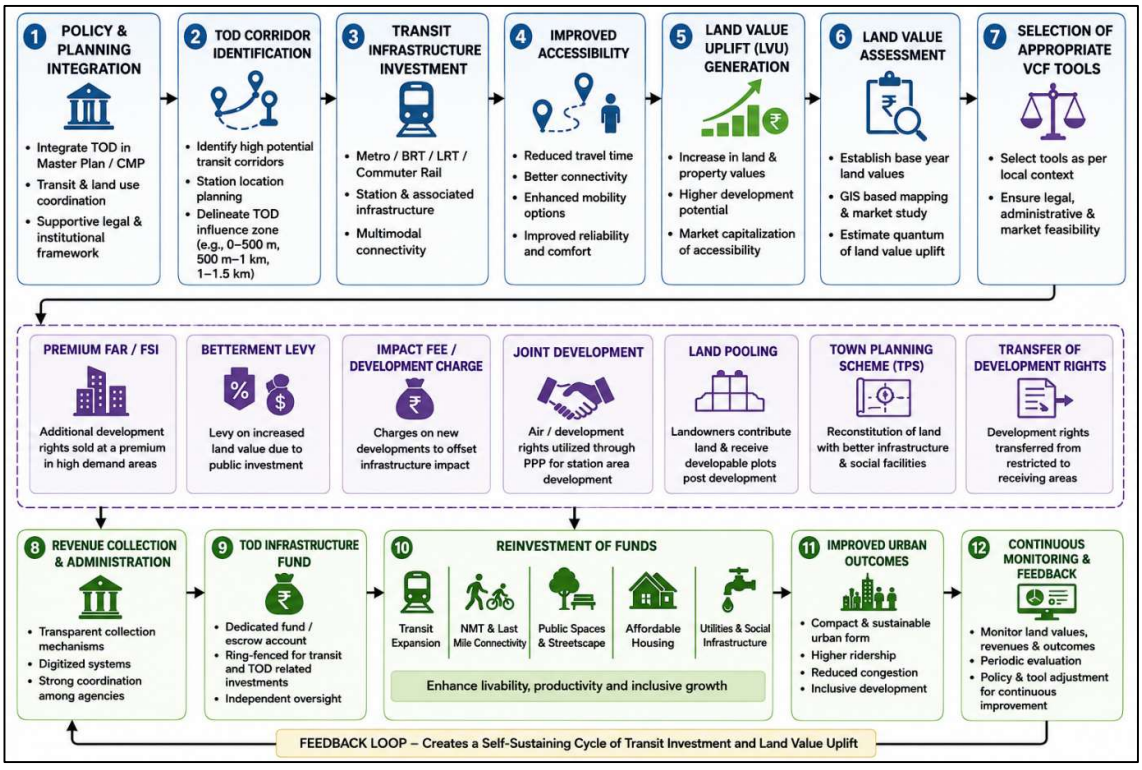


Figure 15: Proposed VCF framework for Indian cities *Source: Author*

The proposed Value Capture Financing Framework in Figure 15 follows a cyclical implementation process beginning with the identification of high-potential transit corridors through statutory development plans and comprehensive mobility plans. Public investment in metro rail, Bus Rapid Transit (BRT), Light Rail Transit (LRT) or multimodal transport systems

enhances accessibility, reduces travel time and improves connectivity. These improvements generate measurable increases in surrounding land and property values, creating opportunities for Value Capture Financing.

The first operational stage of the framework involves delineating TOD influence zones, generally within walking distance of transit stations, followed by detailed GIS-based mapping of existing land use, ownership patterns, Floor Area Ratio (FAR), development potential and prevailing market values. Baseline land values should be established before project implementation and periodically reassessed after transit investment to estimate transit-induced land value uplift.

The second stage involves selecting appropriate Value Capture Financing instruments according to local planning conditions and market characteristics. Premium FAR may be suitable in high-demand commercial corridors, whereas land pooling and Town Planning Schemes are more appropriate for peripheral expansion areas. Betterment levies and impact fees can recover a portion of public investment from directly benefited properties, while joint development enables partnerships between public authorities and private developers for integrated station area redevelopment.

Revenue generated through these mechanisms should be deposited into a dedicated TOD Infrastructure Fund managed by the Urban Local Body or Special Purpose Vehicle. Ring-fencing these revenues ensures that funds generated through transit-induced value appreciation are reinvested exclusively into transit infrastructure, public spaces, pedestrian facilities, cycling infrastructure, affordable housing, utility improvements and station area redevelopment. Such reinvestment further enhances accessibility, resulting in additional land value appreciation and creating a continuous cycle of sustainable urban investment.

Continuous monitoring forms the final component of the framework. GIS-based land information systems, periodic property valuation, financial audits, stakeholder consultations and performance indicators should be used to evaluate implementation effectiveness. Adaptive policy revisions based on monitoring outcomes will improve transparency, public confidence and long-term financial sustainability

11.3.2. Selection of appropriate Value Capture Financing Tool

Table 22: Selection matrix for VCF tools and their relevancy *Source: Author*

VCF Instrument	Primary Revenue Source	Recommended Application	Priority	Expected Contribution
Premium FAR / FSI	Additional development rights	High-density station areas	Very High	Very High
Transferable Development Rights (TDR)	TDR certificates	Redevelopment & heritage protection	Very High	Medium
Betterment Levy	Portion of land value increase	Benefited land parcels	High	Medium
Impact Fee	Development approvals	New developments	Medium	Medium
Joint Development	Commercial station development	Metro stations	High	High
Land Pooling / TPS	Land /plot readjustment	Redevelopment and vacant lands	High	High
Land Value Tax	Incremental land taxation	Long term option	Medium	Medium

In Table 22 the VCF tools are shown as per their applicability and potential. In context of Raipur the applicability of **Premium FAR** is very high and can fetch very high revenue the extent of normal FAR must be kept lower and the rate of premium FAR to be high, since the developers would want to achieve maximum built up spaces to gain more profits there would be willingness to pay higher prices for premium FAR.

TDRs are also highly applicable as the sending zones are earmarked in the development plan, which can generate medium revenues but have great economic and social impact.

Betterment levy is very important as infrastructure for TOD can be regarded as an upgradation of services to the existing built-up spaces, and for such improvement this tax is of very high importance and directly contributing to it.

Impact fees are to be collected for the new building approvals that have an impact on existing infrastructure services, so it is also very important and it contributes directly.

Land pooling and **Town planning schemes** are important and high revenue generating in nature, however they are complex and more feasible in greenfield projects, so in context of Raipur and the selected transit nodes there is lesser chances of its applicability.

Land Value Tax is an important source of revenue as it is incremental & periodical which enables the authorities to bear the cost of maintenance. It is highly applicable in the case of Raipur.

Based on the findings of the study, a contextual Value Capture Framework has been proposed for implementation in Raipur. The framework follows a sequential planning process beginning with identification of the proposed transit corridor and delineation of the TOD influence zone. Existing land use, land ownership, accessibility, development potential, and prevailing land values are assessed through spatial analysis.

Subsequently, areas expected to experience significant land value appreciation are identified and appropriate Value Capture Financing instruments are selected according to local development characteristics. Premium FAR, Joint Development, Betterment Levy, Development Charges, and Transferable Development Rights are proposed as primary financing mechanisms for station influence areas, while Land Pooling may be adopted for greenfield expansion zones.

Revenue generated through these instruments should be deposited into a dedicated TOD Infrastructure Fund managed by an institutional coordination mechanism involving the Urban Administration and Development Department, Raipur Development Authority, Raipur Municipal Corporation, transport agencies, and financial institutions. The collected revenue may subsequently be reinvested into transit infrastructure, station area improvements, pedestrian facilities, cycling infrastructure, affordable housing, public utilities, and urban environmental enhancement, thereby creating a continuous cycle of sustainable urban development.

The suitability of individual Value Capture Financing instruments varies according to land market characteristics, development intensity, ownership patterns and institutional capacity. Rather than advocating a single financing mechanism, this study recommends adopting a combination of complementary instruments that correspond to different stages of urban development. Premium FAR and Joint Development are most effective in established commercial centers with strong market demand, while Land Pooling and Town Planning

Schemes are better suited for expanding urban areas where large parcels of land remain available. Betterment Levies and Impact Fees are appropriate where measurable public investment has directly increased property values. Accordingly, a hybrid financing strategy is considered more appropriate than reliance on any single Value Capture Financing mechanism, enabling cities to diversify revenue sources while reducing implementation risk. This aligns well with your concluding recommendation that hybrid financing is preferable to a single revenue source.

11.4. Proposed institutional coordination & governance

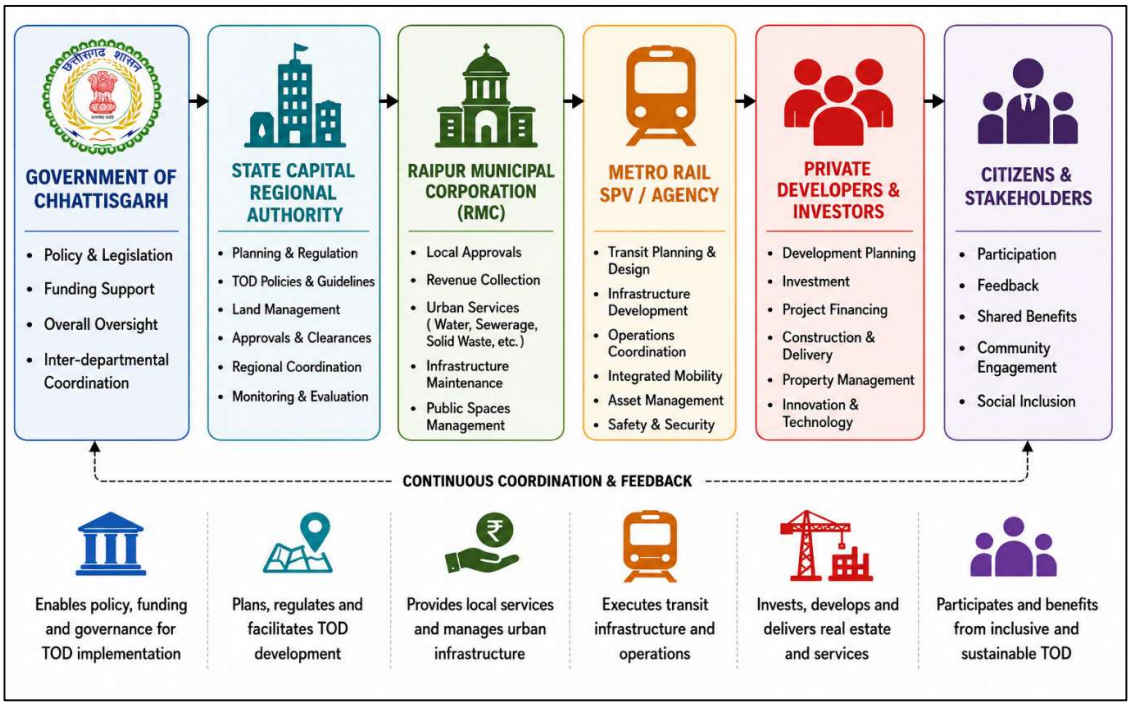


Figure 16: Governance and institutional coordination *Source: Author*

The state government has notified the creation of State Capital Regional Authority (SCRA) in order to govern the matters of urban planning in the area comprising Nava Raipur, Raipur, Bhilai and Durg cities. All the ULBs of these cities have to work in coordination with SCRA as well as the authority responsible for building as well as operations of metro.

The SCRA will coordinate with developers, citizens and other stakeholders by making policies and regulations governing the use of VCF tools and thereby creating a robust transit infrastructure in the state. The government institutions and agencies responsible for implementation and operations is depicted in Figure 16.

CHAPTER XII

CONCLUSIONS AND RECOMMENDATIONS

Urban India is experiencing unprecedented demographic growth and rapid spatial expansion, resulting in increasing demand for efficient public transportation and sustainable urban infrastructure. Conventional approaches to financing urban transport infrastructure have become increasingly inadequate due to limited public resources, rising capital costs, and growing fiscal constraints faced by Urban Local Bodies (ULBs). Transit-Oriented Development (TOD) has emerged as an integrated planning strategy that promotes compact, mixed-use, high-density development around mass transit corridors while encouraging sustainable mobility patterns. Simultaneously, Value Capture Financing (VCF) has gained recognition as an innovative financing mechanism that enables governments to recover a portion of the land value increment generated through public infrastructure investments.

The present study explored the applicability of Value Capture Financing mechanisms for supporting Transit-Oriented Development implementation in Indian cities with particular reference to the proposed TOD corridor along Ring Road No. 1 between Tatibandh and Telibandha in Raipur. Through systematic literature review, policy analysis, comparative case studies, spatial assessment, and preparation of a contextual implementation framework, the research demonstrates that land-based financing instruments can substantially improve the financial sustainability of urban transit projects while simultaneously promoting planned urban growth.

12.1. Achievement of Research Objectives

The first objective examined the evolution of Transit-Oriented Development policies and financing mechanisms in India. The review revealed that although TOD principles have gradually been incorporated into national and state planning policies, implementation remains limited due to institutional fragmentation, inadequate financial planning, and insufficient integration between transport agencies and urban development authorities.

The second objective identified the financial and institutional challenges associated with TOD implementation. The study found that dependence on government grants, delayed

infrastructure investments, fragmented governance structures, outdated land administration systems, and weak municipal financial capacity significantly constrain implementation of large-scale transit-oriented projects.

The third objective evaluated various Value Capture Financing mechanisms applicable to Indian conditions. The analysis demonstrated that instruments such as Premium Floor Area Ratio (FAR), Betterment Levy, Transferable Development Rights (TDR), Joint Development, Land Pooling, Development Charges, and Impact Fees possess considerable potential for generating sustainable revenue streams when implemented within appropriate legal and institutional frameworks.

The fourth objective assessed national and international case studies. Experiences from Hong Kong, Tokyo, Singapore, London, Delhi, Ahmedabad, Hyderabad, Bengaluru, and Mumbai demonstrate that successful TOD implementation requires coordinated land-use planning, integrated transport investment, proactive land management, and diversified value capture mechanisms adapted to local institutional conditions.

Finally, the study developed a contextual Value Capture Framework tailored for Raipur. The proposed framework integrates spatial planning, regulatory reforms, institutional coordination, phased implementation strategies, and multiple financing instruments to support future transit infrastructure development.

12.3. Major Findings of the Study

Public investment in transit infrastructure consistently generates measurable increases in surrounding land and property values. However, without appropriate policy interventions, these financial gains accrue almost entirely to private landowners and developers while the public sector bears the cost of infrastructure provision. Value Capture Financing provides a practical mechanism for redistributing part of these publicly created benefits to finance additional infrastructure investments.

The literature indicates that no single value capture instrument is universally applicable. Rather, successful implementation depends upon combining multiple instruments according to local land market characteristics, legal frameworks, institutional capacity, and development objectives. Accordingly, a hybrid financing strategy is more appropriate than reliance on a single revenue source.

The proposed Raipur TOD corridor possesses significant potential for future transit-oriented redevelopment due to its strategic connectivity, existing commercial activity, availability of redevelopment parcels, and planned urban expansion. Although the city currently lacks a high-capacity mass transit system, early preparation of TOD regulations and financing mechanisms will enable future infrastructure investments to be implemented more efficiently and sustainably.

The study further demonstrates that Value Capture Financing should not be considered merely as a revenue generation tool but as an integrated urban planning instrument capable of guiding land use, encouraging compact development, reducing urban sprawl, enhancing accessibility, promoting mixed land uses, and improving environmental sustainability.

12.4. Recommendations

Based on the outcomes of the research, the following recommendations are proposed for policymakers, planning authorities, and Urban Local Bodies.

1. Prepare city-specific Transit-Oriented Development policies integrated with Master Plans and Development Plans.
2. Establish statutory provisions enabling implementation of multiple Value Capture Financing instruments under state planning legislation.
3. Create a dedicated TOD Infrastructure Fund to ensure that revenues generated through value capture mechanisms are exclusively reinvested into transport and urban infrastructure.
4. Implement Premium FAR and Joint Development as the initial financing mechanisms in high-demand station influence areas due to their administrative simplicity and immediate revenue generation potential.
5. Introduce Betterment Levy and Impact Fees in areas directly benefiting from transit infrastructure improvements after establishment of transparent valuation methodologies.
6. Encourage Land Pooling and Town Planning Schemes for planned development in peripheral urban expansion areas.

7. Strengthen institutional coordination through establishment of multidisciplinary TOD Implementation Cells comprising planners, engineers, financial experts, land administrators, and legal professionals.
8. Develop GIS-based land valuation systems for continuous monitoring of land value changes before and after infrastructure investment.
9. Promote public participation and stakeholder consultation throughout planning and implementation to improve transparency and reduce implementation conflicts.
10. Develop technical capacity within Urban Local Bodies through specialized training programmes on Value Capture Financing, municipal finance, GIS, and transit-oriented planning.

12.5. Scope for Future Research

Future studies may undertake detailed economic feasibility analysis using real land transaction data to estimate actual revenue generation from different Value Capture Financing instruments. Hedonic pricing models, difference-in-differences analysis, and spatial econometric techniques may be employed to quantify land value uplift associated with transit investments.

With future implementation of metro, BRT, or other mass transit systems in Raipur, longitudinal studies may evaluate actual land value appreciation and compare observed outcomes with the proposed framework developed in this study.

Further research may also explore institutional governance models, public-private partnership structures, affordable housing financing, climate-resilient TOD planning, and digital land administration systems that support sustainable value capture implementation.

12.6. Conclusion

Transit-Oriented Development and Value Capture Financing represent complementary strategies capable of transforming the manner in which Indian cities finance and manage urban growth. Rather than relying solely on government grants and conventional taxation, cities can utilize the economic value created by public investments to finance future infrastructure and improve urban services.

The proposed Value Capture Framework developed for Raipur demonstrates that sustainable financing, integrated land-use planning, and coordinated institutional governance can collectively support implementation of transit-oriented urban development. Although successful implementation will require legislative reforms, administrative capacity, political commitment, and stakeholder cooperation, the framework provides a practical roadmap for achieving financially sustainable, environmentally responsible, and socially inclusive urban development.

The study concludes that adoption of integrated Value Capture Financing strategies will not only strengthen municipal financial resilience but also contribute significantly toward the realization of compact, accessible, economically productive, and sustainable Indian cities in accordance with the objectives of the National Transit-Oriented Development Policy, the National Urban Transport Policy, and the Sustainable Development Goals.

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Annexures



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			240 से 500 वर्गमीटर	2.00 + TDR
			500 से 750 वर्गमीटर	2.00 + TDR
			750 से 1000 वर्गमीटर	2.00 + TDR
			1000 वर्गमीटर से अधिक	2.50 + TDR
		औद्योगिक		1.00
		सार्वजनिक और अर्द्ध–सार्वजनिक	150 वर्गमीटर तक	1.50 + TDR
			150 से 240 वर्गमीटर	1.50 + TDR
			240 से 500 वर्गमीटर	1.50 + TDR
			500 से 750 वर्गमीटर	2.00 + TDR
			750 से 1000 वर्गमीटर	2.00 + TDR
			1000 वर्गमीटर से अधिक	2.50 + TDR

Infrastructure financing strategies for Transit-Oriented Development for Indian cities: A Value Capture Framework for TOD implementation.,
Bhawani Shankar Tamrakar (24209011124)

सारिणी 18.9 मिश्रित भूमि उपयोग के मानक

भूमि का आकार (वर्गमीटर में)	आवासीय				व्यवसायिक		पी.एस.पी.	
	भूखण्डीय विकास		बहुमंजिला भवन					
	भूतल कवरेज (%)	एफ.ए.आर.	भूतल कवरेज (%)	एफ.ए.आर.	भूतल कवरेज	एफ.ए.आर.	भूतल कवरेज	एफ.ए.आर.
1	2	3	4	5	6	7	8	9
240 से कम	60	2.00	—	—	60	2.00	40	1.50
240 से अधिक 500 तक	50	2.00	—	—	60	2.00	40	1.50
500 से अधिक 1000 तक	40	2.00	35	2.00	60	2.00	40	1.50
1000 से अधिक 2000 तक			35	2.50	50	2.50	30	2.00
2000 से अधिक 4000 तक			35	2.50	50	2.50	30	2.00
4000 से अधिक 6000 तक			30	2.50	50	2.50	30	2.00
6000 से अधिक 10000 तक			30	2.50	50	2.50	30	2.50
10000 से अधिक			30	2.50	50	2.50	30	2.50