TRANSIT ORIENTED DEVELOPMENT STRATEGIES IN LUCKNOW FOR SUSTAINABLE URBAN GROWTH

Thesis Submitted in Partial Fulfilment of the requirements for the award of the degree of

MASTERS IN URBAN PLANNING

By
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1230152013

Under The Guidance of
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SCHOOL OF ARCHITECTURE & PLANNING,
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2024-2025

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EXECUTIVE SUMMARY

One of the most common forms of physical activity is walking which is the mother of all the modes of transport which provides inexpensive and equal transportation options to improve residents' health and quality of life. Due to several associated advantages such as wellbeing of residents and improving health, reducing air pollution, traffic congestion and decreasing energy consumption, walking has become an interesting topic for researchers. To have modern cities with highly efficient transportation facilities which support walking, cities and neighbourhoods are trying to promote a pedestrian-friendly environment. As a result, walkability is a sustainable concept to improve the liveability of growing cities that describes the level of capability of the built environments to support walking for multiple purposes including transport, leisure and exercise purposes.

This study has several limitations and due to time and resource constraints, the sample size that was selected for the survey in each neighbourhood is limited. Therefore, the low response rate may influence the final results. The model outcomes were validated not only using the individual's perception determined from questionnaire survey but also utilizing mixed methods of GIS analysis in objective parameters of walkability.

What makes this research unique is that all aspects of neighbourhoods such as physical, social and safety characteristics have been considered objectively and subjectively. The results of this study can assist policymakers and professionals to give more public space to walking and improve the quality of neighbourhoods' environments.

Although measurement of walkability includes several methods and approaches, this research has emphasized on the walkability index as well as neighbourhoods features that influence the willingness of people to walk. Since Lucknow is not considered a walkable city, it is valuable to investigate how this city has tackled this issue. Therefore, for better interpretation, one such neighbourhood in Lucknow was selected to examine the level of walkability and the factors affect that.

In conclusion, the overall result implies that due to defining indexes such as population density, mixed-use and connectivity for walkability, some aspects of neighbourhoods' features were recognized significant in this study. Among all of the physical aspects variables of neighbourhoods, accessibility is the most important factors influence walkability, however, the quality of built environment significantly affect people's perceptions as well and in social aspects of neighbourhoods, social interactions and liveliness of streets seem to be significant in walkability. Also, from safety aspects view, the most important factors were a sense of security and sense of safety that affect the walkability. The incredible outcome that was explored in this study is that the physical environment influence the social and safety aspects of neighbourhoods and social aspects influence the safety aspects of neighbourhoods. Therefore, there is an interrelationship between independent variables that can influence the willingness of people to walk.

ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the individuals who have contributed to the completion of my Master's thesis in Urban and Regional Planning. Their unwavering support and encouragement have played a crucial role in my academic journey.First and foremost, I am immensely grateful to my thesis guide, Ar. Kuwar GhanShyam His invaluable guidance, expertise, and unwavering support throughout this research endeavour have been instrumental in shaping the direction and quality of my work. His continuous encouragement, insightful feedback, and patience have truly been a source of inspiration for me.

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Furthermore, I would like to acknowledge the role of my mentor, Ar. Kuwar Ghanshyam. His extensive knowledge, constructive criticism, and valuable insights have significantly contributed to the development of my research. His unwavering dedication and unwavering support have been invaluable, and I am deeply grateful for his mentorship.

I would also like to express my gratitude to my friends and loved ones who have been there for me throughout this journey. Their unwavering support, understanding, and encouragement have provided me with the strength and motivation to overcome challenges and persevere. Their presence has brought joy, laughter, and solace during the demanding times of thesis work.

Lastly, I would like to extend my appreciation to all the individual who have directly or indirectly contributed to my growth as a researcher and planner .Your collective efforts have played an integral role in shaping my academic and personel development.

To everyone mentioned above and to those not mentioned individually but who have been a part of my journey, please accept my heartfelt gratitude for your unwavering support, guidance, and encouragement. This thesis would not have been possible without each and every one of you. Thank you for being a part of this significant milestone in my academic life.

UNDERTAKING

I Mr. Omkar Chaurasiya, the author of the thesis titled
“TRANSIT ORIENTED DEVELOPMENT STRATIGIES IN LUCKNOW FOR SUSTAINABLE URBAN GROWTH”.

Hereby declare that this is an independent work of mine, carried out towards fulfillment of the requirements for the award of the Masters in Urban & Regional Planning at the Department of Architecture and planning BBDU lucknow. The work has not been submitted to any other organization/institution for the award of any Degree/Diploma.

Omkar Chaurasiya
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Date: June,2025

TRANSIT ORIENTED DEVELOPMENT STRATEGIES IN LUCKNOW FOR SUSTAINABLE URBAN GROWTH

INTRODUCTION

Transit-Oriented Development (TOD)

Transit-Oriented Development (TOD) is an urban planning and design strategy that promotes the creation of compact, walkable, mixed-use communities centered around high-quality public transportation systems. The core idea of TOD is to reduce reliance on private vehicles by integrating residential, commercial, and recreational spaces within walking distance (typically 400–800 meters) of transit stations such as metro, bus, or rail lines.

By encouraging higher densities near transit nodes, TOD aims to enhance accessibility, reduce traffic congestion, lower greenhouse gas emissions, and improve the overall quality of urban life. It supports sustainable growth by fostering vibrant neighborhoods where people can live, work, shop, and play without depending heavily on cars.

TOD is particularly relevant in rapidly urbanizing regions and cities looking to optimize land use and create more inclusive, connected, and environmentally responsible urban environments.

Importance of TOD in Sustainable Urban Growth

Transit-Oriented Development (TOD) plays a crucial role in promoting sustainable urban growth by aligning land use planning with public transportation infrastructure. As cities continue to expand, unplanned and car-centric development has led to traffic congestion, air pollution, urban sprawl, and inefficient resource use. TOD offers a solution by fostering compact, walkable, and mixed-use neighborhoods around transit hubs, helping cities grow in a more balanced and efficient manner.

Brief overview of Lucknow's urban transport scenario

🚇 Public Transport Infrastructure

Lucknow Metro: Operational since 2017, the metro system has become a vital mode of transport. On January 1, 2024, it recorded its highest-ever ridership of 1.30 lakh passengers, indicating growing public trust in this efficient and reliable service.

City Buses: Managed by Lucknow City Transport Services Limited (LCTSL), the city operates a fleet that includes 40 electric buses introduced under the FAME-I scheme. However, the overall bus-to-population ratio remains below national benchmarks, with only six buses per lakh people compared to the recommended 70–80.

Intermediate Public Transport (IPT)

E-Rickshaws and Tempos: E-rickshaws dominate the IPT sector, comprising 70% of this segment. Their popularity is attributed to the non-requirement of permits, making them a convenient choice for short-distance travel. Fixed-route tempos cover approximately 49% of the city area, offering affordable and accessible transport options.

🚗 Private Vehicle Usage

Private transport accounts for 47% of the modal share in Lucknow, with two-wheelers being particularly prevalent. This high reliance on private vehicles contributes to traffic congestion and environmental concerns.

🌱 Sustainability Initiatives

Electric Vehicle (EV) Adoption: Uttar Pradesh leads India in EV registrations, surpassing states like Delhi and Maharashtra. The state's Electric Vehicle Manufacturing and Mobility Policy 2022 aims to bolster EV adoption, develop charging infrastructure, and attract significant investments, positioning Lucknow as a potential hub for electric mobility.

Cycle Infrastructure: Efforts are underway to make Lucknow more bicycle-friendly. Dedicated cycle tracks have been established, and plans are in place to expand this network, drawing inspiration from cities like Amsterdam.

🚧 Challenges Encroachments:

Cycle tracks and pedestrian pathways often face obstructions due to illegal parking and unauthorized stalls, compromising safety and accessibility for non-motorized commuters.

Infrastructure Development: Projects like the Green Corridor aim to improve connectivity, but face challenges related to land acquisition and encroachments. The Lucknow Development Authority is actively working to address these issues to ensure timely project completion.

Key Components of TOD Strategies in Lucknow:

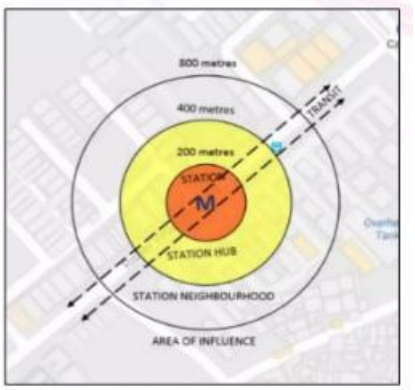


Figure 1 Influence Zone (500-800m radius)

1. Integration of Land Use and Transport Planning:

Mixed-Use Development: Encouraging a blend of residential, commercial, and institutional spaces within proximity to transit stations to reduce travel distances and promote public transport usage.

High-Density Zoning: Implementing policies that allow for increased building densities near transit corridors, optimizing land use and supporting a larger population within accessible areas.

2. Enhancement of Public Transportation Infrastructure:

Lucknow Metro Expansion: The development of the Lucknow Metro, operational since 2017, serves as a backbone for TOD. The metro network facilitates efficient movement across the city, making public transport a viable alternative to private vehicles.

Feeder Systems: Integrating bus services, cycle tracks, and pedestrian pathways with metro stations to ensure seamless first and last-mile connectivity.

3. Pedestrian and Cyclist-Friendly Environments:

Infrastructure Development: Constructing dedicated cycle tracks and pedestrian pathways to encourage non-motorized modes of transport, thereby reducing carbon emissions and promoting public health.

Safety Measures: Implementing traffic calming measures, adequate street lighting, and pedestrian crossings to ensure the safety of walkers and cyclists.

4. Policy and Institutional Framework:

Regulatory Reforms: Amending zoning laws and building regulations to support higher densities and mixed land use in areas surrounding transit stations.

Capacity Building: Enhancing the capabilities of urban planning bodies to design and implement TOD projects effectively.

Aim

The primary aim of Transit-Oriented Development (TOD) strategies in Lucknow is to promote sustainable urban growth by integrating land use and transportation planning. TOD seeks to create compact, high-density, mixed-use, and pedestrian-friendly urban environments around transit hubs, reducing dependence on private vehicles and enhancing accessibility, economic viability, and environmental sustainability.

Objectives of TOD Strategies in Lucknow

1. Promote Sustainable Mobility:

Encourage the use of public transport (Metro, buses) and non-motorized transport (walking, cycling) to reduce traffic congestion and air pollution.

Develop last-mile connectivity through feeder bus services, cycle-sharing, and pedestrian pathways.

2. Optimize Land Use and Urban Density:

Increase residential and commercial density near metro and transit stations.

Encourage mixed-use development to integrate housing, offices, retail, and public spaces.

3. Enhance Urban Livability and Public Spaces:

Create walkable neighborhoods with safe and well-designed pedestrian infrastructure.

Develop green spaces, parks, and recreational zones to improve the quality of life.

4. Improve Economic Competitiveness:

Boost economic activity and job opportunities near transit hubs.

Attract private investments in real estate, retail, and commercial sectors through TOD incentives.

5. Reduce Carbon Footprint and Environmental Impact:

Minimize car dependency, leading to a reduction in greenhouse gas emissions.

Encourage energy-efficient buildings and eco-friendly urban planning initiatives.

6. Strengthen Institutional and Policy Framework:

Implement zoning and regulatory reforms to facilitate TOD-friendly development. Ensure stakeholder participation involving government agencies, private developers, and the public in planning and execution.

7. Ensure Equitable and Inclusive Urban Development:

Provide affordable housing near transit hubs to accommodate diverse socio-economic groups.

Improve accessibility for differently-abled persons, senior citizens, and low-income groups.

To analyze TOD strategies in Lucknow

1. Integration of Land Use and Transport

Lucknow Metro corridors (particularly the North-South corridor) serve as focal points for potential TOD zones. Existing urban form shows low to moderate density around many metro stations, highlighting the need for planned densification through mixed-use zoning.

2. Multi-Modal Connectivity

Metro stations are not yet fully integrated with other public modes such as buses, e-rickshaws, and non-motorized transport (NMT).

Lack of formal last-mile connectivity hinders the seamless travel experience expected in TOD areas.

3. Policy and Planning Framework

Lucknow is yet to formally adopt a TOD policy at the city level, although guidelines from the National TOD Policy (MoHUA, 2017) and AMRUT initiatives influence planning indirectly. The Lucknow Master Plan 2031 identifies key growth corridors but does not explicitly demarcate TOD zones or provide FAR-based incentives near transit hubs.

4. Infrastructure and Public Realm

Infrastructure such as footpaths, cycle tracks, and station area improvements exist but are inconsistently implemented and often encroached upon.

Public spaces around transit stations lack pedestrian priority, shade, and urban amenities—key TOD principles.

5. Land Use Regulations and Incentives

No significant application of TOD-specific land use tools such as higher FAR, mixed-use zoning, or transferable development rights (TDRs) in areas surrounding metro stations.

Real estate development is largely market-driven, with limited coordination with transit infrastructure.

6. Community and Stakeholder Engagement

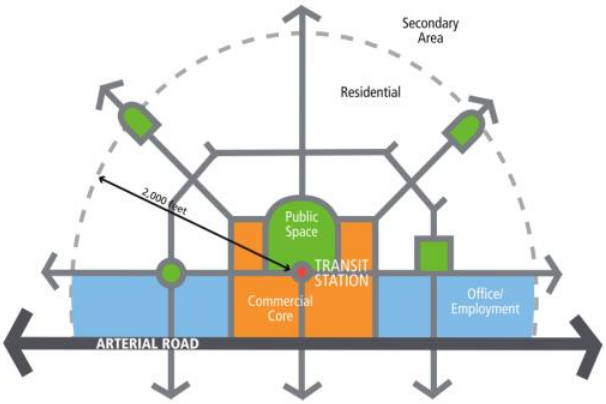
TOD planning in Lucknow currently lacks strong community engagement and public awareness.

Local businesses and residents often remain disconnected from metro development planning, limiting the social sustainability of TOD.

To study the impact of TOD on urban sustainability

1. Environmental Impact

Reduction in Emissions: TOD promotes the use of public transport, walking, and cycling, thereby reducing dependence on private vehicles and lowering carbon emissions and air pollution.



2. Social Impact

Improved Accessibility: TOD enhances access to employment, education, healthcare, and recreation, especially for low-income and non-driving populations.

3. Economic Impact

Increased Land and Property Values: Proximity to transit nodes often leads to appreciation in land values and investment potential.

RESEARCH ISSUES

Here are five research questions (issues) related to Transit-Oriented Development (TOD) strategies in Lucknow for sustainable urban growth:

Research Questions:

1. How effective are existing TOD policies in promoting sustainable urban growth in Lucknow?

Evaluating government policies, planning frameworks, and implementation strategies.

2. What are the key challenges in implementing TOD in Lucknow, and how can they be addressed?

Examining barriers such as land use policies, financial constraints, and public resistance.

3. What impact does TOD have on traffic congestion, pollution levels, and public transport ridership in Lucknow? Analyzing the environmental and mobility benefits of TOD-based urban planning.

4. How can land use and urban planning be integrated with TOD to create walkable and accessible transit corridors in Lucknow? Identifying best practices for mixed-use development, pedestrian infrastructure, and zoning regulations.

5. What role can public-private partnerships (PPP) play in financing and implementing TOD projects in Lucknow?
Exploring investment models and stakeholder collaborations to support TOD expansion.

Here's a refined and expanded list of research questions related to Transit-Oriented Development (TOD) strategies in Lucknow for sustainable urban growth:
Primary Research Issues & Questions

1. Effectiveness of TOD Policies & Frameworks
How effective are current TOD policies in promoting sustainable urban growth in Lucknow?
What policy changes are needed to enhance TOD implementation?
2. Urban Mobility & Transportation Impact
How does TOD influence public transport ridership, traffic congestion, and pollution levels in Lucknow?
What measures can improve multimodal integration (metro, buses, cycling, walking)?
3. Challenges & Barriers in TOD Implementation
What are the key challenges in implementing TOD in Lucknow (land use conflicts, financial constraints, governance issues)?
How can institutional coordination between urban planners, transport authorities, and policymakers be improved?
4. Land Use & Urban Planning Integration
How can Lucknow optimize land use planning to support high-density, mixed-use development around transit hubs?
What strategies can enhance walkability and first/last-mile connectivity in TOD zones?
5. Economic & Social Impact of TOD
What are the economic benefits of TOD on real estate, commercial growth, and job creation in Lucknow?
How can TOD strategies ensure social inclusivity, such as affordable housing near transit hubs?
6. Role of Public-Private Partnerships (PPP) in TOD Development
What investment models and financing strategies can support TOD expansion in Lucknow?
How can private sector involvement accelerate TOD infrastructure development?
7. Environmental Sustainability & Resilience
How does TOD contribute to reducing carbon emissions and promoting eco-friendly urban development?
What climate resilience strategies should be incorporated into TOD planning in Lucknow?

METHODOLOGY

Implementing Transit-Oriented Development (TOD) in Lucknow involves a comprehensive methodology that integrates land use and transportation planning to foster sustainable urban growth. This approach is designed to create high-density, mixed-use communities centered around public transit hubs, thereby reducing reliance on private vehicles and promoting environmental sustainability.

Methodological Steps for Implementing TOD in Lucknow:
1. Delineation of Influence Zones:
Definition: Identify areas within a 500-800 meter radius of transit stations, considered as the 'influence zone' where TOD principles will be applied.
Implementation: Utilize Geographic Information System (GIS) tools to map these zones accurately, ensuring they encompass key urban areas and potential development sites.

2. Land Use Planning and Zoning Reforms:

Mixed-Use Development: Promote a blend of residential, commercial, and institutional land uses within the influence zones to encourage a self-sustaining environment.

Density Regulations: Amend zoning laws to allow higher Floor Area Ratios (FAR), facilitating vertical growth and accommodating more residents and businesses near transit hubs.

3. Infrastructure Development:

Public Transit Expansion: Enhance the existing Lucknow Metro network by extending lines and increasing the number of stations to improve accessibility.

Non-Motorized Transport (NMT) Facilities: Develop pedestrian pathways and dedicated cycling lanes to promote walking and cycling as primary modes of transport within influence zones.

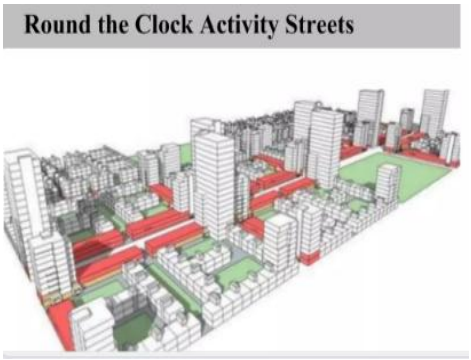
4. Design and Urban Form:

Compact Building Design: Encourage the construction of multi-story buildings to optimize land use and reduce urban sprawl.

Public Spaces: Integrate parks, plazas, and recreational areas within the urban fabric to enhance livability and community engagement.

5. Policy and Regulatory Framework:

Development Control Regulations (DCR): Formulate guidelines that support TOD objectives, such as reduced parking requirements and incentives for developers to include affordable housing.



Stakeholder Engagement: Involve community members, urban planners, and policymakers in the planning process to ensure the TOD strategy aligns with local needs and aspirations.

6. Implementation and Phasing:

Pilot Projects: Initiate TOD with pilot projects in select influence zones to demonstrate feasibility and gather data for future developments.

Scaling Up: Based on pilot project outcomes, gradually expand TOD initiatives to other parts of the city, ensuring continuous monitoring and adaptation of strategies.

7. Monitoring and Evaluation:

Performance Metrics: Establish indicators such as public transit ridership levels, reduction in traffic congestion, and air quality improvements to assess the impact of TOD.

Feedback Mechanisms: Create channels for public feedback to refine and enhance TOD policies and implementations continually.

By meticulously following this methodology, Lucknow aims to transform its urban landscape into a more sustainable, efficient, and livable city, effectively addressing the challenges posed by rapid urbanization.

SCOPE & LIMITATION OF STUDY

Scope and Limitations of Studying Transit-Oriented Development (TOD) Strategies in Lucknow for Sustainable Urban Growth.

Scope of the Study

1. Enhancing Public Transit Efficiency

Evaluating the integration of Lucknow Metro, city buses, and other transit modes.Identifying ways to improve first- and last-mile connectivity.

2. Urban Planning and Land Use Optimization
Assessing mixed-use developments near transit hubs.Studying zoning regulations to promote high-density growth around metro corridors.

3. Sustainability and Environmental Benefits
Analyzing the impact of TOD on reducing vehicular emissions. Promoting walkability, cycling, and non-motorized transport.
4. Economic and Social Impact
Examining how TOD influences real estate, employment opportunities, and local businesses. Addressing social equity by ensuring affordable housing near transit nodes.
5. Infrastructure Development and Investment
Reviewing policies and financial models supporting TOD. Identifying investment opportunities in transit infrastructure and urban renewal projects.
6. Case Study Analysis
Comparing Lucknow's TOD strategies with other Indian and global cities.Learning from best practices to refine local implementation.


Conceptual TOD along Transit Corridors

Limitations of the Study

1. Data Availability and Accuracy
Limited access to real-time transport data and urban development reports. Inconsistencies in demographic and travel behavior data.
2. Institutional and Policy Constraints
Coordination challenges between different government agencies and urban planners.Rigid land-use policies and slow policy implementation.
3. Public Participation and Awareness
Low public engagement in TOD planning and execution.Resistance to behavioral shifts from private vehicle use to public transport.
4. Financial and Investment Barriers
High capital investment required for infrastructure and redevelopment.Limited public-private partnership (PPP) models supporting TOD in Lucknow.
5. Geographical and Cultural Factors
Unplanned urban sprawl affecting TOD implementation. Socio economic diversity influencing transit choices and land-use patterns.
6. Time Constraints
TOD strategies require long-term implementation, making short-term impact assessment difficult.

Conclusion
The study of TOD strategies in Lucknow holds significant potential for guiding sustainable urban growth, but it also faces challenges related to policy, finance, public participation, and data availability. Addressing these limitations through integrated urban planning, policy reforms, and stakeholder collaboration is crucial for effective TOD implementation.

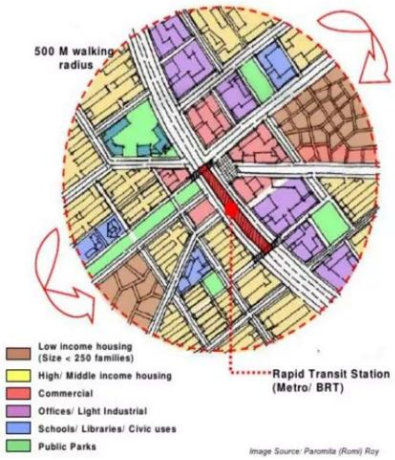
Transit Oriented Development
Case Study - Delhi

Definition

A Transit Oriented Development (TOD) is the creation of compact, walkable, mixed - use, pedestrian- and bicycle-friendly communities centred around high quality transit system especially the BRTs and MRTs.

Purpose

In Growing Traffic Congestion In Growing Pollution - Motorized vehicle Desire for Quality of Urban Lifestyle Desire for lifestyle away from traffic Growing national support for Smart Growth Changes in Family structure - Singles, empty-nesters, etc.



Goals of TOD

Reduce private vehicle dependency Promote Public Transport Through Design, Policy and Enforcement Provide access to maximum no. of people Through Densification and Multimodal Connectivity.

Concept and Ideas

Integrated urban places designed to bring people, activities, buildings, and spaces together, with easy walking and cycling connection between them and near-excellent transit service to the rest of the city.

Design Principles

WALK

High quality, unobstructed pedestrian footpaths provide basic mobility for all. Furniture, landscaping elements, and active building edges transform walkways into vibrant public spaces.-15 points

CYCLE

Street design ensures safety for cyclists by reducing carriageway speeds or creating separate cycle tracks. A completa network, adequate shading elements, smooth surfaces, and secure cycle parking are essential. - 5 points

CONNECT

Short and direct pedestrian and cycling routes require highly connected network of paths and streets around small, permeable blocks. This is primarily important for walking and for transit station accessibility, which can be easily discouraged by detours.- 15 points

TRANSIT

Transit connects and integrates distant parts of the city for pedestrians. Access and proximity to high-capacity public transit service, defined as bus rapid transit (BRT) or rail transit is a prerequisite for TOD Standard recognition. High-capacity public transit plays a critical role, as it allows for highly efficient and equitable urban mobility, and supports dense and compact development patterns. Transit also comes in various forms to support the entire spectrum of urban transport needs, including low- and high-capacity vehicles, taxis and motorized rickshaws, bi-articulated buses and trains. - based on design.

MIX

When there is a balanced mix of complementary uses and activities within a local area (e.g., a mix of residences, workplaces and local retail commerce), Diverse uses peaking at different times keep local streets animated and safe, encouraging walking and cycling activity, and fostering a vibrant human environment where people want to live. - 25 points

DENSIFY

To absorb urban growth in complict and dense forms, urban areas must grow vertically (densification) instead of horizontally (sprawl). It helps generate resources for investment in system improvements and expansions. - 15 points.

COMPACT

The basic organizational principle of dense urban development is compact development. In a compact city, or a compact district, the various activities and uses are conveniently located close together, minimizing the time and energy. - 10 points

SHIFT

When cities are shaped by the above seven principles, personal motor vehicles become largely unnecessary in day-to-day life.. Scarce and valuable urban space resources can be reclaimed from unnecessary roads and parking, and can be reallocated to more socially and economically productive uses. The performance objective below focuses on these benefits.-15 points

Benefits of TOD

Better place to live, work and play - Higher Quality of life Greater mobility choices Increased transit ridership Reduced traffic congestion Reduced injuries and accidents Reduced spending on transportation– affordability Increases public safety Increases transit ridership Reduces rates of vehicle miles travelled - Reduced diesel Reduces air pollution and energy consumption rates Helps conserve resource lands and open space
Plays a role in economic development of the nation. Decreases infrastructure costs Contributes to more affordable housing in Urban Development.

Rating as per ITDP

ITDP authority

MOBILIZE is the annual sustainable transport summit of the Institute for Transportation and Development (ITDP), which brings together urban transport and development practitioners alongside world-class researchers to celebrate best practices and accelerate implementation of sustainable transport projects.

Each year, ITDP and the Sustainable Transport Award Committee select a city that has implemented innovative sustainable transportation projects in the preceding year.
These strategies improve mobility for all residents, reduce transportation greenhouse and air pollution emissions, and improve safety and access for cyclists and pedestrians.

Government Policies

National Transit Oriented Development (TOD) Policy – 2017
Ministry of Housing and Urban Affairs, Government of India

This policy seeks to enhance the depth of understanding of States and UTs on TOD as a viable solution to many of the challenges like haphazard urban growth and sprawl, mobility, rapidly rising private vehicles on roads, pollution, housing choices etc.
This new urban design and planning in the form of TOD, is being incentivised by the Ministry under two more initiatives viz., Metro Policy and Green Urban Mobility Scheme which also will be discussed with States and UTS for taking them on board.
Under TOD, city densification will be promoted alang mass transit comidors through vertical construction by substantially enhancing FARS (Floor Area Ratio) backed by promotion of Non-motorised Transport Infrastructure for walking and cycling to transport stations, development of street networks in the influence zone of transit corridors, multi-modal integration, effective first and last mile connectivity through feeder services to enable people access public transit in 5 to 10 minutes from home and work places.
Under the new Metro Policy, TOD has been mandatory while under Green Urban Mobility Scheme, TOD has been made an essential reform and is given priority for receiving central assistance.

Present Efforts in India

Mumbai

Eliminating low density, outward expansion, the city's proposed Development Plan instead calls for higher FSI up to 8 along rapid transit corridors and commercial districts, while restricting FSI to 2 or less in areas without transit access.

Ahmedabad

Allowed higher densities for developments along transit corridors, with Central Business District having an FSI of 5.4. better streets, an improved public realm and infrastructure upgrades.

Delhi

To allow higher densities In a TOD zone, which extends 500 metre on either side of an identified Delhi Metro corridor, to avail 400 FAR, mandate mixed use, and eliminate setbacks and compound walls for developments near public transport hubs.

Case Study - Delhi

Interconnected Street Network

Small walkable blocks; Pedestrian cut-throughs every 100 M.

Mix of uses to provide people of varied social groups with options to live, work and play within easy access to public transport and daily necessities.

Rail India Technical and Economic Service – RITES Has already started incorporating it and above shown comparison is the change that would be brought in Delhi because of TOD. New Infrastructure Calculation of hours travelled in Vehicles Calculation of Annual Transit Trips

Problems

In spite of Delhi's recent investment in Public Transportation, it was unable to deliver efficient, comfortable and affordable mobility options to its citizens.

This has consequentially resulted in the ever increasing number of private vehicles.

There has been an exponential growth in private motor vehicle ownership, and a corresponding increase in pollution and congestion, with loss of man-hours. It also lacked to address the integration of infrastructure, land-use and transport.

Solution

UTTIPEC & Delhi Development Authority: framed a Transit Oriented Development for Delhi.

Zoning of TOD for Delhi

To facilitate an organized development and to bring transparency in the development process as per TOD, the Influence Zone is further divided as:

Zone 1:Intense TOD Zorne (300 M influence zone)

Zone 2:Standard TOD Zone (800 M influence zone)

Zone 3: TOD Transition Zone (2000 M influence zone)

TRANSIT ORIENTED DEVELOPMENT PROMOTING INTEGRATED LAND USE AND TRANSIT PLANNING

CASE STUDY -1 (NAYA RAIPUR)

Naya Raipur Background

When Chhattisgarh was established in 2000, Raipur was chosen as the capital. However, the city's civic infrastructure was already overburdened, so a new city was created to serve as the state's administrative center. The new city, named Naya Raipur, was located 17 km southeast of the old city.

Naya Raipur - Objectives and Approach

A satellite city to Raipur holding Capital function is the primary identity of Naya Raipur. It will be modern in the use of technology, uphold worthy traditions and core values, prevailing man- nature symbiotic culture as well as abundant natural & cultural assets in the region. The citizens will be offered a wide range of living options with equity and dignity. The city will strive to make an impact in the following role:

Scope of Work

Project objective

Naya Raipur Development Authority wishes to develop the city of Naya Raipur with state of art type of features and is aiming to provide world class facility in the region. The project, being green field development, necessitates the construction of totally new infrastructure systems. According to the development plan of Naya Raipur, the new capital city will have its own water supply and distribution, sewerage, storm water drainage and solid waste management systems in line with the planning and development norms with the appropriate agencies, as applicable.

Context Analysis / Demography Analysis

Table 6.2 Future Population of the Region

Year	Population of the Region	Percentage of Region's Population to Total Population of the State
1991	2,285,044	12.97
2001	3,060,485	14.69
2011	4,099,076	16.90
2021	5,490,117	20.08
2031	7,353,216	23.75

Source: Census of India and Consultant's Projection

Existing Land Use – NRDA Planning Area The NRDA planning area

The NRDA planning area consists of 41 villages covering a total of 23742.63 Ha. The Existing Land Use Plan of these 41 villages was adopted under the provisions of section 69(B) read with section 15 (3) of the Chhattisgarh Nagar Tatha Gram Nivesh Adhiniyam 1973 (no. 23 of 1973) by the Housing and Environment Department, Government of Chhattisgarh vide notification ref. no. 37, dated 20.06.2002.

Table 4.1: Land Use Distribution in the NRDA Planning Area

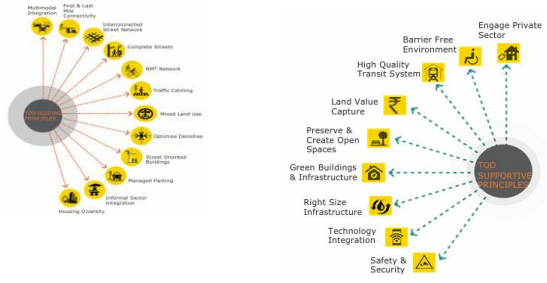
S.No.	Land Use	Area (in Ha)	Percentage
1	Residential	257.48	1.08
2	Commercial	6.50	0.04
3	Industrial	29.07	0.12
4	Public & Semi Public (Public amenities and facilities)	20.59	0.08
5	Transportation - Roads and Streets	1131.44	4.77
6	Recreational	107.73	0.45
7	Water Body	1846.70	7.78
8	Agriculture	20343.12	85.68
	Total	**23742.63**	**100**

Economic Analysis

The main activity base of Naya Raipur would be the Government / State Capital functions. However, a diversification of economic activities is desirable which would be attained through the following activities:

1. Software Technology Park
2. Gems and Jewellery and other similar industries
3. Business Offices
4. Health, Education and Research services
5. Regional recreational activities

Urban Policy and TOD Principles



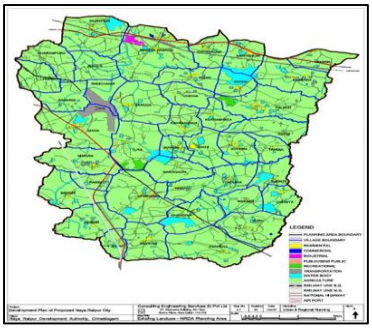
1. MULTIMODAL INTEGRATION

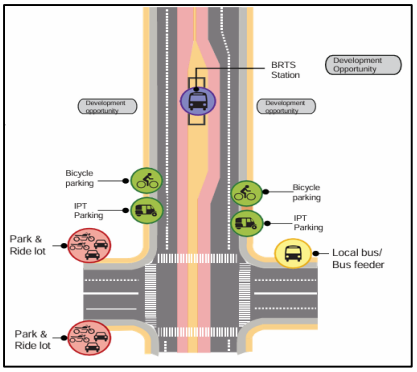
❖ Create clear, direct, and short transfers between transit modes and routes.

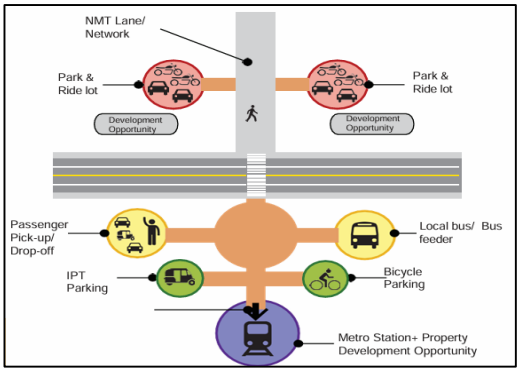
❖ Minimize travel time and cost for maximum commuters.

❖ Prioritize pedestrians, cycling, public transportation, and IPT over other private modes in site planning of transit interchanges

Multimodal Integration at BRTS: Feeder bus stops for perpendicular routes, IPT and park and ride lots are generally integrated with BRTS at the crossings to make the transfers as convenient as possible.







2. FIRST & LAST MILE CONNECTIVITY

❖ Reduce the distance and time it takes people to travel from their origins to stations and from stations to destinations.

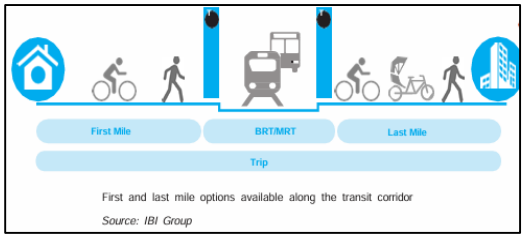
❖ Induce modal shift from personal vehicles P P by providing viable mobility options and extending the reach of transit to maximum users.

3. INTERCONNECTED STREET NETWORK

❖ Develop an interconnected and streets and blocks system with routes providing direct connections between transit station and other area destinations.

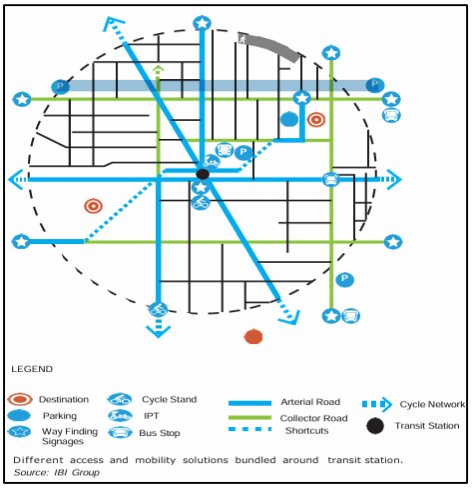
❖ Identify a clear hierarchy of streets to accommodate a wide range of traffic patterns, including pedestrian, cycling and vehicular.

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



Urban Infill Areas: Reconnect/ dedicate a comprehensive NMT network for the core where as plan vehicular movement just outside the core.

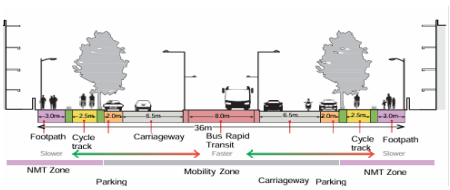
Greenfield Areas: Establish and/or reconnect a comprehensive street grid of small blocks, accommodating pedestrian, vehicular and cycling connections.

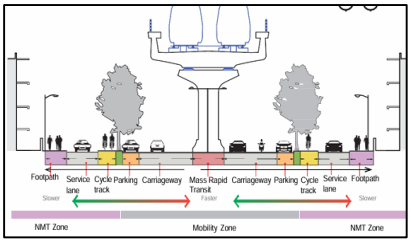


4. DESIGN COMPLETE STREETS

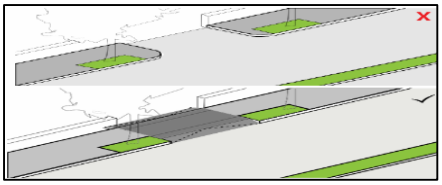
❖ Create a balance between the movement of pedestrians, cyclists, transit, and vehicles.

❖ Promote equitable allocation of Row for balanced allocation of space and modes.





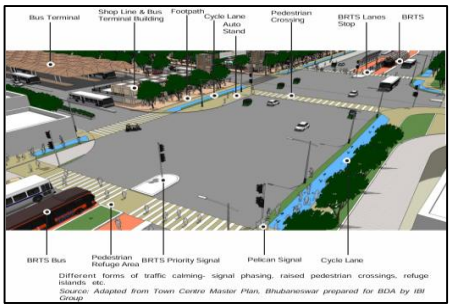
5. NMT NETWORK



❖ Shift the balance of the roadway so that it caters more to NMT users of all types within station areas and transit zones.

❖ Increase safety and comfort on the sidewalk for NMT users.

6. TRAFFIC CALMING

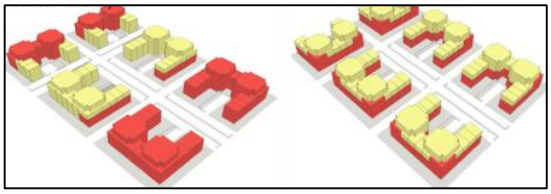


Emphasize pedestrian and cyclist safety, comfort and convenience to improve accessibility to transit stations.

❖ Decrease speeds along heavily trafficked streets to protect multi-modal users near transit stations.

7. MIXED LAND USES

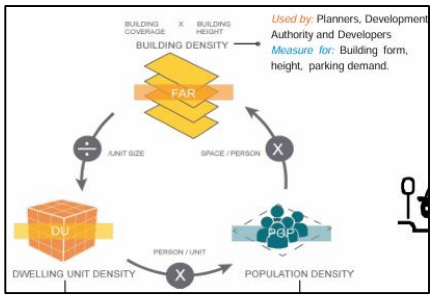
Promote more efficient land use patterns at a city scale by providing residents access to retail, commercial and civic services, employment and recreational facilities without needing to travel by automobile.



❖ Large single land uses located along transit alignments, should be encouraged to redevelop into higher density, mixed-use forms.

❖ Encourage multiple functions in the same building and development to improve pedestrian activity, safety, and financial viability of overall development.

8. OPTIMIZED DENSITIES



❖ Encourage enforcement of differential increase in density regulations (as opposed to uniform blanket citywide regulations) at transit stations based on existing capacities of land, NMT infrastructure, transit capacity, and utilities.

❖ Ensure densities are strategically distributed across the urban area as a means to create compact city forms.

9. STREET ORIENTED BUILDINGS

❖ Provide natural surveillance and “eyes on the street” for pedestrian safety by regulating street edge design and not limiting controls to RoW design.

❖ Develop regulations to integrate the public realm street edge treatment with private sector development.

10. MANAGED PARKING

❖ Reduce vehicular trips within Station Area (800m from transit station.

❖Maximize development opportunities on public lands surrounding the transit station for providing more equitable uses.

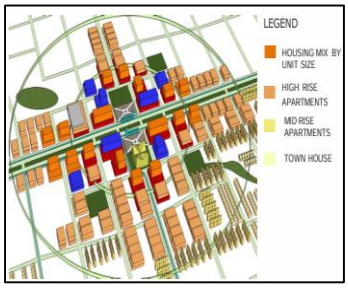
11. INFORMAL SECTOR INTEGRATION

❖ Ensure that TOD plans enable equitable distribution of benefits to all sections of the society.

❖ Provide and promote a supportive environment for earning livelihoods to the street vendors as well as ensure absence of congestion and in public spaces and streets. (Source: National Street Vendors Policy, Protection of Livelihood and Regulation of Street Vending Act, 2014)

❖ Address integration of informal residential areas as part of TOD redevelopment projects.

12. HOUSING DIVERSITY



❖ Ensure that all residents of urban areas have access to a range of housing options within their affordability limits within a 10 minute walking/ cycling distance from a transit station.

❖ Ensure a minimum supply of affordable housing options for low- and medium income population within walking/ cycling distance of stations, and in close proximity to sources of employment and recreation.

NAYA RAIPUR CONTEXT

• Connecting the dots between multiple initiatives • How do we integrate TOD principles within functional and in-progress projects?

• Doweneedmore density or redistribution of densities?

• How do we integrate planned transit with proposed land uses?

• Is the development code supportive of TOD principles?

TOD IN A GREENFIELD CONTEXT

❑ Comprehensively planned new cities offer an important solution to meet the nation's urban crisis.

❑ Opportunity to create high-quality sustainable "places".

❑ Reconnect people and planning proactively.

❑ Upfront infrastructure development.

❑ Strong leadership support and political will.

❑ Enable design of community driven processes and systems.

MASTER PLAN SALIENT FEATURES

❑ INSPIRED BY CORBUSIER'S CHANDIGARH & OTHER CAPITAL CITIES AROUND THE WORLD

❑ GARDEN CITY DENSITY - 560,000 PEOPLE IN 80 SQ.KMS.

❑ DIVERSE EMPLOYMENT BASE PROPOSED

❑ GREEN BELT AS AN URBAN GROWTH BOUNDARY

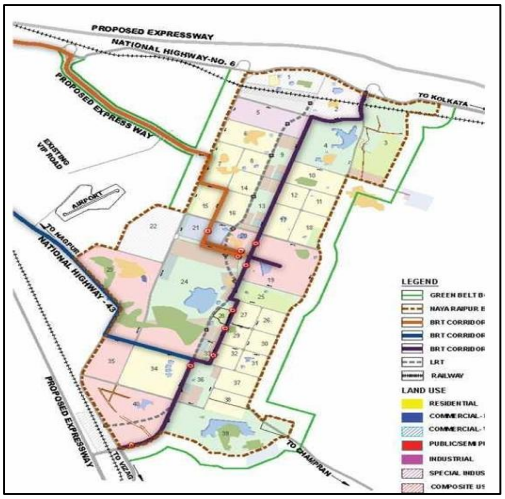
❑ MEGA BLOCK GRID SYSTEM - 800m X 800m SECTORS

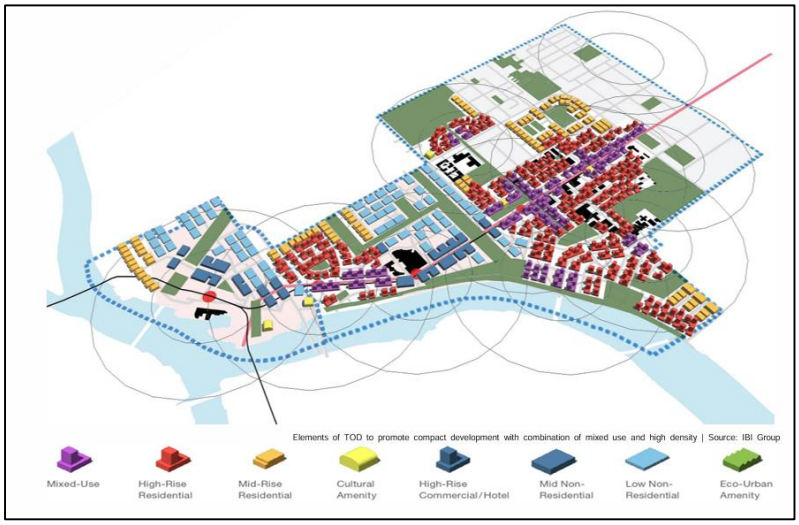
❑ MONUMENTAL SCALE - 100m & 60m WIDE ROADWAYS

❑ AUTOMOBILE ORIENTED POLICIES - 2PPH ASSUMPTION

❑ SEGREGATED LAND USES

❑ EXTENSIVE OPEN SPACE NETWORK





CASE STUDY -2 BHOPAL (MP)

INTRODUCTION

Bhopal, the capital of Madhya Pradesh, is a fascinating amalgam of scenic beauty, old historic city and modern urban planning.It is the 11th century city Bhoj Pal, founded by Raja Bhoj, but the present city was established by an Afghan soldier, Dost Mohammed (1707-1740). Bhopal is known as the "City of Lakes" because of its many natural and artificial lakes. The city's name comes from Bhoj Tal, an 11th century lake built by the Hindu raja Bhoj.

Location

Bhopal is centrally located, making it well connected to the rest of the country.It's close to major tourist attractions like Kanha, Ujjain, and Sanchi.

	Bhopal	Curitiba	Ottawa
Population	1.79 million (2011)	1.76 million	1.2 million
Area	684.24 sq.km	430.9 sq.km	5716 sq.km
Gross Density	2616 persons/sq.km	4095 persons /sq.km	196.6 persons/sq.km
Urban Area Density	6893 persons/sq.km	4200 persons/sq.km	1860 persons/sq.km
Higher Order Transit	BRTS + proposed MRTS	BRTS	BRTS + Proposed LRT

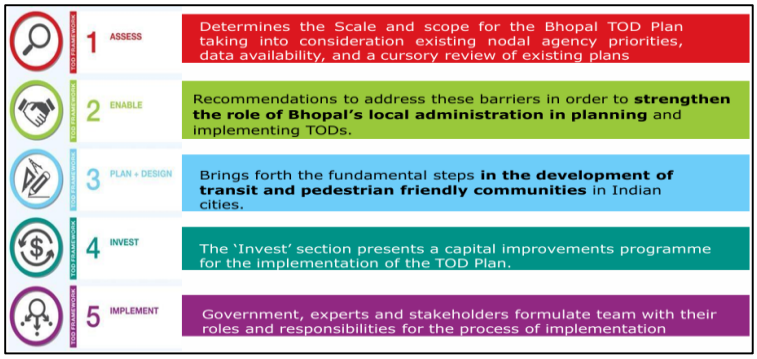
NEED FOR TOD IN BHOPAL

- Prioritizing public transit use and reduced use of private vehicles for daily commuting.
- Providing policy directions to establish a TOD centric growth pattern.
- Capitalizing upon the land value potential near BRTS and Metro stations to attract private sector investment in joint development.
- Formulating a strategic implementation programmed that outlines the phasing strategy for investment.

TOD encourages residents, workers and shoppers to use Mass Transit and reduces their dependency on private motorized vehicles by compact, mixed-use and pedestrian friendly development around Transit Station and along Transit Corridor.

➢ Reduce traffic congestion
➢ Improve public health
➢ Minimize environmental impact Bhopal has incorporated TOD into its development plans, including the Bhopal Development Plan 2031. The plan encourages TOD along proposed Metro corridors and Commercial Mixed Use Zones (CMU Zones).

Step-by-Step Process



INSTITUTIONAL FRAMEWORK

• Multiplicity of agencies
• Landuseplanning falls under the purview of Town and Country Planning at state level or development authority.
• Insufficient capacities to develop and implement TOD projects

PREVIOUS BHOPAL MASTER PLAN

TOD Consistencies:

• Differential densities for city with higher density areas proposed around the existing and the proposed work centers.
• Proposed Mass Rapid Transit System connecting major work centers, and traffic generating zones.
• Recommends variable FSIs based on site context.

PREVIOUS PLAN DCRs

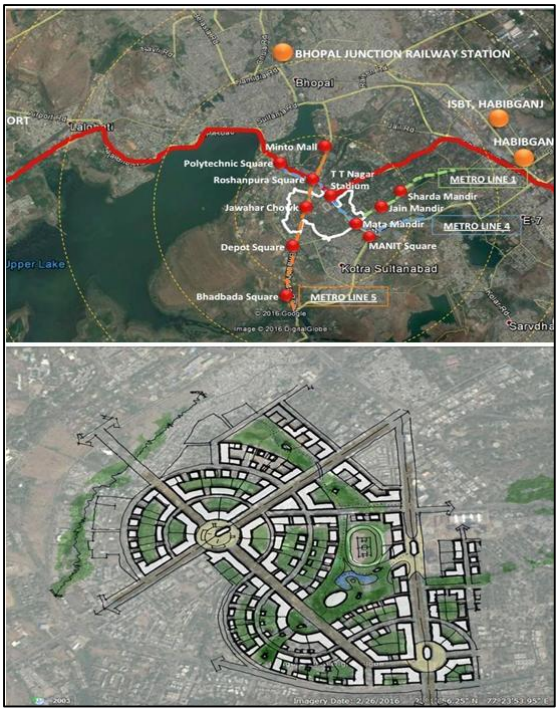
FAR

• Residential Use: 0.75- 1.33
• Commercial Use: 1.5-2.5
• Mixed Use: FAR for commercial development will be 0.75 only where FAR for residential area is 0.75
• DENSITIES PROPOSED (Development Plan- 2005)
• Low- up to 125PPH • Medium- 126-250 PPH
• Medium & High- 251- 400PPH
• High- 401- 600PPH

TOD Gaps:

• Does not address regulatory or implementation mechanisms for coordinated land use and transportation planning.

TODO BASED MASTER PLAN



		State level			District Level			City Level			
		Town and Country Planning	Urban Administration and Development	Transportation Department	Regional Transport Office (RTO)	Collectors Office	Traffic Police	Capital Project Administration	Development Authority	Urban Local Body (BMC)	Bus SPV (BCLL)
Land Use	Policy Formulation	■									
	Plan Development	■	■						■		
	Implementation							■	■	■	
	Enforcement					■			■	■	
Urban Transport	Policy Formulation		■								
	Plan Development		■								■
	Implementation			■						■	■
	Enforcement				■		■				

• Hotels and Lodges: 1ECS/75 sq.m
• Govt. Semi-public and private offices: 1ECS/100 sq.m of built-up area.

PREVIOUS PLAN BHUMI VIKAS ADHINIYAM

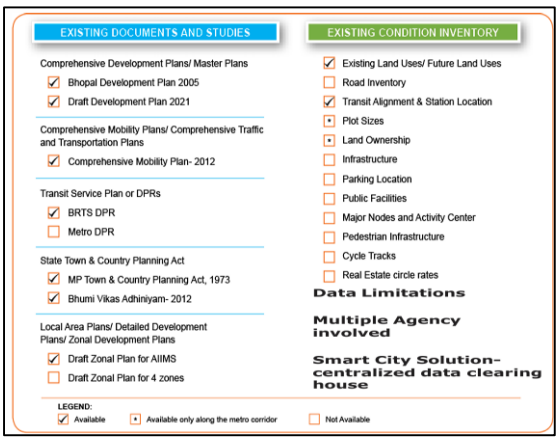
TOD Consistencies:

Introduces a new category of residential use R2 that permits commercial on ground floor
• The assessment of the shopline is based on:
• Infrastructure capacity
• Traffic survey
• Express clearance require for permitting high-rise buildings to ensure balance of infrastructure and other utilities.

PREVIOUS PLAN BRTs DPR

TOD Consistencies:

• Proposed typical cross section based on different ROWs
• Segregated traffic lanes for BRT, slow moving vehicles, non motorized transport and pedestrians.
• Proposed integration of BRT with the existing feeder service.
• Planned the BRTS routes linking the proposed sub cities.



TODO Gaps:

- Does not discuss micro-strategies to improve accessibility to transit stations.
- Lack of integration of parking and with local feeder service- autos, tata magic.
- The plan does not take into consideration universal accessibility. **TODO TASK FORCE**

Organization	TOD Principles	Roles and Responsibilities
T&CPO	Mix Land uses | Optimize Densities | Street Oriented Buildings	Integration of TOD principles in the Regulatory Framework
UADD	Interconnected Street Network | Complete Streets | NMT Network	Incorporating pedestrian related principles while formulating plans for city's mobility
BDA	Housing Diversity	Formulate tools and strategies to produce affordable housing near public transit
BMC	Traffic Calming | First & Last Mile Connectivity | Informal Settlement	Integration of traffic calming measures and first and last mile connection while planning transport infrastructure
BCLL	Multimodal Integration	Route rationalization and integrating feeder service with the transit and development
Police	Manage Parking	Enforcement and regulation of traffic and parking

GOAL SETTING

Two- Pronged Approach: BRTS vs. MRTS Eliminating Policy/ Regulations barriers- Acts/ Development Plan / DCR modifications Differential FARs / Optimized Densities based on Station Area Plans/ Special TOD Zone Prioritization for Development of Station Areas Financial and non-financial incentives to push market towards desired investment.

MIXED LAND USES EXISTING POLICIES

Mixed land use- Mixed land use zone means a use zone in the land use plan consisting of more than one use zones, in such case use premises/use activities permitted.in both the use zones shall be applicable. (Section 4.12) At the time of Zonal Development Plan, streets of mixed use activity shall be identified. Commercial activity allowed shall be only on the ground floor to the extent of 25% or 50sqm.

PROPOSED AMMENDMENTS

In all integrated schemes, a minimum of 30% of overall FAR shall be mandatory for Residential use, a minimum 10% of FAR for commercial use and minimum 10% of FAR for community facilities. Mix of uses and FAR utilization for the remaining 50% FAR shall be as per the land use category designated in the Zonal Plan.

Eliminating Policy level

MULTIMODAL INTEGRATION EXISTING POLICIES

To establish reliable, efficient multimodal public transport system. Provide for multi nodal Regional Bus Terminal facilities following regional bus stations should be developed according to the needs and the volume of the bus users.

PROPOSED AMMENDMENTS

Intermodal integration of formal public transport, para transit and cycle sharing should be within 200m from each other Coordinate local feeder transit service schedules and routes to provide seamless connectivity between local, regional, and rapid transit services by reducing waiting times. Bus routes along collectors and arterial roads provided every 800m- 1km. Transit feeder stops/local bus stops: 400m or 5 min walk.

Adopt transit priority measures to ensure the efficient movement of surface transit to and from the station area, including measures such as signal priority and dedicated transit lanes.

NMT NETWORK

EXISTING POLICIES Not Addressed

PROPOSED AMMENDMENTS Prioritization of public transport and non-motorized private modes in street design.

Maximum number of people should be able to move fast, safely and conveniently through the city.

To retrofit streets for equal or higher priority for public transit and pedestrians. Shift the balance of the roadway so that it caters more to NMT users of all types within station areas and transit zones. Provide enough room on the sidewalk for NMT users of varying speeds, ages, and abilities. Create street-level activity and well-watched streets for pedestrian security and enjoyment. Provide adequate amenities for pedestrians, cyclist, NMT and public transport users.

- Fully automated • unmanned • 24/7 Service Availability
- 32000 registered users • Central control system • Redistribution
- Cashless • 500 Smart cycles • 50 docking stations

TODO TYPOLOGIES

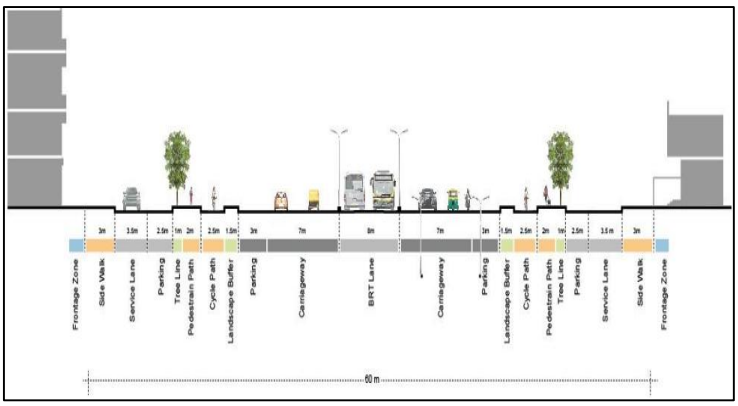
- Traffic calming
- Pedestrian crosswalks
- IPT integration
- Universal Access

	Mixed Use Commercial	Mixed use Neighbourhoods	Employment Centres	Retail Destinations	Heritage Precincts	Transit Interchanges
Characteristic	Significant center of economic and cultural activity with regional- scale retail destinations.	Predominantly residential district within the core/old city area	Significant centre of economic and community activity & offices of the city + a moderate mix of retail.	Famous destinations, recreation areas, mass congregation historical, cultural areas	Old parts of the city with significant & architectural characteristics	Predominantly a mix of commercial, institutional and residential district organized around transit stations
Land Use	Residential- 30-40% Commercial- 30-50% PSP & Others- 10-20%	Residential- 50-70% Commercial- 20-30% PSP & Others- 10-20%	Residential- 30-40% Commercial- 10-20% PSP & Others- 30-50%	Residential- 30% Commercial- 50-60% PSP & Others- 10-20%	Residential- 30-40% Commercial- 10-20% PSP & Others- 10-20% Heritage Areas- 20-30%	Residential- 30% Commercial- 10-20% PSP & Others- 10-20% Transportation- 20-30%

ACCESSBILITY

Implementation Strategy

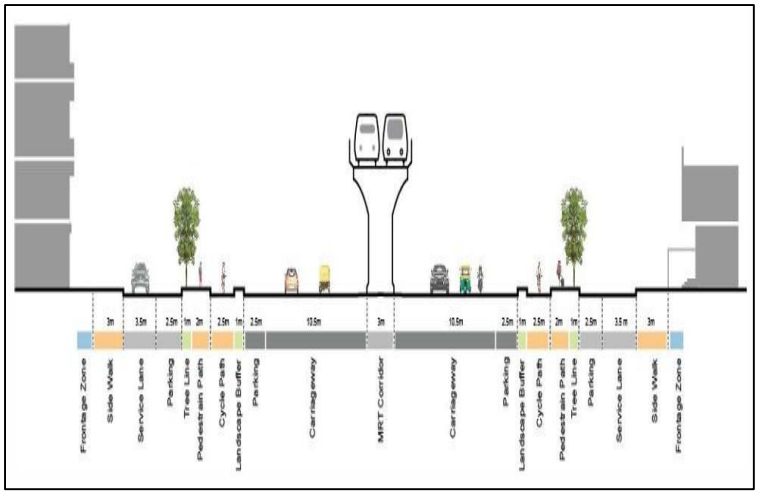
- Formulation of Task Force to ensure continuity in TOD planning process
- Prepare TOD policy and relevant bye-laws
- Establish a TOD Overlay District as a Special Area in Development Plan under preparation.
- Notification of Rules & Regulations to establish statutory relevance for TOD Principles.
- Improve citywide Public Transport & NMT facilities along with route rationalization for bus routes and feeder routes.
- Conduct detailed Station Area Planning for priority stations.
- Identify key catalyst projects/ sites for TOD.



Financing Models

1. Land Banking- Urban Infill
2. Land Pooling- TP Schemes (Greenfield)
3. Premium FARs in exchange of providing:
   - Public amenities
   - Public open space
   - Achieving IGBC or Green Building certification
   - Affordable housing units
   - Public access for creating small block sizes
4. Transit Agency: Rail + Property
   - Land Value Capture
   - Joint Development
5. Align with Smart City Project/ funding & other central government programs

Implementation Strategy – KEY SITES



INFERENCES FROM CASE STUDY & LITERATURE STUDY

Based on the case study of TOD in Lucknow and literature studies, the following key inferences can be drawn:

1. Effectiveness of TOD Strategies in Lucknow

TOD has positively influenced urban mobility by encouraging metro usage and reducing traffic congestion.
However, first/last-mile connectivity issues remain a challenge, limiting accessibility to transit hubs.
High-density, mixed-use development around metro corridors is still in its early stages but has shown potential for economic growth.

2. **Impact on Sustainable Mobility**

TOD has led to an increase in public transport ridership, reducing dependence on private vehicles.
Pedestrian-friendly infrastructure is underdeveloped, making it difficult to achieve full benefits of TOD.
Integration of metro, bus, and cycling infrastructure needs improvement for seamless multimodal transport.

3**. Urban Planning & Land Use Implications**

TOD has encouraged commercial and residential development near metro stations, increasing real estate value.
However, zoning and land-use regulations need better enforcement to prevent unplanned urban sprawl.
Parking management reforms and pedestrian infrastructure improvements are required to make TOD zones more efficient.

4. **Environmental & Social Benefits**

Reduction in carbon emissions and air pollution due to fewer private vehicles.
TOD can improve social equity by providing affordable housing near transit hubs, but challenges in implementation persist.
Green spaces and eco-friendly urban infrastructure are lacking in existing TOD developments.

5. **Challenges & Limitations**

Institutional coordination issues between urban planning and transport departments slow down TOD implementation.
Public-private partnerships (PPPs) are underutilized, limiting investment in TOD projects.
Resistance from local businesses and residents affects policy execution (e.g., concerns about displacement, high-density zoning).

6. **Policy & Governance Recommendations**

Strengthen TOD policy framework to encourage higher-density, mixed-use development.
Improve multimodal integration by developing pedestrian paths, cycling lanes, and feeder services to metro stations.
Promote public-private partnerships (PPP) for financing TOD-based infrastructure projects.
Encourage community participation in TOD planning to address public concerns and ensure inclusive urban development.

Conclusion

TOD in Lucknow has shown positive early-stage impacts, but its full potential is yet to be realized.
Stronger policy enforcement, infrastructure investment, and community engagement are needed for long-term sustainable urban growth.
Future TOD strategies should focus on enhanced multimodal connectivity, green urban infrastructure, and equitable land use planning to make Lucknow a model for sustainable urban development.

BASED ON LITERATURE AND CASE STUDIES COMPILATION A DETAILED METHODOLOGY IS COMPULSORY

Methodology for Studying TOD Strategies in Lucknow

1. Research Design

This study follows a mixed-method approach, combining qualitative and quantitative research to analyze TOD strategies in Lucknow. It involves: Literature Review (secondary data analysis)
Case Study Analysis Field Surveys & Data Collection Comparative Study with Best Practices

2. **Literature Review (Secondary Research)**

Objective:

To understand TOD principles, global best practices, and their applicability in the context of Lucknow.

Sources of Literature:
Research papers on TOD and sustainable mobility Government policies and reports (AMRUT, Smart City Mission, Lucknow Metro Policy) Urban transport and city planning guidelines Case studies from other Indian and global cities.

Key Focus Areas:
TOD principles and their role in sustainable urban growth Success factors in TOD Implementation Policy frameworks and urban planning strategies Challenges and limitations in TOD execution.

3. Case Study Methodology
Selection Criteria for Case Study:
Lucknow Metro and its TOD corridors
TOD-based developments near major transit hubs (e.g., Hazratganj, Charbagh, Transport Nagar) Comparative analysis with other Indian cities (Delhi, Ahmedabad, Pune)

Case Study Parameters:
Urban Planning & Land Use: Density, mixed-use zoning, walkability Mobility & Transport Infrastructure: Metro ridership, first/last-mile connectivity Environmental Impact: Reduction in pollution and carbon footprint Economic & Social Benefits: Real estate growth, employment, social inclusion.

4. Data Collection Techniques

Primary Data Collection:
Field Surveys & Observations:
Land use patterns near metro stations Walkability and non-motorized transport (NMT) infrastructure Traffic flow and parking management
Interviews & Questionnaires:
Urban planners and transport officials Residents and daily commuters Business owners near TOD zones
Secondary Data Collection:
GIS maps for land use analysis Government reports on transport policies Metro ridership statistics and urban growth indicators.

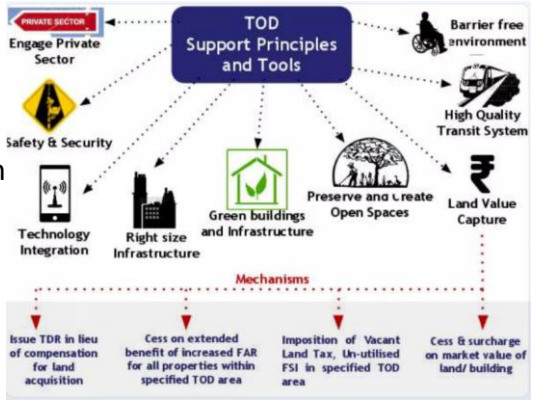
5. Data Analysis Methods
Qualitative Analysis:
Thematic analysis of policy documents and stakeholder interviews SWOT analysis of TOD implementation in Lucknow

Quantitative Analysis:
Statistical evaluation of metro ridership and transport trends GIS-based spatial analysis of TOD zones.

6. Comparative Analysis
Best Practices from Other Cities:
Delhi's TOD Policy Ahmedabad's BRTS model Global TOD examples (Singapore, Tokyo, Hong Kong)
Applicability to Lucknow:
Identifying adaptable strategies Policy recommendations based on successful models.

7. Conclusion & Policy Recommendations
Summarizing key findings from literature and case studies
Proposing policy improvements for TOD-based sustainable urban growth Suggesting a roadmap for future TOD development in Lucknow This methodology ensures a comprehensive and data-driven approach to analyzing TOD strategies in Lucknow

FINAL INFERENCES FROM LITERATURE & CASE STUDIES ON TRANSIT- ORIENTED DEVELOPMENT (TOD)



Final Inferences from Literature & Case Studies on Transit-Oriented Development (TOD) Strategies in Lucknow for Sustainable Urban Growth
Based on an extensive review of literature and case studies, the following key final inferences have been drawn:

Effectiveness of TOD Strategies in Lucknow

✓ TOD has enhanced public transport accessibility, especially around metro corridors.
✓ There is a gradual shift from private vehicles to public transit, leading to reduced congestion.
✗ However, the integration of land-use planning with transport infrastructure is still weak.
✗ First/last-mile connectivity remains a major challenge, affecting TOD efficiency.

2. Urban Planning & Infrastructure Development

✓ TOD principles such as mixed-use development and high-density planning are being implemented.
✓ Metro corridors have spurred real estate growth and commercial activities.
✗ Lack of pedestrian-friendly infrastructure and safe cycling lanes limits TOD effectiveness.
✗ Zoning regulations and land acquisition issues hinder compact urban development around transit hubs.

3. Impact on Sustainable Mobility & Environment

✓ TOD has reduced carbon emissions and improved air quality by promoting public transit.
✓ Compact, transit-focused urban growth helps optimize land use and reduce urban sprawl.
✗ The absence of green infrastructure and sustainable energy integration in TOD developments is a drawback.
✗ Public transport system expansion needs stronger policy support and financial backing.

4. Socio-Economic Implications

✓ TOD corridors have boosted property values and commercial growth.
✓ Improved mobility enhances job accessibility, benefiting lower-income groups.
✗ The risk of gentrification and displacement of low-income communities near transit hubs needs to be addressed.
✗ There is a lack of community participation in TOD planning, leading to social resistance.

5. Challenges & Barriers in TOD Implementation

✗ Institutional coordination issues slow down TOD execution in Lucknow.
✗ Financial constraints limit large-scale TOD investments and infrastructure upgrades.
✗ Policy fragmentation between urban planning and transport departments delays progress.
✗ Need for Public-Private Partnerships (PPP) to fund TOD-based infrastructure projects.

6. Lessons from Global & Indian TOD Models

✓ Delhi's TOD model emphasizes high-density urban growth near transit hubs, which can be adapted for Lucknow.
✓ Ahmedabad BRTS TOD strategy showcases effective multimodal integration.
✓ International models like Singapore and Tokyo highlight the importance of mixed-income housing near transit hubs.
✗ Lucknow's TOD policy needs better alignment with global best practices for successful implementation.

7. Policy Recommendations & Future Roadmap

Strengthen TOD Policy Frameworks: Encourage compact, mixed-use, and pedestrian-friendly developments.
Improve First/Last-Mile Connectivity: Develop feeder bus networks, cycle-sharing, and pedestrian pathways.
Encourage Sustainable Infrastructure: Integrate green spaces, energy-efficient buildings, and smart transit solutions.
Enhance Public Awareness & Participation: Engage communities in TOD decision-making.
Develop Financial Models for TOD: Promote Public-Private Partnerships (PPP) for infrastructure funding.

Conclusion

TOD strategies in Lucknow have shown initial success, but comprehensive planning and policy interventions are required. Infrastructure development, multimodal integration, and governance reforms are essential for TOD success. With better implementation of global best practices, Lucknow can become a model for sustainable urban mobility in India.

Final Inferences from Literature & Case Studies on Transit-Oriented Development (TOD) in Lucknow for Sustainable Urban Growth

Based on extensive literature review and case study analysis, the following key inferences have been drawn regarding the effectiveness, challenges, and future potential of TOD strategies in Lucknow:

1. TOD's Role in Sustainable Urban Mobility

✓ TOD has improved public transit accessibility, particularly around metro corridors.
✓ There is a gradual shift from private vehicles to metro and public transport, reducing congestion and emissions.
✗ However, first/last-mile connectivity issues persist, limiting seamless transit access.
✗ Poor pedestrian and cycling infrastructure weakens the effectiveness of TOD principles.

2**. Land Use & Urban Planning Challenges**

✓ High-density, mixed-use development has been initiated near metro stations, stimulating economic activity.
✓ TOD corridors have increased real estate value, making transit zones attractive for investment.
✗ Lack of strict zoning regulations and fragmented policies hinder proper urban land use.
✗ Unregulated urban sprawl outside TOD zones reduces the intended benefits of transit-oriented growth.

3. **Environmental & Sustainability Impact**

✓ Reduced dependence on private vehicles has contributed to a decrease in traffic congestion and carbon emissions.
✓ TOD promotes compact urban growth, which helps conserve land and reduce urban sprawl.
✗ There is a lack of green infrastructure (e.g., urban parks, tree cover) in TOD zones.
✗ Energy-efficient transit and green building practices need better integration into TOD policies.

4. **Socio-Economic Outcomes**

✓ TOD enhances accessibility to jobs and services, benefiting lower-income populations.
✓ Increased commercial activity near transit hubs has boosted local businesses and economic opportunities.
✗ Rising land values can lead to gentrification and displacement of low-income communities.
✗ Insufficient affordable housing policies in TOD areas create inequality in urban access.

5**. Institutional & Policy Barriers**

✗ Coordination gaps between urban planning, transport, and governance bodies slow down TOD execution.
✗ Financial constraints and lack of incentives for private sector participation hinder TOD investments.
✗ Parking regulations and land acquisition issues affect the efficiency of TOD zones.
✗ Public participation in TOD planning is minimal, leading to resistance from local communities.

6. Lessons from Global & Indian TOD Models

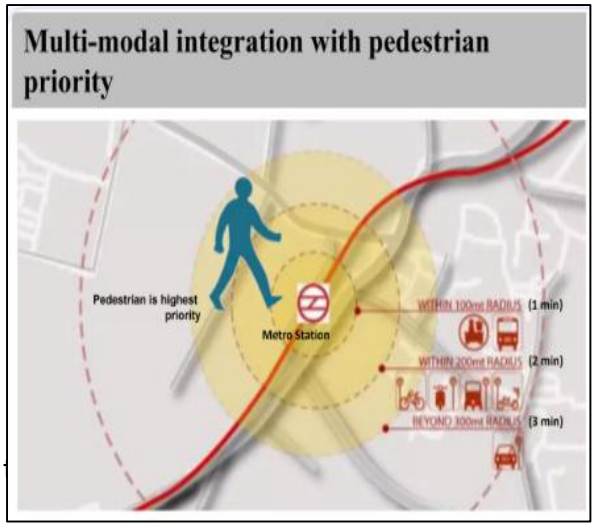
✓ Delhi's TOD policy offers insights on high-density development around metro corridors.
✓ Ahmedabad's BRTS model demonstrates effective multimodal transport integration.
✓ International examples (Singapore, Tokyo, Hong Kong) highlight best practices in mixed-use zoning and seamless transit connectivity.
✗ Lucknow's TOD strategy needs stronger integration with these successful models to enhance effectiveness.

7. Policy Recommendations & Future Roadmap

Strengthen TOD Policy Frameworks: Implement stricter zoning laws and enforce high-density, mixed-use developments.
Improve First/Last-Mile Connectivity: Develop feeder bus networks, cycle lanes, and pedestrian-friendly pathways.
Enhance Sustainability Measures: Incorporate green infrastructure, energy-efficient buildings, and eco-friendly transit solutions.
Encourage Public-Private Partnerships (PPPs): Attract private investment for TOD-based infrastructure projects.
Increase Public Engagement in TOD Planning: Ensure that community needs are addressed to prevent social displacement.

Conclusion

TOD has the potential to transform Lucknow's urban mobility, but policy gaps, infrastructure limitations, and governance issues need to be addressed.
Holistic urban planning, multimodal connectivity, and sustainability-focused policies will be crucial for TOD success.
With better policy implementation and adaptation of global best practices, Lucknow can emerge as a model for sustainable urban growth in India.



RESEARCH AREA

Research Area: Transit-Oriented Development (TOD) Strategies for Sustainable Urban Growth in Lucknow

Broad Research Area:

Urban Planning & Sustainable Development Public Transport & Mobility Planning Land Use & Infrastructure Development Environmental Sustainability in Urban Growth

2. Specific Research Focus:

Implementation of TOD strategies in Lucknow's metro corridors
Impact of TOD on urban mobility, congestion reduction, and public
Land use planning and mixed-use development in TOD zones
Environmental and social sustainability aspects of TOD in Lucknow
Challenges, policy gaps, and recommendations for improving TOD effectiveness.

3. Research Significance:

Addresses urban sprawl and traffic congestion in Lucknow Promotes sustainable and pedestrian-friendly urban growth Contributes to policy recommendations for better TOD implementation. Provides a comparative framework for TOD in other Indian cities.

RESEARCH PROPOSAL

Transit-Oriented Development (TOD) Strategies for Sustainable Urban Growth in Lucknow

Introduction

1. Urbanization is rapidly transforming Indian cities, leading to increased traffic congestion, environmental degradation, and inefficient land use. Transit-Oriented Development (TOD) has emerged as a strategic approach to sustainable urban growth by integrating land use with public transportation. This research explores TOD strategies in Lucknow, evaluating their impact on mobility, infrastructure, and sustainability.

2. Research Objectives

To analyze the current urban mobility patterns and challenges in Lucknow. To assess the effectiveness of TOD strategies in improving public transport accessibility. To evaluate the impact of TOD on land use planning and economic growth. To identify challenges and policy gaps in TOD implementation. To propose recommendations for enhancing TOD strategies for sustainable urban development.

3. Research Questions

How does TOD influence mobility and public transport usage in Lucknow?

What are the key benefits and limitations of TOD in the city's urban planning framework?

How does TOD impact real estate development and economic activity?

What are the major barriers to effective TOD implementation in Lucknow?

How can TOD strategies be improved for better integration with sustainable urban planning?

4. **Literature Review**

The literature review will focus on the principles of TOD, global best practices, and case studies from cities like Delhi, Ahmedabad, and international examples such as Singapore and Tokyo. Additionally, government policies, urban transport reports, and academic research on TOD in India will be analyzed to establish a theoretical framework.

5. Research Methodology: This study follows a mixed-method research approach, including qualitative and quantitative analysis.

5.1 Data Collection Methods Primary Data: Field surveys, interviews with urban planners, transport authorities, and commuters.Secondary Data: Government reports, GIS mapping, metro ridership statistics, and urban policy documents.

5.2 Data Analysis Methods Qualitative Analysis: Policy review, stakeholder interviews, and SWOT analysis of TOD strategies.

Quantitative Analysis: Statistical evaluation of metro usage, GIS-based land use mapping, and economic impact assessment.

6. **Case Study Selection**

The study will include an in-depth analysis of TOD corridors in Lucknow, focusing on key metro stations such as:

Charbagh Metro Station: Major transport hub with mixed-use development potential.

2. **Hazratganj Metro Station**: High commercial activity and pedestrian connectivity.

3. **Transport Nagar Metro Station**: TOD potential in industrial and residential zones.

7**. Expected Outcomes**

A comprehensive evaluation of TOD's role in improving urban mobility and sustainability in Lucknow. Identification of challenges and policy gaps in current TOD frameworks. Policy recommendations for enhancing TOD implementation and integration with urban planning. A comparative analysis of Lucknow's TOD approach with other Indian and global cities.

8**. Significance of the Study**

This research will provide valuable insights for urban planners, policymakers, and transport authorities to enhance TOD-based sustainable urban development. It will contribute to shaping future policies and infrastructure projects aimed at creating more efficient, livable, and environmentally friendly urban spaces in Lucknow.

9. Conclusion

Transit-Oriented Development is a crucial element in sustainable urban growth. By assessing the effectiveness, challenges, and future potential of TOD strategies in Lucknow, this research aims to contribute to the ongoing efforts of creating a more sustainable and well-connected city.

DATA COLLECTED – PRIMARY AND ECONOMY

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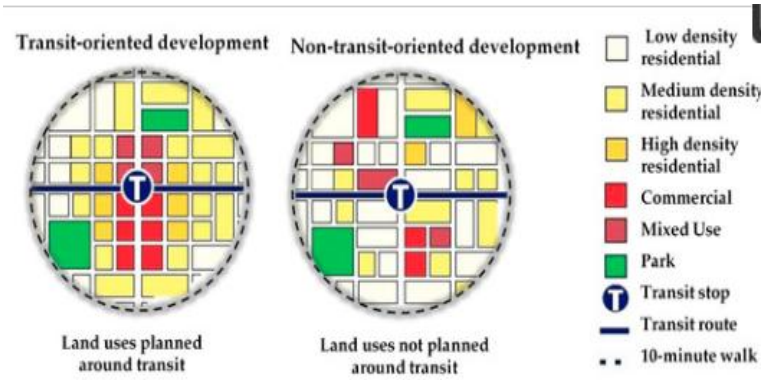

FINAL INFERENCES FROM LITERATURE & CASE STUDIES ON TRANSIT- ORIENTED DEVELOPMEN (TOD) DATA ANALYSIS

Introduction

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1. To analyze the current urban mobility patterns and challenges in Lucknow.
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9. **Data Analysis**

The collected data will be analyzed using a combination of spatial, statistical, and thematic methods:

GIS Mapping: To visualize land use changes, transit accessibility, and TOD influence zones.
Statistical Tools: For analyzing commuter surveys, ridership trends, and population densities.
SWOT Analysis: To assess the strengths, weaknesses, opportunities, and threats related to TOD

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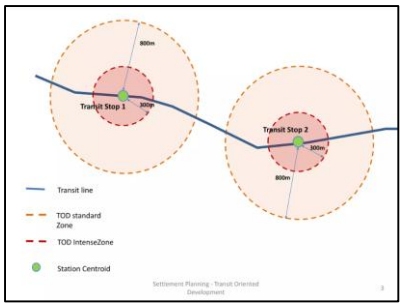

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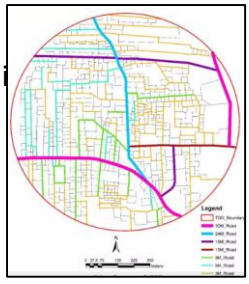

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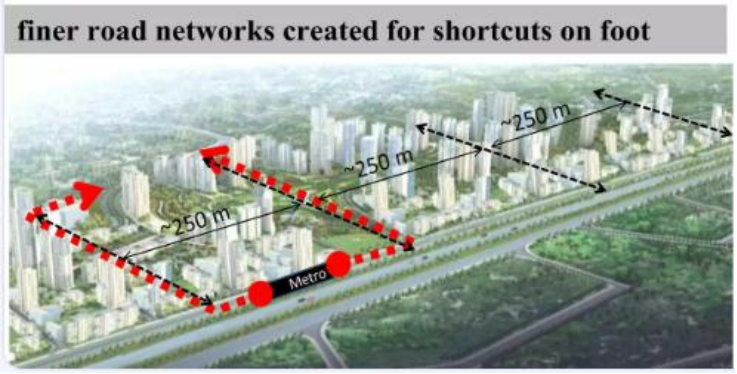

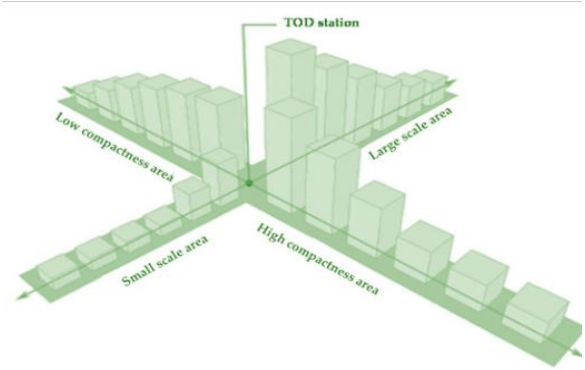

9. Data Analysis

The collected data will be analyzed using a combination of spatial, statistical, and thematic methods:

GIS Mapping Tools (e.g., ArcGIS, QGIS): To visualize TOD zones, land use transformation, population density, and walkability indices.

Statistical Tools (e.g., SPSS, Excel): To analyze metro ridership patterns, modal shift, commuter satisfaction, and land value appreciation near transit nodes.

SWOT Analysis: To assess the strengths, weaknesses, opportunities, and threats related to TOD implementation.

Comparative Frameworks: To benchmark Lucknow's TOD initiatives against cities such as Delhi, Pune, and Ahmedabad.

10. Conclusion

Transit-Oriented Development is a crucial element in sustainable urban growth. By assessing the effectiveness, challenges, and future potential of TOD strategies in Lucknow, this research aims to contribute to the ongoing efforts of creating a more sustainable and well-connected city.

Here's a breakdown of the detailed data analysis methods for your study on TOD strategies in Lucknow:-

1. GIS Analysis (Geographic Information System)

Purpose: To assess spatial relationships and visualize urban changes influenced by TOD.

Tools: QGIS, ArcGISMethods:

Create buffer zones (e.g., 500m, 800m) around metro stations to define TOD influence areas.

Analyze land use transformation (residential to commercial/ mixed-use) within these zones.

Generate heat maps for walkability, population density, and public transport accessibility.

Outcome: Identifies how land development is spatially connected to transit proximity.

2. **Statistical Analysis**

Purpose: To quantify trends, behaviors, and correlations based on numerical data.

Tools: Microsoft Excel, SPSS, RMethods:

Descriptive statistics (mean, median, mode) for understanding commuter demographics and travel patterns.

Regression analysis to study correlation between proximity to transit and land value or ridership.

T-tests/ANOVA to compare satisfaction levels or travel times between TOD and non-TOD areas.

Outcome: Provides evidence-based support on how TOD affects transport use and property trends.

3. SWOT Analysis (Qualitative)

Purpose: To evaluate strengths, weaknesses, opportunities, and threats of TOD in Lucknow.

Methods:
Based on interview data, policy reviews, and observation reports.
Categorize stakeholder feedback into internal (S/W) and external (O/T) factors.
Outcome: Highlights the ground-level realities and policy gaps in TOD execution.
3. SWOT Analysis (Qualitative)
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Methods:
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Categorize stakeholder feedback into internal (S/W) and external (O/T) factors.
Outcome: Highlights the ground-level realities and policy gaps in TOD execution.
4. Content Analysis
Purpose: To interpret textual data from interviews, policy documents, and stakeholder responses.
Tools: N Vivo, manual coding Methods:
Create themes and codes from interviews (e.g., accessibility, affordability, safety).
Analyze frequency of concerns or suggestions raised across different respondent groups.
Outcome: Gives insight into public perception and governance issues related to TOD.
5. Comparative Analysis
Purpose: To benchmark Lucknow's TOD initiatives against successful models.
Methods:
Select case cities (Delhi, Ahmedabad, Singapore).
Use indicators like density, mix of land use, transit ridership, and implementation policy.
Compare across a matrix to determine strengths and gaps in Lucknow's TOD model.
Outcome: Identifies best practices and lessons applicable to Lucknow's context.

Introduction
This report explores the implementation and impact of Transit-Oriented Development (TOD) strategies in Lucknow, a growing urban center in India. TOD promotes sustainable mobility by integrating high-density land use with efficient public transport. The study investigates TOD's role in shaping land use, reducing congestion, enhancing accessibility, and promoting sustainable urban growth in the context of Lucknow.
2. Research Objectives
To evaluate TOD principles and their application in Lucknow.
To identify existing mobility challenges and assess how TOD addresses them.
To analyze the effectiveness of TOD zones in terms of accessibility, land use, and transport efficiency.
To draw comparisons with TOD practices in other cities and provide recommendations for improvement.

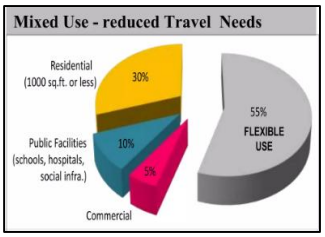
3. Literature Review Summary
Key takeaways from previous studies:
TOD enhances urban resilience through densification and mixed-use developments.
International case studies (e.g., Singapore, Portland) demonstrate increased public transport usage and walkability.
Indian cities like Ahmedabad and Delhi show policy-level progress with mixed results in implementation.
Lucknow, being a Tier-2 city, is at an early stage of TOD development, primarily along metro corridors.
4. **Case Study Overview – Lucknow Metro Corridor**

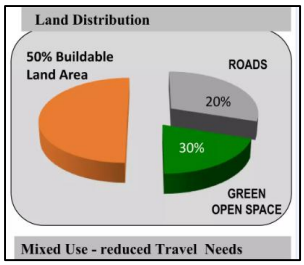
Charbagh Metro Station: Identified as a major intermodal hub with commercial potential.
Hazratganj Metro Station: TOD prospects through existing retail and heritage districts.
Transport Nagar: Industrial character transitioning towards mixed-use development with metro access.

5. Data Collection

Primary Data: Interviews, surveys of metro users, on-site assessments of TOD infrastructure.

Secondary Data: Metro ridership statistics, LDA development plans, GIS data, academic research papers.





6. **Data Analysis Techniques**

GIS Mapping: Buffer zone analysis, land use visualization, accessibility heat maps.

Statistical Tools (Excel, SPSS): Survey data analysis, ridership patterns, regression models.

SWOT Analysis: TOD readiness and implementation challenges.

Content Analysis: Stakeholder feedback and policy documents.

Comparative Analysis: TOD benchmarking with cities like Ahmedabad and Delhi.

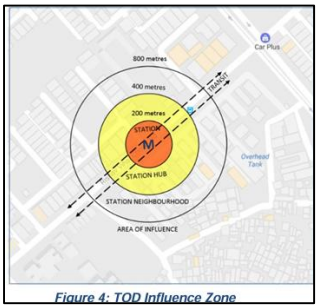


Figure 4: TOD Influence Zone

7. **Inferences**

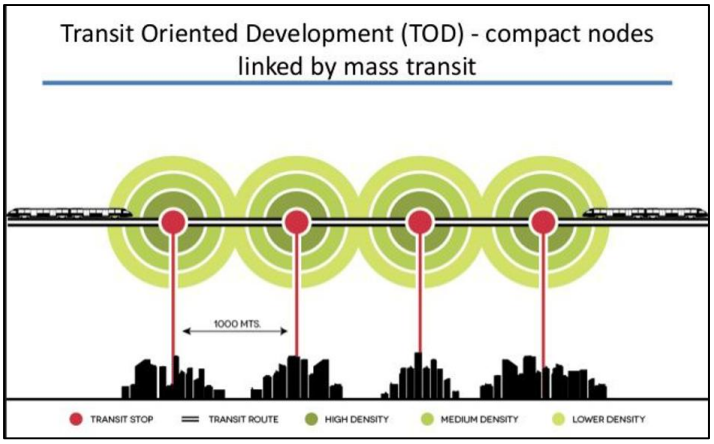
Positive influence of TOD on walkability and connectivity near metro stations. Existing land use around metro corridors requires zoning updates to align with TOD principles. Public awareness and last-mile connectivity remain critical gaps. Policy implementation is fragmented across agencies.

8. Methodology Summary

Mixed-method approach: Combines qualitative (interviews, content analysis) and quantitative (spatial and statistical) techniques. Focus areas: Accessibility, land use change, user experience, policy effectiveness. Tools used: GIS (ArcGIS/QGIS), Excel, SPSS, NVivo.

9. Chapterization Structure

1. Introduction
2. Literature Review
3. Methodology
4. Case Study of Lucknow Metro Corridor
5. Data Analysis and Findings
6. Policy Framework and Stakeholder Perspectives
7. Comparative Evaluation
8. Recommendations
9. Conclusion
10. References and Appendices



10. Final Inferences

TOD presents a strategic opportunity for guiding Lucknow's urban growth sustainably. While there are signs of progress along metro corridors, effective TOD implementation requires cohesive planning, improved regulatory frameworks, stronger public engagement, and integration with affordable housing and non-motorized transport.

11. Proposals and Recommendations

Zoning Reforms: Update zoning laws to promote high-density, mixed-use development within 800 meters of metro stations.

2. Affordable Housing Integration: Ensure TOD zones include affordable housing to prevent displacement and encourage social inclusion.

3. Strengthen Last-Mile Connectivity: Develop NMT (non-motorized transport) infrastructure like pedestrian walkways, bike lanes, and shared mobility options.

4. Unified Planning Authority: Establish a dedicated TOD cell within LDA to streamline cross-agency coordination.

5. Incentive Mechanisms: Offer Floor Area Ratio (FAR) bonuses and tax incentives to developers implementing TOD principles.

6. Public Participation: Engage citizens through consultations and awareness campaigns to promote transit use and urban sustainability.

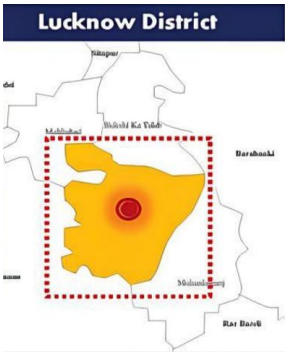
7. Smart Infrastructure: Integrate digital tools such as mobility apps, smart ticketing, and real-time transit information to improve user experience.

CASE AREA – LUCKNOW (UP)

Lucknow, being the capital of Uttar Pradesh, the most populous state of India, has several unique characteristics. The city is known as cultural heritage city. It is situated as the bank of river Gomti. The more densely populated areas of the city are on the southern bank of the river and several planned residential colonies have been developed to the north of the river.

Former capital of United Province of Oudh and present seat of State Government of Uttar Pradesh, the Lucknow city is situated in between 26o 52' North and 80o 56' East on the banks of river Gomti. It is junction of Northern and North Eastern Railways. It was the largest city in the United Province of Oudh and the fourth largest in the British India

The climate of city is a mean between that of the cooler sub monstrance districts and the dry hot tracts south and west of it. The city has a humid subtropical climate with a cool dry winter from December to February and a hot summer from April to June. The city receives about 100 cm of annual rainfall mostly from the south west monsoons between July and September.



Connectivity

Demographic Analysis of Lucknow (2024 Estimate)

Parameter	Value / Detail
City Type	Capital of Uttar Pradesh, Tier-2 Metropolitan City
Total Population (Urban)	~3.4 million (2024 est.)
Census 2011 Population	2,817,105 (Municipal Corporation Area)
Population Growth Rate (2011–24)	~2.3% annually (higher than national avg.)
Population Density	~10,000–12,000 people/km² in core urban areas
Area (Municipal Limits)	~349 km²
Sex Ratio	915 females per 1000 males
Literacy Rate	84.7% (urban); higher than national urban average
Major Languages	Hindi, Urdu, English
Religious Composition	Hindu (75%), Muslim (23%), Others (2%)
Slum Population	~11% of urban population (slum rehabilitation ongoing)
Working Population	~35–40% of total
Youth Population (15–35 yrs)	~33%

Projected Population of Lucknow City

Particulars	1981	1991	2001	2011*	2021*
Lucknow Urban Agglomeration					
Population	1007604	1669204	2245509	3226000	4500000
Decadal Growth	23.79	65.66	34.53	43.66	39.49
Lucknow Municipal Corporation					
Population	947990	1619116	2185927	3166000	4440000
Decadal Growth	22.38	70.79	35.00	44.84	40.24
Lucknow Cantonment					

Source: Master Plan 2021,

Infrastructure Analysis of TOD in Lucknow

1.Transit Infrastructure

Aspect	Details
Metro System	Lucknow Metro (Red Line & planned Blue Line)
Operational Corridors	CCS Airport – Munshipulia (22.87 km, Red Line)
Key TOD Nodes	Charbagh, Hazratganj, Alambagh, Transport Nagar
Last Mile Connectivity	E-rickshaws, autos, buses, pedestrian access—still informal
Issues	Incomplete integration with feeder services and NMT (non-motorized transport)

2. Road & Street Network

Aspect	Details
Primary Roads	NH-27, NH-30, Shaheed Path, Cantt Road
Street Hierarchy	Present but lacks TOD-oriented multimodal design
Encroachment	Major issue in Charbagh-Alambagh zone
Walkability	Limited; footpaths discontinuous, often obstructed
Cycle Infrastructure	Largely missing or underutilized

3. Basic Urban Infrastructure

Infrastructure	Availability & Issues
Water Supply	Adequate in core, stressed in fringe areas
Sewerage & Drainage	Existing but outdated in TOD corridors; risk of flooding
Electricity	Good coverage; vulnerable to peak demand in dense TOD zones
Solid Waste Management	Present but inconsistent segregation and collection
Telecom & Digital Infra	Widespread 4G/5G, smart city CCTV coverage in parts

4. Land Use & Zoning

Aspect	Observation
Zoning around Metro	Mostly mixed-use but not optimized for density & walkability
Land Acquisition Issues	Slows down station-area upgrades and TOD real estate
Vacant & Underused Land	Several parcels near Charbagh & Alambagh suitable for densification
Heritage Constraints	Charbagh Railway Station (heritage zone) limits vertical development

5. Social Infrastructure

Facility Type	Availability
Educational Institutions	Dense presence near Charbagh–Hazratganj
Healthcare Facilities	SGPGI, Balrampur Hospital, private clinics
Parks & Open Spaces	Janeshwar Mishra Park (away from TOD zone), limited public space near metro
Safety & Security	Moderate, but lighting and surveillance need improvement in station areas

Strengths for TOD in Lucknow

- Metro already functional in key corridors.
- High population density near Charbagh, Alambagh.
- Existing institutional/commercial clusters support walk-to-work culture.

Challenges

- Lack of coordinated first/last mile infrastructure.
- Encroachments and informal land use.
- Need for upgraded utilities and public realm around metro stations.

Recommendations for Strengthening TOD Infrastructure

- Develop multimodal interchange hubs at Charbagh (rail + metro + bus).
- Introduce complete streets with NMT focus.
- Leverage smart city ICT tools for integrated urban management.
- Incentivize mixed-use high-density development near metro stations.
- Improve public amenities and green spaces within 800m TOD radius.

Major TOD-Eligible Areas in Lucknow

1. Charbagh Railway & Metro Junction Area

Transit Nodes: Charbagh Metro (Red Line), Lucknow Junction & Charbagh Railway Station

TOD Potential:

- Major intermodal hub (Metro + Indian Railways + Bus terminal)
- High footfall, strong walkability prospects
- Mixed-use redevelopment opportunity

Issues: Encroachment, heritage building regulations, poor pedestrian infrastructure

2. Alambagh Area

Transit Node: Alambagh Metro Station (Red Line), major city bus hub

TOD Potential:

- Dense residential + retail corridor
- Excellent metro and bus access
- Vacant parcels for vertical mixed-use development

Opportunities: Last-mile NMT paths, integrated commercial-residential infill

3. Hazratganj Area

Transit Node: Hazratganj Metro Station

TOD Potential:

High land value, central CBD

Strong retail and institutional presence

Challenges: Limited scope for new construction, but excellent retrofit TOD potential

4. Transport Nagar

Transit Node: Transport Nagar Metro Station (Red Line terminus)

TOD Potential:

Existing logistics, warehousing land with redevelopment scope

Proximity to CCS Airport (connectivity booster)

Strategy: Convert underused transport plots into TOD mixed-use clusters

5. Gomti Nagar Extension

Transit: Proposed Metro Blue Line; good road network (Shaheed Path)

TOD Potential:

Greenfield area with major institutional and IT development

High land availability, planned growth

Status: Smart city projects already initiated here

6. Indira Nagar – Munshipulia

Transit: Munshipulia Metro Terminal

TOD Potential:

High residential density and metro dependence

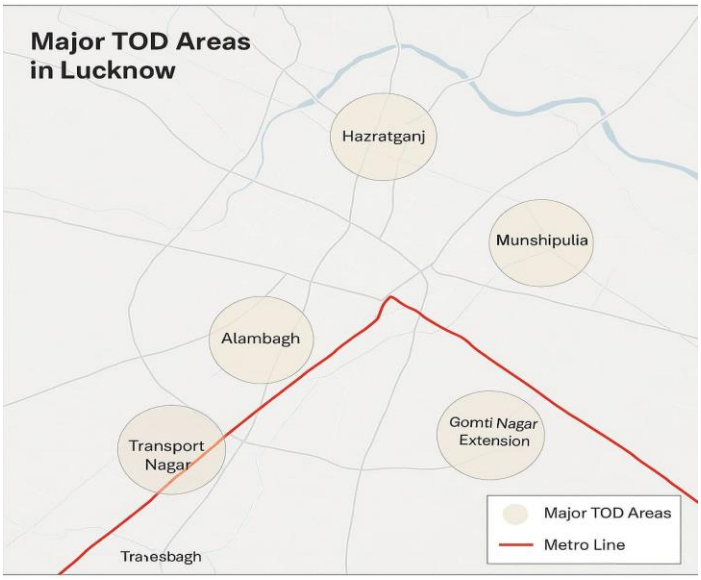
Opportunities for walkable community transformation

Needs: Mixed-use zoning changes and pedestrian upgrades

TOD Priority Corridor (Red Line Focus)

A continuous TOD corridor of ~10–12 km can be developed across: **Transport Nagar → Alambagh → Charbagh → Hazratganj → Munshipulia**

TOD Area	Transit Type	Development Type	TOD Opportunity
Charbagh	Metro + Rail	Brownfield Retrofit	Multimodal Hub
Alambagh	Metro + Bus	Urban Infill	Mixed-use Development
Hazratganj	Metro	Retrofit in CBD	Walkability Upgrades
Transport Nagar	Metro Terminus	Redevelopment	Employment Cluster
Gomti Nagar Ext.	Proposed Metro	Greenfield TOD	Institutional TOD
Munshipulia	Metro Terminal	Residential Retrofit	High Ridership Zone



LULC Representation: Map Layers

Your LULC map should include:

Color-coded legend (e.g., green for open space, yellow for residential) Buffer zones (e.g., 500–800 m from metro station) Overlay of transit lines (e.g., metro, roads) Key public amenities and hotspots

LULC Distribution

(Charbagh Area - ~1.5 km radius)

Land Use Category	Approx. % Coverage
Residential	30–35%
Commercial	15–20%
Public Transport Land	10–12%
Public/Institutional	10%
Open/Vacant	8–10%
Green/Open Space	5%
Roads & Rail	20–25%

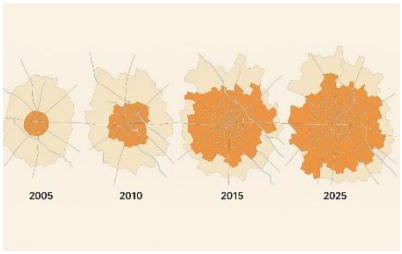
Land Use and Land Cover (LULC) Analysis

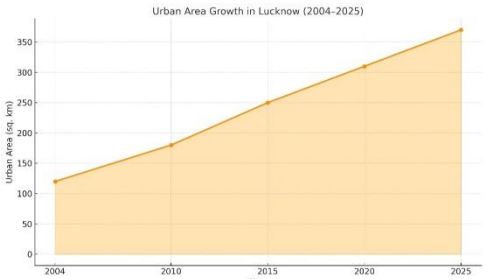
TOD site area (e.g., Charbagh or Alambagh in Lucknow):

Land Use & Land Cover (LULC) of TOD Site

(Example: Charbagh Area)

Category	Description
Residential	High and low-density housing colonies
Commercial	Shops, markets, offices (esp. near Charbagh, Alambagh)
Public/Semi-public	Govt. buildings, railway/metro stations, bus terminals
Transportation	Roads, railway lines, metro tracks
Open Spaces	Parks, maidans, riverbanks (limited in Charbagh area)
Vacant/Underused Land	Open lots, degraded land with development potential
Institutional	Schools, colleges, hospitals
Industrial	Small-scale units or workshops (e.g., near Transport Nagar)
Water Bodies	Drains, ponds, or canals in surrounding areas





Map of 2004 **Map of 2011** **Map of 2023**

Land Use and Land Cover (LULC) Classification

Primary Land Use Categories

Category	Description
Residential	Built-up areas used for housing (low, medium, high density)
Commercial	Shops, malls, offices, retail markets
Industrial	Factories, workshops, and warehousing facilities
Public/Semi-public	Government offices, schools, colleges, hospitals
Recreational	Parks, stadiums, gardens, open public spaces
Transportation	Roads, railways, bus terminals, metro lines and stations
Utilities	Power plants, water treatment, telecom stations
Mixed-use	Buildings/zones combining residential, commercial, or office uses

Standard LULC Classification Systems

System	Used By	Class Levels
NRSC (India)	National Remote Sensing Centre	Level I–III
USGS Anderson Classification	United States Geological Survey	Level I–IV
MODIS/Global LULC Data	NASA/ESA datasets	Coarse-scale

Primary Land Cover Categories

Category	Description
Built-up Area	Concrete structures including housing, industry, commercial zones
Vegetation	Trees, grasslands, plantations, gardens
Water Bodies	Rivers, ponds, lakes, canals
Barren Land	Vacant, unused or degraded land
Agricultural Land	Crop fields, orchards, farmlands
Wetlands	Swampy or marshy land with seasonal or permanent water coverage

Example LULC Distribution Charbagh TOD Zone (Hypothetical)

Land Class	Area (%)
Residential	35%
Commercial	20%
Transportation	15%
Public/Institutional	10%
Green/Open Space	5%
Vacant/Barren Land	8%
Water Bodies	2%
Industrial	5%

Population Density of Lucknow (2001–2025)

Year	Population Estimate	Urban Area (sq. km)	Population Density (persons/ sq. km)
2001	~2.24 million	~120 sq. km	~18,667
2011	~2.82 million	~180 sq. km	~15,667
2015	~3.15 million	~250 sq. km	~12,600
2020	~3.75 million	~310 sq. km	~12,097
2025	~4.30 million (est))	~370 sq. km (est	~11,622

Multiple Ring Buffer Maps

Buffer Maps for built-up areas by year (e.g., 2004, 2011, 2023)

A **Multiple Ring Buffer Map** is a spatial analysis tool that shows concentric zones (rings) at set distances from a central point (like Charbagh Metro Station or Hazratganj) to visualize:

- Spread of urban development
- Intensity of land use
- Suitability for TOD zones

Charbagh Area – TOD Ring Buffer Map

1. Core Transit Hub (Charbagh Metro & Railway Station)

This is the central node where Lucknow Metro's North–South Red Line interchange meets Lucknow Charbagh Junction .

2. Inner Buffer – ≈ 500 m (10–12 min walk)

This walking-range zone represents the primary "influence area" around the station. According to India's TOD policy, this buffer should be compact, pedestrian- and non-motorised-transport (NMT)-friendly, with higher density and mixed-use development.

Buffer Radius	Typical Use	TOD Insight Example
0–1 km	High Density Core (Metro/Hub)	Priority TOD development (mixed-use, walkable)
1–2 km	Transition Zone	Mid-rise buildings, institutional/public land
2–3 km	Periphery	Medium density, needs better connectivity
3–5 km	Fringe	Urban expansion, potential future TOD planning

3. Outer Buffer – ≈ 800 m (15–20 min walk)

This zone forms an extended corridor, often overlapping between adjacent stations if metro stops are spaced ~1 km apart. Ideal for TOD—integrating residential, commercial, and public spaces.

Existing Situation Analysis: TOD in Lucknow

1. Urban Context of Lucknow

- **Population (2023):** ~4 million (urban agglomeration)
- **Urban Growth:** Expansion mainly along major transport corridors (e.g., Kanpur Road, Faizabad Road)
- **Master Plan 2031:** Proposes decentralization with mixed-use nodes and connectivity hubs.

2. Charbagh Site Overview

Location: Central Lucknow; major transport interchange.
Connectivity:
Railway Station: Charbagh Railway Junction (North Central & Northern Railways)
Metro Station: Charbagh Metro Station (Red Line terminal)
Bus Terminal: Charbagh ISBT (adjacent)
Intermediate Public Transport (IPT): Autos, rickshaws, taxis
Potential TOD Hub: Due to multimodal connectivity and available redevelopment space.

3. Land Use and Built Form

Dominant Uses: Transport terminals, hotels, small retail, low-rise residential
Land Use Issues:
Haphazard commercial growth
Poor pedestrian infrastructure
Low Floor Area Ratio (FAR) usage near the metro
Vacant/Underused Land:
Available for redevelopment and densification around the metro.

4. Demographics & Population Density

- Ward Population Density (Charbagh Area): ~22,000 persons/sq. km
- Mixed income groups with strong informal economy
- High floating population due to transit infrastructure

Challenges Identified

Area	Challenge
Urban Form	Low FAR and mixed-use integration
Accessibility	Weak pedestrian/NMT networks
Land Use	Fragmented, underutilized parcels
Governance	Lack of TOD zoning or unified planning agency
Environment	Poor air quality, heat islands in paved zones

5. Mobility & Transport Systems

Strengths:
Metro + Rail + Bus convergence point
High ridership potential
Weaknesses:
Poor pedestrian and NMT (Non-Motorized Transport) access
Inadequate last-mile connectivity
Traffic congestion and parking encroachment near metro gates

6. Open Spaces and Environment

Lack of organized green/public space within walking distance
Environmental concerns due to vehicular emissions near transit hubs

7. Infrastructure & Services

Water Supply: Adequate
Sewerage & Drainage: Overburdened
Electricity: Regular supply
Waste Management: Poor; high littering in public and transit spaces

TOD Opportunity Zones

- 0–500m buffer around Charbagh Metro: High-priority TOD area
- 500–1000m: Transition zone for mid-rise mixed use
- 1–2 km: Supportive low-rise with improved walkability.

Housing Infrastructure Map – Charbagh Area (Verbal Analysis)

Housing Type	Location (Approx.)	Description
Low-income housing	East of Charbagh (Naka)East of Charbagh (Naka)	Dense, informal settlements, poor access
Government housing	South of Railway Station	Railways & PWD colonies
Rental accommodations	Near metro gates	Small hotels, PGs, hostels
Slum pockets	Along railway tracks	Unplanned, poor sanitation, high density
Mixed-use buildings	Near metro corridor	Residential above shops, poorly planned

Housing Conditions:

- Over 50% are semi-permanent or old buildings
- Lack of regulated rental housing
- Overcrowding in slum-like zones
- Few mid-rise or high-rise residential developments

Potential TOD Housing Proposals:

- In-situ redevelopment of old railway colonies
- High-rise mixed-use TOD blocks within 500m
- Rental & affordable housing with metro access

2. Growth Direction of Lucknow Urban Area
Visual Map Will Show:
Core Area: Hazratganj, Charbagh, Aminabad
Growth Corridors:
South-East: Towards SGPGI, Raebareli Road (fastest growth)
North-East: Faizabad Road, Gomti Nagar Extension
West: Towards Kanpur Road & Transport Nagar (emerging industrial/transport corridor)

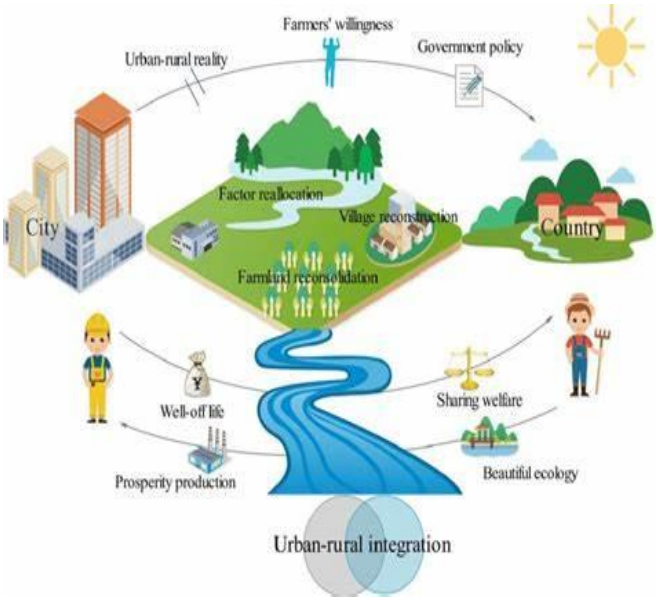
Issues	Opportunities
Unregulated land use	Scope for zoning reforms & mixed-use planning
High encroachment on roads & walkways	Designated NMT and street redesign potential
Poor quality of existing housing stock	Redevelopment through TOD vertical housing
No last-mile connectivity infrastructure	Scope for e-rickshaw, bike-share, and footpaths
Lack of green spaces	Linear parks or green TOD corridors possible
Congestion & pollution from mixed transport	Multimodal integration hubs and traffic calming

Existing Land Use – Charbagh TOD Influence Zone

Study Area: 500m–1000m radius around Charbagh Metro & Railway Station

Land Use Category	Approx. % Coverage	Key Observations
Transportation	35%	Railway station, bus terminal, metro station dominate; large land parcels
Commercial	20%	Shops, markets, informal vending near roads and station gates
Residential	25%	Mostly low-rise, high-density; many structures are old or semi-permanent
Government/Institutional	10%	Railway quarters, government offices
Vacant/Underused	5%	Several plots within railway land & back streets lie idle or encroached
Recreational/Open	2–3%	Very limited formal parks or green zones

Unplanned landuse



Key Issues Identified in Existing Land Use

Issue Category	Specific Problems
Fragmented Land Use	Lack of zoning or TOD overlay zones – chaotic mix of use types
Underutilized Land	Railway land near platforms remains unused or inefficiently used
Informal Developments	Slums, illegal commercial kiosks, unplanned structures encroach footpaths/roads
Lack of Green/Open Space	No designated green pockets within 500m TOD radius
Poor Walkability	Built form ignores pedestrian priority—continuous frontage & street shading lacking
Traffic Congestion	Roadside vendors and informal transport cause severe vehicular and pedestrian conflict

Opportunities for TOD-Based Redevelopment

Opportunity Area	Proposal
Vertical Mixed-Use Development	Use underutilized railway land for high-density mixed-use TOD towers
Integrated Zoning Reform	Apply TOD overlay zone to enforce high FAR, vertical development, and ground-floor activity
Street Revitalization	Redesign roads for pedestrians, cyclists, and transit lanes (complete streets model)
Affordable Rental Housing	Develop formal rental housing blocks close to the metro to serve low-income groups
Green Infrastructure	Introduce green buffers, mini-parks, and shaded pedestrian walkways
Intermodal Connectivity	Seamless transitions between rail, metro, IPT, and buses—central to TOD

Roads and Transportation – Existing Situation

Area: Within 500m–1km of Charbagh Railway & Metro Station

Component	Key Details
Major Roads	Kanpur Road (NH-25), Latouche Road, Subhash Marg
Public Transport	Metro (Red Line terminal), Charbagh ISBT (city + interstate buses)
Rail Network	Charbagh Junction (major northern Indian railway node)
IPT	E-rickshaws, autos, cycle rickshaws—dominant in last-mile trips
Parking	Largely unorganized; spillover onto footpaths and road edges
Pedestrian Access	Inadequate walkways, encroachments, unsafe street crossings
NMT Movement	No designated cycle lanes or safe pedestrian routes

Key Issues in Roads and Transportation

Problem Area	Description
Traffic Congestion	High volume of buses, autos, and private vehicles near the station causes severe bottlenecks
Poor Walkability	Encroachments, uneven pavements, and lack of pedestrian crossings make walking difficult
Unregulated Parking	Vehicles park on sidewalks and junctions due to absence of structured parking areas
Weak Last-Mile Connectivity	Lack of integration of e-rickshaws, autos, or shuttle services with metro/rail exits
Signal & Traffic Control	Poor traffic signal synchronization and lack of smart traffic management
Street Hierarchy Misuse	Local roads used by heavy vehicles; no restriction on movement types

Opportunities Through TOD Implementation

TOD Strategy Area	Proposal
Multimodal Integration	Build Transit Hub integrating metro, rail, bus, e-rickshaw with designated zones
Complete Street Redesign	Prioritize pedestrians, cyclists, and IPT through widened footpaths and segregated lanes
Structured Parking	Multi-level parking near station entry points + smart parking management
Last-Mile Connectivity	E-rickshaw loops, public bike-sharing stations at 250m intervals
ITS Implementation	Real-time bus/metro tracking, smart traffic lights, and signage
Pedestrian Priority Zones	Car-free streets around metro exit (100–200m radius), shaded and active frontages

Opportunities for TOD-Based Urban Growth in Lucknow

TOD in Lucknow – Issues and Opportunities

Issue Category	Specific Problems
Lack of TOD-Specific Zoning	No clear demarcation of TOD zones around metro or major transit stations
Low FAR/FSI in Transit Zones	Existing Floor Area Ratios are low and discourage vertical/mixed-use development
Weak Street & NMT Infrastructure	No complete street model; poor walkability and no dedicated cycle infrastructure
Old & Inefficient Land Use	Slums, government colonies, and informal housing dominate near transit hubs
Institutional Fragmentation	Multiple agencies (LUDA, UPMRC, Railways, Nagar Nigam) work in silos
No Last-Mile Connectivity Plan	Lack of feeder modes to metro—IPT and buses not integrated
Poor Data & Monitoring	Lack of GIS-based monitoring for land use, pedestrian movement, or transit usage
Parking Mismanagement	Absence of TOD parking policies—free/illegal parking near stations
Slow Private Sector Engagement	Little incentive or policy support for PPP or TOD-based real estate models

Opportunities for TOD-Based Urban Growth in Lucknow

Opportunity Area	Proposal / Strategic Value
Existing Metro Network (30+ km)	Lucknow Metro Phase 1A and upcoming corridors form ideal TOD spines
Charbagh as TOD Nucleus	Metro, rail, and ISBT convergence makes Charbagh a prime site for vertical, dense TOD
Vacant/Underused Land	Railway, govt. land available for redevelopment within 500m of transit nodes
Integrated Mobility Planning	LUDA and UPMRC can co-develop TOD & last-mile connectivity strategies
Scope for Complete Street Design	Redesign of 2-3 major arterials (e.g. Latouche, Subhash Marg) around metro stations
Affordable Housing Potential	TOD incentives can attract affordable rental + EWS housing developers
Pilot TOD Projects	Charbagh & Alambagh can act as pilot demonstration zones for TOD-based development
Digital Planning Tools (GIS)	Base for creating TOD zoning overlays, density studies, and real-time transit planning

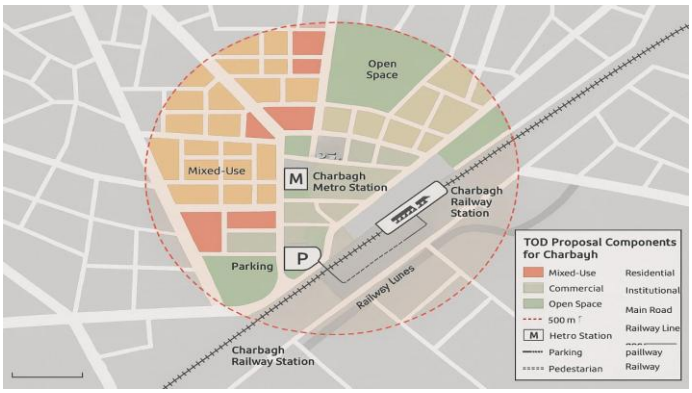
Eateries & Hotels	Deep Palace, Mohan Hotel, and Local Dhaba Strip	Affordable and mid-range accommodation and food for travelers
Railway Colonies	Railway Staff Quarters & Govt Housing	Dense residential settlements support nearby commercial demand
Open Spaces	Garden area in front of Charbagh Station	Limited but used for informal resting, gathering, and vending

Existing Attraction Points

Charbagh TOD Influence Area
(500m–1km radius)

Category	Attraction Point	Description
Transit Hubs	Charbagh Railway Station	Major intercity rail terminal; architectural heritage; daily high footfall
Metro Station	Charbagh Metro Station (Red Line)	Terminal station; key commuter node in LMRC network
Bus Terminal	Charbagh ISBT (Bus Stand)	Long-distance + city buses; informal transit stop hub
Religious Sites	Jama Masjid Charbagh	Historical mosque; attracts regular visitors

Heritage Structure	Charbagh Railway Building (British Era)	Indo-Saracenic architecture; draws architecture, history enthusiasts
Health Facility	Balrampur Hospital (approx. 1.2km)	Major public hospital nearby; footfall from patients and visitors
Educational	Lucknow Polytechnic / Coaching Centres	Cluster of private coaching and small institutes in the vicinity
Commercial Nodes	Aminabad (1.5 km), Naka Hindola Market	Wholesale + retail markets; commercial spillover into Charbagh area



Public Perception of TOD in Lucknow

Summary of Survey Findings

Question Asked	Majority Response	Do you want green/open spaces in TOD zones? ✓ 90% – Yes Clear demand for integrated public spaces
Are you aware of TOD (Transit-Oriented Development)?	✗ 65% – No	Public unfamiliarity with term "TOD"
Is living near a metro/rail station important?	✓ 72% – Yes	Transit proximity valued for daily convenience
Would you prefer vertical housing near transit?	✓ 58% – Yes (if affordable)	Cost-sensitive, but open to compact housing
Are amenities like shops, parks, offices nearby helpful?	✓ 80% – Yes	Strong demand for mixed-use walkable communities
Do you feel roads/pedestrian access near Charbagh is safe?	✗ 60% – No	Safety and walkability are perceived as poor
Is last-mile transport (rickshaw/bus) easily available?	✗ 55% – No	Gap in first/last-mile service infrastructure
Do you want green/open spaces in TOD zones?	✓ 90% – Yes	Clear demand for integrated public spaces

STRENGTHS ✓	WEAKNESSES ✗
Major transit hub (Charbagh Railway Station + Metro connectivity)	Congested and poorly organized road network
Central location in city with good accessibility	Encroachment and unregulated land use
Existing public transport infrastructure (Metro, City Bus, Autos)	Lack of pedestrian safety and walkable zones
Available institutional and railway lands for TOD redevelopment	Low public awareness about TOD benefits
Government support via Smart City Mission & AMRUT	Bureaucratic delays in planning & land acquisition

SWOT Analysis: TOD in Lucknow

OPPORTUNITIES	THREATS ⚠
Redevelopment of under-utilized land around transit hubs	Risk of gentrification and loss of affordable housing
Walkable, mixed-use urban neighborhood model	Resistance from existing informal settlers/vendors
Boost in economic activity via commercial & retail TOD zones	Traffic rerouting challenges during implementation
Potential for affordable housing near job centers	! Lack of coordination between agencies (LUDA, UPMRC, LMC)
Integrated public green spaces for quality of life	Infrastructure burden if population rapidly intensifies

1. Land Use Restructuring

Proposal: Convert fragmented and underutilized land (especially railway lands) into mixed-use zones: residential, commercial, institutional.

Implementation: Use TOD zoning overlays with FSI relaxation near transit hubs (0–500m).

Outcome: Promotes compact urban form and walkability.

2. Mixed-Income, High-Density Housing

Proposal: Develop affordable, rental, and EWS housing in vertical form within 500m of Charbagh station.
Model: PPP (Public-Private Partnership) or railway redevelopment model.
Outcome: Controls urban sprawl and supports inclusive growth.

3. Street & Public Realm Redesign

Proposal: Redesign roads with Complete Streets **approach:**

- Wide footpaths
- Bicycle lanes
- Street furniture
- Green buffers

Pilot Area: Station Road, Subhash Marg, Gautam Buddha Marg
Outcome: Improves walkability, pedestrian safety, and urban aesthetics.

Transit-Oriented Development Proposals

Charbagh, Lucknow

4. Multimodal Integration

Proposal: Create an integrated mobility hub at Charbagh by connecting:

- Metro Line 1 & 3
- Railway terminal
- City bus depot
- Auto-rickshaw and e-rickshaw stands

Design Feature: Common ticketing, signage, passenger info system
Outcome: Reduces transfer times and increases public transport use.

5. Green Spine and Open Spaces

Proposal: Introduce linear green corridors and pocket parks along abandoned rail spurs and vacant plots.
Public Realm Additions:

- Urban plaza near metro gate
- Green medians
- Tree-lined streets

Outcome: Improves environmental quality and supports social life.

6. Smart Infrastructure

Proposal: Integrate Smart City elements like:
Smart lighting
CCTV
Public Wi-Fi
Digital kiosks
Focus Areas: Transit nodes, public parks, key streets
Outcome: Enhances safety and real-time information access.

7. Organized Vendor Zones

Proposal: Allocate designated hawker zones with modular kiosks near transit points.
Support: Urban Livelihood Mission funding + ULB coordination
Outcome: Reduces encroachment and supports livelihoods.

8. Parking & Traffic Management

Proposal:

- Multi-level parking at Charbagh Metro + Railway interface
- Restrict surface parking to peripheral areas
- Dynamic pricing model

Outcome: Frees up street space and promotes transit usage.

9.Community Participation & Education

Proposal: Launch TOD awareness programs in wards near Charbagh through:

- Workshops
- School programs
- Posters & digital outreach

Outcome: Improves acceptance, minimizes opposition.

10. TOD Zone Delineation Map (Conceptual)

You should include a map showing:
0–500m: Intense mixed-use TOD core
500–800m: Moderate-density housing + green belt
800m–1.2km: Feeder zone with multimodal access

Proposals for Mixed-Use Development Charbagh, Lucknow

1. Mixed-Use Zoning within TOD Radius

Proposal: Define a Mixed-Use TOD Core within 500–800 meters of Charbagh railway and metro station.

Land Use Mix:

- 40% Residential (high- and mid-rise apartments)
- 30% Commercial/Retail (shops, showrooms, street vendors)
- 20% Institutional (co-working, education, clinics)
- 10% Recreational/Public amenities

2. Vertical Development with Flexible FAR

Proposal: Introduce variable Floor Area Ratio (FAR) to allow vertical growth and efficient land use.

Up to FAR 4.0 within 300m

Tapering to FAR 2.0–2.5 by 800m

Includes: Residential floors above commercial podiums (shops, services)

3. Ground-Level Commercial with Upper Residential

Proposal: Enforce design codes that reserve ground floors for retail/commercial and upper floors for residential or office use.

Streets: Station Road, Gautam Buddha Marg, Subhash Marg

4. Integrated Public Open Spaces

Proposal: Integrate public plazas, mini parks, courtyards, and shaded seating within mixed-use clusters.

Design Approach: Encourage pedestrian pockets every 100–150m

Partnerships: Engage private developers under PPP model

5. Parking & Access Management

Proposal:

Shared parking spaces (basement/multilevel)

Limited on-street parking

Last-mile facilities: EV stations, cycle stands

6. Adaptive Reuse & Infill Development

Proposal: Identify old warehouses, underused railway housing, vacant plots for infill development with mixed-use TOD-compliant designs.

Support: Incentives for adaptive reuse under Smart City Mission or AMRUT 2.0

7. Socio-Economic Diversity & Inclusion

Proposal:

- Reserve 20–25% of housing units for EWS/LIG segments
- Develop rental housing and hostels for students and working professionals
- Organize informal markets (hawker zones) in TOD design

8. Smart Services & Infrastructure

Proposal: Mandate all mixed-use buildings to include:

- Smart metering
- Rainwater harvesting
- Waste segregation
- Solar rooftops
- Internet-ready infrastructure

Recommendation Policy Framework for TOD in Lucknow

1. Strategic Planning and Zoning Policies

Policy Recommendation:

Declare a TOD Zone with a defined influence area (0–800m radius) around Charbagh railway + metro station.

Amend Master Plan and Zonal Development Plans to:

- Introduce Mixed-Use Zoning
- Allow Higher FAR (up to 4.0) in core TOD areas
- Enable vertical growth with relaxed setbacks

2. Financial and Incentive Policies

Policy Recommendation:

Provide incentives such as:

- FAR bonuses for affordable housing, green buildings
- Fee waivers for TOD-compliant developments
- Reduced parking requirements

Establish a TOD Infrastructure Fund via:

- Land value capture
- PPP contributions
- Municipal bonds

3. Multimodal Integration and Last-Mile Connectivity

Policy Recommendation:

Mandate development of:

- Multimodal transit hubs
- Last-mile services (e-rickshaws, cycles, shared autos)
- Real-time passenger info systems

Introduce Common Mobility Cards and app-based integration

4. Land Management and Redevelopment

Policy Recommendation:

Facilitate land pooling, transfer of development rights (TDR), and land readjustment schemes

Enable adaptive reuse of old railway lands and government plots in Charbagh

5. Design and Development Guidelines

Policy Recommendation:

Enforce TOD design codes:

- Active frontages
- Zero setback commercial zones
- Building heights stepped away from transit

Mandate public realm design:

- Pedestrian-friendly streets
- Plazas, shaded sidewalks, universal access

6. Affordable & Inclusive Housing Policy

Policy Recommendation:

- Reserve 20–25% of housing in TOD zones for EWS/LIG
- Promote rental housing, hostels, and co-living spaces
- Partner with PMAY/Smart City for implementation

7. Environmental Sustainability Integration

Policy Recommendation:

Mandate:

- Solar rooftops
- Rainwater harvesting
- Green building certification (GRIHA/IGBC)

Encourage green buffers, urban forests, and linear parks in the TOD area

8. Institutional Coordination & Stakeholder Engagement

Policy Recommendation:

Establish a TOD Cell within LDA or UPMRC

Enable coordination between:

- Railways
- Metro authority
- Municipal corporation
- Local communities

Conduct public awareness drives about TOD benefits

Implementation Strategy & Expected Outcomes

1. Implementation Phasing

Phase	Time Frame	Focus Areas
Phase I	Year 1–2	Policy notification, stakeholder engagement, land survey, zoning update
Phase II	Year 3–4	Infrastructure upgrades, multimodal hub development, affordable housing
Phase III	Year 5–7	Mixed-use construction, smart features, public realm activation
Phase IV	Year 8–10	Expansion to nearby TOD zones, impact monitoring, feedback-based revisions

Key Implementation Steps

a) Institutional Setup

Form a dedicated TOD Coordination Committee under LDA, including UPMRC, Railways, Municipal Corporation, and Urban Transport Dept.

b) TOD Zoning & Regulation

- Update Master Plan to delineate TOD zones (0–800m around Charbagh)
- Apply TOD overlays to relax FAR, setbacks, parking norms

c) Infrastructure Development

- Redesign roads with Complete Streets
- Build multimodal integration hub
- Set up smart public amenities (Wi-Fi, lights, e-charging)

d) Public-Private Participation (PPP)

- Invite private developers for mixed-use redevelopment
- Offer incentives like TDRs and FAR bonuses

e) Community Engagement

- Conduct awareness programs, surveys, stakeholder workshops
- Include feedback loops for phased design correction

Expected Outcomes

✓ Urban Form & Design

Compact, vertical, walkable development
Revitalization of underutilized railway and metro precincts

✓ Mobility & Accessibility

Increase in public transit ridership (by 30–40%)
10–15% reduction in traffic congestion in core area

✓ Environmental Sustainability

Reduced carbon emissions from private vehicles
Increase in green cover and stormwater management capacity

✓ Economic Growth

Rise in local employment opportunities via retail, services, and construction
Increase in land values and property tax revenue for ULB

✓ Social Equity

Access to affordable housing near job centers
Inclusion of informal workers via regulated vendor zones

📌 Monitoring Indicators

To evaluate TOD success in Charbagh:

- % Modal shift to public transport
- % of affordable housing stock built
- Street quality index (walkability score)
- Land value appreciation
- Mixed-use built-up area (in sq.m)

📝 Summary

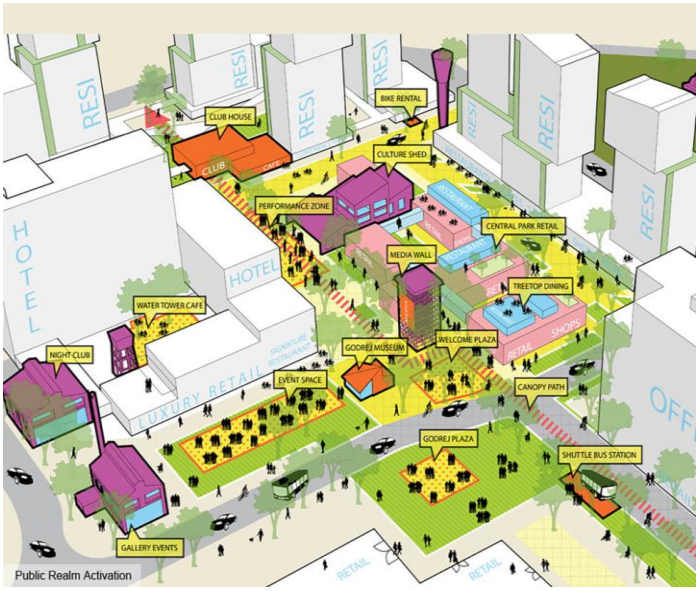
With effective implementation of the TOD model in Charbagh, Lucknow can witness:

- A shift from car-centric to transit-centric development
- Efficient land use and better urban governance
- A replicable TOD framework for other Indian cities

Planned land use zoning

Transit-Oriented Development

Potential for mixed-use & residential clusters



HOUSING MIX BY UNIT SIZE

HIGH RISE APARTMENTS

MID RISE APARTMENTS

TOWN HOUSE