

Evaluating the Evolution and Impact of Transit-Oriented Development (TOD) Policies in India: A Comprehensive Literature Review

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Abstract: This literature review critically examines India's national Transit-Oriented Development (TOD) policy, beginning with an exploration of the historical urbanization context. The main elements and objectives of the TOD policy are dissected, drawing insights from case studies across implemented cities. Stakeholder perspectives, challenges, and outcomes are analyzed. The paper delves into policy shortcomings, criticisms, and potential improvements, incorporating a comparative analysis with international TOD policies. Additionally, it scrutinizes policy instruments, effect assessment studies, and existing literature gaps. The findings culminate in recommendations for future research and policy enhancements, aiming to fortify Transit-Oriented Development projects in India by addressing identified areas of improvement and building on global best practices.

Keywords: Transit-Oriented Development (TOD), Urbanization, Stakeholder perspectives, case studies, criticisms.

1. Introduction

1.1 Problem Statement

Transit-Oriented Development (TOD) is a sustainable urban development approach that integrates transit stations with land use planning, aiming to reduce automotive dependency and increase accessibility to diverse destinations within walking distance[1]. It is particularly relevant in the context of Chinese urban expansion and travel growth, where a model for operational TOD has been proposed[2]. The concept of TOD was popularized by Peter Calthorpe in the late 1980s, who saw it as a solution for sustainable community design and a way to address social issues. Despite its potential, the outcomes of TOD projects can be diverse, depending on various factors and complex interrelations [3] [4].

TOD policies are crucial in the Indian urban landscape due to their potential to address transportation and neighbourhood structure issues [5]. However, the adoption of TOD standards from developed countries in India requires careful consideration of spatial extent and access modes

[6]. In the context of Indian metro cities, TOD can help decongest areas and provide a solution to problems such as encroachment and densification [7]. To ensure the effectiveness of TOD planning, context-specific criteria are essential, with transit service being a key consideration in Delhi [8].

The literature review aims to analyze and synthesize existing research on the national TOD policy in India. It is very important to understand and explore the Sustainable Development Goals (SDGs) in India, and its relationship with TOD [9]. The need for context-specific approaches to Transit-Oriented Development (TOD) in India is underscored, with an emphasis on adaptability in influence zones and specific challenges in policy, planning, and implementation [6][10]. The measurement of Transit-Oriented Development (TOD) levels is discussed, a critical aspect for evaluating the effectiveness of the national TOD policy in India. The importance of considering local contexts and challenges in the implementation of TOD in India is underscored [11].

1.2 General

The historical evolution of urbanization in India has been a neglected subject [12], despite its significant impact on society and the economy [13]. The process of urbanization has been characterized by haphazard growth and overpopulation, particularly due to migration and industrialization [11]. This trend has been further accelerated in recent decades, with a significant increase in the pace of urbanization observed from 1971 to 1981 [14]. However, India's slow rates of urbanization have also been noted, prompting a closer examination of the spatial distribution of economic activity and the role of government policies in influencing this process [11] [14].

The need for transit-oriented urban development in India is driven by a range of factors. The need to address the adverse impacts of motor-vehicle activity, particularly on the poor, by prioritizing non-motorized modes and public transit [15][16]. It has been highlighted the importance of carefully considering the spatial extent of influence areas and access modes in the Indian context [6]. Practical application of these principles, using a spatial multi-criteria evaluation to assess the potential for transit-oriented development in Ahmedabad [17]. The need for transit-oriented urban development in India to address the challenges of urbanization, congestion, and environmental deterioration [18].

1.3 Overview of National Transit-Oriented Development Policy in India:

The national TOD policy in India is a complex and evolving framework, influenced by a range of factors. It emphasizes the need for context-specific TOD standards, given the diverse urban environments in India [6]. The importance of land value capture and the need for indicators to measure the effectiveness of Indian TOD policies [19]. A decision framework for defining TOD in Indian cities, highlighting the importance of local expertise and context [5]. A financial model for implementing TOD schemes, particularly in the context of mass rapid transit systems [7].

The Indian government's National Transit-Oriented Development Policy embodies a multifaceted approach with principles aimed at providing equitable mobility, alleviating urban congestion and pollution, and enhancing accessibility for various activities. The policy underscores its commitment to holistic urban development by prioritizing efficiency, environmental sustainability, and improved accessibility as core pillars within its strategic framework [20]. It also seeks to meet community goals such as economic development, reduced congestion, and improved public health [21]. The policy is part of India's broader shift towards sustainable transportation, with a focus on reducing carbon emissions and addressing climate change [22]. The integration of public transportation through e-Governance is a key component of the policy, with the government implementing various initiatives to improve service delivery and accessibility [23].

2. Data and Methods

2.1 Literature Review

The implementation of Transit Oriented Development (TOD) in Indian cities has been explored in several studies. It has been highlight the potential benefits of TOD, such as sustainable urbanization and innovative funding opportunities [24][19].

However, It also identifies challenges, including the lack of certain indicators in Indian TOD policies [19]. A broader perspective, discussing the successful implementation of TOD in Asian cities and the spatial potentialities and constraints in suburban and rural contexts [25][26].

The implementation of Transit Oriented Development (TOD) policies in Indian cities has been met with a range of outcomes, challenges, and lessons. It highlights the potential benefits of TOD, including reduced congestion and pollution, but also underscores the challenges in financing and execution [27]. Further emphasizes the need for locally-specific strategies, such as development-based land value capture, to fund TOD projects [19].

The broader evolution of urban transportation policies in India, noting the shift towards demand-oriented policies and the need for more effective monitoring and governance [22]. A specific focus on the use of value capture mechanisms for financing rail transit systems, underscoring the potential for sustainable growth but also the embryonic stage of these practices in India [28]. TOD policies in Indian cities, but also the need for more effective financing, governance, and monitoring mechanisms.

2.2 Stakeholder Perspective

A range of perspectives on India's national Transit Oriented Development (TOD) policy have been explored. The need for context-specific planning criteria, with a focus on transit service [8]. The importance of land use, transportation, and high-density development in enhancing resident

satisfaction[29].The need for adaptable TOD influence zones, considering the unique mobility patterns in India[6]. The need for innovative funding opportunities and the integration of lacking land-use and transit planning mechanisms in Indian TOD policies[19]. The importance of tailoring TOD policies to the specific needs and characteristics of Indian cities.

Stakeholder engagement has significantly influenced the formulation and execution of the National TOD policy. The importance of stakeholder interactions in the institutionalization of TOD practices, with Permana emphasizing the role of cross-boundary transportation agencies, planning agencies, public transport operators, the state government, and property developers, and Chava proposing a deliberation framework for developing inclusive housing strategies[30][31]. The need for collaboration and information sharing among stakeholders to address the challenges and ensure equitable and sustainable TOD. The importance of incorporating stakeholder values and interests in policy choices and strategy formulation, respectively, to ensure that the National TOD policy aligns with the needs and expectations of all relevant parties[32][33].

2.3 Challenges and Critiques

The implementation of the national TOD policy in India faces several challenges and critiques. The need for better integration of public transport and land use planning, as well as the challenges in execution and financing[27].The need for adaptability studies to determine the appropriate size of influence zones and the consideration of different access modes[6]. The importance of factors such as population and employment densities, block length, and multimodal integration in Indian TOD policies[19]. A comprehensive overview of the challenges, including contextual, policy and planning, implementation, and actor-related issues[10]. The need for a more nuanced and context-specific approach to the implementation of the national TOD policy in India.

The national transit-oriented policy in India, while aiming for sustainable transportation, faces several challenges and shortcomings. These include a lack of monitoring, complex institutional capacities, and urban governance issues [22] [9]. The policy also needs to shift investment from road expansion to sustainable transport [34]. Furthermore, it should consider the health impacts on the economically disadvantaged groups, who rely on public transportation, walking, and cycling [35]. These local realities highlight the need for a more comprehensive and inclusive approach to urban transportation policy in India.

2.4 Comparative Analysis

A comparative analysis of Transit Oriented Development (TOD) policies in various countries reveals both commonalities and differences.The emphasis on mixed-use development, high density, and connectivity in TOD policies, with the latter also underscoring the importance of flexibility,

accessibility, and collaboration. [36][37].The role of regional planning and land value capture, respectively, in promoting TOD[26][19]. Despite these similarities, the specific approaches and challenges vary across countries, with the European context emphasizing transport and land use integration, and the Indian context facing issues such as automobile dependency and traffic congestion.

The concept of transit-oriented development (TOD) has been widely embraced internationally, but its transferability as a policy concept is complex [38]. Successful implementation of TOD in the United States has been linked to the integration of light rail transit and supportive public policy [39]. Criteria and indicators for applying TOD in metropolitan cities have been identified, focusing on both macro and micro levels of urban design[40]. However, challenges such as inconsistent urban policies and weak local authorities have been identified in the Iranian context, suggesting the need for tailored approaches [41]. These international experiences highlight the importance of context-specific policy solutions and the need for strong actor relationships and information sharing in the transfer of TOD concepts.

3. Discussion

3.1. Policy Instruments and Mechanisms

A range of policy instruments and mechanisms have been proposed and evaluated in the context of India's Transit-Oriented Development (TOD) policy. Indicators for evaluating Indian TOD policies, highlighting the need for factors such as population and employment densities, block length, and multimodal integration[19]. A decision framework for defining TOD in Indian cities, emphasizing the importance of context-specific criteria and indicators[5]. The need for adaptability studies in the formulation of TOD standards, particularly in relation to influence zones and access modes[6]. A financial model for implementing TOD schemes, addressing issues such as encroachment and densification in station areas[7]. The complexity and importance of context-specific policy instruments and mechanisms in India's TOD policy.

A range of regulatory and incentive mechanisms are crucial for the successful implementation of Transit-Oriented Development (TOD).The need for both community and developer incentives, with a focus on land use planning instruments and travel demand management measures[42].The role of financial incentives, with a review of state, regional, and local programs that provide grants, loans, tax credits, and direct financial incentives for TOD plans and projects[43].The importance of a strategic policy for centers and rapid transit, a statutory base, and a public-private financing mechanism[44]. A Tax Increment Financing (TIF) framework for funding integrated land use and transit projects, which can generate more funding and involve the private

sector[45]. Comprehensive approach that includes regulatory frameworks, financial incentives, and public-private partnerships to support TOD.

3.2. Evolution and Impact Assessment

A review of the Indian TOD policy reveals several key findings. Firstly, the need for adaptability studies to determine the appropriate influence zone size and access modes [6]. Secondly, the importance of considering local conditions such as rising real estate incomes and traffic congestion in the implementation of development-based LVC schemes [19]. Thirdly, the potential of TOD to reduce vehicle miles traveled and shift travel behavior, with the recommendation to incorporate TOD into facility planning and design [46]. Lastly, the potential of TOD to mitigate greenhouse gas emissions and improve the urban environment, with a call for a comprehensive transport policy [47]. The Indian TOD policy has the potential to positively impact urban development, transportation efficiency, and overall urban quality of life, but requires careful consideration of local conditions and a comprehensive approach to policy implementation.

The impact assessment studies on the national TOD policy in India have utilized a range of methodologies. Cost-benefit analysis, which is a common approach in transport policy impact assessments[48]. The concept of Green TOD, incorporating ecological and environmental dimensions, and used the FDT method to screen evaluation criteria[49]. A travel demand model for TOD, evaluating transit quality of service using accessibility indicators[50].

3.3. Gaps in Existing Research

The current literature on the national TOD policy in India reveals several gaps. A lack of indicators in Indian TOD policies, particularly in areas such as population and employment densities, block length, intersection intensity, electric charging stations, multimodal integration, and smart apps[19]. The need for adaptability studies on TOD influence areas, considering the varying sizes and modes of influence[6]. The challenges in policy, planning, and implementation of TOD in developing countries, including India, but does not specifically address the national TOD policy[10].

A global perspective on TOD research, but does not specifically focus on India. Therefore, there is a need for further research that specifically addresses the gaps in the current national TOD policy in India, particularly in terms of indicators, adaptability studies, and policy, planning, and implementation challenges[51].

The need for more research in the area of implementation is a recurring theme in the literature. The importance of understanding and reporting on the planning, delivery, and long-term outcomes of evidence-based practices[52][53]. More studies that link program implementation with outcomes, and for a better understanding of the conditions and processes of implementation, particularly in the context of global health[54][55]. These calls for more research highlight the

complexity of implementation and the need for a more comprehensive understanding of its various aspects.

4. Conclusion

In the realm of national Transit-Oriented Development (TOD) policies in India, future research and policy development should take a multifaceted approach to address the complexities and nuances of urban planning in the subcontinent. A paramount avenue for exploration lies in a thorough assessment of implementation challenges, elucidating the intricate dynamics involving land-use conflicts, regulatory hurdles, and stakeholder resistance that impede the seamless execution of TOD strategies. Quantitative impact analysis should be prioritized to measure the tangible effects of TOD policies on urban development indicators, such as public transportation ridership, traffic congestion reduction, and improvements in air quality, thus providing empirical evidence to inform policy refinements. Social equity and inclusivity aspects of TOD policies warrant dedicated scrutiny, examining their effectiveness in fostering affordable housing, reducing socio-economic disparities, and enhancing accessibility for marginalized communities. The integration of smart technologies into TOD planning and implementation represents a promising frontier, exploring how real-time tracking, smart traffic management, and digital connectivity can augment the efficiency and adaptability of TOD initiatives. With an increasing global focus on climate resilience, research should delve into the environmental sustainability of TOD policies, assessing their impact on carbon emissions, urban heat island mitigation, and the promotion of green infrastructure. Cross-city comparative studies, public participation dynamics, and stakeholder engagement frameworks should be explored to glean insights from diverse urban contexts, while investigating the integration of TOD policies with regional planning frameworks can contribute to more coordinated and holistic urban growth. Establishing long-term monitoring and evaluation mechanisms will be pivotal for tracking sustained impacts, and finally, adapting successful international TOD best practices to the Indian landscape can offer innovative solutions for the evolving urban fabric. This comprehensive research agenda aims to inform future policy adjustments, ensuring that TOD policies in India align with the dynamic needs and challenges of its unique urban landscapes.

To enhance the effectiveness of Transit-Oriented Development (TOD) policies in India, it is imperative to prioritize multi-stakeholder collaboration, fostering partnerships between government bodies, urban planners, and local communities. Streamlining regulatory frameworks and expediting land-use approvals can mitigate implementation challenges. Invest in comprehensive public awareness campaigns to garner support and participation. Prioritize the integration of smart technologies for real-time monitoring and adaptive planning. Tailor TOD strategies to address socio-economic disparities by incorporating affordable housing initiatives. Establish mechanisms

for continuous public engagement and feedback throughout the policy lifecycle. Additionally, incentivize private sector involvement in TOD projects to drive innovation and investment. Regularly evaluate and update policies based on evolving urban dynamics, ensuring flexibility and responsiveness to emerging challenges and opportunities.

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