

ASSESSING TRANSIT-ORIENTED DEVELOPMENT POLICY FRAMEWORKS: TRANSFERABLE GLOBAL LESSONS FOR MUMBAI'S TOD MODEL

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ABSTRACT

Transit-Oriented Development (TOD) has, over the past few decades, acquired the status of a planning mechanism, *perceived as a solution to congestion, unsustainable mobility, and spatial inefficiency in contemporary urban contexts. Yet, particularly in the Global South context, the operationalisation of TOD has often been reduced to a densification mechanism, concentrated around transit infrastructure, with limited engagement with questions of regulation, governance, and social equity. This paper attempts to understand TOD policy frameworks, by examining how regulatory instruments and institutional arrangements have shaped TOD outcomes through case studies of Hongkong, Tokyo, New York, Singapore, & Bogota. Through qualitative evaluation framework structured around the 9-D principles, policy benchmarking and an institutional feasibility assessment, the paper evaluates the applicability of these mechanisms to Mumbai's fragmented planning context. The analysis establishes that density-led TOD, as embedded and promoted, in Mumbai's Development Control and Promotion Regulations (DCPR 2034), functions predominantly as a densification tool, rather than an urban-mobility restructuring strategy. It remains insufficient to reduce automobile dependence or prioritize pedestrianization and risks deepening processes of transit-induced displacement, gentrification and socio-spatial inequity. The paper critiques the current "planning" approach of TOD, as infrastructure provision and highlights the disjunction between the policy intent & the spatial outcomes. The paper contributes to TOD research by underscoring human-centric urbanism and the necessary regulatory governance, rather than infrastructure provision, as the critical driver of TOD effectiveness, and positioning TOD beyond density metrics toward a more socially equitable and context-responsive framework.*

KEYWORDS: Transit-Oriented Development; 9D principles, Governance; Regulatory framework; Pedestrianization, Parking Policy; Mumbai. Transit-Oriented Development; 9D principles, Governance; Regulatory framework; Pedestrianization, Parking Policy; Mumbai.

INTRODUCTION

Mumbai occupies a contradictory position within contemporary discourse on urban mobility and planning. On the one hand, the city is underpinned by one of the most intensively used suburban rail systems globally and a well-developed bus-transit network and currently being complemented by a rapidly expanding metro network. On the other, it continues to exhibit rising levels of private vehicle ownership, severe congestion, compromised pedestrian safety, and entrenched socio-spatial inequity. Given these conditions, it is important to ask why substantial investments in public transport infrastructure have not yielded equitable or sustainable urban mobility results. Transit-Oriented Development (TOD) has emerged as a policy response to this question, increasingly being mobilised as a framework to integrate land use and transport, especially in the context of an ever-expanding metro network. Mumbai's Development Control and Promotion Regulations (DCPR) 2034 formally institutionalise TOD by defining influence zones around mass transit nodes (metro stations), and monetized land, by additional Floor Space Index (FSI). However, regulations specify this framework only for Metro Line 3. Also, in practice, TOD in Mumbai has largely been operationalised as yet another tool by DCPR, aiming for land value capture, by vertical densification, with limited attention to the regulatory and institutional mechanism that shape everyday mobility. This paper argues that Mumbai's TOD framework exemplifies a broader tendency within Global South cities to conflate proximity to transit with transit orientation. Density is mobilised as a proxy for sustainability, while critical instruments such as parking regulation, pedestrian prioritisation, and affordable housing mandates remain weak or absent. As a

result, TOD risks functioning less as a mobility strategy and more as a mechanism for capitalizing the economic potential of land, of which there is a dearth.

Hence, the enquiry guiding this research is:

Which TOD policy instruments, as evidenced in global practice, are transferable to Mumbai's institutional and socio-economic context, and how might they be recalibrated to foreground socio-spatial equity and sustainable urban mobility rather than density alone? The research reframes TOD as a problem of regulatory urbanism and governance rather than one of urban form or infrastructure delivery and through a structured transferability assessment, it demonstrates how selective adaptation, as compared to a wholesale replication of global TOD frameworks, can potentially result in more equitable outcomes in Mumbai.

TOD, DENSITY, AND REGULATORY URBANISM: A REVIEW OF THE LITERATURE

From Morphology to Regulation: Peter Calthorpe, in his seminal work, framed Transit-oriented Development (TOD) as a design-led response to automobile-oriented urbanism, concerns of traffic, housing and long-range issues such as pollution & environmental degradation. It emphasized compact urban form, mixed land use, and pedestrian accessibility within walkable transit nodes, with focus on walkability and public space. It emerged as a variant of New Urbanism, highly influenced by Ebenezer Howard's Garden City concept (1902), promoting affordability, environmental sustainability, and community-centric urbanism. The theory underscored the relationship between access to mass transit systems, mobility and the aspirational quality of life. The original

intent conferred TOD with significant community benefits such as providing improved quality of life and reduced household transportation expenses, while at a macro scale, providing stable mixed-income neighbourhoods with lowered environmental impacts and drastically reduced traffic congestion. Subsequent discourses expanded this outlook with suitability evaluation metrics such as the '3-Ds', later the '5-Ds' and relatively recent 9-Ds, reinforcing the association between built form and commute patterns. This indexes the gradual digression from community-centric vision to an operational definition, focussing on land use & land value capture only. Further, the dimensions of development, as "D" in the name of the theory, have evolved over time, beginning with Cervero and Kockelman's (1997) "Density, Diversity, and Design" framework, other "Ds" have been enlisted subsequently. The framework evolved from 3D to 5D, to a broader definition, and later reinforced expanded "D" variables, namely destination accessibility, distance to transit, demand management, development finance, digitalization & discourse (governance). The elaborate "9-D" framework by (Sriram Mangu, 2025) is an analytical framework for evaluation, pertinent to Global South cities. Cervero and Murakami (2009), as well as Ewing and Cervero (2010), challenged the causal relationship between density, land-use diversity, and pedestrian oriented design generally encouraged adoption of transit systems, but with marginal impact. This demonstrates that density alone produces uneven mobility outcomes. Instead, it is the regulatory environment, pertaining to prioritizing pedestrians, "minimum" parking provision, pricing, and street design, that negotiates the relationship between proximity to transit and mobility choices. This realigns TOD research away from urban form & morphology and gravitates towards regulation. Globally, TOD has since been adopted voraciously by countries, both in the Global North & South, marked by different application trajectories, and varying extents of efficiency. Hongkong has adopted the "rail + property" model, allowing transit authorities to capture land value by promoting vertically integrated mixed-use development, which financially supports the transit system & helps develop the public realm. Thus, density, development finance, and government discourse, dominate the narrative of TOD in Hongkong (BroadwayMalyan, 2015). Tokyo adopted a pedestrian-first approach, with fine grain development around transit nodes, including retail and recreational facilities, and at macro level, has a multi-nodal "neighbourhood" development, ensuring high ridership and successful adoption of public transit systems. Finance model adopted allows private-railway companies to develop real estate around nodes, through a public-private synergy, thereby exhibiting diversity & design as TOD's core dimensions. Chinese metropolitan centres have similarly integrated real-estate development with metro corridor-based densification, through state-directed planning, underscoring the role of discourse. European cities like Copenhagen stress upon prioritizing sustainable urbanism, walkability, bicycle-friendly urban design and high public transit usage, promoting concentrated development along the "fingers" of transit corridors with greener wedges in between. Stockholm &

Germany have likewise reduced automobile-reliance and created compact human-scale city cores. North American cities such as Portland, are TOD frontrunners, with light-rail transit systems surrounded by walkable & bicycle-friendly dense neighbourhoods, with housing and retail. New York has reassessed regulations repeatedly and evolved over-time. Historically existing transit systems have been evaluated, and densities have been realigned to boost mixed-use, resolving concerns of accessible housing, traffic congestion, and carbon-footprint, while always prioritizing accessible public realm. Vancouver relies on its Skytrain rapid transit system, where mixed-use towers centre around stations, integrated with high-density housing. Curitiba in Brazil, is an exponent of sustainable Bus rapid transit system, integrated with corresponding land use patterns, having higher densities near transit corridors and pedestrian-friendly streets. Despite not investing in a finance-intensive transit system (such as metro), Curitiba exemplifies economical, safer and humane urbanism, reiterating the role of design and development finance. Bogota, relatively recent, focusses on high-speed, high-capacity transit terminals, with feeder routes, to reduce congestion and urban sprawl, and achieving an equitable model. Singapore (BroadwayMalyan, 2015) is yet another example of governance discourse as an elemental dimension. Public policy encouraging mixed use development, porous public realm along transit nodes, walkability, incentivised and well-developed public transport, with stringent vehicle-ownership and limited parking regulations. Indian cities like Delhi, attempted to develop and adopt BRT, which failed due to disconnect between the public transport and the road network (BroadwayMalyan, 2015), including poor traffic management strategies, resulting in higher congestion. On the contrary, Ahmedabad's BRT has received favourable response, and the city had not monetized land value initially, which led to lower densities across the city, but this seems to be changing now. Most Indian cities, exploring TOD, are relying on metro corridors, which are cost intensive, highlighting the significance of coordination between density, governmental discourse, development finance, institutional framework, while also underscoring the role of design or innovative solutions, by the lack of it! Successful models of TOD, globally, have attempted to create a balance between the pragmatic demands of managing densities, without compromising on sustainable growth and public realm, thereby striving for an improved quality of life. Noteworthy is that these cities have adopted & adapted the TOD principles suitably, without compromising on the local urban cultures, and not just as a blanket policy, across all transit systems, nodes & corridors.

Density, land value, and displacement: Density functions not merely as a spatial dimension, but as a political-economic medium. In urban contexts like Mumbai, which already exhibit high-density, upzoning and FSI incentives systematically translate into intensified land speculation, prompting concerns of who really benefits from TOD. Harvey (2012) situates density within broader discourses of urban growth, arguing that without redistributive

mechanisms, density-led growth tends to result into social inequality. Suzuki et al. (2013) advice that transit infrastructural investments, when combined with higher permissible development promotion controls, can trigger gentrification and displacement of lower-income groups, effectively highlighting the social costs of such infrastructure-led development. Inclusionary land use zoning and affordable housing mandates may act as partial corrective measures, though their suitability & efficacy remains dependent on implementation and institutional coordination.

Indian and global south perspectives on tod: In Global South cities, informality, fragmented governance, complex land ownership and tenure patterns, further impact TOD framework. Indian cities have embraced TOD predominantly through metro-led development narratives, which frequently prioritize land value capture, defined by incentivised FAR/ FSI, over everyday accessibility. The National Transit-Oriented Development Policy (MoHUA, 2017) outlines a comprehensive vision, involving mixed-use development, pedestrian priority, and parking restraints; however, implementation has been uneven, selective and far from effective. Numerous analytical research by NIUA, ITDP India, and WRI India repeatedly highlights the gap between TOD intent and actual on-ground results, highlighting that access & proximity to transit is often undermined by poor walkability, excessive parking supply, and inadequate institutional mechanism. Within this discourse, Joshi (2016; 2019) offers a critique through a traditional Indian planning perspective, which was predominantly pedestrian and sustainable, and aligns with the core values of TOD, further demonstrating that TOD performance in cities like Ahmedabad is governed more by regulatory enforcement, parking policy, and street-level urban design, than by density metrics. Collectively, the research reinforces the argument that TOD in India should be understood as a governance issue rather than morphological one.

METHODOLOGY

This research adopts a qualitative and analytical methodology structured around three analytical parameters. First, a policy benchmarking exercise examines TOD frameworks in Tokyo, Singapore, New York, and Bogotá, selected for their distinct governance arrangements and exhibited mobility outcomes. Each case is analysed through policy lenses related to regulatory controls, parking management, and development incentives, and through institutional feasibility assessment, evaluate the applicability of these mechanisms within Mumbai's planning and governance environment, with particular attention to statutory compatibility with DCPR 2034 and inter-agency coordination constraints, culminating into transferable policy synthesis, tailored to Mumbai.

COMPARATIVE TOD POLICY FRAMEWORKS AND TRANSFERABLE MEASURES

Tokyo's TOD model success lies in its integration of private railway operations with real estate development. Rail

companies develop station-area housing, retail, and commercial space, generating non-fare revenue while maintaining stringent controls on parking and car ownership. While often cited as a model of effective TOD, its reliance on long-term land control and private rail ownership, indexing financial integration with regulatory discipline, limits its direct transferability to Mumbai. There is a strong impetus from the government, which has been systematically and elaborately planned, by the government, progressively over the years. The discourse, and continuously evolving policies ensure creation of positive public space impacts, especially surrounding the transport systems. While Hong Kong also focusses on capturing land value and perhaps enhancing it through the quality of public space offered, thereby serving that purpose of design which was originally intended. Mumbai on the contrary, lacks in concentrated and consistent efforts towards developing the public realm. Further densification may also become detrimental to public space, both quantitatively & qualitatively. Key takeaways from Hongkong are, vertical integration of real estate, transit systems and conscious effort in prioritizing public space, using land value cross subsidies (BroadwayMalyan, 2015). Singapore is prototypical of state-led TOD, where land use planning, public housing supply, and transport infrastructure are intricately woven together. High-density development is inseparable from aggressive demand management measures, including limited parking and restrictive vehicle ownership. Essentially, public housing ensures that TOD benefits are broadly and equitably distributed. Moreover, a futuristic planning, enables the governance to take measures, well in advance. And not just attempt to resolve current concerns, with instantaneous but short-term measures, as in the case of Mumbai. Current premise, both in time and policy, with many TOD-nodes along the Mumbai Metro Line 3, having high redevelopment potential, offers an opportunity to change the governance discourse on affordable public housing and prioritizing accessible public transit systems. Bogotá's BRT-led TOD strategy foregrounds accessibility & pedestrianization, and social housing provision along transit corridors. Its relative institutional simplicity and explicit emphasis on affordability & equity offer important lessons for cities operating under capacity constraints. Bogota highlights that TOD or urban development, need not be dependent on cost-intensive mechanisms, and a diverse array of transit systems can enhance with multi-modal connectivity, can be deployed to serve urban areas beyond the TOD impact zones. Since 1960s, Mumbai has been using its suburban railways, in conjunction with the BEST bus system, to service far-flung suburban areas. However, the two systems are not being realigned with the newer modes like metro. Policy framework also refers to only metro stations as TOD zones, ignorant of other modes availability and assess. New York's experience illustrates how TOD can be advanced through zoning reform rather than infrastructure expansion alone. It has historically evolved urban conditions in which transit and density co-existed, and pre-date the TOD concept. In New York, transit expansion was gradually institutionalised through zoning reassessments, infrastructural planning, and impetus to mixed-use. The removal of parking

minimums and the utilization of inclusionary housing bonuses highlights the role of regulatory framework, instruments in shaping mobility patterns and development outcomes. Accessibility gains translated into increased land value capture, which in turn encouraged vertical growth and programmatic layering. Critically, density was functional, more than being volumetric. Residential, commercial, and employment opportunities overlapped within walkable distance, boosting ridership and vibrant urban life. Over time, transit stations became a part of the shared experiences, collective memory and special legibility, rather than isolated transit infrastructure. New York exemplifies a historically layered transit - density synergy, in which infrastructural expansion, zoning reform, and public realm design evolved conjointly. Important learnings from New York encourage Mumbai to reflect on design systems rather than parts, with feedback mechanism to complete the development loop. Mumbai's TOD framework, as articulated in DCPR 2034, remains under-whelmingly, just a devise of upzoning and densification. FSI incentives are offered within transit influence zones without adequate reforms in parking regulation or affordability mandates, leading to compromised ridership & gentrification. Institutional fragmentation among the Municipal Corporation of Greater Mumbai (MCGM), MMRDA, Indian Railways, and metro SPVs further dilutes the possibility of integrated station-area planning. The persistence of parking minimums, even in transit-rich areas, effectively subsidises private vehicle ownership and undermines the stated objectives of TOD. Mumbai Metro corridors are accompanied by policy instruments using land value capture, FSI enhancement, and influence zones. However, the conversion of regulatory densification into spatial integration remains inconsistent. While densities are high, often due to real-estate pressures and informality, the alignment between access to transit and mixed-use restructuring is limited. Predominant Mono-functional zoning continues in several employment and residential districts, limiting the symbiosis between mobility and everyday urban life. Despite having well developed transit systems, including multi-corridor suburban railways and well-networked bus system, transport systems have not been used to manage density. Rather, the bus system, in particular, have been neglected. Metro infrastructure is extremely cost-intensive, and the civic financial burden does not solve core issues of equity, affordability, congestion and long-range concerns of pollution. Also, water transport is not even in the discourse of development. Mumbai, thus, represents a contemporary attempt to engineer the density-transit synergy through policy, yet within a governance and land-use structure that remains fragmented. This is analytically significant as the narrative shifts from normative adoption of TOD metrics, correlating zoning regulations & transit proximity, toward a structured enquiry into deeper enquiry into relational urban conditions that mandates the synchronisation of mobility systems, flexible mixed-use, and the design of transit as urban public space. Such a reframing is essential for understanding why density and transit modes, alone do not guarantee transit urbanism, and why historically evolved transit cities continue to

outperform policy-driven TOD implementations in producing integrated, legible, and socially active metropolitan environments.

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