Assessing the Suitability and Implement ability of Proposed Transit-Oriented Development Nodes in Delhi

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***Abstract*—Transit-oriented development (TOD) is frequently reduced to increased development intensity around public-transport stations, yet successful TOD requires the coordinated performance of transport accessibility, land-use diversity, pedestrian and cycling conditions, multimodal integration, infrastructure capacity, public-realm quality, housing affordability, governance and financing. This paper integrates three supplied manuscripts into a single Delhi-focused research framework that connects the ex-ante suitability assessment of twelve proposed TOD nodes with a longitudinal interpretation of Delhi's TOD policy evolution from 2015 to 2026. The integrated framework combines the node–place perspective with seven core assessment dimensions—balance, placemaking, design, modal shift, multimodality, network connectivity and livability—and adds implementation readiness dimensions covering infrastructure capacity, land assembly, governance, financing and equity safeguards. The methodology uses network-based catchments, secondary spatial and administrative data, proposed commuter/expert/observation surveys, indicator normalisation, expert-based Analytic Hierarchy Process (AHP), a 0–100 TOD Suitability Index (TODI), and sensitivity and robustness testing. Because the supplied doctoral material contains a research design rather than completed field, survey or GIS results, the paper does not fabricate node scores or rankings. Documentary evidence shows a non-linear policy trajectory: the 2015 framework used a broad 500-metre corridor influence zone and FAR 400; the 2019 framework moved toward selected strategic nodes; the 2021 framework strengthened integrated node-area planning through an approximately 800-metre planning area, a 500-metre intense-development area and Influence Zone Plans; and the 2026 framework returned to corridor-based coverage, reduced the qualifying plot threshold to 2,000 m², retained maximum FAR 500, allocated 65% of permissible FAR to residential units below 100 m², and simplified approvals through a single-window orientation. Evidence on Delhi station catchments also indicates that actual walking influence can exceed conventional policy radii, while land-use-change evidence demonstrates development pressure around metro infrastructure. The paper concludes that Delhi should combine the implementation flexibility of the 2026 framework with area-level coordination, capacity gates, multimodal access plans, public-realm standards, affordable-housing and anti-displacement safeguards, transparent use of TOD-generated resources, and measurable post-implementation monitoring.**

***Index Terms*—Transit-oriented development; Delhi; TOD nodes; node–place; accessibility; multimodality; walkability; affordable housing; governance; policy evolution; TOD suitability index; implementation.**

I. INTRODUCTION

Transit-oriented development is fundamentally a land-use and mobility strategy rather than a density policy alone. The established literature links density, diversity and design to travel behaviour, while subsequent research highlights destination accessibility, street-network characteristics and distance to transit as additional dimensions of the built environment (Calthorpe, 1993; Cervero & Kockelman, 1997; Ewing & Cervero, 2010). The practical implication is that additional floor area near a station does not, by itself, guarantee walking, cycling, public-transport use or an inclusive urban environment.

The node–place perspective is particularly useful because a station performs simultaneously as a transport node and as an urban place (Bertolini, 1996, 1999). A node can have strong regional connectivity but weak pedestrian access, poor public-realm quality or inadequate local destinations. Conversely, a highly active urban place may lack the infrastructure and

transport capacity required to absorb additional development intensity. Delhi's heterogeneous urban form, multimodal transport system, redevelopment pressures and institutional complexity make this distinction especially important.

The three supplied manuscripts approach the problem from complementary directions. The first develops an ex-ante framework for assessing twelve proposed TOD nodes using seven dimensions, network catchments, indicators, surveys, expert weighting and safeguards. The second examines policy evolution, spatial catchments, housing, multimodality, governance, financing and project-level evidence. The third provides a longitudinal policy-evolution interpretation focused on the balance between integrated TOD planning and development facilitation. The present paper integrates these strands rather than reproducing them as separate articles.

The central research problem is therefore twofold: first, how can the suitability of proposed TOD nodes be assessed without reducing TOD to station proximity or density; and second, how should the changing policy and institutional environment be incorporated into that assessment? The integrated answer proposed here is a policy-to-place framework in which the regulatory TOD zone, actual multimodal catchment, development parcel, infrastructure/service catchment and implementation system are treated as related but distinct spatial and institutional units.

II. AIM & OBJECTIVES

AIM –

To develop an integrated, context-sensitive and academically transparent framework for assessing the suitability and implement ability of proposed TOD nodes in Delhi, while critically interpreting the evolution of Delhi's TOD policy from 2015 to 2026 and translating the combined evidence into node- and typology-specific implementation guidelines.

OBJECTIVES -

i. 1. Understand TOD Node Characteristics

Identify and classify the twelve TOD nodes by analysing their transport roles, urban form, land-use patterns, development context and network-based catchments.

ii. 2. Build a Multidimensional TOD Framework

Adapt the node–place model into a broader framework that integrates balance, placemaking, design quality, multimodality, modal shift potential, connectivity, livability and essential safeguards for safety, access, affordability and displacement protection.

iii. 3. Create a Transparent TOD Suitability Index

Develop a documented 0–100 TOD Suitability Index using normalised indicators and expert-derived weights, ensuring clarity, methodological integrity and avoidance of unsupported or misleading scores.

iv. 4. Translate Findings into Policy & Implementation Tools

Analyse how Delhi's TOD policy evolved between 2015 and 2026 and convert node-level and policy-level insights into differentiated implementation guidelines and a measurable monitoring framework.

RESEARCH QUESTIONS -

i. What spatial, land-use, transport, built-environment and socio-economic characteristics determine the suitability of proposed TOD nodes in Delhi?
ii. How can the node–place perspective be adapted to Delhi's heterogeneous station and corridor contexts?
iii. How can network-based accessibility, land-use diversity, multimodality, pedestrian conditions and livability be integrated into a transparent TOD suitability index?
iv. How sensitive are suitability assessments to catchment definition, indicator weighting, normalisation and critical indicators?
v. How have Delhi's TOD policy, development controls, housing provisions, governance, financing and approval mechanisms evolved from 2015 to 2026?
vi. What safeguards and institutional mechanisms are required so that additional development intensity produces integrated TOD rather than transit-adjacent development?

III. LITERATURE REVIEW AND CONCEPTUAL POSITION

From the 3Ds to multidimensional TOD - Cervero and Kockelman's (1997) density–diversity–design framework established a foundational connection between the built environment and travel demand. Ewing and Cervero's (2010) meta-analysis broadened

the evidence base by emphasising destination accessibility and street-network characteristics, while confirming that land-use diversity and intersection density are associated with walking. Ibraeva et al. (2020) further describe TOD as an integrative field spanning transport engineering, land-use planning and urban design. Together, these studies support an interpretation of TOD in which density is meaningful only when accompanied by accessibility, mixed uses and pedestrian-supportive urban form.

The supplied doctoral framework extends these principles through seven dimensions: balance, placemaking, design, modal shift, multimodality, network connectivity and livability. This extension is appropriate for Delhi because it captures both the transport function of a station and the qualities of the surrounding place, while explicitly incorporating social conditions.

Node–place theory and station-area heterogeneity -

Bertolini's node–place model treats stations as simultaneous transport nodes and urban places. The framework distinguishes situations in which transport connectivity and urban activity are balanced from situations where one function exceeds the other or both are weak (Bertolini, 1996, 1999). Subsequent station-classification research similarly demonstrates that station performance depends on context, regional role, accessibility, centrality and surrounding development (Reusser et al., 2008; Zemp et al., 2011).

For Delhi, this means that a universal development standard is unlikely to be sufficient. Transit hubs, established residential stations, mixed urban cores and linear corridors can require different interventions even when they are part of the same metropolitan transit system. The proposed typology therefore functions as a bridge between quantitative assessment and policy interpretation rather than as a claim that every station should attain the same density or intensity.

Spatial catchment and accessibility - A central methodological issue is the definition of the station influence area. Fixed circular buffers are administratively convenient but may not represent actual pedestrian or multimodal accessibility. Ann et al. (2019), using Delhi Metro stations and multimodal accessibility methods, found station-specific variation and reported mean walking-distance values of approximately 1.2–1.3 km for the four-station study. The supplied comparison therefore uses 1.25 km only as the midpoint of that published range; it is not presented as a new measurement or as a replacement for Delhi's regulatory boundary.

The integrated framework consequently distinguishes the notified regulatory TOD zone from the effective network catchment. Network distance, physical barriers, crossings, last-mile modes, universal access and interchange conditions should be measured separately. This distinction is important because spatial scale can materially influence TOD typologies and results (Kang & Miwa, 2025).

Equity, land-use change, governance and financing -

TOD can generate development pressure and land transformation beyond the immediate station environment. Begam et al. (2024) report long-term changes in Delhi Metro buffer areas, including increases in built-up land and reductions in open land and vegetation. This evidence supports the inclusion of ecological capacity, green infrastructure and open-space protection within suitability assessment.

Equity cannot be treated as a secondary outcome. Zhao et al. (2024) show through the Node-Place-People model that a station can appear balanced under traditional node–place measures while social vulnerability remains. Kaniewska et al. (2024) likewise show that formal TOD policy support does not automatically guarantee equitable affordability outcomes. Delhi's assessment should therefore consider actual housing costs, tenure, household vulnerability, transport costs and displacement risk.

Implementation also depends on institutional coordination and financing. Mathur (2019) identifies coordination constraints in Delhi's land-value-capture context, while Regmi (2024) identifies recurring governance gaps involving leadership, resources, prioritisation, coordination and stakeholder engagement. These findings support the integration of governance and financing readiness into TOD implementation assessment.

EVOLUTION OF DELHI'S TOD POLICY, 2015–2026

The integrated documentary evidence shows that Delhi's TOD policy has not evolved as a simple linear progression. Instead, it has moved between broad corridor-based planning, selected strategic nodes, integrated node-and-influence-zone planning, and a renewed corridor-based framework. This trajectory can be interpreted as a continuing

negotiation between area-level spatial coordination and development facilitation.

2015: broad corridor influence zone - The 2015 framework established an influence zone extending up to 500 m on either side of MRTS corridors and permitted FAR 400. TOD schemes were generally linked to a minimum 1-hectare area, with phased development possible on 3,000 m² plots. The framework also contained explicit social and spatial obligations, including residential, commercial, community-facility, road/circulation and green-open-space components. The supplied manuscript reports that the policy example directed 45% of developed FAR toward poor and middle-income housing through the housing/EWS structure. A computerised single-window mechanism was also proposed (Government of India, 2015).

The key implementation lesson is that policy ambition and operationalisation are not equivalent. A broad influence-zone concept can establish a strong planning direction, but its effectiveness depends on workable scheme thresholds, land assembly, infrastructure provision, public-realm delivery and institutional coordination.

2019: strategic node orientation - The 2019 revision shifted emphasis toward selected strategic TOD nodes. The supplied policy analysis describes a development incentive structure allowing 1.5 times the existing permissible FAR or 300, whichever was higher, subject to a maximum of 500. The shift can be interpreted as an attempt to concentrate implementation effort and make TOD more strategically manageable, while also creating dependence on sufficiently large and viable development opportunities.

2021: integrated node and influence-zone planning -

The 2021 framework consolidated the node-based model by defining an approximately 800-metre influence zone, comprising an 800-metre TOD Planning Area and a 500-metre Intense Development Area. An Influence Zone Plan (IZP) was required to address road widening, multi-utility zones, intermediate public transport, pedestrian and non-motorised transport facilities, multimodal integration, parking, urban furniture, signage, public conveniences and street vending. A TOD scheme generally required a minimum area of 1 hectare and access to an 18-metre road under specified conditions (DDA, 2021a).

From the perspective of node suitability, the 2021 framework is important because it linked development with area-level infrastructure and public-realm planning. It therefore represents the strongest expression in the policy sequence of TOD as coordinated place transformation.

2026: corridor-based expansion and development facilitation - The 2026 framework changes the spatial logic again. The TOD Zone is described as a 500-metre-wide corridor on either side of existing and planned/approved Metro corridors, together with 500-metre-radius nodes around RRTS, railway and other specified mass-transit stations. The minimum qualifying TOD plot is reduced to 2,000 m², access is linked to an existing or proposed continuous 18-metre right-of-way, base FAR is 400 and maximum FAR is 500 subject to charges. At least 65% of permissible FAR is allocated to residential use for dwelling units below 100 m²; at least 10% is for neighbourhood commercial, facilities and social amenities; and the remaining 25% is flexible for other specified uses (DDA, 2026a; Government of India, 2026).

The Government of India evidence cited in the supplied manuscripts reports approximately 207 km² within the new corridor/node coverage, including about 80 km² of land-pooling areas, low-density residential areas and unauthorised colonies previously excluded under the earlier framework. The reform also replaces the earlier large-node development logic with smaller qualifying plots and a simplified single-window orientation.

Table 1. Comparative evolution of selected Delhi TOD provisions

Dimension	2015	2019	2021	2026
Spatial logic	500 m either side of MRTS corridors	Selected strategic TOD nodes	Selected nodes; 800 m planning + 500 m intense area	500 m corridor + 500 m station/RRTS/rail nodes
Minimum scheme/plot	1 ha scheme; 3,000 m² phased development	Strategic node approach; 1 ha	1 ha TOD scheme	2,000 m² TOD plot

		scheme		
Maximum FAR	400	Up to 500	Up to 500	500
Housing	45% of developed FAR in policy example for poor/middle-income housing	Housing provisions revised	Affordable/non-ownership housing provisions	65% FAR for residential units below 100 m²
Area planning	Integrated scheme requirements	Selective node planning	IZP prerequisite and detailed area works	Single-window; earlier IZP/local-body sequence removed
Mobility/public realm	Walking/cycling, active frontage, public space	TOD development controls	Explicit NMT, IPT, MMI, parking and public-realm works	Pedestrian walkway option; infrastructure augmentation through policy/charges
Governance/approval	Single-window proposed	DDA-led strategic identification	DDA + IZP + local-body sanctioning structure	TOD Committee/single-window orientation
Financing	TDR and dedicated TOD mechanisms	TOD charges/fund framework	Ring-fenced TOD fund	TOD charge + dedicated fund; ₹10,000/m² FAR TOD charge reported for base FAR 400

Source: Integrated from the three supplied manuscripts, based on Government of India (2015, 2026) and DDA (2019, 2021a, 2021b, 2026a, 2026b). Values are policy provisions, not performance scores.

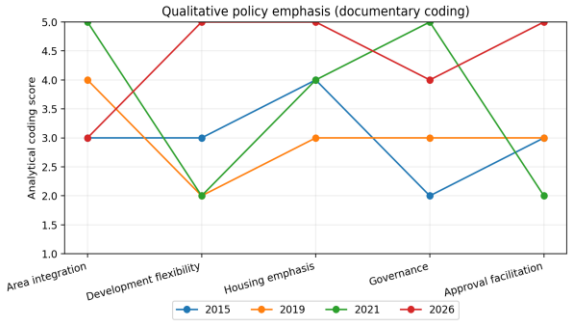

Figure 1. Qualitative policy emphasis across successive Delhi TOD frameworks. Note: the coding is interpretive documentary coding (1 = limited; 5 = highly explicit), not a statistical performance index. Source: supplied policy-evolution manuscript.

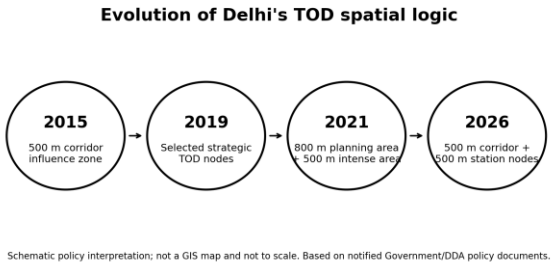

Figure 2. Evolution of Delhi's TOD spatial logic, 2015–2026. This is an author-generated policy schematic, not a GIS map and not to scale. Source: Government of India (2015, 2026) and DDA (2019, 2021a).

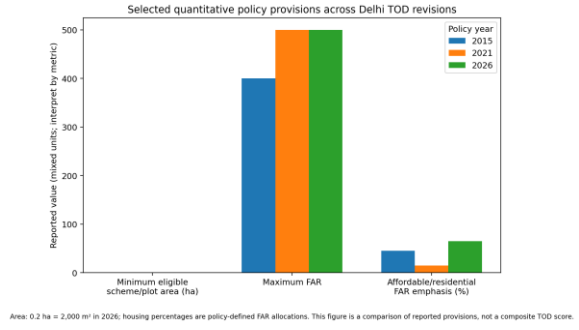

Figure 3. Selected quantitative policy provisions across Delhi TOD revisions. The figure compares reported policy values; it is not a composite TOD score. Source: Government of India (2015, 2026) and DDA (2021a, 2026a).

IV. INTEGRATED CONCEPTUAL FRAMEWORK FOR NODE SUITABILITY

The integrated framework retains the seven core dimensions proposed in the doctoral research but places them within a broader implementation-readiness structure. This avoids two common analytical errors: treating transit proximity as sufficient evidence of TOD, and allowing a composite score to conceal a critical failure in an essential condition.

Seven core suitability dimensions -

Dimension	Planning question	Candidate indicators
Balance	Is the node balanced as an urban activity and transport node?	Population, housing and employment; density; jobs–housing ratio
Placemaking	Does the node offer a civic and everyday urban destination?	Land-use entropy; vertical mix; use/development mix; public amenities
Design	Can people walk and cycle safely?	Sidewalk continuity; pedestrian impedance; path length; crossing quality; intersection density; cycling connectivity
Modal shift	Can proximity and service characteristics change travel behaviour?	Distance to transit; observed mode share; transit frequency; parking supply and use
Multimodality	Can users transfer efficiently between modes?	Bus/Metro stop density; feeder coverage; interchange quality; transfer time; universal access
Network connectivity	Does the node connect effectively to the wider city?	Street-network density; routes and crossings; destination accessibility; GIS-based accessibility
Livability	Who can remain and benefit?	Housing affordability; household income; vehicle ownership; housing-cost burden; displacement risk; equity

Source: Integrated from the proposed TOD suitability framework in the supplied doctoral manuscript. Final indicator selection remains subject to data availability, expert review, pilot testing and correlation analysis.

Implementation-readiness dimensions - The policy-evolution evidence indicates that the seven core dimensions should be complemented by implementation variables that determine whether planned development intensity can actually be delivered without fragmenting the station area. These include development capacity and land assembly, infrastructure and environmental capacity, governance coordination, financing and monitoring. These are treated as decision gates and implementation dimensions rather than arbitrary additions to a fabricated score.

Implementation dimension	Required assessment
Spatial catchment	Use the notified regulatory TOD zone as a boundary, but separately measure actual pedestrian and multimodal catchments using network distance, barriers, crossings and last-mile conditions.
Development capacity	Assess existing FAR, vacant/developable land, land

	assembly, plot fragmentation, road ROW and infrastructure capacity before assuming that higher permissible FAR can be absorbed.
Infrastructure and environment	Assess water, sewerage, drainage, power, waste management, public facilities, green infrastructure and heat/flood resilience.
Governance	Identify agencies responsible for land, transit, roads, utilities, housing and approvals and test whether responsibilities are coordinated at the relevant spatial scale.
Financing	Track TOD charges, additional FAR charges, value capture and the destination of ring-fenced funds; link financing to visible area improvements.
Equity	Measure actual affordability, tenure, household vulnerability, transport costs, displacement risk and protection of existing livelihoods.
Monitoring	Establish baseline, implementation and post-implementation indicators for accessibility, mobility, housing, infrastructure, public realm and grievances.

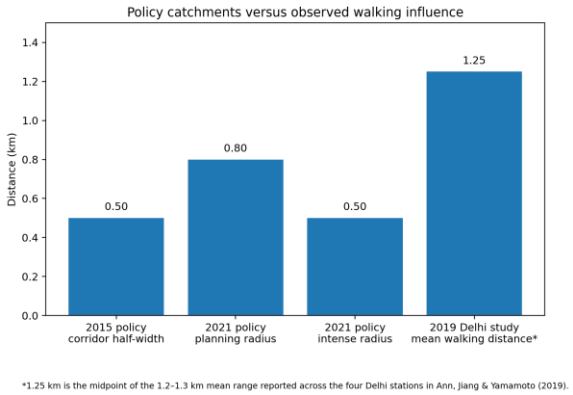

Figure 4. Policy catchments compared with observed walking influence in a Delhi Metro study. The 1.25 km value is the midpoint of the published 1.2–1.3 km mean walking-distance range in Ann et al. (2019); it *is not a new GIS measurement. Source: Government of India (2015); DDA (2021a); Ann et al. (2019).*

V. METHODOLOGY

Research design - The proposed empirical assessment adopts a mixed-method, cross-sectional and ex-ante design. The unit of analysis is the individual proposed TOD node and its associated network-based influence area. The research integrates policy/document review, GIS-based spatial analysis, field observation, commuter surveys, expert assessment and secondary data. The purpose is prospective: to determine whether a proposed node has the conditions required to support TOD before major additional development intensity is approved or implemented.

The policy component is documentary and comparative. The policy period is divided into 2015, 2019, 2021 and 2026 and compared across spatial structure, development intensity, land-use and housing, mobility/public realm, governance/approvals, and financing/implementation. Documents are coded for explicit provisions rather than inferred intentions.

Twelve proposed nodes -

No.	Proposed node	Proposed typology
1	Kashmere Gate	Transit hub
2	Nizamuddin/Sarai Kale Khan	Transit hub
3	Anand Vihar	Transit hub
4	New Delhi Railway Station	Transit hub
5	Dwarka Sector-21	Urban residential node
6	Dwarka Sector-8 to Sector-14 Metro Station corridor	Urban residential node / corridor context
7	Jangpura RRTS Station	Urban mixed core
8	Haiderpur Badli Mor Metro Station (Mukarba Chowk)	Urban residential node
9	Rohini Sector-18 Metro Station	Urban residential

		node
10	Malviya Nagar Metro Station	Urban mixed core
11	Karkardooma Pink and Blue Line Stations	Urban mixed core
12	Trilokpuri Metro Station	Urban mixed core

Source: Supplied doctoral TOD framework. Typology and regulatory status should be verified against current planning documentation and field evidence before final empirical ranking.

Assessment sequence -

i. Node and catchment definition: link each station/interchange to the pedestrian and street network; incorporate railway lines, major roads, rivers, controlled-access facilities, grade-separated infrastructure and other barriers.
ii. Indicator extraction: calculate the selected indicators within the same network-based catchment.
iii. Field and survey assessment: supplement GIS and administrative data with commuter surveys, expert assessment and structured observation of pedestrian continuity, crossings, cycling, interchange, feeder services, parking and public realm.
iv. Indicator scoring and weighting: normalise indicators to a common scale and derive dimension weights through expert AHP, including a consistency check.
v. TOD Suitability Index computation: calculate dimension scores and the overall TODI while retaining individual dimension results.
vi. Sensitivity and robustness testing: test alternative catchments, weights, normalisation methods, threshold rules and leave-one-dimension-out specifications.
vii. Typology-specific interpretation: report data quality, seven dimension scores, TODI, safeguard status, uncertainty and priority interventions rather than relying on a rank alone.

Network catchment - The primary planning reference proposed in the supplied framework is an 800 m network distance, with alternative 400 m and 1,200 m network distances used for sensitivity testing. These are analytical specifications for the future empirical study, not completed measurements. The effective catchment should be reported separately from any conventional radial buffer.

Indicator normalization - For a positive indicator, where higher values represent better TOD performance, the normalised score is:

$u_{ij} = 100 \times [z_{ij} - min(z_j)] / [max(z_j) - min(z_j)]$

For a negative indicator, where higher values represent poorer performance (for example, pedestrian impedance, excessive parking supply or housing-cost burden), the proposed transformation is:

$u_{ij} = 100 \times [max(z_j) - z_{ij}] / [max(z_j) - min(z_j)]$

Threshold-based indicators should use explicitly documented piecewise scoring rules. Missing values, outliers, inconsistent spatial units and high inter-correlation should be examined before final aggregation.

Expert weighting and TOD Suitability Index - The relative importance of the seven dimensions is proposed to be determined through expert-based AHP pairwise comparisons. Indicator weights within each dimension should sum to one, and the AHP consistency ratio should be reported. If expert judgments are inconsistent or the expert sample is too small, an equal-weight model should be retained as a transparent baseline. Weights must be established from expert evidence and methodological criteria rather than selected to generate a preferred ranking.

$D_i d = \Sigma_j w_j d \, u_{ij}$

$TODI_i = \Sigma d=1^{7} w_i d \, D_i d$

The resulting TODI has a nominal range of 0–100. It is a decision-support measure rather than an automatic development entitlement. A high TODI should not override a critical failure in pedestrian safety, infrastructure capacity, universal accessibility, emergency access, public space or social protection.

Validation and statistical analysis - Validation should compare index patterns with observed access and egress behaviour, assess inter-rater variation and AHP consistency, and test robustness under alternative catchments, weights and normalisation approaches. Where sufficient data exist, correlation, regression, cluster analysis, spatial autocorrelation/hotspot analysis and land-use entropy can be used. Because the proposed design is observational and cross-sectional, statistical associations should not be interpreted as proof of causality.

VI. EVIDENCE BASE AND FINDINGS

The integrated findings are deliberately separated into documentary/published evidence and planned empirical analysis. This distinction is essential because the supplied doctoral framework contains proposed surveys, field observations and GIS procedures but does not contain completed node-level measurements or final AHP weights. Accordingly, the paper reports policy quantities and published empirical evidence where available, but does not report hypothetical TODI scores.

Policy trajectory - The strongest documentary finding is the non-linear trajectory of Delhi TOD policy. The spatial logic changed from a broad 500 m corridor influence zone in 2015, to selected strategic nodes in 2019, to node-plus-influence-zone planning with detailed area works in 2021, and back to corridor-based implementation in 2026. This can be interpreted as movement between an integrated area-planning logic and development-facilitation logic.

The 2026 reforms address practical barriers associated with large-scale node development by reducing the qualifying plot threshold and simplifying approvals. At the same time, removing or reducing the earlier IZP prerequisite increases the importance of maintaining an alternative mechanism for area-level coordination. Without such coordination, individually compliant projects could collectively produce fragmented streets, disconnected pedestrian routes, overloaded utilities and inconsistent public-realm outcomes.

Spatial catchment evidence - Ann et al. (2019) provides direct Delhi evidence that station influence varies by mode and context. The reported mean walking-distance range of approximately 1.2–1.3 km is larger than the 500–800 m policy conventions used in the supplied documents. The implication is not that a 1.25 km circle should replace the policy boundary. Rather, suitability assessment should distinguish regulatory geography from effective network accessibility.

Land-use and environmental pressure - Begam et al. (2024) document land-cover transformation in Delhi Metro buffer areas between 1997 and 2019, including increases in built-up land and reductions in open land and vegetation. For suitability assessment, development capacity should therefore be evaluated together with ecological carrying capacity, green infrastructure, open-space protection and water-sensitive design.

Karkardooma implementation case - The East Delhi Hub–Karkardooma provides project-level evidence connecting policy intentions with a large development site. DDA documentation cited in the supplied manuscript describes a 29.60-hectare site, 25.47 hectares of net development area, 30.71% green area, proposed FAR of 2.500, and a 70% residential, 20% civil-facilities and 10% commercial structure. Phase I is reported at 1,524 dwelling units, including 498 EWS units. The project is adjacent to Karkardooma Metro Station, an interchange of the Blue and Pink Lines (DDA, 2025).

These values demonstrate project planning potential but should not be interpreted as proof of post-occupancy TOD performance. The distinction between project feasibility and policy-system effectiveness remains important.

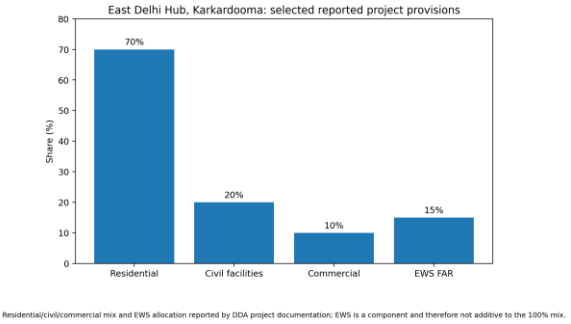

Figure 6. East Delhi Hub, Karkardooma: selected reported project provisions. EWS is a housing component and is therefore not additive to the 100% residential/civil/commercial land-use mix. Source: DDA project documentation as reproduced in the supplied manuscript.

VII. TYPOLOGY-SPECIFIC SUITABILITY AND IMPLEMENTATION STRATEGY

The four proposed typologies provide a practical mechanism for translating assessment results into differentiated policy action. They should be verified against spatial evidence and field observations before final publication of node-specific findings.

Transit hubs - Kashmere Gate, Nizamuddin/Sarai Kale Khan, Anand Vihar and New Delhi Railway Station are treated as transit hubs requiring interchange-first planning. Priorities include direct and weather-protected pedestrian routes, universal

accessibility, coordinated bus and intermediate-public-transport services, safe curb management, efficient transfer arrangements, passenger information and separation of through traffic from station-access movements. Additional intensity should be linked to demonstrated interchange and public-realm capacity.

Urban residential nodes - Dwarka Sector-21, the Dwarka Sector-8–14 corridor, Haiderpur Badli Mor and Rohini Sector-18 require a retrofit-oriented strategy. Priority interventions include continuous footpaths, safe crossings, shaded walking routes, cycling connections, neighbourhood bus and feeder coverage, improved access to schools and local markets, and appropriate parking management. New mixed-use development should support daily neighbourhood needs while protecting residents, local open spaces and existing livelihoods.

Urban mixed cores - Jangpura, Malviya Nagar, Karkardooma and Trilokpuri require fine-grained placemaking and strong social safeguards. Priorities include mixed-use infill, connected public-space networks, protection of small businesses and local livelihoods, affordable and rental housing, universal design and targeted improvement of underserved streets and facilities. Development intensity should be negotiated with infrastructure capacity and community requirements rather than applied uniformly.

Corridor-scale planning - Where the corridor typology is applicable, implementation should coordinate station-to-station accessibility, land-use continuity, pedestrian and cycling networks, utility capacity and public-realm investment. The corridor approach introduced in 2026 can improve flexibility and participation, but it requires sub-area planning mechanisms to prevent fragmented parcel-by-parcel development.

VIII. INTEGRATED POLICY GUIDELINES FOR IMPLEMENTATION

Access before intensity - Prepare a node-level access plan before approving major intensification. Set measurable targets for walking, cycling, bus/feeder services, paratransit, interchange facilities and universal accessibility.

Infrastructure-linked development rights - Connect additional development rights to verified infrastructure capacity and a funded schedule of supporting public works, with named agencies, milestones and completion triggers.

Affordable housing and anti-displacement - Evaluate affordability using housing cost, household income, tenure, transport cost and vulnerability. Treat the 65% residential FAR provision in 2026 as a policy input, not as proof of affordability.

Parking and curb management - Treat parking and curb space as travel-demand-management instruments. Where appropriate, price scarce curb/parking resources and direct a defined share of revenue to walking, cycling, transit and interchange improvements.

Multimodal governance - Create a node-level delivery cell or equivalent coordination mechanism involving planning, transport, municipal, traffic, utility, housing and community stakeholders. Maintain a common implementation schedule and publish progress.

Value capture with visible benefits - Where TOD charges or land-value-capture mechanisms are used, disclose the contributors, funded projects, responsible agencies and distribution of benefits; prioritise improvements within the affected node/catchment.

Participatory monitoring - Repeat commuter and structured-observation instruments periodically after implementation, and maintain a transparent grievance and response mechanism.

Area-level coordination within corridor flexibility - Retain sub-area or corridor-level infrastructure and public-realm plans even where the regulatory system allows smaller qualifying plots and simplified approvals.

Proposed implementation gate -

Transit accessibility → infrastructure capacity → public-realm readiness → additional development intensity

Where critical safeguards are not satisfied, development intensity should be deferred or linked to specified enabling works and measurable implementation milestones. This staged principle operationalises the central argument of the integrated framework: transit accessibility should precede, and be reinforced by, capacity and public-realm readiness.

Table 2. Proposed post-implementation monitoring dashboard

Indicator group	Examples
Walking and accessibility	Catchment population connected to continuous accessible walking routes; pedestrian conflicts/injuries; universal-access compliance
Multimodal performance	Average and maximum transfer time; feeder-service coverage; interchange quality
Land-use performance	Land-use entropy/diversity; jobs-to-housing balance; active frontage
Parking and curb	Parking occupancy; curb utilisation; parking-management revenue where applicable
Mobility outcomes	Public-transport mode share; walking/cycling access
Housing and equity	Housing and transport cost burden; affordable-housing delivery; tenure and displacement indicators
Public realm and infrastructure	Public-space completion; pedestrian-infrastructure completion; infrastructure-capacity status
Governance	Grievance registration and resolution time; milestone completion; agency responsibility tracking

Source: Integrated from the supplied TOD suitability and policy-analysis manuscripts. Indicators should be measured at baseline, implementation and post-implementation stages.

IX. DISCUSSION

The integrated evidence supports a policy-to-place interpretation of TOD. The 2019–2021 framework most strongly expressed TOD as an area-transformation process, while the 2026 framework places greater emphasis on development facilitation through smaller qualifying plots, broader corridor coverage and simplified approvals. Neither logic is inherently sufficient. Integrated area planning can be constrained by land assembly, ownership fragmentation and procedural complexity; development facilitation can be weakened by fragmented projects that are individually compliant but collectively disconnected.

The central planning challenge is therefore to combine parcel-level flexibility with area-level coordination. In practical terms, the 2026 framework can simplify participation without abandoning coordinated planning if corridor and node sub-areas retain infrastructure, multimodal, public-realm and housing safeguards.

The framework also changes the meaning of suitability. Suitability is not a static property of a station; it is a relationship between transit accessibility, urban form, development capacity, infrastructure, governance, housing, financing and implementation conditions. A station with excellent regional connectivity but weak pedestrian access should not automatically receive a development entitlement. Similarly, an area with strong urban activity but inadequate transport capacity may require infrastructure and accessibility improvements before intensification.

Equity is integral to this interpretation. The 2015 policy contained a strong explicit housing structure, while the 2026 framework places substantial emphasis on residential units below 100 m². However, formal FAR allocation cannot establish affordability by itself. Actual rents or prices, tenure, household income, transport costs and displacement risk must be monitored. This is consistent with the broader equitable-TOD literature (Kaniewska et al., 2024; Zhao et al., 2024).

Finally, the integrated framework should be understood as a decision-support system rather than a single score. The composite TODI can organise evidence, but safeguard conditions, data quality, uncertainty and typology-specific interpretation are necessary to prevent false precision. This is especially important because the proposed empirical study is cross-sectional and because the 2026 policy is too recent for long-term outcomes to be established.

X. LIMITATIONS AND ACADEMIC INTEGRITY BOUNDARIES

i. The supplied doctoral framework does not contain completed commuter surveys, expert AHP matrices, field-observation datasets or station-level GIS measurements. Therefore, this

integrated paper does not report fabricated node scores, rankings or statistical results.

ii. The 2026 policy is newly notified. Its provisions can be compared, but long-term effects on land markets, housing affordability, travel behaviour and urban form cannot yet be established from a mature post-implementation dataset.

iii. The Karkardooma evidence is based on official project documentation rather than an independent post-occupancy evaluation; it should therefore be interpreted as project-level documentary evidence.

iv. The qualitative policy-emphasis figure is interpretive documentary coding and must not be treated as a statistical index.

v. The supplied manuscripts contain a minor inconsistency in the administrative dating/description of some 2026 policy material. To avoid propagating an unsupported discrepancy, the integrated analysis relies on the substantive provisions and identifies the 2026 framework by year rather than using the disputed date as an analytical variable.

vi. The final empirical typology of individual nodes should be verified using current regulatory documents, spatial evidence and field observations before publication of station-specific conclusions.

XI. CONCLUSION

This paper integrates the three supplied manuscripts into a single research framework for assessing the suitability and implementability of proposed TOD nodes in Delhi. The combined evidence shows that TOD should not be defined by transit proximity or development intensity alone. Successful TOD depends on the interaction of node performance, place quality, network accessibility, infrastructure capacity, multimodal integration, housing affordability, governance, financing and social protection.

Delhi's policy trajectory from 2015 to 2026 is non-linear. The 2015 framework established broad corridor influence zones and high development intensity with explicit housing and public-space provisions. The 2019 and 2021 reforms shifted toward selected nodes and stronger integrated area planning, including Influence Zone Plans and multimodal/public-realm requirements. The 2026 framework returned to corridor-based coverage, reduced the qualifying plot threshold to 2,000 m², retained maximum FAR 500, strengthened residential emphasis and simplified approvals.

The principal implication is not that corridor-based or node-based TOD is universally superior. Rather, development flexibility must be matched by spatial coordination and measurable implementation accountability. For the twelve proposed nodes, the next empirical stage should apply the seven-dimensional TOD suitability framework using network-based catchments, validated indicators, transparent expert weighting, sensitivity analysis and independent safeguard assessment.

The most defensible policy principle emerging from the integrated evidence is therefore: transit accessibility → infrastructure capacity → public-realm readiness → additional development intensity. If Delhi can preserve area-level coordination, protect affordability and existing communities, connect development rights to infrastructure capacity, and transparently direct TOD-generated resources to visible local improvements, the flexibility of the current framework can be used without sacrificing the integrated character that distinguishes genuine TOD from transit-adjacent development.

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Appendix A. Evidence-to-Assessment Matrix

Evidence source	Evidence used in integrated paper	Analytical role
Government of India (2015)	500 m corridor influence zone; FAR 400; 1 ha; housing/public-space provisions	2015 policy baseline
DDA (2019)	Strategic node approach; revised development controls	Policy transition
DDA (2021a, 2021b)	800 m planning area; 500 m intense area; IZP; NMT/IPT/MMI/public realm; scheme requirements	Integrated node planning
DDA (2025)	Karkardooma project size, green area, FAR and housing mix	Project-level evidence
Government of India (2026) / DDA (2026a, 2026b)	Corridor/node coverage; 2,000 m²; FAR 500; 65% residential; charges and simplified approval mechanism	Current policy framework
Ann et al. (2019)	Delhi station catchments and walking-distance evidence	Spatial catchment
Patnala et al. (2020)	Context-sensitive Indian TOD decision framework	Indicator/decision-framework support
Begam et al. (2024)	Delhi Metro land-cover transformation evidence	Environment and development pressure
Mathur (2019)	Delhi land-value capture and coordination constraints	Finance/governance
Kang & Miwa (2025)	Sensitivity of TOD typologies to spatial scale and indicators	Methodological caution
Kaniewska et al. (2024)	Uneven affordability outcomes in TOD	Housing/equity
Regmi (2024)	Governance and implementation challenges in Asian cities	Institutional interpretation

Zhao et al. (2024)	Node-Place-People and social vulnerability	Equity and displacement lens

Note: The integrated paper uses the supplied manuscripts as its primary basis. Published and policy evidence is distinguished from proposed empirical work.

Appendix B. Data and Quality-Control Protocol -

i. Record source, collection/publication date, spatial resolution, responsible agency, processing method and data-quality flag for every dataset.
ii. Harmonise datasets from different years so that temporal differences do not create artificial differences between nodes.
iii. Verify station/interchange status, regulatory boundary, applicable policy version, parcel structure, responsible agencies and development-control provisions before node-level analysis.
iv. Do not replace missing or low-quality indicators with unsupported estimates; record missingness and incorporate it into uncertainty assessment.
v. Report both dimension-level results and the composite TODI so that strong performance in one dimension cannot conceal a critical weakness elsewhere.
vi. Run sensitivity tests for 400 m, 800 m and 1,200 m network catchments, alternative weights and normalisation approaches, and a leave-one-dimension-out test.
vii. Separate safeguard assessment from composite scoring and disclose any critical safeguard failure.