JOURNAL OF EARTH SCIENCE AND GEOMATICS INDONESIA
Volume 2 (2026), Page 57-70, E-ISSN 3163-9763

# Assessing Transit-Oriented Development Performance in a Medium-Sized Indonesian City: Evidence from Rajabasa Terminal, Bandar Lampung

**Ongki Alexander [1*], Khalid Afwan Fadlillah [1], Salsya Anisa Putri [1]**

1. Geomatics Engineering Study Program, Faculty of Infrastructure and Regional Technology, Institut Teknologi Sumatera, South Lampung, Indonesia

*corresponding author: ongki.123230014@student.itera.ac.id

Received: May 29, 2026
Revised: August 31, 2026
Accepted: September 18, 2026
Published: November 10, 2026

**Citation:** Alexander, O. (2026). Assessing Transit-Oriented Development Performance in a Medium-Sized Indonesian City: Evidence from Rajabasa Terminal, Bandar Lampung. Journal of Earth Science and Geomatics Indonesia, 2, 57-70.

**Copyright:** © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license

## Abstract

Transit-Oriented Development (TOD) research in Indonesia has predominantly focused on large metropolitan rail-based systems, leaving the applicability of TOD principles to bus-terminal contexts in medium-sized cities empirically underexamined despite their functional importance for regional connectivity. This gap constrains the development of TOD evaluation frameworks that are sensitive to transit modes other than rail. This study addresses this gap by assessing TOD conformity in the Rajabasa Terminal area, Bandar Lampung a Type A intercity bus terminal and BRT origin point using the ITDP TOD Standard 3.0 framework across eight dimensions: Walk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift. A descriptive-evaluative design was employed, integrating GIS-based spatial analysis, field observation, and indicator-based scoring within a 400-meter catchment zone subdivided into three road-boundary-defined analytical blocks. Because several ITDP indicators were structurally inapplicable to the bus-terminal context, the maximum adjusted score was set at 61. All three blocks achieved a Bronze rating, with adjusted scores of 37 (Blocks 1 and 2) and 38 (Block 3), equivalent to 60.66% and 62.3% respectively. Strong dimensions include mixed land use, intermodal connectivity, and compactness, whereas cycling infrastructure, pedestrian crossings, and residential density remain the weakest. Off-street parking scored highly under the Shift indicator, yet this reflects persistent private-vehicle dependency rather than genuine modal shift, underscoring the need for targeted parking management. These findings demonstrate both the applicability and the contextual limitations of the ITDP TOD Standard in bus-based transit environments, offering an empirically grounded basis for adapting TOD evaluation frameworks to medium-sized, non-rail-served Indonesian cities and identifying priority interventions to advance Rajabasa Terminal toward Silver or Gold TOD standards.

**Keywords: Transit-Oriented Development; Rajabasa Terminal; ITDP TOD Standard; Spatial Analysis; Sustainable Urban Mobility**

## 1. Introduction

Rapid urbanization in Indonesian cities has placed increasing pressure on urban transportation systems. In medium-sized cities such as Bandar Lampung, sustained population growth (Lampung Provincial Central Statistics Agency, 2023) has driven a significant rise in private motor vehicle ownership, exceeding the capacity of both road networks and public transportation services. This challenge reflects a structural pattern observed across Indonesian cities. Ronan (2023) reported that the national motor vehicle fleet nearly doubled between 2002 and 2019, while Tam (2024) noted that among the 44 cities with public transportation services, up to 19 were projected to cease full operation by 2023. This dual crisis uncontrolled motorization alongside deteriorating mass transit has been widely documented as a major obstacle to sustainable urban mobility, particularly in medium-sized cities where public transportation capacity remains limited (Fadhil et al., 2024; Hasibuan & Mulyani, 2022).

To address these challenges, Fadhil et al. (2024) recommend the Avoid-Shift-Improve (ASI) approach as an integrated policy framework aimed at reducing both emissions and congestion. One of the principal instruments within this framework is Transit-Oriented Development (TOD), a spatial planning approach that integrates mixed land use with public transportation networks to produce compact, efficient, and pedestrian-friendly urban areas (Hasibuan & Mulyani, 2022). Walkability is a critical dimension of TOD, as the majority of transit-based trips require pedestrian access at both the origin and destination ends of the journey (Yazid et al., 2023). At the methodological level, the Node-Place Model serves as a standard evaluation framework for assessing the balance between a transit node's functional role and the urban character of its surrounding area, as further developed in recent studies (Uddin et al., 2023; Yang et al., 2022).

A number of studies have documented TOD implementation in Indonesia with varying outcomes. Hasibuan & Mulyani (2022), in an eight-year longitudinal study of the Jakarta Metropolitan area, found a gradual shift in commuter travel behavior toward transit modes, though implementation remained at an early stage. Taki et al. (2023) demonstrated that intermodal integration is a key determinant of TOD success in Jakarta, while Taki et al. (2024) examined the characteristics of TOD implementation in the Fatmawati area. Outside Jakarta, Agustin & Hariyani (2022) evaluated TOD in Malang City, and Indradjati (2024) analyzed the relationship between urban form and travel mode choices in medium-sized cities. Ricardianto et al. (2023) and Hasibuan et al. (2024) further emphasize that TOD typologies must be adapted to local scale and context, as standards designed for MRT/LRT systems cannot be applied uniformly. This raises an important question: to what extent are TOD principles applicable to medium-sized cities served by bus terminals rather than rail-based transit?

This gap the absence of TOD studies focusing on bus terminals in medium-sized Indonesian cities makes the Rajabasa Terminal area in Bandar Lampung a highly relevant case. As a Type A terminal, Rajabasa functions as a strategic node for both intercity interprovincial (AKAP) and intercity intraprovincial (AKDP) transportation, connecting the islands of Java and Sumatra (Ministry of Transportation of the Republic of Indonesia, 2020), and underwent physical

revitalization in 2024 (RRI.co.id, 2024). Despite its functional importance, existing studies of bus terminal-based TOD in Indonesia's medium-sized cities reveal a recurring pattern: functionally significant transit nodes consistently fall short of TOD ideals due to inadequate pedestrian infrastructure, limited intermodal integration, and the absence of mixed land use in surrounding areas (Azizah et al., 2025; Ridho et al., 2023).

Against this background, this study aims to assess the level of TOD conformity in the Rajabasa Terminal area using the ITDP TOD Standard 3.0 framework, identify the strengths and weaknesses of each TOD dimension across three spatial blocks, and formulate targeted planning recommendations for the City of Bandar Lampung. The findings are expected to contribute to the development of an adaptive TOD evaluation framework applicable to medium-sized Indonesian cities, addressing a knowledge gap that has long been dominated by research conducted in large metropolitan contexts (Hasibuan et al., 2024).

Methodologically, this study contributes an adapted application of the ITDP TOD Standard 3.0 originally developed and predominantly validated in rail-based and metropolitan transit contexts to a bus-terminal setting in a medium-sized city, thereby testing the framework's indicator structure under conditions for which several rail-specific criteria are structurally inapplicable. Theoretically, the findings extend the TOD literature by demonstrating both the transferability and the boundary conditions of the ITDP framework: while core dimensions such as land-use mix, intermodal connectivity, and compactness remain analytically robust across transit modes, indicators tied to fixed-guideway infrastructure require contextual adjustment when applied to bus-based nodes. This positions the study as an empirical contribution to the ongoing discussion on adapting standardized TOD assessment tools to non-rail transit environments in the Global South.

## 2. Materials and Methods

### 2.1 Study Area

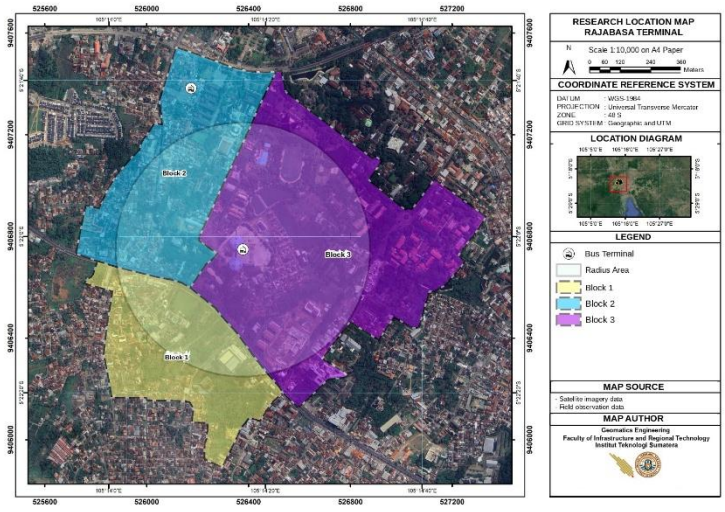



**Figure 1.** Map of the Research Location

Lampung City, Lampung Province, Indonesia. Rajabasa Terminal is a Type A passenger terminal serving as a node for intercity interprovincial (AKAP) and intercity intraprovincial (AKDP) transportation, and as the origin point of the Trans Bandar Lampung Bus Rapid Transit (BRT) corridor. The overall study area was delineated within a 400-meter buffer from the terminal

boundary, consistent with the comfortable walking distance standard to a transit node as defined in the ITDP TOD Standard 3.0 (ITDP, 2017). Within this catchment zone, the study area was further subdivided into three analytical blocks Block 1, Block 2, and Block 3 with boundaries defined by the existing road network rather than geometric subdivision. This approach ensures that each block reflects realistic spatial units of urban activity as they relate to the transit node. The 400-meter buffer therefore serves solely as the outer boundary of the study area, while intra-area differentiation is determined by road boundaries.

### 2.2 Research Framework

This study employed a descriptive-evaluative research design integrating GIS-based spatial analysis, field observation, and indicator-based TOD scoring. The research framework consisted of four main stages:

a. spatial delineation of the TOD study area using a 400-meter buffer and road-based block segmentation;
b. primary and secondary data collection through field observation and spatial data acquisition;
c. GIS-based spatial analysis and TOD indicator assessment using the modified ITDP TOD Standard 3.0 framework; and
d. classification of TOD performance for each analytical block..

The analytical framework was designed to evaluate the spatial characteristics, infrastructure conditions, and land-use patterns surrounding Rajabasa Terminal in relation to TOD principles.

### 2.3 Data Sources and Field Survey

This study utilized both primary and secondary data sources. Primary data were obtained through field surveys conducted in April 2026, including direct observation of pedestrian facilities, bicycle infrastructure, parking areas, land-use conditions, and intermodal transportation connectivity within the study area. Field surveys also included road-based block verification, pedestrian infrastructure mapping, land-use validation, to ensure consistency between GIS interpretation results and actual field conditions. Secondary data were collected from government agencies, satellite imagery, and spatial planning documents. The data sources used in this study are presented in Table 1.

**Table 1**. Data Sources Used in the Study

| Data | Source | Purpose |
|---|---|---|
| Satellite Imagery | Google Earth Pro and Planetary SAS Imagery (2026) | Land-use interpretation and spatial verification |
| Land Zone | RDTR region II Bandar Lampung City | Land-use and zoning analysis |
| Transportation network data | Field survey and local transportation maps | Accessibility and route analysis |
| Pedestrian and bicycle infrastructure | Field observation | TOD indicator assessment |

### 2.4 TOD Indicators and Scoring Procedure

The evaluation of TOD suitability in the Rajabasa Terminal area was conducted using the ITDP TOD Standard 3.0 framework (ITDP, 2017). The assessment considered eight TOD principles, namely Walk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift.

However, this study did not apply all indicators available in the original ITDP TOD Standard 3.0 framework. Several indicators were excluded due to limitations in data availability, local context suitability, and the absence of supporting infrastructure variables in the study area. Therefore, a modified TOD scoring approach was implemented.

The TOD assessment was conducted for each analytical block generated through the delineation process. Each block was evaluated independently based on the availability, quality, and spatial distribution of TOD-supporting indicators. The indicators used in this study are presented in Table 2.

**Table 2**. TOD Indicators Used in the Study

| Principle | Indicators |
|---|---|
| Walk | Pedestrian paths, pedestrian crossings, active building frontage |
| Cycle | Bicycle lane network, bicycle parking |
| Connect | Connectivity between transportation modes |
| Transit | Walking distance to public transportation |
| Mix | Mixed land use |
| Densify | Residential density and non-residential density |
| Compact | Urban block integration and accessibility to transport options |
| Shift | Off-street parking availability |

The original ITDP TOD Standard has a maximum score of 100 points. However, due to indicator adjustments and data limitations, the maximum achievable score in this study was reduced to 61 points. Therefore, the TOD classification thresholds were proportionally adjusted to maintain consistency with the original ITDP classification categories.
The adjusted score was calculated using the following equation:

$$x = \left(\frac{a'}{a}\right) b \quad (1)$$

where:
x = adjusted TOD score
a'= adjusted maximum score (61)
a = original ITDP maximum score (100)
b = original TOD classification threshold score

### 2.5 GIS-Based Spatial Analysis

Spatial analysis was conducted using ArcMap 10.8 software to process and analyze spatial characteristics within the delineated TOD study area. The analysis began with the generation of a 400-meter Euclidean buffer from the Rajabasa Terminal centroid to define the spatial extent of the study area.
Subsequently, the study area was segmented into analytical blocks using artificial boundaries, particularly road networks, following spatial delineation principles commonly applied in urban spatial analysis. The delineated blocks were then used as the primary analytical units for TOD assessment.
The GIS-based analysis included:
a. land-use digitization and classification;
b. mapping of pedestrian infrastructure and crossing facilities;
c. identification of bicycle lanes and bicycle parking facilities;
d. analysis of transportation routes and intermodal connectivity;
e. residential density mapping; and
f. spatial overlay analysis for TOD indicator evaluation.

The results of the spatial analysis were integrated with the modified ITDP TOD scoring framework to assess the TOD performance level of each analytical block.

### 2.6 Classification of TOD Performance

TOD performance classification in this study followed the adjusted scoring categories derived from the ITDP TOD Standard 3.0. Since the maximum achievable score was modified from 100 to 61, the classification intervals were proportionally converted.

**Table 3**. Adjusted TOD Classification

| TOD Classification | Original ITDP Score | Adjusted Score |
|---|---|---|
| Gold | 86–100 | 52–61 |
| Silver | 71–85 | 43–51 |
| Bronze | 56–70 | 34–42 |

## 3. Results

### 3.1 Spatial Characteristics of the Delineated TOD Study Area

Land use interpretation reveals that the Rajabasa Terminal catchment zone is predominantly characterized by city-scale Public Service Facilities (SPU), concentrated in the northern and eastern portions of the study area. Residential land use with medium to high density occupies the western and southern sections. Commercial land uses are distributed along the main arterial corridors connecting to the terminal. Block 1, located in the southwestern portion, is dominated by residential and mixed commercial use. Block 2, positioned in the northwestern section, contains the highest concentration of public service facilities. Block 3, occupying the central-eastern area adjacent to the terminal itself, exhibits the most diverse land use mix, combining transit facilities, commercial uses, and residential areas.

This spatial pattern reflects preliminary conditions conducive to TOD, particularly in terms of mixed land use potential and activity concentration around the transit node. However, functional separation between zones and the absence of continuous non-motorized transport connectivity remain notable constraints across all three blocks. A spatial summary of each block is presented in Table 4.

**Table 4**. Spatial summary of analytical blocks within the Rajabasa TOD catchment area

| Indicator | Block 1 | Block 2 | Block 3 |
|---|---|---|---|
| Approximate block area (ha) | ± 23,507 | ± 36,273 | ± 93,530 |
| Dominant land use | Residential+Commercial | Public Service Facilities | Mixed (Transit+ Commercial+Residential) |
| Pedestrian path arterial roads | Present | Present | Present (continuous) |
| Pedestrian path local roads | Absent | Absent | Partial |
| Pedestrian crossings | Absent | Absent | Present (zebra cross) |
| Bicycle lane | Partial marking only | Absent | Partial marking only |
| Bicycle parking | Absent | Absent | Absent |
| Off-street parking | Present | Present | Present |
| Residential density range (dwellings/ha) | 0–40 | 0–40 | 0–40 (moderate in corridor) |
| Adjusted TOD score | 37 / 61 | 37 / 61 | 38 / 61 |
| TOD rating | Bronze | Bronze | Bronze |

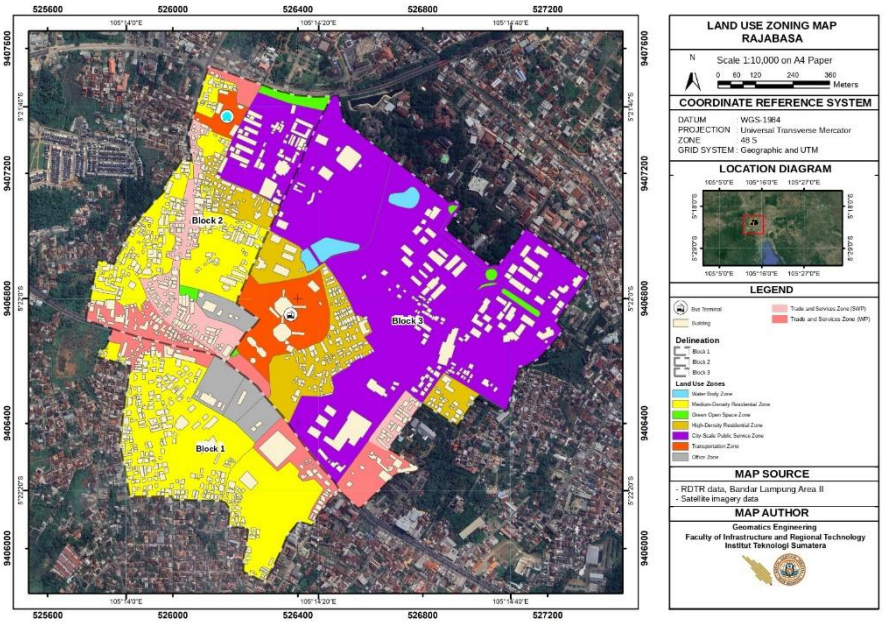



**Figure 2.** Land-use zoning within the Rajabasa Terminal study area

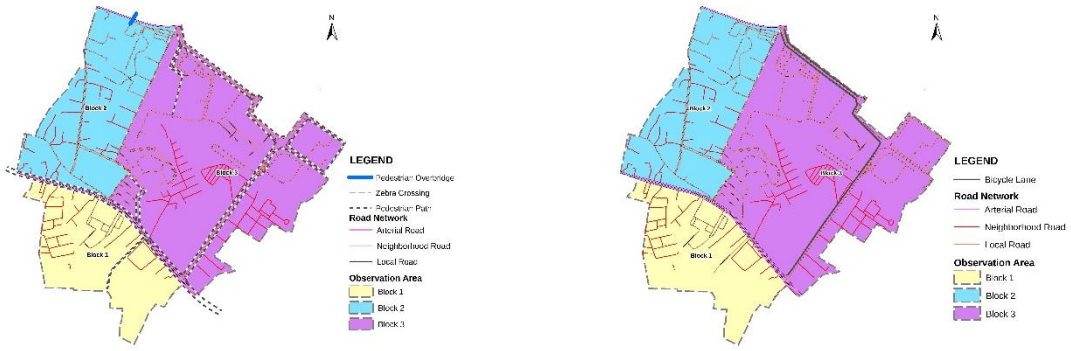
### 3.2 Assessment of Walk and Cycle Conditions.

#### a. Walkability Conditions

Pedestrian infrastructure is present along the main arterial corridors directly connecting to Rajabasa Terminal, including sidewalks, zebra crossings, and at least one pedestrian overbridge. However, pedestrian network continuity is limited on local and neighborhood roads within the residential sections of Block 1 and Block 2, where dedicated sidewalks and crossing facilities are largely absent. Block 3 recorded the strongest Walk performance, scoring 3 out of 3 on the pedestrian path sub-indicator, reflecting more complete sidewalk provision along its primary corridors. Pedestrian crossings were scored 0 in Blocks 1 and 2 due to insufficient crossing infrastructure on local roads. Active building facades scored 6 out of 6 in Blocks 1 and 2 and 4 out of 6 in Block 3, indicating relatively active street frontages along commercial corridors. Overall, the Walk principle is only partially fulfilled, with performance concentrated on arterial roads and absent on secondary road networks.

#### b. Cycling Infrastructure

Although bicycle lane markings were observed on portions of the main arterial corridors during field survey, these facilities do not meet the ITDP Cycle indicator criteria for a complete and continuous bicycle lane network. The observed markings were discontinuous, absent on local and neighborhood roads, and not accompanied by dedicated bicycle parking at any point within the study area. Consequently, all three blocks received a score of 0 on both the bicycle lane network and bicycle parking sub-indicators. This confirms that the Cycle principle is the weakest dimension in the Rajabasa TOD assessment. The existing partial markings represent a foundation that could be developed into a complete network, but in their current state they do not constitute functional cycling infrastructure as defined by the ITDP standard. Figure 3 presents the spatial distribution of bicycle infrastructure in the study area.




**(a)** **(b)**

**Figure 3.** Pedestrian accessibility map of the study area (a), Bicycle lane distribution within the study area (b).

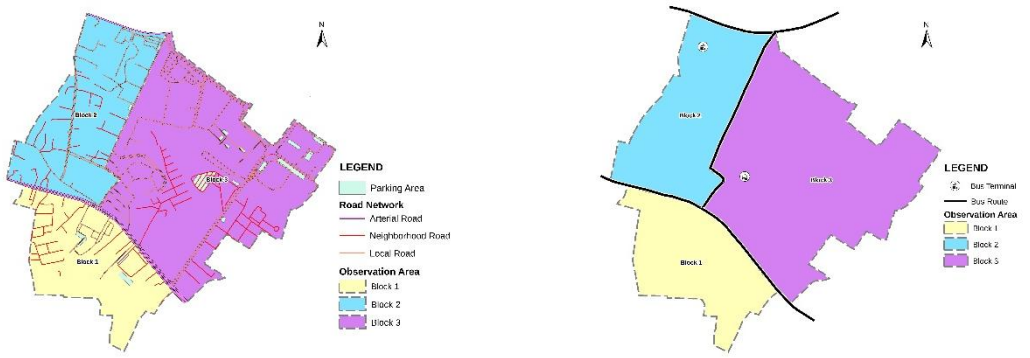
### 3.3 Connectivity and Transit Accessibility

The road network within the study area (**figure 4**) consists of arterial, local, and neighborhood roads forming a hierarchical structure that connects all three blocks to Arabas Terminal as the primary transit node. The Connect indicator measuring intermodal connectivity received a maximum score of 5 out of 5 across all blocks, reflecting the availability of multiple transit modes accessible on foot from within the catchment zone. Rajabasa Terminal is served by multiple public transportation modes, including AKAP intercity buses, AKDP intraprovincial buses, and the Trans Bandar Lampung BRT corridor. Under the ITDP Transit indicator, walking distance to public transport was assessed as a fixed condition fulfilled across all three blocks, given the terminal's central position within the study area. The Compact sub-indicator measuring the number of accessible public transportation options on foot scored 2 out of 2 in all blocks. Despite these strengths in connectivity, the absence of protected pedestrian and cycling routes linking residential areas to the terminal remains a critical gap that limits the overall quality of transit access.

### 3.4 Land Use Mix, Density, and Compactness

#### a. Mix

Mixed land use scored the maximum of 8 out of 8 across all three blocks, reflecting the presence of residential, commercial, public service, and transit land uses within the catchment zone. This result indicates that the foundational land use diversity required for TOD is already present in the Rajabasa area, providing a strong base for future intensification.




**(a)** **(b)**

**Figure 4.** Road network and off-street parking distribution map (a), Public transportation route map within the Rajabasa Terminal catchment area (b)

### b. Densify

Residential density analysis indicates that the majority of the study area falls within the very low to low density range of 0–40 dwellings per hectare across all three blocks. Moderate density (41–100 dwellings/ha) is observed only in limited pockets along arterial corridors in Block 3. No area within the study zone reaches the high-density threshold required to satisfy the ITDP Densify indicator. Consequently, all three blocks received a score of 0 on both Densify sub-indicators non-residential density above baseline and total housing units per hectare above reference. This finding indicates that land use intensity around Rajabasa Terminal remains well below TOD-recommended density levels, significantly limiting the potential for transit ridership generation through residential catchment.

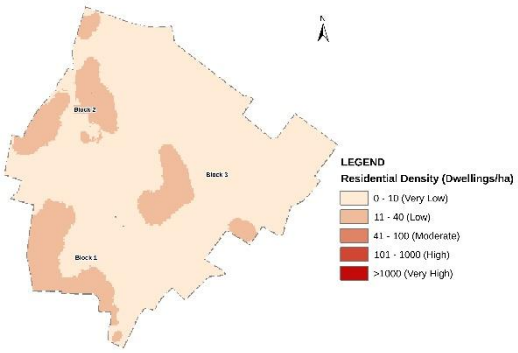



**Figure 5**. Residential density distribution map of the study area

### c. Compact

The Compact indicator, measuring the number of building sides adjacent to the built-up urban area, scored 8 out of 8 across all blocks, indicating that the physical built environment within the study area is already sufficiently compact and continuous. This result reflects the mature urban

character of the Rajabasa catchment zone, where building coverage is generally high along arterial and local road corridors.

### 3.5 TOD Scoring and Classification

**Table 5.** Maximum Adjusted Score (max = 61)

| Principle | Parameter | Total Score | Score obtained | | |
|---|---|---|---|---|---|
| | | | Block 1 | Block 2 | Block 3 |
| Walk | Pedestrian Paths | 3 | 0 | 0 | 3 |
| | Pedestrian crossings | 3 | 0 | 0 | 0 |
| | Active building façade | 6 | 6 | 6 | 4 |
| Cycle | Bicycle lane network | 2 | 0 | 0 | 0 |
| | Bike parking | 1 | 0 | 0 | 0 |
| Connect | Connectivity between modes of transportation | 5 | 5 | 5 | 5 |
| Transit | Walking distance to public transport | Fixed Conditions | Fulfilled | Fulfilled | Fulfilled |
| Mix | Mixed land use | 8 | 8 | 8 | 8 |
| Densify | Non-residential density higher than baseline | 7 | 0 | 0 | 0 |
| | The total number of housing units per hectare is higher than the reference | 8 | 0 | 0 | 0 |
| Compact | The number of sides of the building adjacent to the built-up area (urban area) | 8 | 8 | 8 | 8 |
| | The number of different public transportation options that can be accessed on foot | 2 | 2 | 2 | 2 |
| Shift | Off-street parking | 8 | 8 | 8 | 8 |
| | Total score | 61 | 37 | 37 | 38 |
| | Total score ( % ) | 100 | 60.66 | 60.66 | 62.3 |

Based on the aggregated scoring results presented in Table 4, all three analytical blocks achieved a Bronze rating under the adjusted ITDP TOD Standard 3.0 classification. Block 1 and Block 2 each obtained an adjusted score of 37 out of 61 (60.66%), while Block 3 recorded a marginally higher score of 38 out of 61 (62.30%), as summarized in Table 5. The score difference between blocks is primarily attributable to Block 3's stronger pedestrian path provision, reflecting its closer proximity to the terminal entrance and more developed arterial corridor infrastructure.

The Bronze rating indicates that the Rajabasa Terminal catchment area meets only the minimum TOD conformity threshold and falls substantially short of Silver (adjusted score ≥ 43) or Gold (adjusted score ≥ 52) standards. The primary scoring gaps are concentrated in the Cycle dimension (0 out of 3 across all blocks), the Densify dimension (0 out of 15 across all blocks), and the Walk sub-indicator for pedestrian crossings (0 out of 3 in Blocks 1 and 2). These three dimensions collectively account for 18 out of the 24-point gap between the highest recorded score (38) and the Silver threshold (43), confirming that targeted intervention in cycling infrastructure, pedestrian crossings, and residential densification would yield the most direct improvement in TOD performance.

**Table 5.** TOD conformity rating per analytical block.

| Block | Adjusted Score (%) | Maximum Score | Score (%) | TOD Ratings |
|---|---|---|---|---|
| Block 1 | 37 | 61 | 60.66% | Bronze |
| Block 2 | 37 | 61 | 60.66% | Bronze |
| Block 3 | 38 | 61 | 62.30% | Bronze |

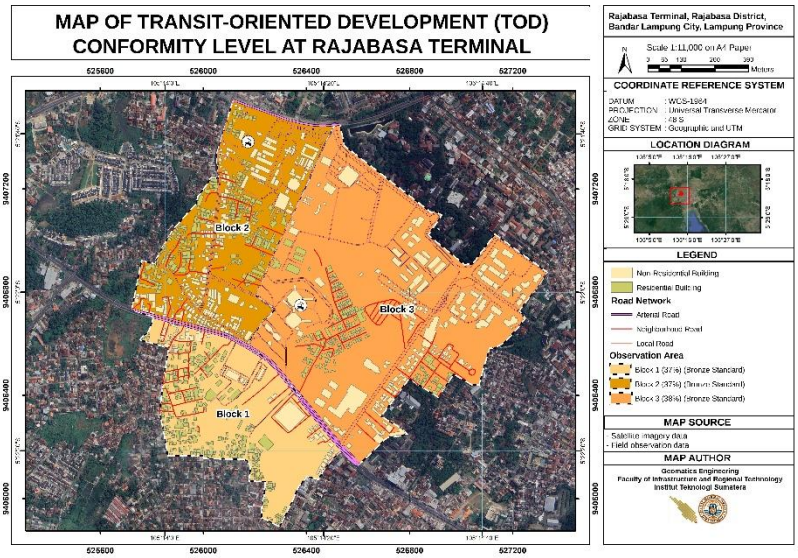



**Figure 8.** Map of the Conformity Level of Transit Oriented Development ( TOD ) at Rajabasa Terminal.

### 3.6 Planning Implications

The findings of this study point to four priority intervention areas required to advance the Rajabasa Terminal catchment toward Silver TOD standard. First, the most immediately actionable improvement is the development of a continuous and protected pedestrian network including sidewalks with minimum clear width of 1.8 meters, barrier-free design, and safe crossing facilities along all road categories within the catchment zone, with particular urgency on local and neighborhood roads in Blocks 1 and 2. Second, the establishment of a dedicated bicycle lane network connecting residential areas, commercial nodes, and the terminal entrance, accompanied by secure bicycle parking at the terminal access points, would directly address the zero-score Cycle dimension and unlock additional scoring potential without requiring major land use changes. Third, increasing residential and mixed-use density within the catchment zone particularly through infill development incentives and regulatory provisions for vertical housing adjacent to the transit node is essential to meeting the Densify threshold. Fourth, parking management strategies, including supply caps, transit-integrated pricing, and the reorientation of existing off-street parking toward shared multimodal mobility hubs, are needed to translate the currently high Shift score from a descriptor of private vehicle infrastructure into a genuine instrument of mode shift. These four interventions should be embedded within the next revision of Bandar Lampung City's RDTR to ensure regulatory enforceability and long-term implementation accountability

## 4. Conclusions

This study assessed the level of Transit-Oriented Development (TOD) conformity in the Rajabasa Terminal area, Bandar Lampung, using the ITDP TOD Standard 3.0 framework applied across three spatial blocks within a 400-meter catchment zone, with block boundaries defined by the existing road network.

Assessment results indicate that all three blocks achieved a Bronze rating, with adjusted scores of 37 (Blocks 1 and 2) and 38 (Block 3) out of a maximum of 61, equivalent to 60.66% and 62.30% respectively. These results confirm that the study area meets only the minimum TOD conformity threshold and has not yet reached Silver or Gold standards

The relative strengths of the area are identified in:

1. Diverse mixed land use within the catchment zone;
2. Strong intermodal connectivity supported by the strategic position of Rajabasa Terminal as an AKAP and AKDP node;
3. Accessible public transportation options within walking distance; and
4. The presence of off-street parking facilities.

The principal weaknesses are:

1. Uneven pedestrian infrastructure, with sidewalks and crossings present only on arterial corridors and absent from local and neighborhood roads;
2. The absence of a continuous and functional bicycle lane network and bicycle parking facilities;
3. Low and fragmented residential and non-residential density that does not meet ITDP Densify thresholds; and
4. Continued dominance of private vehicle use, indicating that the Shift principle has not been meaningfully achieved.

These results indicate that, despite Rajabasa Terminal's strategic function as an intercity and BRT node, TOD implementation around bus-based transit infrastructure in medium-sized Indonesian cities remains constrained primarily by pedestrian and cycling infrastructure deficits and low surrounding density, rather than by connectivity or land-use diversity. The persistence of a Bronze-level rating across all three blocks suggests that bus-terminal-based TOD faces structural challenges distinct from rail-based systems, particularly in translating strategic transit function into pedestrian- and density-supportive surrounding development. This pattern implies that TOD planning instruments calibrated for rail transit cannot be directly transposed to bus-terminal contexts; instead, planning priorities should be sequenced to first address non-motorized infrastructure and density regulation before pursuing higher-order TOD outcomes such as modal shift. These findings contribute to the growing body of TOD literature in Indonesia by demonstrating both the applicability and the contextual limitations of the ITDP TOD Standard 3.0 in a bus-terminal setting within a medium-sized city a context that has received comparatively little scholarly attention relative to metropolitan rail-based TOD studies, and by illustrating how standardized TOD frameworks require contextual recalibration when applied beyond rail transit.

## 5. Limitations

This study is subject to several limitations. First, the assessment relies on physical and spatial indicators derived from the ITDP TOD Standard and does not incorporate resident or commuter

travel-behavior data. Second, the single-case design limits the generalizability of findings to other bus-terminal contexts in Indonesia. Third, socioeconomic dimensions of transit accessibility, such as affordability and equity of access, were not examined. Future research should therefore incorporate network-based walkability assessment, resident and commuter perception surveys, and comparative analysis across multiple medium-sized Indonesian cities to further validate and refine the evaluative framework applied in this study.

## 6. Declaration of Interest

The authors declare that I have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## References

Agustin, I. W., & Hariyani, S. (2022). The implementation of "Transit Oriented Development" in the Tugu – Kertanegara Area, Malang City. *Journal of Regional and Urban Development*, *18*(1), 76–97. https://doi.org/10.14710/pwk.v18i1.33836

Azizah, A., Pratama Sari, D., Adelia Putri, N., Sri Asih, R., & Syarif, S. (2025). Area Design with a Transit Oriented Development Approach in the Lempake Samarinda Terminal Area. *TRANSFORM: Journal of Tropical Architecture and Sustainable Urban Science*, *4*(2). https://doi.org/10.30872/transform.v4i2.4290

*Central Statistics Agency of Lampung Province*. (2023). Central Statistics Agency of Lampung Province. https://lampung.bps.go.id

Fadhil, D. N., Wihanesta, R., Aulifia, R., Surjadi, P., Hakim, S., Pribadi, Y. S., Silitonga, S. A., Nabila, G., Aryani, B., & Alwi, B. (2024). *Unraveling the Complexity of Urbanization and Sustainable Urban Development, Encouraging Solutions for Inclusive and Resilient Indonesian Cities*. https://wri-indonesia.org/id/wawasan/mengurai-kompleksitas-urbanisasi-dan-pembangunan-kota-berkelanjutan-mendorong-solusi-untuk

Hasibuan, H. S., Koestoer, R. H., Permana, C. T., Danial, M. H., Marzukhi, M. A., & Elizandri, B. N. (2024). The progression of transport infrastructures and Transit Oriented Development (TOD) areas in Jakarta and Kuala Lumpur suburban: Lessons from policy approach. *Journal of Infrastructure Policy and Development*, *8*(9), 6025. https://doi.org/10.24294/jipd.v8i9.6025

Hasibuan, H. S., & Mulyani, M. (2022). Transit-Oriented Development: Towards Achieving Sustainable Transport and Urban Development in Jakarta Metropolitan, Indonesia. *Sustainability*, *14*(9), 5244. https://doi.org/10.3390/su14095244

Indradjati, P. N. (2024). Walking Choice in Medium-sized and Small Cities: *International Review for Spatial Planning and Sustainable Development*, *12*(3), 139–160. https://doi.org/10.14246/irspsd.12.3_139

*Ministry of Transportation of the Republic of Indonesia.* (2020). Revitalization of Rajabasa Lampung Type A Bus Terminal. Ministry of Transportation of the Republic of Indonesia. https://portal.dephub.go.id/post/read/kemenhub-revitalisasi-terminal-bus-tipe-a-rajabasa-lampung

Ricardianto, P., Suryobuwono, A. A., Liana, E., & Endri, E. (2023). Implementation strategy of transit-oriented development based on the bus rapid transit system in Indonesia. *Decision Science Letters*, *12*(3), 551–560. https://doi.org/10.5267/j.dsl.2023.4.008

Ridho, R., Putra, B. H. R., Adiman, E. Y., & Audah, S. (2023). STUDY OF THE POTENTIAL ARRANGEMENT OF THE MANGKANG TERMINAL AREA BASED ON TRANSIT ORIENTED DEVELOPMENT (TOD). *Journal of Archives of Civil Engineering and Planning*, *6*(2), 93–102. https://doi.org/10.24815/jarsp.v6i2.30914

Ronan. (2023, Juli 13). *Decarbonisation Pathways for Indonesian Sustainable Urban Mobility (DISUM)* [Text]. ITF. https://www.itf-oecd.org/decarbonisation-pathways-indonesian-sustainable-urban-mobility-disum

*RRI.co.id*. (2024). Rajabasa Terminal Will Appear With A New Face. https://rri.co.id/bandar-lampung/regional/591468

Taki, H. M., Pratiwi, C. A., & Marasabessy, M. A. (2024). THE ANALYSIS OF APPLICATION AND CHARACTERISTICS OF TOD FATMAWATI AREA. *Journal of Synergy Landscape*, *1*(2), 418–422. https://doi.org/10.25105/tjsl.v1i2.19449

Taki, H. M., Wicaksono, R., & Badawi, M. A. (2023). Transit Oriented Development (TOD) network arrangement system in the City of Jakarta. *IOP Conference Series: Earth and Environmental Science*, *1263*(1), 012032. https://doi.org/10.1088/1755-1315/1263/1/012032

Tam, A. (2024, Juli 15). Building the Momentum for Transport Electrification in Indonesia. *Institute for Transportation and Development Policy - Promoting sustainable and equitable transportation worldwide*. https://itdp.org/2024/07/15/building-momentum-for-transport-electrification-in-indonesia/

Uddin, Md. A., Hoque, Md. S., Tamanna, T., Adiba, S., Muniruzzaman, S. Md., & Parvez, M. S. (2023). A framework to measure transit-oriented development around transit nodes: Case study of a mass rapid transit system in Dhaka, Bangladesh. *PLOS ONE*, *18*(1), e0280275. https://doi.org/10.1371/journal.pone.0280275

Yang, Y., Zhong, C., & Gao, Q.-L. (2022). An extended node-place model for comparative studies of transit-oriented development. *Transportation Research Part D: Transport and Environment*, *113*, 103514. https://doi.org/10.1016/j.trd.2022.103514

Yazid, H., Hasibuan, H. S., & Koestoer, R. H. (2023). Walkability Concept Toward Sustainable City: Comparative Insights of Brisbane and Bogor Urban Areas. *Indonesian Journal of Environmental Management and Sustainability*, *7*(1), 20–26. https://doi.org/10.26554/ijems.2023.7.1.20-26