SINEKTIKA Jurnal Arsitektur

p-ISSN: 1411-8912
e-ISSN: 2714-6251
http://journals.ums.ac.id/index.php/sinektika

ASSESSING URBAN VIBRANCY LEVEL OF TRANSIT-ORIENTED DEVELOPMENT AREA IN LEMPUYANGAN STATION, YOGYAKARTA

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History of the manuscript:
Manuscript submitted March 25, 2026
Manuscript accepted July 1, 2026

ABSTRACT

This study assesses the level of urban vibrancy within the Transit-Oriented Development (TOD) area of Lempuyangan Station, Yogyakarta, to evaluate how transit proximity contributes to the formation of an active and integrated urban environment. A quantitative spatial analysis is applied using a 400-meter TOD radius divided into 100 × 100 m grid cells to capture street-level dynamics. Urban vibrancy is measured through a composite index combining mixed-use diversity, morphological permeability, and concentration of people, represented by the Residential–Non-Residential Ratio (RNR), Building Mix Index (BuMi), intersection density, population density, and Point of Interest (POI) distribution. All indicators are normalized using min–max scaling and equally weighted to produce a vibrancy index ranging from 0 to 1. The results show a low weighted average index of 0.31, indicating that the TOD area is dominated by border vacuums (35.5%), formed by large monofunctional infrastructure that interrupts spatial continuity, while most of the area falls into potential vibrant zones (52.97%) where transit proximity exists but lacks sufficient density and functional diversity. Only 11.53% of the area reaches the vibrant category, appearing as small and fragmented active cores, and no grid achieves a very high level of vibrancy. These findings suggest that transit accessibility alone is insufficient to generate urban vibranacy due to monofunctional land use, low mix diversity, large impermeable blocks, and the spatial separation between residential concentration and activity centers. Strengthening vibrancy in the Lempuyangan TOD area therefore requires land-use diversification, increased development density, improved block permeability, and the transformation of inactive edges into active urban seams to create a more balanced and sustainable TOD environment.

KEYWORDS: Lempuyangan Station, spatial analysis, Transit-Oriented Development, urban vibrancy, Yogyakarta

Penelitian ini menilai tingkat vibrancy *perkotaan di kawasan* Transit-Oriented Development (TOD) *Stasiun Lempuyangan, Yogyakarta, untuk mengevaluasi peran kedekatan transit dalam membentuk lingkungan yang aktif dan terintegrasi. Analisis spasial kuantitatif menggunakan radius TOD 400 meter yang dibagi ke dalam grid 100 × 100 m untuk menangkap dinamika skala jalan.* Vibrancy *diukur melalui indeks komposit yang menggabungkan keberagaman mixed-use, permeabilitas morfologi, dan konsentrasi manusia, direpresentasikan oleh* Residential–Non-Residential Ratio *(RNR),* Building Mix Index *(BuMi), kepadatan persimpangan, kepadatan penduduk, dan distribusi* Point of Interest (POI). *Seluruh indikator dinormalisasi dengan min–max scaling dan diberi bobot sama untuk menghasilkan indeks 0–1. Hasil penelitian menunjukkan nilai rata-rata tertimbang yang rendah sebesar 0,31, yang mengindikasikan bahwa kawasan* TOD *didominasi oleh* border vacuums *(35,5%), terbentuk oleh infrastruktur monofungsi berskala besar yang memutus kontinuitas spasial, sementara sebagian besar area termasuk dalam kategori* potential vibrant *(52,97%), yaitu kondisi di mana kedekatan dengan transit sudah ada tetapi belum didukung oleh kepadatan dan keberagaman fungsi yang memadai. Hanya 11,53% area yang mencapai kategori* vibrant*, muncul sebagai inti aktivitas yang kecil dan terfragmentasi, dan tidak ada grid yang mencapai tingkat* vibrancy *sangat tinggi. Temuan ini menunjukkan bahwa aksesibilitas transit saja tidak cukup untuk menghasilkan* vibrancy *perkotaan, karena masih didominasi oleh penggunaan lahan monofungsi, rendahnya keberagaman fungsi, blok yang tidak permeabel, serta pemisahan spasial antara konsentrasi hunian dan pusat aktivitas. Oleh karena itu, peningkatan* vibrancy *di kawasan TOD Lempuyangan memerlukan diversifikasi penggunaan lahan, peningkatan kepadatan pembangunan, perbaikan permeabilitas blok, serta transformasi tepi yang tidak aktif menjadi* urban seams *yang aktif guna menciptakan lingkungan TOD yang lebih seimbang dan berkelanjutan.*

KATA KUNCI: *Stasiun Lempuyangan, analisis spasial,* Transit-Oriented Development*,* vibrancy *perkotaan, Yogyakarta*

INTRODUCTION

The implementation of Transit-Oriented Development (TOD) has emerged as a cornerstone of spatial planning and urban transformation in the Special Region of Yogyakarta. According to the the Long-Term Development Plan of Yogyakarta Municipality 2025–2045, key transport nodes such as Tugu, Lempuyangan, and Giwangan are officially designated as primary economic catalysts and strategic urban zones. This policy direction is further reinforced by the Spatial Plan of the Special Region of Yogyakarta 2023–2043, which positions these transportation hubs as vital components for enhancing accessibility within the context of the philosophical axis corridor. At the municipal level, the Regional Spatial Plan of Yogyakarta 2021–2041 identifies Stasiun Lempuyangan as a critical study area due to its strategic location and its proximity to the heritage district of Kotabaru (Figure 1). Consequently, the development of Lempuyangan is not merely a transport project but a central element of the city's long-term identity and economic resilience.

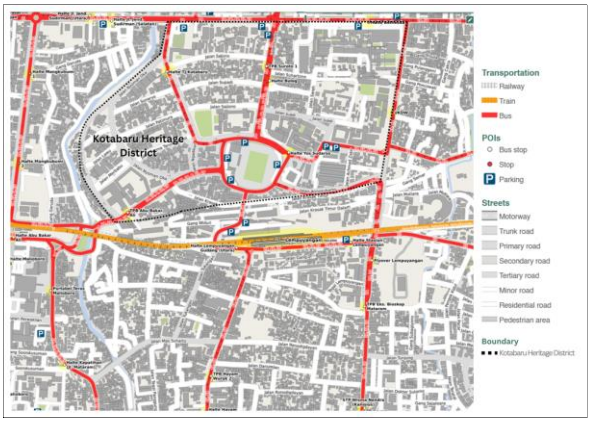

Figure 1. Transportation Network and Strategic Position of Lempuyangan Station Near Kotabaru Heritage District (Source: ÖPNVKarte, 2026, retrieved from https://www.xn--pnvkarte-m4a.de/#110.3738;-7.7987;15)

Despite these high-level strategic designations, a significant performance gap exists between policy intent and spatial reality. TOD, defined as the integration of public transport with compact, mixed-use, and accessible urban development to reduce car dependency (ATR, 2017; Calthorpe, 1993), remains insufficiently realized in this context. Stasiun Lempuyangan exhibits a TOD index of 0.465, indicating a relatively low level of alignment with TOD principles (density, diversity, and connectivity) compared to Stasiun Tugu, which achieves a higher index of 0.600 (Rufia & Diyono, 2024). Although the station serves as a primary integration point for the KRL Jogja-Solo commuter line and Trans Jogja bus services, the surrounding area suffers from low vitality and significant activity gaps (Wibowo et al., 2021) . This quantitative gap highlights a failure to fully maximize the potential of Lempuyangan as a transit hub, despite its role as a critical node in the regional rail network. Consequently, the area presents a representative case for studying how a transit station can possess high connectivity yet struggle to foster the dense, vibrant urban life typically associated with successful TOD.

This lack of vitality is physically manifested in a starkly divided urban landscape between the northern side of the station in the Gondokusuman District and the southern side in the Danurejan District. The northern side, specifically the Kotabaru area, functions as a powerful crowd generator characterized by high land-use diversity, commercial activity, and office spaces that sustain interaction throughout the day. In contrast, the southern side is dominated by monofunctional residential areas that exhibit passive, temporal activity rhythms, often resulting in a quiet atmosphere during the night hours. Foot traffic data collected during morning (08:00), noon (12:00), and night (20:00) clearly shows this contrast, reflecting fragmented urban rhythms rather than a cohesive and integrated TOD ecosystem.

Understanding these fragmented rhythms requires a look at urban vibrancy, which serves as a critical barometer for TOD success. The synergy between high-density transit nodes and diverse land uses creates a self-sustaining ecosystem of social and economic activity (Xiao et al., 2021; Yu et al., 2022). According to the foundational theories (Jacobs, 1961), vibrancy is not merely a byproduct of design but a dynamic manifestation of continuous human interaction within the physical environment, which, when integrated with TOD principles like the 5Ds, Density, Diversity, Design, Distance, and Destination (Ewing & Cervero, 2010) that transforms transit stations from mere transit points into place-based urban centers. Urban vibrancy is further sustained by the presence of mixed-use environments that ensure a constant flow of users throughout the day, fostering a sense of liveliness and public safety (Garvin, 2019; Montgomery, 1998). The relationship between TOD and urban vibrancy tends to be nonlinear, in which specific thresholds of TOD intensity must be reached before substantial gains in vibrancy emerge (Peng et al., 2023; Rao & Zhu, 2024). By prioritizing pedestrian-oriented design and social connectivity (Gehl, 2013), a vibrant TOD area mitigates the risk of fragmented spaces, ensuring that infrastructure supports inclusive urban growth and long-term environmental sustainability (Calthorpe, 1993).

The theoretical anchor for this synergy lies in the relationship between physical urban forms and human behavior. Jane Jacobs’s (1961) four generators of diversity (mixed uses, small blocks, aged buildings, and concentration) function as the structural catalysts required to sustain a "sidewalk ballet" of spontaneous interaction. Conversely, Jacobs identifies "border vacuums" which is large-scale, single-function structures like railways, campuses, or highways, as forces that stifle vibrancy by creating dead ends that interrupt urban flow. These borders transform "general land" into stagnant "special land", diminishing the natural surveillance of "eyes on the street" and weakening economic activity.

To bridge the gap between these theoretical frameworks and empirical evidence, contemporary research has transitioned from traditional manual observations toward the integration of multi-source urban big data. Early foundations of vibrancy research relied on human-scale techniques, most notably Jan Gehl's framework, which addresses five core questions: how many, who, where, what, and how long, through manual pedestrian counts, behavioral mapping, individual shadowing, and semi-structured interviews (Gehl & Svarre, 2013; Merlino, 2011). While these methods successfully transform subtle behavioral patterns into credible, human-oriented design evidence, they are often labor-intensive and prone to bias. The emergence of geospatial big data, consisting of large-scale, spatio-temporal datasets from digital platforms, now overcomes these limitations by measuring previously intangible urban qualities at scale. Researchers utilize Point of Interest (POI) data as a quantitative proxy for mixed primary uses (Gao et al., 2024; Rambe & Wibisono, 2025), mobile phone signaling data to measure population intensity (Botta & Gutiérrez-Roig, 2021; Collins et al., 2024; Jia et al., 2021; Rao & Zhu, 2024), social media check-ins to capture social popularity (Gao et al., 2024; Peng et al., 2023; Xiao et al., 2025), and public transport data, such as smart card tap-in/out records and GPS trajectories from ride-sharing services, offer detailed insights into urban mobility patterns and network connectivity (Tu et al., 2022). Collectively, these data sources create a comprehensive, data-driven picture of modern urban vibrancy.

The analysis of these datasets typically occurs across multiple scales, ranging from macro-city grids to micro-street segments. At the macro level, studies in cities like Oslo and Shenzhen utilize 1×1 km to 2×2 km grids to maintain size consistency and capture city-wide trends, such as mobile phone locating requests (Chen & Huang, 2024; Lang et al., 2022). Moving to the meso-district scale, researchers often employ 50 m to 100 m grids to homogenize spatial data from census tracts and buildings, aligning the analysis with Jane Jacob's street-level perspective and the JANE Index (Delclòs-Alió & Miralles-Guasch, 2018; Gómez-Varo et al., 2022). At the most granular micro-scale, the focus shifts to road segments of 10 m to 200 m buffers. This high-resolution approach, applied in cities like Seoul and Beijing, treats the street as the fundamental unit of urban awareness, allowing for the characterization of floating populations and human-eye perspectives on visual-spasial features (Jang et al., 2024; Lu et al., 2023).

This research aims to examine the synergy between transit proximity and active urban use. To address this, the study focuses specifically on answering the core question: *What is the level of urban vibrancy in the Transit-Oriented Development area of Lempuyangan Station?* Ultimately, the objective of this research is to diagnose the area's current ability to support dynamic urban life by mapping the exact spatial distribution of its vibrant zones, potential vibrancy areas, and stagnant border vacuums. Through this spatial lens, the study provides an empirical breakdown of how the presence of a transit hub and the surrounding urban form interact to shape the vibrancy patterns observed at this critical rail node.

METHODS

Study Area

The research focuses on the TOD area of Lempuyangan Station, a railway node in Yogyakarta, Indonesia. The study area is delineated using a 400-meter buffer radius from the station's center, representing the standard comfortable walking distance in tropical urban contexts (Indradjati, 2024; Pueboobpaphan et al., 2022). Administratively, this area spans the Gondokusuman and Danurejan Districts, covering approximately 83.46 hectares (Figure 2). This spatial boundary transforms the station from a mere transit point into an urban district where population density and diverse activities can be measured accurately.

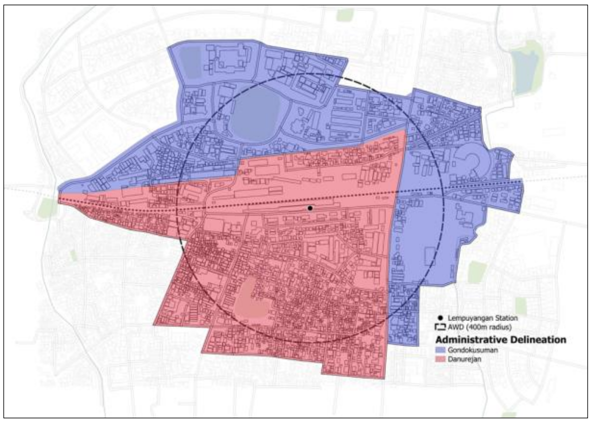

Figure 2. Administrative Delineation of Study Area
(Source: Author's Document, 2026)

To capture street-level dynamics, the study area is divided into a micro-scale analysis system using 100 x 100-meter grid cells (Figure 3). This resolution is specifically chosen to reflect the street-level perspective popularized by Jane Jacobs, allowing for a granular observation of urban life that larger administrative boundaries often obscure (Delclòs-Alió & Miralles-Guasch, 2018). By utilizing a consistent grid, the research ensures a standardized unit for aggregating diverse spatial data. Furthermore, this unit aligns with the default resolution of demographic datasets, enabling seamless data integration without the statistical risks associated with resampling.

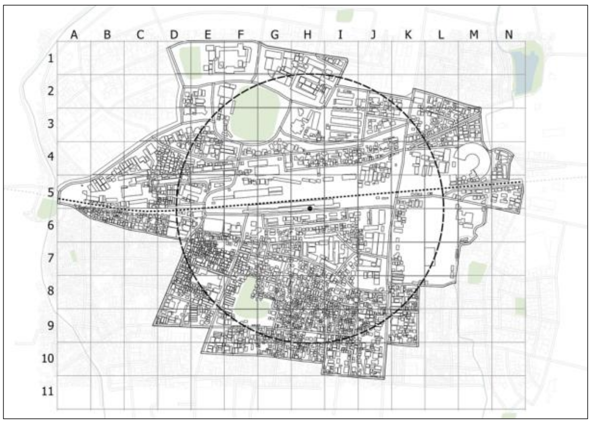

Figure 3. Grided Study Area
(Source: Author's Document, 2026)

Data Collection

Data collection was conducted between September and December 2025 to capture the existing physical and operational status of the Lempuyangan TOD area. The assessment of urban vibrancy relies on three primary components: mixed-use diversity, permeability (short blocks), and concentration of people. Mixed-use data was obtained through field surveys of building functions to determine the Building Coverage Ratio (BCR) for Residential and Non-Residential (RNR) categories, which serves as the foundation for the structural balance analysis. This balance is quantified using the Residential-Non-Residential Ratio (RNR), while functional diversity is measured through the Building Mix Index (BuMi). Both formulations are adapted from the methodology established by (Delclòs-Alió & Miralles-Guasch, 2018; Gómez-Varo et al., 2022) to calculate the entropy of distribution across distinct land-use categories. Street permeability data, specifically intersection density, were extracted from OpenStreetMap and Google Maps to measure the ease of movement within each grid. Finally, the concentration of people was modeled by integrating WorldPop raster data (calibrated with official census data from Yogyakarta Municipality Census Bureau) and Point of Interest (POI) density mapped via Google My Maps.

Building age is excluded from the urban vibrancy assessment primarily due to significant data availability constraints in the Lempuyangan study area. While the researcher acknowledges that building age is theoretically a crucial element for fostering economic and social diversity, there is currently no comprehensive, granular, or integrated spatial database that records the construction year of every building in this specific location.

$$RNR = 1 - \left| \frac{BCR_{resi} - BCR_{nonresi}}{BCR_{total}} \right|$$

$$BuMi = \frac{-\sum_{i=1}^{n}(P_i \times \ln P_i)}{\ln(n)\ n}$$

Where:
P_i: The proportion of BCR for function i relative to the total built-up area
n: The total number of functional categories ($n = 5$)

Data Analysis

The analysis employs a composite Urban Vibrancy Index calculated at the 100-meter grid level to maintain a street-level perspective. Because the indicators (ratios, densities, and counts) use different units, a min-max normalization is applied to transform all raw data into a standardized scale of 0 to 1. The final vibrancy score is derived using an equal weighting method, assuming that land-use diversity, physical connectivity, and human concentration contribute equally to urban vitality, as suggested by Jane Jacob's theories. To account for the edge effect where the 400-meter buffer cuts through grid cells, an area-weighted average is used to calculate the aggregate vibrancy of the entire precinct. The results are classified into four intensity levels (very low to very high) and categorized into spatial archetypes: border vacuums (0.00–0.25) for stagnant areas, potential vibrancy (0.26–0.50) for developing zones, and vibrant (0.51–1.00) for active urban cores.

RESULTS AND DISCUSSION

Spatial Condition in Lempuyangan TOD Area

The spatial distribution of building functions in the Lempuyangan Station area was dominated by residential use. As shown in the mapping results (Figure 4), housing permeates almost the entire study area, particularly within the southern and central sectors, creating a stable base of local population. Beyond this residential dominance, a strategic clustering of non-residential functions is evident where educational facilities form a significant anchor in the northern and northwestern regions, while commercial and service-oriented buildings gravitate toward the primary road corridors and major intersections. The presence of industrial and transportation infrastructure in a linear, longitudinal pattern across the center of the site reflects the historical evolution of the railway, acting as a functional spine that separates yet connects different urban pockets.

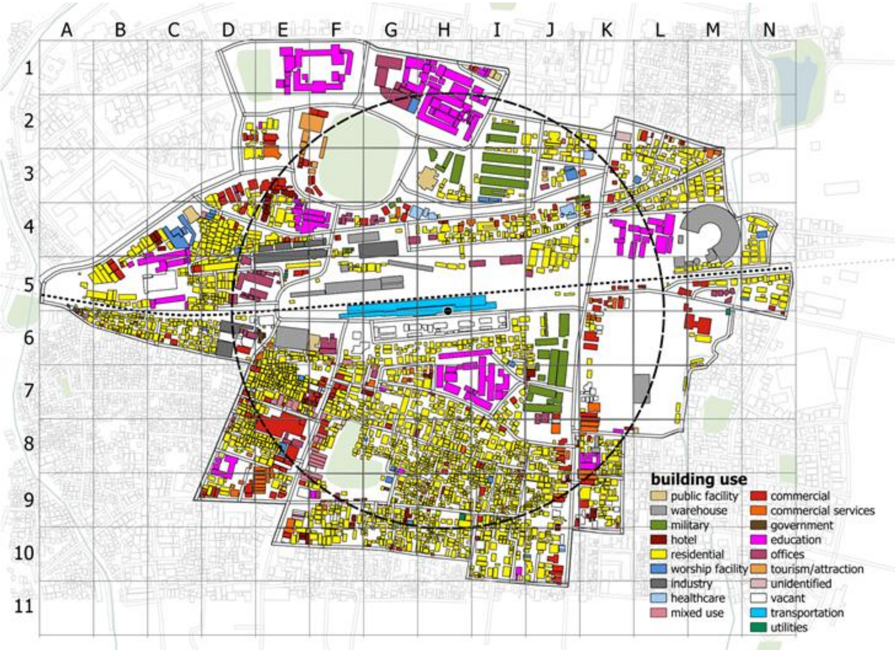

Figure 4. Building Function of Lempuyangan TOD Area
(Source: Author's Document, 2026)

The classification of building functions into specific clusters (Figure 5) ranging from residential and retail/hotel/catering to administrative and services provides a more nuanced understanding for identifying how different land uses contribute to the area's intensity as a destination rather than just a transit point (Chorus & Bertolini, 2011). While the Administration & Services and Education/Health/Culture clusters are robust, the Retail/Hotel/Catering cluster remains limited to specific corridors, and the Industrial & Distribution category represents the smallest spatial proportion. This functional diversity is critical for assessing vibrancy, as a balanced mix of these clusters ensures that the station area remains active beyond transit hours. The current distribution suggests a strong daytime vibrancy driven by administrative and educational sectors, but highlights a potential gap in evening-use functions vital for a fully integrated 24-hour ecosystem.

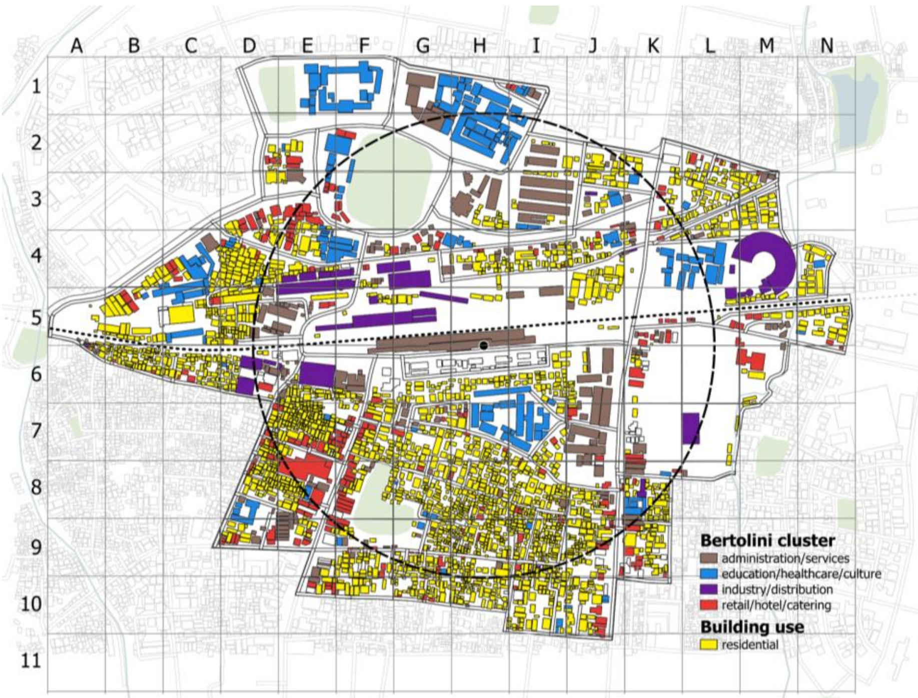

Figure 5. Building Function Classification of Lempuyangan TOD Area
(Source: Author's Document, 2026)

Factors Shaping Urban Vibrancy in Lempuyangan TOD Area

The assessment of urban vibrancy within the Lempuyangan TOD area is built upon three fundamental components: mixed-use diversity, permeability (short blocks), and concentration of people.

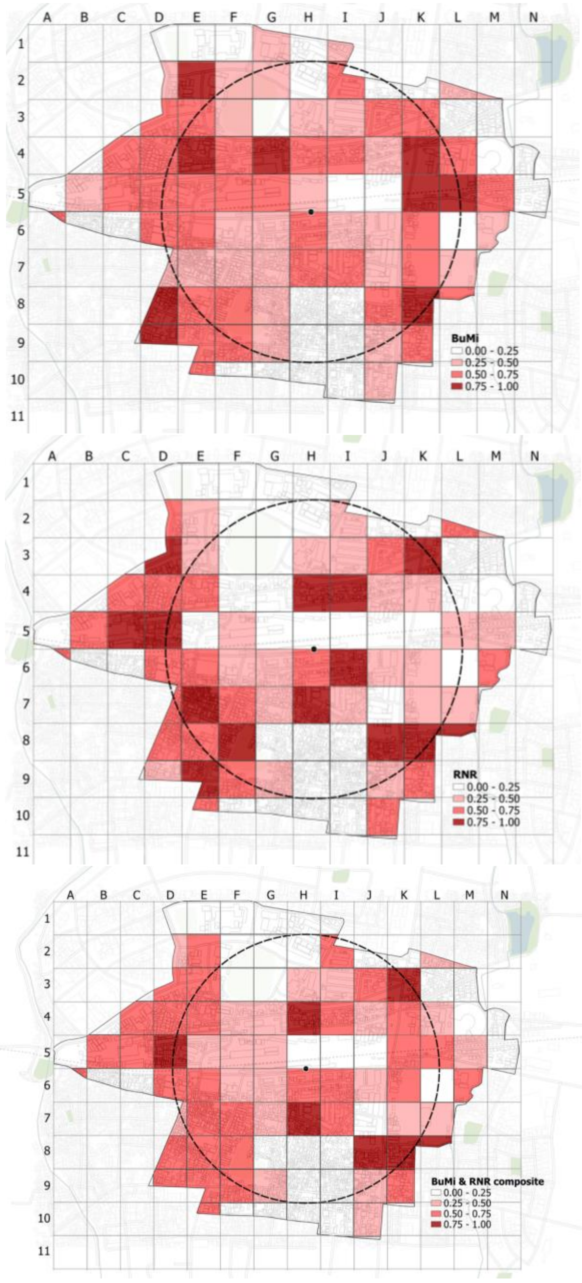

Figure 6. Mixed-Use Heatmap
(Source: Author's Document, 2026)

Based on the RNR and BuMi composite analysis, where BuMi measures functional diversity using an entropy-based approach (0–1) and RNR captures the balance between residential and non-residential uses (0–1), high vibrancy potential is identified in areas where housing is integrated with diverse non-residential clusters (Delclòs-Alió & Miralles-Guasch, 2018; Gómez-Varo et al., 2022). In this study, BuMi is operationalized through an adapted classification of building uses, grouping functions into residential and four non-residential clusters (retail/hotel/catering; education/health/culture; administration/service; and industry/distribution), allowing a more context-specific reading of land-use mix within the TOD framework This combined approach enables a more nuanced interpretation of how variations in land-use composition relate to the spatial distribution of urban vibrancy.

As illustrated in the Mixed-Use Heatmap (Figure 6), a balanced composition facilitates a continuous flow of people and prevents the area from becoming a dead zone during specific hours by ensuring that different functions peak at different times of the day. Conversely, low BuMi and RNR values (0.00 – 0.25) are prevalent in the central core (surrounding the station node) and specific northern segments, where land use remains more homogenous or monofunctional. These areas, often dominated by large-scale special functions like railway infrastructure, gated institutional, or dense singular housing blocks, lack the functional friction and diversity of uses necessary to spark continuous urban activity.

Morphological permeability and the presence of short blocks play a critical role in facilitating micro-interactions within the urban fabric. The analysis of intersection density reveals a stark contrast between the southern and northern sectors of the TOD. The southern and western zones are characterized by a fine-grained local network, where small blocks and frequent intersections, as shown in the Short Blocks Heatmap (Figure 7), enhance pedestrian permeability. Although some areas suffer from cul-de-sacs, the overall high density of nodes supports daily social encounters. In contrast, the presence of large blocks occupied by railway infrastructure, educational institutions, and military zones creates significant barriers, resulting in low connectivity and restricted public access.

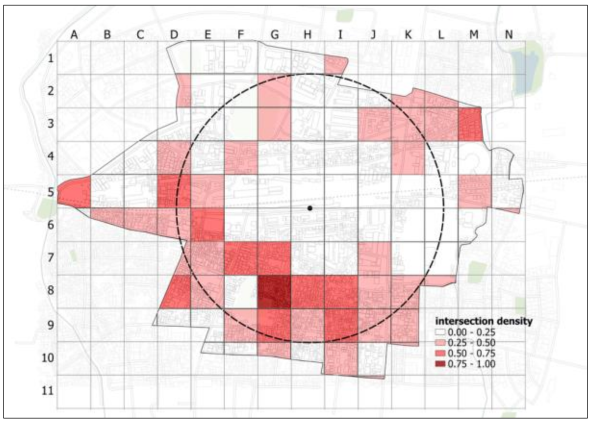

Figure 7. Short Blocks Heatmap
(Source: Author's Document, 2026)

The concentration of people and POI represents the coexistence of a stable user base and activity magnets, which is a prerequisite for a vibrant TOD. In Lempuyangan, Concentration of People Heatmap (Figure 8) highlights a spatial mismatch. The Danurejan district in the south exhibits high population density but fewer formal POIs. Meanwhile, the Gondokusuman district to the north serves as a destination-based with a high concentration of commercial POIs but relatively low residential density. This imbalance suggests that while the south provides the people, the north provides the purpose, yet they remain spatially segregated rather than integrated.

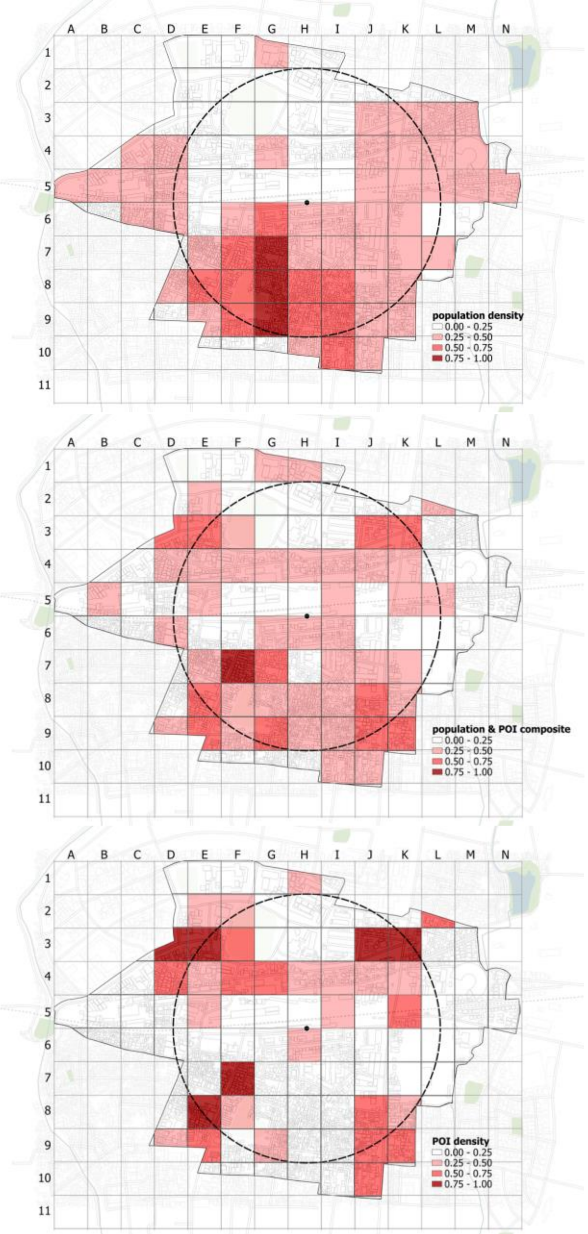

Figure 8. Concentration of People Heatmap
(Source: Author's Document, 2026)

Composite Vibrancy Distribution

The synthesis of the three factors (functional diversity, morphological permeability, and user concentration) culminates in a composite vibrancy index. This index categorizes the Lempuyangan TOD area into four distinct levels of urban vitality, ranging from stagnant zones to active hubs. The classification allows for a clearer understanding of which segments of the TOD are meeting their potential and which are lagging behind. The quantitative distribution of these levels is summarized in the table below:

Table 1. Composite Vibrancy Capacity within the TOD Area

Class	Index Range	Number of Grids	Total Area (ha)	% Area
Very Low	0.00–0.25	45	29.63	35.5%
Low	0.25–0.50	50	44.21	52.97%
High	0.50–0.75	10	9.62	11.53%
Very High	0.75–1.00	0	0	0.00%

The spatial distribution, visualized in the Composite Vibrancy Heatmap (Figure 9), reveals that the Lempuyangan TOD is overwhelmingly dominated by low-intensity conditions. Approximately 88.47% of the study area falls within the "Very Low" (35.5%) and "Low" (52.97%) categories, indicating a significant lack of urban energy. In contrast, areas with "High" vibrancy (scores of 0.50–0.75) account for only 11.53% of the total area and remain highly localized and fragmented, failing to form a dominant, cohesive center of activity. Furthermore, absolutely no grids achieved a "Very High" vibrancy score (0.75–1.00), emphasizing the complete absence of a truly robust urban core. The data suggests that despite the high accessibility and proximity to a transit node, the surrounding environment remains largely passive and underutilized.

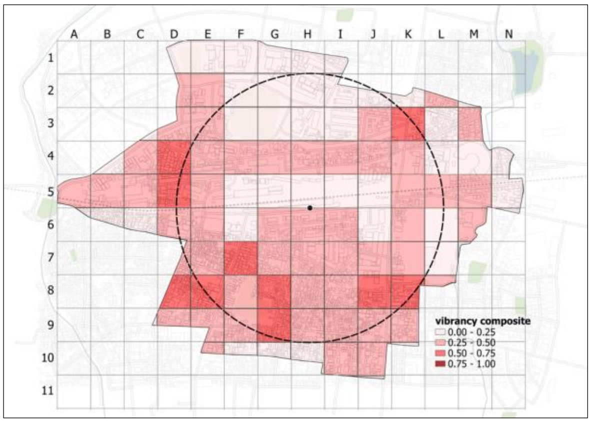

Figure 1. Composite Vibrancy Heatmap
(Source: Author's Document, 2026)

The "Very Low" vibrancy zones, which occupy 35.5% of the study area, act as "border vacuums" primarily due to large-scale monofunctional land uses such as railway infrastructure, logistics zones, large city parks lacking active commercial edges, and enclosed institutional or military complexes. These segments function as physical and social dead zones that interrupt the natural flow of the city, preventing the transit node's energy from diffusing into the surrounding neighborhoods. Because these areas lack active commercial edges or street-level permeability, they remain isolated from the pedestrian network and fail to contribute to the station's functional ecosystem.

The majority of the TOD area (52.97%) is classified as “Low” vibrancy. These zones, identified as “potential vibrancy” represent a state of urban stagnancy where transit proximity is present, but the density required for a thriving environment is lacking. These zones hold basic urban activities but are constrained by structural barriers, including monofunctional residential layouts, massive blocks with low intersection density, and a general lack of human concentration. While not entirely inactive, the individual or combined effect of these built-form constraints physically hinders diverse activities required to transition from passive proximity to active intensity. Consequently, without targeted densification, functional diversification, or the restructuring of massive blocks into shorter, permeable segments, the physical environment will continue to suppress the level of activity necessary for a vibrant urban district.

In contrast, the “High” vibrancy areas, identified as “vibrant”, accounting for 11.53% of the land are notably fragmented, preventing the spillover effect where activity in one block fuels the economic and social life of the next. This spatial disconnection, coupled with the complete absence of any “Very High” vibrancy grids, indicates that Lempuyangan has not yet achieved the peak urban intensity defined by transit-oriented standards. The lack of a cohesive, high-intensity core suggests that the station operates as a localized transit stop rather than a robust, integrated urban epicenter.

The weighted average vibrancy index of 0.31 quantifies a significant discrepancy between the station’s empirical reality and the high-intensity hubs envisioned in transit-oriented area (ATR, 2017; Calthorpe, 1993). These findings underscore that transit accessibility alone is an insufficient catalyst for urban energy. To reverse this, the area requires aggressive land-use diversification and a strategic transformation of stagnant zones and border vacuums (such as large parks and institutional complexes) into “functional seams”. Where physical barriers like railway infrastructure, logistics zones, and military complexes cannot be fully penetrated to allow public circulation, a robust “counterforce” of residential and commercial densification nearby is essential to concentrate a critical mass of people. Without these interventions, Lempuyangan will remain a site of under-actualized urban potential rather than a functional pedestrian epicenter.

CONCLUSION

The study reveals a significant performance gap between the strategic designation of Lempuyangan Station as a primary transit hub and its empirical reality as a vibrant urban center. With a weighted average vibrancy index of only 0.31, the area currently fails to meet the high-intensity standards typically associated with successful TOD. The data shows that a staggering 88.47% of the study area falls into “Very Low” or “Low” vibrancy categories, indicating that the mere presence of high-capacity transit infrastructure and regional connectivity is an insufficient catalyst for fostering urban vitality. Instead of a cohesive, high-intensity core, the station operates as a localized transit stop surrounded by fragmented, underutilized urban pockets.

A primary inhibitor of vibrancy in this precinct is the presence of “border vacuums” created by large-scale, monofunctional infrastructure and institutional barriers. The longitudinal railway corridor, while essential for transport, acts as a physical and social dead zone that bifurcates the district. This is further exacerbated by a stark spatial mismatch between the northern and southern sectors, the Gondokusuman District to the north provides purpose through commercial and educational POIs but lacks residential density, while the Danurejan District to the south provides people but lacks activity magnets. This segregation prevents the natural spillover effect necessary for a self-sustaining urban ecosystem, leaving the vibrant zones (which account for only 11.53% of the area) isolated and unable to influence the broader urban fabric.

To transform Lempuyangan from a passive transit node into a vibrant TOD district, the study suggests that Yogyakarta’s urban planning must move beyond simple accessibility and toward aggressive land-use diversification and structural stitching.This requires converting stagnant border vacuums into “functional seams” by introducing active commercial edges along large parks & institutional blocks and densifying residential/commercial uses in the immediate vicinity of the station. Without targeted interventions to increase functional friction and break down massive blocks into permeable segments, the Lempuyangan TOD area will likely remain under-actualized potential, failing to provide the dynamic urban life envisioned in the city’s long-term development goals.

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