ISSN: 2360-821X ajmrd.editor@gmail.com

American Journal of Multidisciplinary Research & Development

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Important Dates

Paper Submission: 31 December 2025

Author Notification: Within 24 Hours

Review process: 5-7 days

Journal Publication: 10 January 2026

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1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

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Current Issue

"December-2025"

1	**The Impact of Media School Clubs on Students' Media Literacy Skills, specifically for Sri Lanka** Dr. Nayana Suraweera Country: Sri Lanka Page: 01-07	**Department of Mass**	PDF
2	**Evaluation of Changes in Alpha Fetoprotein in Trimesters of Gestation among Pregnant Women Attending Clinic in Enugu State University Teaching Hospital, Enugu, Nigeria.** Ugwuene, Francis Onukwube, Ani, Chiagozie Joseph, Ezugwu Izuchukwu Domitilla. And Ngwu Martina Amuche. Country: Nigeria Page: 08-11	**Allied Health Sciences**	PDF
3	**The Right to Abortion: An Analysis of Zambian Law Vis-À-Vis Sharia Law** Faizan Sedat, Dr Douglas Walter Rolls Country: Zambia Page: 12-23	**Law**	PDF
4	**Morphological Characteristics of Active Frontage for Livable Placemaking in TOD Area** Riza Nurhuda, Dedes Nur Gandarum Country: Indonesia Page: 24-42	**Architecture**	PDF

5	**Implementation of Maternal and Child Program: Case Study in Boven Digoel Regency** M Iriansyah, Fitriani, Edoardus E Maturbongs Country: Indonesia Page: 43-50	**Child health**	
6	**Correlation between the Laboratory and Practicum Performance of the Bachelor of Science in Hotel and Restaurant Management Students in a Higher Educational Institution** Rene D. Osorno, Judy Ann Ong Ferrater-Gimena Country: Philippines Page: 51-58	**Education**	
7	**Assessment on Student Body Organization of Hospitality Management Students** Maria Isabel A. Guillen, Maryneil A. Cumahig, Judy Ann Ong Ferrater-Gimena Country: Philippines Page: 59-70	**Management**	
8	**Technology Empowerment and Narrative Reconstruction: International Brand Communication Strategies of Chinese Enterprises in Africa from the Perspective of AIGC Large Models** WenTao Lin, Si'ao Liao Country: China Page: 71-77	**Studies**	
9	**Quality of Birth Certificate Issuance Services: A Case Study at the Population and Civil Registration Office of Mahakam Ulu Regency, East Kalimantan, Indonesia** Keling, Yonathan Palinggi, Ida Bagus Made Agung Dwijatenaya Country: Indonesia	**Public service**	

	Page: 78-90		
10	**Unveiling the Role of Algebraic Competence in Shaping Grade 11 Students' Success in General Mathematics** Elton John B. Embodo Country: Philippines Page: 91-102	**Education**	

American Journal of Multidisciplinary Research & Development (AJMRD)
*Volume 07, Issue 12 (**December - 2025**), PP 24-42*
ISSN: 2360-821X
www.ajmrd.com

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Morphological Characteristics of Active Frontage for Livable Placemaking in TOD Area

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ABSTRACT: This study examines livable placemaking in transit-oriented development (TOD) areas by focusing on the performance of active frontage and community open space in two study areas: Kebayoran (within an 800 m radius of ASEAN and Blok M BCA MRT Stations) and Senen (within an 800 m radius of Pasar Senen Station). The TOD Livable Placemaking framework is constructed through a systematic review of 317 publications, which are mapped into nine livable placemaking attributes and subsequently synthesized into a relational framework of four key attributes examined in greater depth, namely connectivity & linkage, walkability & cyclability, community engagement, and health & wellbeing. A mixed-methods approach is employed, combining spatial analysis of satellite imagery and street-corridor observations, measurement of active frontage and community open space indices, and user perception questionnaires. The findings indicate that Kebayoran has more integrated, greener, and more active levels of active frontage and community open space than Senen, although both locations still contain corridors with low performance. The study hypothesizes that strengthening placemaking attributes within TOD areas enhances neighborhood livability.

Keywords - About five key words in alphabetical order, separated by comma

I. INTRODUCTION

The contemporary city is no longer a static backdrop for human activities but a dynamic and evolving system, shaped by shifting patterns of mobility, density, and interaction. As urban populations increase and the demand for mobility intensifies, cities are compelled to reimagine their spatial frameworks through more integrated models of development, particularly by aligning land use and transport systems [1]. This integrated approach, central to Transit-Oriented Development (TOD), positions transit stations not as isolated infrastructure but as anchors of vibrant, walkable, and mixed-use communities. In such frameworks, the concept of active frontage becomes pivotal. It denotes the interface between buildings and the street that encourages direct engagement with the public realm. This may include transparent facades, entrances to commercial establishments, cafes, or communal facilities that stimulate street-level activity and visual continuity. Within TODs, where pedestrian flows are naturally concentrated around transit hubs, active frontage serves not only a functional role but also contributes to the creation of socially engaging and emotionally resonant urban environments.

What makes active frontage crucial in TODs is its ability to bridge the gap between high-density development and the human experience of urban life. Densification is a core principle in transit-oriented planning, yet without appropriate design mechanisms, it risks creating alienating environments. Thoughtfully designed street edges activate the public realm, making it more walkable, legible, and meaningful [2]. This transformation aligns with a broader urban agenda that seeks to humanize the city, placing everyday life, memory, and social interaction at the forefront of spatial organization [3], [4]. This shift reflects a broader rethinking of urban design's role. Rather than serving as a stylistic exercise in shaping physical form, urban design increasingly functions as an intermediary discipline, operating between architecture and urban planning, capable of mediating spatial qualities at multiple scales [4]. The street, as a realm of public life, becomes an important design focus. It must evolve from being a mere conduit for vehicles into a multifunctional social space, one that expresses the identity of a place, enables everyday encounters, and nurtures a sense of belonging. Indeed, the notion of place, distinct from space, has re-emerged as central in the discourse of livability. Cities are not only physical entities composed of roads and buildings but also cultural landscapes imbued with meaning. As Jacobs (1961) suggested, urban environments function like living organisms: they grow, decline, regenerate, and adapt over time.

In this view, streets with vibrant, human-scale frontages support the vitality of public life by offering a sense of

continuity, familiarity, and openness [5]. Furthermore, the experience of the built environment is closely tied to spatial legibility and imageability, as articulated by Lynch (1960). Urban districts that feature distinctive, active, and well-defined street edges contribute to cognitive clarity and visual identity. These elements improve wayfinding and reinforce collective memory, thereby enhancing the emotional and functional quality of the urban experience. In TOD areas, this is particularly important, as transit stations are often perceived as disorienting or transitory. Through active frontage, such spaces can be transformed into recognisable and engaging urban places [6]. Drawing on Lynch's (1981) later work, the attributes of a meaningful and functional urban environment, vitality, sense, fit, access, and control, find clear resonance in the goals of active frontage. Each attribute points to the need for urban environments to be adaptable, perceptible, inclusive, and empowering. In TOD contexts, where multiple systems, transit, housing, commerce, converge, the street-level interface becomes the primary spatial tool through which these principles can be enacted [4].

In Maslow's hierarchy of needs, humans are posited to have eight levels of needs. These begin with biological and physiological needs, followed by the need for safety and security. Next are the need for belonging and love, reflected in relationships with social groups, and the need for esteem or appreciation. Above these are cognitive needs, then aesthetic needs related to beauty, order, and harmony. At the higher levels are the need for self-actualization, namely the effort to develop one's own potential, and finally the need for transcendence, that is, the drive to help others achieve their own self-actualization.

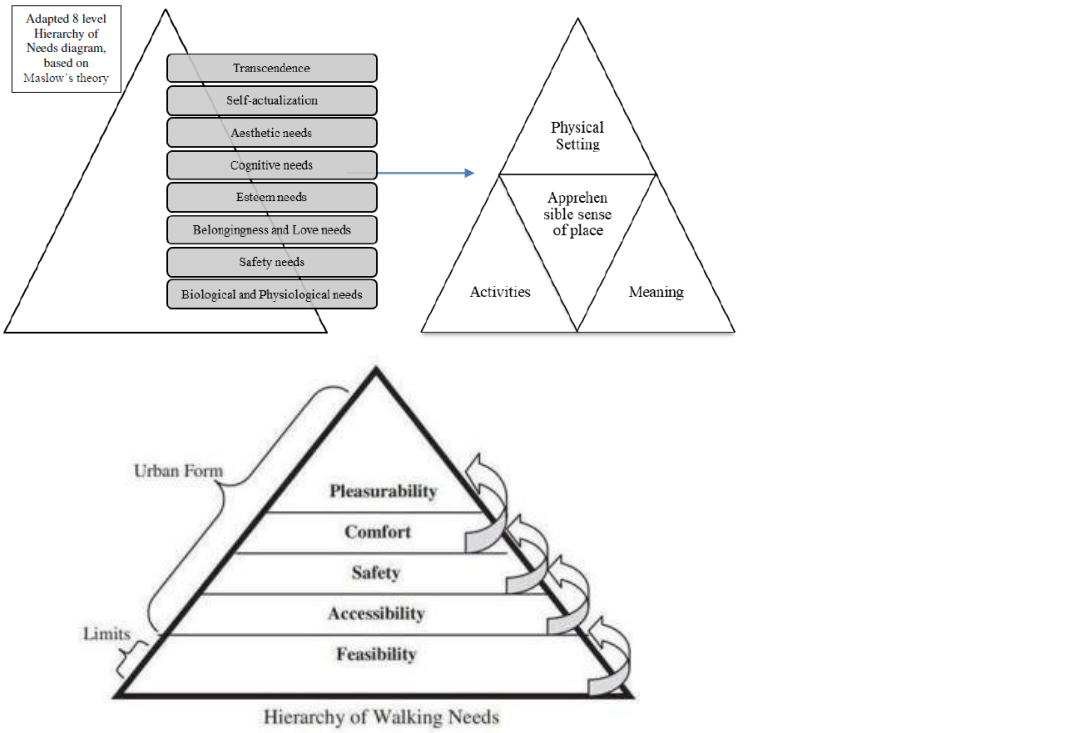


Figure 1.1. Diagram of the Hierarchy of Human and Pedestrian Needs
Source: [7], [8]

Urban livability cannot be addressed solely through infrastructure upgrades; it also requires an understanding of the qualitative dimensions of public life. Streets must support not only mobility but also encounters, rest, commerce, and cultural expression. A continuous and transparent ground-floor edge invites people to linger, engage, and feel secure. Such environments foster casual interactions, support local economies, and cultivate a shared sense of urban identity [6]. Moreover, active frontage plays a critical role in regulating the threshold between public and private domains. This interface is not merely visual, it constitutes a space of negotiation that shapes social behavior, security, and perceived ownership. When properly designed, it can enhance inclusivity while ensuring passive surveillance, comfort, and dignity in public life [3], [9]. From a sustainability perspective, active frontages contribute significantly to ecological goals by encouraging walkability, reducing car dependency, and supporting transit-oriented lifestyles. They form part of a broader livability framework that balances environmental performance, economic vibrancy, and social cohesion. A well-designed active edge not only reduces carbon footprints but also enhances mental well-being, safety, and local identity, qualities that are foundational to a resilient urban future [10].

The main attributes of the livability dimension can be described through a set of interrelated components that collectively shape the quality of spatial experience for users. Active building frontages, characterized by a high degree of transparency and permeability, enable visual and physical connections

between building interiors and outdoor spaces. Connectivity refers to how well street networks, pedestrian paths, cycling routes, and public transport nodes are integrated with one another, thereby facilitating mobility, expanding opportunities for interaction, strengthening social networks, and fostering a sense of place attachment. Safety encompasses both traffic safety and social security. Design features such as clear routes, safe pedestrian crossings, controlled vehicle speeds, adequate lighting, and the presence of continuous activity can reduce the risk of accidents and enhance users' sense of safety. Environmental quality is reflected in the physical and ecological condition of space, including the presence and quality of green–blue open spaces. Finally, the use of space for various types of activities and the duration of users' presence at a given location can encourage people to stay longer, indicating that the space successfully supports meaningful everyday life [11]

The deployment of active frontage within TOD developments is not a superficial aesthetic choice, but a strategic intervention that fundamentally enhances urban livability [2], [9]. It mediates density, fosters inclusion, supports sustainable mobility, and strengthens the character of place. Through a nuanced understanding of how built form interacts with public life, planners and designers can ensure that the urban spaces around transit nodes become more than functional, they become places of meaning, identity, and shared value.

II. LITERATURE REVIEW

Conceptually, transit-oriented development (TOD) can be understood as an urban design strategy that structures growth around transit nodes through the deliberate integration of diverse land uses and mixed building functions, thereby producing spatial and functional coherence at the district scale [12], [13], [14], [15], [16], [17]. This integration is operationalised by shortening travel distances and enhancing accessibility, particularly through the design of permeable building blocks and façades that open visually and physically onto the public realm, thus increasing route choice and ease of movement for pedestrians and cyclists (Kamani F. & Paydar, 2024; Niu et al., 2021; Papagiannakis et al., 2022; Xia et al., 2024). In turn, such TOD parameters are expected to induce a modal shift from private vehicles to high-capacity, rail-based public transport, helping to reduce congestion and emissions while simultaneously fostering more walkable and cyclable environments [13].

Within this broader framework, **active frontage** becomes a key design mechanism: by activating ground-floor façades with commercial and service uses, providing visual transparency between interior and exterior spaces, and shaping a pedestrian-friendly public–private interface, active frontage intensifies street life and improves the experiential quality of sidewalks as everyday public spaces [1], [21].

In TOD settings that prioritise pedestrians and cyclists, active frontage does not operate in isolation but is closely interlinked with the provision of community open space, which functions as a spatial and social catalyst that transforms the station area from a mere transit corridor into a lived-in urban environment [22]. Strategically located community open spaces form part of the public realm that stitches together residential, commercial, office, and public facilities within comfortable walking distance, while serving as meeting points that enhance comfort, affordability of access, safety, and equity for diverse user groups [4], [23], [24], [25]. In this sense, community open space should not be treated as leftover or residual land, but rather as a programmed and actively managed social infrastructure that, in synergy with continuous active frontage along TOD corridors, generates everyday social interaction and sustains the vitality of the TOD precinct over time [6], [26].

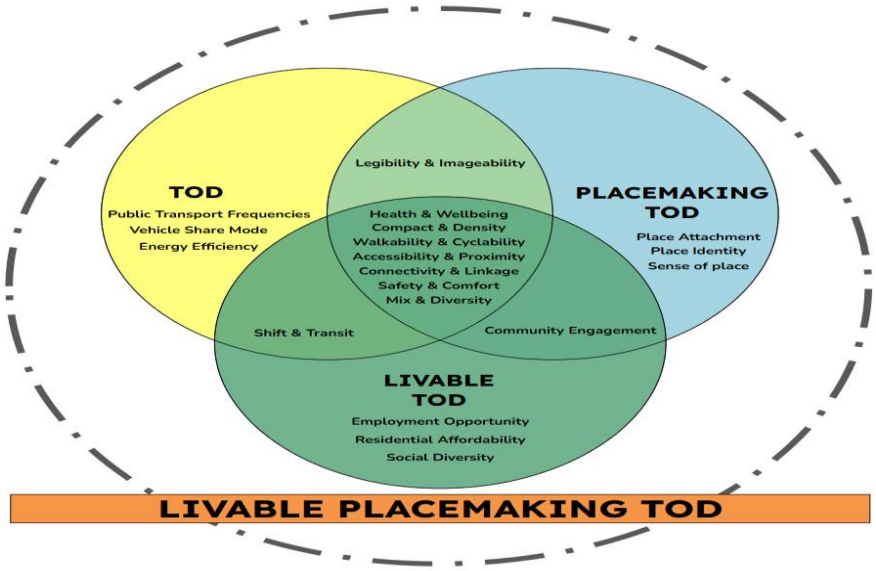


Figure II.1 Attributes and Variables of Livable TOD Placemaking
Source: Author's synthesis

II.1 Active Frontage

Active frontage in the context of urban design within Transit-Oriented Development (TOD) is not merely a physical attribute of building edges, but a strategic interface that mediates the relationship between private and public realms through the deliberate activation of ground floors both visually and functionally. Exterior space, in this sense, should not be understood only as a circulation corridor, but as a socio-spatial container that accommodates activities, social interaction, and the formation of emotional attachment between users and the urban environment. When outdoor spaces are carefully designed to support everyday use, they can foster a sense of belonging and place attachment, thereby sustaining urban vitality and activity over time [25]. Walkable exterior environments become the basic infrastructure of urban life: pedestrians, as Rubenstein (1992) notes, are people who move from one place to another on foot, and for Gehl (2010), city life fundamentally takes place "on the feet" of its inhabitants. Walking is therefore not only a mode of movement, but also a process of sensing, observing, and directly engaging with urban life [27]. Within this experiential framework, active frontage becomes the primary device that translates movement along the street into lived, meaningful public space.

Within TOD frameworks, active frontage operates as a design strategy that synchronizes land use with mobility systems by aligning comfortable pedestrian routes with animated ground floors. This strategy encourages active movement based on walking and cycling, while simultaneously supporting the uptake of mass transit by making access routes more attractive, legible, and safe (Mehta et al., 2020; Niu et al., 2021; Wu et al., 2024). A fine-grained mix of uses at walkable distances further reinforces the continuity between transit networks and pedestrian networks, positioning active frontage as a key catalyst for creating integrated, easily accessible urban districts [1]. In this regard, the spatial transition from transit nodes toward public spaces, such as plazas, ground-floor retail, and transparent building facades, becomes critical in establishing a seamless "connector" between private interiors and public streets. Such interfaces not only enhance visibility and perceived safety, but also lengthen people's dwelling time in the city through more intensive social encounters and opportunities for informal interaction [28], [29]. In many TOD precincts, regulations even encourage or mandate the transformation of ground-floor residential frontages into retail or service uses along primary corridors, with building setbacks functioning as extensions of the sidewalk. Although the land remains privately owned, this approach effectively contributes to the public realm by creating active edges that provide "eyes on the street," a stronger sense of safety, and sustained urban vitality [1], [30].

Operationally, urban design frameworks that require active frontage zones, for instance for retail, cafés, or restaurants, have proven effective in maintaining frequent use of the street edge and enriching the experiential quality of the sidewalk [24]. Conceptually, active frontage refers to the ground-floor edge of buildings that exhibits a high level of activity, characterized by numerous doors and windows, visual transparency to interior spaces, and adequate physical connectivity with pedestrian routes. Such conditions have been shown to improve perceptions of comfort, safety, and sociability in public space [31]. The strategy of designing active building facades is then translated into a series of physical elements: closely spaced access doors, the use of commercial or service functions at ground level, and a high degree of facade transparency. These measures intensify the interaction between interior and exterior realms, producing a safer and more vibrant environment for pedestrians [26], [27]. In TOD areas, these qualities are particularly important along key pedestrian desire lines connecting stations, bus stops, and local amenities, where active frontage can transform what might otherwise be a monotonous corridor into an animated urban promenade [29], [32], [33].

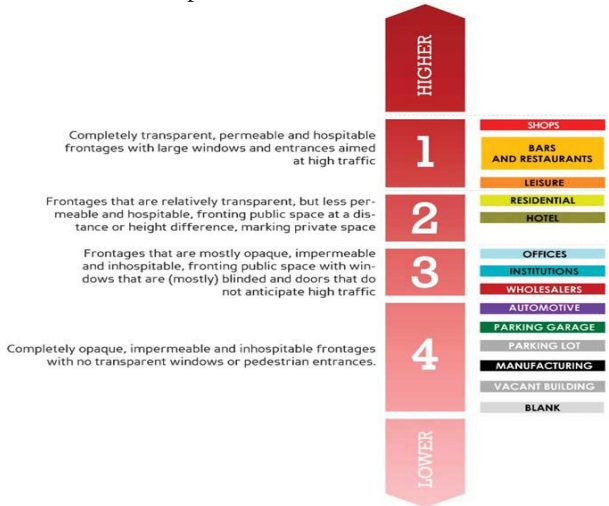


Figure II.2. Categories of Land-Use Functions Aligned with the Concept of Livable TOD Placemaking
Source: [34]

Morphologically, active frontage integrates three interrelated dimensions—visual permeability, physical permeability, and active uses—into a coherent spatial system. Visual permeability concerns the transparency of building facades and the visibility of interior activities, including the degree to which sightlines remain unobstructed between inside and outside; this transparency supports informal surveillance and strengthens the sense of safety and engagement along the street (Dameria & Fuad, 2021; Hassan et al., 2019). Physical permeability refers to the number and spacing of entrances along the frontage, as well as the configuration of thresholds and boundaries between private and public space; frequent, easily accessible entrances shorten walking distances, disperse pedestrian flows, and increase opportunities for spontaneous interaction (Dameria & Fuad, 2021; Eledeisy, 2023). Finally, active uses encompass the types and temporal patterns of activities hosted at the ground floor, including land uses that remain active into the evening, the presence of canopies and weather protection, the proximity of building edges to the street, and the orientation of entrances toward the sidewalk (Hassan et al., 2019). When these three dimensions are orchestrated in an integrated way, active frontage becomes a powerful urban design instrument that not only supports TOD objectives—such as transit ridership, walkability, and mixed use—but also cultivates an engaging, safe, and socially rich public realm.

II.1.1 Transparent Frontage

One of the fundamental mechanisms in shaping *active frontage* is the degree of visibility or transparency that the building façade provides, enabling pedestrians to visually access interior activities. Such transparency does not merely function as a visual connector between public and private realms; it serves as a catalytic interface that stimulates social interaction and enhances the spatial experience along the street, while simultaneously allowing abundant natural light to enter the interior and conveying a sense of openness. Large windows, glazed doors, and minimized blank walls strengthen this function, transforming the building façade from a passive boundary into an active contributor to urban vitality [6], [29]. Empirical research consistently demonstrates that street segments with high façade transparency increase pedestrian *dwelling time*, encouraging people to pause, observe, and engage with street-edge activities [29], [31]. Transparency also communicates interior–exterior interactions, allowing visual cues of private activities to spill outward into public space and creating an open, dynamic urban interface [35]. As Jacobs (1961) emphasizes through the principle of *eyes on the street*, façade openings enable reciprocal visibility between building occupants and street users, thereby reinforcing natural surveillance. The frequency of façade openings directly enhances the intensity of informal observation, strengthening public perceptions of safety [30].

Within pedestrian-oriented urban development, transparent frontage thus becomes essential to forming lively and safe environments. Design elements such as extensive glazing, permeable ground floors, and active ground-level uses foster mutual visibility between private interiors and public sidewalks, reinforcing natural surveillance and contributing to overall street vitality. The presence of visible interior activities enhances spatial sociability, while high visual permeability correlates with elevated levels of perceived safety and pedestrian comfort—particularly in transit-oriented precincts where continuous activity throughout the day is critical for creating inclusive, safe, and sustainable urban environments [20], [29], [30]. Urban vitality driven by *active frontage* is strongly linked to the presence of commercial ground-floor functions that anchor continuous activity patterns. Retail units and small businesses act as key attractors, sustaining activity throughout the day and evening [18], [24]. Pedestrian corridors lined with active façades significantly increase the use intensity of public space and promote social engagement within dense urban areas [36], [37]. The clustering of commercial uses, green elements, and cultural programs along transit corridors elevates the frequency of social interactions and encourages pedestrians to linger, sit, and engage [26], [38].

The role of *transparent frontage* in reinforcing *eyes on the street* becomes even stronger when combined with fine-grained built form, small permeable blocks, and compact street networks—conditions that enrich walkability and enhance natural surveillance [2], [4]. In transit-oriented contexts, these elements help prevent the emergence of "dead frontages" after business hours, ensuring that the street continues to host social, economic, and cultural activity [39]. Beyond its aesthetic contribution, transparent frontage generates a sense of pedestrian engagement and place attachment. When interior activities are visually accessible, pedestrians develop a stronger sense of connection to the surrounding environment, turning the frontage into a sensorial and social threshold rather than a rigid barrier between public and private space [26], [30]. Empirical evidence further shows that façade openings of at least 20% achieve the highest visual-engagement scores in commercial streets, indicating the substantial perceptual impact of transparency on pedestrian experience [32]. As highlighted by Jacobs (1961) and Hillier (2004), these visual qualities are inseparable from well-connected street networks and mixed-use configurations that prioritize wide sidewalks and minimize on-street parking, thereby creating continuous urban promenades that are physically and visually legible, safe, and conducive to non-motorized mobility [6], [30].

Operational Definition of Transparent Frontage
In the context of this research, a transparent building façade (Transparent Frontage) is operationally defined as a ground-floor façade design strategy that actively interacts with the public realm through visual openings (such as windows and transparent doors), the visibility of human activities from the outside, and a diversity of engaging functions (particularly commercial uses). Together, these elements contribute to safety through eyes on the street, aiming to create visual engagement, enhance vitality, and promote comfort and pedestrian safety within the transit area.

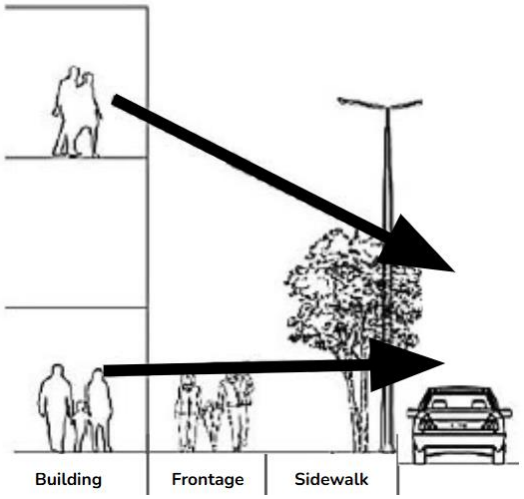


Figure II.3 Transparan Frontage increas eyes on the street
Source: Author's synthesis.

II.1.2 Permeable Frontage

In the context of Transit-Oriented Development (TOD), *permeable frontage* constitutes a critical dimension of active frontage because it ensures spatial continuity between public space and the buildings that frame it. At the urban-network scale, the capacity of pedestrians to penetrate urban blocks through accessible passages integrated within or between buildings becomes essential to prevent active frontage from functioning merely as a physical barrier; instead, permeability transforms it into a seamless spatial sequence that reinforces walkability and the narrative of pedestrian movement—an attribute widely recognized as fundamental to the form and performance of livable cities [40]. Empirical studies consistently demonstrate that such permeability is most effective in areas characterized by small block structures and high intersection density, where finer-grain connectivity amplifies opportunities for visual and physical interaction, producing richer, more dynamic walking experiences that simultaneously multiply the presence of active frontage. Within this framework, shorter block lengths and a higher density of intersections serve as key morphological indicators closely associated with enhanced visibility and permeability. These relationships are captured in evaluative tools such as the **AwaP** (Average Weighted Parameter) index, which quantifies block-size diversity to assess area-wide accessibility and movement potential [40]. Conversely, environments dominated by repetitive large block modules or continuous opaque walls tend to produce *blank frontages* that undermine pedestrian engagement, diminish perceived safety, and weaken urban vitality, an effect observed across various urban contexts where massiveness in façade treatment suppresses opportunities for interaction and passive surveillance (Alonso de Andrade et al., 2018b; Pafka & Dovey, 2017).

In Jakarta, the strategic use of *public easements* within TOD corridors, such as those running through multiple MRT station precincts, illustrates how semi-public access (for example, commercial corridors that remain open during operational hours) functions as an intermediary spatial device capable of stitching together fragmented blocks and reconstituting movement networks [23]. Findings from the Karet–Benhill precinct further substantiate this principle by showing that the effectiveness of permeability hinges on the management of operational hours, separation of pedestrian and vehicular flows, and the consistency with which building frontages maintain openness and legibility toward the public realm [41]. These factors determine the degree to which permeability can convert previously disconnected parcels into an integrated spatial system. Architectural articulation of permeable frontage extends beyond the mere presence of doors or physical openings. Elements such as canopies, verandas, balconies, recessed entries, and other façade components provide intermediate spatial conditions that ease the transition between building interiors and public walkways, reinforcing the perception that buildings actively participate in the life of the street. Such features foster both visual and physical engagement, enabling pedestrians to access buildings, navigate between blocks, and experience a sense

of enclosure and orientation essential for a lively and adaptive TOD environment [32], [42]. Façade permeability can be operationalized through several indicators, including the ratio of accessible entry points, spacing between entrances, and the proportion of transparent or penetrable façade surface per 100 meters of building frontage [32], [42]. Evidence from studies in Rome suggests that physically permeable frontages achieve maximum scoring when the number of publicly accessible entrances meets or exceeds a threshold of five entries per 100 meters [32]. Conversely, large parcels with few entrances generate blind walls, significantly diminishing permeability, weakening pedestrian interaction, and eroding the broader vitality of the urban environment [43].

Operational Definition of Permeable Frontage
In the context of this research, a permeable building frontage (Permeable Frontage) is operationally defined as the portion of a building that can be physically accessed or traversed by pedestrians—whether through passages, corridors, or other building openings—that strategically connects private spaces with public realms, shortens travel distances, enhances the spatial integration of the area, and strengthens opportunities for social interaction, thereby supporting the emergence of active uses within the district.

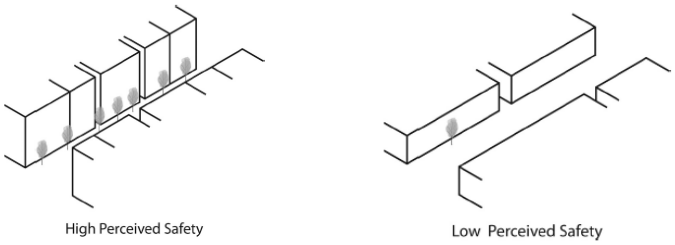


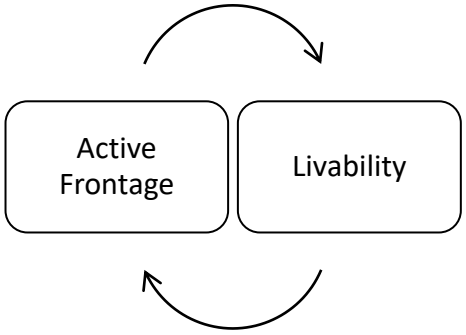
Figure II.4 Illustration of Permeable Frontage
Source: [31]

II.1.3 Active Uses

In cultural-perceptual terms, the transition between spaces often generates emotional responses—ranging from a sense of unfamiliarity to feelings of comfort—shaped by the presence of human activity behind shopfront glazing, the depth of visual fields, the continuity of promenades, variations in materials and elevation, and the proportion of openings that together form a perceivable "frontage narrative" for pedestrians [6], [28]. This experiential dimension becomes more pronounced when viewed alongside empirical evidence showing that degrees of permeability correlate directly with individuals' emotional states, thereby affirming that enhancing transparency is not merely an aesthetic choice but a strategic intervention capable of improving attention, engagement, and urban legibility for pedestrians [44]. Building on this premise, the design of **active frontage** within the framework of physical permeability becomes consequential; when frontages are programmed and articulated in line with the activity intensity of the district, pedestrian corridors evolve organically from mere channels of movement into lively places with diverse functions and consistently high usage frequencies [25], [37].

This transformation is further reinforced through ground-floor activation strategies such as integrating retail or café functions, orienting openings to the street, and ensuring a visually engaging interface between the private interior and the public realm [38]. Complementary elements, including well-arranged sidewalk furniture, transitional vegetation, and the removal of obstructive informal parking, have been shown to enhance pedestrian experience, strengthen both visual an
d physical continuity, and widen inclusive access to public space [6], [45]. Ground-floor setbacks, when applied deliberately, can generate sheltered zones that bolster pedestrian comfort, while transparent shopfronts and continuous human presence amplify the attractiveness of the walking route. The spatial transition from building edge to sidewalk typically reinforces the stratified pedestrian zone structure, comprising the frontage zone, the pedestrian through-zone, and the furnishing zone, each serving as a stage for urban furniture, seating, planters, and display elements that invite interaction. Importantly, during evening hours, the presence of **active frontage** becomes even more critical, as illuminated and programmatically active edges help prevent the emergence of dead frontages and maintain perceptions of safety and vibrancy in the public realm [26], [45].

Operational Definition of Active Use
In the context of this research, active use (active façade use) is operationally defined as the presence of ground-floor functions that are publicly relevant, directly oriented toward the street, easily accessible to pedestrians, and exhibit visible signs of ongoing activity (such as people entering and exiting or the regular use of space) during the designated observation periods. Together, these characteristics consistently contribute to the vitality, visual engagement, and perceived safety along the active frontage.



Transparent Frontage

T1. Degree of transparency of the ground-floor building façade

T2. Depth of visual reach to the main activity core inside the building

Permeable Frontage

P1. Number of through-access points penetrating the building at ground floor

P2. Distance between ground-floor access points

P3. Barriers between private–public spaces at ground floor

Active Use

A1. Number of ground-floor units active from 06:00 to after 20:00

A2. Length of facade with active commercial function at ground floor

A3. Diversity of Ground Floor Function

A4. Building setback functioning optimally as a transition zone

Pedestrian routes that area connected with short travel distance within small city block [46]

Outdoor space that are safe and comfortable for social interaction, walking, and cycling [47]

Placemaking that enhance health and wellbeing through inclusive green, active, and safe public spaces [48]

Natural surveillance and safety provided by activities along pedestrian corridors [49]

Quality of public space [50]

Figure II.5 Research Conceptual Framework
Source: author's synthesis

Table II.1. Operational Definition of Active Frontage Variables

Variabel & Sub Variabel		Operational Definition	Indicator	Measurement Method	Instrument	Measurement Scale
Active Frontage	Transparent Frontage	Ground-floor building façades that actively interact with public space through visual openings, the presence of human activities visible from outside, and a diversity of attractive functions,	T1. Degree of transparency of the ground-floor building façade;	Calculating the percentage of the length of transparent ground-floor façade relative to the total length of the ground-floor façade facing the street. Measured at eye-level (±1.5–2.0 m from sidewalk surface)	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)

Variabel & Sub Variabel		Operational Definition	Indicator	Measurement Method	Instrument	Measurement Scale
Active Frontage		which contribute to safety by increasing *eyes on the street*.	T2. Depth of visual reach to the main activity core inside the building.	Measuring the horizontal distance from the sidewalk to the main activity core (cashier, service counter, seating area, main display). Measured at eye-level	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
Active Frontage	Permeable Frontage	Parts of the building that can be physically accessed or traversed by pedestrians, which strategically connect private space with public space, shorten travel distance, and enhance spatial integration of the area in ways that can intensify and encourage social interaction.	P1. Number of through-access points penetrating the building at ground floor;	Counting the number of pedestrian access points that can penetrate the building (doors, through-corridors, arcades, alleys, access to public atria) within one façade segment of 100 m.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			P2. Distance between access points in ground-floor;	Measuring the horizontal distance between the axes of pedestrian access points along the façade, then calculating the average distance.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			P3. Barriers between private–public spaces at ground floor;	Calculating the length of façade dominated by barrier elements such as high fences or level differences that are difficult to traverse, compared with the total length of the façade segment.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
Active Frontage	Active Uses	The presence of ground-floor functions that are publicly relevant, directly oriented to the street, easily accessible to pedestrians, and that show clear signs of regular activity (people entering–exiting, regular use of space) within a given observation period, thereby consistently	A1. Number of ground-floor units active from 06:00 to after 20:00	Identify and calculate the proportion of each ground-floor unit that operates in the morning and at night within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			A2. Length of façade with active commercial functions at ground floor	Measure the length of ground-floor frontage occupied by active functions (retail, cafés, restaurants, services, public services, community facilities) within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)

Variabel & Sub Variabel	Operational Definition	Indicator	Measurement Method	Instrument	Measurement Scale
	contributing to vitality, visual engagement, and perceived safety along the active frontage.	A3. Diversity of land use functions at ground floor	Identify and calculate the level of functional diversity of different ground-floor uses for each unit (e.g., residential, retail, F&B, services, office, public facilities, community facilities) within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
		A4. Building setback functioning optimally as a transition zone.	Calculating the length of façade that provides an open setback area that can be accessed and used by pedestrians.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)

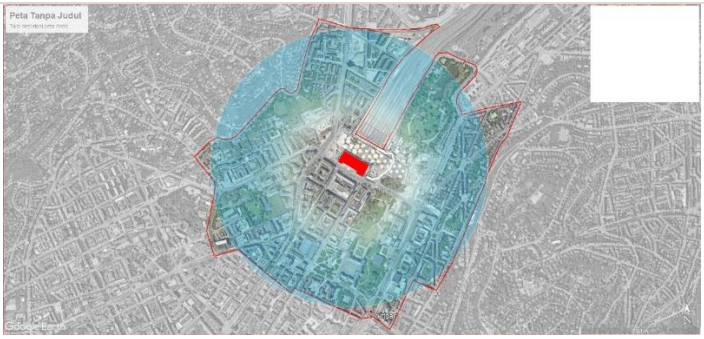
Table II.2. Attributes–Components of Livable Placemaking in TOD Areas

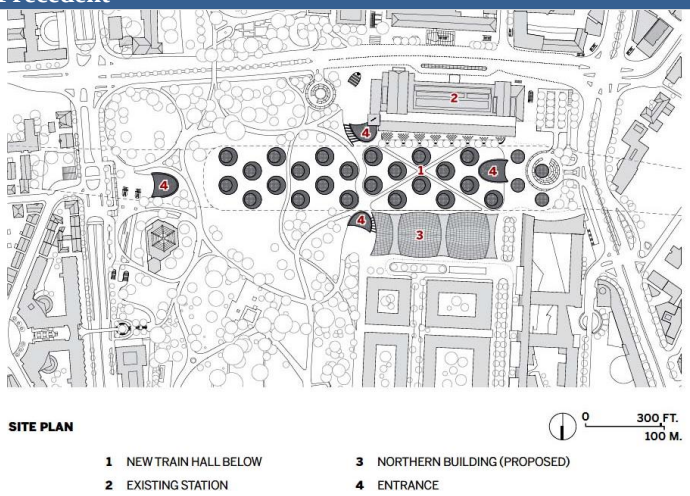
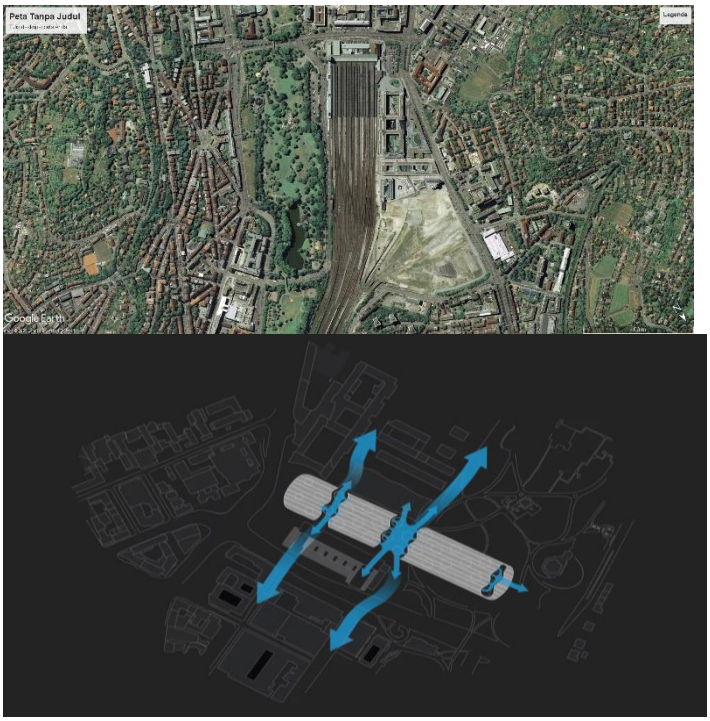
ATTRIBUTE / COMPONENT		*Health & Wellbeing*	*Shift & Transit*	*Walkability & Cyclability*	*Accessibility & Proximity*	*Connectivity & Linkage*	Compact & Density	Mixedness & Diversity	*Safety & Comfort*	*Legibility & Imageability*	*Community Engagement*	
		Placemaking TOD										
		Transit Oriented Development (TOD)										
		Livable TOD										
Morphological	*land use*	**A1, A3**		**A2, A3**	**A2, A3**	**A1, A3, T2**	**A3**	**A1, A2, A3**	**A1, A3, T2**	**A2**	**A1, A2, A3**	Variable
	building form & massing	**P4**		**T1, T2, P3, A2,**	**P1, P2, P3**	**P1, P2, T2**	**A2**	**A2**	**T1, T2, P3, P4, A2**	**T1, T2, P3, P4, A2**	**P4, A2**	
	circulation and parking	**P1**	**P1, P3**	**P4**	**P1, P2, P3**	**A2**			**T1, T2**			
	public open space & green open space	**P3**				**P1, P3**			**P4**	**P4**	**P4**	
	pedestrian ways		**P1, P3**	**P1, P2, P3**	**P1, P2, P3**	**P1, P2, P3**			**T1, T1, P2, P3, P4**	**P3, P4**	**P1, P4**	
	activity support	**A1, A3**		**A1, A2, A3**	**A1**	**A1, A3,**	**A3**	**A1, A2, A3**	**A1, A2, A3**	**A2**	**A1, A2, A3**	
	signage system											
		Vitalit	Access	Vitalit	Access		Fit		Sense		Contro	
		Good City Form										

Urban morphological components are a measurable "container," and good urban quality is a goal that does not automatically arise simply from the existence of that container, but rather from how it is activated and connected. The Active Frontage variable functions as a linking mechanism, among others, by introducing: Transparency, which captures the visual legibility of the ground floor (the degree of façade transparency and the depth of visual reach into the core of activity); Permeability, which depicts the physical connection between private and public realms (the number of through-points, spacing between access points, and barriers between private and public areas); and Active Use, which represents the operation and intensity of ground-floor functions (active hours, the length of façade operating actively, and functional diversity). Livability in TOD is not produced solely by transit access, but also by the quality of the building-edge–public-space façade (frontage), which can be measured through the T–P–A dimensions described in the reciprocal Active Frontage ↔ Livability conceptual framework diagram: good frontage enhances livability, while livability targets guide frontage design

II.2 Precedent Study

Table II.3. Profile of Precedent Study

No.	Precedent	Description
1.	Arnulf Klett-Platz	
	 Stuttgart Hauptbahnhof is a railway station located in the Arnulf Klett-Platz area in the center of Stuttgart. The core of the area's development is the conversion of a 16-track terminus station into an underground station adjacent to the historic Bonatzbau building; the release of the surface rail yard is then utilized as space for the development of green open spaces and interconnected pedestrian–cyclist corridors, as well as various community facilities at the district scale.	*Figure II.6 Layout of Stuttgart Hauptbahnhof Area* Source: https://www.architecturalrecord.com/articles/15246-main-station-stuttgart-by-ingenhoven-architects
	 Open spaces and public amenities within the area are used to support community activities, including park runs, plaza-based community activities (such as playgrounds, weekly markets, automotive events), and festivals.	*Figure II.7 Layout of Stuttgart Hauptbahnhof Area* Source: https://www.stuttgarter-zeitung.de/inhalt.sommerfest-in-stuttgart-das-muessen-die-besucher-wissen.7e093907-5189-4623-a19e-9d7eae1b01bc.html

No.	Precedent	Description
		Figure II.8 Layout of Stuttgart Hauptbahnhof Area Source: https://www.architecturalrecord.com/articles/15246-main-station-stuttgart-by-ingenhoven-architects
		The Stuttgart Hauptbahnhof area positions community open space as the core of the new district built above the underground rail infrastructure. The site plan and aerial photographs emphasize a sequence of plazas, roof gardens, and linear public spaces that cover the former rail tracks while connecting the historic building with the new district and the main pedestrian accesses that cross the station and link to the wider urban network.
		Figure II.9 *Layout of Stuttgart Hauptbahnhof Area* Source: https://world-architects.com/en/ingenhoven-associates-dusseldorf/project/main-station-stuttgart

No.	Precedent	Description
		

III. METHODOLOGY

The objective of this proposed thesis research is to develop a conceptual framework for livable placemaking within Transit-Oriented Development (TOD) areas; to identify the role of the Active Frontage variable in enhancing pedestrian quality and experience; to examine the contribution of Community Open Space to social interaction and environmental quality; and to evaluate the integration of these two variables in improving livability and placemaking within TOD areas. Research on livable placemaking in transit-based urban districts is conducted using a quantitative method. Measurements related to movement and activity analysis are employed to validate users' perceptions of the area, which are substantiated by on-site behavioral evidence, including observations of circulation patterns, user activities, and the calculation of user intensity through pedestrian counts and the time spent accessing the area during peak morning and evening activity periods.

Overall, the quantitative methods used, questionnaires (measuring perception), indices (measuring spatial performance), and movement–activity observation (measuring behavioral evidence), collectively produce a comprehensive quantitative portrait of livable placemaking in TOD areas.

The formula for measuring the transparent façade index [18], [46]:

$$V_I = 1 - \left(\frac{v1}{v1 + v2 + v3 + v4}\right)$$

Keterangan:

V_I = Visibility Index;
v1 = length of façade without visibility;
v2 = length of façade with visibility into empty space;
v3 = length of façade with visibility into private space;
v4 = length of façade with visibility into semi-public space.

This formula reflects the proportion of transparent façade elements as a form of visual access between buildings and the surrounding public realm. A higher VI value indicates better visibility quality.

IV. RESULT AND DISCUSSION

The questionnaire results indicate that most respondents assess the visibility of ground-floor activities along the main corridors in Kebayoran as medium to high. The Panglima Polim–Melawai–Bulungan segment, Gandaria Tengah, and the area around M Bloc Space exhibit a significant percentage of transparent façade length, with large glass openings, building façades accommodating commercial functions, and minimal blank walls.

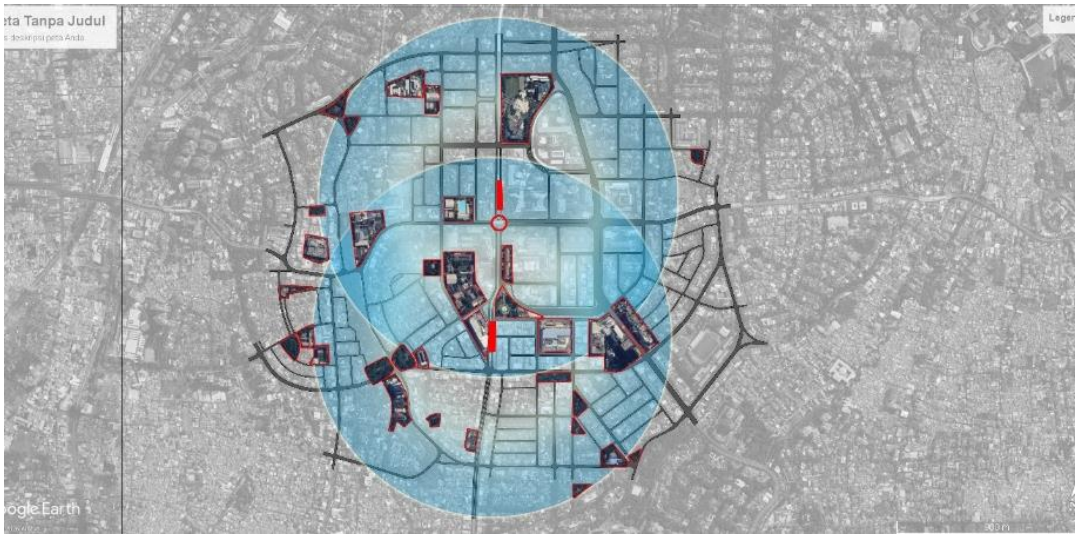


Figure IV.1. Diagram alur penelitian
Source: Author's synthesis

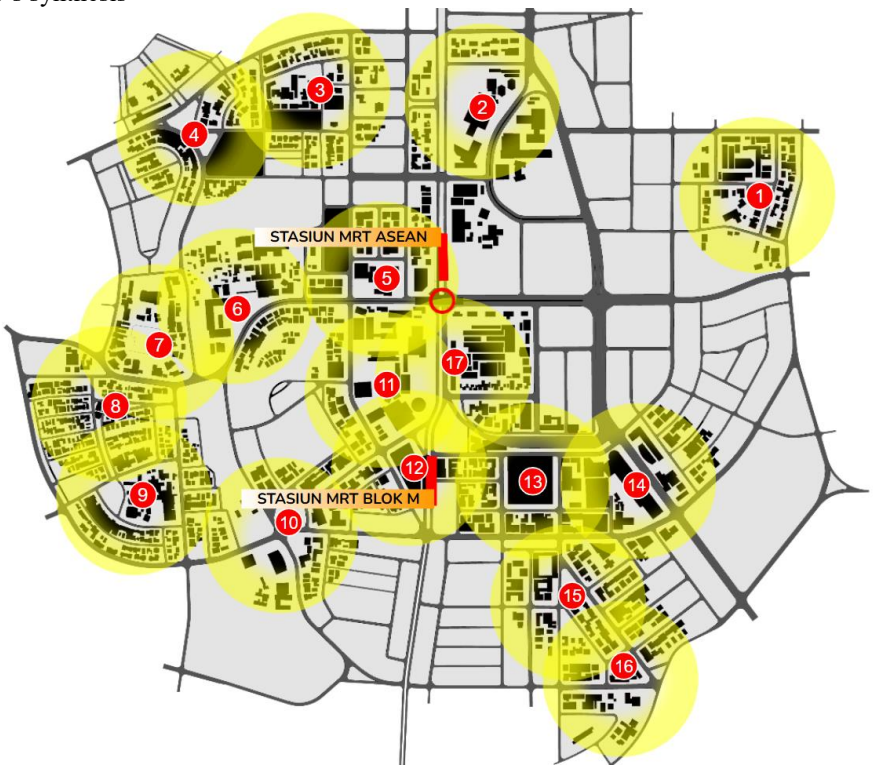


Figure IV.2 Identification of data collection points in the MRT ASEAN–Blok M area
Source: Author's synthesis

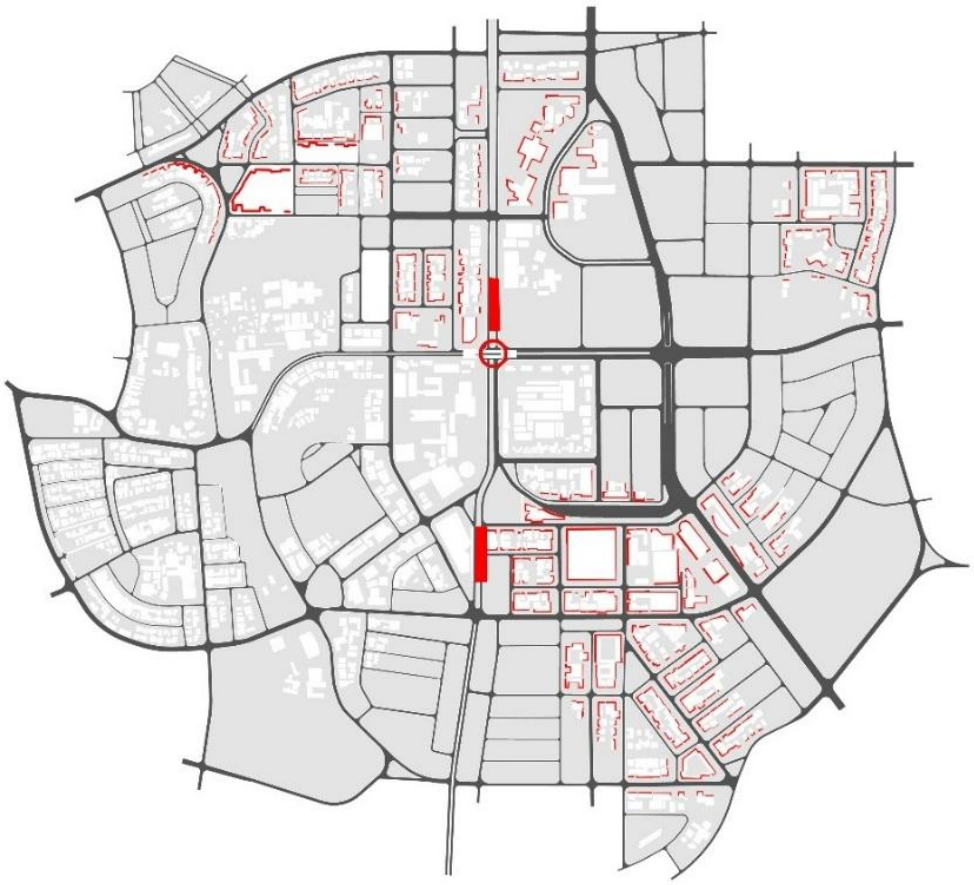
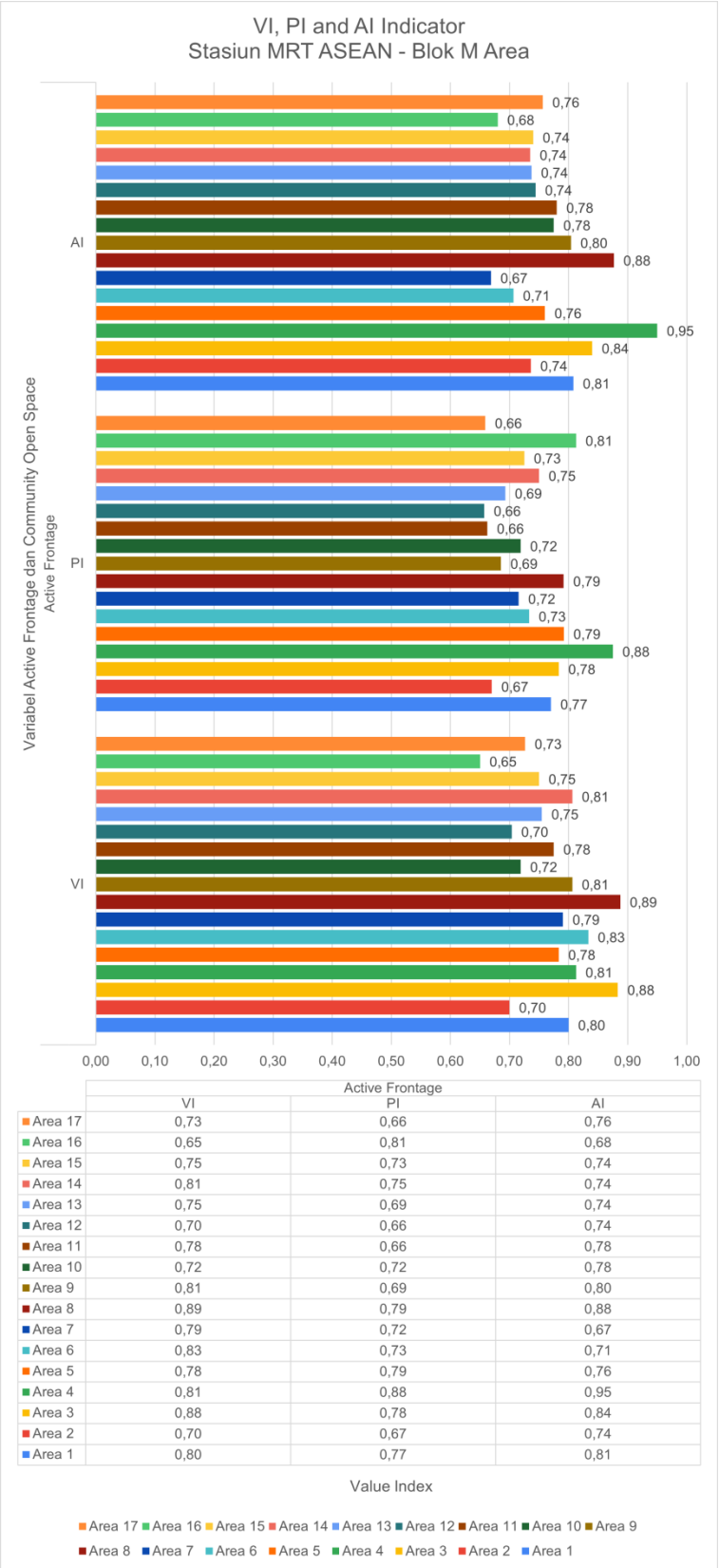


Figure IV.3 Identification of active frontage in the MRT ASEAN–Blok M area
Source: Author's synthesis

The questionnaire results indicate that most respondents assess the visibility of ground-floor activities along the main corridors in Kebayoran as medium to high. The Panglima Polim–Melawai–Bulungan segment, Gandaria Tengah, and the area around M Bloc Space exhibit a significant percentage of transparent façade length, with large glass openings, building façades accommodating commercial functions, and minimal blank walls. Perceptually, this produces a connected urban sequence along the walking route that makes users feel they are continually greeted by activities behind the glass, in line with the notions of soft edges and active edges.
In terms of permeability, the commercial corridors around Blok M Square, Plaza Blok M, and M Bloc Space show relatively short distances between entrances and numerous direct accesses from the sidewalk to ground-floor units. Physical barriers between private and public space take the form of level differences and fences that reinforce the edge element. Several local street segments show high fences, massive walls, or vehicle parking in front of buildings, which hinder easy pedestrian access and egress. This indicates that the implementation of permeable frontage principles is not yet evenly distributed across the entire corridor network.
From the perspective of active use, Kebayoran performs relatively well. Ground-floor façades at many observation points are occupied by functions that are directly oriented toward the public realm, namely retail, F&B, services, sports facilities, educational facilities, and creative spaces (for example M Bloc Space, GOR Bulungan, GOR Pati Unus), although still constrained in some cases by fences. At several points there are also residential fences or parking and loading functions, which lower the active use score.



	Active Frontage		
	VI	PI	AI
Area 17	0,73	0,66	0,76
Area 16	0,65	0,81	0,68
Area 15	0,75	0,73	0,74
Area 14	0,81	0,75	0,74
Area 13	0,75	0,69	0,74
Area 12	0,70	0,66	0,74
Area 11	0,78	0,66	0,78
Area 10	0,72	0,72	0,78
Area 9	0,81	0,69	0,80
Area 8	0,89	0,79	0,88
Area 7	0,79	0,72	0,67
Area 6	0,83	0,73	0,71
Area 5	0,78	0,79	0,76
Area 4	0,81	0,88	0,95
Area 3	0,88	0,78	0,84
Area 2	0,70	0,67	0,74
Area 1	0,80	0,77	0,81

Figure IV.5 Questionnaire Results for the Visibility Index Level in the MRT ASEAN – Blok M Area
Source: Author's synthesis

V. CONCLUSION

In summary, the findings of this research indicate that in the Blok M area, where the level of active frontage is relatively high, it is able to support higher levels of walkability and cyclability, improve connectivity and linkage, enhance health and wellbeing, and strengthen community engagement.

Table V.1. Active Frontage Characteristics

Active Frontage
Transparent Frontage (Visual)
T1. Degree of façade transparency on the ground floor T2. Degree of visual depth of view to the main activity areas inside the building
Permeable Frontage (Physical)
P1. Number of ground-floor access points that penetrate/lead through the building P2. Distance between ground-floor building entrances P3. Barriers to access between private and public space on the ground floor
Active Uses
A1. Number of ground-floor premises active from 06:00 until after 20:00 A2. Length of active commercial frontage on the ground floor A3. Diversity of ground-floor functions A4. Optimal building setback as a transition zone

Source: Author's synthesis

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Word count: 7827
Character count: 47871

American Journal of Multidisciplinary Research and Development (AJMRD)
Volume X, Issue X (XXXX-XXXX 2025), PP XX-XX
ISSN: 2360-821X
www.ajmrd.com

Research Paper **Open Access**

Morphological Characteristics of Active Frontage for Livable Placemaking in TOD Area

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ABSTRACT: *This study examines livable placemaking in transit-oriented development (TOD) areas by focusing on the performance of active frontage and community open space in two study areas: Kebayoran (within an 800 m radius of ASEAN and Blok M BCA MRT Stations) and Senen (within an 800 m radius of Pasar Senen Station). The TOD Livable Placemaking framework is constructed through a systematic review of 317 publications, which are mapped into nine livable placemaking attributes and subsequently synthesized into a relational framework of four key attributes examined in greater depth, namely connectivity & linkage, walkability & cyclability, community engagement, and health & wellbeing. A mixed-methods approach is employed, combining spatial analysis of satellite imagery and street-corridor observations, measurement of active frontage and community open space indices, and user perception questionnaires. The findings indicate that Kebayoran has more integrated, greener, and more active levels of active frontage and community open space than Senen, although both locations still contain corridors with low performance. The study hypothesizes that strengthening placemaking attributes within TOD areas enhances neighborhood livability.*

Keywords - *About five key words in alphabetical order, separated by comma (10 Italic)*

I. INTRODUCTION

The contemporary city is no longer a static backdrop for human activities but a dynamic and evolving system, shaped by shifting patterns of mobility, density, and interaction. As urban populations increase and the demand for mobility intensifies, cities are compelled to reimagine their spatial frameworks through more integrated models of development, particularly by aligning land use and transport systems [1]. This integrated approach, central to Transit-Oriented Development (TOD), positions transit stations not as isolated infrastructure but as anchors of vibrant, walkable, and mixed-use communities. In such frameworks, the concept of active frontage becomes pivotal. It denotes the interface between buildings and the street that encourages direct engagement with the public realm. This may include transparent facades, entrances to commercial establishments, cafes, or communal facilities that stimulate street-level activity and visual continuity. Within TODs, where pedestrian flows are naturally concentrated around transit hubs, active frontage serves not only a functional role but also contributes to the creation of socially engaging and emotionally resonant urban environments.

What makes active frontage crucial in TODs is its ability to bridge the gap between high-density development and the human experience of urban life. Densification is a core principle in transit-oriented planning, yet without appropriate design mechanisms, it risks creating alienating environments. Thoughtfully designed street edges activate the public realm, making it more walkable, legible, and meaningful [2]. This transformation aligns with a broader urban agenda that seeks to humanize the city, placing everyday life, memory, and social interaction at the forefront of spatial organization [3], [4]. This shift reflects a broader rethinking of urban design's role. Rather than serving as a stylistic exercise in shaping physical form, urban design increasingly functions as an intermediary discipline, operating between architecture and urban planning, capable of mediating spatial qualities at multiple scales [4]. The street, as a realm of public life, becomes an important design focus. It must evolve from being a mere conduit for vehicles into a multifunctional social space, one that expresses the identity of a place, enables everyday encounters, and nurtures a sense of belonging.

Indeed, the notion of place, distinct from space, has re-emerged as central in the discourse of livability. Cities are not only physical entities composed of roads and buildings but also cultural landscapes imbued with meaning. As Jacobs (1961) suggested, urban environments function like living organisms: they grow, decline, regenerate, and adapt over time.

In this view, streets with vibrant, human-scale frontages support the vitality of public life by offering a sense of continuity, familiarity, and openness [5]. Furthermore, the experience of the built environment is closely tied to spatial legibility and imageability, as articulated by Lynch (1960). Urban districts that feature distinctive, active, and well-defined street edges contribute to cognitive clarity and visual identity. These elements improve wayfinding and reinforce collective memory, thereby enhancing the emotional and functional quality of the urban experience. In TOD areas, this is particularly important, as transit stations are often perceived as disorienting or transitory. Through active frontage, such spaces can be transformed into recognisable and engaging urban places [6]. Drawing on Lynch's (1981) later work, the attributes of a meaningful and functional urban environment, vitality, sense, fit, access, and control, find clear resonance in the goals of active frontage. Each attribute points to the need for urban environments to be adaptable, perceptible, inclusive, and empowering. In TOD contexts, where multiple systems, transit, housing, commerce, converge, the street-level interface becomes the primary spatial tool through which these principles can be enacted [4].

In Maslow's hierarchy of needs, humans are posited to have eight levels of needs. These begin with biological and physiological needs, followed by the need for safety and security. Next are the need for belonging and love, reflected in relationships with social groups, and the need for esteem or appreciation. Above these are cognitive needs, then aesthetic needs related to beauty, order, and harmony. At the higher levels are the need for self-actualization, namely the effort to develop one's own potential, and finally the need for transcendence, that is, the drive to help others achieve their own self-actualization.

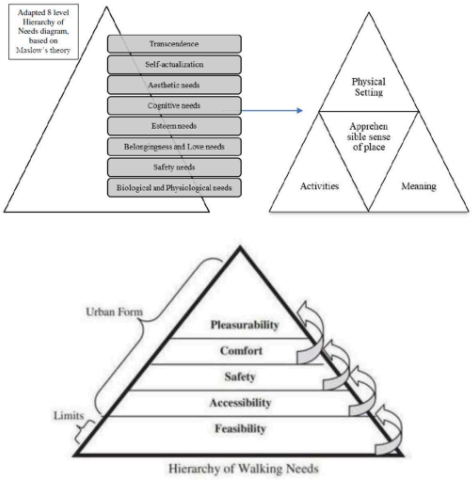


Figure 1.1. Diagram of the Hierarchy of Human and Pedestrian Needs

Source: [7], [8]

Urban livability cannot be addressed solely through infrastructure upgrades; it also requires an understanding of the qualitative dimensions of public life. Streets must support not only mobility but also encounters, rest, commerce, and cultural expression. A continuous and transparent ground-floor edge invites people to linger, engage, and feel secure. Such environments foster casual interactions, support local economies, and cultivate a shared sense of urban identity [6]. Moreover, active frontage plays a critical role in regulating the threshold between public and private domains. This interface is not merely visual, it constitutes a space of

negotiation that shapes social behavior, security, and perceived ownership. When properly designed, it can enhance inclusivity while ensuring passive surveillance, comfort, and dignity in public life [3], [9]. From a sustainability perspective, active frontages contribute significantly to ecological goals by encouraging walkability, reducing car dependency, and supporting transit-oriented lifestyles. They form part of a broader livability framework that balances environmental performance, economic vibrancy, and social cohesion. A well-designed active edge not only reduces carbon footprints but also enhances mental well-being, safety, and local identity, qualities that are foundational to a resilient urban future [10].

The main attributes of the livability dimension can be described through a set of interrelated components that collectively shape the quality of spatial experience for users. Active building frontages, characterized by a high degree of transparency and permeability, enable visual and physical connections between building interiors and outdoor spaces. Connectivity refers to how well street networks, pedestrian paths, cycling routes, and public transport nodes are integrated with one another, thereby facilitating mobility, expanding opportunities for interaction, strengthening social networks, and fostering a sense of place attachment. Safety encompasses both traffic safety and social security. Design features such as clear routes, safe pedestrian crossings, controlled vehicle speeds, adequate lighting, and the presence of continuous activity can reduce the risk of accidents and enhance users' sense of safety. Environmental quality is reflected in the physical and ecological condition of space, including the presence and quality of green–blue open spaces. Finally, the use of space for various types of activities and the duration of users' presence at a given location can encourage people to stay longer, indicating that the space successfully supports meaningful everyday life [11]

The deployment of active frontage within TOD developments is not a superficial aesthetic choice, but a strategic intervention that fundamentally enhances urban livability [2], [9]. It mediates density, fosters inclusion, supports sustainable mobility, and strengthens the character of place. Through a nuanced understanding of how built form interacts with public life, planners and designers can ensure that the urban spaces around transit nodes become more than functional, they become places of meaning, identity, and shared value.

II. LITERATURE REVIEW

Conceptually, transit-oriented development (TOD) can be understood as an urban design strategy that structures growth around transit nodes through the deliberate integration of diverse land uses and mixed building functions, thereby producing spatial and functional coherence at the district scale [12], [13], [14], [15], [16], [17]. This integration is operationalised by shortening travel distances and enhancing accessibility, particularly through the design of permeable building blocks and façades that open visually and physically onto the public realm, thus increasing route choice and ease of movement for pedestrians and cyclists (Kamani F. & Paydar, 2024; Niu et al., 2021; Papagiannakis et al., 2022; Xia et al., 2024). In turn, such TOD parameters are expected to induce a modal shift from private vehicles to high-capacity, rail-based public transport, helping to reduce congestion and emissions while simultaneously fostering more walkable and cyclable environments [13].

Within this broader framework, **active frontage** becomes a key design mechanism: by activating ground-floor façades with commercial and service uses, providing visual transparency between interior and exterior spaces, and shaping a pedestrian-friendly public–private interface, active frontage intensifies street life and improves the experiential quality of sidewalks as everyday public spaces [1], [21].

In TOD settings that prioritise pedestrians and cyclists, active frontage does not operate in isolation but is closely interlinked with the provision of community open space, which functions as a spatial and social catalyst that transforms the station area from a mere transit corridor into a lived-in urban environment [22]. Strategically located community open spaces form part of the public realm that stitches together residential, commercial, office, and public facilities within comfortable walking distance, while serving as meeting points that enhance comfort, affordability of access, safety, and equity for diverse user groups [4], [23], [24], [25]. In this sense, community open space should not be treated as leftover or residual land, but rather as a programmed and actively managed social infrastructure that, in synergy with continuous active frontage along TOD corridors, generates everyday social interaction and sustains the vitality of the TOD precinct over time [6], [26].

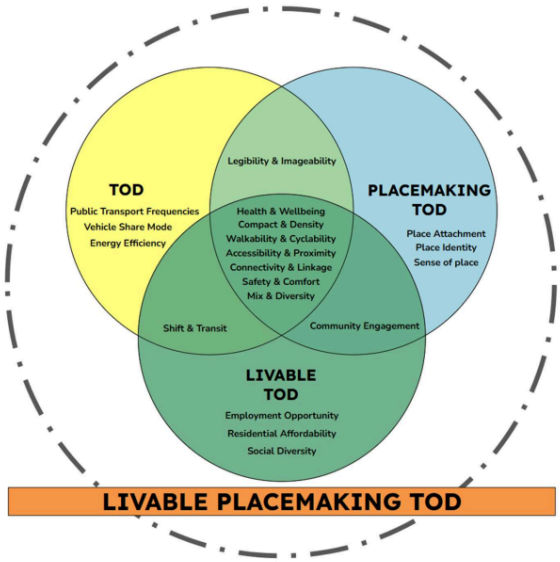


Figure II.1 Attributes and Variables of Livable TOD Placemaking
Source: Author's synthesis

II.1 Active Frontage

Active frontage in the context of urban design within Transit-Oriented Development (TOD) is not merely a physical attribute of building edges, but a strategic interface that mediates the relationship between private and public realms through the deliberate activation of ground floors both visually and functionally. Exterior space, in this sense, should not be understood only as a circulation corridor, but as a socio-spatial container that accommodates activities, social interaction, and the formation of emotional attachment between users and the urban environment. When outdoor spaces are carefully designed to support everyday use, they can foster a sense of belonging and place attachment, thereby sustaining urban vitality and activity over time [25]. Walkable exterior environments become the basic infrastructure of urban life: pedestrians, as Rubenstein (1992) notes, are people who move from one place to another on foot, and for Gehl (2010), city life fundamentally takes place "on the feet" of its inhabitants. Walking is therefore not only a mode of movement, but also a process of sensing, observing, and directly engaging with urban life [27]. Within this experiential framework, active frontage becomes the primary device that translates movement along the street into lived, meaningful public space.

Within TOD frameworks, active frontage operates as a design strategy that synchronizes land use with mobility systems by aligning comfortable pedestrian routes with animated ground floors. This strategy encourages active movement based on walking and cycling, while simultaneously supporting the uptake of mass transit by making access routes more attractive, legible, and safe (Mehta et al., 2020; Niu et al., 2021; Wu et al., 2024). A fine-grained mix of uses at walkable distances further reinforces the continuity between transit networks and pedestrian networks, positioning active frontage as a key catalyst for creating integrated, easily accessible urban districts [1]. In this regard, the spatial transition from transit nodes toward public spaces, such as plazas, ground-floor retail, and transparent building facades, becomes critical in establishing a seamless "connector" between private interiors and public streets. Such interfaces not only enhance visibility and perceived safety, but also lengthen people's dwelling time in the city through more intensive social encounters and opportunities for informal interaction [28], [29]. In many TOD precincts, regulations even encourage or mandate the transformation of ground-floor residential frontages into retail or service uses along primary corridors, with building setbacks

functioning as extensions of the sidewalk. Although the land remains privately owned, this approach effectively contributes to the public realm by creating active edges that provide "eyes on the street," a stronger sense of safety, and sustained urban vitality [1], [30].

Operationally, urban design frameworks that require active frontage zones, for instance for retail, cafés, or restaurants, have proven effective in maintaining frequent use of the street edge and enriching the experiential quality of the sidewalk [24]. Conceptually, active frontage refers to the ground-floor edge of buildings that exhibits a high level of activity, characterized by numerous doors and windows, visual transparency to interior spaces, and adequate physical connectivity with pedestrian routes. Such conditions have been shown to improve perceptions of comfort, safety, and sociability in public space [31]. The strategy of designing active building facades is then translated into a series of physical elements: closely spaced access doors, the use of commercial or service functions at ground level, and a high degree of facade transparency. These measures intensify the interaction between interior and exterior realms, producing a safer and more vibrant environment for pedestrians [26], [27]. In TOD areas, these qualities are particularly important along key pedestrian desire lines connecting stations, bus stops, and local amenities, where active frontage can transform what might otherwise be a monotonous corridor into an animated urban promenade [29], [32], [33].

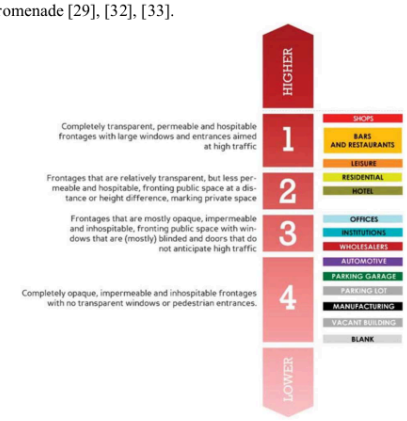


Figure II.2. Categories of Land-Use Functions Aligned with the Concept of Livable TOD Placemaking

Source: [34]

Morphologically, active frontage integrates three interrelated dimensions—visual permeability, physical permeability, and active uses—into a coherent spatial system. Visual permeability concerns the transparency of building facades and the visibility of interior activities, including the degree to which sightlines remain unobstructed between inside and outside; this transparency supports informal surveillance and strengthens the sense of safety and engagement along the street (Dameria & Fuad, 2021; Hassan et al., 2019). Physical permeability refers to the number and spacing of entrances along the frontage, as well as the configuration of thresholds and boundaries between private and public space; frequent, easily accessible entrances shorten walking distances, disperse pedestrian flows, and increase opportunities for spontaneous interaction (Dameria & Fuad, 2021; Eledeisy, 2023). Finally, active uses encompass the types and temporal patterns of activities hosted at the ground floor, including land uses that remain active into the evening, the presence of canopies and weather protection, the proximity of building edges to the street, and the orientation of entrances toward the sidewalk (Hassan et al., 2019). When these three dimensions are orchestrated in an integrated way, active frontage becomes a powerful urban design instrument that not only supports TOD objectives—such as transit ridership, walkability, and mixed use—but also cultivates an engaging, safe, and socially rich public realm.

II.1.1 Transparent Frontage

One of the fundamental mechanisms in shaping *active frontage* is the degree of visibility or transparency that the building façade provides, enabling pedestrians to visually access interior activities. Such transparency does not merely function as a visual connector between public and private realms; it serves as a catalytic interface that

stimulates social interaction and enhances the spatial experience along the street, while simultaneously allowing abundant natural light to enter the interior and conveying a sense of openness. Large windows, glazed doors, and minimized blank walls strengthen this function, transforming the building façade from a passive boundary into an active contributor to urban vitality [6], [29]. Empirical research consistently demonstrates that street segments with high façade transparency increase pedestrian *dwelling time*, encouraging people to pause, observe, and engage with street-edge activities [29], [31]. Transparency also communicates interior–exterior interactions, allowing visual cues of private activities to spill outward into public space and creating an open, dynamic urban interface [35]. As Jacobs (1961) emphasizes through the principle of *eyes on the street*, façade openings enable reciprocal visibility between building occupants and street users, thereby reinforcing natural surveillance. The frequency of façade openings directly enhances the intensity of informal observation, strengthening public perceptions of safety [30].

Within pedestrian-oriented urban development, transparent frontage thus becomes essential to forming lively and safe environments. Design elements such as extensive glazing, permeable ground floors, and active ground-level uses foster mutual visibility between private interiors and public sidewalks, reinforcing natural surveillance and contributing to overall street vitality. The presence of visible interior activities enhances spatial sociability, while high visual permeability correlates with elevated levels of perceived safety and pedestrian comfort—particularly in transit-oriented precincts where continuous activity throughout the day is critical for creating inclusive, safe, and sustainable urban environments [20], [29], [30]. Urban vitality driven by *active frontage* is strongly linked to the presence of commercial ground-floor functions that anchor continuous activity patterns. Retail units and small businesses act as key attractors, sustaining activity throughout the day and evening [18], [24]. Pedestrian corridors lined with active façades significantly increase the use intensity of public space and promote social engagement within dense urban areas [36], [37]. The clustering of commercial uses, green elements, and cultural programs along transit corridors elevates the frequency of social interactions and encourages pedestrians to linger, sit, and engage [26], [38].

The role of *transparent frontage* in reinforcing *eyes on the street* becomes even stronger when combined with fine-grained built form, small permeable blocks, and compact street networks—conditions that enrich walkability and enhance natural surveillance [2], [4]. In transit-oriented contexts, these elements help prevent the emergence of "dead frontages" after business hours, ensuring that the street continues to host social, economic, and cultural activity [39]. Beyond its aesthetic contribution, transparent frontage generates a sense of pedestrian engagement and place attachment. When interior activities are visually accessible, pedestrians develop a stronger sense of connection to the surrounding environment, turning the frontage into a sensorial and social threshold rather than a rigid barrier between public and private space [26], [30]. Empirical evidence further shows that façade openings of at least 20% achieve the highest visual-engagement scores in commercial streets, indicating the substantial perceptual impact of transparency on pedestrian experience [32]. As highlighted by Jacobs (1961) and Hillier (2004), these visual qualities are inseparable from well-connected street networks and mixed-use configurations that prioritize wide sidewalks and minimize on-street parking, thereby creating continuous urban promenades that are physically and visually legible, safe, and conducive to non-motorized mobility [6], [30].

Operational Definition of Transparent Frontage
In the context of this research, a transparent building façade (Transparent Frontage) is operationally defined as a ground-floor façade design strategy that actively interacts with the public realm through visual openings (such as windows and transparent doors), the visibility of human activities from the outside, and a diversity of engaging functions (particularly commercial uses). Together, these elements contribute to safety through eyes on the street, aiming to create visual engagement, enhance vitality, and promote comfort and pedestrian safety within the transit area.

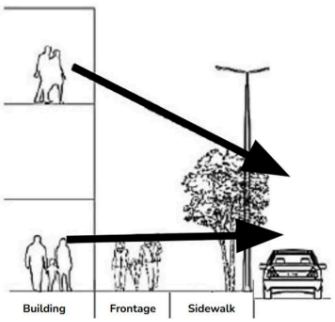


Figure II.3 Transparan Frontage increas eyes on the street
Source: Author's synthesis.

II.1.2 Permeable Frontage

In the context of Transit-Oriented Development (TOD), *permeable frontage* constitutes a critical dimension of active frontage because it ensures spatial continuity between public space and the buildings that frame it. At the urban-network scale, the capacity of pedestrians to penetrate urban blocks through accessible passages integrated within or between buildings becomes essential to prevent active frontage from functioning merely as a physical barrier; instead, permeability transforms it into a seamless spatial sequence that reinforces walkability and the narrative of pedestrian movement—an attribute widely recognized as fundamental to the form and performance of livable cities [40]. Empirical studies consistently demonstrate that such permeability is most effective in areas characterized by small block structures and high intersection density, where finer-grain connectivity amplifies opportunities for visual and physical interaction, producing richer, more dynamic walking experiences that simultaneously multiply the presence of active frontage. Within this framework, shorter block lengths and a higher density of intersections serve as key morphological indicators closely associated with enhanced visibility and permeability. These relationships are captured in evaluative tools such as the **AwaP** (Average Weighted Parameter) index, which quantifies block-size diversity to assess area-wide accessibility and movement potential [40]. Conversely, environments dominated by repetitive large block modules or continuous opaque walls tend to produce *blank frontages* that undermine pedestrian engagement, diminish perceived safety, and weaken urban vitality, an effect observed across various urban contexts where massiveness in façade treatment suppresses opportunities for interaction and passive surveillance (Alonso de Andrade et al., 2018b; Pafka & Dovey, 2017).

In Jakarta, the strategic use of *public easements* within TOD corridors, such as those running through multiple MRT station precincts, illustrates how semi-public access (for example, commercial corridors that remain open during operational hours) functions as an intermediary spatial device capable of stitching together fragmented blocks and reconstituting movement networks [23]. Findings from the Karet–Benhill precinct further substantiate this principle by showing that the effectiveness of permeability hinges on the management of operational hours, separation of pedestrian and vehicular flows, and the consistency with which building frontages maintain openness and legibility toward the public realm [41]. These factors determine the degree to which permeability can convert previously disconnected parcels into an integrated spatial system. Architectural articulation of permeable frontage extends beyond the mere presence of doors or physical openings. Elements such as canopies, verandas, balconies, recessed entries, and other façade components provide intermediate spatial conditions that ease the transition between building interiors and public walkways, reinforcing the perception that buildings actively participate in the life of the street. Such features foster both visual and physical engagement, enabling pedestrians to access buildings, navigate between blocks, and experience a sense of enclosure and orientation essential for a lively and adaptive TOD environment [32], [42]. Façade permeability can be operationalized through several indicators, including the ratio of accessible entry points, spacing between entrances, and the proportion of transparent or penetrable façade surface per 100 meters of building frontage [32], [42]. Evidence from studies in Rome suggests that physically permeable frontages achieve maximum scoring when the number of publicly accessible entrances meets or exceeds a threshold of five entries per 100 meters [32]. Conversely, large parcels with few entrances generate blind walls, significantly diminishing permeability, weakening pedestrian interaction, and eroding the broader vitality of the urban environment [43].

Operational Definition of Permeable Frontage
In the context of this research, a permeable building frontage (Permeable Frontage) is operationally defined as the portion of a building that can be physically accessed or traversed by pedestrians—whether through passages, corridors, or other building openings—that strategically connects private spaces with public realms, shortens travel distances, enhances the spatial integration of the area, and strengthens opportunities for social interaction, thereby supporting the emergence of active uses within the district.

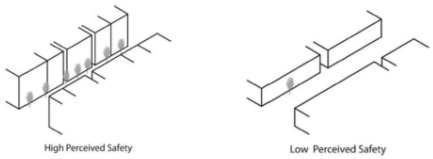


Figure II.4 Illustration of Permeable Frontage
Source: [31]

II.1.3 Active Uses

In cultural-perceptual terms, the transition between spaces often generates emotional responses—ranging from a sense of unfamiliarity to feelings of comfort—shaped by the presence of human activity behind shopfront glazing, the depth of visual fields, the continuity of promenades, variations in materials and elevation, and the proportion of openings that together form a perceivable "frontage narrative" for pedestrians [6], [28]. This experiential dimension becomes more pronounced when viewed alongside empirical evidence showing that degrees of permeability correlate directly with individuals' emotional states, thereby affirming that enhancing transparency is not merely an aesthetic choice but a strategic intervention capable of improving attention, engagement, and urban legibility for pedestrians [44]. Building on this premise, the design of **active frontage** within the framework of physical permeability becomes consequential; when frontages are programmed and articulated in line with the activity intensity of the district, pedestrian corridors evolve organically from mere channels of movement into lively places with diverse functions and consistently high usage frequencies [25], [37].

This transformation is further reinforced through ground-floor activation strategies such as integrating retail or café functions, orienting openings to the street, and ensuring a visually engaging interface between the private interior and the public realm [38]. Complementary elements, including well-arranged sidewalk furniture, transitional vegetation, and the removal of obstructive informal parking, have been shown to enhance pedestrian experience, strengthen both visual an

d physical continuity, and widen inclusive access to public space [6], [45]. Ground-floor setbacks, when applied deliberately, can generate sheltered zones that bolster pedestrian comfort, while transparent shopfronts and continuous human presence amplify the attractiveness of the walking route. The spatial transition from building edge to sidewalk typically reinforces the stratified pedestrian zone structure, comprising the frontage zone, the pedestrian through-zone, and the furnishing zone, each serving as a stage for urban furniture, seating, planters, and display elements that invite interaction. Importantly, during evening hours, the presence of **active frontage** becomes even more critical, as illuminated and programmatically active edges help prevent the emergence of dead frontages and maintain perceptions of safety and vibrancy in the public realm [26], [45].

Operational Definition of Active Use
In the context of this research, active use (active façade use) is operationally defined as the presence of ground-floor functions that are publicly relevant, directly oriented toward the street, easily accessible to pedestrians, and exhibit visible signs of ongoing activity (such as people entering and exiting or the regular use of space) during the designated observation periods. Together, these characteristics consistently contribute to the vitality, visual engagement, and perceived safety along the active frontage.

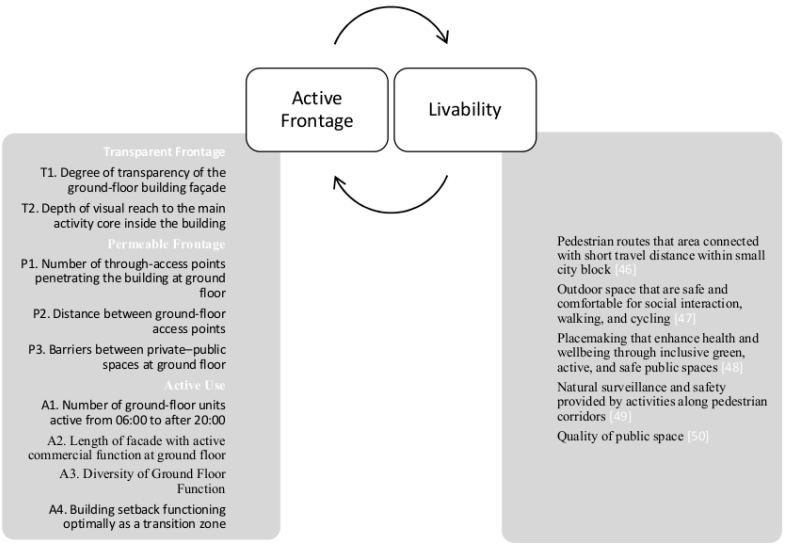


Figure II.5 Research Conceptual Framework

Source: author's synthesis

Table II.1. Operational Definition of Active Frontage Variables

Variabel & Sub Variabel		Operational Definition	Indicator	Measurement Method	Instrument	Measurement Scale
Active Frontage	Transparent Frontage	Ground-floor building façades that actively interact with public space through visual openings, the presence of human activities visible from outside, and a diversity of attractive functions, which contribute to safety by increasing *eyes on the street*.	T1. Degree of transparency of the ground-floor building façade;	Calculating the percentage of the length of transparent ground-floor façade relative to the total length of the ground-floor façade facing the street. Measured at eye-level (±1.5–2.0 m from sidewalk surface)	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			T2. Depth of visual reach to the main activity core inside the building.	Measuring the horizontal distance from the sidewalk to the main activity core (cashier, service counter, seating area, main display). Measured at eye-level	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)

Variabel & Sub Variabel		Operational Definition	Indicator	Measurement Method	Instrument	Measurement Scale
Active Frontage	Permeable Frontage	Parts of the building that can be physically accessed or traversed by pedestrians, which strategically connect private space with public space, shorten travel distance, and enhance spatial integration of the area in ways that can intensify and encourage social interaction.	P1. Number of through-access points penetrating the building at ground floor;	Counting the number of pedestrian access points that can penetrate the building (doors, through-corridors, arcades, alleys, access to public atria) within one façade segment of 100 m.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			P2. Distance between access points in ground-floor;	Measuring the horizontal distance between the axes of pedestrian access points along the façade, then calculating the average distance.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			P3. Barriers between private–public spaces at ground floor;	Calculating the length of façade dominated by barrier elements such as high fences or level differences that are difficult to traverse, compared with the total length of the façade segment.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
Active Frontage	Active Uses	The presence of ground-floor functions that are publicly relevant, directly oriented to the street, easily accessible to pedestrians, and that show clear signs of regular activity (people entering–exiting, regular use of space) within a given observation period, thereby consistently contributing to vitality, visual engagement, and perceived safety along the active frontage.	A1. Number of ground-floor units active from 06:00 to after 20:00	Identify and calculate the proportion of each ground-floor unit that operates in the morning and at night within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			A2. Length of façade with active commercial functions at ground floor	Measure the length of ground-floor frontage occupied by active functions (retail, cafés, restaurants, services, public services, community facilities) within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			A3. Diversity of land use functions at ground floor	Identify and calculate the level of functional diversity of different ground-floor uses for each unit (e.g., residential, retail, F&B, services, office, public facilities, community facilities) within a 100 m segment	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)
			A4. Building setback functioning optimally as a transition zone.	Calculating the length of façade that provides an open setback area that can be accessed and used by pedestrians.	Camera, Google Earth, smartphone, supporting questionnaire	Ratio scale (%)

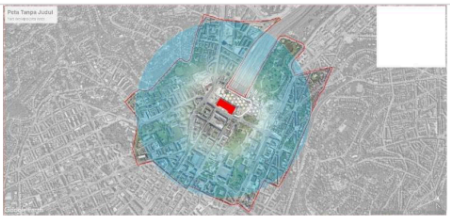
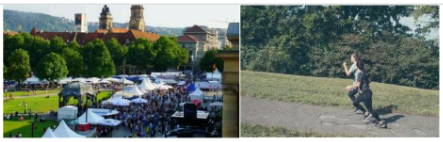
Table II.2. Attributes–Components of Livable Placemaking in TOD Areas

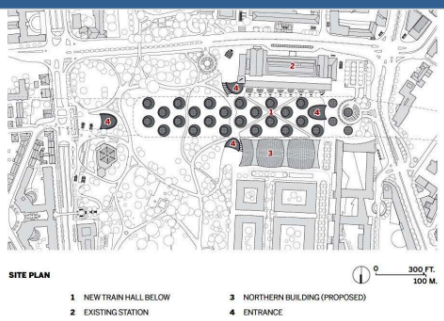
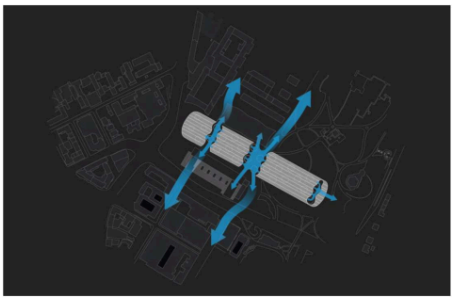
		Placemaking TOD									
ATTRIBUTE		Transit Oriented Development (TOD)									
		Livable TOD									
COMPONENT		*Health & Wellbeing*	*Shift & Transit*	*Walkability & Cyclability*	*Accessibility & Proximity*	*Connectivity & Linkage*	Compact & Density	Mixedness & Diversity	*Safety & Comfort*	*Legibility & Imageability*	*Community Engagement*
Morphological	*land use*	**A1, A3**		**A2, A3**	**A2, A3**	**A1, A3, T2**	**A3**	**A1, A2, A3**	**A1, A3, T2**	**A2**	**A1, A2, A3**
	building form & massing	**P4**		**T1, T2, P3, A2,**	**P1, P2, P3**	**P1, P2, T2**	**A2**	**A2**	**T1, T2, P3, P4, A2**	**T1, T2, P3, P4, A2**	**P4, A2**
	circulation and parking	**P1**	**P1, P3**	**P4**	**P1, P2, P3**	**A2**			**T1, T2**		
	public open space & green open space	**P3**				**P1, P3**			**P4**	**P4**	**P4**
	pedestrian ways		**P1, P3**	**P1, P2, P3**	**P1, P2, P3**	**P1, P2, P3**			**T1, T1, P2, P3, P4**	**P3, P4**	**P1, P4**
	activity support	**A1, A3**		**A1, A2, A3**	**A1**	**A1, A3,**	**A3**	**A1, A2, A3**	**A1, A2, A3**	**A2**	**A1, A2, A3**
	signage system										
Variable		Vitality	Access	Vitality	Access		Fit		Sense		Control
		Good City Form									

Urban morphological components are a measurable "container," and good urban quality is a goal that does not automatically arise simply from the existence of that container, but rather from how it is activated and connected. The Active Frontage variable functions as a linking mechanism, among others, by introducing: Transparency, which captures the visual legibility of the ground floor (the degree of façade transparency and the depth of visual reach into the core of activity); Permeability, which depicts the physical connection between private and public realms (the number of through-points, spacing between access points, and barriers between private and public areas); and Active Use, which represents the operation and intensity of ground-floor functions (active hours, the length of façade operating actively, and functional diversity). Livability in TOD is not produced solely by transit access, but also by the quality of the building-edge–public-space façade (frontage), which can be measured through the T–P–A dimensions described in the reciprocal Active Frontage ↔ Livability conceptual framework diagram: good frontage enhances livability, while livability targets guide frontage design

II.2 Precedent Study

Table II.3. Profile of Precedent Study

No.	Precedent	Description
1.	Arnulf Klett-Platz	
		*Figure II.6 Layout of Stuttgart Hauptbahnhof Area* Source: https://www.architecturalrecord.com/articles/15246-main-station-stuttgart-by-ingenhoven-architects
	Stuttgart Hauptbahnhof is a railway station located in the Arnulf Klett-Platz area in the center of Stuttgart. The core of the area's development is the conversion of a 16-track terminus station into an underground station adjacent to the historic Bonatzbau building; the release of the surface rail yard is then utilized as space for the development of green open spaces and interconnected pedestrian–cyclist corridors, as well as various community facilities at the district scale.	
		*Figure II.7 Layout of Stuttgart Hauptbahnhof Area* Source: https://www.stuttgarter-zeitung.de/inhalt.sommerfest-in-stuttgart-das-muessen-die-besucher-wissen.7e093907-5189-4623-a19e-9d7eae1b01bc.html
	Open spaces and public amenities within the area are used to support community activities, including park runs, plaza-based community activities (such as playgrounds, weekly markets, automotive events), and festivals.	

No.	Precedent	Description
		Figure II.8 Layout of Stuttgart Hauptbahnhof Area Source: https://www.architecturalrecord.com/articles/15246-main-station-stuttgart-by-ingenhoven-architects
		
		
	The Stuttgart Hauptbahnhof area positions community open space as the core of the new district built above the underground rail infrastructure. The site plan and aerial photographs emphasize a sequence of plazas, roof gardens, and linear public spaces that cover the former rail tracks while connecting the historic building with the new district and the main pedestrian accesses that cross the station and link to the wider urban network.	

No.	Precedent	Description
	  	Figure II.9 *Layout of Stuttgart Hauptbahnhof Area* Source: https://world-architects.com/en/ingenhoven-associates-dusseldorf/project/main-station-stuttgart

III. METHODOLOGY

The objective of this proposed thesis research is to develop a conceptual framework for livable placemaking within Transit-Oriented Development (TOD) areas; to identify the role of the Active Frontage variable in enhancing pedestrian quality and experience; to examine the contribution of Community Open Space to social interaction and environmental quality; and to evaluate the integration of these two variables in improving livability and placemaking within TOD areas. Research on livable placemaking in transit-based urban districts is conducted using a quantitative method. Measurements related to movement and activity analysis are employed to validate users' perceptions of the area, which are substantiated by on-site behavioral evidence, including observations of circulation patterns, user activities, and the calculation of user intensity through pedestrian counts and the time spent accessing the area during peak morning and evening activity periods.

Overall, the quantitative methods used, questionnaires (measuring perception), indices (measuring spatial performance), and movement–activity observation (measuring behavioral evidence), collectively produce a comprehensive quantitative portrait of livable placemaking in TOD areas.

The formula for measuring the transparent façade index [18], [46]:

$$V_I = 1 - \left(\frac{v1}{v1 + v2 + v3 + v4}\right)$$

Keterangan:

V_I = Visibility Index;
v1 = length of façade without visibility;
v2 = length of façade with visibility into empty space;
v3 = length of façade with visibility into private space;
v4 = length of façade with visibility into semi-public space.

This formula reflects the proportion of transparent façade elements as a form of visual access between

buildings and the surrounding public realm. A higher VI value indicates better visibility quality.

IV. RESULT AND DISCUSSION

The questionnaire results indicate that most respondents assess the visibility of ground-floor activities along the main corridors in Kebayoran as medium to high. The Panglima Polim–Melawai–Bulungan segment, Gandaria Tengah, and the area around M Bloc Space exhibit a significant percentage of transparent façade length, with large glass openings, building façades accommodating commercial functions, and minimal blank walls.

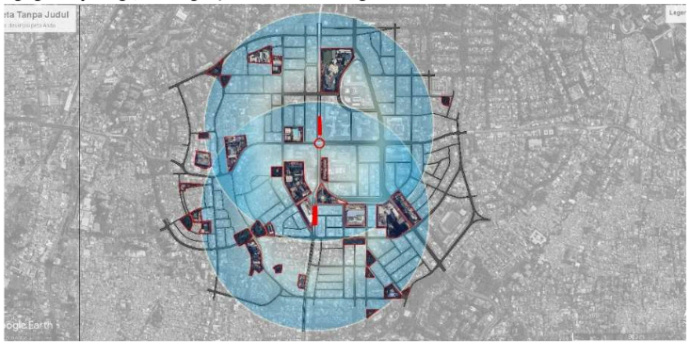


Figure IV.1. Diagram alur penelitian
Source: Author's synthesis

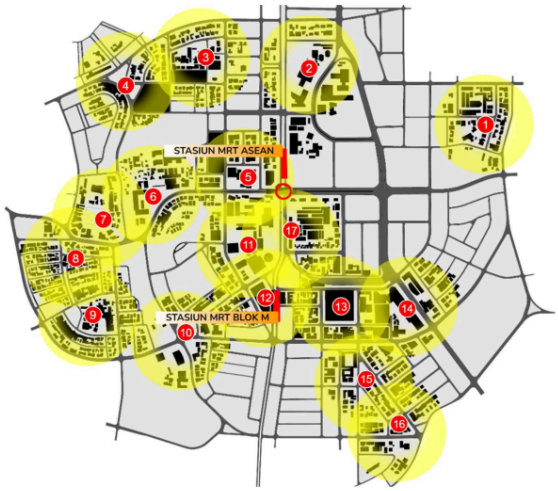


Figure IV.2 Identification of data collection points in the MRT ASEAN–Blok M area
Source: Author's synthesis

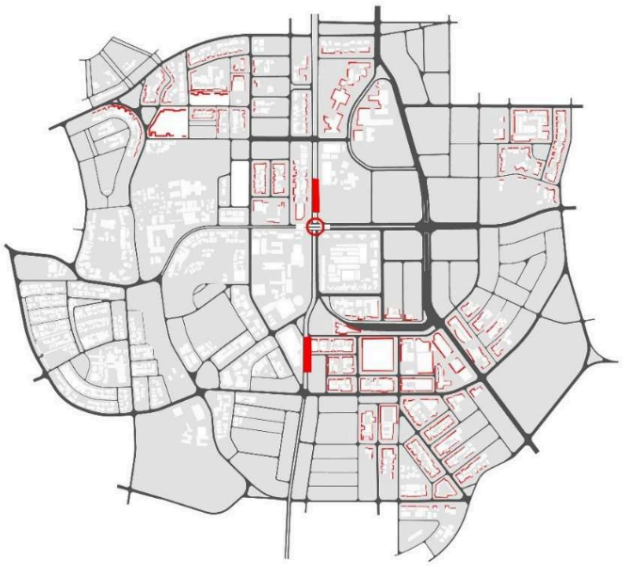


Figure IV.3 Identification of active frontage in the MRT ASEAN–Blok M area

Source: Author's synthesis

The questionnaire results indicate that most respondents assess the visibility of ground-floor activities along the main corridors in Kebayoran as medium to high. The Panglima Polim–Melawai–Bulungan segment, Gandaria Tengah, and the area around M Bloc Space exhibit a significant percentage of transparent façade length, with large glass openings, building façades accommodating commercial functions, and minimal blank walls. Perceptually, this produces a connected urban sequence along the walking route that makes users feel they are continually greeted by activities behind the glass, in line with the notions of soft edges and active edges.

In terms of permeability, the commercial corridors around Blok M Square, Plaza Blok M, and M Bloc Space show relatively short distances between entrances and numerous direct accesses from the sidewalk to ground-floor units. Physical barriers between private and public space take the form of level differences and fences that reinforce the edge element. Several local street segments show high fences, massive walls, or vehicle parking in front of buildings, which hinder easy pedestrian access and egress. This indicates that the implementation of permeable frontage principles is not yet evenly distributed across the entire corridor network.

From the perspective of active use, Kebayoran performs relatively well. Ground-floor façades at many observation points are occupied by functions that are directly oriented toward the public realm, namely retail, F&B, services, sports facilities, educational facilities, and creative spaces (for example M Bloc Space, GOR Bulungan, GOR Pati Unus), although still constrained in some cases by fences. At several points there are also residential fences or parking and loading functions, which lower the active use score.

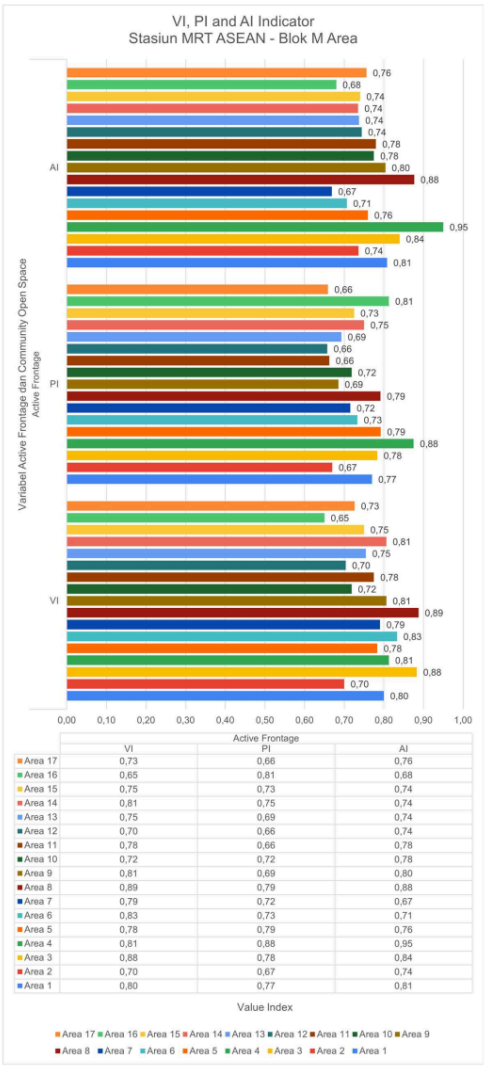


Figure IV.5 Questionnaire Results for the Visibility Index Level in the MRT ASEAN – Blok M Area
Source: Author's synthesis

V. CONCLUSION

In summary, the findings of this research indicate that in the Blok M area, where the level of active frontage is relatively high, it is able to support higher levels of walkability and cyclability, improve connectivity and linkage, enhance health and wellbeing, and strengthen community engagement.

Table V.1. Active Frontage Characteristics

Active Frontage
Transparent Frontage (Visual)
T1. Degree of façade transparency on the ground floor
T2. Degree of visual depth of view to the main activity areas inside the building
Permeable Frontage (Physical)
P1. Number of ground-floor access points that penetrate/lead through the building
P2. Distance between ground-floor building entrances
P3. Barriers to access between private and public space on the ground floor
Active Uses
A1. Number of ground-floor premises active from 06:00 until after 20:00
A2. Length of active commercial frontage on the ground floor
A3. Diversity of ground-floor functions
A4. Optimal building setback as a transition zone

Source: Author's synthesis

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