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ANALYSIS OF TRANSIT ORIENTED DEVELOPMENT (TOD) PRINCIPLES TO SUPPORT SUSTAINABLE TRANSPORTATION IN URBAN AREAS

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ABSTRACT
Implementing Transit Oriented Development (TOD) areas is an effort to overcome problems in urban areas due to rapid growth over time. These problems cause difficulties in mobility and land use, followed by traffic congestion, increased pollution, and accessibility that is not maximized. Therefore, the implementation of TOD is needed to support more sustainable movement in urban areas, especially in cities that have the potential to implement TOD. This study aims to discover the principles of TOD in a metropolitan area and the development strategies and recommendations that can be made to turn a metropolitan area into a TOD area. The method used in this research is the scoring method based on the TOD principles of ITDP standard 2017 and field observation activities. SWOT analysis was then conducted to determine the development strategy and recommendations that can be made. The research results at the study location still need to be included in the TOD area, where the study only scored 52 points. Efforts that can be made include adding recommendations for walking and cycling infrastructure at the study location so that it scores 66 points, which is included in the bronze category as a TOD area.

Keywords: Cirebon, green transportation, public transportation, transit-oriented development, tod standard, sustainable transportation

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INTRODUCTION

The rapid development of urban areas in many countries, including Indonesia, has led to mobility and land use problems, such as traffic density and suboptimal community accessibility (Intari et al., 2022). These problems are also driven by people's perspective on the level of economic prosperity with private vehicle ownership, which can exacerbate congestion problems in an urban area (Guzman et al., 2020). This increase in the number of vehicles will also increase energy consumption and carbon emissions in large quantities. Even in 2020, the transportation sector accounts for 16% of total carbon emissions, the largest source of carbon emissions (Mei et al., 2024). Using private vehicles has proven unsustainable for a future of social welfare and viable cities while hindering the transition to low-carbon mobility (Sopjani et al., 2020). To overcome these problems, efforts are needed to reduce dependence on private vehicles. One of the efforts that can be made is to develop a transportation network through the Transit Oriented Development (TOD) area (Zafira & Puspitasari, 2022).

Transit Oriented Development (TOD) areas aim to create practical, mixed-use, pedestrian-friendly neighborhood conditions that combine commuting, lodging, schools, parks, and other social activities (Ali et al., 2021a). By concentrating urban development around transit stops or stations, TOD is considered a strategy to increase public transport ridership, encourage the use of non-

motorized vehicles, reduce air pollution, and improve the efficiency of transportation services (Ibrahim et al., 2023). By developing close transit stations, TOD can not only increase the use of public transport but also has the potential to increase property prices in the vicinity (Ibraeva et al., 2020). TOD also addresses poor urban growth issues such as accessibility and lack of open space (Liu et al., 2022).

One of the cities with successful TOD area development is Toyama City in Japan, which successfully changed its strategy to become a compact city and promoted public transportation and TOD before the spread became too large and challenging for the city government to manage (Kidokoro, 2020a). TOD development has also been successfully applied in urban areas in the US with a walkable and sustainable development approach (Berawi et al., 2019). In a study (Taki et al., 2019), applying TOD principles to the rail network can help reduce congestion, improve waiting times, and address commuter discomfort. TOD has the potential to be applied in cities with lower density than metropolitan cities or suburban areas or small towns (Nigro et al., 2019).

One small city with the potential to apply the principles of TOD is the city of Cirebon; this is also encouraged by the Rebana Metropolitan City Development Plan, which involves the city of Cirebon. This metropolitan city development plan was also authorized in West Java Regional Regulation Number 12 of 2014 (Januar, 2023).

The rapid growth of urban areas has led to significant challenges in managing mobility and land use, particularly concerning traffic congestion, limited accessibility, and high pollution levels. Previous studies have explored Transit-Oriented Development (TOD) as a solution for sustainable urban planning, emphasizing its effectiveness in reducing car dependency, promoting public transport, and improving urban livability (Ali et al., 2021; Guzman et al., 2020). For example, Guzman et al. (2020) examined sustainable mobility in Bogotá, demonstrating how TOD reduces congestion and supports efficient land use. Similarly, studies by Berawi et al. (2019) and Kidokoro (2020) highlighted successful TOD implementations in cities like Toyama, Japan, and several metropolitan areas in the U.S., showcasing TOD's potential to create compact, walkable, and mixed-use neighborhoods.

Despite the general benefits of TOD documented in these studies, relatively few focus on small or mid-sized Southeast Asian cities. TOD development faces unique challenges like lower density and limited public transport infrastructure. This study addresses this gap by examining TOD principles in Harjamukti Terminal in Cirebon City, Indonesia, a growing urban area with potential TOD application yet needing more non-motorized infrastructure and public transit facilities.

In the plan, the city of Cirebon will become the center of activity, requiring facilities that support connectivity and mobility. One of the public transportation facilities that can support mobility in the city of Cirebon is the type A Harjamukti terminal area. The Harjamukti terminal area has the potential to become a TOD area in the future, as can be seen from the density of settlements around the Harjamukti terminal and the availability of public transportation that can support movement. However, to make the Harjamukti terminal area a TOD area, there are several problems: the existing pedestrian facilities are not maximized and are not disability friendly. This can be seen on several roads with no safe pedestrian paths and damage to the existing pedestrian paths. In addition, there are also no bicycle facilities to support non-motorized movement. Other factors that can support the creation of TOD in the Harjamukti terminal area also need to be studied to discover the shortcomings and advantages of the existing conditions.

The novelty of this study lies in its focus on applying TOD principles in a mid-sized city setting, tailored explicitly to Cirebon's unique spatial and socio-economic characteristics. Unlike other

studies centered on dense metropolitan areas, this research investigates how TOD can be adapted for smaller urban contexts, identifying specific infrastructural and policy recommendations to bridge the gap between TOD standards and the local conditions in Harjamukti. By evaluating the current infrastructure through the 2017 ITDP TOD Standard and proposing development strategies tailored to the location, this study provides actionable insights for similar urban areas across Southeast Asia.

The study is essential as it supports sustainable transportation solutions tailored to mid-sized cities, aiming to improve public transit, pedestrian infrastructure, and cycling facilities. These recommendations are crucial for reducing carbon emissions, enhancing urban accessibility, and promoting sustainable growth patterns in Indonesia and beyond, aligning with global sustainability goals.

Given the existing challenges and potential within the Harjamukti terminal urban area, this research aims to analyze the suitability of Transit Oriented Development (TOD) principles. This research also aims to find development strategies and recommendations that can be made to improve the harjamukti terminal area and turn it into a TOD area. Hopefully, this research can be a reference and input to related parties from TOD principles that still need to be implemented optimally, thus including the harjamukti terminal urban area in the TOD standard.

METHOD

This study was conducted in the Harjamukti terminal area of Cirebon City, focusing on a radius of 800 meters from the terminal. This radius aligns with the maximum walkable distance typically used in TOD assessments. Data were collected using a combination of field observations and secondary data sources, including the Regional Spatial Plan (RTRW) and Detailed Spatial Plan (RDTR) of Cirebon City, as well as satellite imagery. Field observations involved documenting current conditions for pedestrian paths, public transport facilities, and other infrastructure relevant to TOD principles. Observers assessed the availability, quality, and accessibility of these facilities to determine the area's readiness for TOD implementation.

The study utilized the TOD Standard by the Institute for Transportation and Development Policy (ITDP) from 2017, which outlines eight fundamental principles for developing Transit-Oriented Development areas: Walk, Cycle, Connect, Transit, Mix, Densify, Compact, and Shift. Each principle includes specific metrics that help assess how well an area supports sustainable, accessible, and efficient transportation. The scoring system categorizes areas into Gold, Silver, or Bronze standards based on their alignment with these principles, enabling structured analysis of potential improvements. A SWOT analysis was also conducted to identify strengths, weaknesses, opportunities, and threats, forming a foundation for development recommendations tailored to the Harjamukti terminal area.

Research Location

The research location was in the Harjamukti terminal area of Cirebon city, with a radius of 800m from the Harjamukti terminal. Taking a radius of 800m is based on the maximum distance that can be traveled on foot (ITDP, 2017).

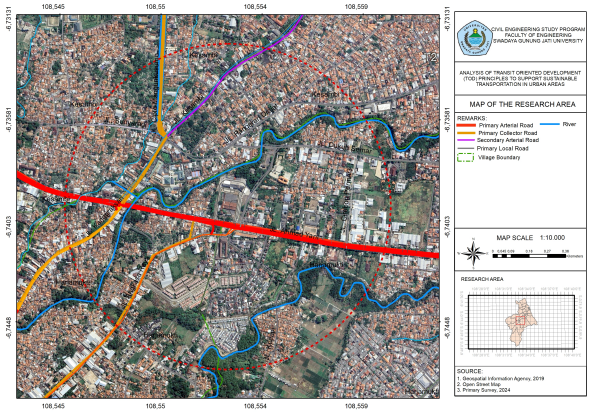

Figure 1.
Research Location Map

Research Flow

The research flow used in this study can be seen in the following figure:

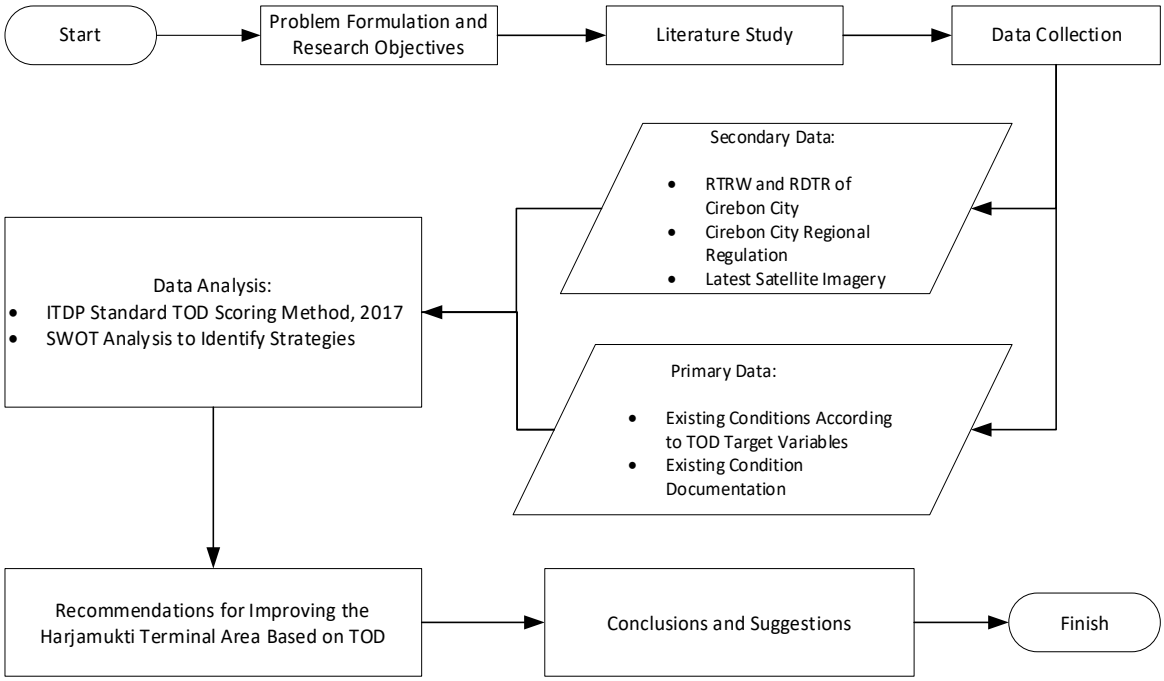

Figure 2.
Research Flow Chart

This study uses a qualitative method to assess the existing condition of the Harjamukti terminal area by observing the TOD area concept scoring method according to the Institute for Transportation and Development Policy (ITDP) 2017. According to ITDP (2017), eight principles must be applied to the TOD area: walk, cycle, connect, transit, mix, densify, compact, and shift, which have their respective values. These values will be accumulated according to the TOD standard class: gold, silver, and bronze. After scoring the TOD principles, a SWOT analysis is then carried out to determine the strategies for developing development efforts that can be carried out in the Harjamukti terminal area. Then, recommendations are made for efforts to improve the Harjamukti terminal area and turn it into a TOD.

After data collection, the analysis began with scoring TOD principles based on the 2017 ITDP TOD Standard metrics. Field data on infrastructure conditions were compared against ITDP

standards, and each metric was scored based on compliance. For example, the "Walk" principle was evaluated by examining pedestrian path availability, crosswalks, and visually active frontage. Scores were assigned for each principle and then aggregated to determine an overall TOD readiness level, with final scores categorizing the area as either Gold, Silver, Bronze, or below TOD standards.

In addition to the TOD scoring, a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) was conducted to provide further strategic insight. Strengths included existing infrastructure elements supportive of TOD, such as the primary arterial location and the presence of public transport services. Weaknesses focused on deficiencies, such as a lack of dedicated cycling facilities and limited park access. Opportunities involved external factors that could support TOD, such as regional development plans and potential investments in non-motorized transit infrastructure. Threats included challenges like community reliance on private vehicles and limitations in land availability.

The SWOT analysis was conducted through a matrix that compared internal (strengths and weaknesses) and external (opportunities and threats) factors, allowing for the identification of strategic actions. Using this matrix, strategies were formulated by aligning strengths with opportunities, addressing weaknesses with opportunities, countering threats with strengths, and minimizing weaknesses in light of threats. The TOD scoring and SWOT analysis insights were then synthesized to develop recommendations for infrastructure improvements and policy interventions to transform the Harjamukti terminal area into a functional TOD zone.

RESULTS AND DISCUSSION

Block Division of the Research Area

The block division is carried out to facilitate observation, and data analysis is carried out later using the TOD standard. Within a radius of 800m, the research area is divided into nine block areas by following the main roads in the research area. The division of blocks can be seen in the following figure:

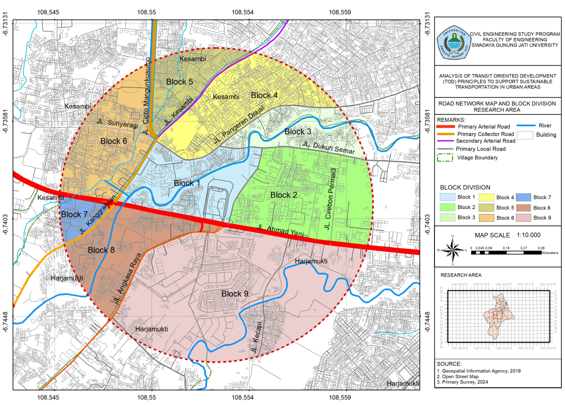

Figure 3.
Block Division of Harjamukti Terminal Area

Scoring Analysis of Conformity of TOD Principles

1. WALK
   a. Walkways

   The observation results on the walk principle can be seen in the following figure:

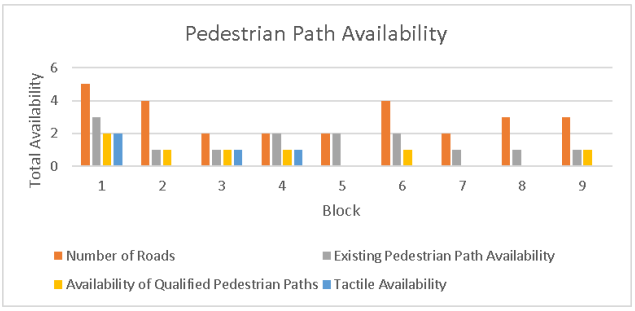

Figure 4.
Pedestrian Path Availability

The calculation of pedestrian paths follows TOD principles, so this metric **scores 0 points.**

b. Crosswalks

Based on the assessment results for the availability of pedestrian crossings in the study area, no crossing facilities provide crossing facilities in all directions, so they do not provide pedestrians a sense of security and comfort. Aka, for this metric, gets a **score of 0 points.**

c. Visually Active Frontage

The percentage of active building frontages within the study area can be seen in the following graph:

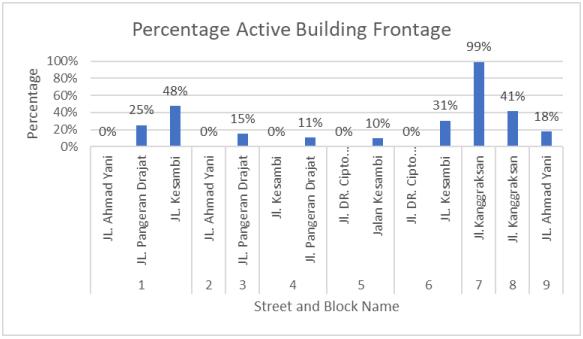

Figure 5.
Visually Active Frontage Availability

Based on the assessment, the study area has a total pedestrian path length of 5,080 m with a percentage of active building frontage of 19%. This percentage is still below the TOD standard of 50%, so it gets a **score of 0 points.**

d. Physically Permeable Frontage

The percentage of permeable building frontage within the study area can be seen in the following graph:

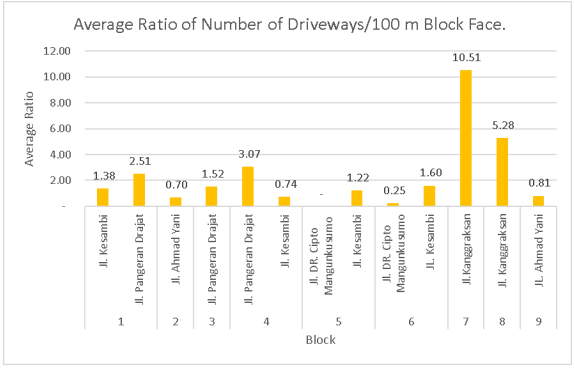

Figure 6.
Physically Permeable Frontage Availability

Based on the assessment results for permeable building faces, the average number of driveways per 100 m block face is 2.28. Each block still needs to meet the TOD standard, which requires a minimum average number of driveways per 100 m block face of 3 or more. So, it has a **score of 0 points in this assessment.**

e. Comfortable and temperature-controlled pedestrian infrastructure

The percentage of comfortable and temperature-controlled pedestrian infrastructure in the study area can be seen in the following graph:

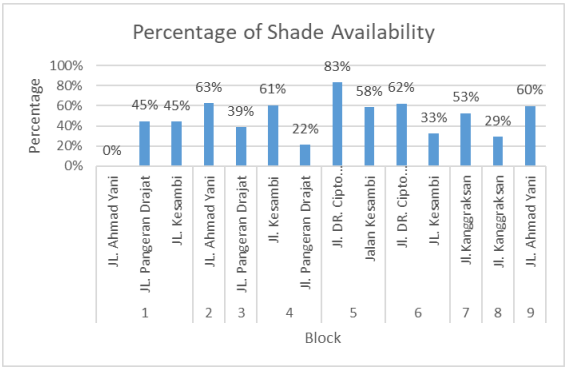

Figure 7.
Availability of comfortable and temperature-controlled pedestrian infrastructure

Based on the total results of the availability of shade and protection, the percentage is 45%. This percentage still does not meet the TOD standard, which requires a minimum availability of shade of 75%, so it gets a **score of 0 points**.

2. CYCLE

There are no bicycle lanes or bicycle parking facilities in the study area, so the cycle principle metric **scores 0 points.**

3. CONNECT

a. Walking and cycling routes are short, direct, and varied

The average Sub Block Face Length within the study area is as follows:

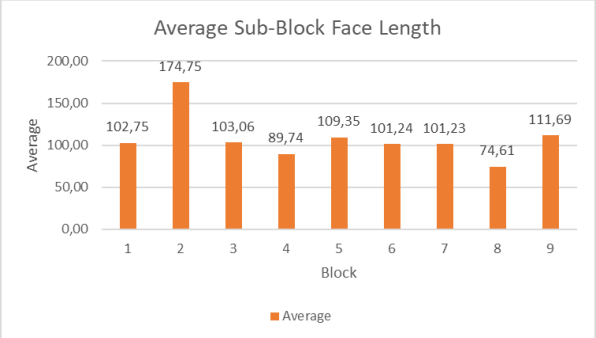

Figure 8.
Average Sub-Block Face Length

The average sub-block face length within the study area was 103.48 meters. In the ITDP TOD Standard context, sub-block face length is essential because shorter block lengths

promote excellent walkability and connectivity within a TOD area, reducing the need for motorized travel and making pedestrian and cycling routes more accessible.

According to ITDP's criteria, an ideal TOD area has an average sub-block face length of less than 110 meters. By achieving an average of 103.48 meters, the Harjamukti terminal area meets this benchmark and receives a total score of 10 points for this metric. This result reflects that the area has been developed with a relatively compact block structure, which is favorable for TOD because it enables more straightforward navigation for pedestrians, encourages active transportation, and supports local businesses by creating a more connected environment.

Moreover, achieving this score suggests that, from a spatial layout perspective, the Harjamukti terminal area has a foundational urban structure that aligns well with TOD principles. However, while the compact block layout supports TOD, it must be complemented with pedestrian-friendly infrastructure, such as well-maintained sidewalks, crosswalks, and non-motorized transit options, to realize this layout's benefits fully. In this regard, the score for sub-block face length highlights the potential for Harjamukti to advance toward a TOD model but also indicates that additional enhancements to pedestrian and cycling infrastructure are necessary to make full use of this structural advantage.

b. Walking and cycling routes are shorter than motorized routes.

Based on the scoring in this metric, there are no suitable pedestrian network intersections, and only intersections are for motor vehicles. Therefore, this metric **scores 0 points.**

4. TRANSIT

Public transportation services, such as city transportation and trans-Cirebon buses, serve the community in the research area, so the Harjamukti terminal area qualifies as a TOD area.

5. MIX

a. Complementary Land Use

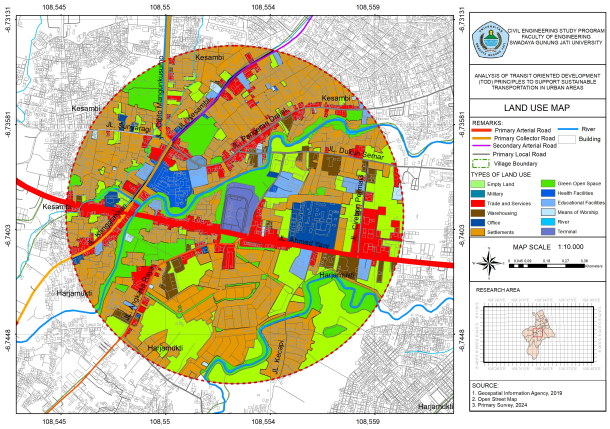

Figure 9.
Figure 10. Land Use Map

Reveals that residential land comprises 41.96% of the total area. In the context of TOD principles, a balanced mix of land uses—such as residential, commercial, and public spaces—is critical for promoting accessibility, reducing commuting times, and encouraging walkability within the neighborhood. The ITDP TOD Standard suggests that for a TOD area to score highly, the predominant land use should exceed 50%, reflecting a concentrated use that supports high-density, pedestrian-oriented environments.

In this study, with residential land use falling short at 41.96%, the area receives 8 points out of the maximum for this metric. This score indicates that, while there is a significant residential presence, it needs to be sufficiently dominant to foster a fully integrated, mixed-use environment conducive to TOD. Ideally, a TOD area would benefit from increased mixed land uses, including more commercial and recreational spaces alongside residential areas, to create a more vibrant, accessible environment that encourages residents to use non-motorized modes of transport for daily needs.

Furthermore, the relatively low percentage of dominant land use suggests opportunities for strategic densification and diversification of land use types. Increasing the proportion of complementary land uses—such as local shops, offices, and green spaces—within or near residential areas could enhance the functionality of the TOD area, reducing the need for long commutes and encouraging localized, sustainable transportation options.

b. Access to Local Services

Access to local services in the TOD area is a source of fresh food that can serve a radius of 500 meters, and education and health facilities must have a service radius of 1000 meters. In the study area, three types of local services, namely educational facilities, health facilities, and fresh food sources, serve the entire study area, so this metric **scores 3 points.**

c. Access to Parks and Playgrounds

The study area has no known access to parks and playgrounds, so this metric **scored 0 points.**

d. Affordable Housing

Affordable housing within the study area has yet to be available. The housing price is far from 30% of the average income in the study area. Therefore, this metric **scored 0 points.**

e. Housing Preservation

Based on observation and literature through news and local regulation documents, there are no plans to relocate housing in the study area. In this metric, 100% of houses are retained in the study area, and **3 points were scored.**

f. Preservation of Business and Services

Based on observation and literature through news and local regulation documents, there are no plans to relocate trade and service buildings in the study area. In this metric, 100% of houses are retained in the study area, and **2 points were scored.**

6. DENSIFY

a. Non-Settlement Density

In research conducted by (Intari et al., 2022), the non-residential density in the blok M with a radius of 500 meters is 79.15%, while within a radius of 1000 meters, it is 67.28%. The results for the 500m radius and 1000m radius research areas for non-settlement density found that the difference between the two was more than 5% of the reference, so it scored **0 points for this metric.**

b. Settlement Density

In research conducted by (Intari et al., 2022), the density of settlements in Blok M with a radius of 500 meters is 20.86%, while within a radius of 1000 meters, the density of settlements is 32.72%. Based on the results for a radius of 500 m and a radius of 1000 m for settlement density, it is found to be higher than the reference, and the 500 m coverage area is denser than the 1000 m coverage area, so for this metric, it gets a **score of 8 points.**

7. COMPACT

a. Urban Area

Based on the calculation results for urban metrics in the study area, 62% of buildable and developed land was obtained. This percentage is 60%—70%, which **scores 2 points.**

b. Public Transportation Options

A map of public transportation within the study area can be seen in the following figure:

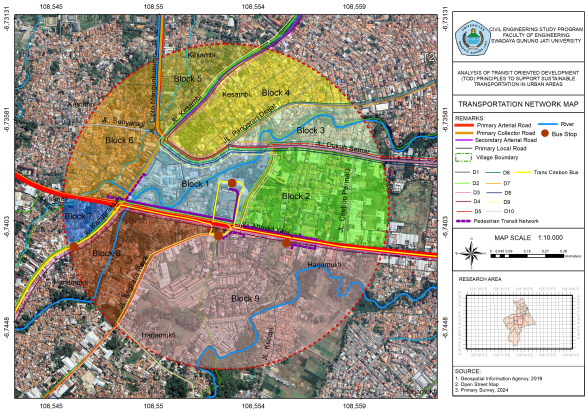

Figure 11.
Map of Public Transportation Options

Existing public transport options in the research area are regular public transport such as city transportation and trans-Cirebon buses, so the assessment of this metric **scores 1 point.**

8. SHIFT

a. Off-Street Parking

A map of off-street parking availability and driveways within the study area can be seen in the following figure:

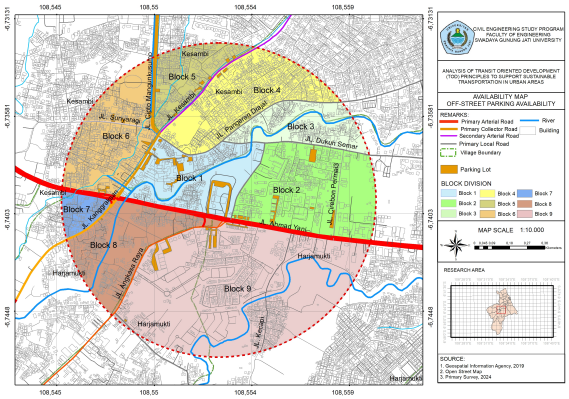

Figure 12.
Off-Steet Parking Availability and Vehicle Entrance Lane

Based on the calculation obtained for the percentage of off-street parking availability, streets and driveways have an area of 31364 m2 out of 2,009,600, so the percentage is 1.56%. This metric **scores 8 points.**

b. Driveway

The average Driveway within the study area is as follows:

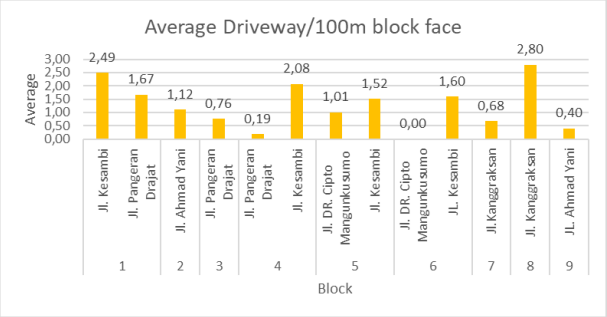

Figure 13.
Average Number of Driveways

Based on these results, the average driveway is 1.11. With this result, there are less than two driveways / 100 m of block frontage, thus **scoring 1 point.**

c. Road Area for Motorized Vehicles

Based on the results obtained, this metric uses road space for motorized vehicles with a percentage of ≤15%, which is 3.97%, so this metric gets a **score of 6 points.**

The recapitulation results of the application of TOD principles in the research area can be seen in the following table:

Table 1. Scoring Assessment of Existing Conditions of TOD Area

No	Principle	Metrics	Score
1	Walk	Pedestrian Path (3 Points)	0
		Pedestrian Crossings (3 Points)	0
		Active building face (6 points)	0
		Permeable building face (2 points)	0
		Percentage of walkway sections that provide sufficient shading or protective elements. (1 Points)	0
2	Cycle	Cycling Infrastructure Network (2 Points)	0
		Bicycle Parking at Public Transport Stations (1 Point)	0
		Bicycle Parking in Buildings (1 Point)	0
		Bicycle Access to Building (1 Point)	0
3	Connect	Small Blocks (10 Points)	10
		Prioritizing Connectivity (5 Points)	0
4	Transit	Walking Distance to Public Transportation (Required)	qualified
5	Mix	Complementary Land Use (8 Points)	8
		Access to Local Services (3 Points)	3
		Access to Parks and Playgrounds (1 Point)	0
		Affordable Housing (8 Points)	0
		Housing Preservation (3 Points)	3
		Preservation of Business and Services (2 Points)	2
6	Densify	Non-residential Density (7 Points)	0
		Settlement density (8 points)	8
7	Compact	Urban Area (8 points)	2
		Public Transportation Options (2 Points)	1
8	Shift	Off-Street Parking (8 Points)	8
		Motorized Vehicle Access Density Level (1 Point)	1
		Road Area for Motorized Vehicles (6 Poin)	6
		AMOUNT	**52**

Based on the results obtained for the total points in the study area, a score of 52 points was obtained, so the Harjamukti terminal area still needed to be included in the TOD area standard. Therefore, several development strategies can be implemented to improve the TOD-based Harjamukti terminal area.

SWOT Analysis to Identify Strategies for TOD Area Development

For SWOT analysis to find out the development strategy of the TOD area can be seen in the following table:

Table 2. SWOT Analysis

Internal Factors / **External Factors**	**Strength:**	**Weakness:**
	1. The Harjamukti terminal area is on a primary arterial road 2. Short walking and cycling routes 3. Mixed land use 4. Full access to local services 5. Preservation of housing and businesses retained 6. High residential density 7. Little land use for motorized vehicles.	1. Lack of pedestrian facilities 2. Unavailability of cycling facilities 3. Walking and bicycle routes are still not short 4. lack of access to the park 5. Lack of affordable housing 6. lack of non-residential density 7. lack of fast and high-capacity public transit.
Opportunity:	**Strategi (Strength-Opportunity):**	**Strategi (Weakness - Opportunity):**
1. TOD development issues at harjamukti terminal 2. Rebana metropolis plan 3. Is one of the tourist destination cities in West Java 4. Plan for urban infrastructure development 5. Bicycle path development plan. 6. Plans for subsidized housing 7. Development plan of mass public transit system	1. Utilize the terminal site to develop a TOD area. 2. Maintain the TOD principles that have been applied. 3. Develop short walking and cycling routes. 4. Expand public transit services. 5. Develop adequate facilities to attract more users from outside the city.	1. Develop pedestrian infrastructure. 2. Develop cycling facilities. 3. Improve access to and availability of attractive and convenient parks 4. Develop an affordable housing program 5. Development of a mass public transit system.
Threat:	**Strategi (Strength-Threat):**	**Strategi (Weakness - Threat):**

1. The number of people who depend on motorized vehicles 2. Public transportation route development policy is not evenly distributed 3. The community is less concerned and does not maintain pedestrian infrastructure 4. Irregular parking on public transportation 5. No maintenance of TOD supporting infrastructure 6. Choice of online transportation mode 7. constraints in land acquisition	1. Provide efficient and convenient transportation alternatives such as public transport and bicycle facilities. 2. Increase public awareness of the use of public transportation 3. conduct routine maintenance 4. Maintain the preservation of housing and businesses and supporting infrastructure of TOD 5. Regulate public transportation to be more organized	1. Socialization and policies to maintain pedestrian and cycling infrastructure 2. Improve pedestrian and cycling infrastructure. 3. Conduct dialogues with communities to address land acquisition constraints. 4. Reduce inappropriate use of pedestrian paths. 5. Develop a more organized, convenient and efficient public transit system.

Furthermore, in the SWOT analysis, IFAS and EFAS analysis is carried out to determine the right strategy for developing the TOD area by giving weights and ratings to *Strengths, Weaknesses, Opportunities,* and *Threats.* The analysis results are in the form of coordinate points on a cartesian diagram containing four quadrants. The results of the IFAS and EFAS analysis in the SWOT analysis of the research area can be seen in the following figure:

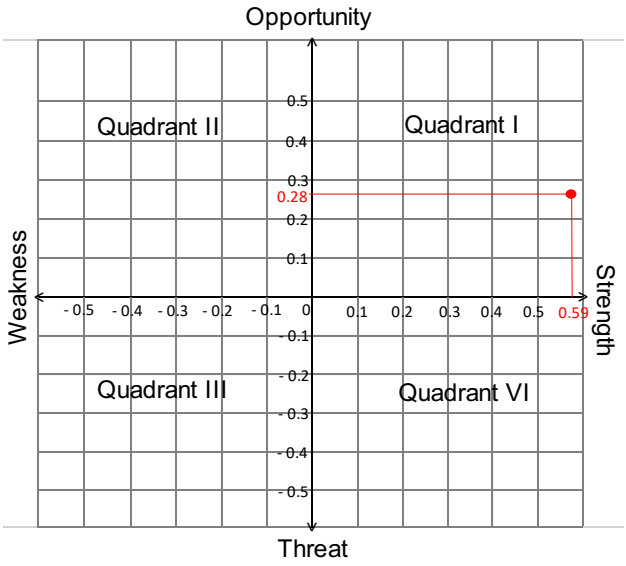

Figure 14.
Diagram of X and Y Values of SWOT Analysis

Based on these results, the research area is in quadrant I, meaning the TOD area has good strengths and opportunities. The strategy recommendation is progressive, which means it is in an optimal and stable condition to continue expanding, increasing growth, and achieving maximum progress.

Recommendations for TOD Area Development

In this development recommendation, two main principles in the TOD standard, namely the Walk and Cycle principle, are added to encourage people not to depend on private vehicles and to

increase interest in walking and cycling. The recommendation map for pedestrian and cycling facilities is as follows:

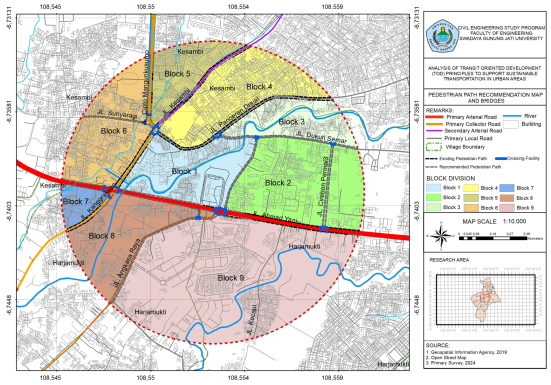

Figure 15.
Pedestrian and Crosswalk Recommendation Map

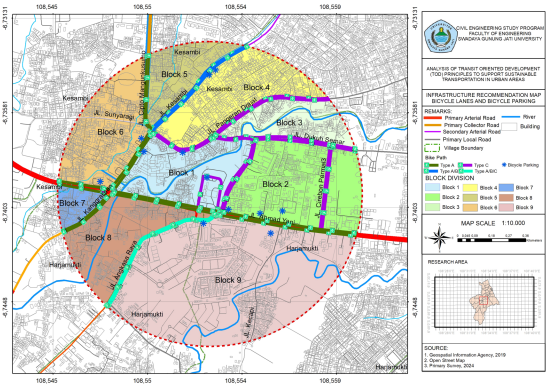

Figure 16.
Bicycle Infrastructure Network Recommendation Map

A recapitulation of the assessment of recommendations for the availability of pedestrian and cycling infrastructure can be seen in the following table:

Table 3. Recapitulation of Recommendations for pedestrian and cycling infrastructure availability

No	Principle	Metrics	Score Existing	Score After Recommendation
1	Walk	Pedestrian Path (3 Points)	0	3
		Pedestrian Crossings (3 Points)	0	3
		Active building face (6 points)	0	0
		Permeable building face (2 points)	0	0
		Percentage of walkway sections that provide sufficient shading or protective elements. (1 Points)	0	1
2	Cycle	Cycling Infrastructure Network (2 Points)	0	2
		Bicycle Parking at Public Transport Stations (1 Point)	0	1
		Bicycle Parking in Buildings (1 Point)	0	1
		Bicycle Access to Building (1 Point)	0	1
3	Connect	Small Blocks (10 Points)	10	10
		Prioritizing Connectivity (5 Points)	0	0
4	Transit	Walking Distance to Public Transportation (Required)	qualified	qualified
5	Mix	Complementary Land Use (8 Points)	8	8
		Access to Local Services (3 Points)	3	3
		Access to Parks and Playgrounds (1 Point)	0	1
		Affordable Housing (8 Points)	0	0
		Housing Preservation (3 Points)	3	3
		Preservation of Business and Services (2 Points)	2	2
6	Densify	Non-residential Density (7 Points)	0	0
		Settlement density (8 points)	8	8
7		Urban Area (8 points)	2	2

	Compact	Public Transportation Options (2 Points)	1	2
8	Shift	Off-Street Parking (8 Points)	8	8
		Motorized Vehicle Access Density Level (1 Point)	1	1
		Road Area for Motorized Vehicles (6 Poin)	6	6
		AMOUNT	**52**	**66**

Thus, implementing the recommended improvements for pedestrian and cycling infrastructure increases the area at the Harjamukti terminal by 14 points, scoring 66 points. With these points, the study area gets the Bronze category, which is the majority of the objectives of the Transit-Oriented Development area.

CONCLUSION

Applying TOD principles in the Harjamukti terminal area has a score of 52 points and still needs to be included in the TOD standard. This score is obtained from short walking and cycling routes, mixed land use, fulfillment of local service access, preservation of housing and businesses that are still maintained, high residential density, and little land use for motorized vehicles such as off-street parking, driveways, and road areas. The shortcomings in the Harjamukti terminal area as a TOD area are the lack of pedestrian infrastructure, the unavailability of facilities for cyclists, walking and cycling routes are still not short of motor vehicle routes, lack of access to parks, lack of affordable housing in the area, lack of non- residential density in the area, development that has occurred has not been entirely carried out, and lack of fast and high-capacity public transportation. The SWOT Analysis carried out to find out the strategies that can be used in developing the results obtained to carry out a development strategy with the strategy recommendation is progressive, which means that it is in an optimal and stable condition so that it is possible to continue to make improvements in the development carried out. Adding walking and cycling infrastructure facilities can increase the score of the Harjamuki terminal area and make it a TOD-based area. These recommendations can increase the score by 14%, resulting in the Harjamukti terminal area being included in the TOD area with the Bronze standard. The bronze standard is a TOD area standard, which means that development has met the majority of the objectives of the Transit Oriented Development area.

This research was conducted in a location that has yet to apply the TOD principles so that future researchers can conduct research in areas that have met most of the TOD standard principles to provide more significant evaluation results. Similar research can also be done by conducting interviews and questionnaires with stakeholders or users about applying TOD principles. Recommendations can be made using related planning rules and guidelines to find more in-depth development recommendations.

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