

ANALYSIS OF PEDESTRIAN FACILITIES IN THE DUKUH ATAS INTEGRATED TERMINAL AREA (STUDY CASE: TRANSJAKARTA GALUNGGUNG BUS SHELTER AND LRT JABODEBEK DUKUH ATAS STATION JAKARTA)

Elly Adriani Sinaga^a, Aang Gunawan^b, Melani Situmorang^c, Priza Fikri Salam^d

^aFaculty of Management and Business, Institut Transportasi dan Logistik Trisakti, Jakarta,
Indonesia

Corresponding author: ellyadriani@gmail.com

Abstract: The Galunggung Transjakarta bus shelter and the Jabodebek LRT Dukuh Atas Station are two crucial points in Jakarta's transportation network, serving as hubs for pedestrian activity and movement. Adequate pedestrian facilities are essential to support mobility, safety, and comfort for pedestrians, as well as to encourage the use of public transportation, which can help reduce traffic congestion and vehicle emissions. However, many of these facilities are poorly maintained, unsafe, or uncomfortable to use. The aim of this research is to evaluate the physical condition of sidewalks, street crossings, and supporting facilities such as seating, shelters, and lighting. The results of the research are expected to provide recommendations for the improvement of intermodal pedestrian facilities in the Dukuh Atas integrated terminal area. The method used is a qualitative approach. Data collection techniques with direct observation and surveys to pedestrians around the Galunggung Transjakarta Bus Shelter and Jabodebek LRT Station. The data analysis technique uses Walkability Index by the Ministry of Public Works and Public Housing (PUPR).

Keywords: *Pedestrian Facilities; Safety; Comfort; Walkability; Dukuh Atas Integrated Terminal Area*

1. Introduction

Along with the rapid urban development in Jakarta, the need for an efficient and integrated transport system is increasingly urgent. The concept of Transit Oriented Development (TOD) is one of the strategic solutions in overcoming the problems of congestion, pollution, and transport inconvenience in urban areas. TOD promotes the development of transit-oriented areas, by integrating various modes of public transport such as Transjakarta buses and Light Rail Transit (LRT), and prioritising easy access for pedestrians.

Galunggung Transjakarta bus shelter and Dukuh Atas Jabodebek LRT Station are two important points in Jakarta's transport network that are centres of pedestrian activity and movement. The existence of adequate pedestrian facilities in this area is crucial in supporting the smooth mobility of pedestrians, while ensuring their safety and comfort. Good pedestrian facilities not only serve as a link between modes of transport, but also play an important role in encouraging people to walk more and use public transport, which in turn can reduce congestion and motor vehicle emissions.

According to Wirayuda S (2023) in the article Analysis of the Application of TOD Principles in the Dukuh Atas Area (Dukuh Atas LRT Station) to Realise Sustainable Transportation that, often pedestrian facilities in the area have not received adequate attention. Many facilities are poorly maintained, unsafe, or uncomfortable to use, which can reduce their effectiveness. Although the area has three pedestrian bridges, this is a significant underestimate of the need for pedestrian crossings throughout the area. This can force pedestrians to cross at unsafe locations, increase the risk of accidents, and reduce the speed of pedestrian movement. On a positive note, the area already has sidewalks on the main streets. However, mere presence is not enough. The quality of the sidewalks is key. Narrow, uneven or potholed sidewalks can

impede movement and become a potential hazard for pedestrians. Sidewalks adjoining active and permeable building frontages (e.g., shop windows, entrances, and aesthetically appealing displays) tend to be more vibrant and safe because the public eye is always present. Unfortunately, the area lacks active and permeable building frontages, which can reduce the sense of safety and comfort for pedestrians. One important factor for pedestrian comfort is the presence of shade or shelter from the sun, rain or wind. This area seems to be lacking in this aspect, which may discourage people from walking especially in unfavourable weather.

Therefore, it is important to conduct an in-depth analysis of the condition of pedestrian facilities in the Dukuh Atas Integrated Terminal Area, especially around the Galunggung Transjakarta Bus Shelter and the Jabodebek Dukuh Atas LRT Station. This research aims to identify and evaluate the condition of pedestrian facilities in the area, as well as assess the extent to which these facilities fulfil safety and comfort standards for pedestrians. With a comprehensive analysis, it is expected to find various problems and challenges faced, as well as solutions and recommendations for improvements that can be implemented by relevant parties to improve the quality of pedestrian facilities in the Dukuh Atas Integrated Terminal Area.

2. Literature review

Pedestrian Facilities

The Law on Road Traffic No. 22 Year 2009 requires that every road used for public traffic must be equipped with road equipment, one of which is in the form of pedestrian facilities. The pedestrian facilities in question are facilities in the form of special lanes separated from vehicles. For example, a pedestrian path. In accordance with the mandate of the law, pedestrians should enjoy their walking facilities in the form of safe, comfortable and pleasant pedestrian paths. In addition, the importance of pedestrian paths in urban areas as an area attraction and as a green open space for gathering and socializing urban communities. Pedestrian paths are humanized public facilities and animate activities in urban areas..

In the Guidelines for Technical Planning of Pedestrian Facilities published by the Ministry of Public Works and Public Housing (PUPR), pedestrian facilities are all buildings on road space provided for pedestrians to provide services to pedestrians so as to improve the smoothness, security, safety and comfort of pedestrians.

Walkability

Walkability is a concept that encompasses the ability of the urban environment to support walking. Walkability is considered to be a complex set of capacities within the urban morphology and should not be equated or measured based solely on actual levels of walking activity (Dovey & Pafka, 2020).

Walkability is defined as how friendly pedestrian facilities are to pedestrians. It includes the quality of the built environment, urban form, connectivity, safety, and attractiveness of walking, as well as accessibility of infrastructure. Walkability affects accessibility to public transport terminals. (Atallariq et al., 2020)

The Walkability Index assessment

The Walkability Index assessment uses 7 (seven) assessment parameters with several sub parameters, as follows:

1. Parameter 1: Condition and quality of pedestrian paths;
2. Parameter 2: Supporting facilities (amenities);
3. Parameter 3: Infrastructure providing pedestrians with disabilities;
4. Parameter 4: Obstacles;

5. Parameter 5: Crosswalk availability and condition, which consists of 4 (four) Sub parameters such as:

- Sub parameter 5A: Distance between crosswalks;
- Sub parameter 5B: Condition and equipment of level crossings;
- Sub parameter 5C: Condition and equipment of non- level crossings;

6. Parameter 6: Pedestrian conflict with other modes of transportation, which consists of 2 (two) Sub parameters such as:

- Sub parameter 6A: Crossing conflicts;
- Sub parameter 6B: Conflict parallel to traffic.

7. Parameter 7: Safety from crimes.

To assess the quality of pedestrian facilities on each road section, this study uses the Index of Walkability. Index of Walkability is a metric that measures the level of comfort and safety of pedestrians in using pedestrian facilities.

The calculation of Index of Walkability is performed with the following steps:

1. Assessment of each segment: Each pedestrian path segment was assessed based on the above parameters.
2. Calculation of segment score: The score of each segment is obtained from the sum of the multiplication of the value of each parameter with its weight.
- 3.

$$\text{Segment Score} = \sum_{j=1}^n (\text{score} \times \text{weight})$$

4. Calculation of distance score: The segment score is then multiplied by the segment length.

$$\text{Distance Score} = \text{segment score}_i \times \text{segment length}_i$$

5. Calculation the Index of Walkability: The Walkability Index of a segment is obtained from the ratio of the total distance score of all segments to the total length of the segment, then multiplied by 100.

$$\text{Index of Walkability} = \frac{\sum \text{Distance Score}}{\sum \text{Segment Length}} \times 100$$

Framework

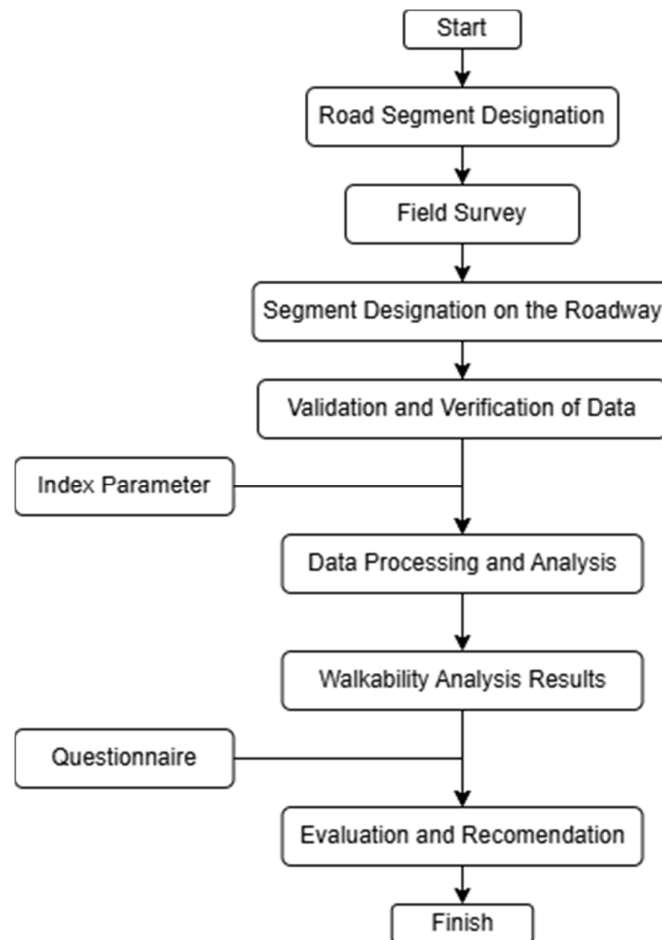


Fig. 1. Research model

Hypotesis

The condition of the quality of pedestrian facilities is not in accordance with the quality requirements that have been set and pedestrian facilities in the upper dukuh are still inadequate for pedestrian needs.

3. Research method

Population dan Sample

Population

The research population is all entities or individuals who are the subject of research. describes a number of people as a generalisation area built based on objects or subjects that have specific levels and characteristics that are formed by researchers to be studied and then draw conclusions. (Prof. Dr. Sugiyono, 2020).

The population in this study is pedestrians at the Galunggung Transjakarta Bus Shelter and Jabodebek Lrt Station Dukuh Atas Jakarta. The existing population is carried out by direct observation, during peak working hours, namely at 7-9 am. The pedestrian population obtained in these two hours is 1324 pedestrians.

Sample

According Prof. Dr. Sugiyono, (2020) the sample is part of the population chosen to be included in the study. This sample is taken to represent the population and assist in making

generalisations about the population. The population in this study was 1324 people, using the slovin formula, the sample in this study was 93 people.

Research instruments

Questioner

According Pranatawijaya et al., (2019) questionnaire is a data collection instrument used to collect large amounts of data. A five-point Likert scale is given to respondents to rate each statement based on their personal experience. The questionnaire in this study was designed to determine the analysis of intermodal pedestrian facilities in the dukuh atas integrated terminal area at the transjakarta galunggung bus shelter and lrt jabodebek dukuh atas station.

Observation

According Dameria & Nursyanti (2022) observation techniques are carried out by collecting data through observation, accompanied by notes taken. Observation is a method of collecting data by directly observing the object of research in its actual condition. Observations in this study were carried out to obtain empirical data regarding the analysis of intermodal pedestrian facilities in the dukuh atas integrated terminal area at the transjakarta galunggung bus shelter and lrt jabodebek dukuh atas station.

Data Analysis Technique

Data analysis techniques using the help of qualitative approach techniques. This research was undertaken to determine the condition of pedestrian facilities at the Tulungagung Transjakarta Shelter and Jabodebek Dukuh Atas LRT. The population in this study was 1324 In determining the sample size using the Slovin formula so the sample studied based on the calculation was 102 people. Data collection in this research is by direct observation which is assessed using the walking feasibility index parameters based on the PUPR ministry and for questionnaires processed using descriptive analysis.

Walkability Index Parameters

Table 3.1 Weight of Each Parameter of Walkability Index

No.	Parameters	Weight
1	Pedestrian facility condition	0,20
2	Supporting Facilities	0,15
3	Infrastructure to support pedestrians with special needs	0,05
4	Obstacles	0,15
	Availability and condition of ferries	
5	a. Distance between crosswalks	0,05
	b. Condition and equipment of level crossings	0,15
	c. Condition and equipment of non- level crossings	0,05
6	Conflicts between Pedestrian routes and other modes	
	a. Crossing conflict	0,05

	b. Parallel conflicts with traffic	0,05
7	Safety from crimes	0,10

Source: PUPR Ministry, (2022)

Table 3.2 Walkability Index Category

Score Range	Description
80 – 100	Excellent
65 – 80	Good
50 – 65	pretty good
30 – 50	less good
< 30	highly inadequate

Source: (PUPR Ministry, 2022)

Descriptive Analysis Method

According Sugiyono (2020) Descriptive analysis is research conducted to determine the existence of independent variables, either only one variable or more (variables that stand alone) without making comparisons of the variables themselves and looking for relationships with other variables. Researchers collected data by distributing questionnaires using a Likert scale.

Table 3.3 Likert scale

No.	Alternative Answers	Rate Weight
1	SS (Strongly Agreed)	5
2	S (Aggred)	4
3	KS (Less Agreed)	3
4	TS (disagree)	2
5	STS(Disagree strongly)	1

Source (Prof. Dr. Sugiyono, 2020)

The Likert scale is used to analyse each statement or indicator, which is then calculated the frequency of answers to each category (answer choice) and then summed up. After each indicator has an amount, it is then averaged and then the researcher draws it on a continuum line to find out the category of the average results. Researchers in determining the scale category on a continuum line use the following formula:

$$\sum p = \frac{\sum \text{questioner answers}}{\sum \text{question} \times \sum \text{respondent}} = \text{Average Score}$$

After knowing the average score, the results are entered into a continuum line with the tendency of the respondent's answer based on the average score and then categorised on the score vulnerability as follows:

$$\text{Intervals Level Score} = \frac{\text{Highest Score} - \text{Lowest Score}}{\text{Total Answer Criteria}}$$

Description:

Highest Score = 5

Lowest Score = 1

Score range = $5/1 = 0,8$

Based on the results of the above calculations, the table scale categories can be found as follows:

Tabel 3.4 Scale Categories

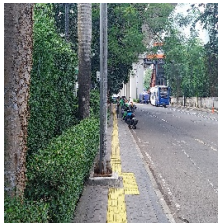
No.	Scale	Value Weight
1	1,00- 1,80	highly inadequate
2	1,81- 2,60	Less good
3	2,61- 3,40	Pretty Good
4	3,41-4,20	Good
5	4,21-5,00	Excelent

Source: Sugiyono (2020)

4. Results and discussion

Survey results based on parameter assessment

Table 4.1 Parameter assessment for Segment 1

No.	Parameters	Note	Photo
1	Pedestrian facility condition	The condition of the sidewalk is still not maintained cleanliness, because there is still a lot of rubbish found in the sidewalk area.	
2	Supporting Facilities	There are supporting facilities in this area such as bollards, shade trees, and lighting.	
3	Infrastructure to support pedestrians with special needs	The condition of supporting infrastructure for people with disabilities is well available but the placement is not appropriate.	

		Segment 1	
No.	Parameters	Note	Photo
4	obstacles	The pedestrian walkway is used for seating, for some people.	
5	a. Distance between crosswalks		
	b. Condition and completeness of level crossings	No zebra crossings available	
	c. Condition and equipment of non-level crossings		
6	a. Crossing conflicts	There are 2 access points for vehicles to enter and exit	
	b. Parallel conflicts with traffic	No motorized vehicles enter the pedestrian path but no barriers are provided	
7	Safety from crimes	Pedestrians are at low risk of crime, neighborhood activity is quite active as the pedestrian path is close to the Transjakarta bus shelter.	

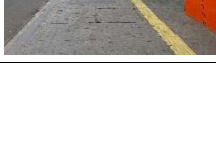
Source: Data processed by researchers

Table 4.2 Parameter assessment for Segment 2

		Segment 2	
No.	Parameters	Note	Photo
1	Pedestrian facility condition	In segment 2 the condition of the sidewalk is good, but the repair work on the sidewalk area causes the cleanliness of the sidewalk to be less maintained.	

No.	Parameters	Segment 2	
		Note	Photo
2	Supporting Facilities	There are supporting facilities in this area, which are directions and bollards.	
3	Infrastructure to support pedestrians with special needs	Disabled support infrastructure is in good condition	
4	Obstacles	The pedestrian path has some obstructions, but with the wide sidewalk, it is still sufficient for pedestrian access.	
5	a. Distance between crosswalks		
	b. Condition and completeness of level crossings	No zebra crossings available	
	c. Condition and equipment of non-level crossings		
6	a. Crossing conflicts	There are 2 access points for vehicles to enter and exit	
	b. parallel conflicts with traffic	No motorized vehicles entering the pedestrian path but no barriers available	
7	Safety from crimes	Pedestrians are at low risk of crime, neighborhood activity is quite active because the pedestrian path is close to the Transjakarta bus shelter.	

Table 4.3 Parameter assessment for Segment 3

No	Parameters	Segment 3	
		Notes	Photo
1	Pedestrian facility condition	The pavement surface is flat and neat, no potholes, non-slip, very well maintained, and clean.	
2	Supporting Facilities	There is CCTV, directions, bicycle parking, bollards, trash bins, etc.	
3	Infrastructure to support pedestrians with special needs	Infrastructure for persons with disabilities (guideways) is available and in good condition, clean, appropriately placed, free of obstructions. There is good grading available so that it is accessible to wheelchair users.	
4	Obstacles	There are obstructions but the sidewalk width is still effective	
5	a. Distance between crosswalks	There is a pedestrian bridge connecting to LRT Jabodebek Dukuh Atas Station	
	b. Condition and completeness of level crossings	No zebra crossings available	
	c. Condition and equipment of non-level crossings	Pedestrian bridge connecting to Jabodebek Dukuh Atas LRT Station equipped with a priority elevator	
	a. Crossing conflicts	No access for vehicles to enter and exit	
6	b.parallel conflicts with traffic	No motorized vehicles entering the pedestrian path but no barriers available	
7	Safety from crimes	Pedestrians are at low risk of crime, there are security guards and the	

No	Parameters	Segment 3	
		Notes	Photo
		surrounding activity is quite active as the pedestrian path is close to LRT Jabodebek Station.	
		<i>Source: Data processed by researchers</i>	

Results of Walkability Parameter Assessment Based on Observation

The walkability assessment analyzed is on the pedestrian path in the Transjakarta Galunggung Bus Shelter Area and LRT Jabodebek Dukuh Atas Station. The segment division is divided into 3 segments.

1. Segment 1: Galunggung bus Shelter entrance/exit - JPM Dukuh Atas Priority Lift
2. Segment 2: Entrance/exit of Galunggung Bus Shelter-Priority Lift of Dukuh Atas LRT Station Door A
3. Segment 3: Jabodebek LRT Station Priority Elevator Door A-Door C1 Jabodebek LRT Station Dukuh Atas LRT Station



Fig 2. The segment section

The walkability assessment for all segments was carried out by giving a score based on the parameters and calculation of the Walkability Index in Guideline No. 05/P/BM/2023 on Determining the Walkability Index in Urban Areas published by the Directorate General of Highways of the Ministry of PUPR. Table 4.1 summarizes the walkability parameter scores for each segment.

Table 4.1 Walkability Index Parameter Score

No.	Parameters	Weight	Segments			Average
			1	2	3	
1	Pedestrian facility condition	0,20	4	4	5	4,3
2	Supporting Facilities	0,15	3	2	4	3,0

3	Infrastructure to support pedestrians with special needs	0,05	4	4	5	4,3
4	Obstacles	0,15	3	3	4	3,3
	Availability and condition of crosswalks					
	a. Distance between crosswalks	0,05	1	1	5	2,3
5	b. Condition and equipment of level crossings	0,15	1	1	1	1,0
	c. Condition and equipment of non-level crossings	0,05	1	1	5	2,3
	Conflicts between Pedestrian routes and other modes					
6	a. Crossing conflict	0,05	3	4	5	4,0
	b. Parallel conflicts with traffic	0,05	4	4	4	4,0
7	Safety from crimes	0,10	4	4	4	4,0
8	Total Score		29	30	45	3,2
9	Length of surveyed segments (m)		218	212	188	206,0
	Segment Score		2,9	2,8	3,95	3,2
	Distance Score		632	594	743	656,1
	Index of Walkability				49%	

Source: Data processed by researchers

From the calculation results, the Walkability Index score based on observations in the Transjakarta Galunggung Bus Shelter and LRT Jabodebek Dukuh Atas Station area is 49%. It shows that the pedestrian path in the area is included in the Less Good category, which means that in the area the conditions of accessibility and convenience, safety, and completeness of existing facilities are inadequate for pedestrians.

It can be seen that the segment that has the highest score is segment 3 with a segment score of 3.95. Meanwhile, the segment with the lowest score is segment 1 with a segment score of 2.9. Based on these results, the parameters that still score below the average are the availability and condition of crossing facilities, supporting facilities, and there are still barriers on the pedestrian path. This is in line with research conducted by Wirayuda S (2023) in the article Analysis of the Application of TOD Principles in the Dukuh Atas Area (Dukuh Atas LRT Station) to Realise Sustainable Transportation that, often pedestrian facilities in the area have not received adequate attention. Many facilities are poorly maintained, unsafe, or uncomfortable to use, which can reduce their effectiveness.

Results of Walkability Parameter Assessment Based on User Perception**Analysis of Respondent Characteristics****A. Gender**

Based on the data from the results of the research that the researchers have conducted, the researchers managed to get data on the gender of the respondents according to the existing table, including:

Gender	Number of Respondents	Percentage
Male	65	64%
Female	37	36%
Total	102	100%

Source: Results of the data questionnaire processed by researchers

B. Age

Age	Number of Respondents	Percentage
< 20 Years	6	6%
20 - 30 Years	68	67%
30 - 40 Years	28	27%
>40 Years	0	0%
Total	102	100%

Source: Results of the data questionnaire processed by researchers

Based on data obtained from 102 respondents, it can be seen in the table that the number of respondents aged <20 years totaling 6 respondents with a percentage of (6%) respondents, respondents aged 20-30 years totaled 68 respondents with a percentage of (67%) respondents, respondents aged 31-40 years totaled 1 respondent with a percentage of (28%) respondents, and respondents > 40 years 0 respondents, out of a total of 112 respondents.

C. Jobs

Jobs	Number of Respondents	Percentage
Student	38	37%
Workers/employees	58	57%
Entrepreneur/Self-employed	3	3%
Housewife	2	2%
Others	1	1%
Total	102	100%

Source: Results of the data questionnaire processed by researchers

Based on the data obtained from 102 respondents, it can be seen in the table that the number of respondents was dominated by respondents with professions as employees / employees as many as 58 respondents with a percentage of 57%, respondents with student jobs were 38 respondents with a percentage of 37%, respondents with entrepreneur / self-employed jobs amounted to 3 respondents with a percentage of 3%, respondents with housewife jobs were 2 respondents with

a percentage of 2%, and respondents with other jobs were 1 respondent with a percentage of 1% of the total 102 respondents.

Descriptive Analysis

The questionnaire used Google Form with a total of 102 respondents. The walkability assessment of the respondents can be seen in Table 4.6

Table 4.6 Assessment Based on User Perception

No.	Parameters	Average Score
1	Pedestrian facility condition	3,9
2	Supporting Facilities	3,2
3	Infrastructure to support pedestrians with special needs	4,0
4	Obstacles	3,3
	Availability and condition of crosswalks	
	a. Distance between crosswalks	2,8
5	b. Condition and equipment of level crossings	1,9
	c. Condition and equipment of non- level crossings	2,7
	Conflicts between Pedestrian routes and other modes	
6	a. Crossing conflict	3,8
	b. Parallel conflicts with traffic	4,0
7	Safety from crimes	4,2
8	Average	3,4

Source: Data processed by researchers

Based on the results of the calculation of user perceptions for the analysis of foot traffic facilities above, it can be concluded that:

1. Pedestrian facilities are generally in good condition, with an average score of 3.9. However, there is a need to make improvements to existing supporting facilities to meet higher standards of comfort and safety for pedestrians.
2. Support facilities still need improvement (Score 3.2) Current pedestrian support facilities are considered to still need improvement, as reflected in the average score of 3.2. These improvements are important to enhance the quality and functionality of these facilities in supporting pedestrian activities.
3. Supporting infrastructure for pedestrians with special needs is generally in good condition, with an average score of 4.0. This indicates that efforts to meet the needs of pedestrians with special needs have been made reasonably well.
4. Barriers on the walkway still require further attention, as indicated by the average score of 3.3. Management and rearrangement of these barriers needs to be done so that they do not interfere with pedestrian comfort and safety.
5. The availability and condition of road crossings are considered inadequate. The distance between crosswalks, with an average score of 2, indicates that the distance is still too far for pedestrian comfort. In addition, the condition and completeness of level crossings received an average score of 1.9, indicating poor conditions. Meanwhile, the condition and completeness of non-tripled crossings had an average score of 2.7, which also indicates that these facilities still need to be improved.

6. Conflicts between pedestrian paths and other modes of transportation still require special attention. The scores of 3.8 and 4.0 indicate that this is still a significant issue and needs further attention to ensure pedestrian safety.
7. The level of pedestrian safety from crime is considered to be in good condition, with an average score of 4.2. However, the overall average score of 3 indicates that there are still aspects that need to be improved to provide a better sense of security for pedestrians.
8. Based on the evaluation conducted, the overall average of the condition of pedestrian facilities was 3.4. This score indicates that while some facilities are adequate, in general, pedestrian facilities still require significant improvements to enhance quality and convenience for users. This is in line with research conducted by Wirayuda S (2023) in the article Analysis of the Application of TOD Principles in the Dukuh Atas Area (Dukuh Atas LRT Station) to Realise Sustainable Transportation that, often pedestrian facilities in the area have not received adequate attention. Many facilities are poorly maintained, unsafe, or uncomfortable to use, which can reduce their effectiveness.

With these results, pedestrian facilities and supporting infrastructure for pedestrians with special needs are in good condition, while supporting facilities and barriers still need further attention. The availability and condition of crosswalks is still poor, and pedestrian conflicts with other modes still need attention. Security from crime is in good condition. The final conclusion is that pedestrian facilities generally need improvement, especially in terms of the availability and condition of crosswalks and supporting facilities.

For the statement of things related to the route that need to be improved. Based on the responses received, it can be concluded that the most urgent route improvements include the maintenance of damaged sidewalks such as uneven surfaces and lack of cleanliness, as well as the addition of zebra crossings to improve pedestrian safety. In addition, shade along the route is considered important to protect pedestrians from the weather, while waste management needs to be improved by increasing the number of trash bins. Improved accessibility, including additional facilities for pedestrians and cyclists, was also a major concern, along with better traffic management and street cleaning. All of these aspects are considered essential to creating a safer, more convenient and pedestrian-friendly route environment.

The majority of users' preference for the type of road crossing is to use a zebra crossing with crossing lights. This indicates that most respondents emphasized the importance of safety and convenience for pedestrians when crossing the road. Crossing lights are considered effective in reducing the risk of accidents, increasing awareness, and providing a safer time for pedestrians to cross. In addition, crosswalk lights also help to manage traffic so as not to disrupt the flow of vehicles, making the crossing process more efficient and affordable. Overall, respondents agreed that the main focus should be on ensuring pedestrian safety when crossing the street.

The final conclusion of this study supports the hypothesis that pedestrian facilities in the Dukuh Atas area still require much improvement to meet the needs of pedestrians and ensure their safety and comfort. Therefore, efforts to improve accessibility, crossing facilities, and traffic management are essential to create a safer and more pedestrian-friendly environment. The results of this study produce similar results with relevant previous research case studies conducted by Dwiky Erlangga, Dewi Handayani and Syafi'I with the title Walkability Value Analysis on Pedestrian Facilities in Transit Oriented Development (Tod) Areas, the results of the analysis show that there are 3 variables that need more attention in pedestrian planning criteria in Indonesia that can affect the determination of handling recommendations, including supporting or complementary facilities, pedestrian facilities with special needs, and space width requirements for pedestrians.

5. Conclusion

Based on the analysis, it can be concluded that the value of the Walkability Index in the area from Galunggung Transjakarta Bus Shelter to LRT Jabodebek Dukuh Atas Station is 49%. This value indicates that accessibility, convenience, safety, and completeness of facilities in this area are still inadequate for pedestrians, especially compared to ideal walkability standards. Assessment based on user perceptions revealed that there are several parameters that need to be improved to achieve optimal walkability. These include the availability and condition of safe crossing facilities, the presence of adequate supporting facilities, and the removal of various barriers such as inappropriate placement of supporting facilities that interfere with pedestrians in the area.

6. Implications

Parameters that still have poor scores need to be improved so that existing facilities are adequate for pedestrians. The following are some improvements that can be made to increase the value of walkability in the Galunggung Transjakarta Bus Shelter area to LRT Jabodebek Dukuh Atas Station:

1. Support facilities such as seating, trash bins, and lighting need to be improved in quality and quantity. The addition of clear signage and information facilities for pedestrians can also improve their comfort and safety while walking.
2. The distance between safe and conditioned crossing facilities needs to be shortened or increased, especially for level crossing facilities. Level crossings should be equipped with clear signs and markings and regularly maintained to ensure the feasibility and safety of users.
3. Obstructions such as improper placement of pedestrian facilities, vendors selling on the sidewalk, or other objects that interfere with pedestrian flow should be addressed. Reorganizing and structuring pedestrian paths more effectively is necessary to ensure that there are no obstacles in the way of pedestrians.
4. Repairing damaged sidewalks using high-quality materials and redesigning sidewalks to improve pedestrian comfort and safety, along with implementing a routine cleaning program that includes clearing sidewalks of garbage, leaves, and other debris on a daily basis or according to the pedestrian density in the area.

7. Research limitations

This research faced several limitations, including constraints in both human, which restricted the ability to conduct broader and more detailed surveys. Additionally, the relatively short duration of the research did not allow for more in-depth measurements or extended surveys. The limitations also extended to the methods used, namely surveys and observations, which may not have captured all relevant aspects of pedestrian facilities in the integrated terminal area of Dukuh Atas.

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