Analysis of Pedestrian Satisfaction toward the Repurposing of Sidewalks along Muara Karang Raya Street

Fernando Donica Yandrie[1], Nunung Widyaningsih[2]

[1]Civil Engineering Department, University of Mercu Buana, Jakarta, INDONESIA
[2]Lecture of Civil Engineering Department, University of Mercu Buana, Jakarta, INDONESIA

E-mail: fernandoyandrie75@gmail.com

ABSTRACT

This study aims to analyze the quality of pedestrian pathways along Muara Karang Raya Street both technical and user perception perspectives. The research methodology includes evaluation of existing conditions, measurement of Level of Service (LOS), Customer Satisfaction Index (CSI), and Importance Performance Analysis (IPA). Findings indicate that while the sidewalks technically perform well with LOS category D, its disturbances from illegal parking, street vendors, and online motorcycle taxis. User satisfaction level reaches 55.95%, indicating moderate satisfaction despite various constraints. IPA analysis reveals that the aspect of orderliness (presence of street vendors/PKL, illegal parking, and online motorcycle taxis) and sidewalk width are in quadrant I; slope, supporting facilities (trash bins, lighting, seating), facilities for disabled persons, and presence of shelters are in quadrant II, accessibility to/from sidewalks, safety, and physical obstacles are in quadrant III, and sidewalk surface conditions are in quadrant IV. The study recommends sidewalk usage regulation, improvement of supporting facilities, and routine maintenance to optimize pedestrian functions. These findings provide significant contributions for pedestrian-oriented public space planning in urban areas.

Keywords: customer satisfaction index, importance performance analysis, level of service, pavement.

INTRODUCTION

Jakarta, as a densely populated area, has become an icon as a large city that is developing rapidly, both in terms of economic level and population. In the process of adapting to the needs of the population, it is necessary for the development of Jakarta City to have good physical and non-physical infrastructure available so as not to hinder the process. Physical infrastructure includes the availability of facilities and infrastructure, land use, and design, while non-physical infrastructure includes social relations and economic activities. Shirvani (1985) stated that there are 8 elements that form a city: land use, building form and mass, circulation and parking, open space, pedestrian paths, activity support, signs/information layout, and preservation. [1]

The need for physical infrastructure is crucial to support accessibility for urban activities and development. Physical infrastructure, for example, includes pedestrian bridges. Sidewalks or pedestrian paths are physical infrastructure in the form of roads designated for pedestrian activities. The Minister of Public Works Regulation No. 03/PRT/M/2014 concerning guidelines for planning, provision, and utilization of pedestrian network infrastructure and facilities in urban areas. This aims to create a safe, comfortable, and humane pedestrian network in urban areas, thus encouraging people to walk. As the primary facility for pedestrian paths, sidewalks should not be neglected because it will also lead to neglect of pedestrian rights. The average Indonesian walks 3,513 steps per day, which is far below the global average of 5,000 steps per day. [2]

A pedestrian-friendly urban environment is one that is well-developed and facilitated. Efforts to improve or repair pedestrian areas often fail due to a lack of supporting attributes. Harvizan explained that the characteristics of sidewalks for pedestrian comfort can be seen from the physical condition of the sidewalk, including sidewalk placement, sidewalk dimensions, surface layers, zebra crossings, drainage, lighting, signs, garden paths, and cleanliness. [3]

The Muara Karang area is a residential area in Pluit, Penjaringan, North Jakarta. Muara Karang Raya Street itself is a one-way street from east to west, known as a business, office, and culinary center area, so that Muara Karang Raya Street has a high pedestrian volume, both workers, business people, and residents who are hunting for culinary delights. Muara Karang Raya Street has 4 vehicle lanes with a width of 20 meters. However, the right and left (2 lanes) are used as on-street vehicle parking to support trade and services along the road. Often the process of parking vehicles on the roadside causes conflicts with pedestrian paths. According to the Pedestrian Facility Guidelines, sidewalks are also called part of highway engineering. This has the purpose of dividing vehicle lanes from pedestrian paths. Sidewalks have a standard width for one person of 0.6 m with a movement width of 0.15 m, it can also be concluded that pedestrians who pass each other need a space of 1.5 m. [4]

However, in reality, sidewalks often do not function as they should. Some of the problems in the Muara Karang Raya Street area include the conversion of sidewalks into parking and selling areas, inadequate sidewalk conditions, broken sidewalks due to the many sidewalk cuts as shop entrances, or various sidewalk obstacles such as: protrusions of shop buildings, online motorcycle taxi gathering places and supporting facilities that block pedestrians around the sidewalk area. This causes obstacles for pedestrians using the sidewalk because their mobility is hampered by the various factors above which affect the level of pedestrian satisfaction on Muara Karang Raya Street.

This inconvenience can lead to a decline in public importance in using sidewalks, ultimately reducing the effectiveness of this infrastructure in supporting urban mobility. Therefore, a study is needed that analyzes the level of satisfaction of sidewalk users in Jakarta City, especially on Jalan Muara Karang Raya, to understand the extent to which the sidewalks meet community needs. For this reason, it is necessary to conduct a study on the conversion of sidewalks with the title "Analysis of the Level of Pedestrian Satisfaction Regarding the Conversion of Sidewalks on Jalan Muara Karang Raya." With this study, it is hoped that a clear picture can be obtained regarding the current condition of sidewalks and the factors that influence user satisfaction. The results of this study can serve as a basis for local governments and related stakeholders in designing better sidewalk policies and improvements, thereby creating a safer, more comfortable, and inclusive environment for all road users.

RESEARCH METHODS

This study uses a quantitative method with a descriptive-analytical approach to analyze the level of pedestrian satisfaction with the conversion of sidewalk functions on Jalan Muara Karang Raya.
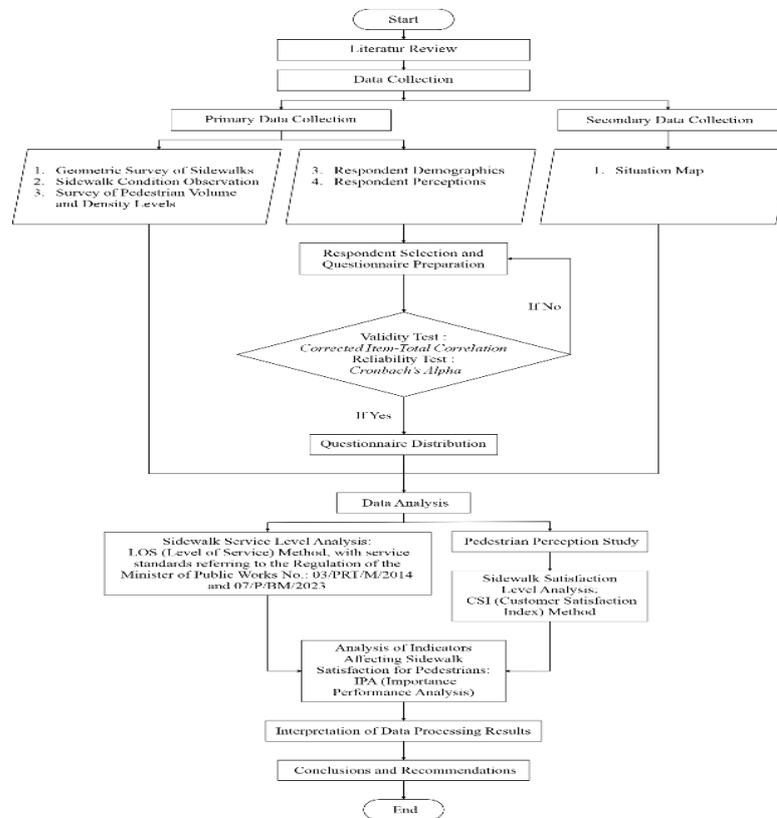
Figure 1. Flow chart

The research location was conducted in the Pluit area, North Jakarta, precisely on Jalan Muara Karang Raya. The research started from the sidewalk section of the Jalan Pluit Barat Raya intersection (Jembatan Pluit Indah) to the SMAK BPK Penabur 6 Jakarta intersection with an observation length of ±1100 m, the Jalan Muara Karang Raya area is considered to be able to represent research on pedestrian satisfaction with the use of available sidewalk facilities, because this area is in a commercial area and shopping center, and there are many connecting modes of transportation that pass through.
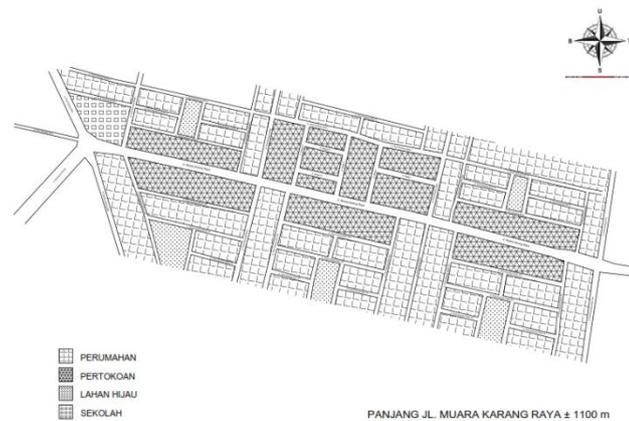

Figure 2. Research location

The research was conducted during peak hours on Saturdays and Sundays, on Saturdays observations were conducted at 15.00-18.00 WIB and 19.00-22.00 WIB and on Sundays observations were conducted at 06.00-09.00 WIB and 16.00-19.00 WIB.

The data in this study were collected through direct observation at the research location and through questionnaires distributed to pedestrians as respondents with statements tailored to satisfaction indicators: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. The collected data were then analyzed using the LOS, CSI, and IPA calculation methods.

RESULTS AND DISCUSSION
Existing Condition of the Muara Karang Raya Sidewalk

The sidewalks along Muara Karang Raya have undergone numerous changes in function, which not only disrupt the aesthetics of the environment but also reduce the comfort and satisfaction of road users. Based on preliminary observations, the sidewalks in the Muara Karang Raya area are often used by street vendors (PKL) for selling. Street vendors use the sidewalks as trading places, both permanently and temporarily as a place to trade, so that the space for pedestrians is increasingly narrow and uncomfortable. In addition, the sidewalks of Muara Karang Raya are also often used as online motorcycle taxi bases, where motorcycle taxi drivers wait for passengers and park their vehicles. The presence of these online motorcycle taxi bases not only reduces the movement space for pedestrians, but also often causes congestion and discomfort for other road users.

This situation is exacerbated by the authorities' lack of thorough enforcement of regulations, resulting in increasingly widespread sidewalk conversion. Sidewalks, which should be safe and comfortable public spaces for pedestrians, are now increasingly being used for commercial and private purposes. This undoubtedly impacts the quality of the street environment and the satisfaction of road users, especially for pedestrians who must share space with other activities that should not be on sidewalks. This phenomenon of conversion is one of the main challenges in creating a safe, comfortable, and friendly road environment for all users, and requires serious attention from various parties to find sustainable solutions.
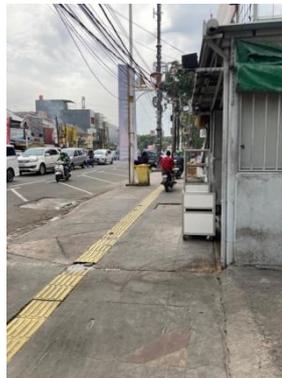
Figure 3. Street Vendor's Cart on the Sidewalk

Figure 3 shows that some of the Muara Karang Raya sidewalks are being used as trading areas by local individuals. Observations indicate that vendors are using portions of the sidewalks to set up carts, tents, and even tables. This, of course, makes pedestrian space narrower than it should be. As a result, pedestrians are forced to walk along the edge of the road or even onto the roadway, which not only reduces road user comfort but also increases the risk of accidents. This phenomenon demonstrates the conflict between economic needs and road users' rights to infrastructure, which should be a priority.

Figure 4. Illegal Parking on the Muara Karang Raya Sidewalk

Not only the presence of street vendors, illegal parking on the sidewalk also narrows the space for pedestrians, it can be seen in Figure 4 that almost all of the sidewalk is used to park their private vehicles, some of these vehicles even block the road facilities for the blind. With the physical limitations of blind people who do not know for sure what the conditions in front of them are, this illegal parking incident is certainly very disturbing and even threatens safety.

Figure 5. Online Motorcycle Taxi Activities on the Muara Karang Raya Sidewalk

This situation is exacerbated by the presence of unscrupulous online motorcycle taxi drivers, who frequently use sidewalks as waiting areas for passengers, dropping off passengers, and even as a pedestrian crossing. Unscrupulous online motorcycle taxi drivers use sidewalks to bypass traffic or avoid traffic jams, potentially endangering pedestrians, especially children and the elderly. Furthermore, the habit of online motorcycle taxis waiting for passengers at the edge of sidewalks also narrows the roadway, ultimately disrupting the comfort of road users.

Table 1. Measurement Results of Sidewalk Characteristics and Standard Compliance in Muara Karang Raya

No		Sidewalk Criteria	Existing Condition in Muara Karang Raya	Compliance Description
1		Pedestrian Path		
	a	Minimum sidewalk width (1.85 meters)	Sidewalk width > 1.85 meters	Meets standard
	b	Walking in pairs (2.2 meters)	Width > 2.2 meters	Meets standard
	c	Walking in a row of three (3.2 meters)	Width > 3.2 meters	Meets standard
	d	Vertical clearance of 2.5 m above the pedestrian walkway	Widht < 2.5 meters (2.25 meters)	Doesn't meet the standard
	e	Additional space for bus stop: 1.5 x 2.4 meters		Meets standard
2		Accessible walkway for persons with disabilities	There are special lanes for people with disabilities	Meets standard
3		Clear Walkway		
	a	Providing a comfortable pedestrian experience	Obstructed by street sellers, irregular parking, and online motorcycle taxis	Doesn't meet the standard
	b	Highly accessible	well-designed accessibility features	Meets standard
	c	Providing a safe and secure environment	Compromise safety and security	Doesn't meet the standard
	d	providing a panoramic view of the area	Surrounding activities can be seen freely	Meets standard
	e	Minimum height clearance	Width < 2.5 meters (2.4 meters)	Doesn't meet the standard
	f	Minimum side clearance	Side < 0.3 meters (0.28 meters)	Doesn't meet the standard
4		Pedestrian path set back from building		
	a	Minimum buffer distance from structure	Width > 0.75 m (0.79 meters)	Meets standard
	b	Height differential between pedestrian pathway and vehicular traffic	Widht < 0.2 meters (0.19 meters)	Meets standard
	c	Vertical difference between pathway and green space	No pedestrian parkway	Doesn't meet the standard
5		Facilities suspended above sidewalk		
	a	Parkway	No pedestrian parkway	Doesn't meet the standard
	b	Outdoor lighting	There is outdoor lighting	Meets standard
	c	Outdoor seating	No outdoor seating	Doesn't meet the standard
	d	Guardrail	No guardrail	Doesn't meet the standard
	e	Trash can	There are trash can	Meets standard
	f	Traffic markings	There are traffic markings	Meets standard
	g	Waiting area	No waiting area	Doesn't meet the standard

Level of Service on Muara Karang Raya Service

The level of service can be calculated by processing primary data related to pedestrian volume and travel time. To determine the level of service on the Karang Muara sidewalk, a Level of Service analysis is used, which can be found in the Minister of Public Works' regulations, as presented in the following table.[5].

Table 2. Level of Service Standard for Pedestrian Walkways

Service Level	Pedestrian Path (m2/Ped)	Average speed (m/min)	Pedestrian Flow Volume (person/meter/minute)	Ratio (V/C)
A	>12	≥78	≤16	≤0.08
B	≥3.6	≥75	23	≤0.28
C	≥2.2	≥72	33	≤0.40
D	≥1.4	≥68	50	≤0.60
E	≥0.5	≥45	83	≤1.00
F	≥0.5	<45	Variables	1.00

Based on the pedestrian flow calculations that have been carried out, the level of service of the Karang Muara sidewalk can be seen as in the following table;

Table 3. Pedestrian Flow Rate on Muara Karang Raya

Time	Total width of side-walks	Width of barriers	Effective width of side-walks	Highest number of pedestrians in an interval of 15 minutes	Pedestrian Flow Rate
	meters	meters	meters	org/15 minutes	person/minute/meter
15.00-15.15	3.3	1.2	2.1	2	0.063
15.15-15.30	3.3	1.2	2.1	3	0.095
15.30-15.45	3.3	1.2	2.1	3	0.095
15.45-16.00	3.3	1.2	2.1	3	0.095
16.00-16.15	3.3	1.2	2.1	2	0.063
16.15-16.30	3.3	1.2	2.1	3	0.095
16.30-16.45	3.3	1.2	2.1	2	0.063
16.45-16.00	3.3	1.2	2.1	2	0.063
17.00-17.15	3.3	1.2	2.1	2	0.063
17.15-17.30	3.3	1.2	2.1	2	0.063
17.30-17.45	3.3	1.2	2.1	3	0.095
17.45-18.00	3.3	1.2	2.1	2	0.063
19.00-19.15	3.3	1.2	2.1	3	0.095
19.15-19.30	3.3	1.2	2.1	4	0.127
19.30-19.45	3.3	1.2	2.1	3	0.095
19.45-20.00	3.3	1.2	2.1	3	0.095
20.00-20.15	3.3	1.2	2.1	3	0.095
20.15-20.30	3.3	1.2	2.1	4	0.127
20.30-20.45	3.3	1.2	2.1	4	0.127
20.45-21.00	3.3	1.2	2.1	4	0.127
21.00-21.15	3.3	1.2	2.1	4	0.127
21.15-21.30	3.3	1.2	2.1	3	0.095
21.30-21.45	3.3	1.2	2.1	3	0.095
21.45-22.00	3.3	1.2	2.1	3	0.095

Tabel 4. Pedestrian Level Service on Muara Karang Raya

Time	Length of sidewalks under consideration ratio	Time traveled	Pedestrian speed	Pedestrian density	Pedestrian space	Service Level
	meters	minute	meters/minute	people/m2	m2/person	
15.00-15.15	20	0.29	69.97	0.02	47.33	D
15.15-15.30	20	0.28	72.51	0.03	31.55	C
15.30-15.45	20	0.29	69.08	0.03	31.55	D
15.45-16.00	20	0.28	70.67	0.03	31.55	D
16.00-16.15	20	0.25	80.21	0.02	47.33	A
16.15-16.30	20	0.28	70.96	0.03	31.55	D
16.30-16.45	20	0.25	79.10	0.02	47.33	A
16.45-16.00	20	0.27	74.07	0.02	47.33	C
17.00-17.15	20	0.29	70.05	0.02	47.33	D
17.15-17.30	20	0.28	70.84	0.02	47.33	D
17.30-17.45	20	0.29	68.18	0.03	31.55	D
17.45-18.00	20	0.29	69.40	0.02	47.33	D
19.00-19.15	20	0.26	77.12	0.03	31.55	B
19.15-19.30	20	0.29	69.40	0.04	23.66	D
19.30-19.45	20	0.29	70.05	0.03	31.55	D
19.45-20.00	20	0.25	80.75	0.03	31.55	A
20.00-20.15	20	0.28	71.99	0.03	31.55	D
20.15-20.30	20	0.28	70.71	0.04	23.66	D
20.30-20.45	20	0.29	68.38	0.04	23.66	D
20.45-21.00	20	0.29	69.81	0.04	23.66	D
21.00-21.15	20	0.28	70.88	0.04	23.66	D
21.15-21.30	20	0.29	70.18	0.03	31.55	D
21.30-21.45	20	0.25	80.92	0.03	31.55	A
21.45-22.00	20	0.28	70.59	0.03	31.55	D

Table 4 shows that the maximum pedestrian speed on the Muara Karang Raya sidewalk is 80.92 meters/minute, referring to table 2 it is known that the average level of service of the Muara Karang Raya sidewalk is in the category of service level D. This shows that pedestrians on the sidewalk of Jalan Muara Karang Raya can walk normally, but often change positions and change speed due to obstacles that hinder pedestrians, in this study the obstacles are the presence of street vendors, illegal parking, and the presence of online motorcycle taxis.

Analysis of Customer Satisfaction Index for Muara Karang Raya Service

Validity

Table 5. Validity Test Results

Variables	Indicator	R count	R Table	Information
Performance	Wide	0.326	0.098	Valid
	Accessibility	0.447	0.098	Valid
	Disabled	0.158	0.098	Valid
	Slope	0.450	0.098	Valid
	Surface	0.403	0.098	Valid
	Facility	0.564	0.098	Valid
	Security	0.516	0.098	Valid
	Shelter	0.562	0.098	Valid
	Neatness (street vendors, parking)	0.609	0.098	Valid
	Obstacle	0.593	0.098	Valid
Importance	Wide	0.434	0.098	Valid
	Accessibility	0.543	0.098	Valid
	Disabled	0.387	0.098	Valid
	Slope	0.353	0.098	Valid

Variables	Indicator	R count	R Table	Information
	Surface	0.503	0.098	Valid
	Facility	0.427	0.098	Valid
	Security	0.629	0.098	Valid
	Shelter	0.448	0.098	Valid
	Neatness (street vendors, parking)	0.460	0.098	Valid
	Obstacle	0.536	0.098	Valid

By using r table for a 5% confidence level and a sample size of 400, the calculated r is 0.098. From table 4, it can be seen that each item in the performance and importance instrument has a higher calculated r value compared to the r table, thus it is concluded that the instrument can be used as a measuring tool in this study because the instrument is declared valid.

Reliability

Table 6. Reliability Test Results

Variables	*Cronbach's Alpha*	Conditions met	Information
Performance	0.601	0.60	Reliable
Importance	0.606	0.60	Reliable

From table 5, it can be seen that the performance variable has a Cronbach's Alpha value of 0.601 and the importance variable of 0.606. The Cronbach's Alpha value of each variable shows a number greater than the threshold (0.60), so it is concluded that the instrument in this study is reliable and can be used in this study.

Correlation Coefficient

Table 7. Correlation Coefficient Results

Correlations		PERFORMANCE	IMPORTANCE
PERFORMANCE	Pearson Correlation	1	.620**
	Sig. (2-tailed)		<.001
	N	400	400
IMPORTANCE	Pearson Correlation	.620**	1
	Sig. (2-tailed)	<.001	
	N	400	400

The table above shows the results of the correlation test with a significance value of 0.000 < 0.005 and a Pearson correlation of 0.620. Based on the basis of decision making when sig. < 0.05 then there is a significant relationship between the two variables, thus there is a significant relationship between performance and importance. To see the magnitude of the relationship and how its direction can be seen the Pearson correlation number of 0.620, where this number is close to 1 so that the relationship between performance and importance can be stated as a strong relationship with a positive direction. This shows that when the performance of the indicators given by the Muara Karang Raya sidewalk increases, it can increase the value of the perspective of importance towards the Muara Karang Raya sidewalk indicator.

Linear Regression Analysis

Table 8. ANOVA Results Linear Regression Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1897,632	1	1897,632	248,190	.000b
	Residual	3043.065	398	7,646		
	Total	4940.698	399			

The Anova output above shows a calculated F value of 248.190, and a significance value of 0.000 < 0.05, indicating that this regression model can be used to predict the variable of importance (Y) through performance (X).

Coefficient of Determination

Table 9. Results of the Coefficient of Determination

Model Summary

Model	R	R Square	Adjusted R Square	Standard Error of the Estimate
1	.620a	.384	.383	2,765

The table above shows the value of the Determination Coefficient (R Square) of 0.384, this shows that the performance variable is able to influence the importance variable by 38.4%, while the remainder is influenced by other variables.

Table 10. Linear Regression Analysis Coefficients Results

Coefficientsa

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	22,179	.929		23,873	.000
PERFORMANCE	.528	.034	.620	15,754	.000

The table above is the output of the Coefficients section of the linear regression analysis. Based on the table above, the regression equation can be compiled as follows;

$$Y = a + bX$$

$$Y = 22.179 + 0.528X$$

The constant of the regression equation is 22.179, this means that even if no influence of performance (X) is given, the importance will remain constant at 22.179. This means that whether or not there is an influence of performance (X), the importance will still occur with a fairly high value. Furthermore, when the influence of the performance variable (X) is given by 1%, the level of importance (Y) will increase by 0.528. A positive b value indicates that the direction of the relationship between performance and importance is positive, this means that the greater the performance given will increase the importance of the facility.

Table 11. Calculation of Customer Satisfaction Index for Muara Karang Raya Services

Indicator	Performance		Importance		Weight Factor	Weight Score	CSI
	Xi	MSS	Yi	MIS			
Sidewalk Width	984	2.46	1556	3.89	10.61	26.11	
Accessibility from & to the route	860	2.15	1356	3.39	9.25	19.89	
Availability of Facilities for the Disabled and the Elderly	1254	3.135	1562	3,905	10.65	33.40	
Slope and gradient of sidewalks	1363	3.4075	1510	3,775	10.30	35.10	55.95%
Condition of the sidewalk surface (Neatness and Regularity)	1429	3.5725	1349	3.3725	9.20	32.87	
Seats, trash cans, signs and lighting	1283	3.2075	1529	3.8225	10:43	33.45	
Safety for pedestrians	1026	2,565	1359	3.3975	9.27	23.78	
Availability of shelter	1257	3.1425	1500	3.75	10.23	32.15	

Indicator	Performance		Importance		Weight	Weight	CSI
Order on pedestrian paths (street vendors, Illegal parking, etc.)	794	1,985	1581	3.9525	10.78	21.41	
Obstacles around the sidewalk (Flower Pots, Electric Poles)	933	2.3325	1359	3.3975	9.27	21.62	
Total		27.95		36.65		279.77	

Based on table 10, it is known that the overall value of pedestrian satisfaction regarding the change of function that occurred on the Muara Karang Raya sidewalk using the CSI method shows a value of 55.95%, referring to table 2.6, this figure shows that the level of pedestrian satisfaction regarding the facilities and performance of the Muara Karang Raya sidewalk is in the Quite Satisfied category.

Importance Performance Analysis (IPA) on Muara Karang Raya Service

Table 12. Level of Performance Conformity with Importances

Indicator	Performance (X)	Importance (Y)	Level of Compliance	Information
Wide	984	1556	63.24	Pretty good
Accessibility	860	1356	63.42	Pretty good
Disabled	1254	1562	80.28	Good
Slope	1363	1510	90.26	Very good
Surface	1429	1349	105.93	Very good
Facility	1283	1529	83.91	Very good
Security	1026	1359	75.50	Good
Shelter	1257	1500	83.80	Very good
Neatness (street vendors, parking)	794	1581	50.22	Not good
Obstacle	933	1359	68.65	Good

Based on the calculation of the level of suitability in table 11 above, it can be seen that of the 10 factors analyzed, one factor is categorized as less good, this is because many street vendors, illegal parking, and online motorcycle taxis were found disrupting traffic on the Muara Karang Raya sidewalk, thus affecting road user satisfaction. Several other factors are categorized as quite good, factors that are categorized as quite good are sidewalk width, accessibility, facilities for the disabled, and obstacles on the Muara Karang Raya sidewalk. Factors that are categorized as good are supporting facilities, security, and the presence of shelters. And factors that are categorized as very good are the slope and surface of the Muara Karang Raya sidewalk.

Table 13. Average Performance and Importance

Indicator	Performance (X)	Average	Importance (Y)	Average
Wide	984	2.46	1556	3.89
Accessibility	860	2.15	1356	3.39
Disabled	1254	3.135	1562	3,905
Slope	1363	3.4075	1510	3,775
Surface	1429	3.5725	1349	3.3725
Facility	1283	3.2075	1529	3.8225
Security	1026	2,565	1359	3.3975
Shelter	1257	3.1425	1500	3.75
Neatness (street vendors, parking)	794	1,985	1581	3.9525
Obstacle	933	2.3325	1359	3.3975
Average		2.80		3.67

The average performance and importance ratings were obtained by dividing the total score for each item by the number of respondents. This average score was then distributed into a Cartesian diagram, where each point represents the condition of the Muara Karang Raya sidewalk facilities.
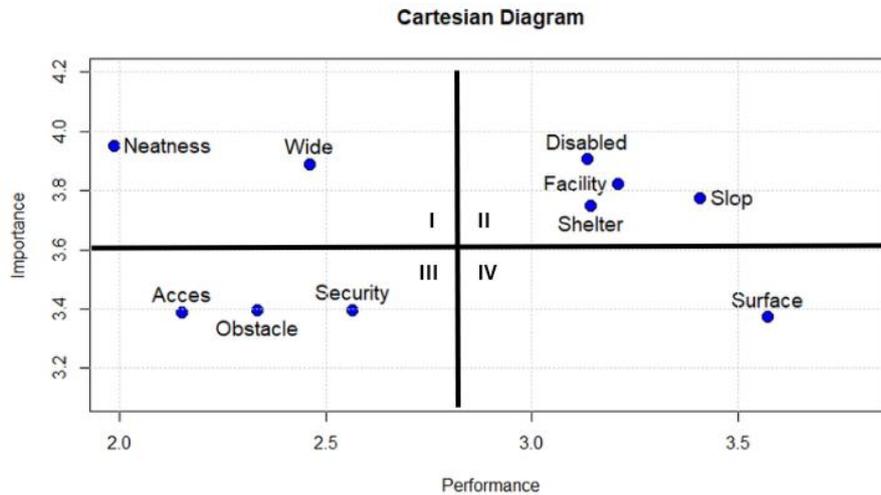

Figure 6. Cartesian diagram

Based on Figure 6 above, the results can be obtained
1. Quadrant I (Sidewalk facilities are the main priority)
   a. Sidewalk width indicator.
   b. Indicators of order on pedestrian paths (street vendors, illegal parking, etc.).
2. Quadrant II (Sidewalk facilities whose performance must be maintained)
   a. Indicators of the availability of facilities for the disabled and the elderly.
   b. Slope and gradient indicators.
   c. Shelter availability indicator
   d. Seating indicators, trash bins, signs and lighting.
3. Quadrant III (Sidewalk facilities to be considered)
   a. Accessibility indicators from & to the route
   b. Safety indicators for pedestrians
   c. Obstacle indicators around the sidewalk (Flower pots, electric poles)
4. Quadrant IV (Excessive sidewalk facilities)
   a. Indicator of sidewalk surface condition (neatness and regularity).

CONCLUSION

Based on the data analysis that has been carried out, the conclusions regarding road user satisfaction with the change in function of the sidewalk on Jalan Muara Karang Raya are as follows; 1) the sidewalk on Jalan Muara Karang Raya is physically in relatively good condition, with adequate width in some sections and a suitable surface. However, its actual condition is hampered by illegal parking, street vendors, and online motorcycle taxis, which reduce the effective width and pedestrian comfort. Several sections also subside due to the lack of amenities such as green lanes, seating, safety railings, trash receptacles, road markings, and waiting stalls. Some sections even lack streetlights, posing a danger to pedestrians at night, 2) by using the Level of Service (LOS) method, the overall level of service value of the sidewalk on Jalan Muara Karang Raya is included in the category of service level D, which reflects the condition of the sidewalk that is less comfortable and crowded. This shows that pedestrians on the sidewalk of Jalan Muara Karang Raya can walk normally, but often change positions and change speed due to obstacles that hinder pedestrians, in this study the obstacles are the presence of street vendors, illegal parking, and the presence of online motorcycle taxis, 3) by using the Customer Satisfaction Index (CSI) method, the level of pedestrian satisfaction shows a percentage of 55.95%, which indicates that

pedestrians feel quite satisfied with the sidewalks on Jalan Muara Karang Raya, 4) using the Importance Analysis (IPA) method, factors influencing pedestrian satisfaction in quadrant I include order (street vendors, illegal parking, and online motorcycle taxis) and sidewalk width. Quadrant II includes slope, supporting facilities (trash cans, lighting, seating), facilities for the disabled, and shelters. Quadrant III includes accessibility to/from the sidewalk, safety, and physical barriers. Quadrant IV only includes the sidewalk surface, 5) based on the findings of this study, the following are several recommendations for the local government, consisting of controlling illegal parking activities and regulating street vendors, providing more adequate supporting facilities, routine maintenance of sidewalk infrastructure, increasing accessibility for the disabled, and consistently socializing and enforcing regulations.

REFERENCES

[1]   H. Risdian, SR Sari, and RS Rukayah, "Urban Design Elements That Influence the Quality of Urban Space on Jalan Jendral Sudirman, Salatiga City,"*Module*, vol. 20, no. 01, pp. 10–17, 2020.

[2]   T. Althoff, R. Sosic, JL Hicks, AC King, SL Delp, and J. Leskovec, "Large-scale Physical Activity Data Reveal Worldwide Activity Inequality,"*Nature*, 2017, doi: 10.1038/nature23018.

[3]   L. Anggraini and A. . I. Tjahjani, "The Effect of Sidewalk Conversion on the Level ofPedestrian Comfort on Fatmawati Raya Hospital Road, Jakarta," J. Syntax Amiration, vol. 2, no. 9, 2021, doi: 10.46799/jsa.v2i9.304.

[4]   M. Darmalim and N. Solikhah, "Reorganization of the Muara Karang Market Area with a Walkable City Approach,"*J. Science, Technology. Urban, Design, Architecture.*, vol. 4, no. 2, pp. 2741–2754, 2023, doi: 10.24912/stupa.v4i2.22265.

[5]   Directorate General of Highways, "Technical Planning Guidelines for Pedestrian Facilities (No. 07/P/BM/2023). Ministry of Public Works and Public Housing," 2023.

[6]   WB Dermawan, A. Johanes, M. Isradi, and AI Rifai, "Analysis of the Satisfaction Level of Sidewalk Users (Case Study on Jl. Jendral Ahmad Yani Bekasi),"*Int. J. Engineering Nat. Sci.*, vol. 7, no. 1, pp. 74–82, 2022.

[7]   M. Isradi, N. Sari, A. Mufhidin, WB Dermawan, and M. Khadem, "Analysis of Pedestrian During The COVID-19 Period in The Dago - Bandung Area,"*J. World Conf.*, vol. 4, no. 2, pp. 68–77, 2022.

[8]   North Jakarta City Statistics Office,*North Jakarta Administrative City in Figures 2020*. North Jakarta: CV. Nario Sari, 2020.

[9]   Minister of Public Works Regulation Number 03 of 2014, "Minister of Public Works Regulation Number 03/PRT/M/2014 Concerning Guidelines for Planning, Provision, and Utilization of Pedestrian Network Infrastructure and Facilities in Urban Areas,"*Minister of Manpower General of the Republic of Indonesia.*, vol. 2013, p. 8, 2014, [Online]. Available: http://pug-pupr.pu.go.id/_uploads/Produk_pengaturan/Permen PUPR No 03-2014.pdf.

[10]   Transportation Research Board (TRB) 2000,*Highway Capacity Manual 2000*. United States of America: National Academy of Sciences, 2000.

[11]   M. Southworth, "Designing the Walkable City,"*J. Urban Plan. Dev.*, vol. 131, no. 4, pp. 246–257, 2005, doi: 10.1061/(ASCE)0733-9488(2005)131:4(246).

[12]   Sugiyono,*Quantitative, Qualitative, Combination and R&D Approaches*. Bandung: CV Alf, 2018.

[13]   AJ Frans, L. Tondobala, and JO Wanni, "Pedestrian Perceptions of Sidewalk Safety and Comfort in Amurang City Center,"*J. Architect. Daeng*, vol. 5, no. 2, 2016.

[14]   R. Hidayat and Z. Urufi, "Comparison of Physical Aspects of Pedestrian Paths and

Satisfaction Levels Based on Pedestrian Perceptions After Revitalization in the Jalan Jenderal Sudirman Corridor, Bandung City," in *2021 National Seminar and Final Project Dissemination*, 2021, no. 3, pp. 937–947.

[15]   M. Hayati *et al.*, "Public Satisfaction with Pedestrian Development in Sambas Market," J. Ekon. Busni, dan Pariwisata, vol. 2, no. 1, pp. 10–16, 2024, doi: 10.59996/ekodestinasi.v2i1.180.

[16]   A. Suhendra and D. Prasetyanto, "Study of Trans Metro Bandung Corridor 2 User Satisfaction Levels Using the Importance-Performance Analysis Approach," *J. Civil Engineering*, vol. 2, no. 2, pp. 59–70, 2016, doi: 10.26760/rekaracana.v2i2.59.