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Analysis of Pedestrian Comfort in Relation to Sidewalk Utilization in the Old Town Area of Gresik

Miftahussurur Rosyadi[1], Widodo Budi Dermawan[2], Muhammad Isradi[3*]
[1]Civil Engineering Student, Universitas Mercu Buana, Jakarta, Indonesia-11650
[2, 3]Department of Civil Engineering, Universitas Mercu Buana, Jakarta, Indonesia-11650
Email address: miftaro16@gmail.com, widodo.budi@mercubuana.ac.id, isradi@mercubuana.ac.id

Abstract— *The comfort of pedestrians is an important indicator in assessing the quality of urban infrastructure, especially in densely populated tourist areas such as the Old Town of Gresik. This study, with reference to the Minister of Public Works, seeks to evaluate the degree of pedestrian comfort based on the physical state of current sidewalks. and Public Housing Circular No. 18/SE/Db/2023, and to assess user views using the Importance Performance Analysis (IPA) methodology. Field observations were conducted on four main road segments: Kramatlangon, KH Zubair, AKS Tubun, and Basuki Rahmat. The research method combines direct observation, questionnaire surveys, and descriptive and inferential statistical analysis using SPSS software. The results of the study indicate that several sidewalk elements, such as shade structures and safety barriers, do not fully meet technical standards, which impacts the level of comfort. Nevertheless, the IPA analysis shows an average user satisfaction level of 93.84% and an average Level of Service (LOS) rating of "A." These findings underscore the importance of providing integrated, safe, and standard-compliant pedestrian facilities to support sustainable mobility and enhance the comfort of public spaces.*

Keywords— *Pedestrian comfort, sidewalks, Old Town Gresik, Importance Performance Analysis, Level of Service.*

I. INTRODUCTION

The Old Town of Gresik, covering an area of 60 hectares, is a historical tourist destination that previously functioned as an important trading port in Indonesia. The high number of visitors, totaling 12,258 people in 2023, indicates the significance of transportation, particularly walking, as an environmentally friendly alternative (Dermawan, Isradi, et al. 2021; Khoirul and Isradi 2024). The Gresik local government has made efforts to improve sidewalks to support this tourism activity. Sidewalks, which are parts of the road designated for pedestrians, should ensure safety and comfort for users from vehicle traffic (Isradi, Dermawan, et al. 2020; Isradi, Arifin, et al. 2022). However, initial observations reveal several issues, such as a lack of shade structures, safety barriers, and insufficient lighting, which can disrupt pedestrian comfort (Isradi, Hidayat, and Prasetijo 2020). The aim of this study is to analyze the extent to which the physical conditions of sidewalks in the Old Town of Gresik comply with the Minister of Public Works and Public Housing Circular No. 18/SE/Db/2023 regarding Technical Planning Guidelines for Pedestrian Facilities, and to assess the level of satisfaction of pedestrians regarding the comfort of sidewalks in the Old Town area of Gresik, as well as to analyze the performance of the sidewalks and propose solutions for their improvement (Cepolina, Menichini, and Gonzalez Rojas 2018; Dermawan, Bagaskara, et al. 2021).

II. RESEARCH METHODOLOGY

A. Research Location

The selected location experiences a high volume of traffic on both the road segment and the intersection, primarily due to the diverse land use in the area, which includes educational institutions, office buildings, public facilities, and residential zones (Firdaus et al. 2021, 2025) The survey was conducted in the Old Town area of Gresik on four main roads, namely Jalan

Kramatlangon, KH Zubair, AKS Tubun, and Basuki Rahmat, with a total length of approximately 1.4 km. This location is situated in the districts of Gapurosukolilo, Pekauman, Bedilan, Pulopancikan, Kebungson, and Pekelingan, which are historical tourist areas with high pedestrian traffic and dense vehicle traffic (Amprasi et al. 2020; Isradi, Alifia, et al. 2022; Rifai et al. 2021). The selection of the location was based on the significant intensity of pedestrian activity and its role as a central tourist hub in the city.

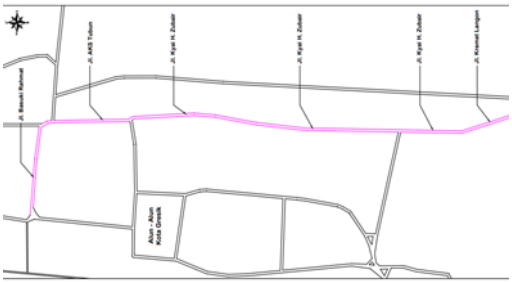

Figure. 1. Research Location Map
Source: Google Maps

Figure 2. Research Location
Source: Personal Document

B. Types and Sources of Data

This study uses a descriptive method with a quantitative approach. The analysis was conducted by describing the physical condition of sidewalks in the Old Town area of Gresik and its supporting facilities. To determine perceptions of comfort, a questionnaire was distributed to respondents covering aspects such as weather, traffic, design, noise, odor, cleanliness, aesthetics, and safety (Firdaus et al. 2021, 2022). The data obtained was then analyzed using descriptive statistics, resulting in a clear picture of satisfaction levels presented as easily understandable percentages.

C. Data Collection Techniques and Methods

In the planning stage of this research, a structured work plan was developed to ensure that all activities could be carried out efficiently and effectively. The preparation stages included:

1. Importance Performance Analysis (IPA) for the relationship between importance and satisfaction (Madani et al. 2024; Yusman et al. 2025).
2. Level of Service (LOS) for sidewalk performance.
3. Validity and reliability testing with SPSS.

III. Results and Discussion

A. Existing Sidewalk Conditions

Visual Conditions

1. Kramatlangon and KH Zubair: The road width is less than ideal, the surface is flat, two-way traffic flows smoothly, but the sidewalk area is reduced due to the presence of street vendors and vehicle parking. Facilities to support and accommodate people with disabilities are adequate.
2. AKS Tubun: The road feels narrow due to road widening, the surface is even, two-way traffic flows smoothly, and there is no reduction in area due to street vendors or parking. Facilities for supporting and accommodating people with disabilities are adequate.
3. Basuki Rahmat: The road width is very good, the surface is even, two-way traffic is very smooth, and there is no reduction in space due to the presence of street vendors or parking. Facilities for supporting and accommodating people with disabilities are adequate.

Geometric Conditions

Based on Table 1, the geometric conditions of the sidewalks in the Old Town of Gresik, specifically the Kramatlangon, KH Zubair, and AKS Tubun segments, do not fully comply with the dimensional standards set forth in SE PUPR No. 18/SE/Db/2023. The Basuki Rahmat segment complies with the standards (DGH 1999; Peraturan Menteri Pekerjaan Umum 2014).

TABLE 1. Geometric Conditions of Sidewalks in the Old Town Area of Gresik

No	Supporting Facilities	Road Segment				Technical Standard SE PUPR No. 18/SE/Db/2023 (m)
		Kramat Langon (m)	KH Zubair (m)	AKS Tubun (m)	Basuki Rahmat (m)	
1	Sidewalk Height	0,15	0,15	0,20	0,20	0,06 – 0,15
2	Width of Kereb	0,15	0,15	0,15	0,15	0,15
3	Facility Lane Width	0,40	0,40	0,30	1,20	0,75
4	Effective Width of Sidewalks	0,85	0,75	0,75	3,00	3,00
5	Front of the Building	0,30	0,30	0,30	2,50	1,50
Total Dimensions (2+3+4+5)		1,70	1,60	1,50	6,85	4,00
The sidewalk is wide enough for two people to walk side by side.		√	√	√	√	
There is sufficient shade (trees/canopies) along the sidewalk.					√	
Sidewalks have facilities for people with disabilities.		√	√	√	√	

Source: Author's compilation, 2025

Supporting Facilities

TABLE 2. Supporting Facilities for Sidewalks in the Old Town Area of Gresik

No	Supporting Facilities	Road Segment			
		Kramat Langon	KH Zubair	AKS Tubun	Basuki Rahmat
1	Signs	√	√	√	√
2	Markinga	√	√	√	√
3	Reflective Tape		√	√	
4	Waiting Area				√
5	Lighting	√	√	√	√
6	Safety Fence				
7	Protective Cover / Shelter				
8	Green Line	√	√	√	√
9	Seating Area				√
10	Trash Bins				√
11	Bus Stop				
12	Bollards				√
13	Bicycle Parking				
14	Emergency Box				
15	Information Board				√

Source: Author's compilation, 2025

Facilities such as safety fences and shelters/shade structures are still not available in accordance with PUPR guidelines.

B. Analisis Level of Service (LOS)

LOS is used as the basis for pedestrian space. This concept is categorized into six standards, namely service levels A to F. This can be seen in Table 3.

On May 17, 2025, an analysis was conducted on several road segments, namely the Basuki Rahmat segment, which is 210 meters long, from 7:00 a.m. to 8:00 a.m., with a sidewalk width of 6.85 meters and an effective width of 3 meters; AKS Tubun Segment, 215 meters long, from 8:00 AM to 9:00 AM, with a sidewalk width of 1.50 meters and an effective width of 0.75 meters; KH Zubair segment, 635 meters long, from 9:00 a.m. to 10:00 a.m., with a sidewalk width of 1.60 meters and an effective width of 0.75 meters; and Kramat Langon segment, 360 meters long, from 10:00 a.m. to 11:00 a.m., with a sidewalk width of 1.70 meters and an effective width of 0.85 meters.

TABLE 3. Level of Service (LOS)

Servic Level	Pedestrian Path (m2/Ped)	Average Speed (m/min)	Pedestrian Traffic Volume (Ped/m/min)	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	Variabel	1

Source: Regulation of the Minister of Public Works, 2014

Pedestrian Volume Analysis

TABLE 4. Pedestrian Volume Analysis

Pedestrians Traffic Data (Morning)		
Segment	**Times**	**Total Of Pedestrians**
Basuki Rahmat	07.00 - 07.15	45
	07.15 - 07.30	44
	07.30 - 07.45	37
	07.45 - 08.00	46
AKS Tubun	08.00 - 08.15	4
	08.15 - 08.30	1
	08.30 - 08.45	5
	08.45 - 09.00	3
KH Zubair	09.00 - 09.15	8
	09.15 - 09.30	12
	09.30 - 09.45	7
	09.45 - 10.00	9
Kramat Langon	10.00 - 10.15	3
	10.15 - 10.30	2
	10.30 - 10.45	0
	10.45 - 11.00	0

Source: Author's compilation, 2025

Pedestrian Flow Analysis

Pedestrian flow can be measured by counting the number of people walking on the sidewalk we observed. Observations were made for 60 minutes at 15-minute intervals, so data was collected every 15 minutes and the total number of pedestrians was calculated and adjusted to a flow unit.

TABLE 5. Analysis of Pedestrian Traffic in Old Town Gresik

Pedestrians Traffic Data (Morning)			
Segment	**Times**	**Total Of Pedestrians**	**flow**
Basuki Rahmat	07.00 - 07.15	45	1
	07.15 - 07.30	44	0,978
	07.30 - 07.45	37	0,822
	07.45 - 08.00	46	1,022
AKS Tubun	08.00 - 08.15	4	0,356
	08.15 - 08.30	1	0,089
	08.30 - 08.45	5	0,444
	08.45 - 09.00	3	0,267
KH Zubair	09.00 - 09.15	8	0,711
	09.15 - 09.30	12	1.067
	09.30 - 09.45	7	0,622
	09.45 - 10.00	9	0,8
Kramat Langon	10.00 - 10.15	3	0,235
	10.15 - 10.30	2	0,157
	10.30 - 10.45	0	0
	10.45 - 11.00	0	0

Source: Author's compilation, 2025

Pedestrian Speed Analysis

The data used to calculate speed includes travel time and segment size. Travel time is the duration required by pedestrians to pass through the studied sidewalk segment (in minutes), while segment size is the length of the sidewalk when the observation was made (in meters). Segment sizes vary for each sidewalk, depending on the surrounding conditions.

TABLE 6. Pedestrian Speed Analysis

Pedestrian Speed Data						
Segment	**Pedestrian**	**Segment Length (m)**	**Travel Time (min)**	**Pedestrian Speed (m/min)**	**Average Time Speed (m/min)**	**Average Space Speed (m/min)**
Basuki Rahmat	1	210	2,25	93,33	94,46	93,33
	2	210	1,95	107,69	94,46	93,33
	3	210	2,55	82,35	94,46	93,33
AKS Tubun	1	215	2,76	77,9	85,23	84,76
	2	215	2,3	93,48	85,23	84,76
	3	215	2,55	84,31	85,23	84,76
KH Zubair	1	635	6,35	100	95,1	94,92
	2	635	7,07	89,82	95,1	94,92
	3	635	6,65	95,49	95,1	94,92
Kramat Langon	1	360	4,55	79,12	89,45	88,74
	2	360	3,95	91,14	89,45	88,74
	3	360	3,67	98,09	89,45	88,74

Source: Author's compilation, 2025

Based on Table 6. above, it can be seen that the average speed in the Old Town of Gresik on the Basuki Rahmat Road segment is 94.46 m/minute.

Pedestrian Space Analysis

The LOS analysis for the four road segments (Basuki Rahmat, AKS Tubun, KH Zubair, Kramatlangon) shows that all segments have a LOS A service level for pedestrian space, traffic volume, average speed, and capacity ratio. This indicates that the sidewalks are flowly able to accommodate pedestrians very well.

TABLE 7. Pedestrian Space Analysis

Pedestrian Space Data			
Segment	**Flow**	**Average Space Speed**	**Pedestrian Space**
Basuki Rahmat	1,022	93,33	91,3
AKS Tubun	0,444	84,76	190,7
KH Zubair	1,067	94,92	88,99
Kramat Langon	0,235	88,74	377,16

Source: Author's compilation, 2025

Pedestrian Ratio Analysis

Capacity ratio is the comparison between the traffic volume of a section and its road capacity. It is calculated by dividing the flow by the pedestrian capacity, assumed to be 100 pedestrians.

TABLE 8. Pedestrian Space Analysis

Pedestrian Ratio Data			
Segment	**Flow**	**Capacity of Pedestrians**	**Ratio**
Basuki Rahmat	1,022	100	0,010
AKS Tubun	0,444	100	0,004
KH Zubair	1,067	100	0,011
Kramat Langon	0,235	100	0,002

Source: Author's compilation, 2025

Based on the pedestrian capacity ratio, it can be concluded that the sidewalks in the Old Town of Gresik are classified as LOS Type A.

C. Level Of Service (LOS) Projection Analysis

The LOS projection for the next 5 years, assuming a 3% annual growth in tourists, also shows that all four road segments will remain at LOS A service level. This means that the sidewalks in the Old Town area of Gresik are projected to continue to provide excellent service for pedestrians over the next five years. The geometric method projection for sidewalks in the Old Town area of Gresik over the next five years can be calculated using the following equation:

$$Pt = P0\ (1+r)t$$

Where:

Pt = Population in year t (people)

P0 = Population in the base year (people)

r = Population growth rate (%)

t = Time difference between the base year and year t (in years)

Thus, we obtain:

Pt = P0 (1+r)t

Pt = 12,168 (1+3%)5

Pt = 14,106 tourists

Thus, the projected number of tourists in Kampung Kemasan, which is part of the Gresik Old Town area, over the next five years is 14,106 tourists.

An analysis was conducted on several road segments, namely the Basuki Rahmat segment, which is 210 meters long, from 7:00 a.m. to 8:00 a.m., with a sidewalk width of 6.85 meters and an effective width of 3 meters; AKS Tubun Segment, 215 meters long, from 8:00 AM to 9:00 AM, with a sidewalk width of 1.50 meters and an effective width of 0.75 meters; KH Zubair segment, 635 meters long, from 9:00 a.m. to 10:00 a.m., with a sidewalk width of 1.60 meters and an effective width of 0.75 meters; and Kramat Langon segment, 360 meters long, from 10:00 a.m. to 11:00 a.m., with a sidewalk width of 1.70 meters and an effective width of 0.85 meters.

Pedestrian Volume Projection Analysis

TABLE 9. Pedestrian Volume Projections Analysis

Pedestrians Traffic Data (Morning)		
Segment	**Times**	**Total Of Pedestrians**
Basuki Rahmat	07.00 - 07.15	53
	07.15 - 07.30	52
	07.30 - 07.45	43
	07.45 - 08.00	54
AKS Tubun	08.00 - 08.15	5
	08.15 - 08.30	2
	08.30 - 08.45	6
	08.45 - 09.00	4
KH Zubair	09.00 - 09.15	10
	09.15 - 09.30	14
	09.30 - 09.45	9
	09.45 - 10.00	11
Kramat Langon	10.00 - 10.15	4
	10.15 - 10.30	3
	10.30 - 10.45	0
	10.45 - 11.00	0

Source: Author's compilation, 2025

Pedestrian Flow Projection Analysis

Pedestrian flow can be measured by counting the number of people walking on the sidewalk we observed. Observations were made for 60 minutes at 15-minute intervals, so data was collected every 15 minutes and the total number of pedestrians was calculated and adjusted to a flow unit.

TABLE 10. Projections Analysis of Pedestrian Traffic in Old Town Gresik

Pedestrians Traffic Data (Morning)			
Segment	**Times**	**Total of Pedestrians**	**flow**
Basuki Rahmat	07.00 - 07.15	53	1,178
	07.15 - 07.30	52	1,156
	07.30 - 07.45	43	0,956
	07.45 - 08.00	54	1,200
AKS Tubun	08.00 - 08.15	5	0,444
	08.15 - 08.30	2	0,178
	08.30 - 08.45	6	0,533
	08.45 - 09.00	4	0,356
KH Zubair	09.00 - 09.15	10	0,889
	09.15 - 09.30	14	1,244
	09.30 - 09.45	9	0,800
	09.45 - 10.00	11	0,978
Kramat Langon	10.00 - 10.15	4	0,314
	10.15 - 10.30	3	0,235
	10.30 - 10.45	0	0,000
	10.45 - 11.00	0	0,000

Source: Author's compilation, 2025

Pedestrian Speed Projection Analysis

The data used to calculate speed includes travel time and segment size. Travel time is the duration required by pedestrians to pass through the studied sidewalk segment (in minutes), while segment size is the length of the sidewalk when the observation was made (in meters). Segment sizes vary for each sidewalk, depending on the surrounding conditions.

TABLE 11. Pedestrian Speed Projections Analysis

Pedestrian Speed Data						
Segment	**Pedestrian**	**Segment Length (m)**	**Travel Time (min)**	**Pedestrian Speed (m/min)**	**Average Time Speed (m/min)**	**Average Space Speed (m/min)**
Basuki Rahmat	1	210	2,25	93,33	94,46	93,33
	2	210	1,95	107,69	94,46	93,33
	3	210	2,55	82,35	94,46	93,33
AKS Tubun	1	215	2,76	77,9	85,23	84,76
	2	215	2,3	93,48	85,23	84,76
	3	215	2,55	84,31	85,23	84,76
KH Zubair	1	635	6,35	100	95,1	94,92
	2	635	7,07	89,82	95,1	94,92
	3	635	6,65	95,49	95,1	94,92
Kramat Langon	1	360	4,55	79,12	89,45	88,74
	2	360	3,95	91,14	89,45	88,74
	3	360	3,67	98,09	89,45	88,74

Source: Author's compilation, 2025

Based on Table 11. above, it can be seen that the average speed in the Old Town of Gresik on the Basuki Rahmat Road segment is 94.46 m/minute.

Pedestrian Projection Space Analysis

The LOS analysis for the four road segments (Basuki Rahmat, AKS Tubun, KH Zubair, Kramatlangon) shows that all segments have a LOS A service level for pedestrian space, traffic volume, average speed, and capacity ratio. This indicates that the sidewalks are flowly able to accommodate pedestrians very well.

TABLE 12. Pedestrian Space Projections Analysis

Pedestrian Space Data			
Segment	**Flow**	**Average Space Speed**	**Pedestrian Space**
Basuki Rahmat	1,200	93,33	77,78
AKS Tubun	0,533	84,76	158,92
KH Zubair	1,244	94,92	76,27
Kramat Langon	0,314	88,74	282,87

Source: Author's compilation, 2025

Pedestrian Ratio Projection Analysis

Capacity ratio is the comparison between the traffic volume of a section and its road capacity. It is calculated by dividing the flow by the pedestrian capacity, assumed to be 100 pedestrians.

TABLE 13. Pedestrian Space Projections Analysis

Pedestrian Ratio Data			
Segment	**Flow**	**Capacity of Pedestrians**	**Ratio**
Basuki Rahmat	1,200	100	0,012
AKS Tubun	0,533	100	0,005
KH Zubair	1,244	100	0,012
Kramat Langon	0,314	100	0,003

Source: Author's compilation, 2025

Based on the pedestrian capacity ratio, it can be concluded that the sidewalks in the Old Town of Gresik are classified as LOS Type A.

D. Research Questionnaire

This research questionnaire was administered to 106 respondents who use facilities located on the sidewalks of the Old Town area of Gresik. The assessment in this study was designed in accordance with the indicators that need to be considered in the Circular Letter of the Minister of Public Works and Public Housing No. 18/SE/Db/2023 concerning Technical Planning Guidelines for Pedestrian Facilities.

TABLE 14. Performance and Importance Assessment

Indicators based on SE PUPR No. 18/SE/Db/2023	**Criteria reviewed**
Safety	Sidewalk Width Conditions
	Sidewalk Safety (slippery, potholes, etc.)
	Security from crime
	Lighting around the sidewalk
Comfort	Unpleasant odors
	Vehicle noise
	Adequate trash bins
Accessibility	Sidewalk Width
	Shape and quality of sidewalk pavement
	Condition of barriers between sidewalks and roads
Beauty	Cleanliness of sidewalks
Social Interaction	Sirkulasi antar pejalan kaki dan aktivitas lain (PKL, Parkir liar) Circulation between pedestrians and other activities (street vendors, illegal parking)

Source: SE PUPR No. 18/SE/Db/2023

1. Gender:
   The majority of respondents were female (62.26%).
2. Age:
   The dominant age groups were 21-25 years old (38.68%) and 26-30 years old (34.91%).
3. Highest Level of Education:
   The majority have a bachelor's degree (43.40%) and high school/vocational school diploma (36.79%).
4. Occupation:
   Most are private sector employees (45.28%) and students (23.58%).
5. Purpose of Using Sidewalks:
   Mostly for exercise (44.34%) and shopping (22.64%).
6. Time of Sidewalk Use:
   Most frequently between 6:00 AM and 12:00 PM (37.74%) and 12:00 PM and 6:00 PM (31.13%).
7. Frequency of Walking:
   Mostly “Sometimes” (2-3 times a week) (62.26%).

E. Research Instrument Test

Validity Test

The validity test in this study aims to evaluate how well the questions in the instrument can accurately describe the concept to be measured, namely the level of comfort of pedestrians when walking on sidewalks in the Old Town area of Gresik. The validity test process will be carried out using SPSS software version 27. All items for the variables of importance and comfort were found to be valid (calculated R value > table R value).

TABLE 15. Validity Test Results

Question Item	**Calculated R**	**R Table**	**Description**
KP01	0,46	0,195	Valid
KP02	0,584	0,195	Valid
KP03	0,384	0,195	Valid
KP04	0,455	0,195	Valid
KP05	0,427	0,195	Valid
KP06	0,356	0,195	Valid
KP07	0,505	0,195	Valid
KP08	0,473	0,195	Valid
KP09	0,458	0,195	Valid
KP10	0,483	0,195	Valid
KP11	0,514	0,195	Valid
KP12	0,451	0,195	Valid

Source: Author's compilation, 2025

Once the interest variables have been declared valid, the validity of comfort can be seen in Table 15.

TABLE 16. Comfort Validity Test Results

Question Item	**Calculated R**	**R Table**	**Description**
KN01	0,489	0,195	Valid
KN02	0,529	0,195	Valid
KN03	0,545	0,195	Valid
KN04	0,741	0,195	Valid
KN05	0,5	0,195	Valid
KN06	0,519	0,195	Valid
KN07	0,673	0,195	Valid
KN08	0,602	0,195	Valid
KN09	0,3	0,195	Valid
KN10	0,479	0,195	Valid
KN11	0,469	0,195	Valid

Source: Author's compilation, 2025

As can be seen in Table 16, the comfort variable results are valid. This is because all data has been declared valid based on the calculated R value being greater than the T table value.

Realibility Test

Reliability testing is a crucial step in assessing the consistency of a measuring instrument. In this study, reliability was tested using Cronbach's alpha coefficient, which is a

common method for assessing the internal reliability of a measuring instrument. If the Cronbach's alpha value for each variable is greater than 0.60, the variable is considered to have an adequate level of reliability. The reliability test results for each variable can be seen in Table 17.

TABLE 17. Reliability Test Results

Variable	*Cronbach Alpha.*	Limit Value	Description
Interest	0,668	0,6	Reliable
Comfort	0,758	0,6	Reliable

Source: Author's compilation, 2025

All variables showed Cronbach Alpha values > 0.6, indicating that the instrument was reliable.

F. Analisis Importance Performance Analysis (IPA)

This study examines how comfort and importance of facilities influence pedestrian area performance in Gresik Old Town. Comfort (X-axis) and importance (Y-axis) are mapped on a Cartesian diagram.

Calculation of Suitability Level

TABLE 18. Pedestrian Assessment of Sidewalk Physical Characteristics Based on Importance Scale

No	Question	Respondent Rating				Total Score	Score
		1	2	3	4		
Safety							
1	What is the safety condition of the sidewalk (slippery, potholes, etc.) that you walk on?	6	14	37	49	341	3,217
2	What is the safety condition of the sidewalk in terms of crime?	1	16	36	53	353	3,330
3	What is the lighting condition around the sidewalk that you walk on?	1	22	37	46	340	3,208
4	What is the condition of the barrier between the sidewalk and the road that you walk on?	1	19	46	40	337	3,179
Comfort							
5	What is the noise level from vehicles on the sidewalk you use?	2	10	52	42	346	3,264
6	What is the cleanliness of the sidewalk you use?	6	21	35	44	329	3,104
7	How comfortable are pedestrians with unpleasant odors on sidewalks?	1	16	43	46	346	3,264
8	How is the availability of trash bins on the sidewalks you walk on?	2	13	31	60	361	3,406
Accessibility							
9	What is the condition of the sidewalk you walk on?	4	15	36	51	346	3,264
10	What is the condition and quality of the pavement on the sidewalk you walk on?	1	21	47	37	332	3,132
Beauty							
11	What is the condition of the scenery around the sidewalk you walk on?	1	26	35	44	334	3,151
Social Interaction							
12	How is the circulation between pedestrians and other activities (street vendors, illegal parking) on the sidewalk you walk on?	0	17	37	52	353	3,330

Source: Author's compilation, 2025

Pedestrian perceptions were analyzed using the Importance Performance Analysis (IPA) method with SPSS 27. The conformity level is the first IPA stage, comparing performance and importance scores of sidewalks in Gresik Old Town based on pedestrian assessments

The total score in Table 4.74 is obtained by multiplying the scale by the number of respondent answers, for example, for sidewalk width conditions:
Total score = (1x4)+(2x15)+(3x36)+(4x51) = 346,
While the score is obtained from the total score divided by the number of respondents = 346/106 = 3.264

TABLE 19. Pedestrian Assessment of Sidewalk Physical Characteristics Based on Comfort Level Scale

No	Question	Respondent Rating				Total Score	Score
		1	2	3	4		
Safety							
1	What is the safety condition of the sidewalk (slippery, potholes, etc.) that you walk on?	1	19	42	44	341	3,217
2	What is the safety condition of the sidewalk in terms of crime?	1	26	41	38	328	3,094
3	What is the lighting condition around the sidewalk that you walk on?	1	30	44	31	317	2,991
4	What is the condition of the barrier between the sidewalk and the road that you walk on?	0	33	45	28	313	2,953
Comfort							
5	What is the noise level from vehicles on the sidewalk you use?	16	25	37	28	289	2,726
6	What is the cleanliness of the sidewalk you use?	3	34	34	35	313	2,953
7	How comfortable are pedestrians with unpleasant odors on sidewalks?	9	24	28	45	321	3,028
8	How is the availability of trash bins on the sidewalks you walk on?	5	17	41	43	334	3,151
Accesibility							
9	What is the condition of the sidewalk you walk on?	0	22	50	34	330	3,113
10	What is the condition and quality of the pavement on the sidewalk you walk on?	4	25	40	37	322	3,038
Beauty							
11	What is the condition of the scenery around the sidewalk you walk on?	1	24	35	46	338	3,189
Social Interaction							
12	How is the circulation between pedestrians and other activities (street vendors, illegal parking) on the sidewalk you walk on?	4	27	42	33	316	2,981

Source: Author's compilation, 2025

The total score in Table 4.75 is obtained by multiplying the scale by the number of respondents' answers, for example for the condition of sidewalk width:
Total score = (1x0)+(2x2)+(3x50)+(4x34) = 330,
Meanwhile, the score is obtained from the total score divided by the number of respondents = 330/106 = 3.113

From the results of the calculation of the level of conformity with the performance of the sidewalk, all indicators received a very good rating, so that overall, 12 indicators received a very good rating regarding the level of conformity with the performance of the sidewalk in the Old Town area of Gresik.

Diagram Cartesian

The Cartesian diagram, also known as rectangular coordinates, is a basic element in mathematics and is used in various disciplines such as physics and geography. This coordinate system was developed in the 17th century by French thinker Rene Descartes. This innovation resulted in a coordinate system that allows for the graphical representation of data and relationships between variables.

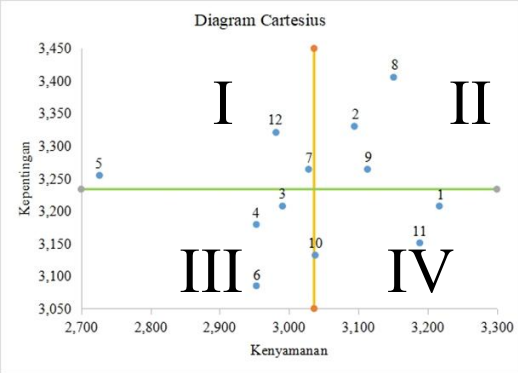

Figure 3. Cartesian Diagram of Sidewalk Comfort and Interest
Source: Author's compilation, 2025

The average value for the 12 indicators analyzed was 3.036 (horizontal) and 3.237 (vertical), which were then mapped onto a Cartesian diagram, dividing the space into four quadrants. The quadrant categorization is as follows:

1. Quadrant I: High importance but low performance, including vehicle noise, comfort from unpleasant odors, and circulation between pedestrians and other activities.
2. Quadrant II: High importance and high performance, including safety from crime, availability of trash bins, and sidewalk width.
3. Quadrant III: Low importance and low performance, including sidewalk lighting, barriers between roads and sidewalks, and sidewalk cleanliness.
4. Quadrant IV: Low importance but high performance, including sidewalk safety conditions, the shape and quality of sidewalk pavement, and sidewalk views.

Comparative Analysis of Observation and Perception Results

Although LOS indicates excellent sidewalk performance, IPA analysis reveals a gap between actual performance and user expectations/interests. Factors in Quadrant I (noise, odor, circulation) require immediate attention as they are considered very important but their performance is still lacking. Sidewalk width, although in Quadrant II, still has potential for improvement to enhance comfort.

IV. Conclusions and Recommendations

Conclusion

1. The physical condition of sidewalks in the Old Town area of Gresik is not yet fully compliant with SE Minister of Public Works and Public Housing No. 18/SE/Db/2023, particularly in the AKS Tubun, KH Zubair, and Kramat Langon segments, while the Basuki Rahmat segment is already compliant. Supporting facilities such as shelters and road barriers are also insufficient.
2. The results of the Importance Performance Analysis (IPA) indicate an average user satisfaction rate of 93.84%, categorized as very good.
3. The flow Level of Service (LOS) and the projected LOS for the next five years are categorized as A, indicating that the sidewalks perform adequately. However, there are still priorities for improvement, including adjusting the width of the sidewalk, adding trash bins, enhancing security (CCTV), and regulating illegal parking and street vendors.

Recommendations

1. The local government needs to improve the dimensions of the sidewalk in segments that do not meet standards, in accordance with SE Minister of Public Works and Housing No. 18/SE/Db/2023.
2. Supporting facilities for sidewalks, such as shade structures, lighting, and safety barriers, need to be installed to enhance comfort and tourist appeal.
3. Priority facilities should be added, including:
   - Trash bins along the sidewalks,
   - CCTV for security,
   - Enforcement of illegal parking and street vendors to restore sidewalks as pedestrian spaces.

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