Integration Facilities for Pedestrians in Train Station Area

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ABSTRACT

This study aims to determine the characteristics of pedestrians, the level of pedestrian service, the performance of pedestrian facilities, and the level of walkability in Bekasi train station area. This study uses several analytical techniques, described as follows: Pedestrian Analysis; Walkability Index; and Importance Performance Analysis (IPA). 100 respondents based on probability sampling technique. The results of the analysis show that pedestrian infrastructure is lacking and inadequate for pedestrians in segments 1 and 2. Segments 3, 4, and 5 already have adequate infrastructure for pedestrians. Importance performance analysis shows that there are indicators that require priority treatment. The indicators are considered very important by pedestrians, however based on pedestrian analysis and the walkability index obtained low ratings.

Keywords: integration, pedestrians, performance, walkability index, station area

A. Introduction

DKI Jakarta and its surroundings, called Jabodetabek, has a network of transportation services and community mobility that is extensive and predominantly commuting (Ricardianto, Wibowo, et al., 2021). The travel patterns of the Jabodetabek people that adapt to the development of the region will make it very possible for a shift in modes of transportation to occur, namely, a condition in which passengers travel change from fashion transportation one to another way of transportation or switching between two services of the same mode of transportation (Maemunah, 2020). Also includes anyone who uses or has used public transit that combines walking Adha & Ernawati, (2018), cycling, motorbikes, or cars as described in Plan Parent Jakarta, Bogor, Depok, Tangerang, and Bekasi (PP RI, 2018). The number of modal shifts made by users in Jabodetabek is enormous. The development of transportation facilities by Maemunah, (2022) and infrastructure at this time needs to prioritize intermodal integration to make it easier for people to move and make travel more efficient. Integration of transportation services is one of the urgent steps to be implemented based on Ricardianto, Martagani, et al., (2021), but this needs to with good accessibility with continuous conditions or, in this case, access to the nodes of transportation modes no obstacles.

Walking is the easiest way to travel short distances in urban areas (Maemunah, 2020). Individually, in groups, and in pairs, the walkability of a place or city can be measured using the Global Walkability Index base on Sirunyan et al., (2017), a study conducted in Asia (Survey on Walkability in Asian Cities), more especially the study conducted in the city of Jakarta. It can be determined using a walking ability score of 48, which means it is unsuitable for walking (Endarwati et al., 2018). A Walkable city emphasizes cities with high walkability values, such as walkability becoming more pedestrian-friendly by Sofwan, (2017). Bekasi City is also an area with problems with pedestrian/pedestrian paths that still need to be more friendly for
As a metropolitan city, Bekasi City needs help, especially with the condition of the pedestrian paths around Bekasi Station, where the station, as an integration facility for pedestrians by Alon et al., (2018), requires to function correctly (Haris, 2017). The problems found are the low effectiveness of pedestrian paths based on space utilization activities as integration facilities, there is a reduction in the area of movement and obstacles for pedestrian activities so that it affects the level of service, pedestrian paths become places for selling and parking, so they are not by their functions resulting in low pedestrian comfort (Percy et al., 2008). So, to be able to overcome these problems, this research was carried out to know the characteristics, level of service, and performance of pedestrian facilities around Bekasi Station, with the hope of being able to provide recommendations for improvements in overcoming pedestrian problems.

To create a walkable environment, efforts can be made to improve a pedestrian-friendly climate described in the following four ways (Percy et al., 2008). Walkability is an indicator of the ability of people to walk to various goals and reasons. Walkability is one of the concepts of a pedestrian-friendly path for pedestrians. The concept of walkability makes an area a pedestrian environment; in this case, the measurement is carried out through a comprehensive assessment of the pedestrian infrastructure and studies linking supply and demand (Adha & Ernawati, 2018). Walkability Index (WI) is a method of evaluating the level of convenience of walking on the facility pedestrian with components: safety and security, comfort and power pull, and support policy government (Endarwati et al., 2018).

B. Methods

The method of study is a survey by interviewing and spreading questionnaires to respondents. 100 sample was taken by simple random sampling, which was the passenger that pasted a barcode in the Bekasi Station Area. The institutions that will be used as references are secondary data: (1) Central Government, namely the Ministry of Transportation; (2) Regional Governments, namely the Bekasi City Transportation Service, the Bekasi City Planning Agency, and the Bekasi City Water Resources Bina Marga Service; and (3) State Owned Enterprises namely PT. Indonesian Railroad (Persero). Secondary data needed include; (1) Data on road sections and road networks obtained from the Public Works and Spatial Planning Office of the City of Bekasi; (2) Land use data and administrative maps obtained from the Bekasi City Regional Planning and Development Agency; (3) Route network maps and public transport data are obtained from the Bekasi City Transportation Agency; (4) Other statistical data obtained from the Central Bureau of Statistics for the City of Bekasi; and (5) Data on the Number of Train Passengers (Bekasiun Station) from PT. Indonesian Railroad (Persero).

This study uses several analytical techniques, in the form of pedestrian analysis, walkability index analysis for pedestrian facilities, and Importance Performance Analysis (IPA), described as follows: (1) Pedestrian Analysis; (2) Walkability Index; and (3) Importance Performance Analysis (IPA). IPA analysis is carried out to be able to identify the level of importance (importance) of an assessment indicator attached to a particular object with the existing reality (performance) that is felt directly by the intended user of the thing, in this case, a pedestrian facility (Ramadhanti & Marlena, 2021). Some indicators using IPA require several stages, such as: (1) Sorting the questionnaire according to predetermined numbering; (2) Perform survey data entry; (3) Conducting screening for data cleaning; (4) Explaining the general description of the characteristics of the respondents; and (5) Performing IPA analysis. The results of the IPA analysis will show the average value of the level of interest and the level of satisfaction. Furthermore, it will be outlined in the Cartesian diagram which consists of four quadrants. Based on the Cartesian diagram, the assessment indicators/variables in each quadrant get an assessment based on the explanation in each quadrant that
has been described. Then proceed with the modal interaction matrix analysis.

C. Results and Discussion

The next process of determining categories and indicators is gap analysis which is used to be able to see the difference between the satisfaction of the object used to the interest in the expected object. This can identify the location or position of each indicator based on the points obtained which can then be concluded through a Cartesian diagram. Gap analysis produces gap values, both positive and negative. Indicators in the assessment quadrant with different priority levels. In general, the values marked negative are more than those marked positive and can indicate a difference between interest and satisfaction either significantly or not, but then this will be tested statistically.

Statistic test

Following up on the results of the gap analysis, it shows the difference in values of interest and satisfaction with an indication that there is a difference in value. Based on the respondent's assessment, a statistical test is needed to be able to see the level of significance in the values of both. Referring to the basis of this decision, it can be concluded that H0 is rejected and Ha is accepted because the significance value is 0.000 <0.005, which means that there are different values from the subject's perspective in assessing the level of interest and satisfaction in an object.

The assessment indicators are in the form of a Cartesian diagram with the allocation of indicators in the quadrants shown in Figure 1. Based on the cartesian diagram referred to, indicators can be identified based on the improvement priority scale as follows: (1) Quadrant I (with the main priority scale) with; (1) indicator 3, namely the availability of pedestrian paths that can be accessed by many people; (2) Indicator 4, namely the availability of pedestrian paths connected to the area around the station; (3) Indicator 6, namely the existence of shade in the form of canopies and the like to protect pedestrians; (4) indicator 7 namely the existence of disabled facilities such as guidance blocks, (5) indicator 10 namely the existence of crossing facilities with safety instruments for pedestrians; Indicator 11, namely the existence of pedestrian paths that are protected/not mixed with motorized vehicles; (6) Indicator 18 namely adequate air circulation and noise level. Quadrant I of gap analysis has a different value which indicates that the performance is not too bad. some of the infrastructure in the area has already been built in a few locations that need handling or improvement.

Quadrant II (an achievement that needs to be maintained), with (1) Indicator 12 namely lighting on pedestrian paths; (2) Indicator 13 namely Monitoring of pedestrian paths with CCTV; (3) Indicator 17 namely the existence of clean pedestrian paths (presence of trash bins and cleaning staff).

Quadrant III (with a low priority scale), with indicator 5 namely the availability of uninterrupted pedestrian paths; (1) Indicator 9, namely the availability of a continuous pedestrian path / no obstacles from/to Bekasi Station; (2) Indicator 14, namely the availability of disturbance reporting instruments on pedestrian paths (complaint telephone); (3) Indicator 15 namely There is an activity function along the pedestrian path; (4) Indicator 16, namely the existence of pedestrian furniture (benches, decorations, etc.). Quadrant IV (not a priority) with (1) indicator 1, namely the close distance from/to Bekasi Station; (2) Indicator 2, namely short travel time from/to Bekasi Station; (3) Indicator 8, namely there are instructions directing pedestrians from/to Bekasi Station

Scores in the walkability assessment were obtained through secondary and primary data, namely interview data with officials or authorized persons at institutions that have authority related to the object of this research. Data collection using the E-Form is then converted into numbers. Based on Table 2, a total score of 14.5 is obtained, which will then be combined or added up with the score on the walkability indicator assessment results.

The nine walkability assessment
indicators are calculated based on location as the segment is determined and then each is calculated from the literature The Global Walkability Index by Holly Virginia krambeck. It is explained that there are five segments which are the locations or objects of research, while the segments referred to are as follows: (1) Segment 1: Jl. Ir. H. Juanda from the Bekasi Station exit on the south side towards the Bekasi Mayor's Office; (2) Segment 2: Jl. The struggle from the Bekasi Station exit on the north side towards the Blue Bird Marga Mulya Taxi Pool; (3) Segment 3: Jl. Ir. H. Juanda from the intersection of the monument months to the Bekasi Junction Mall; (4) Segment 4: Jl. Veterans from the monument intersection in the direction of the Bekasi City BPJS Office; and (5). Segment

<table>
<thead>
<tr>
<th>Pair 1 Interests - Satisfaction</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35.807</td>
<td>17</td>
<td>.000</td>
<td>.88827</td>
<td>.99950</td>
<td>35.807</td>
<td>17</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 1 Statistical test results (t-test)

![Cartesian Diagram](image)

Figure 1 Cartesian Diagram IPA
5, on Jl. Scouts from the intersection of the monument months towards the Great Mosque of Al Barkah. Based on the results of the analysis that segment 2 that Jl. The struggle from the exit of Bekasi Station on the north side to the Blue Bird Marga Mulya Taxi Pool has a very low value while also identifying that in this segment there are issues that need to be exploited for improvement while the highest score is found in the segment on Jl. Scouts from the intersection of the monument months towards the Great Mosque of Al Barkah. Overall, these values will then be added up with scores on institutional surveys with the following results: (1). Segment 1, with a total score of 47.30, (2) Segment 2, with a total score of 46.50, (3) Segment 3, with a total score of 50.50, (4) Segment 4, with a total score of 53.20, (5) Segment 5, with a total score, 57.52.

Based on calculations in segments 1 to 5 related to institutional survey scores and indicators, various values are obtained and this needs to be aligned with the walkability score category which refers to Redfin Company (https://www.walkscore.com/) (Table 3).

It can be concluded that the values in segments 1 and 2 are in the score range 25-49 (few accessible facilities on foot), which means that it has the worst level of walkability compared to other segments, and which shows that this segment does not have adequate infrastructure for pedestrians, needs to be the primary concern and focus for improvement or improvement, especially in segment two which has the lowest score, while segments 3, 4 and 5 are in the range of 50-69, with some facilities can be reached on foot) which means that the segment is quite good.

Intermodal Relationship Analysis (Capital Interaction Matrix)

Based on table 4, there is a box with a value of -12 indicating that the mode and the facility have a very bad interaction. In the diagram, it is known that Platform Facilities have the worst interaction with other modal facilities. Then to calculate the magnitude of the value of interaction between modes and facilities as a whole is obtained by using the normalized score function formula. Based on the calculation of the normalized score, a value of -153 is obtained which indicates that the level of interaction between modes and facilities at Bekasi Station is in a bad category.

Assessment of Pedestrian Characteristics

The assessment was carried out at five predetermined points in the Bekasi Station area, namely:

1. Segment 1

Ir. H. Juanda, from the door, go out of Bekasi side station south to the direction of the Bekasi Mayor's Office. Have an average flow of 20.02 pedestrians /m/ min; No pedestrians can get ahead because room motion is limited and annoying other pedestrians; infrastructure is not adequate going to the door to enter the station side south because pedestrians become the place sell, and on the side crossing no there is facility worthy for pedestrian. In Segment 1 there are several barriers and inadequate infrastructure in reaching the south side of

<table>
<thead>
<tr>
<th>Questions</th>
<th>Point scoring</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Scale 1-5, in this case, the number 1 is considered absent</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>One point for each answer on the checklist</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>The percentage results are divided by 10</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Answer &quot;yes&quot; = 5 and answer &quot;no&quot; = 1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3 for the answer &quot;Always&quot;; 2 for the answer &quot;Sometimes&quot;; and 1 for the answer &quot;rarely&quot;; then the result is divided by 2</td>
<td>3.5</td>
</tr>
<tr>
<td>5</td>
<td>Total</td>
<td>14.5</td>
</tr>
</tbody>
</table>
the station entrance such as pedestrians which are places to sell and on the side of the level crossing there are no adequate facilities for pedestrians.

2. Segment 2

Struggle the door to go out of Bekasi side station north toward Blue Bird Marga Taxi Pool Mulya. Have an average flow of 64.75 pedestrians /m/ min. An average speed of 1.15 m / sec, and Pedestrians cannot get ahead because of limited room motion, leg speed must be restricted, happened conflicts between pedestrians, many infrastructures are damaged, and dangerous safety, the conflict between pedestrians, sidewalks used for trading and taxi stand. In Segment 2, the infrastructure is very inadequate, especially when there is damage that can endanger the safety of pedestrians and has major conflicts between pedestrians and vehicles as well as many side barriers. Apart from that, the sidewalks are also used for trading and motorcycle taxis.

<table>
<thead>
<tr>
<th>Walkability Score</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 - 100</td>
<td>Doing activities does not require a motorized vehicle</td>
</tr>
<tr>
<td>70 - 89</td>
<td>Most activities can be done on foot</td>
</tr>
<tr>
<td>50 - 69</td>
<td>Several facilities can be reached on walking</td>
</tr>
<tr>
<td>25 - 49</td>
<td>Few facilities can be reached on walking</td>
</tr>
<tr>
<td>0 - 24</td>
<td>Almost all activities require a motorized vehicle</td>
</tr>
</tbody>
</table>

Table 3 Measure Walkability Score

Figure 2  Matrix of Mode Relations and Facilities at Bekasi Station
3. Segment 3

Ir. H. Juanda from the intersection monument months to the direction of Mall Bekasi Junction. Have an average flow of 0.67 pedestrians /m/ min. Pedestrians do not can precede, space motion is limited, foot speed should be constrained, and potential conflicts between Pedestrians exist, there is adequate infrastructure for pedestrians, but at the end road, there is a little obstacle that is there is a police post built above the sidewalk. Segment 3 already has adequate infrastructure for pedestrians, but at the end of the road, there is a slight obstacle, namely a police post built on the sidewalk.

4. Segment 4

Veterans of intersection monument months to directions to the Bekasi City BPJS Office. Have an average flow of 2.08 pedestrians /m/ min, Pedestrians can walk fast and precede, there is no conflict, infrastructure is adequate, some pedestrians change function becomes a ramp to enter a shop, and there are several pillars and signs way in the middle sidewalk. In Segment 4, the infrastructure is adequate and some of the pedestrians have changed their function to become a rapport to enter a shop there are several poles and road signs installed in the middle of the sidewalk.

5. Segment 5

Scout from the intersection monument months to the direction of the Great Mosque of Al Barakah. Have an average flow of 1.33 pedestrians /m/ min; Pedestrians are free to move and walk fast and ahead; there is no conflict. Infrastructure is adequate; however, the sidewalk is used for parking and selling. In Segment 5 the infrastructure is quite adequate, it's just that there are still those who park on the sidewalk and use the sidewalk to set up tents to sell.

D. Conclusion

In segments 1 and 2 based on the analysis, there is inadequate and inadequate infrastructure for pedestrians, and segments 3, 4, and 5 already have adequate infrastructure for pedestrians. The results of the importance-performance analysis show that there are indicators that require priority handling, because these indicators are considered very important by pedestrians but, in reality, they are not as expected or unsatisfactory.

The results of the walkability analysis show that the values in segments 1 and 2 are in the range of scores 25-49, namely few facilities that can be reached on foot, which means that they have the worst level of walkability compared to other segments, segments 3, 4 and 5 is in the range of 50-69, ie some facilities can be reached on foot) which means that the segment is quite good. As the results obtained from the analysis of pedestrians, IPA, and walkability index assessments, it was found that special attention was paid to the north side of the station which had low ratings.

E. References


Ricardianto, P., Martagani, M., Teweng, N. M., Maemunah, S., & Kurniawan, J. S.


