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Application of the Walkability Concept to the Yos Sodarso Road Corridor - Mardika Beach Road, Ambon City

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Abstrak: Kawasan pusat Kota Ambon merupakan salah satu kawasan dengan intensitas pejalan kaki yang cukup tinggi. Salah satu koridor jalan yang memiliki aktivitas yang tinggi adalah koridor Jalan Yos Sudarso – Jalan Pantai Mardika. Koridor ini didominasi aktivitas kepelabuhanan serta perdagangan dan jasa. Tingginya aktivitas yang ada belum sepenuhnya diimbangi dengan penyediaan fasilitas pejalan kaki yang memadai. Penelitian ini bertujuan untuk melakukan kajian Penerapan Konsep Walkability Pada Pada Koridor Jalan Yos Sudarso – Jalan Pantai Mardika Kota Ambon, sehingga peningkatan mobilitas masyarakat terkait aktivitas berjalan kaki dapat terakomodasi dengan baik. Metode penelitian yang digunakan dalam studi ini adalah metode kuantitatif. Penelitian ini dimulai dengan mengidentifikasi kondisi jalur pejalan kaki berdasarkan variabel Walkability, kemudian memberikan skor menggunakan skala likert dengan panduan penilaian mengacu pada Walkability Surveys In Asian Cities. Luaran penelitian ini adalah menemukan bahwa nilai indeks walkability pada koridor ini sebesar 55, yang berarti kegiatan pada koridor ini beberapa dapat dicapai dengan berjalan kaki dan dapat juga diartikan bahwa koridor tersebut memiliki potensi walkable.

Abstract: The Ambon City Center area is one of the areas with a fairly high pedestrian intensity. One of the road corridors that has high activity is the Jalan Yos Sudarso - Jalan Pantai Mardika corridor. This corridor is dominated by port activities as well as trade and services. The high level of activity has not been fully balanced with the provision of adequate pedestrian facilities. This study aims to conduct a study on the Application of the Walkability Concept on the Yos Sudarso Street - Mardika Beach Road Corridor in Ambon City, so that increasing community mobility related to walking activities can be properly accommodated. The research method used in this study is quantitative method. This study began by identifying the condition of the pedestrian path based on the Walkability variable, then gave a score using the Likert scale with an assessment guide referring to the Walkability Surveys In Asian Cities. The output of this study is to find that the walkability index value in this corridor is 55, which means that some activities in this corridor can be reached on foot and can also be interpreted that the corridor has walkable potential.

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INTRODUCTION

Walking is one of the most important forms of mobility because every journey begins and ends with walking. In developing countries, walking is the main mode of transportation that allows most urban residents to travel (Shumi, Zuidgeest, Martinez, Efroymson, & van Maarseveen, 2015). Walkability is defined as the extent to which the built environment supports and facilitates walking mobility through providing safety, high levels of accessibility and connectivity to destinations, and visual interest within a reasonable time span (Jamei et al., 2021 , Forsyth, 2015). Walkability is an important part in creating a sustainable city that is connected and gets more benefits in terms of economic, social, environmental and health (Jahanmohan, 2016). Simply put, walkability can be an area that facilitates walking activities (Spoon, 2005).

Walking activities are motivated by various things such as walking for leisure; enjoy nature; explore the surrounding environment; walking for health; walking to think; or walking to access main destinations (Erturan & van der Spek, 2022). Walkability has several important roles in city life, including: 1) as the basis for a sustainable city; 2) as a driver of social activity; 3) as a driver for improving mental and physical health (Sondakh, 2017). The term 'walkability' refers to the quality of walking conditions in urban spaces which include comfort, safety, connectedness and permeability (inclusivity of environmental design) (Tiwari, 2015, Litman, 2022). Regarding the implementation of the walkability concept, pedestrian paths and complementary road facilities become supporting facilities for walking (Fahlen, 2022).

Ambon City is one of the cities that has activities in Malaku Province. The Ambon City Center area is an area with quite high pedestrian intensity. One of the road corridors that has high activity is the Jalan Yos Sudarso - Jalan Pantai Mardika corridor, because this corridor is dominated by port activities as well as trade and services. The high level of activity has not been fully balanced by the provision of adequate pedestrian facilities. This can be seen in several activity centers, such as in the Mardika Traditional Market Area, where currently 150 stalls are built on the sidewalk so that pedestrians cannot use the pedestrian path according to its purpose (Ambon City News, 2022).

Pedestrian safety in the central area of Ambon City also currently needs serious attention, this is because there are several cases of traffic accidents involving pedestrians (Matinahoruw, 2023). Then further, (Sangadji, 2022) stated that the surface and texture (shape) of ceramics used on pedestrian paths are categorized as uncomfortable because the surface and texture of the ceramics used are slippery. The complex activities in the Jalan Yos Sudarso - Jalan Pantai Mardika corridor certainly cause quite high pedestrian intensity, so providing good pedestrian paths needs to be done to prevent negative impacts on pedestrians.

Based on the description of the importance of the concept of walkability and problems in the Jalan Yos Sudarso - Jalan Pantai Mardika corridor, this research aims to conduct a study of the application of the concept of walkability in the Jalan Yos Sudarso - Jalan Pantai Mardika corridor, Ambon City, so that increased community mobility related to walking activities can be accommodated. well.

METHODS

The research method used in this study is a quantitative method. Quantitative methods can be

interpreted as research methods that are based on the philosophy of positivism, used to research certain populations or samples, collecting data using research instruments, data analysis is quantitative/statistical (Sugiyono, 2017) . This research began by identifying the condition of pedestrian paths based on the *Walkability variable,* then providing a score using a Likert scale with a field survey assessment guide referring to *the Walkability Surveys In Asian Cities* (Fabian & Punte, nd) . The walkability indicators used in this research refer to the *Global Walkability Index* developed by MIT and *the World Bank* for the provision of pedestrian paths (Krambeck & Shah, 2006) . The calculation of the walkability index value in this research uses the formula:

$$WI = \frac{\sum(X \cdot N \cdot 10 \cdot Y) \times 0{,}1}{K}$$

Information: WI = Walkability Index, X = Assessment variable, N = Segment length, Y = Number of pedestrians per segment, and K = Total segments.

Several classifications in determining the *Global Walkability Index assessment scale* are explained in the following table:

Table 1. *Walkability Score*

***Walkability* Score**	**Information**
90 – 100	This activity does not require a vehicle
70 – 89	Activities are carried out on foot
50 – 69	Some facilities can be reached on foot
25 – 49	Facilities are limited to reach on foot
0 – 24	Activities require a vehicle

Source: (Krambeck & Shah, 2006, Erlangga, Handayani, & Syafi'I, 2021) .

RESULTS AND DISCUSSION

Pedestrian Path Conditions

Jalan Yos Sudarso Corridor - Jalan Pantai Mardika, Ambon City has a road length of 0.9 km with two-way circulation. Pedestrian paths in this corridor are not yet well provided, this can be seen from the availability of pedestrian paths, the majority of which are on Jalan Yos Sudarso, while on Jalan Pantai Mardika Kota the availability of pedestrian paths is still very minimal. To make the discussion easier and more detailed, it is divided into 2 (two) segments with a corridor map which can be seen in Figure 1.

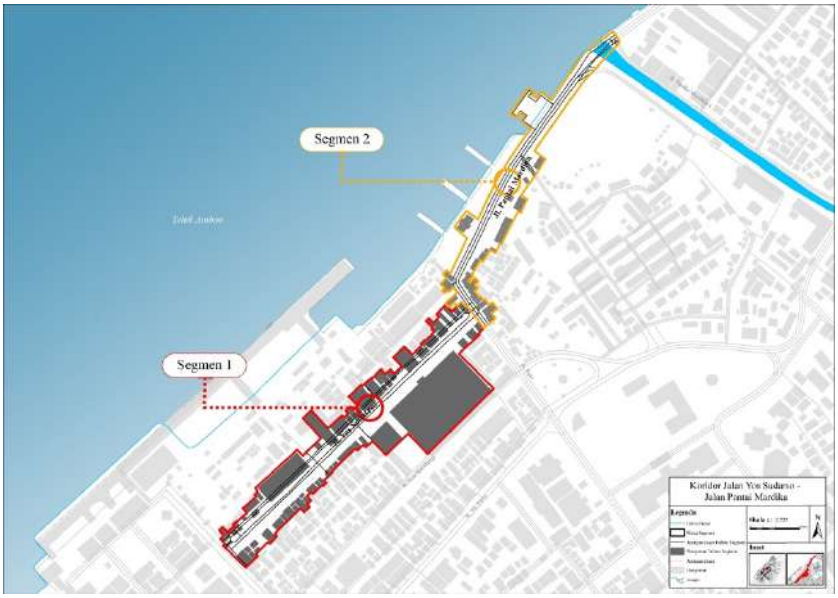

Figure 1. Corridor Map of Jalan Yos Sudarso – Jalan Pantai Mardika, Ambon City

Source: Field Survey Results, 2023

Condition and Availability of Pedestrian Paths

Segment I (Yos Sudarso Harbor – Ambon Plaza)

Segment I has a road length of 0.5 km with the availability of pedestrian paths on the right side of the segment for ± 413 m ether or 82.60% and the left side of the segment for ± 414 m ether or 82.80% of the road corridor served by pedestrian paths with The average width of pedestrian paths is ± 2 meters . Some of the problems found in segment I were pedestrian paths that were damaged because they were used as parking locations for loading and unloading trucks and as parking areas for two-wheeled vehicles.

a) Loading and Unloading Truck Parking b) Two-Wheeled Vehicle Parking

Figure 2. Misuse of the function of the sidewalk as a parking space

Source: Field Survey, 2023

Segment I I (Back of the City – Losari Beach – Mardika Beach)

Segment II has a road length of 0.4 km with the availability of pedestrian paths on the right side of the segment for ± 102 meters or 25.50% and the left side of the segment for ± 321 meters or 80.25% of the road corridor served by pedestrian paths with an average of - The average width of the pedestrian path is ± 2 meters. However, the pedestrian path is covered by traders' stalls for 400 meters.

a) Pedestrian Paths in Damaged Condition b) Pedestrian Paths in Good Condition

c) Pedestrian Paths Used as Traders' Stalls

Figure 3. Condition of pedestrian paths in segment II

Source: Field Survey, 2023

Availability of Crossing Routes

Segment I (Yos Sudarso Harbor – Ambon Plaza)

In segment I there are 2 (two) transportation routes, namely in front of the Yos Sudarso port gate and in front of the Ambon Plaza shopping center. The condition of the crossing lane is quite good, this can be seen from the crossing lines which are still there, but some of the lines have faded.

Figure 4. Condition of Crossing Lane in Segment I

Source: Field Survey, 2023

Segment II (Behind the City – Losari Beach – Mardika Beach)

In segment II there is no crossing lane, so pedestrians in this segment cross randomly.

Availability of Facilities

Segment I (Yos Sudarso Harbor – Ambon Plaza)

In segment I there is a disabled path along the south side pedestrian path. The condition of the disabled path is quite good, but it is cut off at several points, making it difficult for pedestrians with special needs.

Figure 5. Condition of the Disabled Route in Segment I

Source: Field Survey, 2023

Segment II (Behind the City – Losari Beach – Mardika Beach)

In segment II in this corridor there are no facilities on the pedestrian path which causes discomfort for pedestrians.

Figure 6. Pedestrian path conditions with minimal facilities in Segment II

Source: Field Survey, 2023

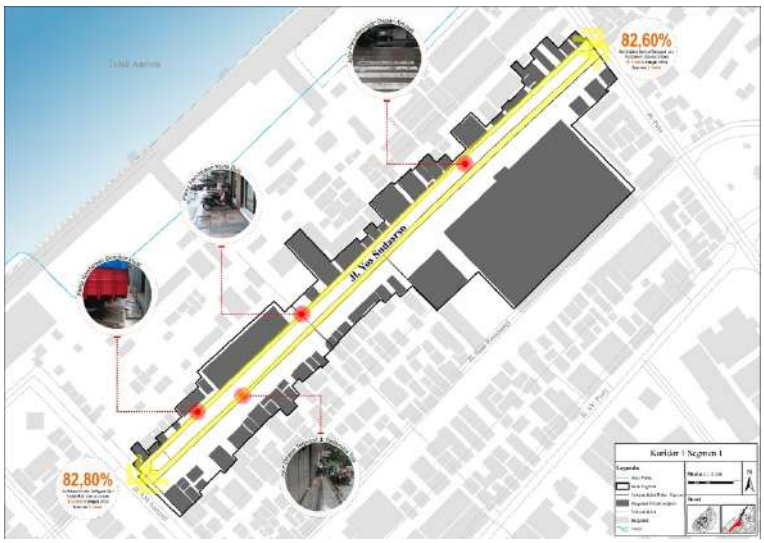

Figure 7. Map of Segment I Pedestrian Path Conditions
Source: Author's Review, 2023

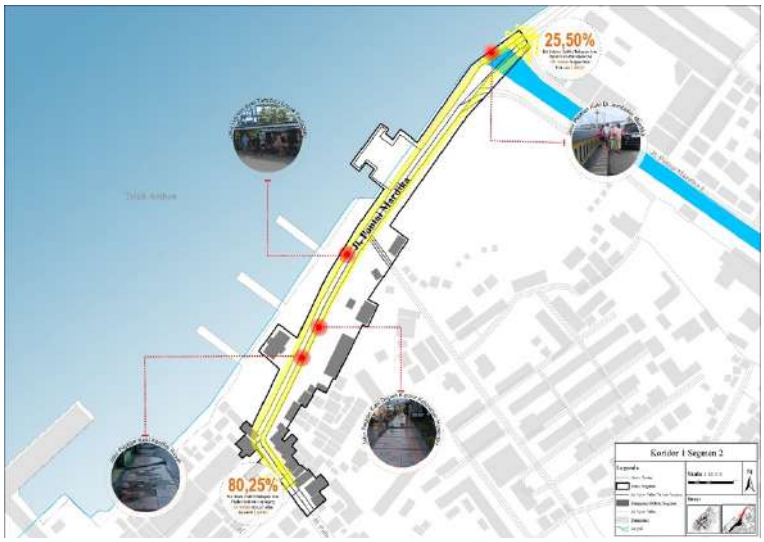

Figure 8. Map of Condition of Pedestrian Path Segment II
Source: Author Review , 2023

Walkability Index Analysis

The walkability index analysis includes, 1) analysis of pedestrian security and safety, and 2) analysis of comfort and attractiveness. The discussion is divided into road segments which will then be summarized in a scoring and weighting table, then the corridor index for Jalan Yos Sudarso - Jalan Pantai Mardika Ambon City is calculated.

Segment I (Yos Sudarso Harbor – Ambon Plaza)

Segment I is a road network with dominating trade and service activities, especially those related to loading and unloading activities. Based on field surveys, the majority of loading and unloading activities and street vendor (PKL) stalls are on the sidewalk so pedestrians feel uncomfortable and choose to walk on the side of the road. The average crossing time required by pedestrians in this segment is 5 - 10 seconds with an average driver speed of 10 - 30 km/hour. Based on field observations, 5 out of 7 drivers always yielded and gave pedestrians space to cross. For the security aspect, this segment is less safe when passing through at night due to the lack of street lights, the only lighting comes from shophouses along the pedestrian path. The number of pedestrians in segment I based on field surveys was 496 people/hour. The calculation of the number

of pedestrians was carried out during peak hours, namely 12.13 - 13.13 WIT. The observation point for this segment is at Ambon Plazza. The selection of observation locations is based on pedestrian intensity in the majority of segments located on Ambon Plazza.

Table 2. Segment II *Wakability Index Analysis*

Sub Variable	Indicator	Analysis	Documentation	Score
Pedestrian Safety and Security				
Conflict	• Road lane mode conflict Service Level from 1 to 5 • Pedestrians who do not feel safe from traffic accidents	In 5 minute intervals, pedestrians found a conflict between street vendors' stalls and loading and unloading trucks.		2
Availability of Pedestrian Paths	• Need • Availability • Condition of pedestrian paths	Pedestrian paths are available, but the majority are used as vehicle parking and loading and unloading activities, thus causing inconvenience for pedestrians.		2
Crossing Route	• Availability and distance of crossing routes	• There are 2 crossing routes in the form of zebra crossings, with a crossing distance of between 100 – 300 meters.		3
Crossing Security	• Time to wait and cross the street	• Waiting time is 5-10 seconds and crossing time is 5 seconds		3
Security from Crime	• General security against crime on the streets	• The activities of this segment are dominated by trade and port activities, so the activities are quite busy which makes pedestrians feel less safe.		3
Rider Behavior	• Yield to pedestrians • Safe driving speed in dense pedestrian areas	• 5 out of 7 drivers always give in and give pedestrians space to cross. • Average driving speed is 20 – 30 km/hour		3
Comfort and Attraction				
Vegetation	Average number of trees per km of road	• The number of trees is 40 trees with an		4

Sub Variable	Indicator	Analysis	Documentation	Score
		average of 12 trees per km		
Cleanliness	• Cleanliness of walkways • Pedestrians feel disturbed by the lack of cleanliness of pedestrian paths • The presence of open ditches along the path	• The pedestrian path in this segment is not clean with lots of plastic waste found scattered around • An open ditch is found on the pedestrian path on the north side of the corridor		1
Quality and Maintenance. Walking Path Surface	• Quality and maintenance of trail surface materials • Pedestrians feel uncomfortable with the poor quality and maintenance of the pedestrian path surface • Proportion of roads without sidewalks	• The surface of the pedestrian path uses ceramic with a smooth texture (south side) and a rough texture (north side) • The proportion of roads without sidewalks is around 20%		2
Disability Infrastructure	The existence and quality of facilities for the blind and disabled	There are disabled only lanes but the majority cannot be used due to obstructions by vendor stalls and parked vehicles.		2
Scope	The proportion of covered walkways (e.g. arcades) to the weight of the climate	85% of the pedestrian walkway is covered by shopping arcades		4
Obstacle	Permanent and temporary obstacles on pedestrian paths	• The width of the pedestrian path is quite comfortable (> 1 meter) but other obstacles come from merchant stalls and vehicle parking		2

Sub Variable	Indicator	Analysis	Documentation	Score
Pedestrian Congestion	Fairly safe and comfortable opportunities are available to cross the road	There is no pedestrian congestion (LOA)		5
Pedestrian Facilities	• Facilities (e.g. benches, etc.) • Pedestrian path discovery signs	There are no supporting facilities in the form of benches or signs for pedestrians		1
Total Score				**37**

Source: Analysis Results, 2023

Segment II (Ambon Plaza – Jalan Pantai Mardika)

Segment II has similar activities to segment I, namely trading and service activities that dominate and activities related to ports. Based on field surveys, street vendor (PKL) activities are on the sidewalk so that pedestrians walk on the side of the road. The average crossing time required by pedestrians in this segment is 5 - 15 seconds with an average driver speed of 20 - 30 km/hour. Based on field observations, 6 out of 10 drivers always yield and give pedestrians space to cross. For the security aspect, this segment is quite safe when passing through at night because of the lighting from trader stalls and street lights. The number of pedestrians in segment II based on field surveys is 535 people/hour. The calculation of the number of pedestrians is carried out during peak hours, namely 13.13 - 14.13 WIT. The observation point in this segment is in a row of street vendor stalls.

Table 3. Segment II Wakability Index Analysis

Sub Variable	Indicator	Analysis	Documentation	Score
Pedestrian Safety and Security				
Conflict	• Road lane mode conflict Service Level from 1 to 5 • Pedestrians who do not feel safe from traffic accidents	• In 5 minute intervals, pedestrians found conflicting vendor stalls covering almost 90% of the pedestrian paths in the Losari beach area. • Pedestrians feel unsafe when walking on this segment because of the potential for accidents with other road users.		1
Availability of Pedestrian Paths	• Need • Availability • Condition of pedestrian paths	Pedestrian paths are available, but the majority are used as street vendor stalls.		1

Sub Variable	Indicator	Analysis	Documentation	Score
Crossing Route	Availability and distance of crossings.	There are no crossing paths or traffic lights, pedestrians cross randomly.		1
Crossing Security	• Time to wait and cross the street	• The average crossing time is 5 – 15 seconds because this segment is the exit and entry route to the trade center and passenger terminal		1
Security from Crime	• General security against crime on the streets	• This segment is dominated by market activity, making it possible for pedestrian crime (pickpocketing) to occur		2
Rider Behavior	• Yield to pedestrians • Safe driving speed in dense pedestrian areas	• 6 out of 10 drivers in this segment choose to yield to pedestrians • The average driving speed in this segment is around 20-30 km/hour		3
Comfort and Attraction				
Vegetation	Average number of trees per km of road	There is no vegetation along this segment		1
Cleanliness	• Cleanliness of walkways • Pedestrians feel disturbed by the lack of cleanliness of pedestrian paths • The presence of open ditches along the path	• The pedestrian path in this segment is quite clean and there are no open gutters		4
Quality and Maintenance. Walking Path Surface	• Quality and maintenance of trail surface materials • Pedestrians feel uncomfortable with the poor quality and	• The surface of the pedestrian path uses smooth textured ceramics (left corridor) and rough textured ones (right corridor) and several points use paving blocks		1

Sub Variable	Indicator	Analysis	Documentation	Score
	maintenance of the pedestrian path surface • Proportion of roads without sidewalks	• Damage to pedestrian paths made of paving blocks • The proportion of roads without sidewalks is around 20%		
Disability Infrastructure	The existence and quality of facilities for the blind and disabled	There is a disabled lane on the pedestrian path to the north of the corridor, but it is closed by traders' stalls.		1
Scope	The proportion of covered walkways (e.g. arcades) to the weight of the climate	100% Pedestrian paths are not covered by shopping arcades		1
Barrier	Permanent and temporary obstacles on pedestrian paths	• The width of the pedestrian path is quite comfortable (> 1 meter) but the majority cannot be used because it is covered by traders' stalls		1
Pedestrian Congestion	Fairly safe and comfortable opportunities are available to cross the road	There was no significant pedestrian congestion		5
Pedestrian Facilities	• Facilities (e.g. benches, etc.) • Pedestrian path discovery signs	There are no other supporting facilities		1
Total Score				**24**

Source: Analysis Results, 2023

Based on the walkability index variable analysis table in this corridor, Segment I and Segment II above, an analysis of the walkability index calculation was then carried out with the results of the index calculation, that the walkability index value in this corridor was 55.18 or 55 (rounded). If you look at table 1 of the walkability scores, this corridor is in the range of 50 – 69, which means that some activities in this corridor can be reached on foot. Furthermore (Fabian & Punte, nd) stated that if the score is between 50 -69 then it can also be interpreted that "waiting to walk" or the corridor has walkable potential.

Directions for Applying the Concept

Application of the walkability concept which will refer to the index value and value or problem of each variable. The direction of

this walkability corridor concept can be seen in Figure 9:

Figure 9. Directions for Implementing the Walkability Concept for the Jalan Yos Sudarso Corridor - Jalan Pantai Mardika, Ambon City

Source: Analysis Results, 2023

CONCLUSION

N *walkability* index value The score obtained in the Jalan Yos Sudarso - Jalan Pantai Mardika Ambon City corridor is 55, which means that some of the activities in this corridor can be reached on foot and it can also be interpreted that the corridor has *walkable potential* . Based on this index value, the application of the *walkability* concept in this corridor can be done through 1) Arranging and controlling street vendors who carry out activities on pedestrian paths, 2) Controlling schedules for loading and unloading activities which are carried out during off-peak hours so that they do not disturb pedestrian comfort. . 3) Planning pedestrian routes, especially on sections of routes that do not yet exist. 4) Addition of crossing lanes at every road intersection as well as pedestrian support facilities. 5)

Arrangement of pedestrian paths with a concept that can provide safety and comfort for pedestrians .

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