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Arrangement of the Aceh Market Center Area on Diponegoro Street Based on the Walkable City Concept

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Abstract

The CBD (central business district) serves as the urban core and is characterised by a high population density. The density in the Central Business District encompasses political, economic, socio-cultural, and technological activity, which also propels the density of structures in metropolitan locales. The Aceh Market area is the largest traditional retail centre, establishing this location as a crucial centre for economic activities within the community. Transportation routes are invariably accompanied by pedestrian pathways to facilitate access to travel destinations for economic, social, recreational, and entertainment objectives. Jalan Diponegoro, situated in the Aceh Market vicinity, is a prominent hub of urban activity in Banda Aceh City. The pedestrian count on Jalan Diponegoro can reach 10,926 individuals simultaneously. The research problem is the assessment of the walkability level in the central area of Banda Aceh City and the suitability of the walkable city concept for this region. The employed research methodology is a mixed-methods approach. Data acquisition was conducted via observation, literature review, and surveys. The analytical procedure employed the walkable city formula and was executed using Microsoft Excel software. The research findings on nine walkable city parameters indicate a walkable city score of 56.78 for Jalan Diponegoro, signifying adequacy. The research findings about the configuration of the walkable city concept encompass the modification of the public telephone indicator to a Wi-Fi facility, along with the introduction of a new indicator, specifically a drop-off point for passenger pick-up and drop-off.

Keywords: Walkable City, Pedestrian, Diponegoro Street, Banda Aceh City Center

1. Introduction

CBD (central business district) is the city center as well as a very densely populated area of a city. The density in the CBD includes political, economic, socio-cultural, and technological activities, which also drives the density of buildings in urban areas (Suria, 2016) [6]. The growth of various activities also triggers a high increase in motor vehicle growth, which can pose an immediate threat to health and the environment (Nasution, 2020) [4].

Banda Aceh City is the capital of Aceh Province. According to the RTRW of Banda Aceh City 2009-2029, Banda Aceh City has two city centers, namely the Peunayong Area and the Aceh Market Area. In terms of land use, the Aceh Market Area is located in the trade and service area, cultural heritage site, and a government center. This makes the Pasar Aceh area very dense with all urban activities. The Aceh Market area is the largest traditional shopping center, making this region a significant hub for economic activity for the community (Maulida, 2023) [3].

Transportation as a means of accessibility to help the community move from place to place and carry out daily activities. The transportation used by the community to reach the Aceh Market area includes motorcycles, cars, and public transportation, both offline and online. The presence of transportation routes is always accompanied by pedestrian paths as a connecting medium to travel destinations such as economic, social, recreational, and entertainment purposes (Ikhsan, 2017) [2]. According to Gideon (1977) [1], walking plays an important role in connecting various daily activities, thereby contributing to the formation of a more humane city character.

Jalan Diponegoro is one of the road corridors located in the Pasar Aceh area, with a length of approximately 600 meters. This road has very high activity because it is located in an area of trade, services, public facilities, offices, and more. The number of pedestrians on Jalan Diponegoro can even reach 10,926 people at one time. However, the pedestrian path on Jalan Diponegoro

has various problems such as vendors selling on the sidewalk, parked vehicles, slippery materials on the pedestrian path, and some parts being damaged, which sometimes forces pedestrians to walk on the motor vehicle lane. The presence of street vendors on the road can endanger the vendors themselves, in addition to causing harm to the public. According to Prokopim Kota Banda Aceh, the presence of street vendors on the sidewalks can disrupt pedestrian access, traffic flow, and entry and exit access to shops. Another issue with pedestrian paths is the lack of maintenance of supporting facilities such as streetlights, ramps, trash bins, bus stops, and signs, which make the pedestrian paths unappealing.

Therefore, further studies are needed regarding the arrangement of the Aceh Market Center area on Diponegoro Street based on the Walkable City concept to create a healthy and pedestrian-friendly urban environment. The US Department of Health and Human Services (2010) [7] states that there are nine indicators used to measure pedestrian quality, namely pedestrian facilities, pedestrian conflicts, crossings, maintenance, sidewalk width, buffers, accessibility, aesthetics, and shade. These nine indicators can also serve as a reference for the walkable city concept in the planning of the Aceh Market area on Jalan Diponegoro to improve the quality of pedestrian pathways.

2. Research Method

In the research "Arrangement of the Aceh Market Center Area on Diponegoro Street Based on the Walkable City Concept," it is a mixed-method study, both quantitative and qualitative. Based on the RTRW Banda Aceh, the research location is situated in the city center of Banda Aceh with land use designated as a cultural heritage area and a trade area for goods and services with a very high level of activity. Primary surveys and secondary surveys are data collection methodologies used in the arrangement of the walkable city concept in the central area of Banda Aceh. Purposive sampling is the method used to understand the walkability in the central area of Banda Aceh City. Purposive sampling is the process of selecting samples that align with the research objectives and specific criteria determined by the researcher. Sugiyono (2010) [5] defines this technique as the process of sampling that involves determining the number of samples to be taken and subsequently selecting samples based on specific objectives, with the condition that they do not deviate from the predetermined sample characteristics. The data analysis methods in this study consist of pedestrian path performance analysis, pedestrian facility analysis based on the walkable city concept, walkable city level analysis, and walkable city concept arrangement analysis.

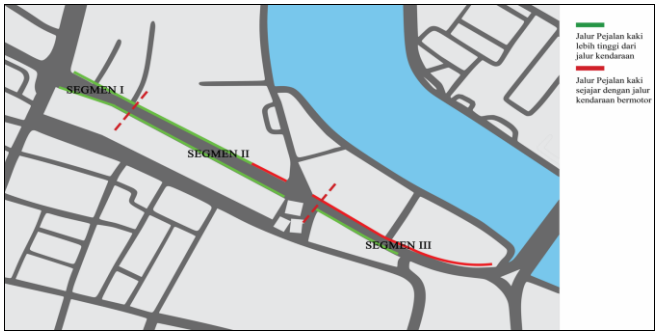
3. Results and Discussions

3.1 Analysis of Pedestrian Path Facilities Based on Indicators *Walkable City*

The analysis of pedestrian path facilities is conducted to determine the presence of walkable city indicators in the existing conditions of Jalan Diponegoro. There are 9 indicators that will be analyzed, including pedestrian facilities, pedestrian conflicts, crossings, maintenance, pedestrian path size, buffers, accessibility, aesthetics, and shade.

a. Pedestrian facility

The pedestrian facilities referred to are the presence of pedestrian paths and the condition of the pedestrian paths being higher than the vehicle lanes. In the existing condition, the pedestrian path on the left section runs along the road with a length of approximately 600 meters. Meanwhile, on the right section, the pedestrian path has a length of approximately 405 meters.



Picture 1: Pedestrian Path

In Segment I, the condition of the pedestrian path between the left and right sections is already higher than the motor vehicle lane by 0.25 m. In Segment II, on the left side of the road, there is a pedestrian path that is parallel to the motor vehicle lane as shown in Figure 4.14. The height difference on this pedestrian path ranges from 0 to 0.65 m for the left section. Meanwhile, on the right side of Segment II, the pedestrian path already has a height difference of 0.25 m. In Segment III, the left side of the road already has a pedestrian path, but the condition of the pedestrian path is still the same as the motor vehicle lane. On the right side, the pedestrian path has a height difference from the motor vehicle lane of 0.25 m.

b. Pedestrian Conflict

This pedestrian conflict is an obstacle found on the pedestrian path. These obstacles sometimes force pedestrians to step down or walk on the motor vehicle lane. On the pedestrian path on Jalan Diponegoro, there are so many obstacles such as vehicles parked on the sidewalk, merchandise, signboards, traffic signs, flower pots, and street vendors. The picture shows the position of obstacles on the pedestrian path on Jalan Diponegoro.

Picture 2: Obstacles on Pedestrian Paths

Obstacles in segment I consist of only one point, which is a street vendor. In segment II, there are more and more diverse obstacles such as merchandise, street vendors, flower pots, signboards, and vehicle parking on the sidewalk. Segment III also has obstacles in the form of street vendors and illegal parking.

c. Cross

The type of pedestrian crossing on Jalan Diponegoro is a zebra crossing, which is a flat pedestrian crossing. The presence of pedestrian crossings here consists of only three points. Two points are located in segment II and one point is in segment III. Meanwhile, there are no pedestrian crossings in segment I.

Picture 3: Position of the Pedestrian Crossing on Jalan Diponegoro

d. Maintenance

The maintenance referred to is the maintenance of pedestrian support facilities. There are seven maintenance facilities: the condition of pedestrian materials, lighting, trash bins, shelters, benches, signs, and public phones. On the pedestrian path on Jalan Diponegoro, some facilities are not available, such as benches and public phones. The other facilities are also no longer maintained, and only the shelters are still in good condition. Figure 4.18 shows the presence of pedestrian path supporting facilities in each segment, and Table 4.13 shows the condition of each supporting facility.

Picture 4: Pedestrian Path Facilities

The materials used for the pedestrian path are ceramics and paving blocks, but the condition of the materials is poor. Some of the ceramics are cracked and damaged, and the inappropriate choice of ceramics can be dangerous as they become slippery when wet. Meanwhile, the paving block pedestrian materials are also cracked and even broken. The type of street lighting on the left side of the road is street lamps spaced 40 meters apart and located in each segment. Meanwhile, the special pedestrian lighting is only on the right side of the road in segment II, spaced 10 meters apart, but some of them are no longer functioning. The presence of trash bins is only on the left side of the road along segments I to III, and the type of trash bins does not have waste separation. As for bus stops, they are only located in segments II and III, with a distance of 300 meters, and are still in good condition.

e. Size of Pedestrian Path

The size of the pedestrian path refers to the width of the pedestrian path. The width of the pedestrian path on Jalan Diponegoro varies. In Segment I, the width of the pedestrian path on the left and right sides is the same, which is 1.81 meters. In Segment II, the left side is the same as Segment I, while the right side has a width of 2.9 meters. In Segment III, the left side is still the same as Segment I, but the right side has a width of 1.66 meters.

f. Buffer

The buffer referred to here is in the form of a separator, either a green lane or a safety fence. In the existing condition, the buffer on the pedestrian path on Jalan Diponegoro consists of a separator such as a parking area that separates it from the motor vehicle lane, as well as the presence of a safety fence at the Trans Koetaradja bus stop.

Picture 5: Railings at Bus Stops as Safety Barriers and Parking Lanes as Separator Lanes

g. Accessibility

The accessibility referred to here is the presence of ramps and pathways for the disabled to provide convenience for disabled individuals on pedestrian paths. In the existing condition on the pedestrian path on Jalan Diponegoro, there are already ramps, but they are damaged and do not meet the applicable standards, and there are also no guide blocks to assist disabled individuals.

Picture 6: Condition of Ramp

h. Esthetic

The aesthetics referred to are the attractions that allow pedestrians to enjoy the beauty through the presence of historical buildings and the existing panorama. In the existing condition, the buildings along this street are no longer well-maintained, with peeling paint, disorganized banners, and some shop windows that are already broken.

Picture 7: The Atmosphere of the Pedestrian Path on Jalan Diponegoro

i. Shader

The shade referred to here is the presence of vegetation that can provide shade along pedestrian paths. The presence of shade trees can be seen in image 4.16. In segment I, there are no shade trees. In segment II, there are shade trees spaced every 5 meters, but they are only on the right side of the road. In segment III, there are already a few shade trees.

Picture 8: The Position of Shade Trees on Diponegoro Street

Picture 9: Shady Trees

3.2 Level analysis of Walkable City

Based on the analysis of the walkable city level against 9 walkable city indicators conducted on Jalan Diponegoro, a score of 56.78 was obtained. Referring to the US Department of Health and Human Services (2010) [7], this walkable city score indicates that Jalan Diponegoro is sufficiently walkable. Table 1 below shows the values for each walkable city indicator.

Table 1: Level of *Walkable City* at Diponegoro Street

S. No	Parameter	Volume	Average (Value/Sample)	Total (average x Volume)
1	Pedestrian facilities	3	3,66	10,98
2	Pedestrian conflict	3	2,78	8,34
3	Cross	3	3,3	9,9
4	Maintenance	2		2,68
	a. Condition of the pedestrian path material		2,4	
	b. Maintenance of streetlights		3,07	
	c. Bin		2,7	
	d. halte		4,15	
	e. Bench		2,19	
	f. Traffic sign		2,78	
	g. Telephone		1,48	
5	Width of path	2	2,68	5,36
6	Buffer	2	2,44	4,88
7	Accesibility	2	2,35	4,7
8	Esthetic	2	2,13	4,26
9	Shade	1	3	3
	Level of *Walkable City*			**56,78**

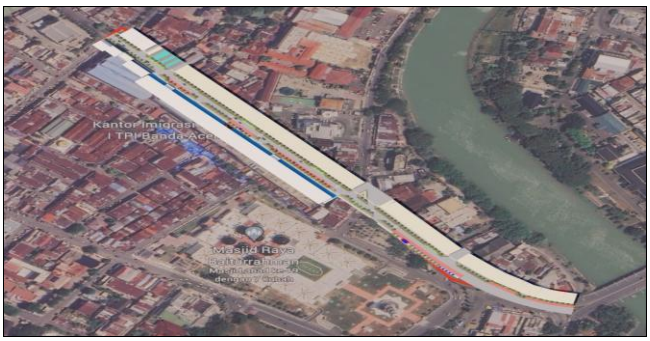
a. The pedestrian facilities on Jalan Diponegoro received a score of 3.66, indicating that the pedestrian path is aligned with the motor vehicle lane and is damaged.
b. The pedestrian conflict referred to is the situation where pedestrians cross the pedestrian path while walking. The average pedestrian conflict score on Jalan Diponegoro is 2.78, indicating that 2-5 pedestrians are walking in the motor vehicle lane.
c. The zebra crossing, which is the only pedestrian crossing on Jalan Diponegoro. The crosswalk has an average score of 3.3, indicating that pedestrians have difficulty crossing the road.
d. The assessment of pedestrian facility maintenance yields an average score of 2.68:
    1. The condition of the pedestrian path material was rated 2.4, indicating that the path is not cracked or damaged, but rather flooded (slippery), overgrown with plants, and shiny.
    2. The average score for the prevalence of streetlights on Jalan Diponegoro is 3.07, indicating that the streetlights are dim and located within a distance of ≤10 meters
    3. The average score for the maintenance of trash bins on Jalan Diponegoro is 2.7, indicating that there are trash bins within a 20-meter radius and no waste segregation.
    4. The maintenance of bus stops on Jalan Diponegoro is rated 4.17, indicating that the bus stops are operational and accessible. The distance between the Trans Koetaradja bus stops is currently 300 meters.
    5. The average score for the maintenance of seating is 2.19, indicating that there are seats in poor condition obstructing pedestrians.
    6. The maintenance of signs on Jalan Diponegoro received an average score of 2.78, which means the placement of the signs is clear but obstructs pedestrians.

7. The maintenance of public telephones received an average score of 1.48, which means there are no public telephones.

e. The width of the sidewalk is 1.5-2.4 meters, with an average pedestrian path width of 2.68.
f. The average buffer score on the pedestrian path on Jalan Diponegoro is 2.44, which means there is a buffer with a width of 0.3 meters.
g. The average score for accessibility is 2.35, which means there is only one access point, but it is in poor condition.
h. The average aesthetic score is 2.13, there are historical buildings and street furniture, but visually it is less appealing.
i. The pedestrian path is not shaded, even though there is vegetation in the form of trees spaced 5 meters apart, as evidenced by an average shading score of 3.

3.3 Recommendation for the Arrangement of the Walkable City Concept on Jalan Diponegoro

The recommendation for the walkable city concept arrangement is made to provide an illustration of a pedestrian path concept that is very friendly to pedestrians. This arrangement also aims to respond to the walkable city value on Jalan Diponegoro, which previously received a score of "sufficiently walkable" to "walkable city." The main focus here is to establish a hierarchy that prioritizes pedestrians, so that the more people choose to walk, the healthier the urban environment becomes and the more economic benefits are gained. The walkable city concept is also applied to the three segments on Jalan Diponegoro according to the nine walkable city indicators.



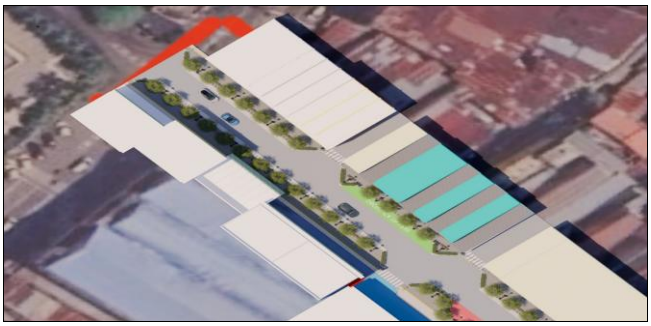
Picture 10: Layout of Pedestrian Path Arrangement

Jalan Diponegoro has a width of 14 meters. With such a wide space, there is a potential for irregular parking of both two-wheeled and four-wheeled vehicles or stopping in areas where they shouldn't. Things like this cause traffic congestion on Jalan Diponegoro. In the arrangement of the walkable city concept, the width of vehicle lanes will be reduced so that no vehicles can stop arbitrarily, ensuring smoothness and ease for road users and pedestrians.

a. Arrangement of the Walkable City Concept in Segment I

Segment I of the pedestrian path on both the left and right sides of the road is entirely the same. Therefore, the arrangement in this segment is the same for both sides of the road. In Segment I, all walkable city indicators have been implemented, but there are no bus stops available in this segment. The walkable city indicators are arranged in such a way as to provide a sense of safety and comfort for pedestrians. Because the public telephone indicator is not available, it is replaced with the same function through the provision of free Wi-Fi that can be accessed via a barcode and set within a certain radius. This arrangement is also designed in such a way as to create an attraction for pedestrians.

In Segment I, there is no parking available for either 2-wheeled or 4-wheeled vehicles, so access to this segment can be through pedestrian paths connected to the surrounding pedestrian routes. Additionally, access to this segment can also be through a drop point that serves to drop off and pick up pedestrians from both private and public vehicles (offline and online).



Picture 11: Layout of the Walkable City Concept Segment I

The width of the pedestrian lane is 6 meters and the vehicle lane is 5.5 meters. Between the pedestrian lane and the motor vehicle lane, there is a separator lane with a width of 1 meter. This separator lane also has bollards to provide safety for pedestrians and prevent motor vehicles from entering the pedestrian lane. The function of the separator lane here can also be used by pedestrians to wait when they want to cross.

b. Arrangement of the Walkable City Concept in Segment II

The arrangement of the walkable city concept in segment II differs from segment I. The difference lies in several additional facilities such as bus stops, two-wheeler parking, four-wheeler parking, islands, and drop points. All walkable city indicators will also be applied in the arrangement of this segment and combined with the previous additional facilities with the aim of providing more comfort for pedestrians.

Picture 12: Layout of the Walkable City Concept Arrangement Segment II

The parking facility for two-wheeled vehicles is within a radius of ±100 meters, covering the area between segments II and I. The purpose of providing this parking space is to facilitate road users in carrying out activities here, such as shopping. The width of the pedestrian path on the left side of the road remains the same as in Segment I, but there are slight differences in the separator. Meanwhile, on the right side of the road, the pedestrian path is separated by a divider in the form of vegetation and vehicle parking. The average

width of the pedestrian path on the right side is 3.5 meters, which is smaller than the left side, due to adjustments made for the drop-off lane to the MPU. The divider between the pedestrian path and vehicle parking is separated by bollards to widen the pedestrian path and provide easier access. The drop-off lane of the MPU building is provided with a ramp and bollards positioned right at the entrance of the MPU, and other barriers such as railings are also provided to prevent vehicles from accessing the pedestrian path. The difference between the vehicle parking area, the vehicle lane, and the drop-off lane is indicated by different colors. The vehicle lane is asphalt gray, the parking area is red, and the MPU drop-off lane is blue.

In this segment II, there is also a Trans Koetaradja bus stop located on the right side of the road with a radius of ±300 meters from the Trans Koetaradja bus stop in segment III. There is a special lane to the bus stop for the Trans Koetaradja bus. However, there is no separator between the bus stop lane and the vehicle lane; they are only distinguished by different lane colors. The width of the bus stop lane is 4 meters. The type of separator between the bus stop lane and the pedestrian lane is also a railing to save space and allow for a wider pedestrian lane. On the left side, there is a drop point with a lane width of 2.5 meters, and each drop point is spaced 100 meters apart. This distance is still within a comfortable range for pedestrians heading to their destination. The special drop point lane is also colored green as a marker and a barrier with the vehicle lane.

Next, there is the provision of parking for four-wheeled vehicles. The arrangement of four-wheeled parking is the same as the bus stop lane, with a width of 4 meters. The application of walkable city indicators in the four-wheeled parking area, such as shade trees, benches, lights, and chairs, remains the same as before. For the separation between the pedestrian path and the parking area, ramps are also used, and bollards are provided to prevent vehicles from entering or driving onto the pedestrian path. On the left side, there is also a drop point available. The size and width are also the same as other drop points. The separator lane on the left side also partially uses plants to better regulate pedestrians crossing and also serves as a different variant to add aesthetic value.

There is a park that connects segment II to segment III, and this park is located on the left side of Jalan Dipenogoro. To access and cross this park, there are pedestrian crossings in the form of zebra crossings, and it is also equipped with ramps and bollards. In the park, there are also circular benches to maximize the function of this area. Surrounding the park, there is also vegetation as a barrier to the vehicle lanes and to provide comfort for pedestrians on Jalan Diponegoro.

c. Arrangement of the Walkable City Concept in Segment III

The implementation of the walkable city concept in segment III differs from segment II, although in terms of facilities, segment III has similar amenities such as bus stops, drop-off lanes, and parking for two-wheeled and four-wheeled vehicles. The bus stops are located on the right side of the road, and almost all of the right side serves as stops for the Trans Koetaradja Bus. Meanwhile, parking for two-wheeled and four-wheeled vehicles is on the left side of the road.

Picture 13: Layout of the Walkable City Concept Segment III

The width of the pedestrian path in this segment is still the same as in segment II, which is 5 meters for the pedestrian path without additional facilities such as bus stops, drop-off points, and vehicle parking. Meanwhile, the section of the pedestrian path with additional facilities is 3.5 meters. In the arrangement of each walkable city indicator, such as separator lanes, shade trees, streetlights, benches, trash bins, and others, it still follows the same layout as in the previous segment. In this arrangement, it is hoped that priority can be given to pedestrians on Jalan Diponegoro and provide a sense of safety and comfort when engaging in activities here.

The analysis of the walkable city concept arrangement is conducted to respond to the previous walkable city score of 56.78, which means "sufficiently walkable." With the implementation of the walkable city concept, it is expected to improve the walkable city score in the center of Banda Aceh City, specifically on Jalan Diponegoro. The analysis of the Walkability Concept Arrangement was conducted on 9 walkable city indicators, namely pedestrian facilities, pedestrian conflicts, crossings, maintenance, pedestrian lane width, buffers, accessibility, aesthetics, and shade (US Department of Health and Human Services, 2010) [7].

4. Conclusion

In conclusion, the walkable city level in the central area of Banda Aceh, specifically on Jalan Diponegoro, received a score of 56.78, which means it is fairly walkable. Based on the US Department of Health and Human Services (2010) [7], there are nine indicators used to assess a walkable city. These indicators include facilities for pedestrians, the potential for conflicts between pedestrians and other road users, ease of crossing, maintenance levels, width of pedestrian paths, buffers (separators between pedestrian paths and vehicles), accessibility, aesthetic aspects, and the presence of shade. Each indicator has a different assessment weight. The indicator with the highest value is pedestrian facilities, which is 10.98, while the lowest value is found in the maintenance indicator with a value of 2.68. The maintenance indicator itself consists of seven components, namely the physical condition of pedestrian paths, maintenance of streetlights, availability of trash bins, bus stops, benches, signs, and public telephones.

The recommendation for the walkable city concept layout on Jalan Diponegoro is presented in 3 segments: Segment I: The pedestrian paths on the left and right sides of the road have the same characteristics, so their layout is the same, except that the left side has an additional facility in the form of a drop point. Segment II: In the layout of the walkable city concept on the left side of the road, there are 2 drop points spaced 100 meters apart and a connecting island leading to Segment III. Meanwhile, on the right side of the road, there are two-wheeled and four-wheeled parking

spaces as well as a bus stop facility. In Segment III on the left side, the arrangement includes additional drop points, two-wheeled and four-wheeled parking spaces, while on the right side of the road, almost the entire stretch is equipped with bus stop facilities.

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