

To cite this article: Retnowati, Hilma Tamiami Fachrudin and Anthoni Veery Mardianta (2022). WALKABILITY STUDY IN MEDAN CITY CENTER BASED ON PEDESTRIAN PERCEPTION: A CASE STUDY OF MERDEKA AND KESAWAN FIELDS, International Journal of Education and Social Science Research (IJESSR) 5 (5): 424-465 Article No. 692, Sub Id 1107

## WALKABILITY STUDY IN MEDAN CITY CENTER BASED ON PEDESTRIAN PERCEPTION: A CASE STUDY OF MERDEKA AND KESAWAN FIELDS

Retnowati<sup>1</sup>, Hilma Tamiami Fachrudin<sup>2</sup> and Anthoni Veery Mardianta<sup>3</sup>

<sup>1,2,3</sup>Architecture Post Graduate Programme, Faculty of Engineering, Universitas Suatara Utara,  
Dr. Mansur Street, Medan, 20155, Indonesia

DOI: <http://dx.doi.org/10.37500/IJESSR.2022.5524>

### ABSTRACT

The rationale for this paper is the development of the pedestrian-friendly concept (walkable) widely in several countries in the world. Walkability is an important element in urban development which is closely related to urban design with health issues, climate change, urban economy and social values. Medan City Center is an area that becomes the movement of attraction and generation of public transportation which is followed by the movement of pedestrians. This study aims to determine the existing condition of the pedestrian path and the value of walkability in the Medan city center, precisely in the Merdeka Square and the Kesawan corridor. This study uses the global walkability index method with a quantitative descriptive approach that describes the walkability conditions in the center of Medan city. The results of the study for safety and security variables on pedestrian paths in the center of Medan city are still not able to provide the best service where security facilities in the form of kerebs and bollards have not been able to make motorcycle riders not take pedestrian paths and security from pedestrian crimes is still not able to ensure the level of security even though lighting facilities are available. Then for convenience and attractiveness regarding maintenance and cleanliness have been met where pedestrian facilities are complete and for cleanliness it is rarely seen scattered garbage. The walkability value in downtown Medan shows the number 69 which means waiting to be walkable.

**KEYWORDS:** pedestrian path, city center, walkability

### INTRODUCTION

Walking is one of the modes of transportation apart from the network system, activity system, and movement system. Apart from being a mode of transportation, walking is also needed to maintain health and can increase social interaction [1]. Walking is one of the modes of transportation apart from the network system, activity system, and movement system. Apart from being a mode of transportation, walking is also needed to maintain health and can increase social interaction [2]. Walking comfort (walkability) in urban spaces refers to the ability to provide a comfortable, safe, and pleasant walking experience for pedestrians. City center walkability is an important element to make a city sustainable and livable because of its central role in urban development [3]. Walking was

originally one of the most important modes of transportation in circulation, but with the development of civilization, walking has begun to be forgotten. The implementation of walkability in urban centers is expected to change the streets in their city centers to become pedestrian-friendly so that they can support the program to reduce the use of private vehicles. As is the case with the city of Medan, which has a mission to implement a consistent urban spatial plan supported by the readiness of infrastructure and utilities that are increasingly modern and sustainable as well as the desire to develop the field as a smart city, one of the important and influential things in making it happen is to pay attention to the city's walkability. Medan as one of the important elements in the safety and comfort of transportation using public transportation. Until now, pedestrian paths are still not maximally used, especially in the city center, for example, the pedestrian path whose function is as a place to walk has changed a lot, for example, becoming a location for street vendors so that pedestrians feel unsafe and uncomfortable walking. on the pedestrian path. In addition to the lack of pedestrian-friendly development policies, regulations and enforcement, the lack of measurement and assessment of walkability levels in the city center also contributes to the rapid transformation of the city center from a walkable center to a high-congestion center. This fact then triggered the author to conduct a study on walkability in the center of Medan City.

## 2. RESEARCH THEORY AND METHODS

### 2.1. Walkability Measurement

In the walkability measurement proposed by Holly Krambeck said that the walkability index has 3 components, namely security and safety, comfort and attractiveness, and policy support [4]. Holly krambeck developed global walkability aimed at assessing pedestrians in terms of safety, comfort and safety. To assess the level of walkability, a measure is used based on the walkability score with a rating scale of 1-100, then grouped into 3 parts, namely the green category with a score of more than 70 (very good for walking), the yellow category with a score of 50-70 (good enough for walking), red category with a score of less than 50 (not good for walking) [5].

**Table 1: Global Walkability Index-Summary of Components and Variables**

Component	Variable
Safety and Security	1. Proportion of road accidents that resulted in pedestrian fatalities (most recent year avail)
	2. Walking path modal conflict
	3. Crossing safety
	4. Perception of security from crime
	5. Quality of motorist behavior

Convenience and attractiveness	6. Maintenance and cleanliness of walking paths
	7. Existence and quality of facilities for blind and disabled persons
	8. Amenities (e.g., coverage, benches, public toilets)
	9. Permanent and temporary obstacles on walking paths
	10. Availability of crossing along major roads
Policy Support	11. Funding and resources devoted to pedestrian planning
	12. Presence of relevant urban design guidelines
	13. Existence and enforcement of relevant pedestrian safety laws and regulations
	14. Degree of public outreach for pedestrian and driving safety and etiquette

Source: Global Walkability Index, 2006

Holly krambeck developed global walkability aimed at assessing pedestrians in terms of safety, comfort and safety. To assess the level of walkability, a measure is used based on the walkability score with a rating scale of 1-100, then grouped into 3 parts, namely the green category with a score of more than 70 (very good for walking), the yellow category with a score of 50-70 (good enough for walking), walking), red category with a score of less than 50 (not good for walking) [5].

**2.2. Method**

To solve research problems in the center of Medan City based on pedestrian perceptions, researchers conducted field observations and survey with questionnaire, the research location is Merdeka Medan field and Kesawan street because the center of Medan city is a magnetic location for activities that trigger people to pass this road. Merdeka Square is a green open space so many people exercise and walk on the pedestrian path in the field. Kesawan street is a location for trade and services, thus triggering people to come and walk on this route. Then to determine the research sample, the researcher uses the Lemeshow formula where the total population is unknown [6].

Lemeshow formula  $n = \frac{Z^2 \cdot P \cdot (1-P)}{d^2}$

Where

Z= Score z at 95% confidence=1.96

P= Maximum estimate = 0.5

d= alpha (0.10)/ sampling =10%

$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1-0.5)}{0.1^2}$

$(0.5) / 0.01$

$n = (3.8416 \times 0.25) / 0.01 \quad n = 0.9604 / 0.01 = 96.04$

So, in this study the researchers took samples for the questionnaire were 96 samples. Because the research location has two segments, 96 samples were taken from each segment, so the total samples taken in the field were 192 samples.

This type of research uses quantitative methods with a descriptive approach. In taking the sample, the researcher used a non-probability sampling technique and the sampling method used the accidental sampling method. Then in determining the sample, the researchers chose a sample based on the age of pedestrians ranging from 15-60 years old with the time of collection during peak hours such as in the morning at 07.00-09.00 WIB, in the afternoon at 12.00-14.00 WIB, and in the afternoon at 12.00-14.00 WIB. afternoon hours from 17.00-19.00 WIB. To determine the sampling day, the researchers took samples on weekdays (Monday, Tuesday, Wednesday, Thursday, and Friday) and holidays (Saturday and Sunday). Then the locations in sampling are on the pedestrian path at the City Hall Road (west entrance), Bukit Baris Road (north entrance), railroad road (east entrance), and Pulau Pinang road (Entrance section). south) as well as for the sampling location in Kesawan, namely on the pedestrian path on Jalan Ahmad Yani, the point is near a tiptop restaurant and near the Tjong a fie museum.

**1. Methods of determining variables**

based on problems and theoretical basis in determining research variables are as follows table 2:

**Table 2: Variable Determination Method**

Variable	Indicator	Parameter
Convenience	Road network	Availability of Road Network
	Facility	Availability of facilities
	Crossing Availability	Availability of crossing network
	Cleanliness	Interesting and clean travel route
	beauty	The itinerary is clearly visible and neatly arranged on the map
Safety and security	Pedestrian conflict	Pedestrian conflicts with other modes (Bicycles, Motorcycles, Cars)
	Crossing Safety	Crossing safety is seen from the mode of transportation that stops at a red light

	Security from crime	How safe are pedestrians from crime?
	quality of driver behavior	the extent to which cities can manage driver behavior
Comfort and Attractiveness	Maintenance and cleaning	all trash is well managed and sidewalks are well maintained
	Disability infrastructure	There are disability facilities and they are well maintained
	Facility	There are facilities in the form of benches, street lamps, public toilets, and trees.
	Obstacle	There are temporary barriers and permanent barriers
	Crossing Availability	There are road crossing facilities (zebra cross, pedestrian bridge)

### 3. ANALYSIS AND DISCUSSION

#### 3.1. Analysis

Merdeka Square is a green open space located in the District of West Medan, precisely between the City Hall Road, Bukit Barisan Road, Railway Road and Pulau Pinang Road. The coordinates of the Merdeka field are at 3°35'24.26 North Latitude and 98°40'40.99 East Longitude. Apart from being a location for entertainment and green open spaces, Merdeka Square is also a historical site of the Dutch-Indies colonial heritage. In the past, the independence field was in the form of a field that was used by the government in the past to carry out important activities. But now Merdeka Square is used as a garden location with a variety of culinary delights. The many snacks offered at Merdeka Square make visitors come to enjoy culinary delights or just take a walk in the park to just chat with friends and family. Merdeka field itself is also a good location for exercising, there is a jogging track and sports facilities provided by the government at the Merdeka field. In the Merdeka field, many visitors carry out activities on foot. Walking is carried out on sidewalks and must provide a sense of security and comfort for pedestrians. There are 3 types of pedestrian models in the Merdeka Square, the first is a pedestrian path or pedestrian path that borders public roads, the second is a green open space pedestrian path in the takeaway area and a pedestrian dining area for visitors. Then kesawan is also in the District of West Medan which is at coordinates 3°35'39.00 North Latitude and 98°40'30.67BT. Kesawan is dominated by shop houses and several private offices. Activities in this area are several sports shops, musical instrument stores, shoe shops, furniture stores, barbershops, hotels, electronics stores,

minimarkets, restaurants, offices, banks and housing estates and there is also a tjong a fie mansion [7]. To see the location of the Merdeka field and the Kesawan area, it can be seen in Figure 1 below.

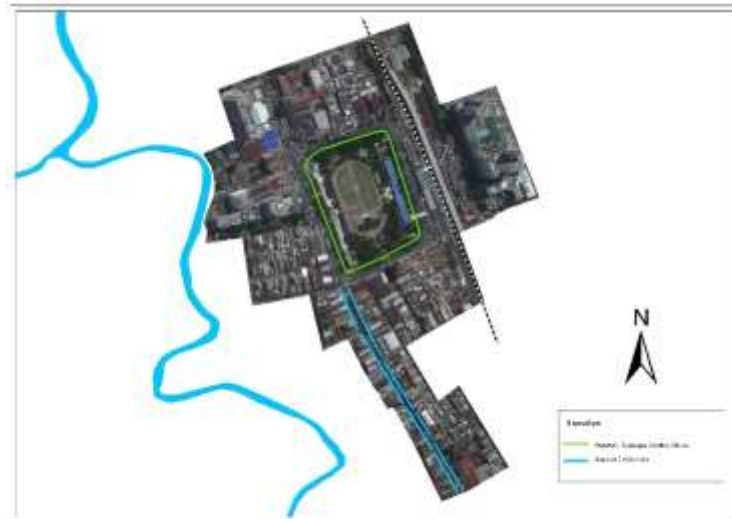


Figure 1: Location

### 3.2. Discussion






#### A. Environmental Factors that are Walkable

According to Austroads, 2009 There are 5 key factors that make pedestrian paths friendly for walking, namely, the availability of a road network, the availability of pedestrian paths and facilities for disabilities, the availability of crossings, cleanliness and beauty [8]

##### 1. Availability of Road Network

The availability of the road network can be reflected in the length of the road per population which indicates the level of regional mobility. The higher the value of regional mobility, the greater the opportunity for the population to carry out regional mobility. The higher the area's accessibility value indicates the greater the ability to access the area. The availability of the road network strongly supports mobility within the city, a good road network will have an impact on economic and social benefits and stimulate the rise of population movement to carry out socio-economic activities. The shape, location, and characteristics of an area will attract the growth of certain activities and functions and these activities will grow in places that have the opportunity to provide benefits. Supporting these activities will enrich the urban experience and can create a better city [9]. For the existing conditions and the availability of roads in the area around the Merdeka field, it can be seen in table 3 below.

**Table 3: Availability of Road Networks in Merdeka Square and Kesawan**




Street Name	Existing Condition	Photo
<b>Lapangan Merdeka</b>		
Balai Kota	For the condition of the city hall road, the width of the road is approximately 22 meters with the function of the road as a secondary artery which means services for public transportation with a high average distance speed, and the role of services for the community in the city. for paving the road using asphalt and it looks like there are no potholes on this road.	
Bukit Barisan	The road conditions already look good, there are no potholes on this road and the pavement is using asphalt. For a road width of approximately 20 meters with a road function as a secondary local, which means a road that connects one secondary area to a residential area, the lowest speed is 10 km/hour.	
Kereta Api	For railways, road conditions are also good and wide, the width of this road is about 16 meters with the addition of a special road for motorists who will stop at the train station, which is about 2 meters, the function of this road as a secondary local link between one area and the other. others such as housing. The paving of this road uses asphalt and is well maintained and there are no potholes on this road.	
Pulau Pinang	The condition of this road is quite good, with an adequate width of about 15 meters with secondary local services, the hardening on this road uses asphalt because asphalt is hardening with a high level of comfort compared to concrete	
<b>Koridor Kesawan</b>		
Ahmad Yani	The kesawan corridor is a primary arterial road which means serving national activities/activity centers with regional activity centers. The width of the kesawan road is 18 meters using asphalt paving, the condition of this road is good, judging by the absence of potholes on this road.	

**2. Availability of Facilities**





In carrying out pedestrian technical planning, the important thing in planning is the safety of road users, especially in suburban or urban areas with high traffic intensity. Road user safety can be met





with complete road user facilities, be it sidewalks, zebra crossings or pedestrian bridges. In addition to the crossing, other supporting facilities are benches, street lamps, public toilets, trees and facilities for people with disabilities. It is very important for disabled facilities to be planned for pedestrian facilities because if there are facilities for people with disabilities, comfort can be fulfilled [10]. The condition and availability of pedestrian facilities can be seen in table 4 below.

**Table 4: Existing Condition of Pedestrian Facilities in Merdeka and Kesawan Square**

Name	Existing Condition	Photo
<b>Lapangan Merdeka</b>		
Chair	Seating facilities on the pedestrian path at Merdeka Square are 38 seats, the length of the seats is about 152 cm, the width is 60 cm and made of iron and the distance between the seats is 5-10 meters	
Trash can	For the existing conditions in the Merdeka field, the number of trash cans in the field is about 17 pieces, with a distance of 5 cm - 10 meters, the materials used are plastic and iron. Trash cans on the pedestrian path have been selected where there are three trash cans with the distribution of trash cans for organic, non-organic, and B3 (hazardous and toxic materials).	
Barrier	Barriers are made with the function of protecting against acts such as terrorist attacks or vandalism as well as preventing motorcycles from climbing onto pedestrian paths (pedestrians). For barrier bars in Merdeka Square, there are pedestrian paths around the city hall, pedestrian paths around Bukit Baris Street and pedestrian paths around Pulau Pinang Road.	



Name	Existing Condition	Photo
Signpost	Directional signs are one part of traffic signs whose function is as a guide and information provider for road users. For signs on the pedestrian path in Merdeka Square, there are road signboards that inform the name of the road and prohibition signs used to declare an act that is prohibited by road users	
Lighting	Street lights are also one of the mandatory facilities for pedestrian paths. Street lights function as lighting so that the road is not dark so that it can reduce crimes such as pickpocketing, robbery. Apart from being a street lamp lighting can also beautify the sidewalk. For the condition of the street lights on the pedestrian path around Merdeka Square, all of them are on at night so that the pedestrian path is not dark and pedestrians feel safe.	
Guiding Block/ramp	Ramp/Guiding Block is a pedestrian facility for persons with disabilities in the form of a straight yellow line, the condition of the ramp in the Merdeka field, the color of the ramp is still visible, only at some points of the ramp with holes and obstructed by permanent obstacles such as lamp posts or seats.	
<b>Koridor Kesawan</b>		
Chair	There are already benches on the pedestrian path around the Kesawan area, and the benches in this Kesawan are still relatively new, they look good and sturdy. The distance between one bench and another is quite varied, some are around 10 meters and some are more than 10 meters, which is about 30 meters.	
Trash can	The trash can facilities on the pedestrian path around the Kesawan area are adequate, on this route, trash cans have been provided, but the trash cans are not distinguished between organic, non-organic and hazardous fuel trash cans.	

Name	Existing Condition	Photo
		
Guiding Block/ramp	<p>Ramp is a yellow line that usually exists on pedestrian paths, the use of this ramp is for pedestrians who have limitations (disability). The ramp serves as a guide for people with disabilities when walking. The hallmark of the ramp is usually a straight yellow line with raised hardening. For the condition of the ramp in the area around the farm, the condition is quite good, it's just that there are several ramp points around the area with holes making it dangerous for pedestrians with disabilities.</p>	
Signpost	<p>The availability of signage in Kesawan serves as a guide for road users and pedestrians. Signage that is on the path to kesawan is as info for motorists. Signage is installed using a pole and then this pole is installed on the pedestrian path so that it becomes a permanent barrier for pedestrians.</p>	
Lighting	<p>There are 48 lamps in the garden with a height of 4 meters, and a distance of 4-8 meters, and the material used is steel</p>	




### 3. Availability of Crossings



Increasing volume of vehicular traffic on highways requires the availability of road crossing facilities. A road crossing is a pedestrian who cuts off the existing traffic flow where traffic regulation must be carried out. Pedestrian crossing facilities can be provided in stages according to the level of need [11].

The pedestrian crossing facilities are divided into two, namely level crossings and non-level crossings. The level crossing consists of a zebra cross and a pelican cross, while for non-level crossings, namely pedestrian bridges and crossing tunnels [12].

Accidents occur in many ways where user characteristics are the main causes of accidents in addition to the influence of road conditions and the environment [13]. Availability of crossings is also one of the factors that can affect accidents where if someone crosses the road not on the crossing the accident rate will be high. Therefore, the availability of road crossings must be fulfilled as a pedestrian right. For crossings in the kesawan corridor, it is at the intersection of four between kesawan and the city hall road where there is only one zebra cross, this makes it difficult for pedestrians to cross and this indicates that availability is still not met in accordance with the guidelines for planning, providing and utilizing infrastructure and facilities. pedestrian area in the area. For existing conditions regarding road crossings can be seen in table 5 below.

**Table 5: Existing Condition of Crossings at Merdeka and Kesawan Square**



Location	Existing Condition	Photo
Lapangan Merdeka		
Zebra Cross in Balai Kota Street	In the existing condition of the road crossing or zebra cross for the condition the white line as a marker has begun to fade but is still visible. This zebra cross is located on the city hall road which coincides at a red light with a crossroads.	
Zebra Cross in Kereta Api Street	In the existing condition on the railroad, this zebra cross serves as a road crossing to the field train station and the white line is still clearly visible.	
Zebra Cross in Pulau Pinang Street	At this crossing the white color has faded, this crossing is at the Medan independent tower which is on Jalan Pulau Pinang	

Location	Existing Condition	Photo
Pedestrian bridge in Kereta Api street	The pedestrian bridge which is located on the railroad that connects the Merdeka Square with the train station, is in good condition and is already operating. This bridge serves as a public facility designed as a security or a special path for pedestrians.	
Zebra Cross in corridor Kesawan	For crossings in the kesawan corridor, it is at the intersection of four between kesawan and the city hall road where there is only one zebra cross, this makes it difficult for pedestrians to cross.	

#### 4. CLEANLINESS

The pedestrian path is a space for pedestrians to carry out activities and to provide services to pedestrians so as to improve the smoothness, safety, and comfort for pedestrians. One of the factors that affect comfort is cleanliness. An area that is kept clean will add a special attraction, in addition to creating a sense of comfort and pleasure for people who pass through the pedestrian path. To fulfill the cleanliness of an environment, garbage bins are usually provided as complementary elements and a well-conceived sewer system [14]. For the existing conditions regarding cleanliness at the research site, it can be seen in table 6 below.

**Table 6: The Existing Condition of Cleanliness in Merdeka Square and Kesawan**


Location	Existing Condition	Photo
Lapangan Merdeka	Untuk kondisi eksisting kebersihan di jalur pejalan kaki lapangan merdeka, tepatnya mengenai fasilitas tong sampah sudah memadai di setiap jalur pejalan kaki ditandai dengan adanya tong sampah di jalur pejalan kaki. Ada sekitar 15 buah tong sampah dengan jarak tiap sampah sekitar 5,71 meter.	
		

Location	Existing Condition	Photo
Koridor Kesawan	Untuk kebersihan di lokasi penelitian koridor kesawan sudah cukup baik dimana terdapat tong sampah dan jalur pejalan kaki yang jarang ditemukan sampah yang menumpuk dan tercecer.	

**5. Beauty**

The beauty of a space needs to be taken seriously to get an atmosphere of comfort. Beauty must always be controlled by the arrangement, taking into account the various shapes, colors, compositions, plant compositions and pavement elements. Beauty includes matters of inner satisfaction. To obtain optimal comfort, beauty must be designed by taking into account various aspects, both in terms of shape, color, composition of plant composition and pavement elements, as well as factors that support the circulation of human activities. The beauty of the pedestrian path can be in the form of images or green facades at that location [15]. For the existing conditions regarding the beauty of the Merdeka and Kesawan fields, it can be seen in table 7 below.

**Table 7: The Existing Condition of Beauty in Merdeka Square and Kesawan**

Location	Existing Condition	Photo
Lapangan Merdeka	For the existing conditions in the Merdeka Square, it is quite beautiful, it can be seen from the many green trees and the sidewalk design that is made so that it is acceptable and some flowers are planted around the pedestrian path in Merdeka Square.	
Koridor Kesawan	For the existing conditions in Kesawan regarding the beauty in the Kesawan corridor, it is rare to find trees as a green facade and the form of old buildings that are not taken care of makes it very difficult to create beauty in this location.	

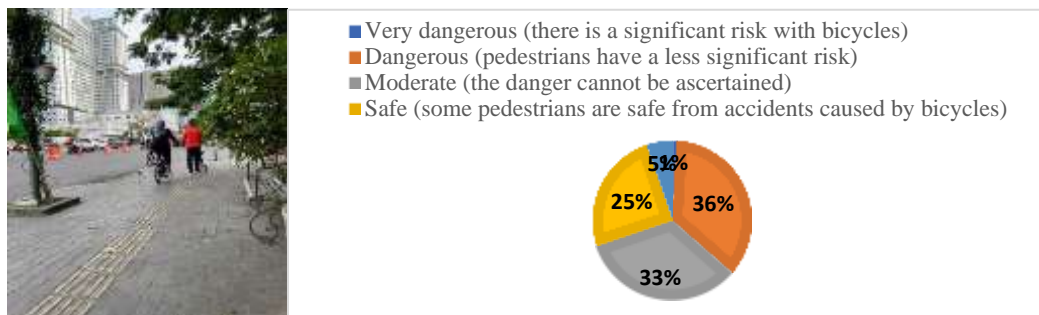
**B. Safety and Security Factor**

**1. Pedestrian Path Conflict**

Pedestrian path conflict is a situation where there is a pedestrian conflict with other modes of transportation, the pedestrian path conflict is divided into 3 parameters, the first is pedestrian conflict with bicycles, pedestrian conflicts with motorbikes, and pedestrian conflicts with cars.

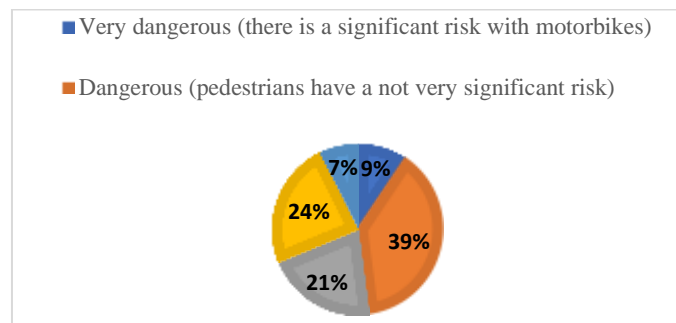
### a. Merdeka Square

The condition of the people in the city will be healthier and easier to reach when city dwellers can easily walk to use public transportation to their daily activities. In addition to walking, the mode of transportation using non-motorized vehicles such as bicycles also makes it healthy and environmentally friendly. But in reality, pedestrians with cyclists do not get the services they should. The unavailability of people's roads, cyclists are difficult to find, crossings are sober, even the threat of traffic accidents for pedestrians with cyclists is getting higher [16] Similar to conditions in the Merdeka field, the absence of cyclists' lanes makes cyclists take pedestrian paths to walk and this usually happens on holidays when people are exercising. (figure 2 (a)) For conflicts between pedestrians and bicycles, respondents mostly choose dangerous (pedestrians have a less significant risk) as shown in Figure 2 b, this cyclist is considered to be disturbing other road users because he uses pedestrian paths. This indicates that pedestrians have a significant risk of having an accident on the pedestrian path.



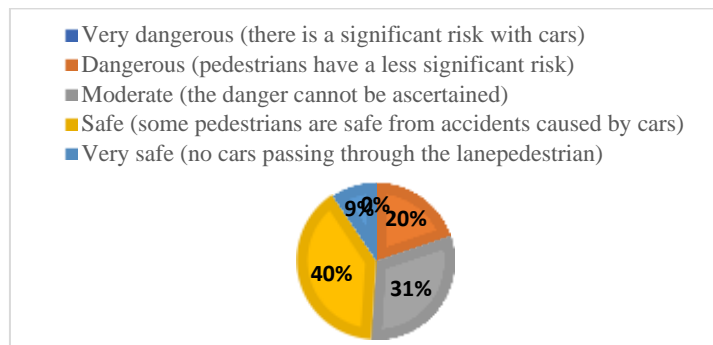
**Figure 2: (a) Pedestrian Conflict with Bike in Merdeka Square, (b) Graphics of Pedestrians and Bicycles Conflict in Merdeka Square**

Then for pedestrian conflicts with motorbikes in the Merdeka Square, we often see views of the misuse of the function of the pedestrian path, where pedestrians are in a weak position if pedestrians and motorbike users mix. Motorcycle users will use the pedestrian path if congestion occurs, this congestion occurs due to the lack of width of the road so that it cannot accommodate motorists which will cause motorcyclists to use pedestrian paths. This is in accordance with what was stated by [17] that the existing pattern of travel facility management is not balanced or not in accordance with the mobility needs of road users. Because transportation activities are dynamic while the infrastructure system is static. Then this is evidenced by the results of questionnaires that have been distributed to respondents (figure 3), where many respondents choose dangerous.



**Figure 3: Graphics of Pedestrian Conflict with Motorcycle in Merdeka Square**

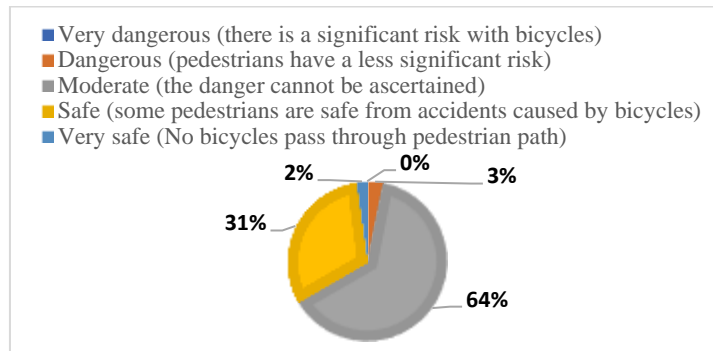
Currently, automobiles cause an increase in greenhouse gas emissions. But not only that, cars also cause air, water, noise pollution, collisions, and increased infrastructure costs. In fact, the existence of an electric car only provides a solution to several problems because it still causes pollution from car tires when running and still takes up space. Then we don't realize that every additional car requires space for road infrastructure, parking lots, which means less space for other activities [16]. This is similar to what happened in Medan City, the addition of cars continues to increase without regulations for reducing private vehicles such as cars causing congestion. However, when traffic jams occur, car drivers do not take the pedestrian path, so there is not much conflict with cars. This is evidenced by the results of distributing questionnaires that have been carried out in Figure 4 where many respondents feel safe when walking from conflicts with cars.



**Figure 4: Graphics of Pedestrian Conflict with Car in Merdeka Square**

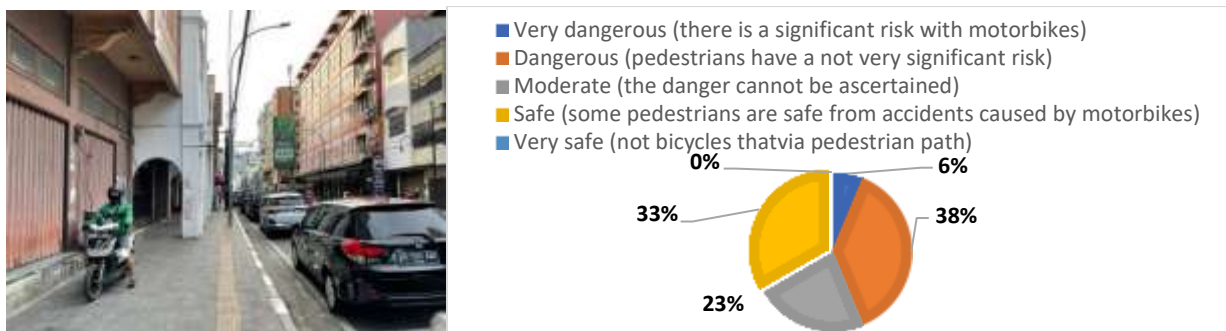
**b. Kesawan**

Kesawan is a location for trade and services, in the area around Kesawan there is also a cultural heritage so that it becomes an attraction for visitors to come to this location. The bicycle lanes in the Kesawan corridor have not been fulfilled, so cyclists are still walking on roads mixed with other vehicles, or cyclists can also use pedestrian paths so this can be a problem for pedestrians. However, pedestrian conflicts with bicycles are still in the safe category, which is evidenced by the respondents' answers to the questionnaire distribution, where many respondents choose safe and very safe and the danger cannot be ascertained as shown in Figure 5 below.



**Figure 5: Questionnaire Results Regarding Pedestrian Conflict with Bicycles in Kesawan**

The second pedestrian conflict is pedestrian conflict with motorbikes, the increasing number of motorbike vehicles on the road, making the character of the city environment change to be car oriented, which prioritizes motorized vehicles and does not or less prioritizes pedestrians, so motorbikes can cause conflict with pedestrians if there are no adequate facilities [18]. This is in line with the existing conditions in the Kesawan corridor. The Kesawan corridor during peak hours will experience congestion, and from this congestion motorcycle vehicles will take the road by going up to the pedestrian path figure 6 (a), resulting in pedestrian conflicts with motorcycles, in addition to traffic jams that make motorcycles ride into the lane. Pedestrians, there are also motorbikes that go up to the pedestrian path because motorbike riders sit back on chairs that are on the pedestrian path in Kesawan just to relax. The matter regarding the conflict between pedestrians and motorbikes is also evidenced by the respondents' answers where many respondents choose to choose dangerous (pedestrians have a less significant risk) as shown in Figure 6 (b). below.

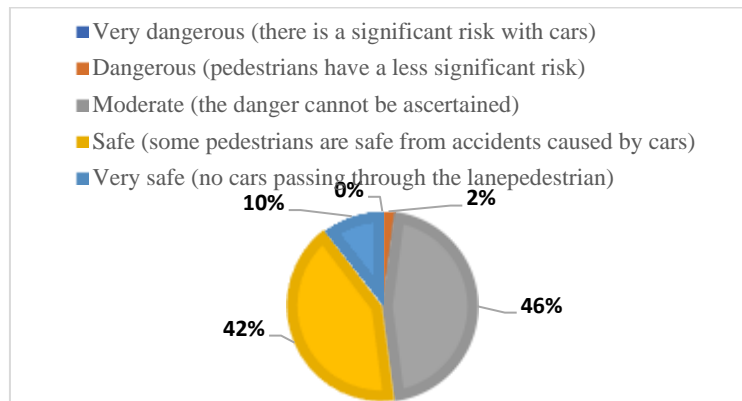


**Figure 6: (a) Pedestrian Conflict with Motorcycle in Kesawan (b) Graph of Questionnaire Results Regarding Pedestrian Conflict with Motorcycle in Kesawan**

Pedestrian paths can provide a sense of security if motorists do not take the pedestrian path. Safe pedestrian paths must be different from motorway lanes. The increase in the number of uncontrolled riders will cause congestion that continues to grow, the congestion that occurs causes motorists to take the pedestrian path. Not only motorcyclists and bicycles, car drivers sometimes want to take the



pedestrian path so that it can cause accidents. For the tabulation of pedestrian conflicts with cars, respondents feel safe and also cannot determine safety with cars, which is seen in Figure 7 below.



**Figure 7: Questionnaire Results Regarding Pedestrian Conflict with Cars in Kesawan**

### Crossing Safety

Feelings of security can be the feeling of pedestrians when crossing without accidents with other modes of transportation and drivers providing opportunities when pedestrians are about to cross. If the lack of adequate pedestrian facilities, especially walking and crossing facilities, it will greatly affect the safety of pedestrians. It is proven that about 65% of road accidents involve pedestrian deaths [19]. In the component of crossing safety, there are two parameters to assess, namely the first how safe it is when crossing and how long it takes to wait when crossing. As for the safety of crossings, crossing facilities must be planned effectively so as to direct pedestrians to cross at the facilities that have been planned and not cross haphazardly. So, the crossing facilities that need to be provided are signs as a transmitter of both orders, prohibitions or directions to road users and can affect road users [20].

#### a. Merdeka Square

The crossing safety facilities are the availability of traffic signs, crossing buttons, pelicans, puffing crossings, and zebra crossings [21]. In accordance with the conditions in the independent field, the existence of a zebra cross can invite motorists to share space with pedestrians. However, the facilities for crossing safety are only zebra crossings, traffic lights and crossing lights figure 8 (a). Then the driver's behavior also affects the safety of the crossing, this is evidenced by the results of a cross-questionnaire using crosstab analysis with the results that drivers usually obey traffic signs so that pedestrians find it difficult to ascertain the dangers caused. (Table 5.6) this means pedestrians are still unable to determine the hazard because drivers sometimes obey traffic but sometimes don't. As for the tabulation of the questionnaire, many respondents chose about 48 respondents stating that it is difficult to ascertain the dangers caused which can be seen in the picture (figure 8 b)

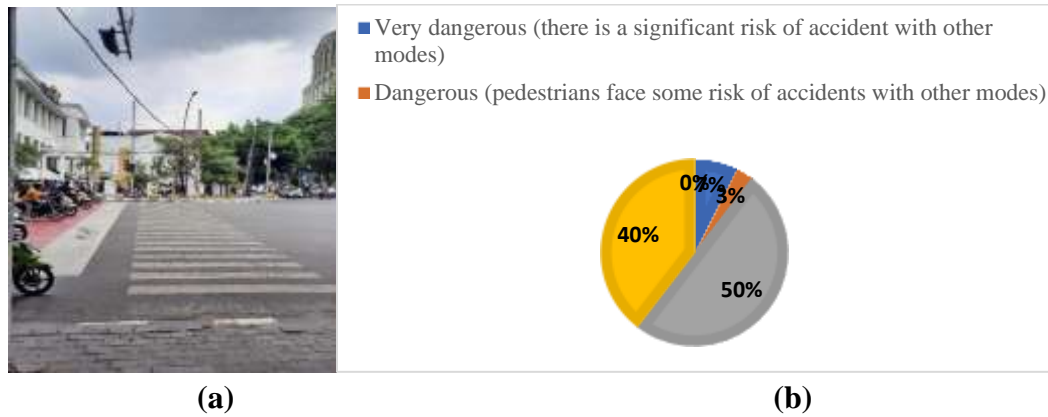


Figure 8: (a) Crossing Safety at Merdeka Square (b) Graph of Crossing Safety at Merdeka Square

Then the second parameter regarding the safety of the crossing is the time needed or spent waiting when crossing [22]. Studied the factors that affect pedestrian waiting time and the frequency to cross the road. He found that the expected waiting time for pedestrians had a large influence on the amount of effort required to successfully cross the road. Hamed determined that more pedestrians waiting to cross had a higher risk of ending waiting time. Then the results of the tabulation of the questionnaire determine the number of respondents who choose to answer difficulties to ensure waiting times. figure 9 (a). For crossing conditions on Merdeka Square which is on the City Hall road, the crossing time is about 50 seconds when all traffic is red. Picture 9 (b) Meanwhile, on the road around the Merdeka Square such as the railway, the Pulau Pinang road only has a zebra crossing without any crossing signs. So, crossing the road waiting for a quiet vehicle. Meanwhile, on the Bukit Barisan road there is no zebra crossing and pedestrians can cross any road. So, it can be concluded that the waiting time for crossings around the Merdeka Square area is still difficult to determine because of the unavailability of crossing signs.

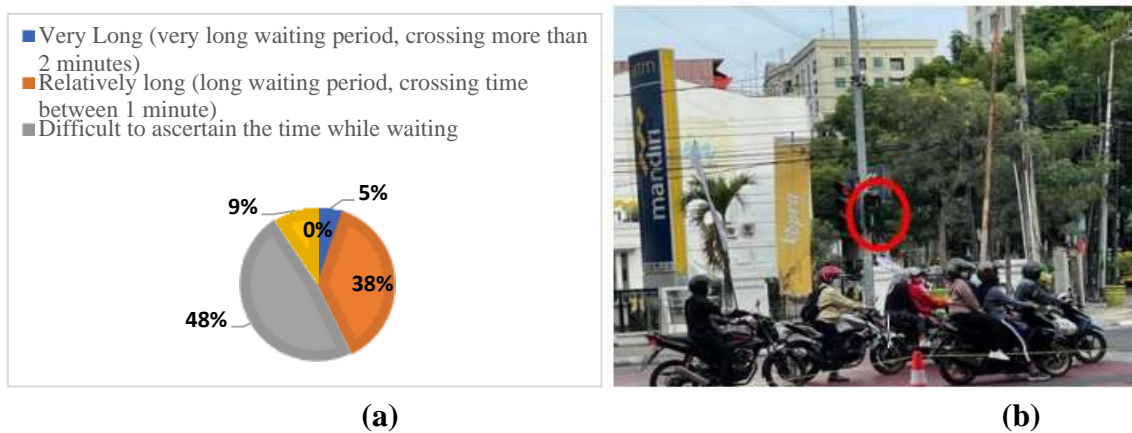
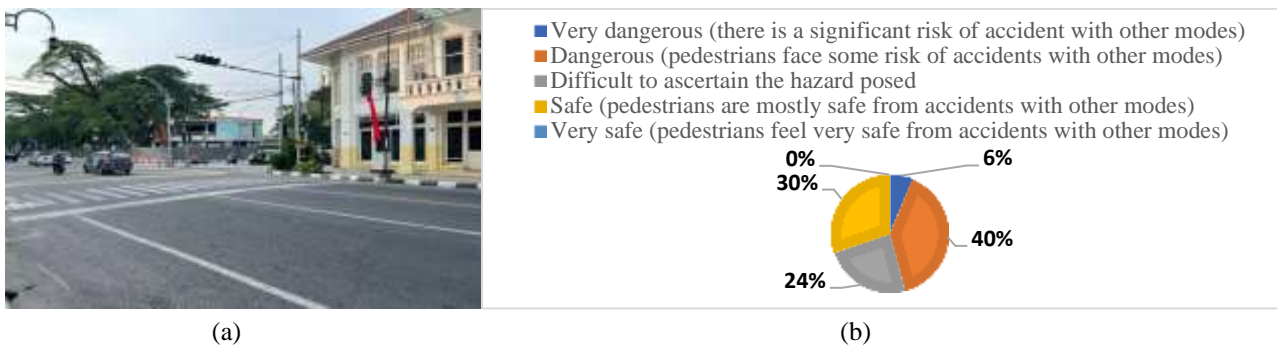


Figure 9: (a) Crossing Safety at Merdeka Square (b) Graph of Crossing Safety at Merdeka Square

**b. Kesawan**

Then for the safety of crossings in Kesawan there is only a zebra cross, and only traffic lights figure 10 (a), this indicates that pedestrian safety facilities are still minimal because in the Kesawan corridor there is only one zebra cross so that pedestrians will cross when crossing. take a path that is not at the zebra cross. For more details regarding the tabulation of the questionnaire can be seen in figure 10 (b) below.



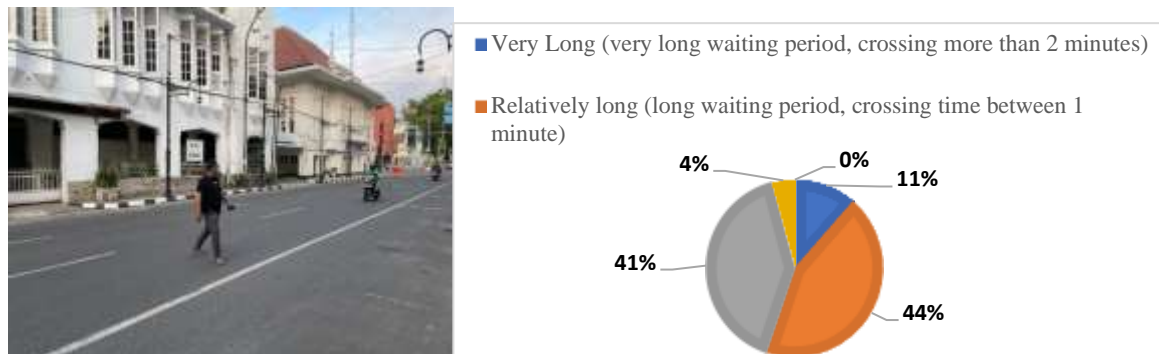
**Figure 10: (a) Crossing Safety in Kesawan (b) Graph of Questionnaire Results Regarding Crossing Safety in Kesawan**

Crossing time is the time it takes pedestrians to cross a certain road. When crossing, crossing will take into account the speed of crossing, the volume of vehicles, the speed of the closest vehicle in front, the width of the road being crossed, and the presence of the crossing [23]. In crossing times, pedestrians have different gaps, the Highway Capacity Manual (HCM) defines the critical gap as the number of seconds before it is possible that a pedestrian will not try to cross. If the available gap is greater than the critical gap, it is assumed that pedestrians will cross. However, if the available gap is smaller than the critical gap, it is assumed that pedestrians will not cross.”

For crossings in Kesawan, it is about 30 seconds for adults, crossings in Kesawan are usually without waiting time to cross which is visible. in Figure 11 (a) because in Kesawan only one crossing is facilitated, namely at the end of Ahmad Yani Street. Then for the tabulation of the time needed to cross can be seen in Figure 11 (b) below.

Crossing time is the time it takes pedestrians to cross a certain road. When crossing, crossing will take into account the speed of crossing, the volume of vehicles, the speed of the closest vehicle in front, the width of the road being crossed, and the presence of the crossing [23]. In crossing times, pedestrians have different gaps, the Highway Capacity Manual (HCM) defines the critical gap as the number of seconds before it is possible that a pedestrian will not try to cross. If the available gap is greater than the critical gap, it is assumed that pedestrians will cross. However, if the available gap is smaller than the critical gap, it is assumed that pedestrians will not cross.”

For crossings in Kesawan, it is about 30 seconds for adults, crossings in Kesawan are usually without waiting time to cross which is visible. in Figure 11 (a) because in Kesawan only one crossing is facilitated, namely at the end of Ahmad Yani Street. Then for the tabulation of the time needed to cross can be seen in Figure 11 (b) below.



**Figure 11: (a) People Crossing Without Zebra Cross in Kesawan (b) Questionnaire Results About Time in Crossing in Kesawan**

### 3. Security from Crime

Security from crime can be defined as the extent to which pedestrian paths, pedestrian bridges, are considered safe from crime, be it mugging, pickpocketing, and unprovoked attacks. Pedestrian safety is assessed when the environment feels safe to walk, whether equipped with facilities such as lights for lighting, or equipped with bollard facilities. Paths that are considered not to provide a sense of security are lanes that have minimal supervision and only a few people are along the path, such as the lack of lighting at night and along the road there are very high walls so that it is very prone to crime [24].

#### a. Merdeka Square

For the results of the questionnaire on security from crime, the result that most respondents chose was that it was difficult to ascertain the level of security felt by pedestrians as shown in Figure 5.17, and in the crosstab of the questionnaire between security from crime and the availability of street lights using crosstab analysis. shows that respondents find it difficult to ensure the level of security felt by pedestrians and it is difficult to ensure safety from crime on pedestrian paths table 5.7 This shows that it is true that respondents are still difficult to ascertain crimes around Merdeka Square even though there are lights along the way. pedestrian path. Meanwhile, in field conditions, security facilities from crime such as street lighting and bollards have been met, where the street lights are always on so that the pedestrian path is bright and not dark (figure 12).

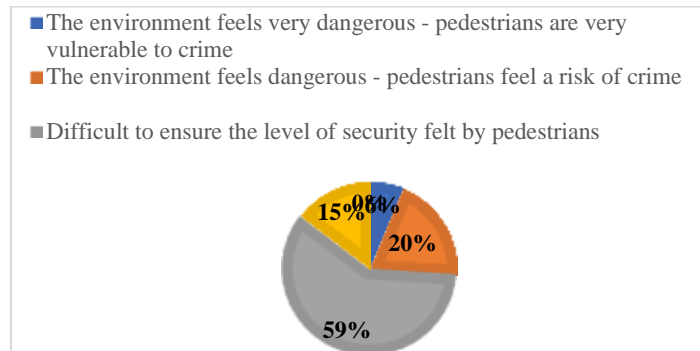


Figure 12: Graph of Security in Crime at Merdeka Square

**b. Corridor Kesawan**

Based on the results of the questionnaire tabulation that has been carried out, for the existing conditions in the security prison from crime have been minimized and facilities such as cerebrum have been fulfilled figure 13 (a), after analyzing using a pedestrian crosstab it is difficult to determine the crime caused because pedestrians feel that the street lights are functioning part. In fact, the street lights in Kesawan are already functioning properly because they are available and all on figure 13 (b). And the tabulation of the questionnaire can be seen in figure 12 (b) below.

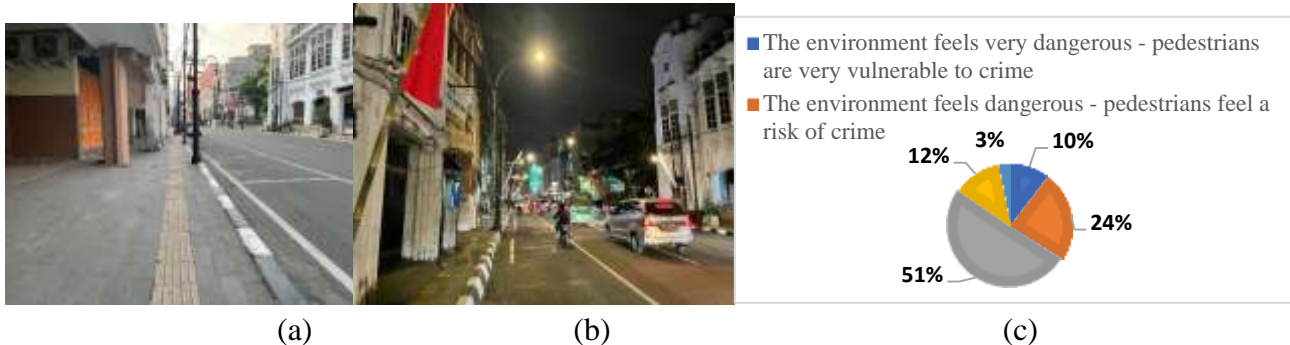


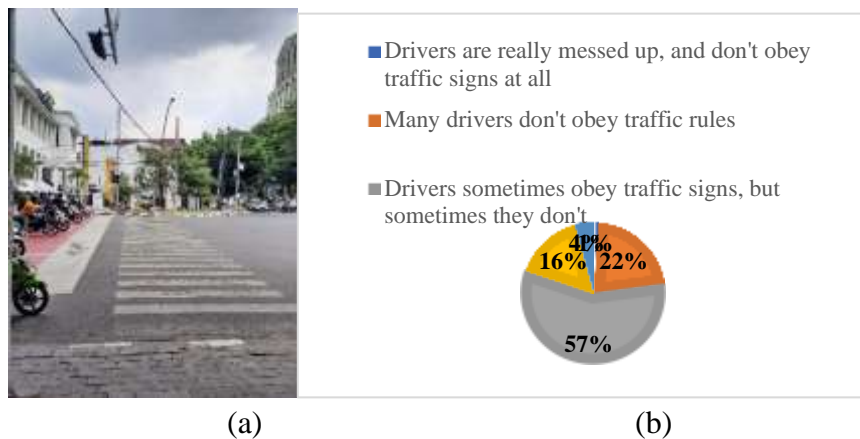
Figure 13: (a) Security Facilities (kereb) in Kesawan (b) Security Facilities (Lamps) in Kesawan (c) Graph of Questionnaire Results Regarding Security in Crime Acts in Kesawan

**4. Quality of Driver's Behavior**

According to Law No. 22 of 2009, motorists as road users should be the pioneers of obeying traffic, namely orderly, smooth, safe, and integrated if traffic takes place regularly in accordance with the rights and obligations of road users. Road users are motorists and pedestrians. It is not only motorists who use the road, road users such as pedestrians, and people with disabilities also have the right to use the road. In driving and using the road, every road user has ethics to respect fellow users. Driver behavior in essence must comply with the existing regulations with pleasure. According to Soengeng, the behavior of motorists should adhere to the values of obedience, obedience, order and order.

**a. Merdeka Square**

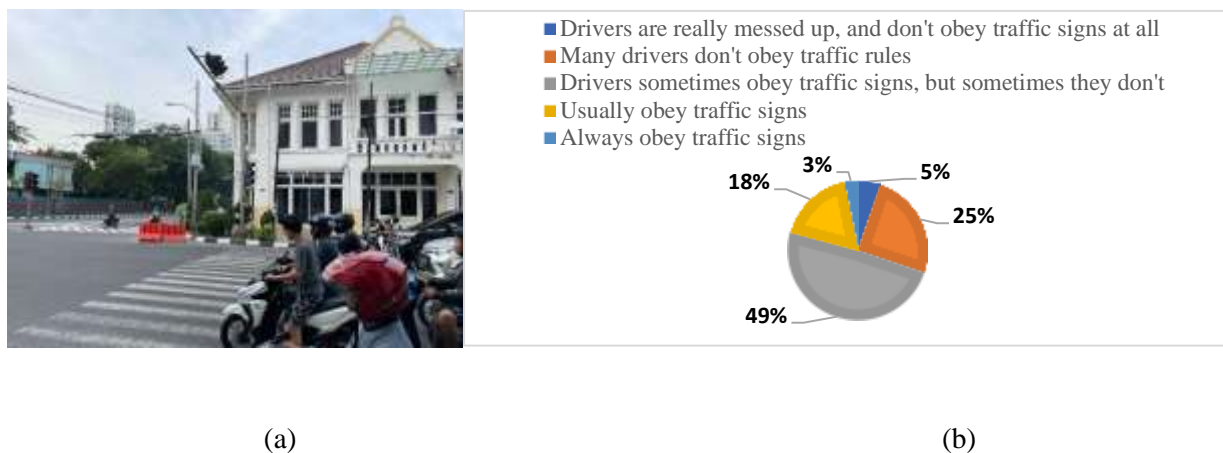
Then at the research location in the Merdeka field, the behavior of drivers is still difficult to ascertain, where sometimes drivers obey traffic signs but sometimes drivers also violate traffic as shown in Figure 14 (a), violations occur when there are too many vehicles and congestion occurs. This is evidenced by the results of the questionnaire that has been given, more respondents said that drivers sometimes obey traffic signs but sometimes they don't) as shown in the following figure 14 (b).



**Figure 14: (a) Driver's Behavior at Merdeka Square (b) Graph of Respondents' Results Regarding Rider Behavior at Merdeka Square**

**b. Corridor Kesawan**

For the existing conditions in Kesawan, the behavior of motorists on the road is good where the riders stop behind the zebra cross, it's just that there are some motorcycle riders who drive on the pedestrian path or just stop to wait for orders like the online motorcycle taxi drivers as shown in the picture 15 (a) The tabulation of the questionnaire can be seen in Figure 15 (b) below.



**Figure 15: (a) Quality of Driver's Behavior in Kesawan (b) Graph of Questionnaire Results Regarding Driver's Behavior in Kesawan**

### C. Comfort and Attractive Factors

#### 1. Maintenance and Cleanliness

Something clean will add to the attraction and comfort for pedestrians. Apart from cleanliness, the maintenance of pedestrian infrastructure is equally important. For example, if the pedestrian path is not fully maintained, then one cannot use the pedestrian path. A clean and well-maintained environment is not only pleasing and comfortable for pedestrians but can also demonstrate the city's respect for pedestrians [25].

##### a. Merdeka Square

Then for the existing conditions in the Merdeka Square regarding the maintenance of the pedestrian path, the pedestrian path is already available but there are several locations where the pedestrian path has holes or the pavement is damaged, as seen in Figure 16 (a), this is the same as the respondents' answers in figure 16 (b) shows that the maintenance of well-maintained and important pedestrian paths as stated by (Swastika, 2018) has not been fulfilled.



**Figure 16: (a) Condition of Pedestrian Path Maintenance at Merdeka Square (b) Grafik Graph of Maintenance and Quality of Pedestrian Paths at Merdeka Square**

Cleanliness is the state of being free from dirt, including dust, garbage and odors. Something clean will add to the attraction as well as comfort for pedestrians. Cleanliness is usually associated with waste management. So that trash bins need to be placed on pedestrian paths [26]. Then the trash cans should be located every 20 meters with the size needed, and the materials used are materials with high durability such as metal and concrete [12]. In addition, trash cans must be placed in spaces free of pedestrian paths and must be easy to transport [27]. Then the results of the questionnaire distribution as shown in figure 17 (a) respondents at most chose a few pedestrian paths covered with garbage, in the Merdeka field area there were 13 units of trash cans made of iron and plastic, for trash cans the distance between one trash can and another is approx. 6 meters and some are 10 meters away figure 17 (b), then this is said to have met the standard.

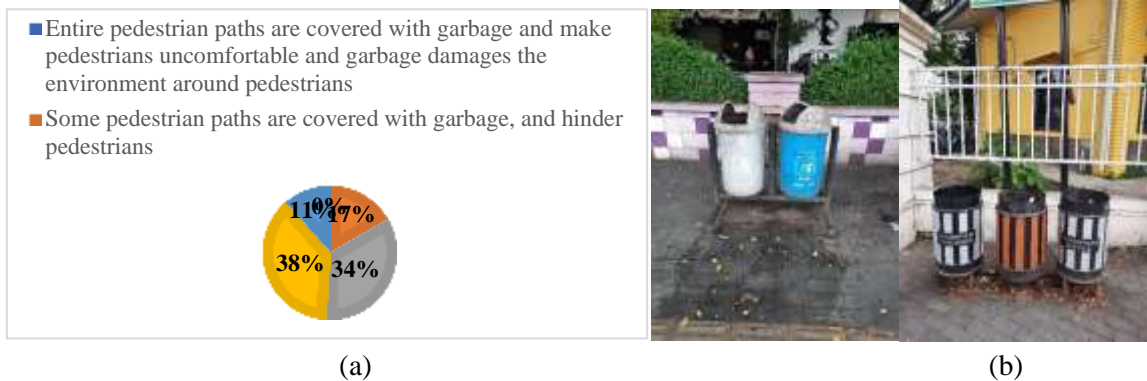


Figure 17: (a) Graph of Cleanliness Conditions for Pedestrian Paths at Merdeka Square (b) Trash cans on Pedestrian Paths at Merdeka Square

**b. Kesawan**

For maintenance in kesawan, it shows that some pedestrian paths are not very well maintained, for example the pedestrian path that has holes shown in Figure 18 (a), this is similar to the respondent's answer which can be seen in figure 18 (b) below. This indicates that the maintenance of the pedestrian path in Kesawan is still not good.

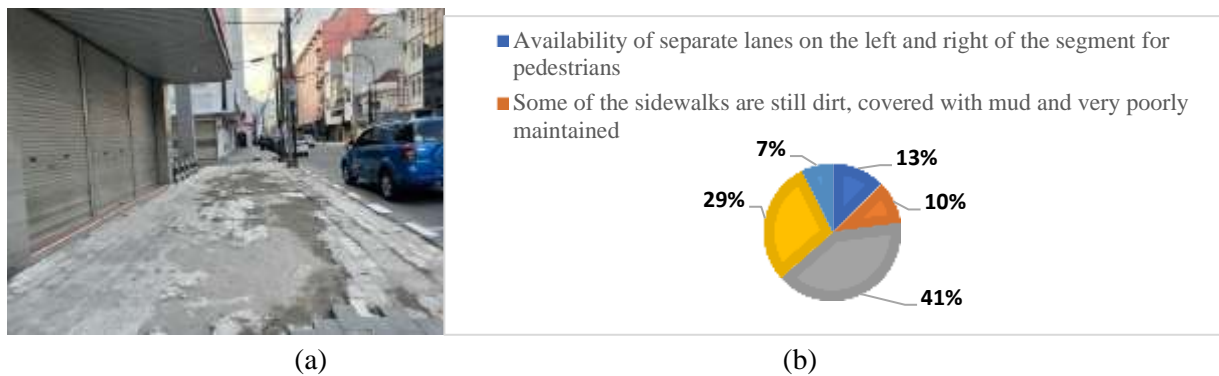


Figure 18: (a) Conditions of Maintenance of Pedestrian Paths in Kesawan (b) Graph of Questionnaire Results Regarding Maintenance of Pedestrian Paths in Kesawan

To get cleanliness on the pedestrian path, garbage bins must be provided and it is necessary to pay attention to certain areas that demand high cleanliness, the selection of ornamental plants and shrubs must be considered so that the power of leaf, fruit and flower loss is important. For the condition of cleanliness in the garden, it has been well maintained, there is no scattered garbage and the supply of waste has been fulfilled, which can be seen in Figure 19 (a). For the tabulation of the questionnaire regarding cleanliness on the pedestrian path, the Kesawan corridor can be seen in Figure 19 (a) below



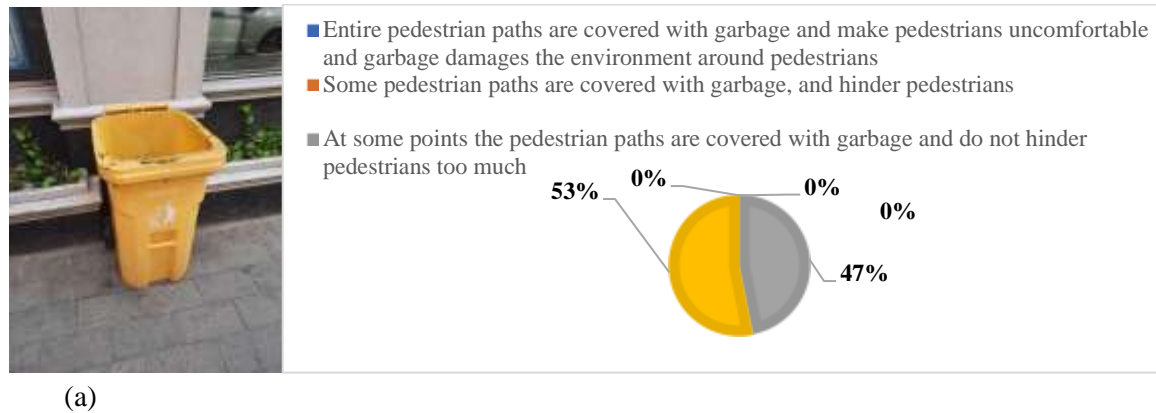


Figure 19: (a) Trash Cans on Pedestrian Paths in Kesawan (b) Graph of Questionnaire Results on Hygiene on Pedestrian Paths in Kesawan

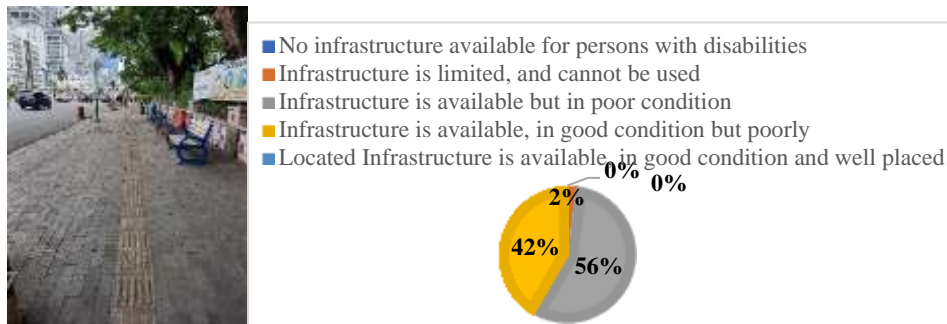
## 2. Disability Infrastructure

Every road used for public traffic must be equipped with road equipment in the form of facilities for pedestrians and people with disabilities [28]. The need for space for pedestrians with special needs according to the Minister of PUPR Number 2 of 2018 is as follows [29].

1. Crutches (walking canes) for people with special needs who have difficulty walking so they can be assisted by crutches or walking sticks. The space for crutches users is to have a width of 95 cm.
2. Wheelchairs, for wheelchairs have a greater need for walking space than people who do not need assistive devices to walk on the pedestrian path. The use of a wheelchair requires space on the pedestrian path with a width of 160 cm.
3. Passing Place is a place to precede or pass each other, where if a person with a disability, then the passing place is 1.8 m wide and 2 m long so that there is no conflict between each other.
4. Provision of information for pedestrians who have limited provision of information facilities that are able to coordinate pedestrians with special needs. It can be an audible signal, a vibration and a detectable warning.
5. Guide lanes, for pedestrians with special needs (blind), require special information on the surface of the pedestrian lane. This information can be in the form of a guiding block.

### a. Merdeka Square

In the existing conditions in the Merdeka field, if it is adjusted to the PUPR minister's decision number 2 of 2018, the disability facilities in the Merdeka field have not met the needs. This is evidenced that there are only guiding block available for persons with disabilities as seen in Figure 20 (a). Meanwhile, facilities such as crutches, wheelchairs, providing information, and even guide lanes do not exist. Then for the results of the questionnaire regarding facilities for persons with disabilities, many respondents chose infrastructure that was available but in poor condition as seen in Figure 20 (b) below.

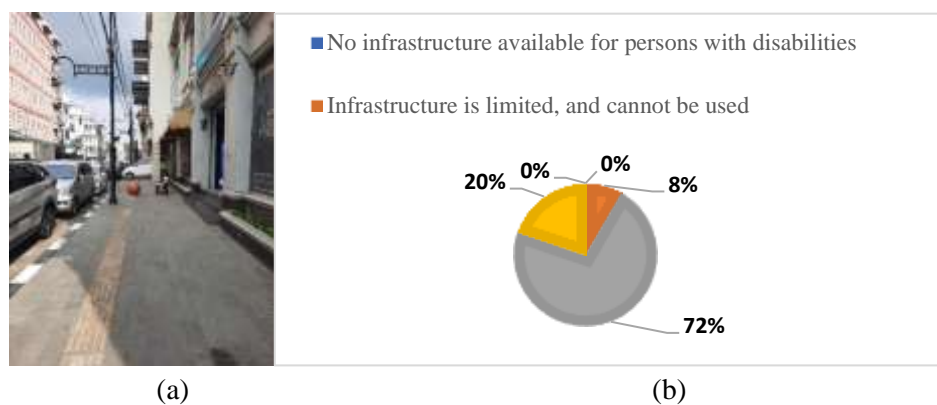


**Figure 20: (a) Ramp Facilities on Pedestrian Paths at Merdeka Square (b) Graph of Questionnaire Results Regarding Availability of Disability Infrastructure on Pedestrian Paths at Merdeka Square**

The results of the questionnaire are inversely proportional to those in the field, almost 56% said the availability of facilities but poor conditions and 42% said the availability of facilities but poor placement while in the field the availability of disability facilities was only ramps, the availability of sticks, wheelchairs were not available.

**b. Kesawan Corridor**

Then for pedestrian facilities with special needs in Kesawan there is only a ramp in the form of a straight yellow line as shown in Figure 21 (a), for cane and other facilities not available. This indicates that the government does not pay much attention to the fulfillment of the needs of pedestrian facilities with special needs. The tabulation of the questionnaire can be seen in Figure 21 (b) below.



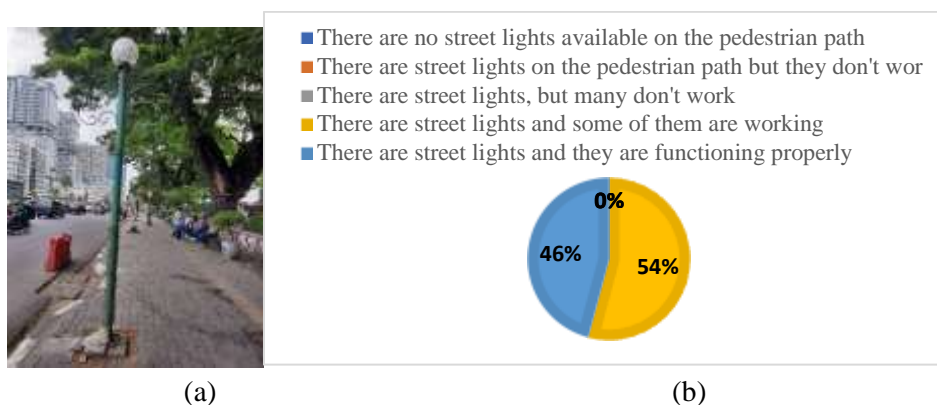
**Figure 21: (a) Disability Facilities in the Form of Ramps on Pedestrian Paths in Kesawan (b) Graph of Questionnaire Results Regarding the Availability of Disability Infrastructure on Pedestrian Paths in Kesawan**

### 3. FACILITIES

Supporting facilities are facilities that provide comfort to users and can be an attraction for pedestrian users to use the pedestrian path. Pedestrian facilities can contribute to the attributes of green transportation along with the provision of public transportation so as to reduce congestion [30]. According to the Minister of PUPR Number 2 of 2018 concerning Technical Planning for Pedestrian Facilities, Pedestrian Facilities are all complementary buildings on road-owned space provided for pedestrians in order to provide services for smoothness, security and comfort, as well as safety for pedestrians, which can be in the form of buildings, complementary information instructions and other supporting tools [10]. (The pedestrian facilities include lighting, signs, bollards, benches, shade plants, telephones, canopies, trash cans.

#### a. Merdeka Square

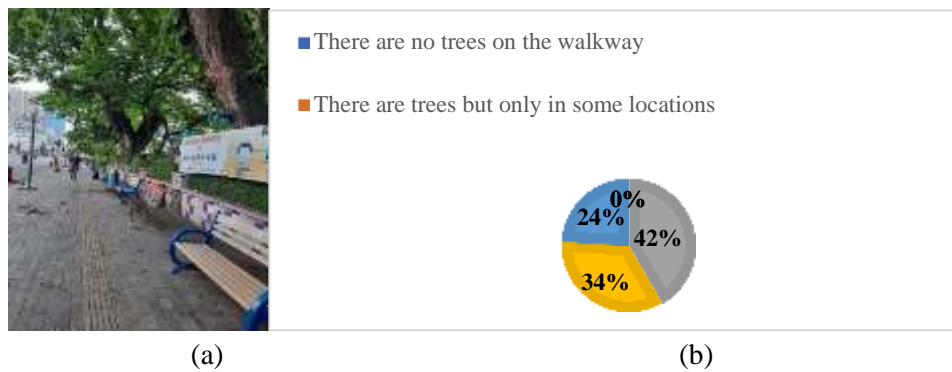
Street lighting is a public facility in the form of street lamps on public roads. The function of this public street lighting is as a safety for road users who can avoid accidents due to damaged roads, and a security function that minimizes crime rates at night, and travels safely from various bad things at night [31]. The existing condition of the lighting in the Merdeka field is already available, but there are some problems with the lighting in the Merdeka field, there are broken lamps filled with grass and the poles have started to rot, but not too many and for lighting needs already fulfilled figure 22 (a) while for the results of the questionnaire, respondents were satisfied with the availability of facilities which can be seen in Figure 22 (b), respondents said that the availability of street lights was plentiful and functioning.



**Figure 22: (a) Street Lights on Pedestrian Paths at Merdeka Square (b) Results of a Questionnaire Regarding the Availability of Lights on Pedestrian Paths at Merdeka Square**

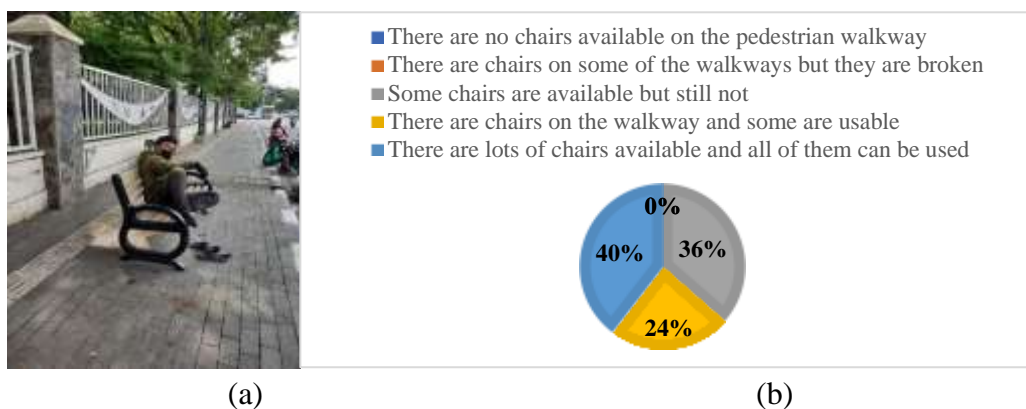
Trees or shade plants serve as protection and conditioning for pedestrians and also serve as shade when the weather is unfavorable. Pedestrians need shade in the form of roofs to shade the sidewalks, trees, parks, waiting stalls, and green lanes covered with leave [32]. Merdeka Square has 45% green area, but the distribution of trees is only on the outskirts of the square. The pedestrian path in the Merdeka Square is the green pathway, which is a pedestrian path in public open spaces. In general, the

independent field has vegetation of tree and shrub species with functions as shade, direction and aesthetics that have a direct influence on pedestrian path users. The vegetation of tree species as shade is more dominated by trambesi trees and mahogany trees which are still under-maintained figure 23 (a), then the results of the questionnaire from the public's perception of the shade are the availability of shade trees and also well maintained figure 23 (b) this is not in accordance with the conditions in the independent field, where the trees in the Merdeka field are not well cared for.



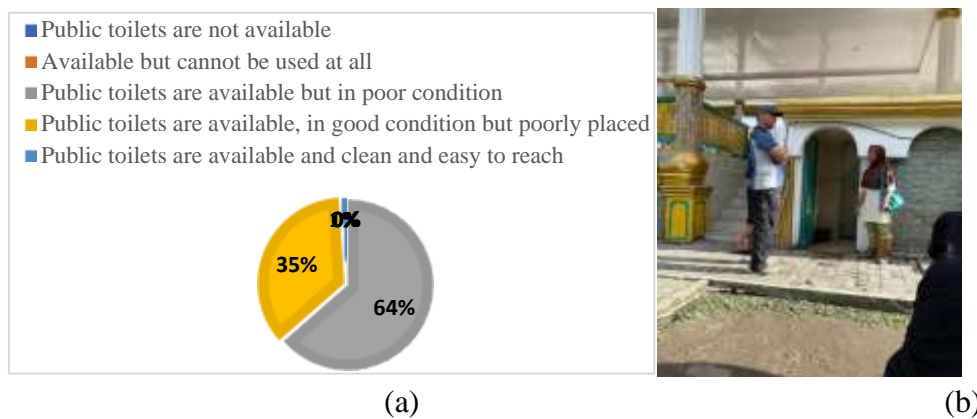
**Figure 23: (a) Availability of Trees on Pedestrian Paths at Merdeka Square (b) Results of a Questionnaire Regarding Availability of Trees on Pedestrian Paths at Merdeka Square**

For the next facility is a seat, the provision of a seat is intended to increase pedestrian comfort and is located on a pedestrian path without disturbing movement. There are about 38 seats on the pedestrian path with the condition of the currently available seating facilities partially damaged made of iron material, but the damage is only a few seats, there is a new seat on the pedestrian path to be exact at railroads made of wood and iron figure 24 (a). Then the respondent's answer to pedestrian facilities in the form of seats is that some respondents are satisfied with the availability of seats, but there are also those who feel that seats are still lacking and only part of them can be occupied figure 24 (b).



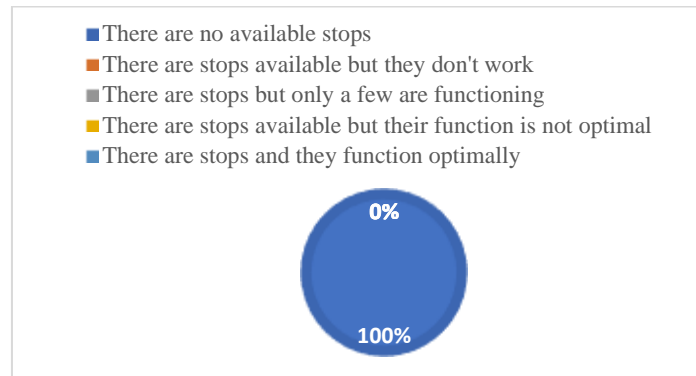
**Figure 24: (a) Availability of Trees on Pedestrian Paths at Merdeka Square (b) Results of a Questionnaire Regarding Availability of Trees on Pedestrian Paths at Merdeka Square**

The next pedestrian facility is a public toilet, a public toilet is a specially designed room with a toilet, water supply and clean and hygienic equipment. Public toilets at Merdeka Square are located in the field with a total of 2 units figure 25 (a), the condition of these toilets is still lacking when compared to visitors who come so there are often long queues. As for the results of the questionnaire, most respondents said that the availability of toilets was in poor condition figure 25 (b), this means that the results of the questionnaire with conditions in the field are the same.



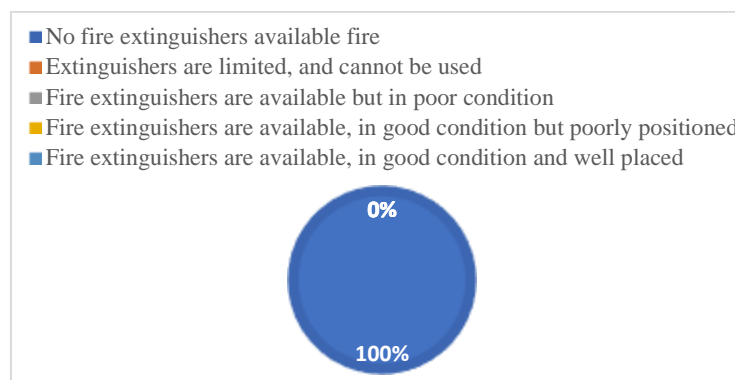
**Figure 25: (a) Questionnaire Results Regarding the Availability of Public Toilets at Merdeka Square (b) Availability of Public Toilets at Merdeka Square**

The bus stop functions as a waiting room for bus users whose placement does not reduce the effective width of the pedestrian path. The material used for the stop is a material that has high durability so it is not easily damaged and is comfortable to use. Then the bus stop is placed on the facility lane so as not to reduce the effective width of the pedestrian path [10]. Then for the tabulation of the questionnaire regarding the availability of shelter facilities, all respondents chose the unavailability of the shelters as shown in Figure 26, the results of this questionnaire are indeed in sync with In the existing situation, the Merdeka field does not have a bus stop, so this shows that the Merdeka field which is used as a city park is still lacking in fulfilling facilities



**Figure 26: Questionnaire Results Regarding Availability of Bus Stops on Pedestrian Paths at Merdeka Square**

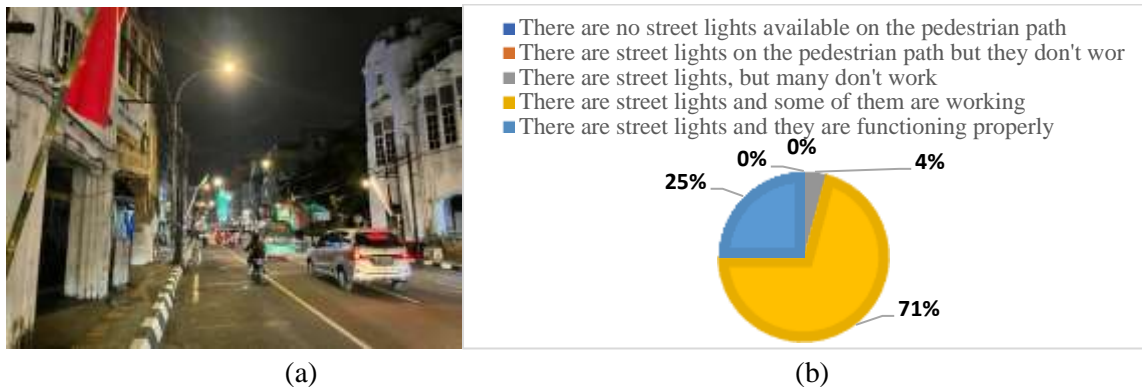
The next pedestrian facility is a fire extinguisher, a fire is an event that occurs due to an unwanted flame [34]. in the Minister of Public Works No. 20 of 2009, in the fire protection infrastructure, it is stated that every environment and building must provide accessibility for firefighting purposes which includes entry routes including return loops for firefighters. In addition to fire engines, fire extinguishers such as dry chemical powder, carbon dioxide, foam and non-CFC liquid halon gas must be available in the public environment. However, this is inversely proportional to the public area of the Merdeka field, in the Merdeka field itself there are no firefighting facilities such as light fire extinguishers, this is evidenced by respondents' answers regarding the availability of fire extinguishers. Of the 96 respondents who were asked to fill out the questionnaire, all respondents chose to answer that there were no fire extinguishers as shown in Figure 27 below.



**Figure 27: Questionnaire Results Regarding Availability of Fire Extinguishers on Pedestrian Paths at Merdeka Square**

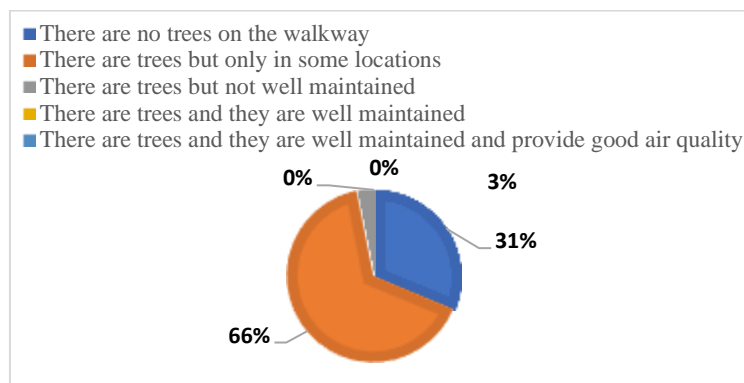
**b. Kesawan**

Street lighting should be placed on the facility path. Then for the conditions in the garden, the lighting is already functioning properly, with 48 lamps in a well-maintained condition. The lighting in the field is placed near the pedestrian lane so that it does not become too much of a barrier for pedestrians figure 28 (a) For the tabulation of the questionnaire, see Figure 28 (b) below.



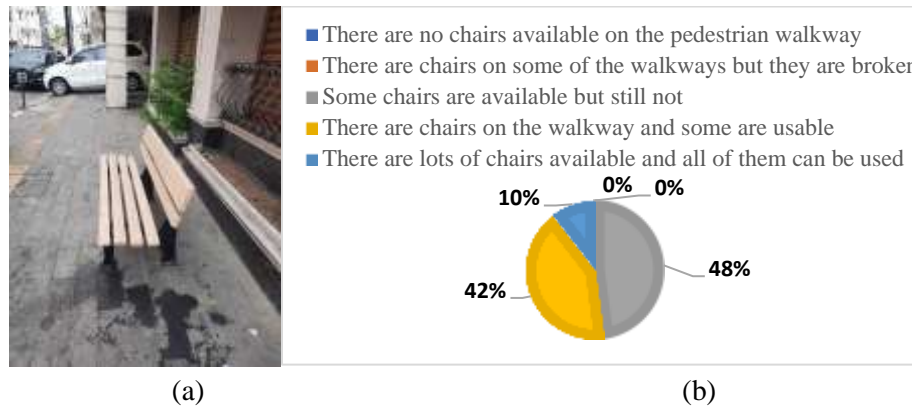
**Figure 28: (a) Street Light Facilities on Pedestrian Paths in Kesawan (b) Results of a Questionnaire Regarding Street Light Facilities in Kesawan**

Then the second supporting facilities are trees/shade, trees or shade which function to provide shade and block the glare of sunlight for pedestrians. In addition, the shade function is able to absorb motor vehicle smoke pollution and reduce noise. For the existing conditions in the garden, the trees are still not available and even shade is also available, so for the conditions in the field, the pedestrians still feel hot when walking in this area. This is similar to the answers from the respondents which can be seen in the picture which says there are no trees on the pedestrian path which can be seen in Figure 29 below.



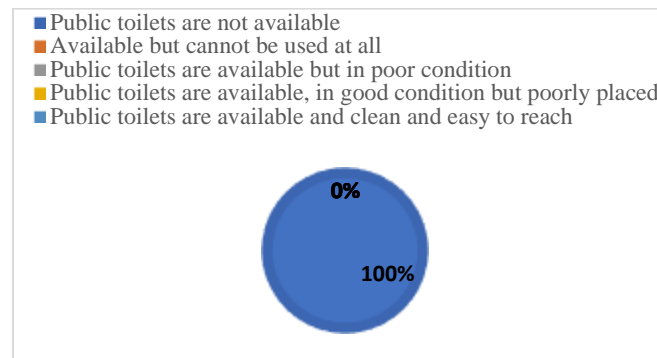
**Figure 29: Questionnaire Results Regarding Tree Facilities in Kesawan**

For supporting facilities for pedestrian paths, the third is a chair or seat. Seating is placed outside the free space for the pedestrian path. Then for the seating facilities in the kesawan, there are 3 seating points, made of wood and still in new condition figure 30 (a), then a round stone can also be seen. So for the need for chairs, it can be said that it has not been fulfilled, which is strengthened by the results of the questionnaire in the picture, many respondents choose available seats but only at some points figure 30 (b)



**Figure 30: (a) Chair Facilities on Pedestrian Paths in Kesawan (b) Results of a Questionnaire Regarding Walking Chair Facilities in Kesawan**

The fourth supporting facility is public toilets, although public toilets are often located on minimal land, but toilets general must pass the space requirements. This is not only for convenience but also for the health of the body. For the availability of public toilet facilities, the farm does not yet have a public toilet. This is also supported by the results of the questionnaire, namely 96 respondents said that there are no public toilets in the kesawan (figure 31). The reason is because there are no public toilets in the kesawan corridor. This means that the animal kingdom does not yet have the readiness to meet pedestrian facilities.



**Figure 31: Questionnaire Results Regarding Tree Facilities in Kesawan**

The fifth supporting facility is the bus stop, the bus stop is one of the supporting facilities that serves as a place to stop public transportation to pick up and drop passengers. The existing conditions in Kesawan do not have bus stop facilities, even though in the Kesawan corridor there are bus stops. And then for the results of the questionnaire regarding the availability of shelters, 96 respondents (100%) chose not to provide shelters figure 32. So, it can be concluded that the need for a bus stop in Kesawan is very much needed considering that in Kesawan there is a trans deli bus stop location.



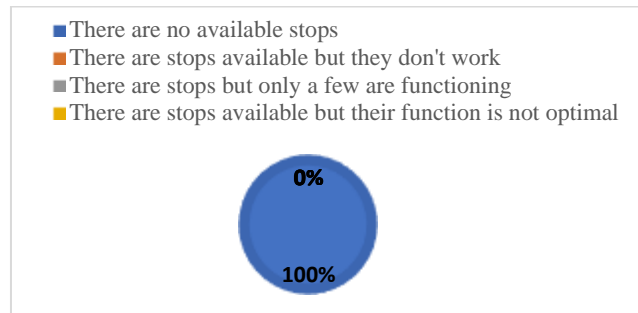


Figure 32: Questionnaire Results Regarding Bus Stop Facilities in Kesawan

Then the next supporting facilities are fire fighting facilities, in addition to fire engines, fire extinguishers such as dry chemical powder fire extinguishers, carbon dioxide, foam and non-CFC liquid halon gas must be available in the public environment. However, this is inversely proportional to trade and service areas such as kesawan, where kesawan has land uses such as restaurants that are prone to fires and in kesawan there are no fire fighting facilities. this is evidenced by the respondents' answers regarding the availability of fire extinguishers. Then for the results of the questionnaire regarding fire extinguishers, 96 respondents chose the absence of fire extinguishers in the field. For more details regarding the availability of fire extinguishers, see Figure 33 below.

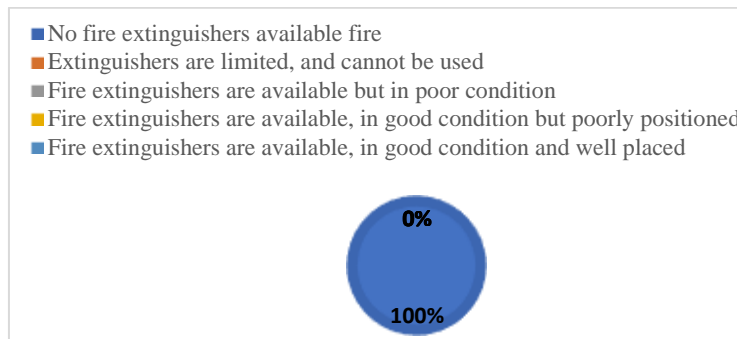


Figure 33: Questionnaire Results Regarding Fire Extinguisher Facilities in Kesawan

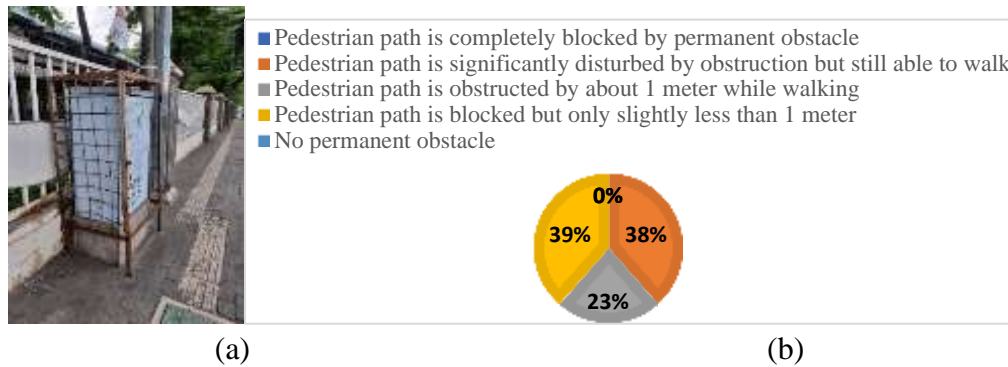
### 5. Barriers

In this study, barriers have 2 characteristics, namely, permanent barriers and temporary barriers. These permanent barriers can be in the form of public telephones, trees, bus stops, lighting lamps in the middle of the pedestrian path which can indicate the ineffective use of the pedestrian path, then temporary/contemporary barriers in the form of street vendors or pedestrian paths that are used as parking lots. whose presence can interfere with pedestrians and cause ineffective pedestrian lane widths [29].

#### a. Merdeka Square

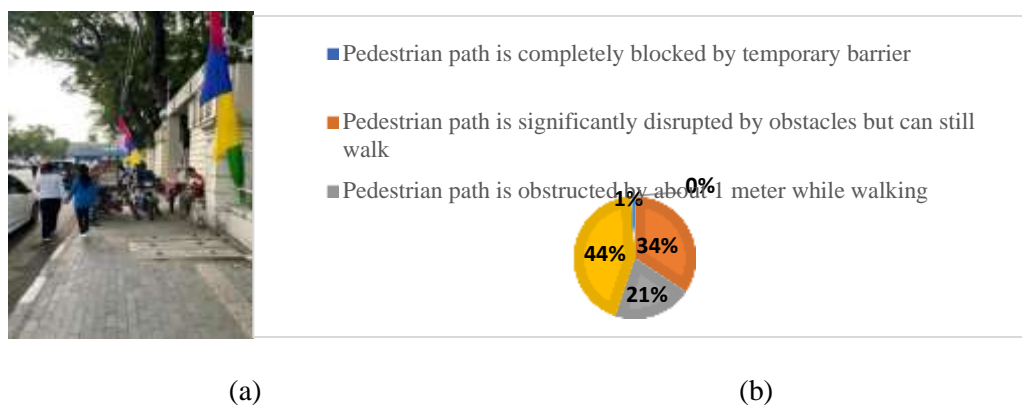
Meanwhile, in Merdeka Square, there are permanent obstacles such as street lamps, chairs, trees, and electricity and telephone poles. For permanent obstacles in the Merdeka field there are 17 points, one

of the permanent obstacles that is too conspicuous in the Merdeka Square is the electricity poles that block pedestrians, especially the ramp facilities which are useful for people with disabilities figure 34 (a). Then the results of the questionnaire tabulation can be seen in Figure 34 (b)



**Figure 34: (a) Permanent Barriers to Pedestrian Paths at Merdeka Square (b) Graph of Questionnaire Results Regarding Permanent Barriers to Pedestrians at Merdeka Square**

For conditions in the Merdeka field, temporary obstacles in the form of parking lots and street vendors, these street vendors stand on the pedestrian path so they take pedestrian rights figure 35 (a). This can also be proven by questionnaires that have been distributed to 96 respondents. Where many respondents chose obstructed pedestrian paths but they also answered with answers that were not too disturbed (figure 35 (b))

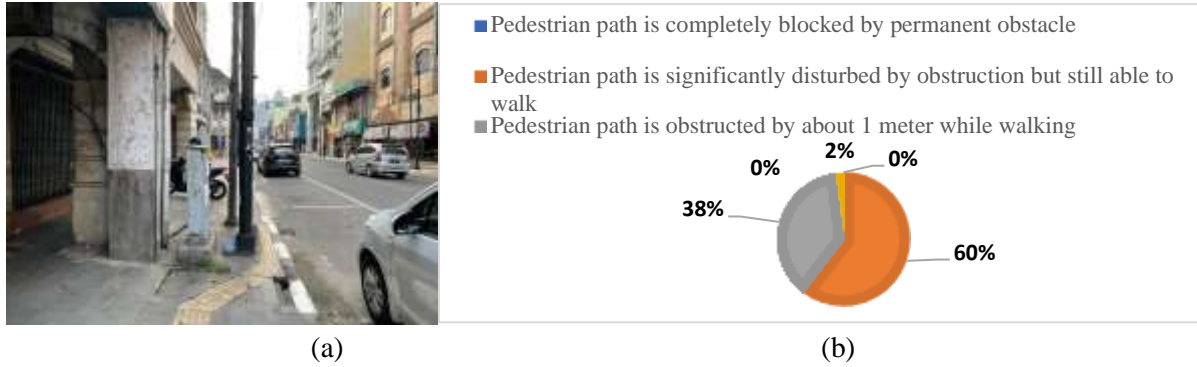


**Figure 35: (a) Temporary Obstacles on Pedestrian Paths at Merdeka Square (b) Results of a Questionnaire Regarding Temporary Barriers on Pedestrian Paths at Merdeka Square**

**b. Corridor Kesawan**

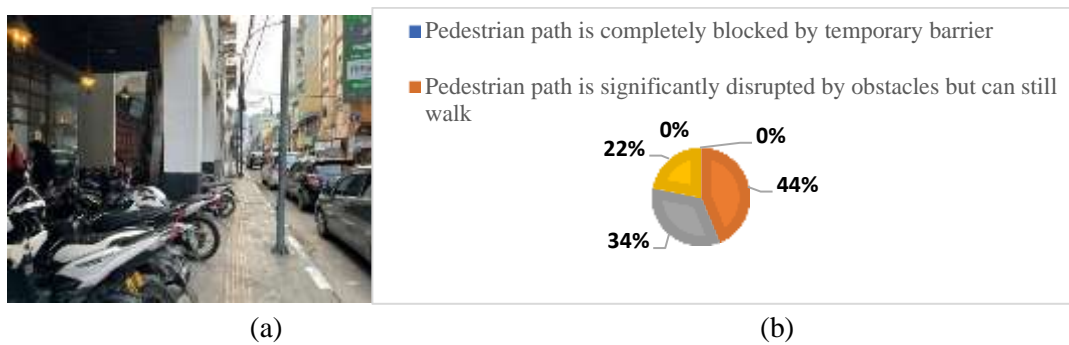
Then for the existing condition in Kesawan there are 25 permanent barrier points in the form of building poles and lamp posts figure 36 (a), this shows that the Kesawan is not in accordance with the element of comfort that has been said by Unterman, it's just a permanent barrier located in the area. kesawan still not too fatal so pedestrians can still walk. so that it can be concluded that there are

obstacles in the field but the obstacles do not hinder pedestrians too much, only making the pedestrian path narrow. The tabulation of the questionnaire can be seen in Figure 36 (b) below.



**Figure 36: (a) Permanent Barriers on Pedestrian Paths in Kesawan (b) Graph of Questionnaire Results Regarding Permanent Barriers in Kesawan**

Then for the existing condition of temporary barriers that are in kesawan, there are still pedestrian paths that are used as parking at several points and this affects pedestrians because the pedestrian path becomes narrow (figure 37 (a)). so that it can be concluded that on the pedestrian path of the Kesawan corridor there is a temporary barrier in the form of motorcycle parking, it's just that it's not too blocking because pedestrians can still walk. The tabulation of the questionnaire can be seen in Figure 37 (b) below.



**Figure 37: (a) Temporary Barriers on Pedestrian Paths in Kesawan (b) Results of a Questionnaire Regarding Temporary Barriers in Kesawan**

### Availability of Crossings

Crossings are facilities that connect between opposite pedestrian spaces. This parameter looks at the availability and distance of the crossing so that it describes the condition of pedestrians when crossing. According to the Minister of Public Works Regulation Number 3 of 2014 concerning Guidelines for Planning, Provision, and Utilization of Pedestrian Network Infrastructure and Facilities in Urban Areas, the availability of crossings aims to ensure that existing pedestrian paths are not interrupted and

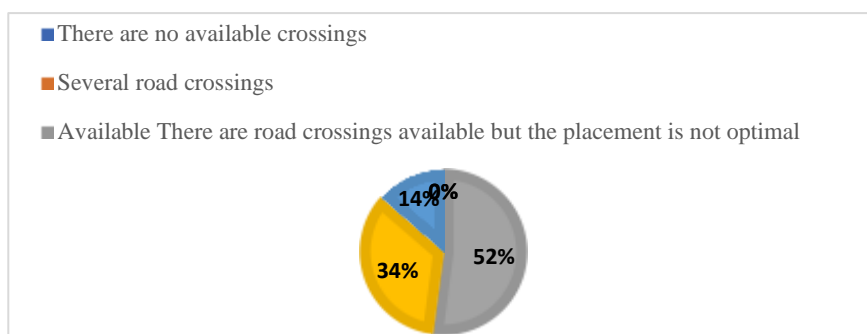
to facilitate the change of different lanes [14]. that crossings are divided into 2, namely level crossings (zebracross, pelican) and non-level crossings (bridge crossings, tunnels).

**a. Merdeka Square**

Then for the availability of crossings in Merdeka Square, Merdeka Square has two crossings, namely 3 zebra located on the City Hall Road, Pulau Pinang Road and the Railway. Then there is a pedestrian bridge on the railroad (figure 38 (a)). After that, for the answers to the questionnaire, most of them chose to have road crossings available but their placement was not optimal (figure 38 (b)) this is because there is no zebra crossing on one of the roads in Merdeka Square so pedestrians find it difficult to cross plus only on the city hall road where the crossing is given a sign -sign.



(a)



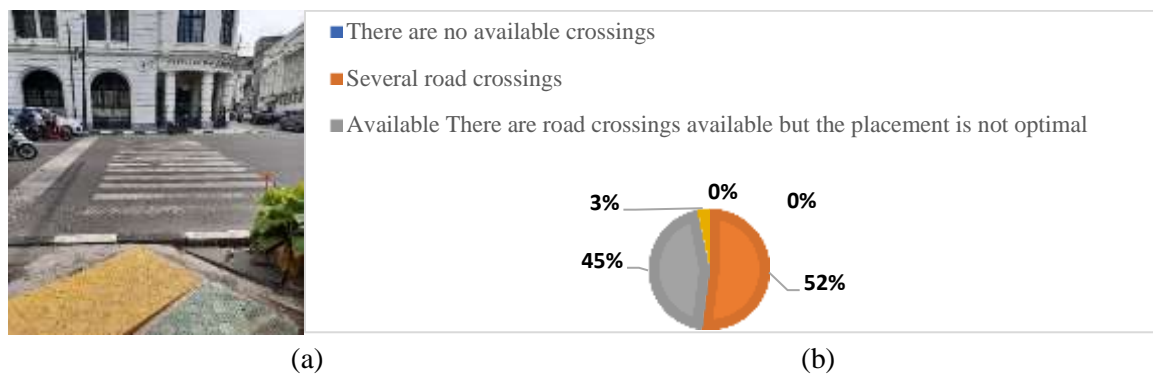
(b)

**Figure 38: (a) Availability of Crossings on Pedestrian Paths at Merdeka Square (b) Graph of Questionnaire Results Regarding Availability of Crossings on Pedestrian Paths at Merdeka Square**

**b. Corridor Kesawan**

Then based on the existing conditions in the area around the Kesawan corridor, the availability of crossings is only a zebra cross that is available between the intersection of 4 Jalan Ahmad Yani and Jalan Pulau Pinang figure 39 (a), this indicates that the availability of crossings in the Kesawan

Corridor still does not meet the needs of the crossing because the road Ahmad Yani is quite long, so if you want to cross safely without conflict, pedestrians will turn towards the crossing so that it will take quite a long time, especially on Ahmad Yani's road, the driver is traveling at high speed. Respondents also said the same thing, which can be seen in Figure 39 (b) below. so, it can be concluded that the availability of crossings still does not meet the needs of pedestrians, especially this area including trade and service areas so that it becomes a magnet for downtown activities.



**Figure 39: (a) Crossing Facilities in Kesawan (b) Results of a Questionnaire Regarding Availability of Crossings in Kesawan**

#### D. Walkability Value

In finding the walkability value in Medan City Center (freedom field and kesawan) the first thing is to tabulate the results of the questionnaire distribution, after getting the results of the questionnaire tabulation, the next step is to count pedestrians crossing the survey location for 5 minutes, after doing the calculations Pedestrians then measure the length of the surveyed pedestrian path with the provisions of km.

**Table 8: Walkability Score Results in Medan City Center**

Indicator	Segmen				Results
	1	Description	2	Description	
Pedestrian Path Conflict	3,1	Good	3,3	Good	70,07
Safety Crossing	2,7	Enough	2,6	Enough	59,32
Security From Crime	2,8	Enough	2,8	Enough	62,16
Quality of Driver Behavior	3	Good	3,1	Good	67,22

Indicator	Segmen				Results
	1	Description	2	Description	
Maintenance and Cleanliness	3,5	Good	3,3	Good	76,45
Infrastructure Disability	3,4	Good	3,1	Good	73,61
Facilities	2,7	Enough	2,1	Enough	56,20
Barriers	3,1	Good	2,5	Enough	65,08
Availability of Crossings	3,6	Good	2,6	Enough	99,64
Pedestrian Count	38		24		
Length of Surveyed Roads (Km)	0,84		0,5 2		
Results					69,97

**Table 9: Walkability Rating By Weight**

Category	Walking Ability Level	Description
1-50		Not Good For Walking
51-70		Waiting to walk
71-100		Very Good For Walking

Source: Gota, 2010

Based on the results of calculations that have been carried out, it can be seen that the walkability value at the research site is 69.97 as shown in table 5.8 above. Where this value is included in the yellow category, with a score of 50-70 which means waiting to walk / good enough to walk. The meaning of good.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

##### 4.1. Conclusions

From the results of the study, it can be seen that the walkability study location in the city center of Medan has shown good enough to walk, this is indicated by the high walkability value at 69.97 with 9

parameters. Even though there are obstacles on the pedestrian path and the availability of facilities has not been fulfilled, the pedestrians are still quite comfortable walking in the center of the Medan city. At the level of walkability in Medan City Center it still does not provide the best service, it is shown in the safety and security variable on the pedestrian path in Medan City Center where for pedestrian safety in the form of kerbs and bollards it is still not able to make motorcyclists not take the pedestrian path. pedestrians so that pedestrian conflicts with other modes of transportation occur, as well as security from crime, pedestrians are still not able to ensure the level of security even though pedestrian facilities such as lighting are available, but from all of that the pedestrian path in Medan City is good enough for walking. this is inversely proportional to being in Japan, security in Japan is maximized as if we are still on the pedestrian path, then we can be sure it is safe from motorists. Then for convenience and attractiveness regarding maintenance and cleanliness in Medan City Center, pedestrian path facilities have been fulfilled starting from benches, lighting, shade and trash cans. Cleanliness on the pedestrian path is also good, it can be seen from the rarely found scattered garbage, it's just that the maintenance of the pedestrian path has not been properly maintained, it can still be found at several points of the pedestrian path with holes and temporary obstacles in the form of street vendors and parking are still found, although once the pedestrian path can still walk.

#### **4.2. Recommendations**

Based on the results of research that has been carried out at the research location, the recommendations from this study are:

In the independent field, in terms of security and safety, several bollards and barriers for pedestrian paths with public lanes are provided so that motorists cannot go up to the pedestrian path which can cause pedestrian conflicts with other modes of transportation. The crossing lights must be updated and the addition of pedestrian lane control facilities. Meanwhile, for convenience and attractiveness, it is necessary to add facilities in the form of fire extinguishers, as well as maintenance of pedestrian paths need to be considered, patching of perforated pedestrian paths and routine maintenance of pedestrian paths carried out by the cleaning and landscaping department. In the safety and comfort corridor area, it is necessary to provide bollards and barriers so that motorcyclists cannot climb onto the pedestrian path, as well as the addition of a zebra cross and crossing facilities as well as widening the pedestrian path to a minimum of 5 meters. Then for comfort and attractiveness it is necessary to add pedestrian facilities in the form of fire extinguishers and shelters as well as shade trees and canopies and the behavior of drivers needs to be considered. Patching potholes on pedestrian paths and routine maintenance that needs to be done. And facilities for persons with disabilities need to be improved. Then the solution so that someone is interested in walking is the first from the government, namely by making it difficult for someone to own a vehicle such as complicating purchasing administration, increasing the selling price of vehicles and increasing personal vehicle taxes and accompanied by the arrangement of pedestrian paths that are easily accessible by public transportation, The example is pedestrians as a by-product of a public transportation system that is efficient enough so that someone will depend on public transportation and they will depend on public transportation which over time

will get used to it. So, in their thinking to move from one place to another is on foot. The government must have a mature and long-lasting concept to create a bigger magnet to attract walking interest in the city center of Medan but not reduce the income turnover of traders. It is also hoped that the cooperation of the government and the academic field in developing pedestrian paths that are connected to the transit area. In addition, the government needs to make strict regulations regarding the consequences of violating motorists and crossing safety in the form of traffic lights.

## REFERENCES

- [1] cardiometabolic risk? Health and Place, 21, 163–169. <https://doi.org/10.1016/j.healthplace.2013.01.009>
- [2] Frank, L. D., Saelens, B. E., Powell, K. E., & Chapman, J. E. (2007). Stepping towards causation: Do built environments or neighbourhood and travel preferences explain physical activity, driving, and obesity? Social Science and Medicine, 65(9), 1898–1914. <https://doi.org/10.1016/j.socscimed.2007.05>.
- [3] Pasaogullari, N., & Doratli, N. (2004). Measuring accessibility and utilization of public spaces in Famagusta. Cities, 21(3), 225–232. <https://doi.org/10.1016/j.cities.2004.03.003>
- [4] Krambeck, H., & Shah, J.J. (2006). The Global Walkability Index.
- [5] Gota, S., Fabian, H. G., Mejia, A. A., & Punte, S. S. (2010). Walkability surveys in Asian cities. Clean Air Initiative for Asian Cities (CAI- Asia)., 20. [http://www.ictct.org/migrated\\_2014/ictct\\_document\\_nr\\_663\\_102A Sophie Sabine Punte Walkability Surveys in Asian Cities.pdf](http://www.ictct.org/migrated_2014/ictct_document_nr_663_102A_Sophie_Sabine_Punte_Walkability_Surveys_in_Asian_Cities.pdf)
- [6] Lemeshow, 1997, Besar Sampel Dalam Penelitian Kesehatan, Yogyakarta, UGM
- [7] Adrian, A. B., Fachrudin, H. T., & Nasution, A. D. (2021). Fasade Typology Analysis, Case Study Kesawan Street, Indonesia. International Journal of Education and Social Science Research, 04(06), 144–156. <https://doi.org/10.37500/ijessr.2021.4611>
- [8] Nichols, G., Veith, G., & Austroads. (2009). Guide to road design. Part 6A, Pedestrian and cyclist paths. Guide to Road Design, 115.
- [9] Tamiami Fachrudin, H. (2018). Can activity support influence image of a street? IOP Conference Series: Earth and Environmental Science, 126(1). <https://doi.org/10.1088/1755-1315/126/1/012197>
- [10] SE Menteri PUPR No. 02/SE/M/2018 Tentang Pedoman Perencanaan Teknis Fasilitas pejalan Kaki, (2018).
- [11] Surandono, A., & Faizal, A. (2015). STUDI KEBUTUHAN FASILITAS PENYEBERANGAN JALAN DI RUAS JALAN PROKLAMATOR BANDAR JAYA KABUPATEN LAMPUNG TENGAH (Studi Kasus Bandar Jaya Plaza - Komplek Pertokoan Bandar Jaya). Tapak, 5(1), 1–10.
- [12] Pedoman Perencanaan, Penyediaan dan Pemanfaatan Prasarana dan sarana Ruang Pejalan Kaki di Kawasan Perkotaan, (2014).



- [13] Marsaid, M. Hidayat, A. (2013). Faktor yang Berhubungan dengan Kejadian Kecelakaan Lalu Lintas pada Kendaraan Bermotor di Wilayah Polres Kabupaten Malang. *Jurnal Ilmu Keperawatan*, 1(2), 98–112.
- [14] Ipak, I. R. (2015). Pengembangan Ruang Pejalan Kaki Dalam Menunjang Sudirman City Walk Di Kota Pekanbaru.
- [15] Rustam, H., & Hardi, U. (2012). *Komponen Perancangan Arsitektur Lanskap*. Jakarta: PT. Bumi Aksara.
- [16] Mungkasa, O., Perencanaan, B., & Nasional, P. (n.d.). Merengkuh Kota Ramah Pejalan Kaki dan Pesepeda: Pembelajaran Mancanegara dan Agenda Ke Depan Grand Design of air polution management of Jakarta View project. <https://www.researchgate.net/publication/355444206>
- [17] Banks, J. H. (2004). *Introduction to Transportation Engineering, 2nd Edition\_Internasional Edition*.
- [18] Mulyadi, A. M., & Santosa, W. (2022). Tingkat Kepentingan Dan Kualitas Fasilitas Pejalan Kaki Dan Korelasinya Terhadap Walkability Pada Kawasan Transit Oriented Development Di Jakarta. *Jurnal HPJI*, 8(1), 27–38.
- [19] Hakim, A. R. (2005). Analisis Keselamatan Dan Kenyamanan Pemanfaatan Trotoar Berdasarkan Persepsi Dan Preferensi Pejalan Kaki Di Penggal Jalan M.T. Haryono Kota Semarang.
- [20] Trianingsih, L. & Hidayah, R. (2014). Analisis Perilaku Pejalan Kaki Pada Penggunaan Fasilitas Penyeberangan Di Sepanjang Jalan Kawasan Malioboro Yogyakarta. *Inersia*, 10(2), 106–121.
- [21] Ir. Agus Nugroho, M., Haryanto, I. D. S., Ir. Erwin Kusnandar, M., Ir. Janny Agustin, M. S., Ir. Joulla Marsela, M., & Drs. Rozali Ahmad, M. S. (2016). *Modul 8 Keselamatan Pejalan Kaki dan Pesepeda 2016*.
- [22] Hamed, M. M. (2001). Analysis of pedestrians' behavior at pedestrian crossings. *Safety Science*, 38(1), 63–82. [https://doi.org/10.1016/S0925-7535\(00\)00058-8](https://doi.org/10.1016/S0925-7535(00)00058-8)
- [23] Tanan, N., Wibowo, S. S., Tinumbia, N., Jalan dan Jembatan, P., Teknologi Bandung, I., Pancasila, U., Nasution No, J. A., Ganesha No, J., & Srengseng Sawah Jakarta Selatan, J. (2017). Pengukuran Walkability Index Pada Ruas Jalan Di Kawasan Perkotaan (Walkability Index Measurement on Road Links in Urban Area). *Jurnal Jalan-Jembatan*, Volume 34(2), 115:127.
- [24] Atikah. (2014). *Kajian Jalur Pedestrian pada Kawasan Wonokromo Surabaya*.
- [25] Purboraras, A. M. (2021). Analisis fungsi ruang pejalan kaki pada ruang terbuka publik.
- [26] Feybe G. Kaliangga., Veronica A. Kumurur., & A. S. (2014). *Kajian Aspek Kenyamanan Jalur Pedestrian Jl. Piere Tendean di Kota Manado*. *Sabua*, 6(2), 243–252.
- [27] Alviansyah, audi. (2021). Identifikasi Ketersediaan Elemen Pendukung Jalur Pedestrian di Koridor Jalan Paledang Kota Bogor.
- [28] Pemerintah Indonesia. (2009). [16] UU RI No. 22 Tahun 2009 Tentang Lalu Lintas dan Angkutan Jalan, Jakarta. In Undang-Undang RI No.22 tahun 2009 (Vol. 2, Issue 5, p. 255). ???
- [29] Rahmatiani, V., & Kameswara, B. (2021). Tingkat Walkability dan Kepuasan Pejalan Kaki di Kawasan Pendidikan Jatinangor dan Kawasan Perdagangan Sudirman. *Tataloka*, 23(3), 438–451. <https://doi.org/10.14710/tataloka.23.3.438-451>

- [30]N. Tanan & G. B. Suprayoga. (2015). Fasilitas Pejalan Kaki Dalam Mendukung Program Pengembangan Kota Hijau. *Jurnal HPJI*, 1(1), 17–28.
- [31]Shamin, N., & Demak, N. A. K. (2018). Evaluasi Tingkat Penerangan Jalan Umum (Pju) Di Kota Gorontalo. *Sekolah Tinggi Teknik (STITEK) Bina Taruna Gorontalo*, 7(1), 44–61.
- [32]Amerta, T. (2019). Studi Kenyamanan Pejalan Kaki Terhadap Pemanfaatan Jalur Pedestrian Dijalan Protokol Kota Pekanbaru (Studi Kasus: Jalan Ahmad Yani Pekanbaru).
- [33]Priatna, B. D., Fachrudin, H. T., & Nasution, A. D. (2021). Legibility in Lapangan Merdeka Medan in Relationship To Place Attachment. *International Journal of Education and Social Science Research*, 04(06). <https://doi.org/10.37500/ijessr.2021.4607>
- [34]Hargiyarto, P. (2003). Pencegahan dan pemadaman kebakaran. *Pencegahan Dan Penanggulangan Kebakaran*, 7.

### Author Profile



**Retnowati** is a postgraduate student in Urban Development Management majoring in architectural engineering at the University of North Sumatra for the 2020/2021 academic year. In 2019, she graduated with a bachelor's degree in engineering from the Medan Institute of Technology. She interested in spatial planning.