Walkability Index Based on Pedestrian Needs in the Losari Beach area of Makassar City

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Abstract

Walkability Indexis the result of measuring the comfort level of pedestrian paths which will be a benchmark for developing pedestrian paths that are feasible for everyone. Jpedestrian paths (sidewalks) can be said to be feasible if they can meet pedestrian needs based on several criteria such as accessibility, circulation, safety, security, beauty, cleanliness, noise, shade, and connectivity. The purpose of this study is to obtain a pedestrian comfort index based on pedestrian needs in the Losari Beach Area and Fort Rotterdam. To produce this comfort index, it is necessary to identify the factors and measure the level of comfort based on pedestrian needs, and to determine the priority of pedestrian needs..The pedestrian path available in this area is known as "Bundaratta", located in the recreation/natural tourism area (Losari Beach) and cultural tourism (Fort Rotterdam) people of Makassar City. With the function of the land as a recreation area, a comfortable pedestrian path is urgently needed by local and foreign tourists to enjoy and reach the existing facilities around the area. This research is a quantitative descriptive study, using a Likert scale to obtain a level of comfort and the Analytical Hierarchy Process (AHP) to obtain priority for the comfort factor. The results showed that the pedestrian comfort index along Losari Beach to Fort Rotterdam is 60.20 and it is in the comfortable category, but it still needs some repairs and improvements in several location segments so that this pedestrian lane falls into the category that is truly comfortable and even very comfortable. for its users.

Keywords: *Comfort index, pedestrian path, pedestrian need.*

Introduction

The term pedestrian or pedestrian comes from the Latin word pedesterpedestris, namely people who walk or pedestrians. Pedestrian also comes from the Greek word pedos which means foot so that pedestrian can be interpreted as a pedestrian or person walking, Pedestrian is also defined as the movement or circulation or movement of people or humans from one place to the origin to another as a destination (destination) by foot(Rubenstein, 1992)[1]. Another definition of a pedestrian is a person who dominantly uses feet (walking) and/or one part of the body (for example with hands for people who do not have legs) to move from one place to another and not in a state of using a vehicle. (Pattisinai, 2013)[2].

Broadly speaking, the motivation of a person in walking, like pedestrians using the sidewalk, divided into 2 (two) types of pedestrians, namely functional pedestrians and optional pedestrians (Gatoet Wardianto, 2017)[3]. Functional pedestrian activities are routine every day or periodically and occur throughout the year, such as walking to school, to work, shopping for daily necessities which are classified as necessary activities, namely compulsory activities. Meanwhile, functional pedestrian activities are optional (optional), such as taking walks, recreation/excursions in historical areas, shopping tours, culinary tours[4], walking for health purposes and even taking walks without a specific purpose or other social activities[5].

Losari Beach area is a natural recreation/tourism area, as well as Fort Rotterdam which is a recreation/ cultural tourism area in Makassar. Pedestrian activity in the area is optional (optional). Very busy at certain times, especially on weekends or holidays. Local and foreign tourists will enjoy the natural beauty of the Losari beach and see the historical buildings of Fort Rotterdam. These

places can be reached by foot along the pedestrian path "Bundaratta"[6].

A. Pedestrian Need Concept: Alfonso (2005)[7], states that pedestrian activity is based on 5 (five) factors of human needs, namely the feasibility factor, the accessibility factor, the safety factor, the comfort factor and the pleasurability factor. The feasibility of a pedestrian path (sidewalk) can be measured from the level of fulfillment of pedestrian needs based on 8 (eight) criteria, namely mobility, accessibility, continuity, connectivity, safety, comfort, security and beauty(Gatoet Wardianto, 2017)[8]. On the other hand, Fruin (1979)[9], states that facility planning for pedestrians (sidewalks)[10] must pay attention to 7 (seven) main targets, namely safety, security, security, convenience, continuity, comfort, system integration (system coherence)[11], and the level of congestion (level of service/LOS). The seven factors are interrelated and influence each other[12].

Proper pedestrian paths or sidewalks must be able to meet pedestrians' needs, not just for walking, but also for leisure, walking, (strolling), and interacting with other pedestrians. (Gatoet Wardianto, 2017)[13]. A well-designed built environment without the presence of pedestrians is not an active social place with a high level of community. This will cause loss of vitality and livability in the area(Rafiemanzelat, Emadi, & Kamali, 2017)[14].

B. Pedestrian Comfort Concept: Sander and Mc Cormick (1993)[15] describes the concept of comfort as a condition of one's feelings towards something and is very dependent on the person experiencing the situation[16]. In other words, comfort is the fulfillment of conditions or conditions that a person wants to stimulate which is received and caused by environmental conditions around him[17]. The desired condition or condition depends on the perception of each individual. The environmental quality of the pedestrian path will affect a person's level of comfort when walking so that in planning it is necessary to consider the human scale, good design, materials, space for walking and a good surface for walking are determinants of pedestrian comfort. (Zakaria & Ujang, 2015)[18].

The word "index" itself according to the Big Indonesian Dictionary (KBBI) from linguistics means the ratio between two certain linguistic elements that may be a measure of a certain characteristic; pointer[19]; If it is related to comfort, it can be defined that the Walkability Index is a list of measures based on the standards referred to to assess a person's comfort level[20], in this case pedestrians, to environmental conditions around the pedestrian path[21]. One of the indicators can be referenced from several studies related to pedestrian comfort on pedestrian paths that produce standards for measuring comfort levels, such as the Global Walkability Index (GWI)[22].(Habibian & Hosseinzadeh, 2018)[23]

Comfort is the main requirement in planning pedestrian or sidewalk facilities by considering pedestrian path conditions related to pavement quality, size, cleanliness, weather, availability of city facilities, circulation, even though the surrounding climatic conditions will affect them on foot.(Corazza, Mascio, & Moretti, 2016).[24]

Here are some of the factors on pedestrian needs that will affect the comfort of walking based on the opinions of several experts and researchers:

(a) Mobility, is a pedestrian requirement related to the space for pedestrians to easily carry out their activities. Pedestrian mobility is determined by the following factors: the track surface, the track width and the absence of obstructions along the sidewalk(Gatoet Wardianto, 2017)[24]. Dimensions (width) of pedestrian paths that are not optimal, uneven surfaces are a major barrier for elderly pedestrians (elderly people) because they are related to where and their safety (Strohmeier, 2016)[16]. Likewise halya with aand permanent obstructions in the form of trees and the placement of city facilities, as well as temporary barriers in the form of several peddlers, motorbike parking, pedicabs and others that will affect pedestrian comfort(Erna & Leksono, 2016)[25]

(b) Accessibility, is the need for pedestrians to access/ reach the desired destination points without obstacles and barriers. Accessibility is the key in making pedestrian paths walkable or pedestrian friendlyfeet, (Rafiemanzelat et al., 2017). Thus, the pedestrian path is easily accessible to everyone, including those with special needs, such as wheelchair users, blind people or the elderly (Zakaria & Ujang, 2015).

(c) Continuity, is the need for pedestrians to be able to carry out walking activities in a sustainable manner, not cut into pieces or stop. The available sidewalk network must ensure the continuity of movement for pedestrians(Gatoet Wardianto, 2017).

(d) Connectivity, is the complete integration of pedestrian paths with transportation modes so that a person can navigate the entire system easily (Bhattacharyya & Mitra, 2013). The unavailability of access to public transportation and the lack of connection of pedestrians and pedestrians is an obstacle to pedestrian mobility (Strohmeier, 2016)

(e) Safety, is the need for pedestrians to avoid traffic accidents. The use of traffic control signals or by pedestrian traffic light signals will create a safe zone between cars and pedestrians, thereby reducing the risk of conflicts and accidents. (Dorohin, Zelikov, & Denisov, 2018). Especially at crossings and road junctions, these control signals are needed to ensure pedestrian safety Elderly(Kim, 2019). The existence of information signs is very useful for pedestrians to provide an overview of the availability/direction of facilities in the area being traversed (Koh Puay Ping & Wong, 2013)

(f) Convenience is a pedestrian need related to climate and weather conditions (heat, sun, wind and rain) as well as the physical conditions of the pedestrian path. Protection can be done by placing trees, shelters, benches or other objects in certain locations that can be used to sit if pedestrians feel tired or just to enjoy the view(Gatoet Wardianto, 2017).

(g) Security is a need for pedestrians to avoid fear of crime that can threaten their lives. The CPTED (Crime Prevention Through Environmental Design) concept is a concept that was built in a certain way to reduce or prevent crime or crime.(Gatoet Wardianto, 2017). Adequate lighting arrangements are also an important factor for attracting visual interest and preventing nighttime crime.(Bhattacharyya & Mitra, 2013)

(h) Beauty is the need for pedestrians to get a pleasant physical atmosphere or environment when doing their activities on foot on the pedestrian path.Trees and parks along the pedestrian path, as well as the scenery around it is what attracts pedestrians. (Koh Puay Ping & Wong, 2013). In this case the role of architects and urban designers in designing streetscapes will be able to refresh and rejuvenate tired pedestrians.(Bhattacharyya & Mitra, 2013).

(i) Circulation is rotation or circulation. This is closely related to the dimensions of the pedestrian path. Comfort can be reduced due to poor circulation, such as the absence of a clear division of space for the circulation of humans and motorized vehicles. Pedestrian circulation is closely related to the dimensions of roads and pedestrian paths, the place of origin of circulation and the exact destination of pedestrian circulation, the purpose of travel, the time of day and the volume of pedestrians.(Ashadi., Rifka H., 2012).

(j) Nature or Climate Style, is a natural condition and climate that occurs at one time. Condition Weather such as rain, wind and temperature have a significant impact on pedestrian behavior as this will influence people's interest in walking(Arana et al., 2014).Modification of city infrastructure, in this case pedestrian paths in accordance with local climatic conditions, will attract pedestrians to continue walking in all seasons and throughout the day.(Shaaban & Muley, 2016). The existence of a shelter such as a gazebo or sheter and vegetation in addition to having aesthetic qualities, plays an important role in urban sustainability, because it has a positive influence on climate and pollution prevention.(Lamour, Morelli, & Marins, 2019).

(k) Fragrance or smell,Bad smells or odors are generated by untreated trash cans, open drainage (gutters) around and odors from motor vehicle exhausts. This unpleasant odor will be smelled by pedestrian path users so that it will reduce pedestrian comfortHygiene and maintenance factors are related to the presence of garbage, or maybe the pungent odor it causes will affect a person walkingi(Erna & Leksono, 2016)

(l) Noise, Noise is unwanted noise in a certain level and time and can cause disturbances to human health and environmental comfort. The permissible noise level for urban areas, especially for trade and service areas and for recreation, ranges from 65 - 70 dB.To minimize, plants are needed as a barrier around the pedestrian path.The arrangement of plants on the sidewalk (on the side of the road) is adjusted to the width of the land, starting from the shoulder of the road to the channel threshold or the Rumija limit. This can reduce the amount of air pollution or noise(Natalia Tanan & Gede Budi Suprayoga, 2015).

(m) Shape,The shape of the pedestrian path design must be adjusted to human standards in order to create a sense of comfort. Wide sidewalks, free from obstacles, freedom of walking, with good quality

coating, green and leafy to provide safety and comfort to users(Lamour et al., 2019). Research results from R. Projadi, Sangkertadi and RC Tarore (2014) revealed that there are 4 (four) physical characteristics of the pesedrian lane that will affect pedestrian comfort, namely shape, dimensions, color and texture.

(n) Cleanliness,is a state free from dirt, including something clean in addition to adding to the attractiveness of the location, it also adds to the feeling of comfort because it is free from garbage and eliminates the unpleasant odors it causes. among them, dust, trash, and odors. Something clean that will add attractiveness as well as convenience for pedestrians (Feybe G. Kaliongga., Veronica A. Kumurur., 2014). It is necessary to arrange and place trash bins on the pedestrian path, the number and distance of every 20 meters at meeting points such as intersections with the size adjusted to the needs. The materials used are materials with high durability such as metal and printed concrete(Ministry of PUPR, 2018)

(o) Lighting, Sufficient lighting for pedestrian paths is a means to increase security against criminal threats in order to create comfort on pedestrian paths (Feybe G. Kaliongga., Veronica A. Kumurur., 2014). Lighting is needed for safety, comfort and aesthetics(Muhammad Muslihun, 2013). The location of the lighting on the pedestrian path is placed every 10 meters with a maximum height of 4 meters, and the materials used are materials with high durability such as metal & printed concrete. (Ministry of PUPR, 2018).

(p) Supporting Elements,Pedestrian path design is no longer oriented to the aspect of beauty alone, but rather focuses on the comfort felt by pedestrians. For this reason, complementary elements of pedestrian paths are needed, including paving, lights, signs, sculptures (vocal points), bollards, benches, shade plants, telephones, kiosks, shelters and canopies, clocks, trash cans, stops and utilities. (Rubenstein, 1992).

This study will use the following variables:

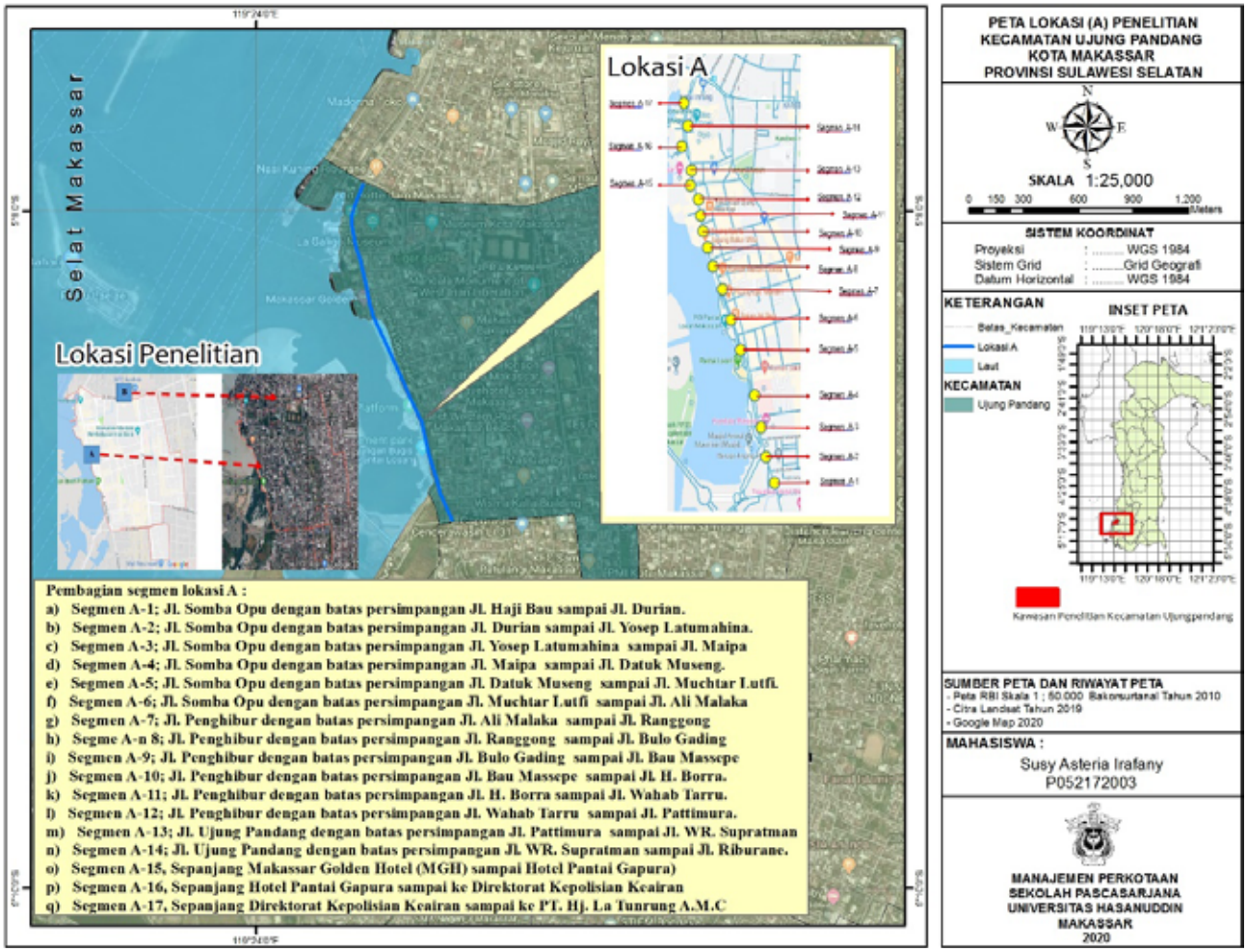
Table 1. Variables and sub-variables for determining the pedestrian lane comfort index

Variable	Sub Variable	Source
Accessibility	• Facilities for pedestrians with special needs • Ramp and Marka	Untermann (1984), R. Judge (2002), Alfonso (2005), Rubenstein (1992) and G. Wardianto (2017)
Beauty	• Pedestrian path material • Garden/Flower Pot • Seat	
Circulation	• Pedestrian path dimensions • The existence of obstructions on the pedestrian path	Untermann (1984) and R. Judge (2002)
Shade	• Shelter/shelter • Vegetation/shade plants	
Cleanliness	• The quantity and quality of bins • Cleanliness level	
Security	• Security systems (CCTV, security posts) • Pedestrian path lighting	Untermann (1984) R. Judge (2002), Alfonso (2005) and Krambeck (2006)
Safety	• Differences in the level of the pedestrian path and the road body • Availability of markers and signs/signals for pedestrian paths • Pedestrian path conditions • Material surface texture • The crossing	Krambeck (2006), Rubenstein (1992) and G. Wardianto (2017)
Noise	Noise canceling facilities	R. Hakim, 2002
Connectivity	Continuity of pedestrian paths Facilities move between modes of transportation	G. Wardianto (2017)

Source: Author's Analysis, 2020

A. Research Method

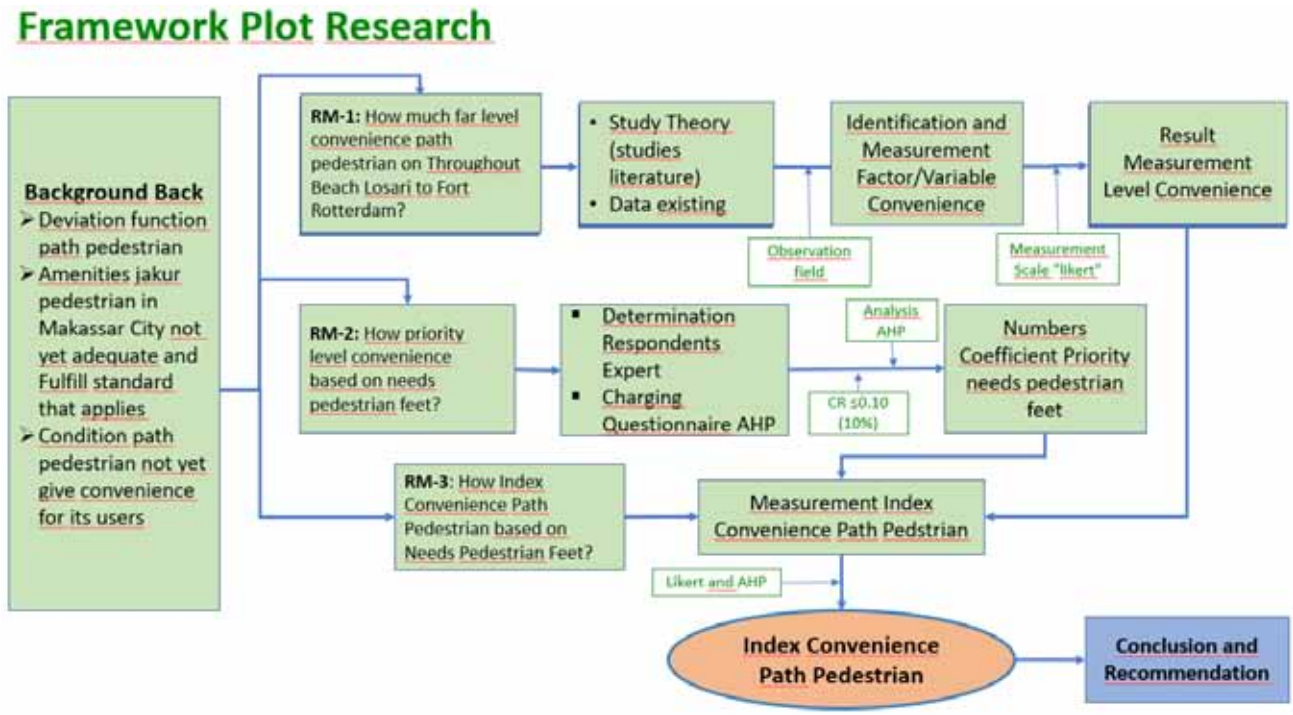
Research Sites: The object of this research is the pedestrian path along Losari Beach to Fort Rotterdam, Makassar City. As for asite selection welds. This is based on the consideration that natural and cultural recreation areas are quite dense with pedestrian activities. This pedestrian path is long enough so that to obtain more valid data, the pedestrian path is divided into 17 (seventeen) pedestrian lane segments.



Source: Author, 2020

Figure 1. Segment Division of Research Sites

Data Collection and Analysis Techniques: This type of research is a quantitative descriptive study with the Analytical Hierarchy Process (AHP) analysis technique. Primarydata collection techniques are carried out through direct observation in the field, structured interviews using a questionnaire and documentation in the form of recorded images/photographs related to the research location. All data related to variables/sub variables will be assessed based on a Likert scale (0 - 5) to obtain a level of comfort. Whereas for priority determination, the variable assessment was assessed by 7 (seven) expert respondents and the data obtained would be processedusing the Analytical Hierarchy Process (AHP) method and the results will be tested for the level of consistency with limitsThe maximum value of Consistency Ratio ≤ 0.1 or 10%. Walkability Index is obtained by multiplying the AHP weighting coefficient with the results of measuring the comfort level of each variable.



Source: Researcher Analysis, 2020

Figure 2. Research Framework

B. Research Results and Discussion:

Measurement of Pedestrian Path Comfort Level: The comfort level of the pedestrian path along Losari Beach to the Fort Rotterdam is measured using variables/sub variables that are measured/assessed as referred to from several applicable regulations (Ministerial Regulations, Ministerial Circular, Decree, Guidebook, etc.). Variables/sub variables are measured using a Likert scale with a score of 1 to 5, where a score of 1 indicates a very bad/very uncomfortable condition, a score of 2 indicates a bad/uncomfortable condition, a score of 3 indicates a fairly good/comfortable condition, a score of 4 indicates a good condition./comfortable and a score of 5 indicates very good condition/very comfortable. The Likert scale obtained is converted into a value at intervals of 0 to 100 to show the results of the index calculation.

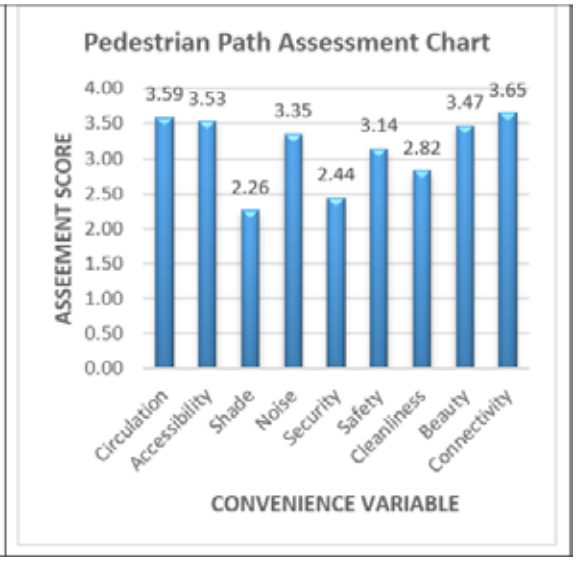
Table 2. Likert Scale and Value Conversion

Likert scale (0-5)	Value conversion (0-100)	Information
1	0 to <20	Very bad/very uncomfortable
2	20 to <40	Bad/uncomfortable
3	40 to <60	Good enough/comfortable enough
4	60 to <80	Good/comfortable
5	80 to 100	Very Good/very comfortable

Source: Author's analysis, 2020

Table 3. Average score of pedestrian comfort level assessment

No.	Variable	Average Score (Score 1 - 5)
1	Circulation	3.59
2	Accessibility	3.53
3	Shade	2.26
4	Noise	3.35
5	Security	2.44
6	Safety	3.14
7	Cleanliness	2.82
8	Beauty	3.47
9	Connectivity	3.65
Average		**3.14**



Source: Author's Analysis, 2020

The table and graph above shows that the average value of the pedestrian paths on the pedestrian path along Losari Beach to Fort Rotterdam is 3.14 and is included in the quite good/quite comfortable category.

The lowest score can be seen in the shade variable: 2.26 (bad/uncomfortable). The sub variable that is very influential on the assessment of this variable is the availability of shelter facilities such as shelters (covered seats) which are not available in every segment of the location. Roofed shelters are only found at bus stops on segments A-5 and A-17 and they are not utilized optimally. This shelter can also be used by pedestrians as a place to change the mode of transportation. The lowest average score below 3.00 is also found in the safety and cleanliness variables. For security factors, security facilities are needed in the form of CCTV facilities that can reach the pedestrian paths at this location. Likewise, the provision of special lighting facilities for pedestrian paths. What is currently available is a street lamp whose illumination level cannot provide optimal lighting for the pedestrian path. Pedestrian lane special lights also function as aesthetic ornaments that beautify pedestrian paths. The existence of security officers can also be empowered to help control the security of pedestrian paths. For the hygiene variable, almost all pedestrian path segments in this location do not provide special trash cans to accommodate pedestrian trash. Based on the prevailing standards, these bins are placed at a distance of about 20 meters and at meeting points (eg intersections). This is necessary to ensure the cleanliness of the pedestrian path. Pedestrian lane special lights also function as aesthetic ornaments that beautify pedestrian paths. The existence of security officers can also be empowered to help control the security of pedestrian paths. For the hygiene variable, almost all pedestrian path segments in this location do not provide special trash cans to accommodate pedestrian trash. Based on the prevailing standards, these bins are placed at a distance of about 20 meters and at meeting points (eg intersections). This is necessary to ensure the cleanliness of the pedestrian path. The pedestrian lane special lights also function as aesthetic ornaments that beautify the pedestrian path. The existence of security officers can also be empowered to help control the security of pedestrian paths. For the hygiene variable, almost all pedestrian path segments in this location do not provide special trash cans to accommodate pedestrian trash. Based on the prevailing standards, these bins are placed at a distance of about 20 meters and at meeting points (eg intersections). This is necessary to ensure the cleanliness of the pedestrian path. Almost all pedestrian lane segments in this location do not provide special trash cans to accommodate the garbage originating from pedestrians. Based on the prevailing standards, these bins are placed at a distance of about 20 meters and at meeting points (eg intersections). This is necessary to ensure the cleanliness of the pedestrian path. Almost all pedestrian lane segments in this location do not provide special trash cans to accommodate the garbage

originating from pedestrians. Based on the prevailing standards, these bins are placed at a distance of about 20 meters and at meeting points (eg intersections). This is necessary to ensure the cleanliness of the pedestrian path.

Source: Author, 2020

Figure 2. Pedestrian Path Condition

The variable average score (3.14) with an interval of 3.00 - <4.00 is in the quite comfortable category, but that does not mean that it does not require improvement but needs to be improved; For safety variables, the surface of the pedestrian paths, especially in segment A-17, needs to be physically repaired because around 50% of the pedestrian paths are damaged (holes) so that it can endanger pedestrian safety. Pedestrian signs (prohibited signs, warning signs, command signs and directional signs) are also not available at this location. Likewise, the pedestrian lane is very minimal, making it difficult for pedestrians to move places because they have to cross a fairly dense vehicle lane. This crossing route is not visible in the Losari beach area, even though there are many pedestrian activities only in the Fort Rotterdam area. For noise variables, plants that are able to reduce noise from motorized vehicles are needed on the road around the pedestrian path. The variables of accessibility and circulation are closely related to the ease of access to reach the pedestrian path and the freedom to move pedestrians on the pedestrian path without any obstacles. Arrangement of supporting facilities such as placing lighting lamps, aesthetic accessories (seats, flower pots, etc.) need to be rearranged so that they do not interfere with pedestrian access and circulation. Connectivity between pedestrian lanes also needs to be considered, especially the connectivity of pedestrians and the available pedestrian paths.

Prioritizing Pedestrian Needs: The determination of priority scale uses the AHP (Analytical Hierarchy Process) method based on 9 factors of pedestrian comfort. To obtain the priority scale, an AHP questionnaire was compiled which will be filled in by experts, namely people do not have to be experts in the field of pedestrian paths, but understand the problems to be studied. Resource persons or informants who become expertists and meet the consistency test requirements come from government elements as many as 3 people, 2 academics, city observers and 1 person each using the pedestrian path.

To obtain an assessment matrix from several respondents, the mean measurement was carried out based on 9 (nine) variables using the Geometric Mean formula.

The formula for the Geometric Mean is as follows:

$$GM = \sqrt[n]{X1 \times X2 \times X3 \times \ldots xXn}$$

Where: GM = Geometric Mean

X1, X2, X3,…, Xn = Weight of the assessment of variables 1, 2, .., n

n = Number n (order)

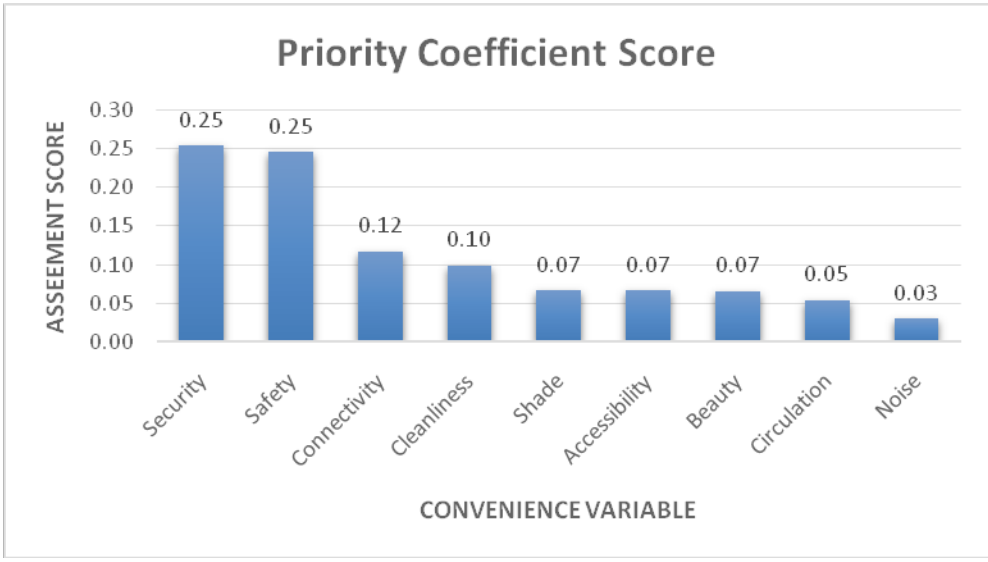
Based on the Geometric Mean formula, the average measurement results are obtained and then the eigen values are calculated to obtain the Priority Vector which is then re-tested for the validity of the data (level of consistency) using the Consistency Ratio (CR) formula as follows:

$$CR = CI/IR$$

Where: CR = Consistency Ratio (requirement CR ≤ 0.1)
CI = Consistency Index ((λ max-n)/(n-1))
IR = Index Random Consistency

Based on the formula above, the calculation of the Consistency Ratio (CR) is 0.015 (consistent, CR ≤ 0.1)

Based on the Analytical Hierarchy Process (AHP) data, which is derived from geometric mean data, the data on the priority order of the pedestrian comfort factors are obtained as follows:



Source: Author's analysis, 2020

Figure 5. Priority sequence graph based on AHP at location A

According to respondents from several experts, the priority needs of pedestrians that really need to be considered in the development of pedestrian paths in this location are the safety and security factors. As a recreation/cultural tourism area, there will be many pedestrians using this pedestrian path, so that the safety and security factors for pedestrians are things that need to be the priority of development so as to provide a sense of comfort for pedestrian lane users. Provision of security facilities (CCTV/security posts/security guards) and lighting needs special attention. Meanwhile, to ensure the safety of pedestrians on pedestrian paths, it is necessary to pay attention to the existence of ramps that are according to standards, availability and placement of markers and signs/signals for pedestrian paths as well as textures and materials used by pedestrian paths. The connectivity factor between pedestrian lanes and transportation mode facilities also needs to be considered in maintaining the continuity of the use of pedestrian paths in Makassar City. This is related to the physical ability of pedestrians and the mileage that pedestrians can travel so that facilities are needed to change modes of transportation to vehicles or public transportation.

Measurement of Pedestrian Track Comfort Index in Makassar City: Measurement of the pedestrian comfort index at each research location uses the results of the assessment of the comfort level of the pedestrian paths obtained from field data by taking into account the priority coefficient from the results of data processing Analytical Hierarchy Process (AHP). To calculate the pedestrian comfort index, the researcher will add up

the multiplication of the comfort level value (column 4) with the priority coefficient (column 3) of each variable. The index numbers obtained for each location will be converted to values 0–100.

Table 4. Walkability Index

Influence Variable	Priority Coefficient	Priority Level (%)	Comfort Level (Scale 1 - 5)
(1)	(2)	(3)	(4)
Circulation	0.0545	5.45	3.59
Accessibility	0.0665	6.65	3.53
Shade	0.0673	6.73	2.26
Noise	0.0306	3.06	3.35
Security	0.2534	25.34	2.44
Safety	0.2454	24.54	3.14
Cleanliness	0.0990	9.90	2.82
Beauty	0.0659	6.59	3.47
Connectivity	0.1174	11.74	3.65
Location Convenience Index A (conversion values 0-100)		**60.20 (Convenient)**	

Source: Author's analysis, 2020

Table above shows that the Walkability Index at location A is 60.20 and is included in the comfortable category (interval 60 to <80). Based on columns (3) and (4), it shows that the security variable has a major priority in improving pedestrian paths at this location, which is 25.34%. Field conditions indicate that the level of comfort is included in the uncomfortable category (2.44) due to the lack of availability of security systems (CCTV, security posts and security guards) which are able to reach all areas of the pedestrian path and the unavailability of lighting specifically intended for pedestrian paths.

Likewise, the safety factor is the second priority (24.54%) in the development of pedestrian paths at this location. Based on the results of the assessment of the level of comfort for each location segment, it shows that the safety sub-variables, namely the availability of markers and pedestrian paths/signs are not available. Likewise, the availability of zebra crossing facilities is inadequate, only available around SombaOpu Fortress, even though these facilities are urgently needed by pedestrians to ensure the safety and security of pedestrians.

The connectivity factor occupies the third priority in improving pedestrian pathways (11.74%), even though it is in the quite comfortable category (3.65). Connectivity between pedestrian lanes and transportation modes is important in improving pedestrian pathways at location A. The existence of 2 (two) bus stops as a place to change the mode of transportation at this location needs to be optimized for use so as to be able to increase pedestrian comfort. Cleanliness and shade factors also need special attention because they are included in the uncomfortable category with the fourth and fifth level of development priority. In this case, the availability of trash and shelter facilities needs to be a concern in providing a sense of comfort to pedestrians.

The pedestrian path accessibility factor at location A is quite comfortable because it is easy to access by normal pedestrians and those with special needs, only need to be equipped with road markings such as a zebra crossover. Other factors such as beauty, circulation and noise which are categorized as comfortable enough, need to be maintained even if the comfort needs to be increased by completing facilities that are not yet available.

C. Conclusions and Recommendations

The conclusions from the results of this study are as follows:

1. The results showed that the pedestrian path along Losari Beach to Fort Rotterdam was in the quite good/quite comfortable category (score 3.14). Improvement needs to be done, starting from providing several facilities to physical development in several location segments

2. The priority of pedestrian needs on pedestrian paths in this location places security, safety and connectivity as the main priority in the development of pedestrian paths in Makassar City. The improvement and development of these three factors need serious handling in order to create a pedestrian path that is comfortable for everyone without exception.

The recommendations of this study are addressed to the Makassar City Government or to further researchers in the following:

1. In developing pedestrian nets in Makassar City, factors such as security, safety and connectivity have become top priorities in addressing one of the increasingly complex challenges of urban development while still paying attention to other supporting factors.
2. Further researchers are advised to carry out more in-depth and detailed research on the priority needs of pedestrians that have been obtained in this study.

Ethical Clearance: No ethical approval is needed.

Source of Funding: Self

Conflict of Interest: Nil

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