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Assessing the performance of the pedestrian path accessibility standards for people with disabilities

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Abstract
An optimal pedestrian pathway should cater to various user needs, encompassing safety, comfort, and universal accessibility. This research endeavors to evaluate the efficacy of pedestrian pathways, with a particular focus on public green spaces in Kendari City. The study emphasizes the implementation of an inclusive design concept for pedestrian pathways, ensuring the protection and fulfillment of rights for all demographic groups. To achieve its objectives, the research employed both qualitative and quantitative methods. A qualitative case study approach was utilized to assess architectural elements, while a Likert scale was employed for the performance evaluation. The findings from the performance assessment indicate that the service attribute values fall short of being optimal. Observational data suggest that most existing facilities fail to adhere to universal design principles, catering to the needs of all individuals. Consequently, there is a pressing need for physical modifications in the pedestrian pathway areas. These modifications include the installation of ramps, clear markings, and pathways for people with disabilities (guiding blocks), as well as the integration of trees and plants, trash receptacles, traffic signs, and essential utilities such as street lighting and billboards. Furthermore, the research highlights the necessity of organizing street vendor (PKL) zones across all area segments to enhance overall accessibility and usability.

Keywords:
Disability;
Pathway;
Pedestrian;
Ramp;

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INTRODUCTION

People with disabilities are citizens entitled to equal access and fair provision of transportation services [1][2]. The UN Convention on the Rights of Persons with Disabilities [3] and Indonesian Law No. 8/2016 [4] affirm that individuals with disabilities have the same rights as those without disabilities, including the right to life, social welfare, accessibility, and independent living. Pedestrian pathways are an important component in the transportation and living needs of individuals with disabilities [5][6].

Indonesian government regulations stipulate that the planning and implementation of public infrastructure and its surroundings must consider accessibility provisions for all individuals, including people with disabilities [7]. Every pedestrian path must comply with the following criteria [8]: (a) accessibility for all pedestrians, including those with physical disabilities; (b) selection of plant species that provide coverage and direction; (c) appropriate and accessible furniture; (d) visible signage and information; (e) presence of ramps and markers for people with disabilities, which must function properly [9]. Important components of pedestrian walkways include drainage systems, ramps, guide blocks, lighting fixtures, waste disposal

facilities, seating arrangements, and support poles [10][11].

Based on the observations, surveys, and evaluations carried out in urban public green spaces, the architectural elements available today do not meet the principles of universal design for all users of pedestrian paths [1][12]. This can be seen in the availability of supporting elements of pedestrian paths, such as ramps and other supporting elements that are not friendly to people with disabilities. Besides, they do not meet the standards set by the PUPR Government Regulation No.14/PRT/M/2017 concerning building amenity requirements [13][14]. This Indonesian government regulation stipulates that the planning and implementation of public infrastructure and its surroundings must consider accessibility provisions for all individuals, including people with disabilities [15].

Observation and evaluation are carried out on architectural elements in the pedestrian path area in the city public green space area in terms of inclusive design that is free of barriers such as physical barriers (physically disabled), visual barriers (blind), hearing barriers (deaf) and intellectual barriers (mentally disabled). Based on the findings of the architectural elements on the pedestrian path, data analysis and comparison with the concept of inclusive design through universal design principles as mandated by the Regulation of the Minister of Public Works and Public Housing (PUPR) Republic of Indonesia No.14/PRT/M/2017 and the principles of Deaf Space [12]. The application of the concept of inclusive design on pedestrian paths is important in studying architectural elements related to the people using pedestrian paths, including people with disabilities.

The design of pedestrian paths that are inclusive and friendly to people with disabilities can support a safe, comfortable, and accessible pedestrian path environment for all people [16]. The concept of developing a pedestrian path used is: 1). Safe means that all facilities, infrastructure, and environmental conditions in the Public RTH area to human resources (the manager) provide certainty and assurance in the smooth travel of pedestrian path users safely [17]. 2). Comfortable means that the pedestrian path has various facilities that give a sense of pleasure so that users of the pedestrian path in the Public Green Space area feel at home with the existing situations and conditions. Fast means that the travel time in the pedestrian path area is barrier-free [18]. 3). Accessible means that the Zone / Segment planned in Public Green Space is integrated with other modes that are also planned in Kendari City [13]: Integration between Zones/Segments with pedestrian paths, Zones/Segments have been integrated with transportation modes and Zones/Segments have been integrated with bus stops [14].

The arrangement of pedestrian paths that are friendly to people with disabilities in the Urban Public Green Space area refers to the Regulation of the Minister of PUPR RI No.14/PRT/M/2017 and the principles of Deaf Space [13]. The concept of safe, comfortable, and accessible pedestrian path design can be applied in general and become a pilot design for disability-friendly pedestrian paths at the provincial or district/city level. Therefore, accessibility rights in the pedestrian path area must be fulfilled, including accessibility for people with disabilities.

METHOD

Material

This study employed qualitative and quantitative methods. The qualitative component utilized a case study approach [19][20], while the quantitative aspect was carried out using a Likert scale [21]. The primary data were collected through various methods and techniques tailored to meet the specific needs of this research. These methods included 1) the distribution of questionnaires, 2) in-depth interviews, 3) observations, and 4) the study of relevant documentation [21]. Secondary data were sourced from 1) literature reviews, 2) academic journals, 3) government regulation guidelines, and 4) pertinent articles. The research focused on the pedestrian pathway within the green open space (RTH) area at Tugu Religi in Kendari City, Southeast Sulawesi. This area was selected because its pedestrian pathway is inaccessible to individuals with disabilities; hence, it lacks inclusivity. Initially established for the Musabaqah Tilawatil Qur'an (MTQ) event in 2007, this location later transitioned into an urban public open space [22].

This study used SPSS 26 to perform Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI) Analysis for data analysis. The evaluation of the existing pedestrian pathways aimed to gather insights into users' perceptions of their current state and expectations for future public transportation services. The criteria for analyzing the pedestrian pathways' performance were based on established standards for their operation. The performance of public transportation services was examined through Importance Performance Analysis (IPA), and user satisfaction was

assessed using Customer Satisfaction Index (CSI) analysis [23].

The research encompassed pedestrian pathways in public green open spaces and involved 399 respondents. Questionnaires were distributed directly to these individuals, who were selected from among the users of the pedestrian pathways, given their direct engagement with the condition of these paths. The study's sample represented all stakeholders with a direct impact on, or expertise regarding, pedestrian pathways. A Focus Group Discussion (FGD) was conducted with a panel of experts in urban planning and the built environment alongside practitioners from the Public Works and Spatial Planning Regional Office [24].

The discussion resulted in specific qualitative data on pedestrian lanes. Free discussion among participants is the key to achieving great results, which is the main difference from conducting group interviews [25]. Thus, the FGD was an optimal tool for the current analysis, i.e., understanding the priorities and utilization of pedestrian lanes that affect their walkability. The FGD was prepared following several recommendations by Duperrey et al. [26] and Inderadi et al. [12], which were adjusted to the case of pedestrian lanes in public open space areas.

Field observations have highlighted a significant discrepancy between the existing pedestrian pathway infrastructure and the needs of individuals with disabilities, revealing a barrier to their independence and mobility. The inadequacy of these pathways necessitates reliance on others for navigation, underscoring the critical need for an inclusive design approach that adheres to universal design principles, particularly those that address the needs of the deaf community. Through comprehensive data collection methods, including observations, simulations, and interviews, a clear picture emerged, necessitating the identification and implementation of targeted strategies for improvement.

The proposed enhancement strategies for pedestrian pathways in Public Green Spaces are twofold, encompassing physical and non-physical elements. The first strategy focuses on the physical redesign of the pathways, aiming to elevate the infrastructure's quality to meet diverse needs. This entails systematically restructuring each segment or zone within the Public Green Spaces, guided by road classification standards and in compliance with Regulation of the Minister of Public Works and Public Housing (PUPR) No. 2 of 2018. The second strategy emphasizes non-physical interventions, such as fostering community involvement and participation and refining governance systems to support the physical infrastructure improvements.

This research has not only illuminated the gaps in current pedestrian pathway infrastructure in serving individuals with disabilities but has also laid the groundwork for future inquiries. The findings suggest a holistic approach to pedestrian pathway enhancement, combining physical upgrades with community and systemic support to foster more inclusive public spaces. It is recommended that these strategies be considered as a basis for continued research, aiming to refine further and implement inclusive design practices for pedestrian pathways.

The study evaluated three different pedestrian path entrance segments (Figure 1). Each of these segments exhibits unique characteristics regarding the layout of the walkway (Figure 2). A comprehensive assessment was conducted of the accessibility and comprehensiveness of each segment, considering important features such as guide blocks, sidewalks, curbs, and ramps specifically designed for wheelchair users with disabilities. Following this assessment, individuals with disabilities were involved in a simulation to evaluate the accessibility of the walkway.

The data triangulation approach in (Figure 3) this study included three integral components: (1) a literature review, (2) an observation and simulation exercise involving wheelchair users on the walkway, and (3) a focus group discussion (FGD) brought together stakeholders, e.g., walkway providers and domain experts. The FGD sessions involved a diverse group, representing persons with disabilities, Urban Planning Experts, Landscape Design Authorities, Architecture Experts, Transportation Planning Experts, Public Health Scholars, and Practitioners from the Public Works Department. The main objective of the FGD session was to collaboratively formulate a ramp model adapted to the pedestrian path, thereby improving safety and comfort, especially for individuals with disabilities.

Figure 1. The Layout of the Study Site

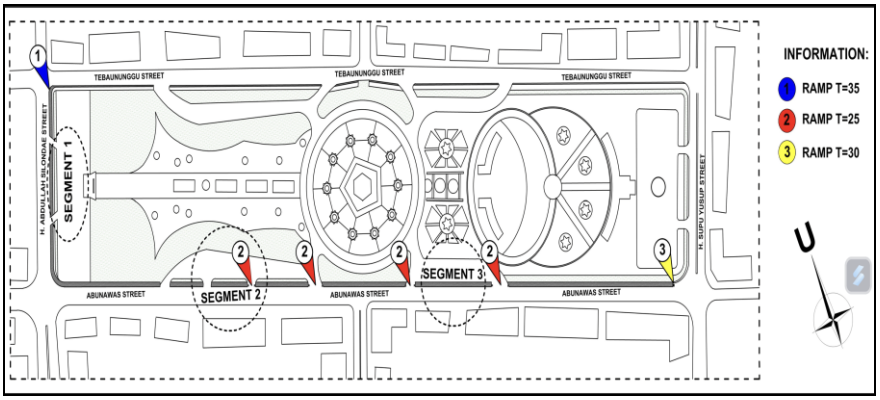


Figure 2. The Layout of the Study Site

RESULTS AND DISCUSSION

Importance Performance Analysis (IPA)

Performance Value and Importance

A study on the level of service using the IPA method was carried out on users of pedestrian lanes in the Kendari public open space area, involving 399 respondents. The assessment attributes were mapped in a Cartesian diagram and divided into Quadrants I to IV (from top to low priority). The result shows that the attribute with an excellent level of performance is the climate attribute (shade) on the pedestrian lane (M=3.42). It shows that the shade at the pedestrian lanes that used soft landscape materials, already applied to public green space areas, concurs with the wishes of respondents or users of pedestrian lanes.

In contrast, the cleanliness variable obtained the lowest performance value, i.e., 2.90, primarily related to the quantity and quality of waste bins. This condition happened because the management neglected the cleanliness of the pedestrian lane.

Concerning interests or expectations, the attribute with the highest value is the safety variable, i.e., the pedestrian lane condition item, with an importance value of 3.91.

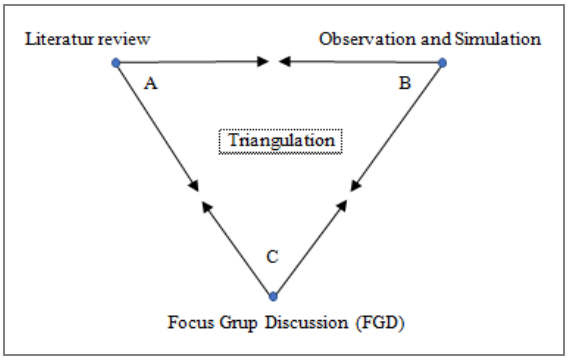


Figure 3. Data Triangulation

Safety is assumed to affect various aspects, such as security, comfort, and safety; therefore, it received the highest expected value, according to the respondents.

Figure 4 presents the maps of the average of service attributes into four quadrants: Quadrant I (eight attributes), Quadrant II (seven attributes), Quadrant III (ten attributes), and Quadrant IV (six attributes). The lowest interest or expectation value is the path-supporting variable, i.e., the toilet and bus stop items, at a value of 3.01. The result indicates that the users need this item the most.

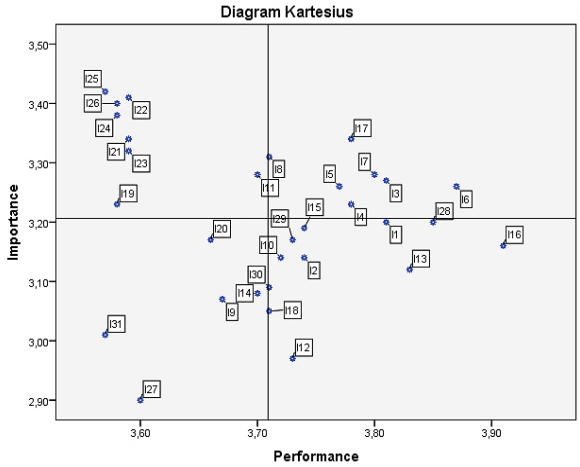


Figure 4. Analysis (IPA)

The assessment result of each service variable is based on the level of importance and satisfaction of pedestrian lanes. The result allows the management to focus on improving and optimizing the variables and items considered necessary by respondents or users. Thus, optimal service can be realized on the pedestrian lanes in Kendari.

The Cartesian diagram in Figure 1 shows the variables affecting user satisfaction in four sections:

A. Quadrant I (Top Priority)

Variables or items that affect the satisfaction of pedestrian path users in public open spaces are included in this quadrant and must be prioritized. Customers consider these factors very important, but their implementation could have been more satisfactory; therefore, it is necessary to improve these attributes.

B. Quadrant II (Maintain Achievement)

It is necessary to maintain the variables or items that affect the satisfaction of pedestrian path users or respondents in this quadrant because the implementation level corresponds with users' interests and satisfaction.

C. Quadrant III (Excessive)

Variables or items that affect the satisfaction of pedestrian path users or respondents in this quadrant are considered excessive in their implementation. This condition is mainly because users or respondents consider them less important in fulfilling the level of satisfaction of lane users. In practice, pedestrian lane users or respondents receive more service than expected; therefore, improving this factor is not a priority.

D. Quadrant IV (Low Priority)

Variables or items affecting the satisfaction of pedestrian path users or respondents in this quadrant are considered less critical and unnecessary for users or respondents. The quality of the implementation is considered moderate.

Customer Satisfaction Index (CSI)

Measuring the Satisfaction Index

The CSI is measured using the average of each service item's importance and satisfaction level because the result can be used as a reference to determine the service value and status. The Customer Satisfaction Index (CSI) is used to examine the overall level of user satisfaction, considering the importance level of the accessibility attributes. The level of CSI is evaluated by matching the customer-perceived performance and the satisfaction (importance) of the service quality. Table 1 shows the CSI for the accessibility variable.

Table 1 shows that eight variables fall under the "Moderately Satisfying" category. This satisfactory level indicates that pedestrian path users felt the public open space area needed to meet their expectations. The CSI values of the above eight variables are 51.00% - 65.99% (Moderately Satisfying). These variables include accessibility, connectivity, circulation, security, safety, noise, cleanliness, and supporting factors for pedestrian lanes in public open spaces. This result indicates that the eight variables need follow-up actions to improve the services.

Table 1. The Customer Satisfaction Index (CSI) Categorization for Each Variable

No.	Code	Attribute	CSI Value	Scale/ Category
1.	P1	Accessibility	64.08%	Moderately Satisfying
2.	P2	Connectivity	65.15%	Moderately Satisfying
3.	P3	Circulation	63.72%	Moderately Satisfying
4.	P4	Security	62.56%	Moderately Satisfying
5.	P5	Safety	63.28%	Moderately Satisfying
6.	P6	Noise	64.00%	Moderately Satisfying
7.	P7	Beauty	67.11%	Satisfying
8.	P8	Climate/Shade	67.95%	Satisfying
9.	P9	Cleanliness	61.12%	Moderately Satisfying
10.	P10	Factors Supporting Public Green Space	61.77%	Moderately Satisfying

Experts

In addition to observations, in-depth interviews, and simulations with respondents at pedestrian lanes in public open spaces, data collection was carried out by interviewing experts to confirm the study result regarding the suitability between the accessibility design of public open spaces and the convenience of pedestrian lane users.

A Focus Group Discussion (FGD) with experts was also conducted to discuss the pedestrian path design and the suitability between the accessibility design of the public open space and the convenience of the pedestrian lane. The FGD was conducted to agree on the model of pedestrian lanes in public open spaces.

Expert 1 agreed with the proposed design and model. Overall, activities at the pedestrian lanes in public open spaces are similar to the design of pedestrian paths that comply with the standards in the Regulation of the Minister of Public Works and Public Housing No. 2 of 2018. The design proposed in this study is an upgraded version of the standard prepared by considering the field conditions and facts regarding the users' needs. The expert agreed that adding curbs, buffer zones, and bicycle lanes is necessary. He also suggested placing bus stops for public transport on arterial routes. Bus stops are designed according to pedestrian lane users' interests and expectations, making it easier for them to get on and off the bus safely and not in risky locations, such as crossroads.

Expert 2 also agreed with the design and model proposed in this study. The model has referred to the standard in the Regulation of the Minister of Public Works and Public Housing (PUPR) No. 2 of 2018. He suggested that the pedestrian lane design should be developed based on road classification, such as arterial, collector, local, and environmental [27]. In addition, the expert suggested that the design be developed according to the users' needs. Finally, the expert recommended focusing on environmental support around the pedestrian path so users feel comfortable walking there.

Expert 3 suggested that the pedestrian path model should be developed based on the Minister of Public Works and Public Housing Regulation No. 2 of 2018. He also suggested repairing and adding facilities to the area to ensure better safety and ease of mobility [28]. The design of a pedestrian lane for the disabled remains integrated into the proposed model with a priority for supporting facilities such as the availability of ramps, guiding blocks, buffer zones, curb ramps, road markings, and traffic signs.

The experts provided several recommendations for arranging environmental—and child-friendly pedestrian lanes in urban public open spaces based on the pedestrian path design concept.

1) Based on the Model and Type of Road

a. Accessibility
   Pedestrian lanes must allow users to develop a sense of socialization, recreation, and freedom. Therefore, security, comfort, and ease of access are needed [21].
b. Connectivity
   The access to public transportation and the connection path with crossing lanes will support the mobility of pedestrian lane users.
c. Circulation
   Circulation means rotation. In this case, it is related to the dimensions of the pedestrian path, namely size, width, height, and slope.
d. Security
   CPTED (Crime Prevention Through Environmental Design) is a concept developed to reduce or prevent crime. The concept has several elements, such as Natural Surveillance, Natural Access Control, Territory Strengthening, Lighting, CCTV (Closed Circuit Television) Cameras, and many more [23].
e. Safety
   Sidewalks should be equipped with safety facilities (barriers or separators), signals, and signs for motorists to be aware of pedestrians. It is also necessary to widen the furniture line.
f. Convenience
   Pedestrians need to avoid discomfort caused by climate and weather conditions. Pedestrian paths are public spaces; therefore, people who pass should be protected from the weather, especially extreme weather, such as hot sun, wind, and rain, when they stop to wait for public transportation or rest on available benches. Protection is provided by placing trees and shelter in certain locations [29].
g. Noise
   The high noise level from passing motorized vehicles can cause discomfort for pedestrians. It can be minimized by providing plants around the pedestrian lane. Noise can be reduced by setting a barrier between the noise source and the users. The plant arrangement on the sidewalk should be adjusted to the width of the land, starting from the shoulder of the road and moving up

to the threshold of the drain or right-of-way area.

h. Beauty
To obtain optimal comfort, beauty must be designed by considering the pedestrian lane's shape, color, plant composition, and elements. This need can be fulfilled by placing aesthetic elements like flowers, floor ornaments, and other aesthetic objects along the lane to make pedestrians comfortable. Trees and parks along the path and the surrounding scenery will attract pedestrians [30].

i. Climate
The climate is a state of nature that occurs at a given time. Microclimatic factors that affect human comfort are temperature, solar radiation, humidity, and wind. Rainfall and solar radiation in the tropics can interfere with pedestrian activities, so shelters and gazebos are needed.

j. Cleanliness
The placement and number of waste bins on pedestrian paths are critical. Waste bins are placed every 20 meters at meeting points, such as intersections, with the amount adjusted to the needs. The materials are high-durability metal and precast concrete.

k. Supporting Factors for Pedestrian Lanes
The pedestrian lane design not only focuses on the aesthetic aspect but also emphasizes the comfort of pedestrians. Therefore, complementary elements that provide comfort for pedestrians are needed, such as paving blocks, lights, signs, sculptures (vocal points), bollards (barriers), benches, shade trees, telephones, kiosks, shelters, and canopies, clocks, waste bins, bus stops, and utilities. The arrangement of aesthetic elements on pedestrian lanes that consider the size, dimension, and human scale will shape the image and character of the city and ultimately create a friendly and comfortable environment for pedestrians [30][31].

This study proposes an ideal pedestrian path model based on the discussions with experts and the characteristics of the research area according to field observations as listed in Table 2.

The Ideal Pedestrian Lane Design Model

At the final stage of this study, an ideal pedestrian path model was formulated using data triangulation analysis. This analysis was conducted by observing the studied phenomena in the research area.

Model (Pedestrian Lane for Arterial Road)

Figure 5 Model 1 of the pedestrian path is a model on the arterial route with a width of 6 m, space of street furniture of 1.2 m, 1.3 m, a buffer zone, and a 2.70 m bicycle lane. To maintain the safety of bicycle users, a buffer zone of 1.3 m will also be made for providing vehicle parking for car users who will park their vehicles around the 3.5-meter pedestrian path. Figure 6 shows model 1 of the pedestrian path on the arterial road. In the picture above, you can see the simulation of users carrying out activities in the pedestrian area.

Figure 7 is a snippet of model 1 of pedestrian paths on arterial roads. In the snippet above, you can see the simulation of users carrying out activities in the pedestrian area. Model 1 pedestrian path on an arterial road consisting of the front area of the building, a pedestrian-free area, pedestrian facilities, bicycle paths, and buffer zones. Figure 8 shows an illustration of model 1 for an arterial road type.

Table 2. The Optimal Pedestrian Lane Model

Classification	Model 1	Model 2	Model 3
Road Function	Artery	Collector	Local
Minimum Widthfree Space Pedestrian	5-6 m	3.5-4 m	3 m
The Effective Width Of The Pedestrian Path	2.75 - 3.75 m	2 - 2.75 m	1.9 m
Lane Width Facility/Curb Zone	1.2 m	0.9 m	0.75 m
Cycling Path	2.70 m	2.70 m	1.9 m
The Front Of The Building/Frontage Zone	0.75 m	0.35 m	0.15 m
Service Attribute With Criteria Minimum	Accessibility Connectivity Circulation Security Safety Comfort Noise Beauty Cleanliness Facility Complementary	Accessibility Connectivity Circulation Security Safety Comfort Noise Beauty Cleanliness Facility Complementary	Accessibility Connectivity Circulation Security Safety Comfort Noise Beauty Cleanliness Facility Complementary
Land Use Around	Markets, School, Office, Public Health, Center, Housing, and Settlement	Markets, School, Office, Public Health, Center, Housing and Settlement, Sreet Vendors Activities	Housing and Settlement, Sreet Vendors Activities

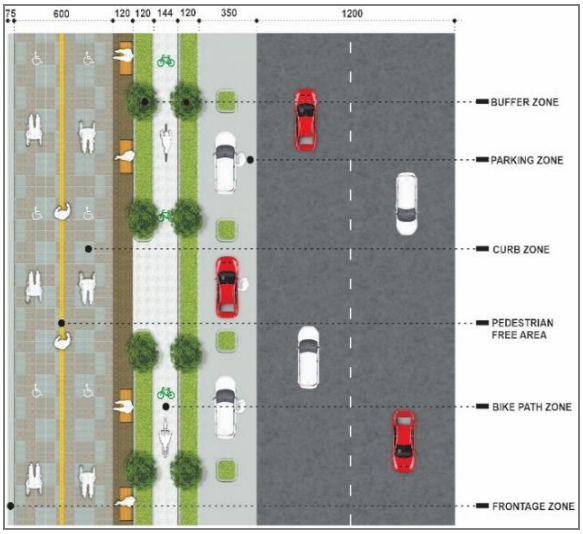


Figure 5. Model 1 Pedestrian Lane for Arterial Road

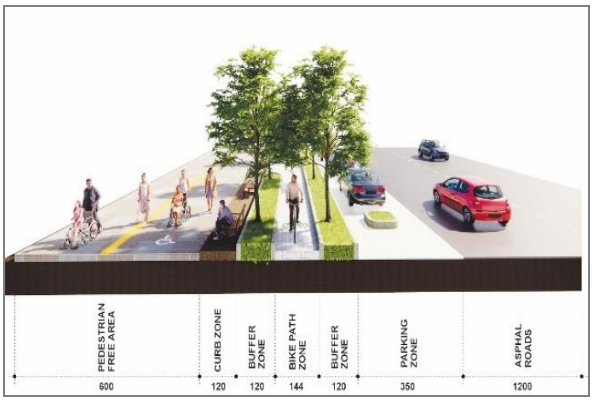


Figure 6. View of Model 1 Pedestrian Lane for Arterial Road

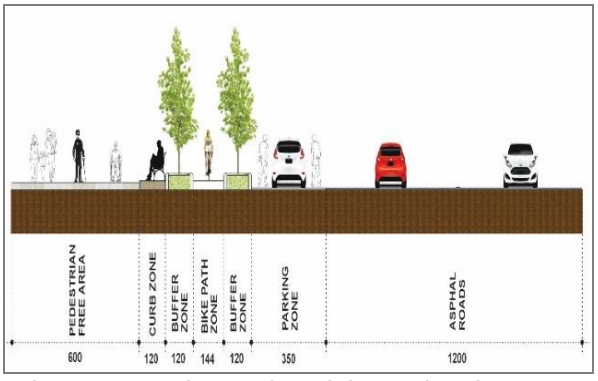


Figure 7. A Snippet of Model 1 Pedestrian Lane for Arterial Road

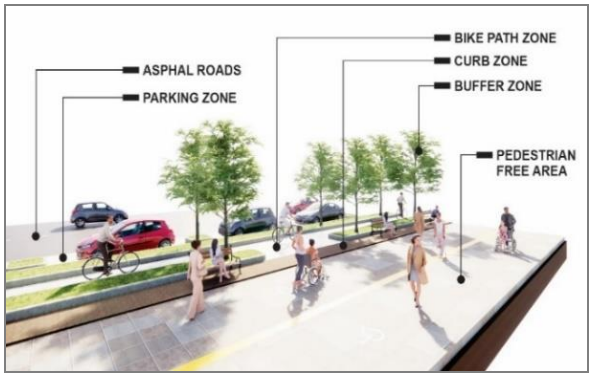


Figure 8. A Bus Stop Perspective of Model 1 Pedestrian Lane for Arterial Road

The pedestrian lane zone on the arterial road consists of pedestrian-free space with a minimum width of 5-6 meters and a minimum supporting facility space of 1.2 meters with service attributes that meet the criteria of accessibility, connectivity, circulation, security, safety, comfort, beauty, climate or shade, and cleanliness. Pedestrian lane support facilities are provided to all communities as listed in Table 3.

Implementation of the Seven Elements of Universal Design

Analysis of the implementation of 7 universal design principles in the RTH Tugu Religi is presented as follows.

Strategic Concept

The concept of a pedestrian lane within the public open space was developed based on the interests and satisfaction of users while also considering various internal and external factors [32]. The open space will provide pedestrian lanes that accommodate users such as workers and students who pass through the lanes. The development concept was prepared based on Kendari's current conditions.

The development concept is also integrated with various modes of public transportation, making it accessible to all levels of society [33]. The re-planning of the pedestrian lane at the public open space in Kendari is intended to increase people's interest in activities such as walking, exercising, and many more. One of the reasons for the low utilization of pedestrian paths in Kendari is the public's poor perception of the path's service. Additionally, pedestrian lanes are less attractive because the currently available pedestrian paths cannot accommodate activities on the paths at the former MTQ public open space.

This condition happened because, initially, the area was not designed for public activities, causing inconvenience to its users.

Considering the issues related to the pedestrian lanes at the public open space in Kendari, the paths are then designed to serve all the community's needs. Pedestrian paths are expected to be accessible, safe, and comfortable, giving users a good impression and experience. The planning of this area also focuses on the psychological aspects of street users, where the design is prepared to provide comfort for the community. The comfortable design is not only for specific Segments but in all areas, including bus stops, lanes for the disabled, and corridors that connect transportation modes with pedestrian paths. The planning also includes a pedestrian path on the connecting lane between the bus stop and the parking lot. This design is intended to facilitate lane users, including the general public and people with disabilities, to access bus stops easily and safely.

Table 3. The Optimal Pedestrian Lane Model

No.	Description	Design Principles	Implementation
1.	Tolerance For Error	• Minimize hazards and losses due to accidents or unintentional events.	• The surface of the pedestrian path is slippery, and potholes can pose a danger to users. • There is a difference in the height of the pedestrian path • There is no connection between the paths, so circulation is interrupted. • Open drainage channels are accident-prone for visitors. • Existing park benches are only available in Segments 2 and 3. • Lack of signage for directions
2.	Perceptible information	• Availability of important supporting information for users. • The existing parking area is equipped with parking instructions and parking lines. • A vehicle parking pattern that requires drivers to park their vehicles in an organized manner. • Special parking for the disabled.	• Signage is not yet available to direct users. • Information on the location of facilities in the park area is not yet available. • Signs in smoke-free areas and • Do not throw garbage in any place. • The disabled parking symbol is not yet available.
3.	Low physical effort	• Existing facilities can be used efficiently and comfortably in all conditions. • Elements of the outdoor space provided are safe for users • Parking areas that are directly adjacent to highways with high intensity are designed in such a way as to minimize the occurrence of traffic accidents.	• The unavailability of handrails on the stairs poses a risk of injury or accident for crutch users, the elderly, and even the visually impaired. • No guideways on stairs and pedestrian paths. • There is a difference in elevation/height of the path. • Drainage channels that interfere with circulation.
4.	Equitable use	• The design minimizes hazards and losses due to accidents or accidental events. • Easily accessible to all groups, including people with disabilities	• Wheelchair users cannot access the park independently • Segments of the area have not been connected, so that circulation is interrupted
5.	Simple and intuitive use	• The design of park facilities should be easily accessible. • The stairs and ramps are easily accessible to everyone and have a simple and easy design.	• People with disabilities have not been able to access the area independently.
6.	Size and space for approach and use	• Requires the use of space size in design by approaching users' posture, size, and movement. • The width of the existing pedestrian path aligns with the accessibility standards, and materials are used that are rough surfaces so that they are not dangerous for people with disabilities.	• The size of the stairs also meets the accessibility standards, but there is no handrail. • The available ramps do not meet the standard of the 3 available ramp models; only ramp model 2 is close to the required standard.
7.	Flexibility in use	• Accommodate the varying circumstances and abilities of each individual. • The entrance can be accessed from all points, and multiple entry options are provided. • The ramp is easily accessible to al	• The size of the pedestrian path has different sizes • Ramps and guiding blocks are unavailable in Segments 4,5 and 6 regions.

The development of pedestrian paths in the public open area has the concept of being "Safe, Comfortable, and Accessible." This concept emphasizes that all community groups can access pedestrian paths.

1. Safe

Pedestrians need protection from traffic accidents, criminal threats, and other physical threats. Traffic accidents are threats that need serious attention. In addition, they need protection from accidental falls due to tripping or height differences between the surface of the road elements [30].

2. Comfortable

The pedestrian path design must be made so people are comfortable using them. This design is realized by providing comfortable seats, shelves for placing luggage, CCTV, entertainment shows, regional music shows, and other components that can increase user comfort. In addition, it is necessary to provide facilities that support the mobility of people with special needs, from bus stops to pedestrian paths [31]. The pedestrian path has a guiding block; therefore, it is safe for people with disabilities, children, pregnant women, and the elderly. Furthermore, priority seats for people with special needs, which can be folded and have hooks for wheelchairs, are available. Therefore, people with disabilities can independently access pedestrian paths.

3. Accessibility

Accessibility for pedestrian lane users includes eliminating obstacles, width, free space, bow and rest areas, slopes or grades, curb ramps, and surface and texture [32]. Ease of access applies to everyone, including those with special needs, such as wheelchair users, the blind, and the elderly. Pedestrian accessibility is essential in making an area walkable or pedestrian-friendly [33].

Design Recommendation

Universal design is a philosophy that aims to create things and environments that are highly accessible for everyone without necessitating significant adaptations. While catering to people with disabilities, this approach also considers the needs of the elderly, pregnant women, children, and foreigners.

The analysis and observations conducted at the green open space of Tugu Religi revealed that most existing facilities do not adhere to universal design principles. Consequently, a design direction is needed to enhance the elements of the current city park in Kendari City. This design direction aligns with the guidelines outlined in the regulation of the Ministry of Public Works and Housing No. 14 of 2017, which addresses the requirements for the convenience of buildings and also refers to the Universal Design Guide for Public Places.

1. Pedestrian paths

Pedestrian paths encircling the green open space of Tugu Religi Park are recommended to have a width ranging from 150 cm to 160 cm. The height of the pedestrian path from the main road should be between 25 cm and 30 cm, with a platform length of 175 cm and a slope ranging from 7° to 8°. The pedestrian path should feature guiding blocks (yellow lines) to enhance accessibility for visitors with disabilities. Additionally, a ramp should be incorporated from the main road to the pedestrian path, facilitating independent access for visitors who use wheelchairs without assistance. Figure 9 shows the pedestrian path plan and Figure 10 shows the standard details of the staircase,

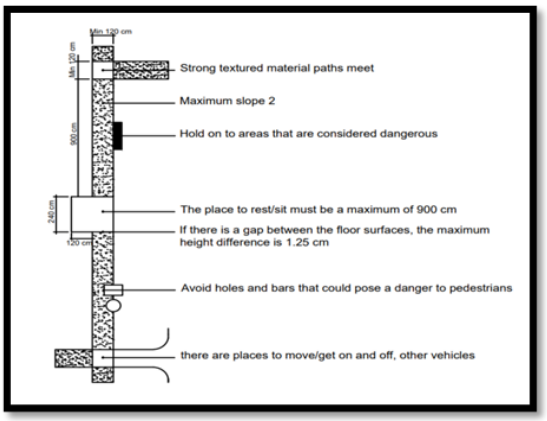


Figure 9. Pedestrian Path Plan

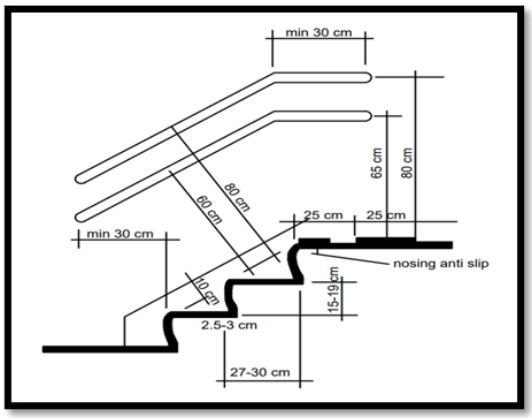


Figure 10. Standard Details of the Staircase

2. Stairs

Recommendations for the height of the existing steps in RTH Tugu Religi vary, with a height of about 15-19 cm and a width of about 27-30 cm. A good stair design should have a stair slope of less than 60° and be equipped with a minimum handrail on one side of the stairs. The handrail should be easy to hold, be 65-80 cm from the floor, and be free from distracting construction elements. The ends should be rounded or well-deflected toward the floor, wall, or pole. The length at the ends (top and bottom) should be increased by 30 cm.

3. Ramp

Pedestrian paths encircling the green open space of Tugu Religi Park are recommended to have a width ranging from 150 cm to 160 cm. The height of the pedestrian path from the main road should be between 25 cm and 30 cm, with a platform length of 175 cm and a slope ranging from 7° to 8°. The ramp shape and slope is shown in Figure 11. The pedestrian path should feature guiding blocks (yellow lines) to enhance accessibility for visitors with disabilities. Additionally, a ramp should be incorporated from the main road to the pedestrian path, facilitating independent access for visitors who use wheelchairs without assistance. Additionally, a ramp should be incorporated from the main road to the pedestrian path, facilitating independent access for visitors who use wheelchairs without assistance. Figure 12 shows a recommendation for pedestrian pathway entry access.

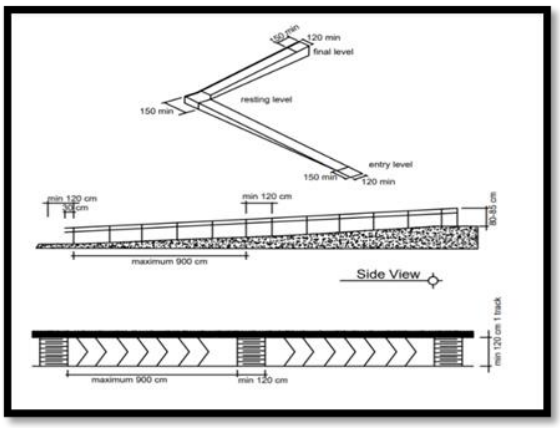


Figure 11. Ramp Shape and Slope

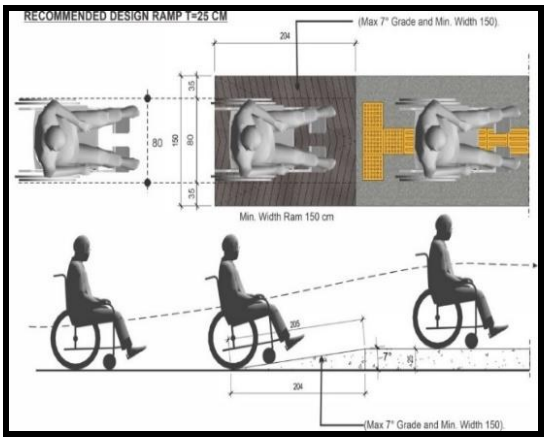


Figure 12. Recommendation for Pedestrian Pathway Entry Access

4. Parking

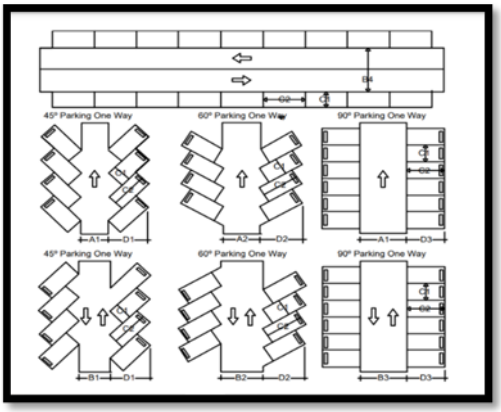
Parking recommendations consider layout, site shape, and economic benefits. Structuring parking pockets by grouping types of vehicles such as cars, motorbikes, and bicycles and preparing special parking for vehicles with disabilities. A good car park design should consider several important factors, such as safety, driver comfort and efficient use of parking space. Figure 13 shows the parking design.A good car park design should consider several important factors, such as safety, driver comfort and efficient use of parking space.

5. Prayer place (*musholla*)

Recommendations need to provide a prayer place, equipped with ablutions and toilets, in the Tugu Religi area to support user needs. A facility or special area provided to perform the ritual of ablution, which is to clean a number of body parts before performing the prayer service. Ablution places are usually equipped with facilities such as sinks, water taps, and other equipment that facilitate the performance of ablution. Figure 14 shows the ablution places.

6. Toilet

Recommendations for toilets where persons with disabilities can also utilize the space inside the toilet have a minimum size of 1520cm x 205 cm. The first thing to do is the type of bathroom door. It is recommended to use a sliding door type to make it easier for wheelchair users to open and close the door. In addition, the width of the toiler door for people with disabilities should also be larger than that of a normal toilet door.



Number of Parking Spaces Which are available	Number of Parking Spaces which are accessibility
1 - 25	1
26 - 50	2
51 - 75	3
76 - 100	4
101 - 150	5
151 – 200	6
201 – 300	7
301 - 400	8
401 - 500	9
501 - 1000	2 % of the total
1000 – and so on	20,1 +1 for every hundred

Figure 13. Parking Design and Number of Disabled Parking Spaces

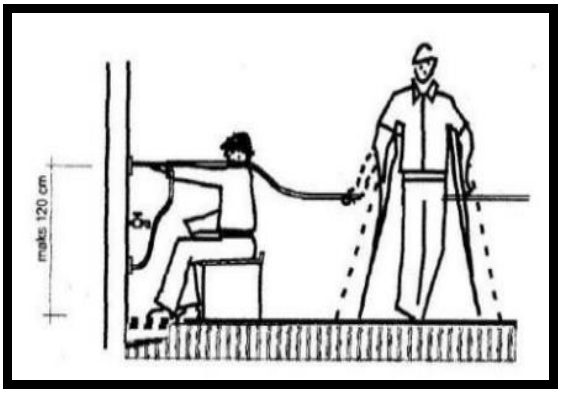


Figure 14. Ablution Faucet Height for the Disabled

To make it easier for wheelchair users, make the door width around 1.5. The disabled toilet should also be equipped with aids for the visually impaired. To help them understand the bathroom instructions, use embossed symbols. Handrails can be useful for visually impaired people and wheelchair users. The function of the handrail is to serve as a handrail when the disabled person walks or moves from the wheelchair to the toilet. The toilet is depicted in Figure 15.

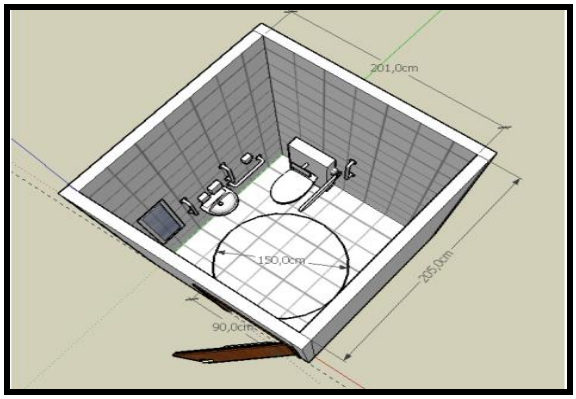


Figure 15. Toilet for the Disabled

7. Specialized signage, signs and markings

Recommendations on the availability of signs and markings, especially those that accommodate the special needs of people with disabilities. One way to easily understand people with disabilities is to understand the meaning of any disability access symbols. Such symbols should be available in public spaces, public transport or on products or goods [34]. Figure 16. Shows a special signs for the disabled.

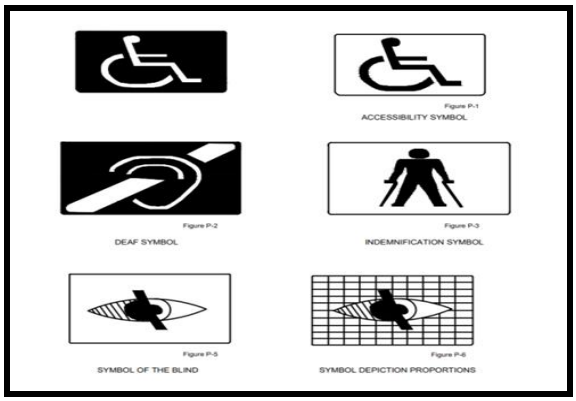


Figure 16. Special Signs for the Disabled

Figure 17. Rubbish Bin

8. Rubbish bin

Waste management recommendations for the green open space of Tugu Religi suggest the placement of at least 30 trash bins at various points throughout the park. The positioning of these bins should be carefully considered to ensure easy accessibility for users of wheelchairs and crutches and individuals with visual impairments, allowing everyone to access the rubbish bin locations. The rubbish bin is shown in Figure 17.

Design Recommendations for the Green Open Space of the Tugu Religi Area

Efforts to design pedestrian paths that are inclusive for people with disabilities in the urban public green open space area are guided by universal design principles. Based on the discussions with experts and the observed characteristics of the research area, the proposed model for an optimal pedestrian path is presented in Figure 18.

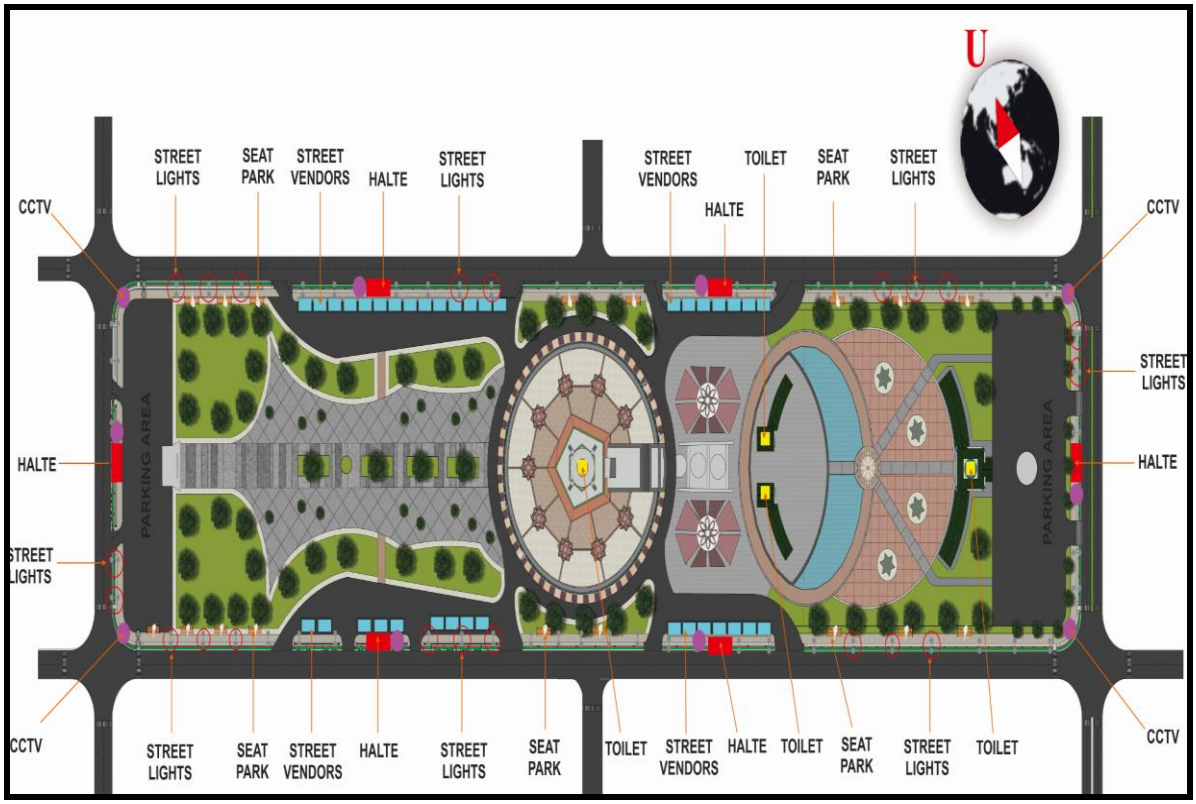


Figure 18. Lay Out Plan of Public Green Open Space Area

CONCLUSION

The quantitative and qualitative analyses of 31 assessment variables reveal the performance levels of existing pedestrian pathways in Kendari, categorized as good, moderate, and poor for each variable. Furthermore, the satisfaction index for users of pedestrian paths was classified in the "Moderately Satisfying" category at 65.57%. The findings provide valuable insights for governmental planning concerning enhancing pedestrian pathway services. The strategy for developing pedestrian pathways in public open spaces is guided by the principle of being "Safe, Comfortable, and Accessible," underscoring the necessity for accessibility by all societal groups. A limitation of this research is its incomplete set of variables, lacking factors that support pedestrian pathways, which suggests that expanding the research variables could render the study more comprehensive.

It is recommended that the government prioritize equitable development and routine maintenance of pedestrian pathways in open spaces. The focus for the development or upkeep of these pathways should encompass nine critical aspects of effectiveness: connectivity, accessibility, circulation, security, comfort, safety, climate or shade, aesthetics, and cleanliness. Future research should investigate the efficacy of urban green open spaces and explore the determinants of pedestrian interest in utilizing these pathways.

The development concept for pedestrian pathways in public open spaces, emphasizing safety, comfort, and accessibility, aims to ensure that pathways are universally accessible to all community members.

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