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Evaluation of User Comfort on The Pedestrian Path of Nicolau Lobato Street, Comoro, Dili

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A B S T R A C T

The pedestrian path on Jalan Nicolau Lobato is a pedestrian path that has quite high activity. Activities on the pedestrian path on Jalan Nicolau Lobato have problems with pedestrian comfort, including several large trees that cover pedestrians and there is no pavement on the pedestrian path. The aim of this research is to identify the condition of pedestrian routes on the Nicolau Lobato Street landscape and evaluate the comfort level of pedestrian routes on the Nikolau Lobato Street landscape. This research analyzes lane users' perceptions of pedestrian lane comfort using Likert scale analysis and formulates policy directions to increase the comfort of pedestrian lanes on Jalan Nikolau Lobato. Based on the results of research that has been carried out, pedestrian paths in the east and west have different sizes and uneven path surfaces. The condition of pedestrian paths, green lanes and rubbish bins is not optimal in terms of provision. Based on pedestrian perceptions, the indicators that are said to be uncomfortable are indicators of paving comfort with 25 respondents uncomfortable, for pedestrian comfort facilities with 23 respondents uncomfortable, connectivity with 24 respondents uncomfortable, waste facilities with 27 respondents uncomfortable, respondents for layout the location of the tree is uncomfortable for 29 people. The results of the analysis show that the physical condition and user perception of the comfort of the pedestrian path are not appropriate. Thus, the results of these findings formulated policy directions to increase comfort in the form of repairs, additions and construction of pedestrian facilities and infrastructure on the pedestrian route on Jalan Nicolau Lobato in accordance with the established criteria and standards..

Keywords: *Comfort, Pedestrian Path, Pedestrian Facilities*

Introduction

Urban areas are required to strive towards becoming well-planned cities. A well-planned city can be defined as one that facilitates traffic movement, including pedestrian pathways. Pedestrian pathways are integral elements in urban areas, contributing significantly to the development and progress of a city, especially in enhancing the comfort and convenience of urban activities. The purpose of establishing pedestrian pathways is to reduce traffic congestion, mitigate air pollution, and address other traffic-related issues. Pedestrian pathways serve as crucial transportation facilities by connecting different functions within an area. Every road used by public traffic must be equipped with pedestrian facilities, as they play a crucial role in city development, particularly in supporting the comfort and convenience of urban activities.

According to Unterman (1984, as cited in Purnomo, 2015), the main function of pedestrian pathways is to provide services to pedestrians, thereby enhancing their smoothness, safety, and comfort. The construction of well-planned pedestrian pathways in accordance with the pedestrian route planning in public areas will improve the comfort, quantity, and quality of pedestrian movement and enhance the urban environment. Moreover, pedestrian pathways can contribute to the health of pedestrians and the overall quality of the urban environment. Shirvani (1985) suggests that pedestrian route planning should consider a balance of interactions between pedestrians and vehicles, safety factors, sufficient space for pedestrians, facilities that offer enjoyment along the pedestrian area, and the availability of integrated public facilities.

Nicolau Lobato Street is one of the roads leading to Nicolau International Airport, with high daily mobility levels for both vehicles and pedestrians. The presence of Nicolau Lobato International Airport results in numerous pedestrian activities carried out by locals and tourists. The high mobility level, ideally, should be accompanied by a road landscape that provides comfort for road users. However, the reality is that much of the road landscape on Nicolau Lobato Street falls short of the ideal impression. This is evident in the irregular placement of trees and the damaged pedestrian infrastructure, which lacks trees, causing discomfort for road users. The journey is disrupted due to the disorderly trees and damaged pedestrian pathways, leading pedestrians to feel uncomfortable, with high air pollution levels affecting road users, local residents, and tourists alike.

Given the above problems, an evaluation of the comfort of the pedestrian pathway in the landscape of Nicolau Lobato Street is necessary. This evaluation is crucial to improve road user comfort, with the ultimate goal of providing recommendations to create an ideal road landscape on Nicolau Lobato Street.

Methodology

The research was conducted on Nicolau Lobato Street, Comoro, Dili, spanning from the Nicolau Lobato Statue to the Nicolau Lobato International Airport parking area. The research location was divided into two segments:

1. Segment 1, from the Nicolau Lobato Statue to the first roundabout, with a road length of 315.10 meters.

2. Segment 2, from the first roundabout to the Nicolau Lobato Airport parking, with a road length of 253.30 meters.

The research utilized various tools, including hardware and software. Hardware tools included a measuring tape, camera, writing tools, and a computer (laptop), while software tools involved Google Earth, Microsoft Word, and Microsoft Excel. The basic map of the research location served as a reference.

Data for this research comprised quantitative information obtained from both primary and secondary sources. Data collection methods included questionnaires, literature reviews, surveys of relevant institutions, and documentary studies.

The population for this study consisted of every pedestrian traversing the pedestrian pathway on Nicolau Lobato Street. The sample selection method employed non-probability sampling, specifically incidental sampling. Incidental sampling involves selecting samples based on chance encounters; anyone who coincidentally meets the researcher and fits the criteria for data collection can be used as a sample.

In this research, two data analysis methods will be employed:

1. Descriptive Analysis: Descriptive analysis involves comparing the current physical condition of the pedestrian pathway with policy standards and regulations governing planning, provision, and utilization of pedestrian pathways.
2. Likert Scale Analysis: The Likert scale is a measurement method used to assess the attitudes, opinions, and perceptions of individuals or groups regarding social phenomena (Sugiyono, 2012). The Likert scale utilizes a questionnaire to determine the level of comfort based on pedestrians' perceptions of Nicolau Lobato Street's pedestrian pathway, considering accessibility, connectivity, comfort, cleanliness, and existing facilities.

To discuss the research results with a descriptive percentage, scores obtained from the questionnaire responses need to be qualitatively classified. The steps for calculating the questionnaire and determining the criteria for pedestrian comfort are as follows:

- Create a questionnaire tabulation from respondents.
- Determine respondent answer scores according to predefined criteria. The scoring criteria are as follows:
    - Each alternative answer to each question item is assigned a score corresponding to the level of the alternative answer item.
    - For each question item, the scoring is on a four-point scale, where:
        - Choosing "Very Comfortable" receives a score of 5.
        - Choosing "Comfortable" receives a score of 4.
        - Choosing "Fairly Comfortable" receives a score of 3.
        - Choosing "Uncomfortable" receives a score of 2.
        - Choosing "Very Uncomfortable" receives a score of 1.
- Sum the scores obtained from each respondent.
- Calculate the percentage score obtained using the formula % = $\frac{n}{N}$ x 100%
- Where:
    - Dp = Descriptive Percentage (%)
    - n = Total respondent scores
    - N = Maximum total scores

The quantitative results obtained from the formula calculation are then converted from quantitative calculations into qualitative sentences. The steps taken to determine the criteria for pedestrian comfort are as follows:

- Determine the maximum score obtained from the multiplication of the highest score, the number of items, and the number of respondents.
- Determine the minimum score obtained from the multiplication of the lowest score, the number of items, and the number of respondents.
- Set the score range by subtracting the minimum score from the maximum score.
- Determine the class interval, obtained by dividing the score range by the criterion range.

- Set the maximum percentage as 100%.
- Set the minimum percentage.
- Set the percentage range.
- Percentage Range=Maximum Percentage−Minimum PercentagePercentage Range=Maximum Percentage−Minimum Percentage
- Set the percentage interval class.

Results

Overview

Dili is the largest city in Timor-Leste, situated on the northern coast of the easternmost part of Timor Island. Presently, Dili still lacks public facilities such as pedestrian pathways, and some existing facilities do not meet the required standards. One such example is the condition of pedestrian facilities in the Comoro village, including waste disposal facilities, zebra crossings, drainage systems, the state of green pathway facilities, traffic signs, and notably, the narrow and damaged condition of sidewalks. Additionally, the sidewalks are often covered by trees, making it inconvenient for pedestrians. Moreover, during daylight hours, pedestrians feel discomfort due to the lack of shading trees along the pedestrian pathway on Nicolau Lobato Street.

Observations indicate that the community is dissatisfied with the deficient facilities along the Nicolau Lobato Street pedestrian pathway. The research results further highlight that respondents, predominantly males, expressed discomfort with the existing pedestrian facilities. The majority of respondents in the age group of 15-30 years, with an average educational background of students, signify that the research location has a higher population of youth compared to older individuals.

Nicolau Lobato Street is a primary arterial road, connecting efficiently between national activity centers or between the national activity center and regional activity centers. The following provides a general overview of the pedestrian pathway on Nicolau Lobato Street.

Figure 1. The pedestrian pathway of Nicolau Lobato Street.

Comfort Conditions of the Pedestrian Pathway

The condition of sidewalks significantly influences pedestrian activities. Well-maintained, comfortable, and clean sidewalks contribute to the overall comfort of a city. The pedestrian pathway on Nicolau Lobato Street currently lacks complete and well-maintained pedestrian facilities, diminishing the comfort for pedestrians. The following outlines the comfort conditions of the pedestrian pathway on Nicolau Lobato Street based on segment divisions:

a. Segment I

The sidewalk in Segment I has a narrow width on the eastern side.

(1) Eastern Section (2) Western Section

Figure 2. Comfort Conditions of Nicolau Pedestrian Pathway

b. Segment II

The sidewalk in Segment II is damaged and narrow. The surface condition of the sidewalk in Segment II is uncomfortable for pedestrians due to damage. Some trees obstruct the pathway, and there are also potholes and uneven surfaces in certain spots on the sidewalk.

Figure 3. Comfort Conditions of Pedestrian Pathway in Segment II

Analysis of the Existing Condition of the Pedestrian Pathway on Nicolau Lobato Street

Based on the Ministry of Public Works of the Timor-Leste Government in 2014, the width of pedestrian pathways in areas designated for commercial, shopping, and entertainment land use should have a minimum width of 2 – 4 meters. According to observations, the width and height of pedestrian pathways on Nicolau Lobato Street vary in each segment due to land adjustments, the awareness of the community, and the government's utilization of urban facilities. The following Table 1 provides the dimensions of the width and height of the pedestrian pathway on Nicolau Lobato Street:

Table 1. Existing Conditions on Nicolau Lobato Street

No	Location	Type	Width West	Height West	Width East	Height East
1	Segment I	Width and Height	2.9 m	15 cm	1.6 m	15 cm
2	Segment II	Width and Height	1.5 m	13 cm	1.8 m	13 cm

Based on Table 1, the pedestrian pathway in Segment I has uneven width. Segment I has a pedestrian pathway with a fairly busy pedestrian activity, as does Segment II. The pedestrian pathway in Segment II also has a narrow width. Segment II has a pedestrian pathway with quite busy pedestrian activity, and there are also shops, restaurants, and vendors in the vicinity. Table 3 presents the results of the analysis of the existing width of the pedestrian pathway on Nicolau Lobato Street.

Table 2. Results of Analysis of Existing Width Conditions of Pedestrian Pathway on Nicolau Lobato Street

No	Location	Criteria	Availability West	Availability East
1	Segment I	2 m - 4 m	Meets	Does not meet
2	Segment II	2 m - 4 m	Does not meet	Does not meet

Based on the analysis results from Table 2, compliance is only found in Segment I on the western side, while Segment I on the eastern side does not meet the criteria. Similarly, Segment II does not meet the criteria. The existing width conditions of the pedestrian pathway on Nicolau Lobato Street are illustrated in the image below.

(1) Western Section (2) Eastern Section

Figure 4. Existing Conditions of Pedestrian Pathway Width and Surface Shape on Nicolau Lobato Street

(1) Western Section (2) Eastern Section

Figure 5. Existing Conditions of Pedestrian Pathway Width and Surface Shape on Nicolau Lobato Street, Segment II

Surface of the Pathway

The pathway surface is a place or object made of various materials used for the passage of vehicles or pedestrians, such as roads, sidewalks, and other user pathways.

Table 3. Types of Pedestrian Pathway Surfaces on Nicolau Lobato Street

No	Location	Surface Type	Condition West	Condition East
1	Segment I	Paving	Absent	Absent
2	Segment II	Paving	Uneven	Uneven

Based on observations on the pedestrian pathway on Nicolau Lobato Street, the surface of Segment I on the western and eastern sides does not have paving. There is no paving on both the eastern and western sides of the pedestrian pathway on Nicolau Lobato Street. In Segment II, the observation results indicate uneven surfaces and damages due to various activities, as well as some trees damaging the pathway surface.

Table 4. Analysis Results of Existing Conditions of Pedestrian Pathway Surface on Nicolau Lobato Street

No	Location	Criteria	Availability West	Availability East
1	Segment I	Even, Stable, Non-slip	Does not meet	Does not meet
2	Segment II	Even, Stable, Non-slip	Does not meet	Does not meet

Based on Table 4, the analysis results state that the surface condition of the pedestrian pathway on Nicolau Lobato Street does not yet meet the standards in both Segment I and Segment II. Figure 6 illustrates the surface condition of the pedestrian pathway on Nicolau Lobato Street based on Segment I and Segment II.

Figure 6. Surface Condition of the Pedestrian Pathway on Nicolau Lobato Street in Segment I

Figure 7. Surface Condition of the Pedestrian Pathway on Nicolau Lobato Street in Segment II

Zebra Crossings

A zebra crossing is a facility that connects opposite pedestrian spaces and is intended for pedestrians to cross the road. According to the Ministry of Public Works of the Timor-Leste Government, road markings for pedestrian crossings have longitudinal lines with a width of 0.30 m and a length of 2.50 m, with a minimum distance between transverse lines of 2.5 m.

Table 5. Provision of Zebra Crossings

No	Location	Availability	Width and Length Measurement
1	Segment I	Available	0.20 m - 2.2 m
2	Segment II	Not available	0

Based on observations on the pedestrian pathway on Nicolau Lobato Street, zebra crossings are present in Segment I but absent in Segment II.

Table 6. Analysis Results of Zebra Crossings

No	Location	Compliance
1	Segment I	Meets
2	Segment II	Does not meet

Based on the analysis results, zebra crossings that meet the criteria are only present in Segment I, while in Segment II, they do not meet the criteria.

Drainage

Drainage system is a method of directing water by creating channels to collect rainwater flowing on the ground surface, then directing it to a larger system and eventually discharging it into rivers and the sea (Kodiatie, 2005). According to the Ministry of Public Works of the Timor-Leste Government, drainage should have a minimum width and height of 60 cm. Table 7 below provides information about the presence of drainage facilities on Nicolau Lobato Street.

Table 7. Presence of Drainage Facilities on Pedestrian Pathway on Nicolau Lobato Street

No	Location	Condition	West Part Size	East Part Size
1	Segment I	Covered	Width 40 cm x Height 45 cm	Width 40 cm x Height 45 cm
2	Segment II	Covered	Width 40 cm x Height 45 cm	Width 40 cm x Height 45 cm

Based on observations, drainage on the sidewalks on Nicolau Lobato Street in both Segment I and Segment II is covered. Table 8 shows the analysis results of the availability of drainage facilities on the pedestrian pathway on Nicolau Lobato Street.

Table 8. Analysis Results of Drainage Facilities on Nicolau Lobato Street Pedestrian Pathway

No	Location	Criteria	Availability
1	Segment I	Width 60 cm x Height 60 cm	Does not meet
2	Segment II	Width 60 cm x Height 60 cm	Does not meet

Based on the analysis results, it does not meet the criteria because there are covered drainage facilities in both Segment I and Segment II, and during rainfall, these conditions may not allow for the effective drainage of excess water.

Green Lane

A green lane is a green area consisting of various flower plants or trees along the road, serving as a supportive element for the comfort of pedestrians. These plants offer numerous benefits to road users, including both drivers and pedestrians. According to the Ministry of Public Works of the Timor-Leste Government, a green lane should have a width of 1.5 m and a height of 2.5 m, which is used for shading. Table 9 displays the presence of green lane facilities on the pedestrian pathway on Nicolau Lobato Street.

Table 9. Presence of Green Lane Facilities on Nicolau Lobato Street Pedestrian Pathway

No	Location	Availability	West Size	East Size
1	Segment I	Available	2.5 m and 2.6 m	1.5 m and 2 m
2	Segment II	Available	Not available	1.5 m and 2 m

Based on observations, the existing condition of the green lane on Nicolau Lobato Street in Segment I shows minimal shading plants on the east and west sides. In Segment II, there are only plants on the east side, providing shade for pedestrians from the sun, making it comfortable to pass through. Table 10 presents the results of the analysis of the provision of green lane facilities on Nicolau Lobato Street pedestrian pathway.

Table 10. Analysis Results of Existing Condition of Green Lane Facilities on Nicolau Lobato Street Pedestrian Pathway

No	Location	Criteria	Availability West	Availability East
1	Segment I	Width 1.5 m x Height 2.5 m	Does not meet	Meets
2	Segment II	Width 1.5 m x Height 2.5 m	Does not meet	Meets

Based on Table 10, the analysis results state that the provision of green lane facilities on Nicolau Lobato Street pedestrian pathway, meeting the standards, is present in Segment I and II.

Waste Bin Facilities

The provision of waste bins is essential to support environmental cleanliness. The cleanliness of a city is influenced by the attention of both the government and its residents. The more frequent maintenance and care for cleanliness, the more beautiful and comfortable the city will be. According to the Ministry of Public Works of the Timor-Leste Government, waste bin facilities should be placed at a distance of 30 meters from each other. Table 11 shows the presence of waste bin facilities on Nicolau Lobato Street pedestrian pathway.

Table 11. Presence of Waste Bin Facilities on Nicolau Lobato Street Pedestrian Pathway

No	Location	Quantity	Distance
1	Segment I	None	0 cm
2	Segment II	1	0 cm

Based on observations on Nicolau Lobato Street pedestrian pathway, waste bin placement is insufficient, with facilities only available in Segment II, where daily activities occur. Segment II has small public waste bins. In Segment I, there is no waste bin, leading the local community to dispose of trash indiscriminately on the side of the road. Table 12 presents the results of the analysis of waste bin facility provision on Nicolau Lobato Street.

Table 12. Analysis Results of Waste Bin Facility Provision on Nicolau Lobato Street

No	Location	Criteria	Availability West	Availability East
1	Segment I	Distance 30 m	Does not meet	Does not meet
2	Segment II	Distance 30 m	Does not meet	Does not meet

Based on Table 12, the analysis results indicate that the provision of waste bin facilities on Nicolau Lobato Street pedestrian pathway does not meet the standard. The image below (Figure 11) illustrates the condition of waste bin facilities found only in Segment I on Nicolau Lobato Street pedestrian pathway.

Street Lighting

Street lighting provides artificial illumination for road users, ensuring pedestrians feel safe during nighttime travel. According to the Ministry of Public Works of the Government of Timor-Leste, street lighting facilities should have a distance of 10 meters between lights and a height of 4 meters. The following is the table depicting the presence of street lighting facilities on Nicolau Lobato Street's pedestrian pathway.

Table 13. Presence of Street Lighting Facilities on Nicolau Lobato Street Pedestrian Pathway

Location	**Availability**	**Distance**	**Height**
Segment I	Available	10 m	4 m
Segment II	Available	10 m	4 m

Based on observations of existing street lighting in Segment I and Segment II, the lamp positions are in the middle of the road, providing illumination for both the west and east sides. The following is the analysis result of street lighting on Nicolau Lobato Street.

Table 14. Analysis Results of Street Lighting Facilities on Nicolau Lobato Street Pedestrian Pathway

Location	**Criteria**	**Availability**
Segment I	Distance 10 meters, height 4 meters	Complies
Segment II	Distance 10 meters, height 4 meters	Complies

Based on the analysis results, the street lighting facilities meet the standards, providing a sense of safety for pedestrians walking on the street.

Analysis of Comfort Level Based on Pedestrian Perceptions on Nicolau Lobato Street Pedestrian Pathway.

To determine the comfort level of pedestrians walking on the pedestrian pathway of Nicolau Lobato Street, the research surveyed respondents' feedback on the indicator variables of comfort level. The obtained comfort results from respondents' responses indicate that the majority of pedestrian users feel uncomfortable due to the lack of pedestrian pathway facilities. Issues such as insufficient trash bins lead to improper disposal of waste by the public. In addition, greenery is lacking in Segment I on the east side and Segment II on the west side, causing discomfort for pedestrians during the day due to the lack of shaded areas.

Moreover, Segment I lacks paving, and in Segment II, there are damages and holes caused by numerous activities and trees. Traffic signs are insufficient in Segment II, and the road dimensions do not meet the standards. These factors contribute to the discomfort perceived by pedestrians.

Recommendations

To enhance the comfort of the pedestrian path on Nicolau Lobato Street, improvements are needed in existing facilities to meet the needs of pedestrians. The facilities that require attention include:

Repairing the surface conditions of the pedestrian path in segments I and II on the eastern side with a smooth, stable, and robust surface to prevent accidents. Additionally, there is a need for a wider pedestrian path to ensure comfortable walking for users.

These improvements are expected not only to enhance pedestrian safety but also to create a more comfortable and user-friendly environment.

4.

Conclusion

Based on the research objective, which is to formulate policy directions for improving the comfort of pedestrian paths on Nicolau Lobato Street that are comfortable, in accordance with pedestrian facility criteria and standards, and meet the needs of road users' facilities and infrastructure, several conclusions can be drawn as follows:

1. The pedestrian path conditions on Nicolau Lobato Street are currently unstable, with many paths being damaged, cracked, and uneven at various points. There are obstacles for pedestrians, such as trees covering the walkways, making it uncomfortable for pedestrians to traverse. The analysis of pedestrian paths on Nicolau Lobato Street indicates the need for improvements and additions to facilities such as repairing the surface material of pedestrian paths, widening pedestrian paths, providing trash bins, zebracross markings, traffic signs, and constructing pedestrian paths for people with disabilities.

2. The perception of pedestrians based on the comfort of pedestrian paths on Nicolau Lobato Street, as gathered from a questionnaire distributed to 70 respondents, indicates that the respondents are uncomfortable with the current pedestrian conditions.

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