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UNDERSTANDING THE MOBILITY PATTERNS OF TEUKU UMAR UNIVERSITY STUDENTS AND IMPLICATIONS FOR CAMPUS TRANSPORTATION

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Article Info

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Abstract

Teuku Umar University (UTU) is a prominent public university located in Meulaboh City, West Aceh Regency, situated in the Southwestern part of Aceh, Indonesia. With the passage of time, the student population at UTU has been steadily increasing, with 6,636 active students enrolled in the academic year 2021-2022. This growth has raised concerns about traffic congestion and the demand for additional parking spaces around the campus, primarily due to an increase in the number of students using private vehicles. Such transportation trends have resulted in significant external costs. To address these challenges and promote sustainable mobility solutions, the implementation of public transport has emerged as a potential remedy, offering faster mobility options, especially for the student community. However, despite the potential benefits of public transport, UTU lacks a public transportation service within a ±5KM buffer zone from the campus. Consequently, this research endeavors to delve into the daily activities of UTU students in their commuting patterns to the campus, critically analyzing their mode choice decisions. By understanding the prevalent daily activities and travel preferences of the students, this study aims to identify the extent to which students would respond to the implementation of public transportation within the ±5KM buffer zone from the UTU campus. The research is designed to be pioneering in nature, aiming to provide valuable insights and recommendations to develop a feasible and effective public transportation project within the ±5KM buffer zone. By incorporating the student perspective and preferences, this study seeks to contribute towards the creation of a sustainable and student-friendly transportation system that would not only alleviate traffic congestion and reduce external cost expenses but also contribute to mitigating greenhouse gas emissions associated with private vehicle use.

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1. INTRODUCTION

Teuku Umar University (UTU) is a public university in the Southwestern part of Aceh, a public university in Meulaboh City, West Aceh Regency. As time goes by, the student population is expected to increase every year, and in the academic year 2021-2022, there were 6,636 active students enrolled at UTU (utu.ac.id, 2022). As one of the land use areas, educational centers have a high intensity in attracting movements [1]. The increase in the number of students, especially those using private vehicles, contributes to traffic congestion [2]and the need for additional parking spaces around the campus [3] and leads to external cost expenses [4]. Implementing public transport is perceived as effective in providing faster mobility, especially for student communities [5]; the transportation sector accounted for 29% of total global greenhouse gas emissions in 2019 [6]. Teuku Umar University does not have a public transportation service within a ±5KM buffer zone from the UTU campus (Figures 1 and 2). Based on daily observations of UTU students, they do not own private vehicles on average. Daily activities are necessary to analyze mode choice decisions in campus travel [7]. Therefore, this research aims to identify the daily activities of UTU students in commuting to the campus and determine the extent of student's response to implementing public transportation within the ±5KM buffer zone from the UTU campus. This research is intended to serve as a pioneer and provide input for developing a public transportation project within the ±5KM buffer zone.

Fig 1. Research Location of Teuku Umar University

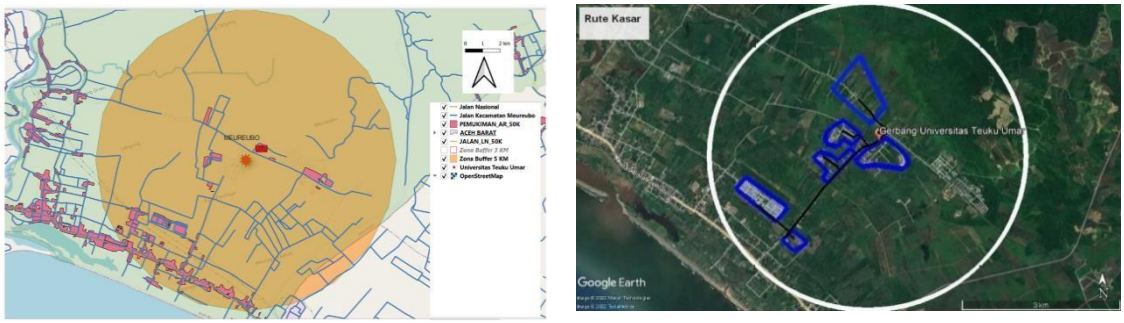

Fig 2. Research Location of Teuku Umar University within ±5 KM Buffer Zone

2. Methods

The method in the research on UTU students' daily activities in commuting to campus begins with collecting primary data on daily activities through the distribution of questionnaires for one month. This process involves a distribution team of 3-4 members in each group, placed at 5 locations within the research zone to obtain the desired population data [8]. Subsequently, the data is processed using the Likert Scale method, and the assessment's weights are determined using the Likert Scale [9] as the basis for analyzing the primary data. The

preliminary data analysis is also supported by secondary data to conduct further analysis, enabling the daily mapping activity of zones and students' responses to implementing public transportation services.

2.1. Validity, Reliability, and Likert Scale

Reliability testing ensures that respondents provide consistent answers when completing the questionnaire. This is done to achieve a distribution of measurement results that closely approximates the predetermined normal distribution [10]. Validity testing assesses the degree to which the questionnaire instrument used in data collection is valid. This validity test aims to determine whether the items presented in the questionnaire can accurately reveal the exact nature of what will be studied [10]. Equation (1):

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2)][N(\sum Y)^2 - \sum Y)^2)]}} \quad (1)$$

The instrument's validity is determined by consulting the correlation coefficient (r) at a one-tailed significance level of 5%. If the calculated r-value exceeds the tabled r-value, the instrument can be considered valid [11]. Thus, the device is deemed suitable for collecting data.

Reliability testing is conducted to determine the extent to which measurement results remain consistent when measuring the same phenomenon multiple times using the same measuring tool [12], [13]. Equation (2):

$$r = \left(\frac{k}{k-1}\right)\left[1 - \frac{\sum \sigma^2 b}{\sigma^2 t}\right] \quad (2)$$

The Likert scale is a research data scale used to measure attitudes, opinions, and perceptions of individuals or groups related to the social phenomenon being studied. The Likert scale measurement involves presenting several questions to the selected respondents, who serve as the sample, and assigning scores to their responses [10] [14]. The following is Table 1.

Table 1. Likert Scale

Category Score	Score
Strongly Agree (SS)	5
Agree (S)	4
Neutral (CS)	3
Disagree (TS)	2
Strongly Disagree (STS)	1

To calculate the total score on a Likert scale measurement, you can use the following Equation: T × Pn, where T represents the total number of respondents who selected a specific choice, and Pn represents the numerical score assigned to that choice.

1. To interpret the results, it is essential to determine the highest score on the Likert scale (Yi) and the lowest score on the Likert scale (Xi) using the following Equation: yi = highest Likert score × number of respondents, and xi = lowest Likert score × number of respondents.
2. To calculate the percentage index on a Likert scale, use the following Equation: Index = (total score) / y × 100, where y represents the highest total score on the Likert scale.

2.2. Sampling Technique

Purposive sampling (also known as judgmental, selective, or subjective sampling) is a sampling technique that involves selecting sample members from a population based on specific considerations for participation in the research [10]. The sample respondents in this study are UTU students who reside within a distance of approximately ±5 KM from the campus. Statistical formulas are used to determine the sample size for each study

zone. It is generally believed that a larger sample size will yield better results. With a large sample size, the mean and standard deviation obtained are more likely to resemble the population mean and standard deviation. However, even a small randomly selected sample can accurately reflect the population. To determine the representative sample size (n') for grouped population data, the following statistical formula (S) is used [15]. In this research, the sampling analysis is based on specific considerations or criteria, which are as follows:

1. The sample consists of Teuku Umar University students.
2. Statistical calculations use Equation (3) to determine the sample size.

$$S = \sqrt{\frac{\sum(x-x^2)}{n}} \quad (3) \qquad \text{and : } n' = \frac{S^2}{(S\,e\,(x))^2}$$

2.3 Zoning

The zoning is carried out for each individual to facilitate the formation of matrices [16],[17]. The zoning is based on residential areas and imaginary lines [18],[19]. The zoning is planned to be within a radius of approximately ±5 KM from the UTU campus, based on housing boundaries. Meanwhile, travel route selection is not carried out as there is only one route option available to reach the campus [20]. From the specified boundary markers, zones can be determined, as shown in Table 2 and Figure 3.

Table 2. Zone Division

No	Region/Village	Zone	Location	Route
	Ujong tanoh darat	A	UTU Campus	UTU Campus
1		B	Community Houses and Putri Abdya Dormitory	Jln. Lingkungan-Jln. Alue Penyareng
2	Ranto panyang Timur	C	ADB 1 Housing Complex	Jln. Keuramat-Jln. Alue Penyareng
		D	Alpen Housing and Mahoni Housing	Jln. Pramuka-Jln. Alue Penyareng
3	Paya peunaga	E	Cinta Kasih Housing	Jln. Komplek-Jln. Alue Penyareng
4	Gunong kleng	F	Sanggamara	Jln. Alue Peunyareng

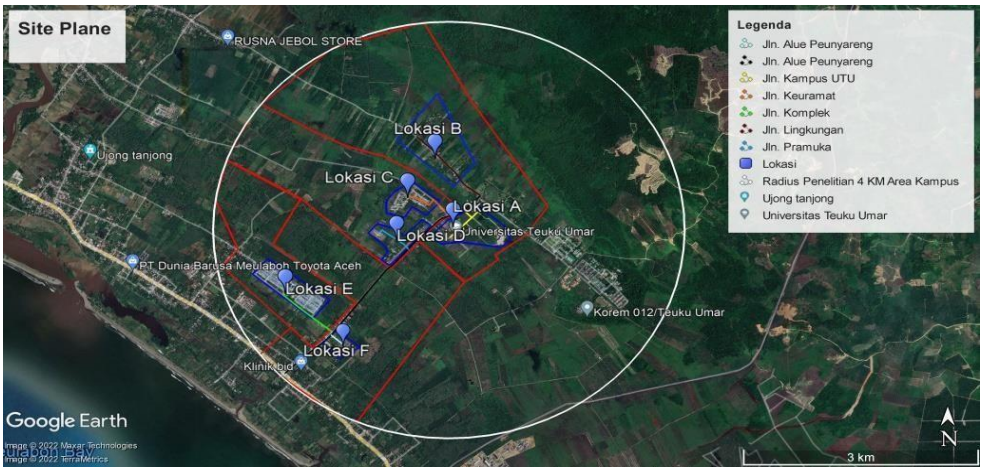

Fig 3. Zone Division

3. Results and Discussion

3.1. Daily Activity

3.1.1. Determination of Respondents

The calculation of student movements toward the campus in each zone was based on direct field analysis over one month. Surveys were conducted in each location for one week. Then, each area had representatives to gather data on daily activity. The determination of the sample size was processed using statistical formulas, and the data recapitulation of the number of respondents in each research zone can be seen in the following Table 3:

Table 3. Movement Data and Number of Student Respondents

	Zone	Average Daily Movement	Participated	Zone	Average Daily Movement	Participated
B	Community Houses and Putri Abdya Dormitory	309	14	D	Alpen Housing and Mahoni Housing	812	7
C	ADB 1 Housing Complex	1092	7	E	Cinta Kasih Housing	338	16
F	Sanggamara Housing	114	11	A	UTU Campus		

3.2.2. Student Characteristics

Based on the data obtained from the survey on the student movement and questionnaires within a radius of ±5 from the UTU campus, several types of characteristics of UTU academic students were identified. The results of the features and the corresponding diagram are as follows: The majority of respondents were female, accounting for 54%, while the majority of male respondents accounted for 46%, as shown in Figure 4 below.

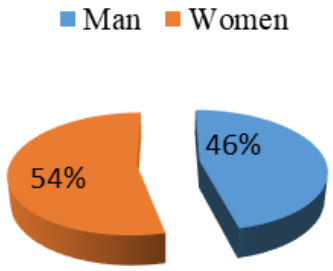

Fig 4. Diagram of Respondents' Gender

Most respondents within the ±5 KM buffer zone of the UTU campus use motorcycles as their means of transportation to the campus, with a percentage of 56%. Cars are used as transportation at 0%, bicycles are used by 6% of the respondents, and walking is chosen by 38%. This is to the data shown in Figure 5 below.

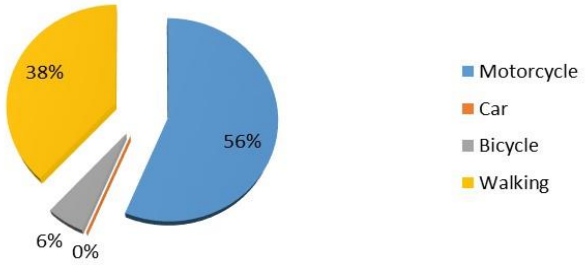

Fig 5. Diagram of Transportation Modes Go to UTU Campus

Most respondents within a ±5 KM radius of the UTU Campus tend to commute (arrive) at 08:00 AM with a percentage of 41%. This is followed by 09:40 AM with a share of 23%, 10:30 AM with a rate of 15%, 11:20 AM with a percentage of 15%, 1:50 PM with a percentage of 6%, and 4:20 PM with a share of 3%. This data can be seen in Figure 6 below.

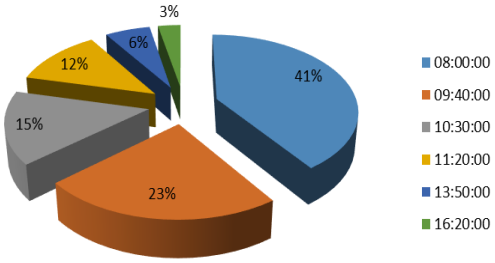

Fig 6. Diagram Frequency of commuting hours Go to Campus

Most respondents within a ±5 KM radius of the UTU Campus tend to commute back home (depart) at 1:50 PM with a percentage of 34%. This is followed by 10:30 AM with a share of 16%, 11:20 AM with a share of 21%, 3:30 PM with a share of 10%, 4:20 PM with a share of 16%, and 5:10 PM with a share of 3%. This data can be seen in Figure 7 below.

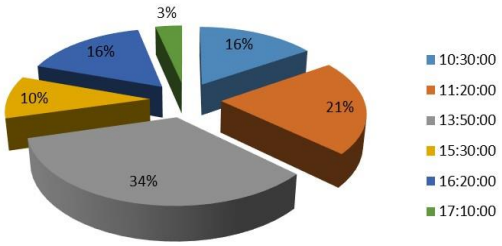

Fig 7. Diagram Of departure hours from campus

The percentage of respondents' opinions regarding the concept of public transportation implementation is as follows: 93.5% of students strongly agree with the idea of public transportation implementation, 82.5% believe that public transportation services provide an alternative solution for students who do not have their vehicles, and 75.3% of students agree to switch from using private cars to using public transportation. (See Figure 8: Summary of Opinion Score Intervals).

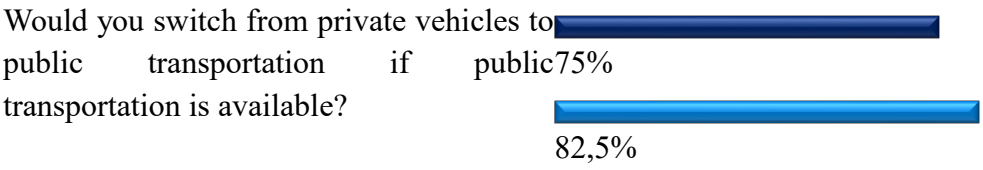

Fig 8. Diagram of Opinion Score Interval

4. Conclusion

The conclusion drawn from this research is that the daily activities of Teuku Umar University students within the ±5KM buffer zone primarily involve the use of motorcycles (56%) and walking (36%). The peak hours for traveling to campus are 8:00 AM, while the peak hours for returning from campus are 1:50 PM. Based on the respondents' opinions, 93.5% of the students strongly agree that implementing public transportation within the ±5KM buffer zone of the UTU campus would be beneficial. Based on this study, a recommendation can be made to develop the concept of public transportation service for UTU students. The data on daily student activities can serve as a fundamental input for expanding public transportation projects in the future stages.

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