Choosing Commuter Transportation Modes to Support Human Mobility (Case Study: Bulukumba Regency, South Sulawesi)

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ABSTRACT

To carry out daily activities and fulfill needs requires movement. In carrying out these movement, there are two choice, namely moving with transportation modes or without transportation modes (walking). This study aims to knowing the factors that influence the choice of private and public transportation modes as well as modeling the choice of commuter transportation modes. Focus of this study is Bulukumba regency that one of the regencies in the southern part of South Sulawesi. The transportation characteristics discussed are the characteristics of the trip (the purpose of he trip, time and distance), characteristics of behaviour travellers (mode selection and reasons for choosing the mode) and characteristics of transportation facilities (Quantitatively involves: waiting time, time for access to other modes and tariffs. Qualitatively involves: safety, comfort and trust). The result of the analysis obtained information that the dominant mode of transportation is used by commuter in Bulukumba regency are private motor vehicles. The tendency of the people of Bulukumba regency to use motorbikes is assessed because motorbikes have a high level of comfort and trust, cheap tariff, flexible schedule, easy access, quickly reach travel destinations and efficiency in use compared to private cars or public transportation modes. The R^2 value of the private motorbike mode selection model is 0.765 meaning that the education and work variables affect the motorbike mode selection by 76.5% and the rest is influenced by other variables. The model for selection public transportation modes has an R^2 value of 0.666, meaning that the tourism and trade variables affect the choice of the public transportation modes by 66.6% and the rest is influenced by other variables.

Key word: modes; commuter; transportation; motorbikes; easy access.

INTRODUCTION

The scope of transportation problems has expanded both in developed countries (industry) and in developing countries (Miro, 2012). This problem is not only limited to roads. Economic growth causes increased mobility so that the need for movement also increases beyond the capacity of the available transportation infrastructure system. The need for transportation services is very qualitative and has different characteristics as a function of time, travel destination, frequency, type of cargo transported, and others (Adisasmita, 2011). Transportation services are not in accordance with the need for movement causing the transportation system to be redundant. This makes the analysis and forecasting of the need for movement even more difficult (Tamin, 2008).

According to (Adisasmita, 2015), the need for movement is a derived need. Movement occurs to meet needs. Meeting needs is an activity carried out every day, for example meeting the needs for work, education, health, and sports. In carrying out the movement to meet these needs, there are two choices, namely with transportation modes or without transportation modes (walking). Movements without transportation modes (eg walking) are usually short distances (1−2 km), while movements with transportation modes are used over medium or long distances. The types of transportation modes used are also very diverse, such as private cars, taxis, buses, trains, motorcycles, airplanes, and ships. Whatever the transportation modes, these modes will never be able to move if the facilities are not prepared, such as roads, rail roads, airports, and seaports or commonly known as transportation infrastructure systems (Sani, 2010).

Private transportation in various regions is a very popular choice of transportation modes, because it is considered to have a fairly high level of efficiency compared to public transportation (Kawengian, 2017). In big cities in developed countries such as Europe and America, the dominant

private transportation mode is the car. In contrast to developing countries such as Indonesia, particularly in Bulukumba Regency, the dominant private transportation mode is motorcycle as evidenced by data on motorcycle sales and motorcycle vehicle ownership. Bulukumba Regency is one of the areas in South Sulawesi Province, Indonesia. The city is a destination for the surrounding hinterland areas, including the Gantarang Sub-District, Ujung Loe Sub-District, and Rilau Ale Sub-District. Developments in the suburbs have made trip generation as well as the center of economic activity in the city center. Gantarang Sub-District, Ujung Loe Sub-District, and Rilau Ale Sub-District as hinterland areas and residential development areas have a tendency to make trips to Bulukumba Regency. Therefore, the research question in this study is how the model in choosing transportation modes for commuters in the three sub-districts and its influencing factors.

Actually, the movement does not need to be performed if all these needs are available at the residence. However, in urban and regional planning, every land use has several characteristics and technical requirements must be met in planning and design. For example, airports must be located far from urban areas for safety and noise reasons and must also be far from mountainous areas for reasons of aircraft flight operations (Vuchic, 1981). Each land or land use has its own technical characteristics that can determine the type of activity that is suitable for that location. Some of the technical characteristics that are often used are topographic conditions (flat, hills, mountains), soil fertility, and geology. As a result, the location of activities is spread heterogeneously in the available space, causing the need for movement that is used for the process of meeting needs. Someone will leave in the morning from the housing location to the work location. Based on several studies, the choice of commuting modes is influenced by socio-economic and demographic factors, travel characteristics, and transportation quality (Bakri, 2016). In general, the influencing factors in choosing commuting modes are gender, education, distance, travel length, speed, and practicality. This shows different behaviors between men and women in choosing transportation modes (Sijabat & Rakhmatulloh, 2013). As explained earlier, the complexity of women's needs causes women to prefer more flexible modes so that public transportation services need to be scheduled in wider range of travel and working hours. Therefore, improving public transportation services must include changes in scheduling and synchronization of arrival and departure times to meet the needs of all users, in addition to physical or structural modifications in planning (Irjayanti et al., 2021).

Location

Figure 1. Map of Bulukumba Regency in South Sulawesi

Bulukumba Regency is one of the regencies in the southern part of South Sulawesi, located approximately 153 Km from the capital city of South Sulawesi Province. Bulukumba Regency is located between 05° 20´ - 05° 40´ South Latitude (LS) and 119° 58´ - 120° 28´ East Longitude (BT) with administrative boundaries:

a. North side: bordering Sinjai Regency
b. South side: bordering the Flores Sea
c. West side: bordering Bantaeng Regency
d. East side: bordering Bone Bay

Bulukumba Regency has an area of about 1,154.67 Km² or about 1.85% of the total area of South Sulawesi, divided into 10 sub-districts covering 24 urban villages and 102 villages. Of the 10 sub-districts, there are 2 large sub-districts, namely Gantarang Sub-District and Bulukumpa Sub-District with an area of 173.51 Km² and 171.33 Km², respectively, or about 29.87% of the total area of Bulukumba Regency while the smallest sub-district is Ujung Bulu Sub-District located in the Regency Capital (Bulukumba Regency) with an area of 14.44 Km² or 1.25% of the total area of Bulukumba Regency.

Characteristics of Transportation

According on Miro, 2008 Based on descriptive analysis on transportation characteristics in the Bulukumba Regency area using interviews with respondents, questionnaires and secondary data, the characteristics of transportation discussed were characteristics of travel (purpose, time, and distance), characteristics of travellers (mode choice and reasons for choosing a mode) and characteristics of transportation facilities (quantitatively regarding waiting time, time needed to access other modes, and fares while qualitatively regarding safety, convenience, and trust).

Linear Regression Analysis

Multivariate analysis using SPSS.28 software supports modeling or simplification of reality (Hidayat et al, 2011). Linear regression is a statistical method used to form a causal relationship model between the dependent variable and one or more independent variables. The relationship between the dependent variable and the independent variable in general in linear regression analysis can be written in the following equation:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_nX_n$$

Description:
Y : dependent variable (predicted value)
a : constant (Y if $X_{1,2,3,.....,n} = 0$)
$X_{1,2,3,n}$: independent variables
$b_{1,2,3,n}$: related to the independent variable (shows the average increase or decrease in the dependent variable for each increase in the independent variable).

RESEARCH METHODS

This study aimed to determine the influencing factors in choosing private or public transportation modes and find out the right model in choosing commuter transportation modes. This study was carried out in Ujung Bulu (the capital of Bulukumba Regency), Gantarang Sub-District, Ujung Loe Sub-District, and Rilau Ale Sub-District because these sub-districts are located closest to Bulukumba Regency (Ujung Bulu Sub-District). This encourages people to travel to Bulukumba Regency (Ujung Bulu District) to meet needs such as work, recreation, shopping, school and other social activities. The map of study site is presented in Figure 2
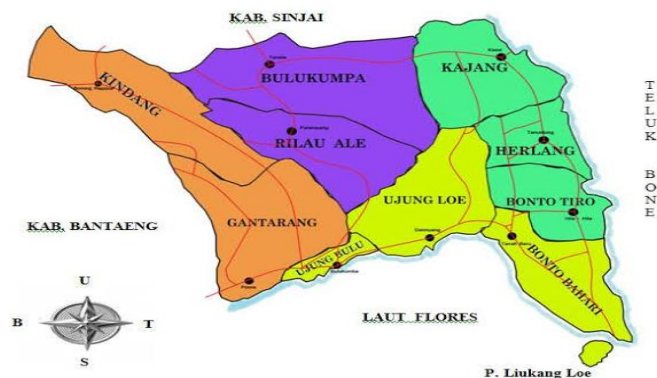

Figure 2. Map of Study Site

The model for choosing commuter transportation modes in Bulukumba Regency is based on a previous study. This study used theory as a basis in the formulation of variables used to collect data in the field. This study used a quantitative approach by developing a study of a phenomenon using mathematical models, theories and hypotheses related to a phenomenon. Quantitative data were mostly used in this study, so the analytical method used in this study was a quantitative descriptive method. This study also used two types of data, primary and secondary. Primary data were collected with 1). direct observation using the five senses. Observations were made to obtain information about a clearer picture related to the problems being investigated.

2) Questionnaires were distributed purposively to commuters.

This questionnaire contains closed questions by directing the sample to the purpose of study. Secondary data were collected with a literature review on a survey at the Central Statistics Agency (BPS) in Bulukumba Regency. The Rosque sampling technique was used in this descriptive quantitative study with a minimum of 30 samples (Mulyono, 1996). In this case the modeling function was considered correct and there were no errors in the model. This study used multiple linear regression method with SPSS as well as the T and F test. The T test was used to determine the influence of each independent variable on the dependent variable and the F test was used to simultaneously test the significance of the independent variables on the dependent variable (Somantri & Muhidin, 2006). Error can serve to show the efficiency of one type of experiment or study to another study. Normally we want an error of a small value, even if there is no error but the absence of error can also raise questions in our research. The most important thing about this error is that the error must occur naturally so that it can describe the real object of research and goog quality control can help reduce the type of error (Wulansari, 2021). In determining the sample size (Rosque technique), the sample was distributed based on the area closest to the Capital of Bulukumba Regency.

The determining factor for the sample was the type of work that had the potential to be a commuter, such as industrial workers, civil servants, traders and the private sector. The distribution of samples was carried out evenly in three sub-districts (Gantarang Sub-District, Ujung Loe Sub-District, and Rilau Ale Sub-District). Each sub-district had the same number of sample distributions, namely 10 samples so that the total sample was 30 people working in several agencies or in the private sector. Based on the above, the study flowchart can be seen in Figure 3 below.
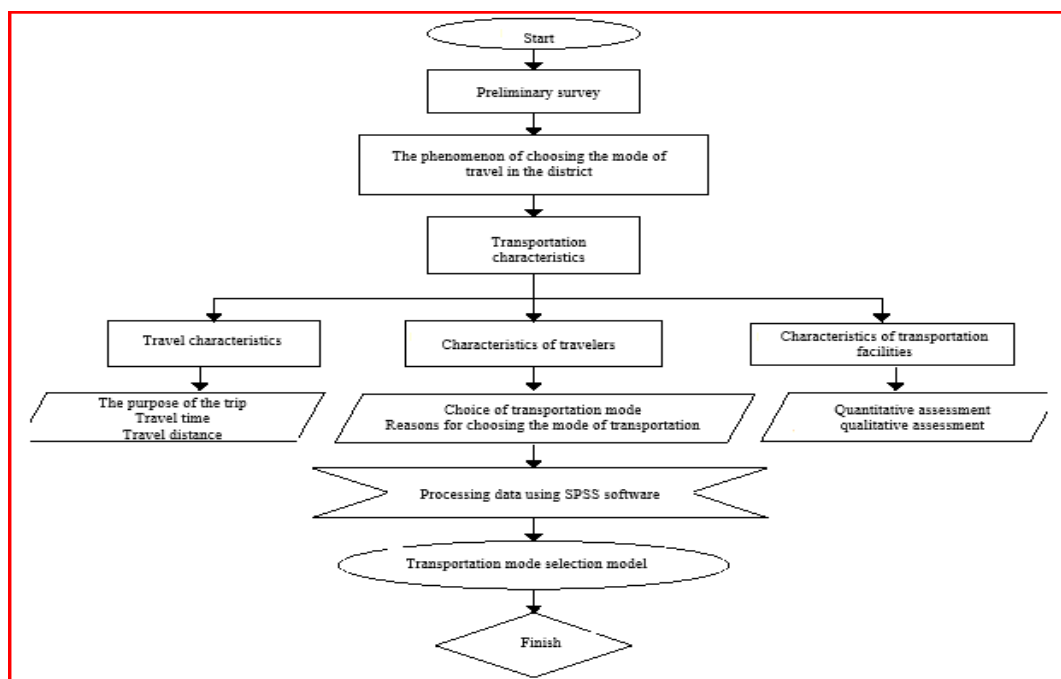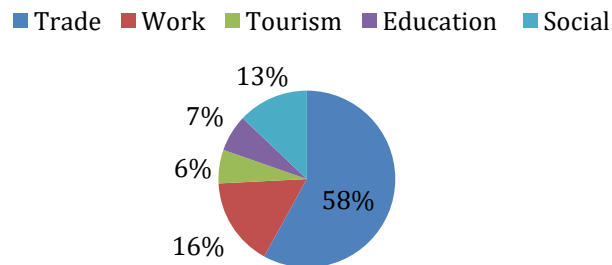

Figure 3. Study Flowchart

RESULTS AND DISCUSSION
The characteristics of transportation are as follows:

Characteristics of Travel

a. Purpose

Purpose in traveling is related to work, trade, social, education and tourism. The results of the interviews and analysis are presented in Figure 4 below.

Figure 4. Purpose of Travel in Bulukumba Regency

Figure 4 can be explained as follows

(1). More than 58 percent of purpose of travel relates to trade such as obtaining goods, shopping or personal business and services in the form of medical and welfare services.

(2). Purpose of travel because work was less than 20 percent in the Capital of Bulukumba Regency.

(3). Other purposes of travel for social, educational and tourist reasons were less than 15 percent each

b. Time

The average time required for one trip between sub-districts using several modes of transportation. The results of observations and analysis are as follows:

(1). Using a car, the travel time needed to get to the Capital of Bulukumba Regency is about 15 to 25 minutes.

(2). Using a motorbike, the travel time needed to get to the Capital of Bulukumba Regency is about 10 to 20 minutes.

(3). Using public transportation modes, the travel time needed to get to the Capital of Bulukumba Regency is around 25 to 35 minutes.

c. Distance

The distance traveled required in one trip sub-districts using several modes of transportation. The shortest distance between sub-districts is about 13 km (Gantarang Sub-District and Ujung Loe Sub-District to Ujung Bulu Sub-District), while the longest distance is about 17 km (Rilau Ale Sub-District to Ujung Bulu)

Characteristics of Travellers

a. Choosing transportation modes

The transportation modes chosen in traveling can be seen in Figure 5
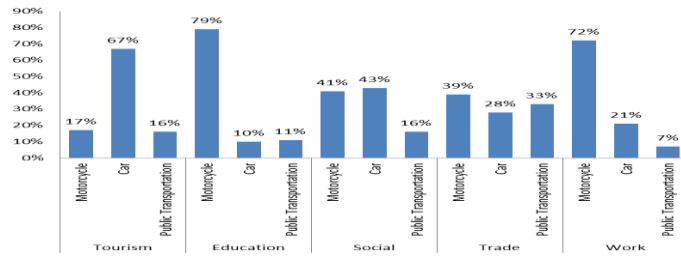
Figure 5. Choosing Transportation Modes

Based on the figure above

(1). Almost 50% of travelers choose motorcycles as a transportation mode for their trips.

(2). Traveling by car was the second choice or almost 40%. Travel to the tourist attractions was dominantly using a car.

(3). Travel using public transportation was approximately 10%. Travel to the market was dominantly using the public transportation.

b. Reason in choosing transportation modes

In traveling, travelers are often faced with the choice of transportation modes. In determining the choice of transportation modes, everyone will consider various factors, including those related to ease of access, a definite schedule, capacity, fares, speed and efficiency. The following percentage of reasons for choosing transportation modes for travelers based on several considerations is presented in Figure 6.
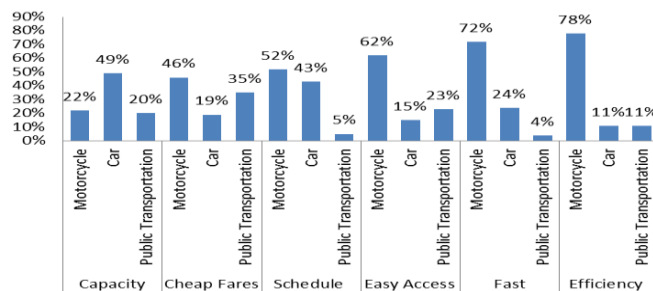
Figure 6. Reason in choosing transportation modes

Based on Figure 6, it can be concluded that :

(1). Motorcycles become dominant when it comes to low fares, fixed schedules, easy access, fast access to destinations, and efficient use.

(2). Cars are dominant when it comes to capacity and flexible schedules

(3). Public transportation becomes dominant when it comes to cheap fares.

Characteristics of Transportation Facilities

Quantitative Assessment

(1). Waiting Time, based on the survey results, it is known that the waiting time using transportation modes varies greatly, depending on the type of transportation mode. The waiting time for public transportation modes is relatively long, about 20-30 minutes until the passengers are full, this is because the routes are not scheduled so that the transportation drivers wait until the passengers are full.

(2). Fares, from the survey results obtained the average fare of public transportation transportation between sub-districts in Bulukumba Regency is Rp. 13000 – Rp. 15,000.

Qualitative Assessment

Based on the survey results, private transportation mode (motorcycle) was more chosen based on the convenience factor (42 percent) and trust (39 percent). However, for the safety factor, private transportation mode (car) was the most chosen (37 percent). Although the service is still unsatisfactory and considered inconvenient, public transportation modes are still an alternative choice for people who do not own a motorcycle or car. These results can be seen in Figure 7 below.
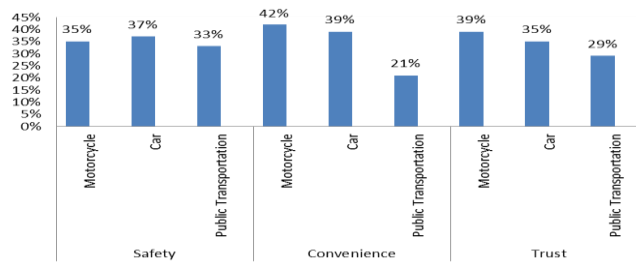

Figure 7. Qualitative Assessment

Model for Choosing Transportation Modes

The variables used in choosing the motorcycle as transportation mode are presented in Table 1

Table 1. Variable used

	Code	Variable	Unit
Y	Dependent variable	Mode Choice	%
X1	Inependent variable	Tourism	%
X2	Inependent variable	Education	%
X3	Inependent variable	Social	%
X4	Inependent variable	Trade	%
X5	Inependent variable	Work	%

Based on the results of regression analysis using SPSS.28, the model for choosing transportation modes using motorcycles was $Y = 3.666 – 0.035X2 – 0.015X5$ with an R^2 value of 0.765 meaning the education and work variables influenced in choosing of 76.5% and the rest was influenced by other variables. The constant value obtained from the regression analysis is the value of the dependent variable when all independent variables (X) are 0 or have not changed. Based on the model for choosing transportation modes using a motorcycle, it is known that the significant influencing factors are education and work.

The variables used in choosing the public transportation modes are presented in Table 2

Table 2. Variable used

	Code	Variable	Unit
Y	Dependent variable	Mode Choice	%
X1	Inependent variable	Tourism	%
X2	Inependent variable	Education	%
X3	Inependent variable	Social	%
X4	Inependent variable	Trade	%
X5	Inependent variable	Work	%

Based on the results of regression analysis using SPSS.28 the model for choosing transportation modes using public transportation was $Y = -2.555 + 0.950X1 – 1.20X4$ with an R^2 of 0.666 meaning that tourism and trade variables influenced in choosing public transportation modes by 66.6% and the rest was influenced by other variables. The constant value obtained from the regression analysis

is the value of the dependent variable when all independent variables (X) are 0 or have not changed. The constant value -2.555 indicates that the use of public transportation is likely to decrease. Based on the model for choosing transportation modes using a motorcycle, it is known that the significant influencing factors are education and work. With the increasing number of tourist destinations, it is possible to increase the use of public transportation, but with the reduced movement in trade activities, the impact of using public transportation will also decrease.

CONCLUSION

The complexity of community activities in Bulukumba Regency is correlated with the movement carried out by commuters with various purposes such as going to work, tourism, school, trade and other social activities. Based on the survey and analysis results, the dominant transportation mode used in Bulukumba Regency was motorcycle. The tendency to use motorcycles was due to having a high level of comfort and confidence, low fares, flexible schedules, easy access, faster to reach travel destinations, and efficiency compared to cars or public transport. As for choosing public transportation, it was significantly influenced by travel for tourism and trade.

ACKNOWLEDGEMENT

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