

# The Choice of Transportation Mode in Transit Location (Case Study: Dukuh Atas Area)



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**Abstract** Traffic in Jakarta is one of the main issues that becomes an annual problem in the capital. According to World Bank data, Jakartans spend at least 3.5 h in traffic jams on average [1]. Being one of the main causes, among others, there are more than 18.6 million private modes of transportation in Jakarta, while users of public transportation only reach 24% [2]. In supporting the choice of public transportation modes to reduce the traffic ratio in Jakarta, it is not sufficient by only providing adequate public transportation, but also requires a city development concept that provides convenience and comfort for road users, including zoning, passenger flow and intermodal integration. Recent studies attempted to find evidence of a relevance between TOD and transit location. The area around Dukuh Atas Station which is planned to be the center of the development of one of the TODs in Jakarta becomes a transit location for 4 modes of public transportation. However, it is difficult for passengers to get on and off at this transit location to move from one mode of public transportation to another, so that passengers choose the private mode of transportation to continue their trip to their destination. Preferences Survey done by using a survey questionnaire conducted in this study determine the preferences of passengers so that they still choose to use public transportation. The results of the study are known factors that passengers desired in order to switch to public transport in Dukuh Atas transit locations which also provide suggestions to the Government and the management of public transport modes to develop this area to be oriented to the comfort for the passengers.

**Keywords** Dukuh Atas · Passenger · Choice of transportation mode · Transportation public · Preference survey

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## 1 Introduction

Jakarta as the National Capital City of Indonesia is a city with a high population density and a high and increasing rate of urbanization. In line with this, traffic is one of the main problems in Jakarta that still cannot be resolved. Concept of urban development that provides convenience and comfort for road users is needed, including areaal arrangement, the flow of passengers and intermodal integration in addition to the provision of adequate public transportation to support the election of public transport modes by passengers. In making the concept of urban development that provides convenience and comfort for road users, the Government plans to develop area of TOD in Dukuh Atas area that carry the vision of the development which is the collaboration of motion in space of the city, improve the quality the life of urban communities through urban movement infrastructure improvements towards a humanist urban space. One of the principles of this development is increased connectivity, namely a simple, direct and intuitive transit connection.

The problems in Dukuh Atas area is the facility unavailability in facilitating the activities of transit and the incapability to make passengers remain comfortable to continue to use public transport which causes passengers tend to switch to private transport for the trip. It can be concluded that at the Dukuh Atas transit location, public transportation is unable to compete with private transportation. If this situation is left abandoned, the users of public transportation will continue to decrease. It is necessary to know the preferences of passengers to continue choosing public transportation at transit locations in the Dukuh Atas area in continuing the trip to the next destination. Therefore, this research is important to maintain sustainable public transportation, where the results of this study can also provide suggestions for the Government, both central and local, managers of public transportation modes, and managers of the Dukuh Atas Area to develop this area with a convenience-oriented orientation to the users.

## 2 Methods

### 2.1 *Framework*

This research started from a theoretical review and then collected research data. Analyzing then were conducted using quantitative descriptive statistical analysis to describe the data that has been collected (Fig. 1).

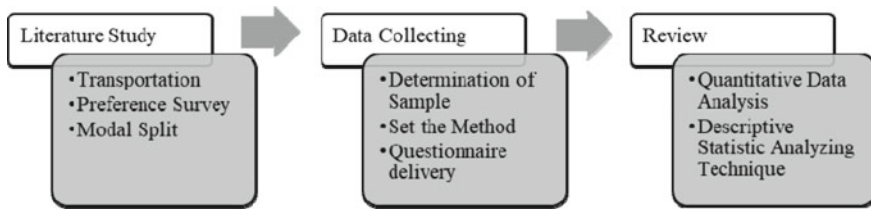


Fig. 1 Framework research

## 2.2 Theory Overview

Transportation is the movement of people and/or goods from one place to another that arises because of activities in the community. According to Tamin [3], the classification of transportation types can be divided into two, namely:

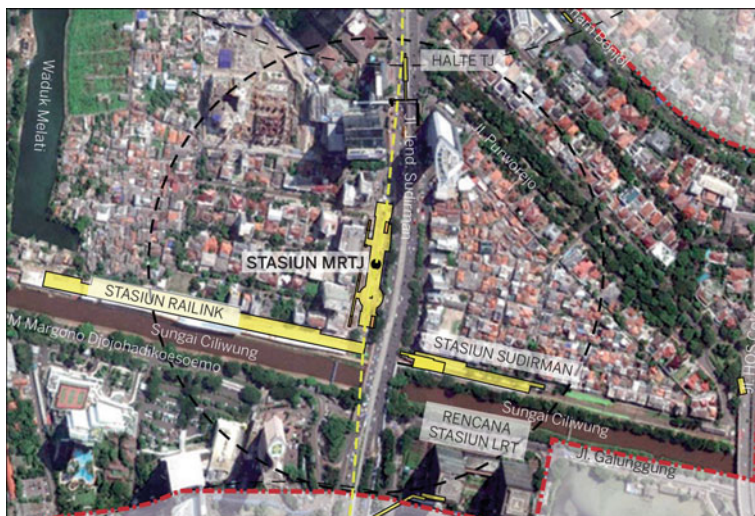
1. Public transportation, is a mode of transportation that is provided for the needs of the movement of people for the sake of public interests or the public in fulfilling their needs; and
2. Private transportation is a mode of transportation which in its operation can freely determine its own line or route as long as it does not violate traffic regulations.

Level of service mode of transportation public is the quality and quantity provided by the mode manager. The variables measuring the level of public transportation services according to Agustin [3] include travel time, fare, accessibility, waiting time, comfort and safety. These variables consist of quantifiable variables such as travel time and rates as well as variables that are difficult to quantify such as accessibility, waiting time, comfort and safety.

Modal Split or modal choice is a modeling or stages of the planning process transport that serves to determine the loading per street or to know the number of people and goods as users to choose various modes of transport available to serve a point of origin-specific purposes, and also for certain trip purpose. Factors that may affect the modal split can be grouped into three, that is characteristic of the road, movement characteristics and characteristic modes of transport facilities [4] (Table 1).

Table 1 Affecting factors of modal split

Factor	Description
Road users	These are vehicle ownership, driver’s license ownership, household structure, income, and the necessity to use other vehicles to work
Movement	It is the purpose of the movement, the time when the movement occurs and the distance traveled
Facility	These include travel time, costs, space availability and estimated rates, as well as comfort, safety and reliability



**Fig. 2** Dukuh Atas area and transit location

Transit Oriented Development, hereinafter abbreviated as TOD, is an area development concept based and centered on mass public transportation stations, which accommodates new growth into a mixed area with an area of 350–700 m from the center of the area which is integrated with the area surroundings through the utilization of ground, lay and underground space. The TOD area is a mixed residential and commercial area with high accessibility to mass public transportation, where mass public transport stations and mass public transport terminals are the center of the area with high density buildings. Meanwhile, mass public transportation is public transportation that can carry large numbers of passengers, which operates fast, safe, secure, scheduled and high frequency (Fig. 2).

Dukuh Atas area which is the case study in this research is located in 3 (three) districts and 2 (two) administrative city areas, namely Menteng District and Tanah Abang District, Central Jakarta Administrative City, and Setiabudi District, South Jakarta Administrative City. The area around Dukuh Atas Station which is planned to be the center of the development of one of the TODs in Jakarta will become a transit location for 4 modes of public transportation, including MRT, CL, BRT and Airport Train. Apart from the four existing transit locations, this area is planned to be the location for LRT transit.

### 2.3 Preference Survey

Survey is the process of collecting and measuring data which has at least 3 (three) characteristics, namely: (1) Aim to produce statistics which are quantitative or

numerical descriptions of several aspects of the population under study; (2) Collecting information by asking structured questions to get answers and process the answers into data analysis; and (3) The information collected is a fraction of the population called the sample.

Consumer preferences can be interpreted as a taste of preference, choice or something that consumers like [5]. The purpose of the preference survey in this study is to determine the preferences and needs of respondents who are passengers of public transportation modes in the Dukuh Atas area, including those who transit at the Transjakarta Tosari BRT Stop, Sudirman CL Station, Dukuh Atas MRT Station, and BNI City Airport Train Station.

### 2.4 Determine of Sample

The sample is part of the population studied and becomes a description for the population in the study [6]. The population in this study is the total number of passengers during 2019 which passes through the station/bus stop public transport mass transit in Dukuh Atas area. Based on data obtained from various sources, the number of CL passengers on the Depok/Bogor—Jatinegara route is 73.84 million people [7], Transjakarta BRT corridor 1 is 30.530.769 people [8], the Airport Railway is about 2 million people [9], and the MRT is 19.990.950 people [10]. So that the total number of passengers as the population size is 126.361.719 people.

After obtaining the population size, then the writer uses the Slovin formula to determine the minimum sample size with a significance level/margin error of 10% with the following calculation results:

$$n = \frac{N}{1 + Ne^2} = \frac{126.361.719}{1 + 126.361.719(10\%)^2} = \frac{126.361.719}{1.263.618,19} \approx 100$$

Legend:

- n minimum number of sample size
- N total population size
- e level of significance/margin of error.

Then this research uses the *Nonprobability Sampling* method, this method does not provide equal opportunities for every member of the population to be selected as a sample. The sampling technique used the *Reliance on Available Subjects* [11], sampling based on available subjects, namely who are members of the population who can be contacted by the author can be a data source and used as a sample.

## 2.5 Descriptive Statistical Analysis

Descriptive statistical analysis is a part of statistics that studies how to collect data and present data so that it is easy to understand. Descriptive statistics are only related to describing or providing information about a data or situation. With the word descriptive statistics function to explain the condition or problem [12].

## 3 Result and Discussions

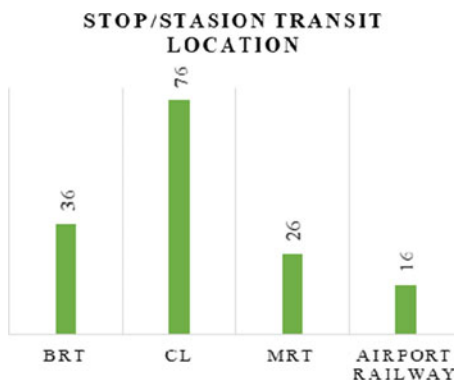
The research discussion is in the form of data analysis using descriptive statistical analysis techniques by describing the statistical presentation of the data that has been collected. The number of samples studied based on respondents obtained from distributing questionnaires within 5 (five) days is 110 respondents.

### 3.1 Questionnaire Result

Based on the results of the questionnaire, we can see that the transit place most frequently visited by passengers is the CL Sudirman Station chosen by 76 respondents, then followed by the Transjakarta Tosari BRT Stop chosen by 36 respondents, then Dukuh Atas MRT Station was chosen by 26 respondents and finally the BNI City Airport Train Station chosen by 16 respondents. This also illustrates that the largest number of mass public transport passengers transiting in the Dukuh Atas area are CL passengers (Fig. 3).

The results of this questionnaire indicate that there are still 54% of respondents who still choose to switch to private transportation when transiting in the Dukuh Atas area. While 24 respondents (22%) answered maybe yes/maybe no, most answered this depending on weather conditions (Fig. 4).

**Fig. 3** Transit location respondents



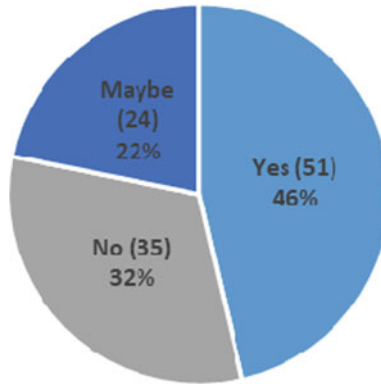


Fig. 4 Respondents willingness to go on with public transportation

### 3.2 Public Transportation Service Level

The level of service (Fig. 5) provided by public transportation modes is a determining factor for passengers in choosing public transportation. Based on the results of the questionnaire, the transportation mode service that affects respondents is dominated by factors of travel time, waiting time, convenience and accessibility. Meanwhile, the respondent considered the safety factor, cost and other factors to be good so that the effect did not have a significant impact on the choice of public transportation modes by passengers.

### 3.3 Passenger Preferences

There are 3 (three) main things that passengers want in the integration of public transportation modes (Fig. 6). First, the movement of passengers from one transit point to another is safe and comfortable, especially for the elderly, children and

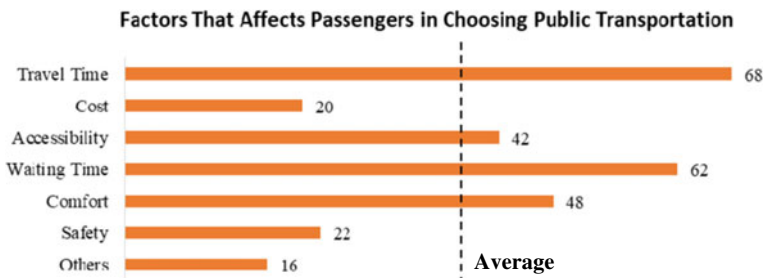


Fig. 5 Questionnaire results of the factors in choosing public transportation

### Passenger Preferences in Integrating the Mode of Public Transportation

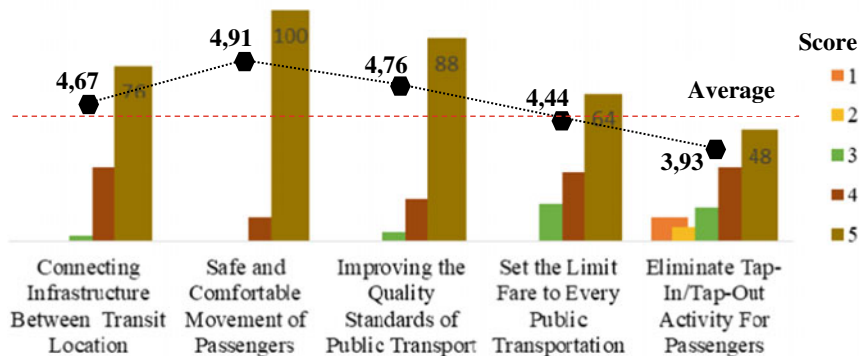


Fig. 6 Questionnaire results of preference respondents in integrating public transportation

pregnant women. Second, equalization and improvement of quality standards for public transportation modes so that all modes of public transportation have a balanced level of comfort and performance. Then the third is the development of infrastructure in form of connecting facilities between bus stops/stations (Table 2).

That the activity of equalizing the quality of the transportation mode standards has the greatest significance by increasing the 5 (five) factors of the size of public transportation services. This was followed by the construction of connecting infrastructure between transit points and ensuring safe and comfortable movement of passengers, each of which increased 4 (four) factors. Then the elimination in tap-in/tap-out activities which increased 3 (three) factors and finally the fare

Table 2 The results of the matrix analysis of the relationship between the size of transportation service size variables and passenger preferences, 2020

Factor	Connecting infrastructure transit location	Safe and comfortable movement of passengers	Improving the standards of public transport	Set the limit fare to every public transportation	Eliminate tap-in/ tap-out activity for passengers
Time travel	■		■		■
Cost fees			■	■	
Accessibility	■	■			■
Waiting time		■	■		■
Comfort	■	■	■	■	
Safety	■	■	■		



restrictions on each public transportation mode was followed by 2 (two) factors that increased.

## 4 Conclusions

The author makes conclusions based on the results of the research discussion and also provides suggestions to the Government and Public Transportation Mode Managers in integrating modes in the Dukuh Atas transit location. The conclusions of this study include:

1. The results showed that 54% of respondents were still unwilling/or unsure about choosing public transportation. Switching mode to private transportation are caused by public transportation were outplayed in intermodal competition in Dukuh Atas transit location. The variables of public transportation services that dominate in influencing passenger choices are travel time, waiting time, convenience and accessibility
2. Managers of public transportation modes to improve service level, especially the punctuality of travel time: arrival, departure and passengers transit as well as increasing comfort both in public transportation modes and in transit.
3. The Government together with managers of public transportation modes to encourage an equalization and improvement of quality standards for each mode of transportation so that all modes of public transportation have a balanced level of comfort and performance.
4. The Government should build infrastructure in form of connecting facilities between bus stops/stations, then together with managers of public transportation modes to ensure that the movement of passengers from one transit point to another is safe and comfortable, especially for the elderly, children and pregnant women.

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