Minimum Service of Pedestrian Facilities Based On Perception of the Trip Maker in Banjarmasin

Nur Endah Widyawati[1], Iphan F. Radam[2,3]

[1]*Graduate Student, Transportation Engineering and Management Program, Magister Study Program of Civil Engineering, LambungMangkurat University, Banjarmasin, Indonesia*
[2]*Professor, Magister Study Program of Civil Engineering, LambungMangkurat University, Banjarmasin, Indonesia*

ABSTRACT : *Developed pedestrian paths in Banjarmasin City are still less attractive to many people due to the high city temperatures. Pedestrian paths in Banjarmasin City are directly connected to shelters and public facilities, so it is necessary to determine the factors that influence the preference of trip maker to use pedestrian paths in Banjarmasin. The research location is on Jl. A. Yani Km. 01 to Km. 06. The research method uses logistic regression analysis using the SPSS program. The variables reviewed are dependent variables such as want to use and do not want to use, independent variables such as characteristics of pedestrian path system, pedestrian trip, pedestrian performance, and shelter condition. The research is conducted on 366 respondents, 181 respondents through field survey, and 185 respondents through a google form. From the analysis results, the influencing factors are the shortest distance people want to walk, a pedestrian guardrail to protect the pedestrian path from the traffic, crossover near shelter and public facilities, roof to shield from heat and rain, closed and odorless drainage, internet (Wi-Fi) facilities in the shelter, available jogging and cycling paths, attractive pedestrian paths, the designation of the shelters used as intended, and the shelter condition is protected from heat and rain.*
KEYWORDS *pedestrian path,logistic regression,trip maker.*

I.   INTRODUCTION

Pedestrian paths have been developed in Banjarmasin, on Jl. A. Yani Km. 01 to Km. 06, but the local community is still less interested in it. One of the reasons is high city temperature that the pedestrian path facilities do not function optimally. Several shelters in this area are directly connected to public facilities in the city center, such as offices, schools, shopping centers, and residential areas. Therefore, it is necessary to determine the facilities that need to be repaired and improved to serve people's need on pedestrian path in Banjarmasin. This research aims to identify and analyze the pedestrian path elements that affect the interest of trip maker to use pedestrian paths, to obtain a model of the equation of trip maker interest, and to determine the priority of trip maker interest in Banjarmasin.

II.   LITERATURE REVIEW

Pedestrian is a means of transportation to connect the functions of trade, cultural and residential areas. Since it is part of the urban transportation system, a pedestrian mode is interconnected with the road network system, so a connection is necessary between the pedestrian and other modes of transportation and other facilities, such as parking lots or shelters [1].

Pedestrian is the main method of transportation, and the reach is affected by physical conditions with approximate speed of 3-4 km/hour [2]. One of the main factors people want to walk is the distance traveled. Trip maker can walk as far as 0.4 km with the furthest distance of 1.6 km [3]. Four factors that affect the distance traveled by people on foot include time, availability of motorized vehicles, land use, and convenience [4].

Pedestrian facilities required in urban lanes include sidewalks, crossings, pedestrian bridges, and safety fences because trip maker often reduce the existing capacity of roads [5]. Pedestrian space facilities consist of seats, pedestrian guardrail, trash cans, lighting, signs, information boards, bus stops and waiting stalls, drainage, green lines, and public telephones [6].

Regression is a variable that depends on one or more explanatory variables to predict the mean value of the variable, closely related to the value obtained from the explanatory variable [7]. Logistic regression is used if the response variable in the regression model is qualitative [8]. The simple logistic regression model is the logistics for one predictor variable X with a dichotomous Y response variable. The value of variable $Y = 1$ means that there is a characteristic and $Y = 0$ means that there is no characteristic. To determine if there is a difference between the observation results and the possible predictions of the model, several tests are necessary including:

1. Hosmer Lemeshow Test
   To determine whether the model formed is correct or incorrect ($\alpha < 0.05$) [9].
2. Overall Model Fit
   To obtain the independent variables in the logistic regression also affects the dependent variable.
3. Coefficient of Determination Test
   To determine the amount of integration of the independent variable is able to explain the variation of the dependent variable.
4. Omnibus Test of Model Coefficient
   To analyze if all independent variables or one of the independent variables affect the dependent variable.

Then, significant test of the variables is applied to the model. Statistical tests and hypotheses are to prove the independent variables in the model have a concrete effect on dependent variables, with the Wald Test or Partial Test.

III. RESEARCH METHODOLOGY

Research Location
The research location is the area on Jl. A. Yani Km. 01 to Km. 06. It is located in the area of offices, hospitals, schools, residentials, and shopping centers.
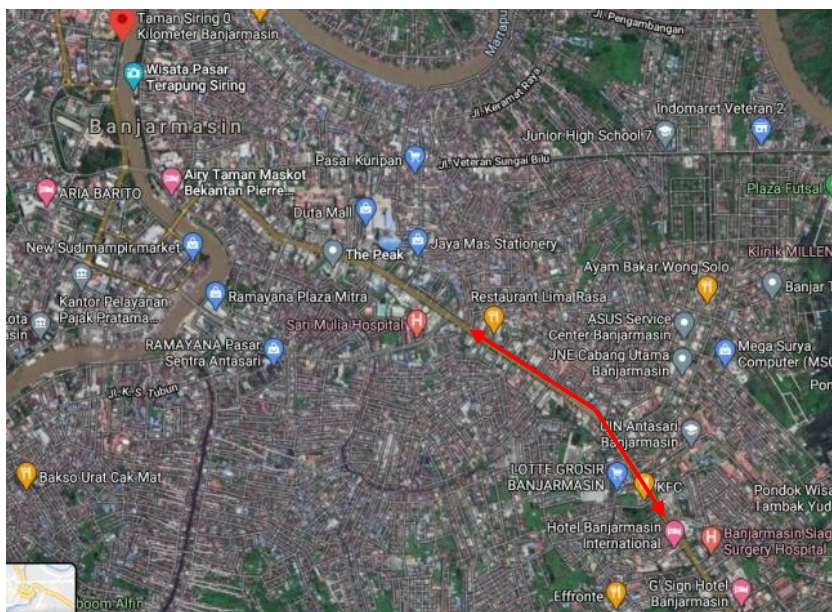

Figure 1. Research location in Banjarmasin

Data Sources
a. Primary data, obtained from interviews and questionnaires to sampled informants. This research was conducted to 366 respondents, 181 respondents through direct survey by questionnaires and interviews in the field, 185 online respondents through google form.
b. Secondary data, is relevant literatures, guidelines and regulations to obtain data related to the function of pedestrian paths in Banjarmasin.

Data Variable

Variables are collected to obtain the data needed in the analysis by observing influential factors as dependent variable (Y) and independent variable (X). The independent variables and dependent variables required consist of:

1) Dependent variable (Y) is the acceptance of pedestrian distance with the following categories:

    0 = Not willing to
    1 = Willing to

    Socio-economic factors of trip maker
    a. Age,
    b. Education,
    c. Occupation,
    d. Gender,
    e. Travel Purpose,
    f. The intensity to walk on the pedestrian path

2) Independent variables (xi) in Table 1. tend to influence the respondents' willingness to use pedestrian paths according to several sources, guidelines, and pilot surveys.

Table 1. Independent Variables That Affect

Indicator Variables		Indicator Variables	
Characteristics of Pedestrian Path System (x₁)		Availability of trash cans on the pedestrian path	$X_{3.10}$
The distance between the start to shelter	$X_{1.1}$	Closed and odorless drainage in pedestrian path	$X_{3.11}$
Safety of pedestrian paths from external disturbances	$X_{1.2}$	Wi-Fi in the shelter	$X_{3.12}$
Cleanliness of pedestrian paths	$X_{1.3}$	Availability of HP battery charging	$X_{3.13}$
Characteristics of Trip (x₂)		Pedestrian paths are separated from disabled path	$X_{3.14}$
Easy access of pedestrian paths	$X_{2.1}$	Pedestrian paths are separated from jogging path	$X_{3.15}$
Pedestrian discipline in pedestrian path	$X_{2.2}$	Pedestrian paths for trip maker, and cycling path are provided	$X_{3.16}$
Characteristics of Pedestrian Path Performances (x₃)		Attractive pedestrian path	$X_{3.17}$
Wide pedestrian sidewalk	$X_{3.1}$	**Characteristics of Shelter Condition (x₄)**	
Availability of bench along the pedestrian path	$X_{3.2}$	Convenient and clean shelter	$X_{4.1}$
Availability of a pedestrian guardrail along the pedestrian path	$X_{3.3}$	An attractive shelter	$X_{4.2}$
Availability of crossings near shelters and public facilities	$X_{3.4}$	Available information on public transportation departures	$X_{4.3}$
Availability of non-level crossings near shelters and public facilities	$X_{3.5}$	Designation of the shelter suits its function	$X_{4.4}$
Availability of street lights on pedestrian path	$X_{3.6}$	Access in and out of public transportation from the shelter	$X_{4.5}$
Availability of signs/instructions on pedestrian paths	$X_{3.7}$	The shelter is protected from heat and rain	$X_{4.6}$
Availability of trees along the pedestrian path	$X_{3.8}$	Available bench at the shelter	$X_{4.7}$
Availability of canopies along the pedestrian path	$X_{3.9}$	Available Wi-Fi for the shelter	$X_{4.8}$

Indicator Variables		Indicator Variables	
The shelter is provided with air conditioner (AC)	$X_{4.9}$	Available special path for disabilities to get in and off public transportation from the shelter	$X_{4.10}$

Data Analysis

The analysis results in Table 2 are obtained from the logistic regression test with SPSS program.

Table 2. Logistic Regression Analysis Results

Test	Test Description	Indicator / Model	Value
Goodness Of Fit	Sig > 0,05	Model	0.346
Overall Model Fit	-2log likelihood block 0 > -2log likelihood block 1	Model	1014.767 > 65.750
Omnibus Test Of Model Coefficients	Sig < 0,05	Model	0.000
Cox & Snell R Square and Nagelkerke R Square Test	The influence of factors as independent variables	Model	Cox & Snell R Square 0.727 and Nagelkerke R Square test 0.969
Variable in the equation	Sig < 0,05	**Characteristics of Pedestrian Path System (x_1)**	
		$x_{1.1}$ Distance	0.046
		$x_{1.2}$ Security	0.049
		$x_{1.3}$ Cleanliness	0.522
		Characteristics of Trip (x_2)	
		$x_{2.1}$ Easy	0.046
		$x_{2.2}$ Discipline	0.092
		Characteristics of Pedestrian Path Performances (x_3)	
		$x_{3.1}$ Wide	0.952
		$x_{3.2}$ Bench	0.956
		$x_{3.3}$ Pedestrian Guardrail	0.016
		$x_{3.4}$ Crossing	0.169
		$x_{3.5}$ Non-level crossing	0.513
		$x_{3.6}$ Street Lights	0.128
		$x_{3.7}$ Signs	0.371
		$x_{3.8}$ Trees	0.304
		$x_{3.9}$ Canopy/Roof	0.056
		$x_{3.10}$ Trash can	0.774
		$x_{3.11}$ Drainage	0.023
		$x_{3.12}$ Wi-Fi	0.003
		$x_{3.13}$ Phone Battery Charging	0.202
		$x_{3.14}$ Disabilities Path	0.675
		$x_{3.15}$ Jogging Path	0.020
		$x_{3.16}$ Only People	0.002

Test	Test Description	Indicator / Model	Value
Variable in the equation	Sig < 0,05	$X_{3.17}$ Attractive	0.005
		Characteristics of Shelter Condition (x4)	
		$x_{4.1}$ Clean and Convenient(Shelter)	0.032
		$x_{4.2}$ Attractive(Shelter)	0.730
		$x_{4.3}$ Information(Shelter)	0.442
		$x_{4.4}$ Designation (Shelter)	0.002
		$x_{4.5}$ Access(Shelter)	0.044
		$x_{4.6}$ Protected (Shelter)	0.105
		$x_{4.7}$ Bench(Shelter)	0.087
		$x_{4.8}$ Wi-Fi(Shelter)	0.150
		$x_{4.9}$ Air conditioner(AC)(Shelter)	0.974
		$x_{4.10}$ Dissabilities Path(Shelter)	0.128

The results of logistic regression test model 1 still does not meet the requirements since 20 independent variables have no significant effect. Then, the model is developed to determine the significance level of research factors, by analyzing non eligible factors. The logistic regression test is repeated until the selected model is obtained where the number of variables with no effect is equal to zero. The analysis result of selected model is as shown in Table 3.

Table 3. Selected Logistics Regression Analysis Results

Test	Test Description	Indicator / Model	Value
Goodness Of Fit	Sig > 0,05	Model	0.261
Overall Model Fit	-2log likelihood block 0 > -2log likelihood block 1	Model	1014.767 > 86.467
Omnibus Test Of Model Coefficients	Sig < 0,05	Model	0.000
Cox & Snell R Square and Nagelkerke R Square test	The influence of factors as independent variables	Model	Cox & Snell R Square 0.791 and Nagelkerke R Square value 0.958
Variable in the equation	Sig < 0,05	**Characteristics of Pedestrian Path System (x1)**	
		$x_{1.1}$ Distance	0.000
		$x_{1.2}$ Security	0.010
		Characteristics of Trip (x2)	
		$x_{2.1}$ Easy	0.047
		$x_{2.2}$ Discipline	0.039
		Characteristics of Pedestrian Path Performances (x3)	
		$x_{3.3}$ Pedestrian Guardrail	0.005
		$x_{3.4}$ Crossing	0.011
		$x_{3.9}$ Canopy/Roof	0.031

		x$_{3.11}$ Drainage	0.000
Test	**Test Description**	**Indicator / Model**	**Value**
		x$_{3.12}$ Wi-Fi	0.000
		x$_{3.15}$ Jogging path	0.005
		x$_{3.16}$ Only People	0.000
		x$_{3.17}$ Attractive	0.005
		Characteristics of Shelter Condition (x4)	
		x$_{4.4}$ Designation (Shelter)	0.000
		x$_{4.6}$ Protected (Shelter)	0.000

Result Discussion

The analysis results is shown in Table 3. Based on the analysis, the results of logistic regression equation are as follows:

$$Ln\frac{p}{1-p} = -11.135\alpha - 2.304_{attractive\ pedestrian} + 2.270_{drainage} + 2.251_{specific\ pedestrian} - 2.205_{Wi-Fi}$$
$$+ 2.052_{protected\ bus\ stop} + 1.730_{bus\ stop\ designation} + 1.688_{Security} - 1.677_{jogging\ path}$$
$$+ 1.389_{crossing} - 1.346_{canopi} + 1.256_{distance} - 1.179_{safety\ fence} + 1.115_{convenience}$$
$$- 1.005_{discipline}$$

Based on the analysis results, the alternative management from the review of trip maker' preference factor to use pedestrian path in Banjarmasin is to suggest the necessary facilities and infrastructure and related guidelines, as shown in Table 4.

Table 4. Alternative Management of Trip Maker Acceptance in Banjarmasin Based on Influencing Factors

No.	Influencing Factors	Required Facilities
1.	Attractive Pedestrian	Attractive pedestrian design
2.	Drainage	Closed and odorless drainage.
3.	Only People	Pedestrian paths are separated with cycling paths.
4.	Wi-Fi	Free internet around shelter and public facilities (reach up to 300 meters)
5.	Protected (Shelter)	The shelter is protected from heat and rain.
6.	Designation (Shelter)	The shelter suits its function.
7.	Security	Guaranteed pedestrian safety from outside disturbances such as thugs and pickpockets.
8.	Jogging path	Pedestrian paths are separated from jogging paths.
9.	Crossing	Available crossing near shelters and public facilities.
10.	Canopy/Roof	Available canopies along pedestrian paths to protect from heat and rain.
11.	Distance	Short distance, approximately 172 meters (70%).
12.	Pedestrian Guardrail	Available pedestrian guardrail along the pedestrian path
13.	Convenience	Convenient access of pedestrian paths.
14.	Discipline	Orderly trip maker

Based on Table 4, the factors need to be considered from the preferences of people to use pedestrian path facilities other than those in the guidelines, previous research, and references are available Wi-Fi in the shelter, convenient access for trip maker to use public transportation to view departure schedules.

IV. CONCLUSION

Based on the analysis, the preferable pedestrian facilities in Banjarmasin are attractive design, closed and odorless drainage, specific paths for trip maker and cycling path, free internet facilities (Wi-Fi) around the shelter, shelters are protected from heat and rain, designated as its functions (not for vendor and busker), guaranteed security on pedestrian paths from pickpockets and thugs, pedestrian paths are separated from jogging paths, a separate jogging path is necessary, available crossing near public facilities and shelter, available canopies along the pedestrian path to protect from heat and rain, a short distance of approximately 172 meters, available pedestrian guardrail along the pedestrian path, convenient access for pedestrian to shelters and public facilities, and discipline trip maker. The factors need to be considered from the preferences of people to use pedestrian path facilities other than those in the guidelines, previous research, and references are available Wi-Fi in the shelter, convenient access for pedestrian to use public transportation to view departure schedules. The suggestions are for further research is expected to present more detailed and in-depth discussion analysis technique regarding the factors that influence the preference of trip maker to use pedestrian paths, such as the relationship between trip maker (behavior, willingness, and user characteristics) with the existing pedestrian paths.

REFERENCES

[1]. Gideon, Giovany. 1977. Human Aspect of Urban Form. Oxford: Pergamon Press.
[2]. Spreiregen, Paul D. 1965. Urban Design: Architecture of Town and Cities. New York: Mc Graw Hill Company.
[3]. AASHTO Green Book, 2004. A Policy on Geometric Design of Highways and Streets, 5th Editon. American Associaton of State and Highway TransportatonOfcials.
[4]. Unterman, RK. 1984. Accomodating The Pedestrian Path. New York: Van Nostrand Reinhold Company.
[5]. Pushkarev, Boris. 1975. Urban Space for Pedestrian. the MIT Press: Cambridge, Mass.
[6]. Ministry of Public Works of RI. 2014. Guidelines for Planning, Provision, and Utilization of Pedestrian Network Infrastructure and Facilities in Urban Areas. Jakarta.
[7]. Gujarati, Damodar N., and Dawn C. Porter. 2009. Basic Econometric 5th Edition. New York: McGraw –Hill.
[8]. Hosmer, D.W., and Lemeshow, S. (1989). Applied Logistic Regression. New York: John Willey.
[9]. Radam, F, Iphan, Agus T. Mulyono, and Bagus H. Setiadji. 2015. Influence Of Service Factors In The Model of Public Transport Mode A Banjarmasin – Banjarbaru Route Case Study. International Journal for Traffic and Transport Engineering. 5(2), PP. 108-119.