A Four-wheeled Vehicle Parking Model in a Residential Area

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Abstract: *The increase in private vehicle ownership by urban residents has caused most housing residents to park their vehicles on street. This creates traffic problems and disrupts the comfort of pedestrians, cyclists and others. The aims of this study is to explain the factors that influence urban mass housing residents to park their four-wheeled vehicles on street, as well as explain the occupant relationship model and housing conditions to their behavior of parking vehicles on street . Data for this analysis comes from 60 heads of households living in a cluster of luxury, middle class and simple housing. Technical determination of respondents is purposive sampling. Quantitative analysis and logistic regression, to explain the number of factors that affect the occupants of four-wheeled parking vehicles on street and explain the occupant relationship model and housing conditions to their behavior of parking vehicles on street. The results showed that 1) there are four factors that influence the mass housing occupants to park their four-wheeled vehicles on street, is a factor in the extent of parking space in a house plot (garage/car port), occupant income per month, number of vehicles owned, and inner road width residential area. 2) The occupant relationship model and housing conditions for their behavior on on-street parking are the smaller the size of the parking space in the house plot, and the wider the road in the residential area, the more housing residents will have four-wheeled vehicles that will affect the do on-street parking.*

Keywords: *Vehicles, On Street parking, Housing*

I. Introduction

Service and procurement of public transportation in Makassar City is still very minimal so people tend to use private vehicles. Based on data from the Department of Transportation, Communication and Information of South Sulawesi, in 2016 public transportation services in Makassar could only absorb 190,534 people/day (11.72%) while the remaining 1,435,186 people (88.28%) were still rely on the use of private transportation[1].

The development of online-based transportation has also encouraged some people to carry out these activities and influence the increase in ownership of new vehicles. Deputy Chairperson of Commission B for the Economy and Regional Revenues of the Makassar DPRD, Mesakh Raymon Rantepadang in the online news Pojoksulsel.com edition Friday, 16th June 2017 explained that "online transportation service companies such as grab have more than 2,000 members or drivers who enter the application, then issue new cars totaling 1,500 people [2].

The ease of obtaining a vehicle with a credit system and a low down payment and low interest rates also affected the increase in private vehicles, especially four-wheelers. Based on data from the Central Sulawesi Statistics Agency, the number of Makassar City passenger cars in year 2013 was 151,328 units and increased rapidly in year 2015 by 190,428 units, up by 26%. But on the other hand, not all housing has enough parking spaces to accommodate vehicles for each household. [3].

The aims of this study is 1) to explain the factors that influence urban mass housing residents to park their four-wheeled vehicles on street, and 2) explain the occupant relationship model and housing conditions to the behavior of occupants parking vehicles on street.

II. Location And Methods

This research was conducted in Makassar City which focused on 3 mass housing clusters, namely luxury, middle and simple class housing in the city of Makassar. The time of research is carried out in December 2017 to February 2018.
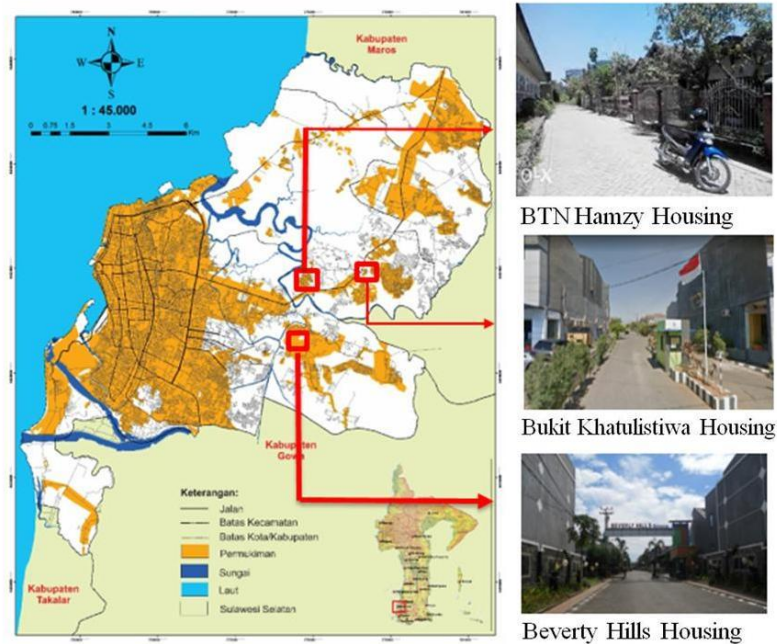

Figure 1. Research location on 3 housing clusters
(luxury, medium and simple)

The analytical method used to achieve the objectives of the first research is quantitative analysis and logistic regression. The technical analysis is a regression analysis used to show the relationship between response variables (outcome or dependent) with a set of predictor (independent) variables, where the response variable is binary or dichotomous [4]. This analysis is used to measure what factors and how much these factors can influence people's behavior to park on street. The variables used in this study are:

1.   Response variable (Y) is the on street occupant parking behavior on each characteristic of the housing area with categories:
1 = Parking on street
0 = Not on street parking
2.   The variables that allegedly influence the behavior of household parking patterns in residential areas [5] [6] [7] [8] [9] [10], namely:
X1 = House Size
1= 36 m^2
2 = 37 m^2 -100 m^2
3 = House size >101 m^2
X2 = Plot size
1 = Plot size ≤ 98m^2
2 = 98m^2 -120 m^2
3 = Plot size >121 m^2
X3 = Number of vehicles
1 = 1 unit
        2 = 2 units
        3 = ≥ 3 units
X4 = The width of the road
1= The width of the road ≤ 8 m^2
2 = 8,1 m^2 -10 m^2
3 = The width of the road ≥ 11 m^2
X5 = Number of family members
1 = Number of family member ≤ 3 people
        2 = 4 people to 6 people
        3 = Number of family member ≥ 6 people
X6 = Monthly income
1   = Total income ≤ IDR 2.500.000,-
2   = IDR 2.501.000 to IDR 5.000.000

3   = Total income $\geq$ IDR. 5.000.000,-
X7 = Extensive individual parking space
1   = Parking area $\leq$ 2.30 x 5.00 m^2
2   = (2.30 x 5.00 m^2) – (3.00 x 5.00 m^2)
3   = Parking area $\geq$ (3.00 x 5.00 m^2)

Then to achieve the purpose of the second research is to formulate a relationship model of occupant characteristics and housing conditions with on-street four-wheeled parking behavior, using quantitative analysis and logistic regression. This occupancy model can show how much the tendency of occupant characteristics and the physical condition of the housing can affect the on-street parking behavior of four-wheeled vehicles in each housing cluster.

III.   The Results

Factors that influence the residential occupants of four-wheeled parking vehicles on street use analysis with logistic regression methods through the SPSS Statistics 22 application. To explain the model of occupational behavior relationships do on-street parking in residential clusters, luxury classes, medium and simple using technical analysis by correlation test (Chi-Square).

Influence Factors on On Street Parking Occupants
Logistic regression analysis of the influence factors of the free variable on street parking behavior, using a confidence level of 95%, the value of $\alpha = 0.05$.

Table 1. Significant Variables in the Equation

Variables	Real Estate			Middle Housing			Simple Housing		
	B	Sig.	Exp (B)	B	Sig.	Exp (B)	B	Sig.	Exp (B)
House Size	,925	,130	2,521	-2,321	,037	,098	-1,952	,082	,142
Plot Size	-2,676	,093	,069	-1,580	,184	4,854			
Parking Area	-3,925	,014	50,678	-1,805	,005	,164			
Number of Vehicles	2,574	,003	,076	2,415	,002	11,187	6,635	,001	761,229
The width of the road	1,864	,042	,155	-1,863	,501	,155			
Family members	,573	,368	1,774	,431	,465	1,538	,776	,209	2,172
Income per Month	-,561	,373	,571	,058	,936	1,060	2,610	,014	13,604
Constant	3,214	,225	24,867	3,265	,354	,354		,004	,000

Source: Analysis results, 2019

Based on the output results in Table 1 above, it can be seen the relationship of the independent variables that have a significant effect on the dependent variables as follows:

Real estate
Variable area of parking space has a sig value 0.014 and the variable number of vehicles has a sig value amounting to 0.003, and the road width variable has a sig value as much as 0.042. Then there are 3 variables that have a significant effect on the variable behavior of residents of luxury housing to do on-street parking.

Middle housing
Variable parking space (parking space area) has a sig value as much as 0.005, and the variable number of vehicles has a sig value as much as 0.002. Then there are 2 variables that have a significant effect on the behavior variable of middle class residential residents to do on-street parking.

Simple housing
The variable number of vehicles has a sig value. equal to 0.001, and monthly income variables have a sig value as much as 0.014. Then the two variables have a significant effect on the behavior variable of simple housing residents doing on-street parking.

Model of Relationship Characteristics of Occupants against Parking Behavior on Street
Model Conformity Test

Tabel 2. Hosmer and Lemeshow Test

Type of Housing	Chi-square	Sig
Luxury	5,473	0,706
Middle	6,819	0,556
Simple	3,991	0,551

Source: Analysis Results, 2019

H_0 : Model accordingly

H_1 : The model is not suitable

Because the sig value in luxury housing (0.706), medium housing (0.556) and simple housing (0.551) is greater than the significance value $\alpha = 0.05$ (p> 0.05), it can be concluded that the three feasible models are used to predict the magnitude of opportunity residential residents do on-street parking.

Testing the Overall Parameters Using the G-Test

Tabel 2. Omnibus Test of Model Coefficients & Model Summary

Type of housing	Sig	Nagelkerke R Square
Luxury	0,003	0,406
Middle	0,000	0,492
Simple	0,000	0,802

Source: Analysis results, 2019

Significant value of p-value (sig value) in the three types of housing shows a value that is smaller than the test significance level of 0.05 then with a 95% confidence level it can be concluded that there is at least one variable that has a significant effect on non-independent variables. Then from the *Nagelkerke R Square* Value data obtained that the independent variables together can explain 40.6% (luxury housing), 49.2% (medium housing) and 80.2% (simple housing) diversity / variation on on-street parking behavior the community in Bukit Khatulistiwa Housing while the rest is explained by other factors.

Based on the analysis above obtained data as follows:
Real estate
Variables that have a significant effect on the dependent variable in luxury housing are the parking area, number of vehicles and road width, so that the results of the above analysis can be interpreted that the negative coefficient on the Slope Value (B) variable parking space indicates that there is a possibility for residents to park vehicles on street when it has a smaller parking area. Then the positive coefficient on the Slope Value (B) variable number of vehicles and road width indicates that it is possible for residents to park vehicles on street when residents have more vehicles and wider road width compared to occupants who have fewer vehicles and narrow road widths.

Middle Housing
The factors that influence parking on street four-wheeled vehicles by residents in Middle Housing are among others the number of vehicles and the size of the parking space. From the results of the above analysis it can be interpreted that the negative coefficient on the Slope Value (B) variable parking space indicates that there is a possibility that residents to park vehicles on street when they have a smaller parking space. Then the positive coefficient on the Slope Value (B) variable number of vehicles shows that it is possible for residents to park vehicles on street when residents have more vehicles than residents who have fewer vehicles

Simple housing
Variables that significantly influence the dependent variable in simple housing are the number of vehicles and monthly income, so that the results of the above analysis can be interpreted that the positive coefficient on the Slope Value (B) variable number of vehicles and monthly income indicates that the possibility of occupants on the street parking when residents have more vehicles and have a monthly income greater than residents who have fewer vehicles and with less income.

IV.   Conclusion

Based on the results of analysis and discussion, it was concluded that in general the factors that influence the behavior of residents of Luxury Housing parking on street four-wheeled vehicles are the area of parking space in the plot of houses (garage/car port), total income per month, number of vehicles and road width. There is one factor that is the same influence of the three types of housing clusters studied, namely the factor of the number of vehicles, while the different factors are the variable width of the road in luxury housing and the income variable per month in simple housing.

The occupant relationship model and housing conditions for their behavior on street parking are the smaller the size of the parking space in the house plot, and the wider the road in the residential area, the more housing residents will have four-wheeled vehicles that will affect the occupants of the parking on street.

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