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An Application of Hedonic Model in Estimating Housing Price in the Area of Crum Rubber Factory in Padang West Sumatera

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ABSTRACT

This research aimed to analyze and determine the effect of environmental quality, house position, distance from the house, the availability of clean water and road types either partially or jointly on the housing price in the surrounding Crum Rubber Factory Area in District of Lubuk Begalung Padang. The research concluded that the quality of the environment, the house position, availability of clean water and road type does not significantly influence the housing price in the surrounding Crum Rubber Factory Area in District of Lubuk Begalung Padang. While the distance of house to the factory location only variables that significantly influence the housing price in the surrounding Crum Rubber Factory Area in District of Lubuk Begalung Padang. Based on these conclusions, suggestions that could be addressed in this research is the government of Padang through the ranks of concerned should consider the availability of clean water around the Crum Rubber Factory Area in District of Lubuk Begalung Padang.

Keywords: Price of the house, environmental quality, hedonic price.

1. INTRODUCTION

Padang City is the capital of West Sumatera Province with an area of 694.96 km² and the number of population around 1,000,096. After Law No. 4 of 1982 is established about Basic Provisions of Environmental Management, the Regional Government of Padang Municipality in the late 80s took the policy of moving some factories to the suburban due to the impact on environmental quality issues. Crum rubber is one of the factories that moved because the waste generated disturbs the comfort of the community, especially the bad smell. The bad smell arises because the impact of processing natural rubber into Crum rubber that can be exported.

Currently the area is no longer a suburb area characterized by an increasing number of housing populated by residents. One of the Crum Rubber Factory is located in District of Lubuk Begalung Padang. The existence of the factory has created a negative externality for the people living in the area. The form of negative externalities is a bad smell. Although the bad smell does not disturb the scene and does not interfere with hearing, but it causes discomfort for the people living around the area.

In fact, although there is a bad smell but there are still many people who live around the factory. The closer to the factory, the stronger the smell, on the contrary the further to the factory, the less the smell. The bad smell as one of the attributes of environmental quality will certainly affect the price of land around the area. The public is willing to pay (WTP) the cheaper price of land for area closer to the the factory and also with its willingness to accept (WTA) the bad smell. While the other, are willing to pay higher price of land for area further to the factory with the less smell.

Based on the facts and phenomena described above, the study should be done to answer the question whether the unpleasant or bad smell is affecting the community in deciding the purchase of land around the Crum Rubber Factory Area?

2. OBJECT OF THE RESEARCH

This research was conducted around Crum Rubber Factory Located in District of Lubuk Begalung Padang. This area is 30.91 km2 with a number of population around 115,286 people with an average density of 3,730 people per km2. Data collection is divided into 4 Zones, where zone 1 is the closest residential location to Parik Crum Rubber, and zone 4 is an increasingly distant location of the Crum Rubber Factory. The location map and the division of the sampling zone can be seen in Figure 1 below.

Figure 1: The object of the study (Crum Rubber Factory) located in District of Lubuk Begalung Padang

3. THEORITICAL REVIEW

According to Sullivan (2000), the price of a property can be characterized by the type of housing use based on the theory of hedonic price. This theory is built through the idea that housing consists of a group of qualitative characteristics components of housing especially concerning environmental comfort or quality of life and quantitative characteristics of housing that forms the implicit price of a home. Definition of hedonic according to language is something related to pleasure. Hedonic econometric model is a method where the independent variables related to quality, for example the quality of a product to be purchased. Hedonic approach is a method to ensure the value of the perceived or pleasure from the good attributes. The value of the attribute is implicit prices (hedonic price) that is not available as the market price.

According to Rosen (Fujita, 1989), an item or good is rated according to the attribute concerned with its usefulness or characteristics. The hedonic method is used to estimate the marginal or price value of the facility for different groups or markets. The main use of the hedonist pricing method is to identify price factors based on the premise that prices are determined by both internal and external characteristics of goods and services.

According to Rosen (Hufsmidtz et al, 1983), the hedonic price is defined as the implied price of a property's characteristics for example, spacious location, the quality and characteristics of housing units) revealed by looking at the various characteristics of the environment associated with it. Turner, Pearce, and Batemen (1994) stated that the Hedonic Price Method (HPM) assesses the price of factors that can not be readily seen in the market, such as the price of environmental quality, the price of the beauty of the park, as well as the price of the location / distance to the city center. While Malpezzi (2002) expresses his opinion that the basic reason for using hedonic price method (HPM) because the price is a factor associated with either the characteristics or services provided. HPM functions explain the factors that affect the price of a house / land. According to Hanley and Spash (1993) the price of land is affected by the characteristics of the land itself, the characteristics of the surrounding environment and the quality of the environment.

This technique is also used by Meyer and Leone (1977) in Hufschmidt, at,al. (1983) based on a view that differences in wages of various cities are interpreted as reflecting Willingness to Accept (WTA) in the form of lower wages for living and working in cities with higher environmental conditions and enjoyment, or WTA in the form higher wages to live and work in cities with poor environmental conditions.

Munn and Palmquist (Contreras, 2014) say that HPM is used to explain the price of a different product. According to Munn and Palmquist, the hedonist model assumes perfect competition and perfect information on a good or service. While Rosen provides a theoretical basis for the relationship between the price of a consumer goods and the characteristics contained in the goods.

Once a model that shows the function of Hedonic Price is formed, we can determine the implicit value of the environmental characteristics. The implicit value can be used to demonstrate the influence of environmental factors on the price of land. The magnitude of the influence of environmental factors is called implicit value because environmental factors are implicitly valued in land pricing. In this research, the bed smell around Crum Rubber Factory will affect the price of land around it. Someone will give lower value in the area close to the factory. Instead someone will give higher value in the area getting farther from the Crum Rubber Factory Location (the better environmental quality). This shows that the environmental quality implicitly affects the price of the land. The implicit value of the environment is indicated by the

value of the marginal change in the environmental quality variable. The implicit value is obtained by making a partial differentiation of the obtained hedonic price function equation, so that it can be established:

$$\delta Ph/\delta Z = \delta (\beta_0 + \beta_1\beta_2 X_1 + X_2 + ... + \beta_n X_n + \beta_z Z/\delta Q_k \quad (1)$$

$\delta Ph/\delta Q_k$ called the rent differential (r).

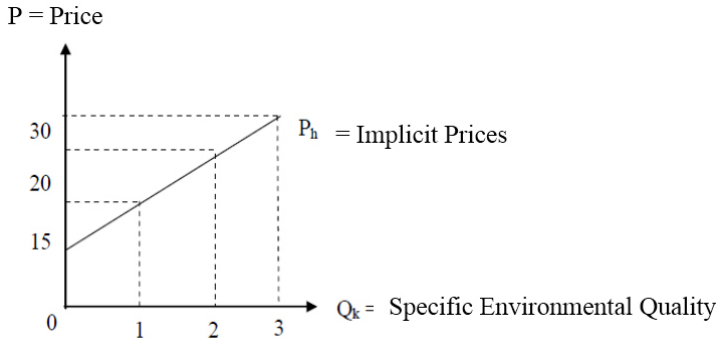

Figure 2: The implicit price environment curve
Source: **Hanley and Spash (1993)**

The implicit price of the environment or so-called reversed demand curve can be shown in Figure 2. This curve shows relationship between the price of the land and its environmental quality. The higher environmental quality of a property, The higher the price of the property.

According to Goodman (1998) environmental attributes cannot be valued explicitly in the market, but implicitly can be valued through hedonic prices. Environmental attributes can take the form of externalities such as crime rates (Thaler, 1978), traffic noise (Williams, 1991) airport noise (Espey & Lopez, 2000, Feitelson et.al, 1996; Mieszkowski & Saper, 1978). In addition, research conducted by Huh and Louie (1997) in Seoul that hospitals have a significant negative effect on property prices, because proximity to hospitals and health centers is not desirable because of the noise that occurred including ambulance siren disturbance, general congestion around hospitals, and superstitious beliefs. Externality in the form of noise affects property values (Palmquist, 1992).

4. RESEARCH METHODS

The population in this research is the entire household (RT) in the area of crum rubber factory in District of Lubuk Begalung Padang City. Respondents were using a technique purposive, that is households buying a house to settlement in the region around crum rubber. The size of the sample was determined and around 100 respondents, the sampling was conducted taking into account the diversity of data and its distribution considering the proportion of the established zone. The dependent variable in this study are house prices and independents variables are environmental quality, house position, house distance to factory location, availability of clean water and road type. Environmental quality is the quality of the physical environment conditions covering hygiene, air pollution, waste management, noise, sanitation, and open green spaces. The position of the house is facing or deflecting the location of Crum Rubber Factory. Furthermore the distance of the house to the factory site is expressed in meters, and clean water is expressed in the availability of water from Water Supply Company owned By Local Government (PDAM). The last road type is indicated by the road type surface in front of the house location (asphalt or cast concrete). Data collection was conducted in September until October 2016.

To estimate the effect of independent variables on the dependent variable, this research used Multiple Regression Method or Ordinary Least Square (OLS). The form of multiple regression equation in this research is as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu \quad (2)$$

where,

Y = price of the house

X_1 = environmental quality

X_2 = house position

X_3 = distance of house

X_4 = the availability of clean water

X_5 = road type

β_0 = constants

β_1 = coefficient of environmental quality estimation

β_2 = coefficient of house position estimation

β_3 = coefficient of home distance estimation

β_4 = coefficient of the availability of clean water estimation

β_5 = coefficient of road type estimation

u = error term

5. RESULTS AND DISCUSSION

The estimation results of multiple regression model with OLS in this research were taking the results of the OLS estimates are already free from multicollinearity and heteroscedasticity as shown in Table 1 below.

Based on the analysis result, the value F test = 2.834042 (Prob: 0,019), simultaneously it shows that environment quality variable (X_1), house position (X_2), distance of house to the factory location (X_3), availability of clean water (X_4), and road type around the factory location (X_5) has a significant effect on prices of houses in Crum rubber Factory area.

Furthermore, partialy the variables that significantly affect the housing price is the distance of house to the factory location (X_3) shown by the value of *t* test = 2.111768 (Prob 0.0374) while other variables such as environmental quality, house position, availability of the clean water, and road types have no significant effect to the housing price around the location of the Crum Rubber Factory Area.

From the analysis results, we can formulate estimation model to estimate the housing price around Crum Rubber Factory as follows:

$$Y = 258.689{,}30 + 34.546{,}06\ X_1 - 128.495{,}70\ X_2 + 149.126{,}90\ X_3 + 467.386{,}30\ X_4 - 107.950{,}20\ X_5 \quad (3)$$

Table 1
Effect of Environmental Quality on Housing price in the Crumb Rubber Location Area
District Lubuk Begalung Padang

Dependent Variable: Y
Method: Least Squares
Date: 07/26/17
Time: 14:23
Sample: 1 100
Included observations: 100

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
X1	34546.06	17854.89	1.934824	0.0560
X2	–128495.7	132213.9	–0.971877	0.3336
X3	149126.9	70617.11	2.111768	0.0374
X4	467386.3	378072.0	1.236236	0.2195
X5	107950.2	124286.6	0.868559	0.3873
C	258689.3	371385.2	0.696552	0.4878
R-squared	0.130999	Mean dependent var		1271902.
Adjusted R-squared	0.084776	S.D. dependent var		666210.9
S.E. of regression	637346.3	Akaike info criterion		29.62614
Sum squared resid	3.82E+13	Schwarz criterion		29.78245
Log likelihood	–1475.307	Hannan-Quinn criter.		29.68940
F-statistic	2.834042	Durbin-Watson stat		1.068152
Prob (F-statistic)	0.019861			

Source: Data processed by Eviews 6.

The R-squared value of the housing price equation around Crum Rubber Factory Area is 0.130999. This shows that the contribution of environmental quality, house position, the house distance, availability of the clean water and road type on the housing price around Crum Rubber is 13.10 percent while the rest of 86.90 percent is influenced by other variables not included in the estimation model. The value of the constant coefficient is 258,689.30 indicates that without the influence of environmental quality, the position of the house, the distance of the house, the availability of clean water and the road type, the value of the housing price is around Rp 258.689,30. (per square meter) in the Crum Rubber Factory Area Lubuk Begalung Padang.

The effect of environmental quality to the housing price around Rubber Crum Factory area in Lubuk Begalung Padang is positive with regression coefficient of 34,546,06 located at α 0,056 > 0,05. This means that if the environmental quality increases by one-unit then the housing price around the Crum Rubber Factory Area will increase around Rp 34.546,06 (ceteris paribus), but the effect is not significant. The insignificant effect of the environmental quality on housing price is due to the environmental quality around Crum Rubber Factory Area can be said to be evenly distributed, unless there is an unpleasant or bad smell. From observations made at the time of the survey showed that the arrangement of the environment around the area is good, hygiene conditions, waste management, comfort and handling of sewer can also be said to be good and there is no indication of air pollution. Therefore, this condition causes the quality of the

environment that was originally assumed bad due to Crum Rubber factory was not proven to affect the housing price around the area.

The value of regression coefficient of the house position variable (X_2) is −128.495,70 located at α 0,3336 > 0,05, indicating that the position of house facing to Crum Rubber Factory location has lower value Rp. 128.495,70 (per square meter). The insignificant effect of the house position is due to the fact that even though the house is facing the Crum Rubber Factory, the factory has been fenced with a high wall so that the bad view has been blocked. Thus, these conditions do not make the house position built by the community whether facing or not facing the Crum Rubber Factory does not cause the housing price around the area to be high or low.

The value of regression coefficient of house distance to Crum Rubber Factory Location is 149.126,90 located at α 0.0374 < 0,05, indicating that if the house distance to Crum Rubber Factory Location increase by one meter then the housing price will increase by Rp. 149.126.90 (per square meter). The effect of the house distance to the factory location is significant, meaning that although the environmental quality around the factory Location has been good and the factory has been fenced with a high wall but the unpleasant or bad smell will still exist and affecting the housing price in that location. The closer the position of the house to the factory location then the lower the price will be. For people living around the factory location at this time may not be a problem, because the smell is already a common thing so it does not bother. But for people who just came to the location then the smell will disturb. People who will buy the house is not only the people who live in the vicinity of the location, but also the people who come from other regions. The people or buyer who wants to buy a home in that location for a low price is a buyer who is willing to accept the bed smell as a consequence of the hedonic value reflected in the housing price.

The value of regression coefficient of clean water availability (X_3) is 467.386,30 located at α 0.2195 > 0,05, indicating that if clean water is available around the location of factory then the housing price will be higher Rp. 467.386,30 (per square meter). The insignificant effect of clean water availability on house prices is due to the fact that around the area of Crum Rubber Factory, clean water facilities are equally available through the piped water network from Water Supply Company owned By Local Government (PDAM) Padang to local residents' houses.

Finally, the value of regression coefficient of road type (X_5) is 107,950,20 located at α 0.3873 > 0,05, indicating that if around the location of factory road type surface is paved (cast concrete) then the price will be higher Rp. 107,950.20 (per square meter) compared to the price of a house that is not paved. The insignificant effect of the road type to the housing price is due to the fact that around the area of Crum Rubber Factory, the road type is almost all paved or cast concrete.

Research findings proving that the implicit price of environmental quality is reflected in the lower house prices at the closer location to the site of the source of the bed smell. The results of this study are in line with Soetjipto, et.all's (2017) which states that the threat of earthquake and tsunami issue in Padang City affect the price of land in Padang City, the closer the land to the seafront, the lower the price. In the study, the threat of earthquake and tsunami issue is one of the attributes of environmental quality from the land close to the seafront.

6. CONCLUSION AND SUGGESTION

The results concluded that environmental attributes in the form of environmental quality, house position, distance from the house, the availability of clean water and road types simultaneously have a significant effect on housing price for residential area in Crum Rubber Factory in Padang West Sumatera. While partially, the variables affecting on the housing price is the distance of house to crum rubber factory location. Environmental attribute values of bad smell around the Crum rubber factory location are implicitly reflect price of the houses, that is the closer to the factory, the the cheaper price will be. The implication of this research is that when the government plan to move the factory location elsewhere, the costs incurred should be charged to the communities living close to the factory location, as they will be externality economies in the form of improved environmental quality reflected in the increase in housing price .

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