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A HEDONIC VALUATION IN PUTRAJAYA WETLANDS

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Abstract: *This study is designed to estimate the economic value of green spaces in the land of Putrajaya by using the Hedonic Pricing Method (HPM). Economic valuation regarding green spaces in Putrajaya is targeted to give an efficient solution in investment and also to facilitate the residents of Putrajaya upon the value of the environment that they received and the significance of reserving the great environment for future consumptions. Survey questionnaires were distributed to 415 respondents in Putrajaya Wetlands who lived in the housing area 2-15 Km from this park. A Hedonic Pricing Model is developed by taking housing price as the dependent variable and structural of the house including distance to the green area as the independent variables. Housing price is used as a proxy to quantify the economic value of green space. Two models (linear model and semi-log model) mainly based on hedonic price model are formulated and regressed through ordinary least square (OLS) method. In term of model comparison, the result revealed that semi-log model (Model 2) performed better than the linear model (Model 1). As expected, a significant inverse relationship between the housing price and its distance from the residential area and the Putrajaya Wetland has been found whereby a slight decrease of 1 Km of the distance will positively increase the housing price by 5.9%. The result positively shows that the green space has contributed indirectly towards the housing price and it indicates that green space is a vital part of urban development in the city area. In conclusion, the green space provides benefits especially regarding its economic value. Thus, conserves and preserve in maintaining this area is ought to be implemented.*

Keywords: *Economic Valuation, Hedonic Pricing Model, Green Space*

Introduction

The creation of a new Federal Government Administrative Centre at Putrajaya marks a new chapter in the development history of modern Malaysia. The development of this city was prompted by the government's desire to balance and dispersed development to areas outside of the capital city of Malaysia, Kuala Lumpur. It also was lead to the improving of the urban environment and quality of life, as well as easing the pressure on the overstretched infrastructure of Kuala Lumpur (Qureshi and Ho, 2011).

Qureshi and Ho (2011) also stated that the development of new Federal Government Administrative Centre at Putrajaya provide a golden opportunity for Putrajaya Corporation, the local planning authority for Putrajaya to embark on innovative planning to represent Malaysian values and multicultural background. Putrajaya is planned to be equipped with the latest technologies and facilities to allow improvement in the effectiveness of the government's machinery and productivity as well providing amenities that will greatly contribute towards a quality urban living and working environment.

As reported by Siong (2006), all residential areas within Putrajaya are developed on the 'neighborhood' concept. At the heart of this concept is that each distinct neighborhood within a larger residential precinct will be well-serviced, would have good access and vehicular and pedestrian movement routes, have ample facilities, have adequate landscaped open spaces, be safe and secure, have a critical mass of residents to make it livable, regardless of housing density. Each neighborhood would be defined by roadways, parks, and open space or housing blocks. At the minimum, each neighborhood would have at least one neighborhood park and would be near a larger park beyond its boundary.

Putrajaya is a plan driven city based on two underlying concepts, the city in the garden and the intelligent city. The adoption of these concepts to guide its physical development was aimed at a balanced and sustainable development, environmentally socially, as well as economically. Sustainability concept is evident in the designation of almost 40% of its total city area of 4,931 hectares specifically for green and open spaces in the Putrajaya Master Plan (Sureshi and Ho, 2011). The sustainability concept created within Putrajaya is parallel with the target for 'Low Carbon Putrajaya'.

At the Copenhagen COP15, Malaysia made a conditional commitment to a reduction of carbon emission intensity of Malaysian GDP, of up to 40% by 2020 from a 2005 baseline and this is followed by the Prime Minister announcement in the 2010 Malaysian Budget speech, that the government will "develop Putrajaya and Cyberjaya as Pioneer Township in Green technology as a showcase for the development of other townships." Rising to the challenge, Putrajaya Corporation in collaboration with the Ministry of Energy, Green Technology and Water and the Sepang Municipal Council, have taken a bold step forward to formulate a Green City Action Plan for Putrajaya and Cyberjaya. To start with, Putrajaya Corporation has taken the initiative to conduct a carbon emission baseline study for Putrajaya. Putrajaya Corporation and other relevant organizations have formed a research team to prepare the feasibility study towards Putrajaya green city 2025. The Goals for Putrajaya Green City 2025 (PGC2025) regarding quantitative

environmental targets are outlined in three themes. One of them is "Low carbon Putrajaya" for climate change mitigation.

There is numerous effort have been proposed and done to fulfill the target. It involves created the 'Green Lung of Putrajaya' including developed 12 metropolitan parks labeled as green spaces. Green space is relatively important in the urban area. Green space located in the urban area can be called as the urban green space. Urban green space (UGS) is a connection between urban area and nature (Pietsch, 2012). It is divided into two groups known as public UGS and private UGS. Public UGS includes parks, forest, sports fields, community gardens, street trees, nature conservation areas, greenways and in fact any vegetation located around the urban environment. Private UGS includes private backyards and corporate campuses (Wolch, Byrne, and Newell, 2014; Roy, Byrne and Pickering, 2012; Pietsch, 2012).

UGS is very important element and it can provide several of benefits regarding social, economic, environmental and health to communities, neighborhoods, cities, and private and government sectors. According to the Urban Green Space Task Force (2002), these benefits include improving the quality of urban regeneration, act as an attractiveness of locations for business, and creating social and community development, create new jobs, giving healthy lifestyle and indirectly it may create environmental sustainability by preventing the natural disasters such as landslide, flood, and any undesirable pollution.

The formation of 'Green Lung of Putrajaya' able to reduce the greenhouse gases emission by 35Kteo2eq and this reduction amount contribute to 1.6% in total reduction. Even, the percentage seems small but this emission reduction is very significant to achieve the target of 'Low Carbon Putrajaya' by 2025 (Sureshi and Ho, 2011). It was proved that the green space is one of the important elements that will contribute to the Putrajaya Green City 2025. Therefore, the existence of 43% of green space in the land of Putrajaya should be well managed so that the quality and the quantity of green space will remain preserved.

However, Luttik (2000) and Zhuo and Parves Rana (2012) claimed that it is not easy to come to a clear conclusion about the effectiveness of existing arrangement for protecting UGS without much more information especially regarding monetary value. They highlighted that information regarding the monetary value is very important to prove that urban green space is really important.

People tend to take for granted of the things that they did not pay for. Free access to the public areas and parks are expected on the degradation of the environmental value as less consciousness among the users is predicted in maintaining it. Thus, by putting a monetary value for the environment, this phenomenon is expected to be alleviated and by chance will increase the awareness of residents of Putrajaya upon the value of the great environment that they received. In the case of Malaysia, Mohd Noor et al. (2015) is one of the earliest ones that have a concern about this issue. They have conducted a study about the economic valuation of urban green space in Subang Jaya, Selangor. However, it is well noticed that there is still the lack of monetary value placed on the environment in the case of Malaysia.

A study about the monetary value of green space in Putrajaya also should be mattered on. It is because the population in Putrajaya is expected to reach up to 347, 700 people on 2025 (Siong,

2011) which is during the 'Low Carbon Putrajaya' is realized. Without this study, it is worried that the percentage of green space in Putrajaya will be declined. It is not an impossible issue because, in reality, it happened at most of the urban area. The main reason for degradation of green space is to cater for population increase. If this issue is also happening to Putrajaya, it is firmly believed that the mission to achieve 'Low Carbon Putrajaya' by 2025 cannot be realized successfully. Hence, the study on the economic valuation of green space in Putrajaya should be conducted to avoid the green space diminished. This study will offer clear information specifically on its monetary value and hence protect the green space from being diminished by any irresponsible agencies.

Literature Review

An economic valuation analysis using Hedonic Pricing Method by Previous Studies

The Hedonic Pricing Method (HPM) uses surrogate markets to assess the price of the environment. The property value is a proxy that is always used in the methods of HPM. The hedonic theory was first introduced by Rosen in the year of 1974 (Tyravainen, 1997). According to (Rosen, 1974) cited in (Tyravainen, 1997), the model assumed that property prices are affected by the characteristics of the house.

Additionally, property prices reflect the extra money that people are willing to pay to receive a better environmental quality. Originally, the word "hedonic" comes from the Greek word meaning "pleasure". HPM is widely used to measure the economic value of UGS (Zhuo and Parves Rana, 2012). Its value can be predicted from the prices of related actual market house transaction (Kong, Yin, and Nakagoshi, 2007). House prices are regressed against sets of control variables. It includes structural attributes of a house, neighborhood variables, and environmental attributes.

Chin and Chau (2003) believed that the property prices are associated with their structural attributes. It includes the size of building lot, the number of rooms and bathrooms, building age and number of parking space (Saphore and Li, 2012; Kong, Yin, and Nakagoshi, 2007; Morancho, 2003). All of them concluded that any functional spaced considered as a significant relationship with the house price.

Other than that, most of the previous studies proved that environmental attribute works well towards the house price. They have believed that there was an inverse relationship between distance and property price (Mahan, Polasky, and Adam, 2000: Tajima, 2003; Morancho, 2003; Boyer and Polasky, 2004; Cho et al., 2006; Cho et al., 2008; and Gibbon et al., 2014). Specifically, the house price was increased by $436 if the distance between the residential area and nearest wetland is reduced by 1000 feet (Mahan, Polasky, and Adam, 2000). Tajima (2003) also proved that proximity to urban green space and proximity to highways has positive and negative impacts on property price respectively.

Based on the previous studies, all of the reviewed variables seems have the significant effect on the house price. Previous studies outside Malaysia have proved that the urban green space attribute which is its distance to the residential area is important factors for house price. Therefore, all of

those variables will be used to estimate the economic value of urban green space in Putrajaya Wetlands.

Data and Methodology

Study area and data collection method

The objective of this research is to estimate the economic value of green space in Putrajaya. Specifically, this research was carried out in Putrajaya Wetlands involving two sub parks which are Wetlands Park and Lake and Recreational Park. This place is situated in the heart of Putrajaya and consideration had been made as these places received mounts of visitors each day. To achieve the objective of this research, all the data was collected by using primary data. A questionnaire was constructed to attain information of the respondents regarding the frequencies of demographic characteristics and house characteristics of respondents. The survey was conducted on the weekend (morning and evening). As mentioned in literature review section, the property price is used as a proxy to estimate the economic value of Putrajaya Wetlands. In this study, the house price is used as a measurement for the economic value of Putrajaya Wetlands. The location factor influences the house price. Therefore, only one residential area will be chosen for this study to avoid any bias in data analysis.

All of the respondents were the visitor of Putrajaya Wetland and our target respondent was the visitors who buy a house and live in Putrajaya. The questionnaires were distributed and collected through face-to-face interviews. Face-to-face interviews are one of the most common survey mode used in any research because complex questions and questionnaire structures are possible (Bateman et al. 2002). Besides, respondent can directly ask enumerator to get a better understanding regarding the questions. Using a cluster sampling technique, we clustered the study area into a specific residential geographical location; and only focus to those who buy a house and live at Putrajaya

Questionnaire design

Relevant information from the respondent was gained by obtaining the data based on the questionnaires distributed. The questionnaire consists of 2 parts. For Section A, the questions are basically on the demographic characteristics of the respondents. In this section, all the details regarding gender, age, income, and occupation are obtained to analyze the frequencies of demographic characteristics of respondents visit Putrajaya Wetland.

In section B, the questions were regarding the house characteristics, environmental characteristic and house price. House characteristics include the age of the house, the number of the bathroom in the house, number of the toilet in the house, number of parking space, the length of the house, the width of the house, and the total number of square feet of the house. While environmental characteristic is the distance between Putrajaya Wetland and residential area. At the end of this section, the question will be regarded on the house price. Overall, this section is designed to estimate the economic value of Putrajaya Wetland.

Samples of the respondents in these areas were selected randomly (Westfall, 2009). The targeted respondents will be approximately 600 with each park contribute 300 of it. The questionnaires are distributed in hand to each of the respondents. Comprehensive screening is done to each of the respondents before delivering the questionnaires to ensure the criteria is met. This study is particularly in need a respondent living in Putrajaya. Failure in showing the criteria is in sequence on rejecting all of the data obtained. During this study, a few questionnaires are sort to discard the information attained is not reliable and found wobbly. A total of 600 questionnaires are distributed but only 415 of it can be used to analyze the data.

Model Specification

This research is regressed through SPSS and E-VIEW software. The first part is regressed through SPSS to obtain the frequencies of the respondents visit Putrajaya Wetlands. While the second part is by using OLS method to regress the HPM model to obtain the empirical value of Putrajaya Wetlands.

The general model of this Hedonic Pricing Method is written as follows:

$$P = f\ (DISTANCE, AGE, B, T, PARKING, L, W, SQFT) \quad (1)$$

Where

P = House Price

DISTANCE = Distance of the residential area to the green area (Putrajaya Wetlands Park)

AGE = Age of the house

B = Number of bathroom in the house

T = Number of toilet in the house

PARKING = Number of parking space

L = Length of the house

W = Width of the house

SQFT = Total number of square feet of the house

The HPM is regress in two different models. Model 1 represents the linear form of HPM. While, Model 2 represents the semi logarithmic form of HPM. The linear form of HPM is indicated by the equation below:

$$P = f(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + \varepsilon) \quad (2)$$

where P is the housing price; $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$ are variables that describe the attributes of the house as explained in equation (1); $b_1, b_2, b_3, b_4, b_5, b_6, b_7, b_8$ are the coefficients of the variables and $\mathcal{E}$ is the residual error.

The semi logarithmic form of HPM is indicated by the equation below:

$$\ln P = f(b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + \varepsilon) \quad (3)$$

For equation (3), the housing is express in the log function while others remain the same as in equation (2). ln *P* represents the natural logarithm of the house price.

Result and Discussion

As mentioned earlier, 600 questionnaires have been distributed throughout this research. However, a total of 415 research paper received and enabled to use. The proposed independent variable was assessed for reliability and convergent validity. All standard factor loading values exceed 0.5 and were significant at p = 0.01. Based on Fornell and Larcker (1981), the obtained factor loading values were met the convergent validity requirement. The independent variables show the reliability values are 0.67 which is almost exceeded the threshold of 0.7. The value obtained indicating that all constructs were reliable.

Table 1 shows the summary of the demographic characteristics of the respondent in Putrajaya. Table 2 shows the result summary for Model 1 and Model 2 of the hedonic pricing method analysis.

Table 1: Demographic Characteristic of Respondent in Putrajaya

Respondent's Characteristic	Frequency	Percentage (%)
Gender:		
Male	274	66
Female	141	34
Race:		
Malay	356	85.8
Indian	32	7.7
Chinese	27	6.5
Age:		
Below 18	6	1.4
19-24	30	7.2
25-30	87	21
Above 31	292	70.4
Occupation:		
Government	176	42.4
Private	176	42.4
Student	48	11.6
Unemployed	15	3.6
Monthly Income:		
Between RM1000-RM2500	43	10.4
Between RM2500-RM3500	110	26.5
Above RM3500	262	63.1

Of the total respondent, 66% of men and 34% are women. This may be because men are more likely to perform activities in the area as this Putrajaya Wetlands Park provides a place for fishing apart from other recreational activities such as kayaking and boating. Apart from that, it may also be caused by the distribution of the survey whereby most of them coming as a family to this park. Consequently, each head of the family voluntarily answered one survey questionnaire. Due to this matter, the proportion of the percentage regarding gender is more to the male compared to the female.

During this study, these surveys distributed only managed to capture only three races in Malaysia, namely Malay, Chinese and Indian. Malay is found to be the majority with a share of 85.8%, India 7.7%, and China 6.5%. This situation may be due to most of those who work in government offices

in Putrajaya comprising of Malays. After all, three races stated above are among the majority in Malaysia, thus imply to the status of Putrajaya as the federal administrative center of Malaysia.

Moving to the next variable of the respondent characteristic, 70.4% of the respondents are above 31 years old. 21% of them are between 25-30 years old, while the others are the minority with just 7.2% and 1.4% for the range of age 19-24 and below 18 respectively. In the discussion, majority of residents in Putrajaya are those who already experienced and have a stable life. This is correlated with the income of the respondents, whereby 63.1% of them have a monthly income above RM3500.

Viewing from the angle of the distribution of occupation, although it is quite surprised to see the percentage whereby both government and private sector share the same percentage which is 42.4%, it is still open for discussion as the distribution of this questionnaires took place regularly on the weekend and for that, this is might be the biggest reason as the numbers of visitors to this park does not limit to only government officers. It is much exultant to see the trending, although the majority of Putrajaya reserve land for government purposes, still it is open wide to welcome all people in using the public space especially the parks provided.

Table 2: Result Summary for Model 1 and Model 2

Variable	**Model 1**		**Model 2**	
	Coefficient	Standard Error	Coefficient	Standard Error
Distance	-34183.76***	12840.09	-0.059***	0.016
Age	-4641.95	4492.701	-0.018***	0.005
Bathroom	108327.4***	34447.52	0.192***	0.043
Toilet	217568.3***	33727.19	0.117***	0.042
Parking	37612.07	31757.21	0.023	0.040
Length	-12950.41***	2486.897	0.014	0.003
Width	-20716.15***	5032.414	0.018	0.006
Square feet	399.417***	55.04872	-0.0001	6.96E-05
Number of Observations	415		415	
Log Likelihood	-5752.527		-116.337	
Akaiken info criterion	27.77		0.605	
Schwartz criterion	27.86		0.702	
R2	0.859		0.830	
Adjusted R2	0.855		0.826	

Based on Table 2, the lowest figure presented by each model for Akaiken info criterion (AIC) and Schwartz criterion (SC) ought to be chosen as the best model. Model 2 has presented a better figure. This can be seen on the result obtained for the AIC and SC. For model 1, the figure shown 27.77 for AIC and 27.86 for SC. While for Model 2, the figure for AIC is 0.605 and SC is 0.702. Thus, it indicates that Model 2 is better compared to Model 1.

Focusing on the Model 2, the value for R^2 is 0.83. This explained that the results have a high explanatory power thus convinced that the housing price can be explained by the independent variables regressed. This Model 2 shows that variables Distance, Age, Bathroom, and Toilet have a significant level of 1%. For variables of Parking, Length and Square feet shown are not significant at all.

Referring to the variable of "Distance", which is related to the green space attributes, the result indicates an inverse relationship between the housing price and the distance to the green area. In explanation, a decrease in the distance to the green area from the residential area resulted in a higher housing price. The increment of house price (monetary value) shows that the green space (Wetlands Park) attributes have an economic value. Specifically, a one unit decrease in the distance from the residential area to the Putrajaya Wetlands Park resulted in 5.9% increment on the housing price. In the calculation, 1 Km decrement on the distance will result to 5.9% increment of the housing price with a value approximately RM43, 496.60. In other words, a decrease distance from the residential area in Putrajaya about 100m inclines the price by RM4, 349.00. The figure in monetary value shows that this Wetlands Park is very valuable thus conserves and reserve in maintaining this area ought to be implemented.

Conclusion

HPM studies showed that urban environmental amenity such as Putrajaya Wetlands Park is measurable and viable to be conducted. In this research context, housing price has been placed as the proxy to the environmental value. Regression analysis discovered that the distance of the green from the residential area as the variable with greatest explanatory power. As expected, the distance of this green area to the residential area affects the housing price significantly.

Discussing to the valuation derived, an increase of 1 Km further away from the Putrajaya Wetlands Park means a drop of 5.9% in the housing price with an average value of RM43, 496.60. The assessment has found an effect at about 5.9% for its distance and thus can be considered as a high impact. In all, the green area indirectly contributes positively towards the housing price. It is also one of the essential parts of the development in the city area.

In summary, the finding shows important findings whereby the Putrajaya Wetlands Park found to be very high in value. The results recommend that policy makers should protect UGS in the urban environment and design zoning and land-use regulation policies accordingly so that the urban green spaces in Putrajaya especially are kept well conserved and preserved.

Limitation of the study

This study has assisted to indicate the value of Putrajaya Wetlands Park. By using HPM technique, the monetary value on the environmental quality of this park is managed to be calculated. However, in retrospect the variables used in this model are limited in accessing other factors that contribute to the housing price. Thus, additional variables are suggested to be included in the study to find out a better trend and results.

In fact, this research is limited to one particular green area in Putrajaya thus the assessment on another premium green area and also other easy access green area that is located nearer to each of the residential area is also needed to ensure better results and findings. This study is however restricted regarding time and expanding the study to a bigger radius is predictable for the purpose of better respondents.

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