



**FOREST VALUATION USING TRAVEL COST METHOD (TCM):
CASES OF PAHANG NATIONAL PARK AND SRENGSENG JAKARTA
URBAN FOREST**

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Abstract

This study aims to estimate the economic value of a recreational park by using the travel cost method (TCM). Case studies have been done for Pahang National Park, Malaysia, and Srengseng urban forest, Jakarta, Indonesia. The data was obtained from a structured interview with visitors. The data was analysed by using Poisson and negative binomial model. Based on the survey result, it is known that the Srengseng urban forest is local public good used by local public residents whereas the Pahang National Park is visited by visitors from all over the world. The frequency determinants of visits to the urban forest are cost, age, occupation, gender, and visitor's satisfaction; meanwhile, visit the national park is affected by travel cost, age, education, income and number of visits. The TCM method utilized in this research resulted in the Srengseng Urban Forest total economic benefit of RM0.44 million per year and the Pahang National Park total consumer surplus of RM15.3 million.

Keyword: recreational forest, travel cost method, economic value, negative binomial model, valuation of natural resources, consumer surplus

INTRODUCTION

Travel Cost Method (TCM) is an economic valuation method which is also known as “Travel Cost Analysis” or “Clawson Method.” This method is a “revealed preference” of economic valuation utilized for objects that cannot be valued based on the ordinary market value. The method is usually used to determine the value of area related to ecosystems and natural resources such as a national park, beach, and other outdoor tourism objects that related to ecosystems and natural resources. In general, this method will assess the value of an object by examining the time and traveling cost of individual or groups of individuals to visit the objects. The value of an object place or 'individual's willingness to pay for visiting the object is inferred from the frequency of visit and travel costs needed to visit the object.

This method is commonly used by economist to assess the value of goods that are not traded on the open market (known as passive or non-use value assets) for example the value of ecotourism. This article uses TCM with case studies of Pahang National Park, Malaysia, and Srengseng Urban Forest, Jakarta, Indonesia.

RESEARCH BACKGROUND

Urban forest and recreation parks are classified as green open spaces which have many benefits for the population, especially for residents living around the area. Direct advantages from these green areas are numerous, such as recreation, aesthetics, environmental and agricultural benefits, water catchment, or for future generations (Brander & Koetse, 2011). Also, urban open spaces also have the benefits of reducing adverse effects such as pollution, hot air, and noise.

Green open space which can also be used as housing, commercial areas or other uses (Bertram & Rehdanz, 2015), causing green space to become more limited. Provision below the optimal level is caused by a lack of information regarding public use interest. The information of economic value is needed to be considered in comparison with other alternative uses (Harnik & Crompton, 2014). Failed in considering non-market value in decision making, will lead to undersupply of good public goods and oversupply of bad public goods (Pearce & Özdemiroglu, 2002).

The value of natural resources needs to be assessed in the context of calculating state wealth. Directorate General of State Asset Management (DGSAM) under the Indonesian Ministry of Finance is assigned to manage state property of Indonesia, including valuing natural resources. Likewise in Malaysia, Valuation and Property Service Department have received several requests from state governments to value natural resources, such as a recreation of rivers and national park, to account them in states' balance sheets.

LITERATURE REVIEW

Natural resources have two benefits. They are use value and non-use value. Use value relates to usage, plan of use, or possible future use, while non-use or passive use value is related to existence value, altruism and bequest values (Bateman et al., 2002). Goods and services produced by nature and environment that are included in the use value category can be valued by money since they are tradable. Resources that do not have a market value such as the value of natural aesthetics, ecological functions, water use function, are generally not traded in the market. For this purpose, an economic valuation mainly non-market valuation is needed to determine the price or value of these resources (Fauzi, 2004).

Non-market valuation techniques can be categorized as direct method and indirect method. The direct method is carried out by asking directly to the consumers about their willingness to pay (known as expressed willingness to pay (WTP) or stated preference technique). Examples of direct techniques are the contingent valuation method (Solikin, 2017) and the contingent choice. Indirect techniques, on the other hand, do not directly determine the value. It implies from the revealed willingness to pay. Examples of the indirect technique are the travel cost method (TCM) which is usually used to measure tourism benefits and hedonic pricing method which is often used to measure assets values. Among the methods, TCM has advantages in regard to observable data, such as the behaviour of visits to tourism site. This method has its disadvantage because it is strongly influenced by model specifications.

Valuation with Travel Cost Method (TCM)

The use of TCM began in 1947 from Hotelling's letter (1947) which suggested the use of TCM to the National Park Service in the United States. Hotelling believes that there is a relationship between visitor travel costs and frequency of visits. Clawson and Knetsch (1966) then realized this method in the late 1960s, known as the Clawson-Knetsch Travel Cost Model to estimate consumer surplus for outdoor recreation.

TCM is usually used to assess the value of recreational benefits as a study by Sohngen (2000) which appraise recreational parks based on one-way trips to two objects, i.e., Ohio's Lake Erie-Headlands and Maumee Bay State. The data was randomly obtained in the summer of 1997 from visitors through a questionnaire including the purpose of visitors to the recreation park, expenses and travel costs, demographic information and visitor perceptions. This method produced an estimated value of Lake Erie recreation park of \$6.1 million and Headland of \$3.5 million. TCM is also used to value river economics (Johnstone & Markandya, 2005) and state parks (Liston-Heyes & Heyes, 1999). Alberini, Zanatta and Rosato (2006) applied TCM to assess the value of fish stocks in the Lagoon of Venice. In China, the coastal value along Xiamen Island of €5.35 million a year was also obtained from the method (Chen et al., 2004). All of these

studies use TCM to assess the benefits of recreational parks and the economic value of environmental resources that do not have market value.

Likewise, Indonesia has widely implemented the use of the travel cost method. The tourism objects that have been appraised are of various types, for example Batu Karas beach in Pangandaran (Zulpikar, Prasetyo, Shelvatis, Komara, & Pramudawardhani, 2017), Merapi mount in Sleman (Dewanta, 2010), Cipondoh Lake in Tangerang (Pancawati, Saifullah, & Indaryanto, 2016), and palace heritage in Cirebon (Dharmawan, Subiyanto, & Nugraha, 2016). Valuation of urban forests includes valuation of Pundi Kayu Recreational Parks in Palembang (Premono & Kunarso, 2010), a green open space in Medan (Munaza, Purwoko, & Patana, 2016), as well as Ir. Juanda Forest Park in Bandung (Akliyah, 2010).

Research Framework

Valuation of natural resources with TCM is carried out with the assumption that the value of an object of natural resources is known from the visitors' willingness to pay. It is assumed that the travel costs represent demand for the object of visit, i.e., represented by the frequency and the cost of the visit (Fauzi, 2004; Pirikiya, Amirnejad, Oladi, & Solout, 2016). When a visitor considers an object worth visit, it means his value of the object surpasses his costs of visits and to gain some consumer surpluses.

In addition to consideration of cost issues, the quality of recreation places will affect the frequency of visits. Visits to an object are usually made after visitors selected the substitution objects to be visited. In addition to income, demographic factors (for example age, gender, education, occupation), will also influence the choice and frequency of visits., the factors that influence a visit to a tourist attraction can be described mathematically by equation (1) (Fauzi, 2004; Dewanta, 2010):

$$V_{ij} = f(C_{ij}, T_{ij}, Q_i, S_j, Y_i, Z_i) \quad (1)$$

Where V_{ij} = number of visit made by individuals i to place j , C_{ij} = individual travel costs i when visiting a tourist object j , T_{ij} = cost of individual time i due to visiting place j , Q_i = quality of recreation place, S_j = substitution of recreation place j , Y_i = individual income i , and Z_i = individual socio-economic characteristic i . In regression analysis, equation (1) is converted to econometric equations with the assumption of linear or other forms. It is expected that the cost variable has a negative sign, to confirm the law of demand. The other variables are expected to have positive coefficients.

METHODS

Data Collection Method

The primary data was obtained from questionnaires distributed to visitors of Srengseng urban forest and Pahang National Park. The primary data is compulsory to determine the frequency of visit, travel cost, income, perception, and demographics. The survey was conducted on weekdays and holidays as well. Respondents are 15 years and above. In additions, secondary data in the form of the number of visitors and the characteristics of the study object are obtained from secondary sources (such as reports, journals, book, internet, sources.)

Data Analysis Method

The approach used in this study is the individual travel cost method (ITCM). This method is more suitable than the zone method because the ITCM method can include socio-economic factors as explanatory variables (Blackwell, 2007). For example, this approach is used by the Directorate of Valuation DGSAM (DGSAM, 2016) to value mangrove forests in Indramayu. The steps taken in the analysis process are:

- i. Conducting a regression on equation (1) with ordinary least square (OLS) or other specifications such as Poisson model and negative binomial if the frequency of visits is skewed to 1, i.e., first visit (Dewanta, 2010).
- ii. Calculating consumer surplus per individual using data on the number of visits and travel cost coefficient on multiple regression result (Fauzi, 2010; Sohngen, Leichtkopler, & Bielen, 1999). For negative binomial model the surplus is estimated using the formula $-1/\beta_1 * v_0$, where β_1 is the regression coefficient of the trip cost variable, meanwhile v_0 shows the average visit (Dewanta, 2010; Martinez-Espineira & Amoako-Tuffour, 2008).
- iii. Aggregating the total value by multiplying the individual surplus by the number of visitors in a given year.

Monetary data for Srengseng Urban Forest initially was quoted and analysed in Rupiah (RP), but the results are translated into Malaysian Ringgit (MR) using Bank Indonesia's mid-transaction rate for 2017 (MR1 = RP3,115.04).

RESULTS

Pahang National Park

Pahang National Park initially established in 1932 based on Wildlife Commission of Malaya Report which recommended the establishment of National Park in Malaysia. In 1936, Wildlife Department was formed followed by the enactment of Taman Negara Pahang No. 2 of 1939, the enactment of Taman Negara Kelantan

No. 14 of 1938 and the enactment of Taman Negara Terengganu No. 6 of 1939; which led to the establishment of “King George V National Park.” After independence, in 1960 the name was changed to National Park (*Taman Nasional*). The National Park is located in three states, i.e., Pahang, Terengganu, and Kelantan. The area of National Park is 4,343 sq km, of which 57% are in Pahang, 24% are in Terengganu, and 19% in Kelantan. In 1994 lodging in National Park was privatized to Kuala Tahan Resort (KTR) and is now known as Mutiara Taman Negara.

The main activities found in this National Park are habitat conservation, species conservation, forest management, enforcement, ecotourism, public awareness, and education. The National park is a biodiversity conservation source that is rich in natural resources consisting of increasingly rare wild animals such as elephants, tigers, and tapirs.

Pahang National Park is located in Kuala Tahan. The closest city is Bandar Jerantut. The Park can be reached from the State Capital, Kuantan, by car or public transportation within 3 to 4 hours. Apart from being rich with natural resources of wild animals, flora fauna, the Pahang National Park is famous as a recreational object worldwide. The Park provides some exciting recreational activities such as rapid shooting, night walk, canopy walking, cave exploration, river exploration, fishing, camping, bird watching, cursing and forest exploration, observing wild animals, visiting Batek native villages, climbing Mount Tahan with height of 7,174 feet and jungle walk with tracks along 210 km.

Visitors can enter The Park by buying RM1.00 of ticket per person. The fishing license price is RM10.00 per person, and the camera license is RM5.00 per one camera unit. Today the Department of Wildlife and National Parks manages National Park while the recreation is managed by the local community and the private sector. In addition to RM1.00 entrance fee per person, visitors need to pay other fees depending on the package offered by resort entrepreneurs. There are private parties that manage tourism packages which charge up to RM600.00 for four days three nights package. The number of travellers coming to National Park every year is between 71,000 and 102,000 from the 2005 to the 2016, or on average 147,815 people per year.

Srengseng Urban Forest

Srengseng urban forest is located in Srengseng Village, Kembangan, West Jakarta city, Jakarta Special Capital Region. An area of 15 hectares is used for tourism, public activities, conservation, and water absorption areas. Entrance ticket for the city forest is very cheap, at RM0.64, plus RM0.64 for a motorcycle parking ticket and RM1.28 car parking ticket.

Initially, Srengseng urban forest is a garbage dump place with sanitary landfill system. In 1994, the location was used as a water catchment area and biodiversity protection and was used as a place of recreation and community

activities. Srengseng urban forest area is founded based on the Decree of the Governor 202/1995.

In this area, 65 species of large trees grow from various types. The Srengseng urban forest is also a habitat for various wildlife. Currently, the condition of the forest as green open space is deteriorating. It happens not only in the condition of vegetation and land cover but also in the existing supporting facilities. The current management activities have not been optimal due to limitations in funding aspects.

The number of visitors to Srengseng urban forest varies throughout 2017. The number of visits is strongly influenced by weather as it is an open site. In the March-September 2017 period, it recorded an average of 2.258 visits per month, or 27,096 visitors a year. Also, the number of motorcycles entering the object was 9,845 units, and the number of cars was 1,690 units or 1.406 motorcycles per month and 241 car units per month. The annual revenue from tickets for people, motorbikes, and cars amounted to RM18,619.34.

TCM Analysis of Pahang National Park

Data on visits to National Park and Urban Forest are shown in Figure 1. Most of the visits are visitors first visit which more suitable to be analysed using Poisson Regression and Negative Binomial Model. We run the regression using these two models to get the best model for determining Consumer Surplus (CS). For the National Park, it was found that the Negative Binomial Regression Model was the most significant compared to the Poisson Model, referring to the overdispersion of these data with the Likelihood-Ratio is 0.000 (sig.). Travel cost coefficient is 0,0012666. Consumer surplus per person per visit is RM783.51. The total consumer surplus is RM15,315,269.97 which implies the value of recreational benefits.

TCM Analysis of Srengseng Urban Forest

Poisson regression and Negative Binomial are applied to TCM Srengseng Urban Forest. As listed in Table 1, there are two significant determinant variables in the Poisson model, i.e., occupation and gender variables. On the other hand, the Negative Binomial model produces cost, occupation, gender, and satisfaction score on tourist experience as significant determinant variables.

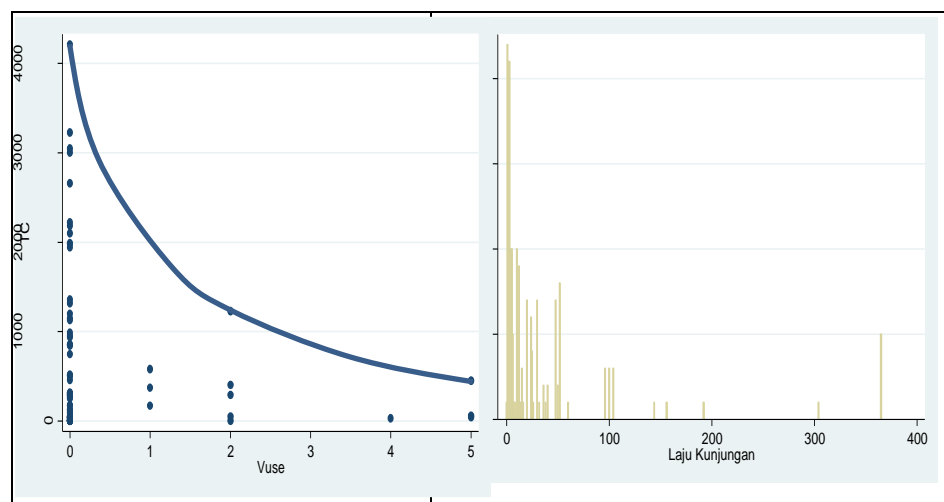


Figure 1. Plotting data visiting National Park (Left) dan urban forest (Right)

Source: Authors

Table 1: TMC Estimation results of Srengseng Urban Forest

Variable	Poisson		Negative Binomial	
	Coefficient	T stat.	Coefficient	T stat.
Travel cost	-0.0114	-1.14	-0.0132***	-3.88
Income	-0.0111	-0.43	-0.0277	-0.72
Age	0.0138	1.58	--	--
Education	--	--	0.0636	1.46
Job	0.164*	1.95	0.172***	2.84
Gender	0.447*	1.82	0.693***	2.82
Score	0.0314	0.89	0.0542*	1.72
Group	-0.0279	-0.89	-0.0290	-1.11
cons	1.347**	2.14	0.460	0.45
N	160		159	
Prob > F	0.0003		0.0004	
R-squared	0.1111		0.0208	
ML Cox-Snell R2	0.993		0.155	

Note: * p<0.1, ** p<0.05, *** p<0.01

Source: Authors

Furthermore, we used negative binomial with the cost coefficient is -0.0132 to value the economic benefits of the Srengseng urban forest. The model generates the consumer surplus per person per trip of RM24.32. As the prediction of average visit number is 23.27, we suggest consumer surplus per group be RM565.92. By noting that the average group of visitors is 3.48 people, we conclude that the consumer surplus per person per year is RM8.70 resulting total consumer surplus of RM440,640.45.

DISCUSSION

Visitors' Characteristics

The Srengseng Urban Forest visitors are residents around the object, which was inferred from data of distance, travel time, and type of vehicle used to visit the urban forest. The visitors are generally working as entrepreneurs with an average income RM1,216.68. When compared to the 2017 DKI Jakarta Provincial Minimum Wage of around RM1,078.64, the average visitors are of the lower middle class. Meanwhile, the visitors of the Pahang National Park are from high-income groups, and most of the visitors are from abroad.

The Factors of Visitation Determinant

From the eight independent variables tested in the models, only four variables were significant. The cost of travel is significant with a negative relationship, as predicted. Additionally, variables of age, occupation, gender, and satisfaction score have positive relationships with the visits. In general, our finding suggests individuals who are male, bear less cost of the visit, working as entrepreneurs, are satisfied with the experience of visiting, will likely to visit The Srengseng Urban Forest. These factors have coefficients that are consistent with the demand theory, which adds to the validity of this study.

The Comparison of Economic Value with Contribution

Based on the results of the study using TCM, each visitor receives an economic benefit of RM24.32 per visit to the Srengseng Urban Forest. This value is far above the entrance ticket price RM0.64 per person plus RM0.64 for motorbike parking and RM1.28 for car parking. The average income of the forest from the entrance ticket was RM26,644.92 per month or around RM320 thousand per year. The income value was also relatively minimal compared to the tourist value of the Srengseng Urban Forest of RM440,443.78. Thus, revenue from ticketing is only 7.3% of the value of tourism calculated using TCM. Likewise, the entrance ticket to the Pahang National Park does not reflect the real value. An RM1.00 for the entrance ticket and RM5.00 for a canopy walk is very small and does not reflect the privileges enjoyed by visitors to the National park.

CONCLUSION

Based on the survey, our findings suggest the character of respondents who visit Srengseng Urban Forest are the surrounding communities, while visitors of the National Park are both from a local citizen and from abroad. It implies that the Pahang National Park is a standard or superior good that is "consumed" not only by the surrounding community but also by the international community, while the Srengseng Urban Forest is a local public good. The study inferred five determinants of visit frequency to the park, or urban forest is costs (negative), age

(positive), occupation (positive), gender (positive), and satisfaction (positive)). Consumer surplus per person per visit is around RM24.32 for the Srengseng Urban Forest compared to RM783.51 for the Pahang National Park. The value of total economic benefits, especially tourism value is RM0.44 million for Srengseng Urban Forest and RM15.32 million for Pahang National Park.

The economic value received way far exceeds the - entrance fees paid by visitors. This finding indicates that residents around the Urban Forest place a high value for the urban forest. The local government should consider increasing the supply of such urban forest since The Srengseng Urban Forest is a public good managed by the provincial government. The provision of more public goods is expected to increase the satisfaction or welfare of the community. The improvement of urban forest facilities can provide alternative social activities for the community (Demir, 2014).

The same thing applies to The Pahang National Park. The National Park Manager can increase the price of admission to the National Park. The private sector takes advantage of the package they offer to enjoy the natural resources in the National Park area. The authorities may need to encourage the private sector to enhance the facilities available in the National park area.

Research Limitations

The analysis assumes that the Srengseng Urban Forest or the Pahang National Forest is a single tourist destination for visitors during their trips, i.e., not taking into account that visitors may get satisfaction during the trip and/or from visiting other tourism objects before/after visiting the Srengseng Urban Forest or the Pahang National Forest. This assumption may cause bias, especially for the Pahang National Park because the visitors are more likely to visit other tourist attractions in Malaysia.

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