ECONOMIC VALUATION OF A NATURAL RECREATION AREA: THE VULCANO TOUR IN MERAPI VULCANO

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ABSTRAK

Daerah Istimewa Yogyakarta (DIY) adalah tujuan wisata terbesar di Indonesia setelah Bali. DIY memiliki lebih dari 100 tujuan wisata, salah satu tempat wisata terkenal adalah Vulcano Tour (VT) *yang berada di kawasan Gunung Merapi. Penelitian ini* menggunakan Individual Travel Cost Method (ITCM) *untuk mengestimasi nilai ekonomi dari* Vulcano Tour (VT)*. Teknik Regresi OLS,* Non-linear Normal/NLS, Poisson, dan Negative Binomial *digunakan dalam estimasi. Studi ini menggunakan data dari pengelola* Vulcano Tour (VT) *dan 60 pengunjung selama periode April sampai Mei 2013. Hasil pengolahan data menunjukkan bahwa jumlah kunjungan ke* Vulcano Tour (VT) *secara signifikan dipengaruhi oleh jumlah kunjungan ke Kota Yogyakarta (ibukota DIY). Nilai ekonomi per kunjungan ke* Vulcano Tour (VT) *berada pada kisaran antara Rp 331.260 (USD 33) sampai dengan Rp 1.536.315 (USD 153,6). Selain itu juga ditemukan bahwa jumlah kunjungan ke VT secara signifikan dipengaruhi jumlah kunjungan ke DIY sehingga* Vulcano Tour (VT) *tidak dapat dipisahkan (atau dengan kata lain bersifat komplementer) dengan tempat wisata lain di DIY.*

Kata kunci: *wisata alam;* Individual Travel Cost Method (ITCM)*; Gunung Merapi;* vulcano tour*; Yogyakarta*

ABSTRACT

Daerah Istimewa (the special region of) Yogyakarta or usually abbreviated as DIY is the second biggest tourism destination in Indonesia after Bali. DIY has more than 100 recreation sites. One of the famous recreation sites in DIY is Vulcano Tour (VT) located in the area of Merapi Vulcano. This study employed the individual travel cost method (ITCM) to estimate the economic value of Vulcano Tour (VT). OLS, Non-linear Normal/NLS, Poisson, and Negative Binomial methods were used to estimate the regression coefficients. This study used primary data from the management of VT and 60 visitors in the period of April to May 2013. The study found that the number of visits to VT was significantly affected by the number of trips to Yogyakarta City (the capital city of DIY). The economic value per visit of VT were ranged from Rp 331.260 (USD 33) and Rp 1.536.315 (USD 153,6). This study also concluded that the number of trips to VT is significantly influenced by the Yogyakarta City as a destination. In other words, the VT cannot be separated from other recreation destinations in DIY.

Keywords: natural recreation area; Individual Travel Cost Method (ITCM); Merapi Vulcano; vulcano tour; Yogyakarta

JEL Classification: Q510

1. INTRODUCTION

Daerah Istimewa (Special Region of) Yogyakarta or usually abbreviated as DIY is the second most important tourist destination in Indonesia after Bali (Hampton, 2012). It is located in the south of Central Java and has an area of 3.185,80 square kilometers (km^2). DIY is bordered by Central Java Province and Hindia (Indonesia) Ocean. DIY consists of one municipality (namely Yogyakarta City) and four regencies (namely: Sleman, Bantul, Gunung Kidul, and Kulonprogo). At the northernmost area of DIY (or center area of Java Island) is the location of Merapi Vulcano. At

the center of DIY, there is the *kraton* or *sultan*'s palace. The *kraton* is located in the middle of The Hindia Ocean (southernmost area) and Merapi Vulcano. The Hindia Ocean, *Kraton*, and Merapi Vulcano are important places in Javanese culture, especially people from DIY.

Merapi Vulcano or Mount Merapi or *Gunung Merapi* (in Indonesian/Javanese language literally means Mountain of Fire), is the most active vulcano in Indonesia. The altitude of Merapi Vulcano is 2.968 meters above sea level. Since 1548, it has erupted 68 times and the last eruption happened in late October until November 2010. That is why Merapi becomes one of the 16 vulcanos that is chosen as The Decade Volcanoes by International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI), a primary international association focusing its efforts to mitigate volcanic disasters and its researches on volcanology and closely related disciplines. Before the major eruptions in 2010, Merapi Vulcano was an important destination for recreation in DIY. One of the prominent sites is located in Dukuh Kinahrejo (sub-village) which is the nearest *dukuh* and the climbing entrance to the peak. Dukuh Kinahrejo is part of Umbulharjo Village. There are several attractions in Dukuh Kinahrejo, including *labuhan, jathilan, kethoprak, wayang kulit, sholawatan.* Furthermore, many facilities such as trekking, camping ground, and outbound area are also available on this site. Before the 2010 eruption, this resort was called Lava Tour (LT) (the tour was started in 2006). However, the residents of the villages around Merapi Vulcano were not involved in the LT business. The majority of the villagers work as farmers and dairy cow breeders. Consequently, LT did not contribute to the economic improvement of the villagers around Merapi Vulcano.

During volcano eruptions in 2010, which took more than 350 lives, the villages around Merapi Vulcano were destroyed. The eruption killed Mbah Marijan, the *Juru Kunci* (caretaker) of Merapi Vulcano, and destroyed his house, that was located around four kilometers from the vulcano's peak. In Javanese tradition, *Juru Kunci* is a spiritual leader in a site. The residents of two villages closest to Merapi, namely Kepuharjo and Umbulharjo, suffered from destruction during those eruptions. Furthermore, since Dukuh Kinahrejo is in the area of the glide of hot clouds (its temperature is nearly 600 degrees Celsius), after the eruptions all residents must be relocated to another place that was prepared by the government. Afterward Dukuh Kinahrejo was closed and no one was allowed to build permanent construction. After the destruction, residents from the two villages (Kepuharjo and Umbulharjo) built a new natural recreation site, namely Vulcano Tour (VT), that is located in the former Dukuh Kinahrejo and surrounding area. VT is different from LT, it is managed by the community around Merapi Vulcano. The community includes five sub-communities and employs 634 people from two villages. In Volcano Tour, tourists can see what was left from the disaster and enjoy adventurous activities.

VT was developed in a short period for disaster mitigation. However, it was also hoped to increase the welfare of the residents of Kepuharjo and Umbulharjo Villages and become a new recreational icon in DIY in the long period. The revenue from the VT must be substantial and sustained. It can happen if the admission fee is optimally charged and is compatible with the economic value received by the visitors. The admission fee is efficient when it is set based on the consumer surplus (CS) of the visitors. This study measured the economic value of VT by calculating the consumer surplus (CS) of the visitors. Shrestha et al. (2002) stated that the measurement of the economic value of natural recreation area is important as a basis for management. This study employed individual travel cost method (ITCM). The method estimated the demand function for VT, then it was used to measure CS or economic value per visit of the visitors.

The same research method (ITCM) to measure a natural recreation site, was also done by

Salma and Susilowati (2004). They found that CS of Curug Sewu, located in Central Java, was Rp 224.198,7 (USD 22,4) per visit or Rp 896.734,9 (USD 89,6) per year. However, the cost paid by the visitor was only Rp 87.652 (USD 8,7) in every visit. The other study by Twerefou and Ababio (2012) used ITCM to measure the economic value of Kakum Nasional Park in Ghana. They surveyed 246 visitors and found the economic value per visitor every year was USD 46,40. The study of four tourism sites in DIY, including Borobudur Temple, the Kraton, Parangtritis Beach, and Kaliurang (Vulcano Tour) was done by Othman and Rahajeng (2013). They found that their economic values, which were measured by contingent ranking (CR) method, were USD14, USD2,7, USD1,5, and USD12, respectively.

This study focused on measuring the economic value per visit of VT. It divided the travel cost into two categories, namely: the average cost from the tourists' hometown to Yogyakarta City (imposed for every site visited), CYK; and the cost spent in VC, CVC. The separation was important because DIY, with an area of only 3,185.8 km^2 and good road access, has 112 recreation sites that were located close to each other. This condition was different from Curug Sewu, Kankun National Park, or other natural recreation areas that were far from other recreation sites. Usually, tourists come to Yogyakarta City to visit several recreation destinations. Consequently, the cost of the trip from their hometowns to Yogyakarta City must be divided between all visited recreation sites. Based on this argument, this study modified the ITCM using two categories of the cost: CYK and CVC. The categorization of the cost was also used in the study of Othman and Rahajeng (2013) that measured the economic value of four recreation sites, including Volcanotour (VT).

2. METHODOLOGY

Adamowicz et al. (1990) stated that travel cost model (TCM) is a standard method in measuring demand for recreation site. Studies that employed TCM were found in developed countries, such as United States, Europe, Australia, and emerging countries, including Southeast Asian countries. Although it is the oldest technique to estimate *consumer surplus*, TCM is the most effective method to measure the economic value of natural recreation site (Shrestha et al, 2002). This technique measures the economic value for non-marketed goods and can be applied to estimate the economic value of recreation that is received by tourists (Clawson et al,1996, Boxall et al, 1996, Brown and Mendelsohn, 1984).

In its application, TCM consists of Zonal Travel Cost Model (ZTCM) and Individual Travel Cost Model (ITCM). ITCM is more appropriate if there is variation in the number of visits in a short period, usually one year; and the individuals visit the same recreation site several times (Eiswerth et al, 2000, Grijalva et al, 2002, Ward and Beal, 2000). When there is a low variation of visits, then ZTCM is more appropriate than ITCM. Because there was large variation and the VT was started recently, this study employed ITCM. Before estimating the modification of ITCM using two types of cost (namely: CYK and CVT), the standard ITCM was estimated. In the model, the number of visits to VT (VVT) was affected by travel cost, CT, the number of visits to Yogyakarta City, VYK, the distance between visitors' hometown to VT, Lok, and the number of recreation destination visited, NRS. The model can be stated as:

$$VVT_i = f(CT_i, VYK_i, Lok_i, NRS_i) \quad (1)$$

Based on the equation (1), the regression model can be written as:

$$VVT_i = \beta_0 + \beta_1 CT_i + \beta_2 VYK_i + \beta_3 Lok_i + \beta_4 NRS_i + \varepsilon_i \quad (2)$$

If the coefficient of the travel cost (CT) estimated in equation (2) is not statistically significant or shows different signs from the theory, then ITCM will be modified by dividing CT into two forms of the cost, cost from respondent's hometown to Yogyakarta City (TCYK) divided by number of destination visited (NRS) or CYK, and cost from Yogyakarta City to Vulcano Tour and cost in Vulcano Tour (CVT). The model can be written as:

$$VVT_i = \beta_0 + \beta_1 CYK_i + \beta_2 CVT_i + \beta_3 VYK_i + \beta_4 Lok_i + \varepsilon_i \quad (3)$$

In equation (3), *CYK* is calculated using equation (4), as follows:

$$CYK = \frac{CT - CVT}{NRS} = \frac{TCYK}{NRS} \quad (4)$$

In equation (3), the travel cost is only cost from Yogyakarta City and cost in volcano tour, CVT. We cannot use average travel cost from respondent's hometown to Yogyakarta City per destination, CYK as the travel cost of VT because it is not only depending on the cost but is dominantly influenced by the number of sites visited. For this reason, in the equation (3) we only measure consumer surplus (CS) based on the travel cost from Yogyakarta City to Vulcano Tour (VT) as well as cost in VT. The CS of Yogyakarta City is measured based on the cost from respondents' hometown to Yogyakarta City (CS for Yogyakarta City). CS for Yogyakarta City is measured using equation (5). The equation (5) can be written as:

$$VYK_i = \beta_0 + \beta_1 TCYK_i + \varepsilon \quad (5)$$

TCYK is the total individual cost during the trip between their hometown to Yogyakarta City. The value of TCYK was similar to CYK multiplied by NRS. In this study, the number of visit to Vulcano Tour (VVT) and the number of visit to Yogyakarta City (VYK) were the numbers of visits in the period between April 2011 and May 2013. The Lok was the road trip distance which is measured using google maps. The travel cost (CT) in equation (2) was transportation cost, cost of consumption, entrance fees, parking cost, etc (including the cost in the trip and in the VT). In this study, the cost was individual expenses. Since there was an indication that the respondents cannot mark off whether the cost was paid for group or individual, the cost for respondents in group is divided by the number of people in the group. Furthermore, the study confirmed the cost by re-checked the trip cost, the admission fees, the vehicles used, the equipment used in VT, and the number of people in the group. The cost for the respondents in the travel package was the travel package fees.

In equation (2), travel cost, CT was the individual cost between respondents' hometown and Vulcano Tour, VT. Furthermore, in equation (3) there were two categories of the cost, cost from respondent's hometown to Yogyakarta City, CYK, and cost from Yogyakarta City to VT and in VT, CVT. Because CYK was individual cost, the expenses during the trip by respondents went in a group were divided by the number of people in the group and the number of visited recreation sites. Furthermore, CVC in equation (3) was also individual cost. The cost for respondents in the group and travel package was also treated the same as CYK.

This study used regression (2) or (3) to calculate the economic value of VT. The economic value was consumer surplus, CS. Based on the theory, the economic value or CS was the deviation between willingness to pay (WTP) of recreation and the cost of recreation (Reynisdottir et al, 2010). Following Creel and Loomis (1990), the CS was estimated by using the negative inverse of

the travel cost coefficient in the demand function. The same method was used by Shrestha et al (2002), Twerefou and Ababio (2012), and Dewanta (2010) in measuring CS for the natural recreation area. Furthermore, the economic value of annual VT was calculated by multiplying CS and the number of visitors a year.

3. ECONOMETRIC MODEL

This study used Ordinary Least Square (OLS) and three other methods, non-linear normal/NLS, Poisson, and Negative Binomial, to estimate economic value of VT per trip. OLS is usually used since it is easy to be applied and understood. OLS (and also NLS) assumes the dependent variable in the regression model is normally distributed. The violation of the assumption of OLS in TCM's estimation will result in the bias of estimation. The feature of the dependent variable is often the count of the number of the trips taken over the season or year (two years in this research) and the outcome of unknown probability distribution function is defined on the non-negative integer (Creel and Loomis, 1990). We used count methods, namely Poisson and Negative Binomial, beside OLS and NLS in estimation, and then compared the result of each method.

The OLS regressi can be written as:

$$Y_i = \beta_1 + \beta_2 X_{1i} + \cdots + \beta_k X_{ki} \tag{6}$$

where Y_i is the number of trip and X_{ji} *(j=1,2,..,k)* are the explanatory variables. The regression assumes there are linear causality relationship from explanatory variables to the number of trip (VVT).

The second method applied in this study, NLS, was employed by using quasy maximum likelihood (QML) to find the equation. The log likelihood function for normal distribution can be writen as:

$$ln(\beta) = \sum_{i=1}^{N} -\frac{1}{2}\left(\frac{y_i - m(x_i,\beta)}{\sigma}\right)^2 - \frac{1}{2} ln(\sigma^2) - \frac{1}{2} ln(2\pi) \tag{7}$$

Thus, maximizing the log likelihood function produces the NLS equation as:

$$y_i = e^{\beta_1 + \beta_2 X_{1i} + \cdots + \beta_k X_{ki}} \tag{8}$$

where Y_i is dependent variable (number of trip) and X_i is independent variables or explanatory variables including cost and characteristic variables. NLS is different from OLS for the first method assumes there is nonlinear causal relationship between explanatory and dependent variables. In this case the dependent variable is VVT.

The thirth method used in this study is Poisson. The Poisson probability can be written as the following:

$$f(Y_i) = \frac{\lambda^Y e^{-\lambda}}{Y!} \tag{9}$$

where Y_i is a discrete density function of the set of a non-negative integer. The dependent variable Y is distributed poisson with mean and variance λ. The log likelihood function can be written as:

$$ln(\beta) = \sum_{i=1}^{N} y_i \ln m\,(x_i, \beta) - m(x_i, \beta) - ln(y!) \quad (10)$$

Maximizing the log likelihood function produces the poisson regression count method as:

$$\lambda_i = E(Y_i) = e^{\beta_1 + \beta_2 X_{1i} + \cdots + \beta_k X_{ki}} \quad (11)$$

The fourth method that was employed in this study is Negative Binomial. This method is common alternative parameters of model using maximum likelihood. The method is appropriate when dependent variable Y is distributed negative binomial (pascal distribution) (λ, α) with α constant and λ varies by the observations. The binomial model can be written as:

$$f(Y = y) = \frac{\Gamma(y + \frac{1}{\alpha})}{\Gamma(y+1)\Gamma(\frac{1}{\alpha})}(\alpha\lambda)^y(1 + \alpha\lambda)^{-(y+\frac{1}{\alpha})} \quad (12)$$

where $\Gamma(.)$ is gamma function. The Negative Binomial probability is nonnegative intengers with mean λ and variance $\lambda + \alpha\lambda^2$. We can see if $\alpha = 0$, the Negative Binomial can be reduced to Poisson probability function. The log likelihood for the negative binomial distribution is given by:

$$ln(\beta, \eta) = \sum_{i=1}^{N} y_i ln\big(\eta^2 m(x_i, \beta)\big) - (y_i + 1/\eta^2) ln\big(1 + \eta^2 m(x_i, \beta)\big) + ln\,\Gamma(y_i + 1/\eta^2) - ln(y_i!) - ln\Gamma(1/\eta^2) \quad (13)$$

where η^2 is a parameter to be jointly estimated with conditional mean parameter β. The Negative Binomial count regression was produced by maximizing the likelihood function can be written as:

$$\lambda_i = E(Y_i) = e^{\beta_1 + \beta_2 X_{1i} + \cdots + \beta_k X_{ki}} \quad (14)$$

All statistical model fitted were the following:

OLS: $Y \sim N(X\beta, \sigma^2 I)$

NLS: $Y \sim N(Y = \exp(X\beta), \sigma^2 I)$

Poisson: $Y \sim Poisson(\lambda = \exp(X\beta))$

Negative Binomial: $Y \sim Negatif\ Binomial(\lambda = \exp(X\beta), \alpha)$

4. DATA

This study used secondary and primary data. Secondary data was used to provide an overview of Vulcano Tour (VT) and general information of recreations in DI Yogyakarta (DIY) and VT. This study used questionaires and deep interviews to find primary information. The leader of the VT community and the leader of sub-communities were interviewed to find the information about the recreation. Furthermore, there were 60 respondents (visitors) chosen by purposive nonprobabilistic sampling, who were questioned via face-to-face survey between April and May 2013, that were used to estimate the economic value of the recreation.

Visitor respondents were mainly non-DIY residents; the majority came from 22 different cities in Central Java, followed by 5 different cities from East Java, and 2 different cities in West Java. The other respondents came from Jakarta, Banten, Bali, Riau, North Sumatera, South Sumatra, Kalimantan, Sulawesi, and Malaysia. Most of the respondents (77%) had monthly

spending between Rp 1 million and Rp 3 million (USD100-300), considered to be within the middle-income population. Furthermore, about 43% and 53% of respondents had undergraduate-level and high school education. Average respondents had come 4.25 times to Yogyakarta City. All respondents visited more than one recreational sites in DIY (average 5.78 sites). About 55% and 38% were traveling with their friends and family. Furthermore, about 55% and 38% of the respondents were spending one day and between 2 to 5 days in DIY, respectively.

What interesting was about 98.3% of respondents agreed that VT was an important destination. Nearly all respondents were satisfied and wanted to revisit. They stated that they would recommend other people to come to VT. About 75% of respondents stated that the former home of Mbah Marijan was the most interesting place in VT. There were 15% and 10% of respondents who stated that Kali Adem and the Dukuh Glagahsari Peak was the most interesting place in VT. About 52% of respondents used Jeep or trails motorcycle, rental adventurous vehicle, in VT. Furthermore, the majority of respondents were satisfied with the facilities (health facility, mosque, rest area, small hotel, water, toilets, and trash can) in VT. The study also asked respondents about the land used in the future. A large percentage of respondents (83%) did not agree with the change of land used outside tourism and agreed to let it be a green area. Based on the information from the management of VT (the leader of the VT community), the average number of visitors per day was between 400 and 500 people. A higher number of visitors came at the weekend (Friday, Saturday, and Sunday). Furthermore, the admission fee for VT was only Rp 3,000 (USD 0.3).

5. EMPIRICAL RESULT OF INDIVIDUAL TRAVEL COST

The descriptive statistic in Table 1 shows the average value, deviation standard, minimum value, and maximum value of the variables used in the study. Four different methods of regression were used to estimate ITCM to construct the demand function of Vulcano Tour (VT).

Table 1. The Descriptive Statistic

Variabel	Average	Std. dev.	Min.	Max.
Number of Visit to Yogyakarta City (*VYK*)	4.25	3.16	1	16
Number of recreation site visited (*NRS*)	5.78	1.63	2	10
Total cost (*RC*) in Rp	212,508	182,616	15,074	726,563
The individual cost divided by number of recreation site visited in DIY (*CYK*)	23,814	48,752	469	240,234
Number of visit to VT (*VVT*)	1.47	0.75	1	4
Cost of VT (*CVT*) in Rp	156,730	149,294	3,000	716,000
The distance of respondents' hometown (*Lok*) to Yogyakarta City in km	366.3	530	55	2,528
Cost from hometown to Yogyakarta City (*TCYK*) in Rp	119,686.6	226,734.8	3,438	1,000,000

The result of regression estimations for the first model (equation 2) can be seen in Table 2. The OLS regression showed that the number of visits to Vulcano Tour, *VVT,* was significantly influenced by the number of visits to Yogyakarta City, *VYK,* and the number of recreation sites visited in DIY, *NRS*. The other regressions (NLS, Poisson, and Negative Binomial) showed that *VYK* was the only variable that significantly influenced *VVT*. However, in all regressions, travel cost, *RC*, the most important variable, did not significantly influence *VVT*. The sign of the

regression coefficient was also different from the theory explained.

Table 2. Estimation of the First Model (Equation 2)

	OLS		NLS		Poisson		Neg. Binomial	
	Coef.	t-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Cons.	1.369	3.824[a)]	0.288	0.948	0.357	0.795	0.357	0.795
RC	2.5E-7	0.943	1.7E-7	0.797	1.9E-7	0.540	1.9E-7	0.540
VYK	0.138	4.759[a)]	0.072	3.594[a]	0.0789	2.489[b)]	0.0789	2.489[b)]
Lok	-5.1E-5	-0.268	-4.9E-5	-0.427	-6E-5	-0.220	-6.E-5	-0.220
NRS	-0.096	-1.747[c)]	-0.047	-1.051	-0.066	-0.932	-0.066	-0.932
R^2	0.312		0.290		0.284		0.284	
Log-L	-55.936		-66.830		-73.980		-73.980	

Significant at critical value [a)] α= 1% , [b)] α= 5%, and [c)] α= 10%

Since all methods in the first model (equation 2) showed that the explanatory variables did not significantly influence the number of visits at Vulcano Tour, *VVT*, the modification of ITCM (equation 3) was estimated. The result of the regression can be seen in Table 3. The OLS and NLS regressions in Table 3 show that *VVT* was influenced by cost from respondent's hometown to Yogyakarta City, *CYK,* and, the number of visit to Yogyakarta City, *VYK*. Furthermore, Poisson and Negative Binomial showed that only *VYK* significantly influenced the *VVT*. All regressions showed that if a person came to Yogyakarta City frequently, he/she was more likely to visit Vulcano Tour. Although the *CVT's* coefficient was not significant, the negative sign of coefficient supported the prediction of the theory.

Table 3. Estimation of Modified Model (Equation 3)

	OLS		NLS		Poisson		Neg. Binomial	
	Coef.	t-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Cons.	0.936	4.702[a]	0.108	0.898	0.070	0.269	0.070	0.269
CYK	3.8E-6	1.827[c]	2.9E-6	2.019[b]	2.6E-6	0.997	2.6E-6	0.997
CVT	-5.1E-7	-0.917	-3.9E-7	-1.273	-3.1E-7	-0.416	-3.1E-7	-0.416
VYK	0.131	4.620[a]	0.069	3.908[a]	0.073	2.376[b]	0.073	2.376[a]
Lok	-0.0001	-0.516	-0.0002	-1.037	-0.0001	-0.378	-0.0001	-0.378
R^2	0.316		0.320		0.318		0.318	
Log-L	-55.763		-66.332		-73.972		-73.972	

Significant at critical value: a) α= 1% ; b) α= 5%; and c) α= 10%

The estimations also showed that the higher the average of respondent's expenditure spent in every site in Yogyakarta, the higher the probability of them to visit to Vulcano Tour, VT. Since *CYK* was *TCYK* (total cost of a trip from hometown to Yogyakarta City) divided by number recreation sites visited, *NRS*, then the cost was the average cost imposed on each recreation site, including VT. The coefficient's sign of the variable *CYK* was different from the theory, because the *NRS* was a divisor; thus, the greater the number of recreation destinations visited, the smaller the values of *CYK*. Consequently, a higher *NRS* would result in a lower number of *VVT*. The sign of this coefficient, based on OLS and NLS, showed that there was a substitution relationship between VT and another recreation site in DIY. It happened because there were many recreation destinations to visit but the time was limited. The average recreation site visited was 5.78 but the respondents only spent one day (55%) and between 2 and 5 days (38%) in DIY. The study also found there was no respondent who came to DIY just to visit VT.

Based on the result and logic explanation, we can conclude that the *CYK* was not travel cost variable but the explanatory variable of the relationship between VT and other recreation sites in DIY, in this case whether the relationship was substitution or complement. The study also

showed that *Lok* as well as *CVT* did not significantly influence *VVT*. Furthermore, according to the theory, the sign of the regression coefficients of the cost from Yogyakarta City to Vulcano Tour and the cost in Vulcano Tour (*CVT*) were appropriate (although they were insignificant for all regressions). Based on the modification of ITCM, we could not measure the travel cost based on the cost from the hometown of respondents to VT, like the original ITCM, but only measure the travel cost from Yogyakarta City to VT. The travel cost from respondent's home to Yogyakarta City was charge for all sites which visited by respondents.

Table 4 showed the travel cost from Yogyakarta City to the Vulcano Tour. Following the work of Creel and Loomis (1990), as well as Shrestha, *et al.* (2002) and Twerefou and Ababio (2012) the economic value per trip on OLS, NLS, Poisson, and Negative Binomial were Rp 1,440,000 (USD 144), Rp 256,000 (USD 25,6), Rp 323,000 (USD 32,3), and Rp 323,000 (USD 32,3). The estimated travel cost of VT in this study was higher than the travel cost of VT in Othman and Rahajeng (2013); which found the economic value of Vulcano Tour was only USD 12. However, the economic value prediction using NLS was the closest travel cost estimation than the economic value by Othman and Rahajeng (2013). The estimation of travel cost from Poisson and Negative Binomial was also not too far from the previous study. However, the result from OLS was far higher than the previous study.

Table 4. Economic value of Vt per trip based on CVT

	OLS	NLS	Poisson	Neg. Binomial
$-\hat{Y}/(2\widehat{\beta_{tc}})$	1440000			
$-1/(\widehat{\beta_{tc}})$		256,000	323,000	323,000
Ec. value/trip (Rp)	1,440,000	256,000	323,000	323,000
Ec. value/trip ($)	144	25,6	32,3	32,3

The exchange rate at the time of this study (2013) approximately was about Rp 10,000 is equal to USD1.00. On 1 May 2013, the selling rate and buying rate of USD at the Central Bank of Indonesia (Bank Indonesia) were RP 10,230; and Rp 9230, respectively.

Furthermore, the regression in Table 5 which measured economic value per trip of Yogyakarta City based on travel costs from respondents' hometown to Yogyakarta City. We found that OLS and Poisson conclude the significant coefficient for cost from respondent's hometown to Yogyakarta City (TCYK). The sign of the cost coefficient was also compatible with the theory (negative sign).

Table 5. Estimation economic value based on TCYK

	OLS		NLS		Poisson		Neg. Binomial	
	Coef.	t-stat	Coef.	z-stat	Coef.	z-stat	Coef.	z-stat
Cons.	4.714	10.546[a]	1.620	10.744[a]	1.571	22.537[a]	1.563	16.731
TCYK	-3.9E-6	-2.208[b]	-2.3E-6	-0.939	-1.33E-06	-3.187[a]	-1.2E-6	-2.636
R^2	0.078		0.100		0.092		0.091	
Log-L	-151.149		-320.015		-145.502		-137.866	

Significant at critical value a) α= 1% , b) α= 5%, and c) α= 10%

The economic value for Yogyakarta City per trip can be seen in Table 6. Since the average site visited by responden was 5.78 in a trip, the travel cost from respondents' hometown to Yogyakarta City must be divided by 5.78. The consumer surplus per site based on OLS, NLS, Poisson, and Negative Binomial were Rp 94,983 (USD 9,4), Rp 75,260 (USD 7,5), Rp 13,100 (USD 13), and Rp 139,446 (USD 13,9).

Table 6. Economic value per trip

	OLS	NLS	Poisson	Neg. Binomial

Travel cost from hometown to Yogyakarta City				
$-\hat{Y}/(2\widehat{\beta_{tc}})$	549,000			
$-1/(\widehat{\beta_{tc}})$		435,000	752,000	806,000
Ec. value (Rp)	549,000	435,000	752,000	806,000
Ec. value (USD)	54,9	43,5	75,2	80,6
Ec. value per site (Rp)	94,983*	75,260	130,100	139,446
Ec. value per site (USD)	9,3	7,5	13,0	13,9
Total travel cost from respondent's hometown to Volcanotour				
RP	1,534,983**	331,260	453,000	462,446
USD	153,4	33,1	45,3	46,2

I. *Rp 549,000/5.78 = Rp 94,983;

II. **Rp 94,983+RP 1,440,000 = Rp 1,534,983.

We calculated the economic value of Vulcano tour by adding the economic value based on travel cost from respondent's hometown to Yogyakarta City in Table 6 and estimation of economic value based on the travel cost from Yogyakarta City to Vulcano Tour in Table 4. The study found that the economic value per trip of Vulcano Tour based on OLS, NLS, Poisson, and Negative Binomial were Rp 1,536,315 (USD 153,6), Rp 331,260 (USD 33,1), Rp 453,000 (USD 45,3), and Rp 462,446 (USD 46,2), respectively.

6. CONCLUSIONS AND POLICY IMPLICATION

Currently, just like other natural recreation sites, VT imposed a cheap admission fee. Consequently, the benefit of VT for the residents of Kepuharjo and Umbulharjo villages, including the former residents of Dusun Kinahrejo, was not optimal. Prediction of consumer surplus of the destination based on four methods was ranged between USD 33,1 and USD 153,4. However, the entrance cost (Rp 3,000 or equivalent to USD 0.3 in 2013) was lower than that.

The study assumed that tourists came to Yogyakarta City first before visiting several recreation sites in DIY, including VT. It was the consequence of Yogyakarta City as the capital city of DIY which has more than 100 recreation destinations. Yogyakarta City is the icon of DIY and is always visited before going to another recreation site in DIY.

Tourists decided to visit several recreation sites from the list after they arrived in Yogyakarta City. The result of this study also showed that the number of the trip to Vulcano Tour was significantly influenced by Yogyakarta City as a destination. This study also showed that all respondents came to DIY to visit more than one recreation sites. No one came to DIY only to visit one recreation site. The huge number of recreation sites in DIY was supposed to be an impetus for DIY to develop the tourism sector. However, the study also showed that the other recreation sites (the number of visited recreation sites) were substitution for VT. In the future, it is better if the government create a policy that makes the recreation site in DIY a low- substitute to each other; or should be a complement to each other (include VT). Other government policies should make tourists spend more days in Yogyakarta City.

Nearly all respondents were satisfied with VT and planned to return. They also wanted to recommend VT to other people. On the other hand, most of the respondents agreed that VT should be maintained as a natural recreation site. Government policies that maintain the conservation area are required to make tourists to re-visit the site and recommend it to other people. However, this study has limitation about the sample size. The number of sample is not quite sufficient to develop demand function in order to estimate the economicvalue of VT in Merapi. So, the further study in the same topic should employ more respondents to have more valid result.

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