Economic Valuation of Tourism Pasumpahan Island West Sumatera with Travel Cost Method

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Abstract. The research was conducted on Pasumpahan Island in Bungus Teluk Kabung Sub-district, Padang, West Sumatera, Indonesia. The aim of this research was to: (1) Identify the visitor characteristics of Pasumpahan Island; (2) Measuring the amount of economic value obtained by Pasumpahan Island seen from the consumer surplus with the Individual Travel Cost Method. Respondents determined by accidental sampling method whit 40 respondents. The data were analyzed using multiple regression models. The research was conducted on Pasumpahan Island in Bungus Teluk Kabung Sub-district, Padang, West Sumatera. The demand based of Travel Cost Method was $Y= 8.258-1.103(X_1)+1.479(X_2)-0.598(X_5)+0.241(X_6)$ with $r^2= 0.98$; $Y$ is the frekuensi of visits, $X_1$ is travel cost, $X_2$ education, $X_5$ is miliage and $X_6$ is gender. The accumulated of the consumer surplus can generate economic value of Pasumpahan Island. The value of consumer surplus Pasumpahan Island is equal to IDR.23.434.881,61 per year or IDR.3.691.532,58 per visit and economic value seen from the Travel Cost Method of IDR.103.946.582.269,63 per year.

Keywords: Pasumpahan Island, Individual Travel Cost, Consumer surplus, economic valuation

1. Introduction

Pasumpahan Island is one of the small uninhabited island located in the water of Sungai Pisang Village, Bungus Teluk Kabung sub-district, Padang City, West Sumatera Province, Indonesia. The appeal of Pasumpahan Island one of which has a white sand beach and in the midst of the island there is a large rock.

A beautiful scenic spot can be seen if climbing up the hill on Pasumpahan Island. The natural scenery that can be seen from the top of the hill is one of the appeals of this island because visitors can see the sunset and sunrise. Unlike other islands around Pasumpahan Island, here visitors can see all the panoramas from various sides. Not only that, on this island there are also various spots to take pictures with various beautiful and attractive backgrounds so that visitors can capture their beautiful moments while visiting Pasumpahan Island. [1]

Understanding the value of various environmental services is very important in making decisions related to resource management that are economically advantageous and environmentally sustainable. However, the economic value of natural resources that offer natural beauty is generally non-market or cannot be traded [2]. The importance of knowledge about the environment today still tends to be overlooked. The community assumes that issues relating to the environment are considered not too important compared to other problems, such as economics, social or political [3]. Suparmoko's opinion (2014), the deterioration of environmental functions is caused by the nature of the environment itself, namely the existence of characteristics or properties of public goods as common property and the
existence of externalities as mentioned above, so that the value of an activity is needed or policy towards the environment [4] [5].

Value is the price given by someone to something at a certain place and time. Usability, satisfaction and pleasure are other terms received and connotes value or price [6]. The size of the price determined by the time, goods or money to be sacrificed someone to own or use goods or services they want while the perception is the view of an individual or group of an object in accordance with the level of knowledge, understanding, expectations and norms [7, 8, 9].

One of the economic valuation techniques that can be used to assess environmental services in the form of natural beauty that is used as a tourist attraction can be done using the Travel Cost Method (TCM) [10]. Travel cost method can use two approaches, namely the cost of travel by zone (Zonal Travel Cost Method) and the cost of individual trips (Individual Travel Cost Method). In the last two decades, the Individual Travel Cost Method (ITCM) has been used more widely due to the advancement of information technology and its advantages because it is able to capture visitors' socio-economic characteristics such as age, income, and education. This information is difficult to obtain if using zone-based travel cost methods [1, 11, 12].

The basic principle of TCM is the theory of consumer demand, that is, the value a person gives to the environment (unmarketed attributes) can be deduced from the costs incurred to the location visited [13, 14]. Costs incurred can be seen from transportation costs, entry fees, expenses at the place of recreation, and the cost of time spent by someone. TCM is built on the theory of consumer demand, so consumer surplus becomes a central issue in TCM. Estimating the amount of consumer surplus can be done if the relationship between the number of visits and the amount of costs is known [2, 3, 5].

The aim of these research were to identify the visitor characteristics of Pasumpahan Island and measuring the amount of economic value obtained by Pasumpahan Island seen from the consumer surplus with the Individual Travel Cost Method.

2. Material and Method

This research was conducted on November - December 2018, on Pasumpahan Island, located in the Teluk Kabung Selatan Village, Bungus Teluk kabung Sub-district, West Sumatra Province, Indonesia. The survey method is carried out by direct interviews with respondents in the field. The tool used to obtain data is a questionnaire and documentation as a supporting tool in this research [3]. This study focuses on visitors to Pasumpahan Island who will be used as respondents, respondents taken in this study, namely by using accidental sampling technique (the technique of determining respondents based on coincidence) with the number of respondents as many as 40 people.

a. Data Analysis.

The data analysis procedure in this research used a descriptive analysis approach to determine the socio-economic characteristics of respondents and the Travel Cost Method to measure the economic value obtained by Pasumpahan Island seen from consumer surplus. Variables that are thought to affect the frequency of visits to Pasumpahan Island are round trip costs, total income, education, age, distance and gender with the model:

\[ Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + e \]

After guessing the demand function of TCM, necessary to do a statistical test which aims to determine the goodness of a model that has been created. The statistical test used partial test (statistical test t), simultaneous test (statistical test f), normality test, multicollinearity test, autocorrelation test and heteroscedasticity test. To find out the economic value of the existence of Pasumpahan Island in terms of tourism, we need to know the consumer surplus value. According to [13, 15, 8].

b. Consumer Surplus and Economic Value.

Consumer surplus for the demand function that has been made (linear) can be measured through the following steps:

1. Calculate the area of value under the demand curve.
   \[ U = \int_0^b (f(x))dx \]
2. Calculating the average travel cost limit.
   \[ C = \left( \frac{\beta_0}{\alpha} \right)^{1/\beta} \]
3. Calculate the area of the curve below the limit price.
4. Calculate consumer surplus value.

\[ CS = U - R \]

5. Calculate of economic value.

\[ NE = CS \times \frac{N}{L} \]

3. **Results and Discussion.**

Pasumpahan Island is a flat island with white sand in the middle of which is a large rock forming a hill and overgrown with several types of tall plants such as coconuts and weeds. The expanse of white sand in the presence of various types of coral reefs and also some mangrove trees further adds to the beauty of Pasumpahan Island.

In addition to the enchanting natural beauty of this 5 Ha island area, Pasumpahan Island also has various facilities that can pamper visitors. The facilities available in the form of a gazebo, prayer room, bathroom, lodging, place to charge cellphone, volleyball court, takraw field, banana boat, where borrowing tools such as snorkeling, life jackets, and canoes (small boats).

On this island there are also some beautiful spots to take pictures, camping areas (to set up tents), fishing areas, souvenir shops, and several stalls that provide food. The characteristics of the respondents in this study were based on 40 visitors as respondents who were visiting Pasumpahan Island during the study (Table 1).

| Characteristics   | Data       | Percentage (%) |
|-------------------|------------|----------------|
| Age               | 26-35 Years Old | 42.50          |
| Gender            | Male       | 70.00          |
| Education         | 13-16 years | 65.00          |
| Type of Work      | Entrepreneur | 50.00          |
| Income            | Rp3.000,000-Rp4.500,000 | 32.50          |
| Residential Area  | West Sumatera Province | 62.50          |
| Mileage           | ≤150 Km    | 62.50          |
| How to Visit      | With Family | 55.00          |
| Transportation Type | Private Car | 52.50          |
| Destination of Visit | Family Picnic | 55.00        |

*Research data (2018)

The rationale for the Travel Cost Method is the time and cost spent during tourism activities by individuals to visit a tourist attraction. The travel cost method is the first technique used to assume the value of a tourist place related to the travel costs incurred by visitors. Travel cost in this research represent total travel costs incurred by respondents during the journey from the initial location to Pasumpahan Island then back again to original location.

| Type Of Cost         | Total (Rp) | Percentage (%) |
|----------------------|------------|----------------|
| Transportation       | 5,126,000  | 20.46          |
| Consumption          | 3,205,000  | 12.80          |
| Boad fees            | 1,200,000  | 4.70           |
| Entrance Ticket      | 600,000    | 2.40           |
| Opportunity Cost     | 10,097,600 | 40.31          |
| Rent Place           | 1,890,000  | 7.55           |
| Other Costs          | 2,930,000  | 11.70          |
| **Total**            | **25,048,600** | **100.00**   |

*Research data (2018)

In determining the demand requirements for visits to Pasumpahan Island, the travel cost approach uses econometric techniques, namely multiple linear regression [13]. Using the variables mentioned earlier, the following is a model of the Pasumpahan Island travel demand function equation:
Y = 8.258 - 1.103 X1 + 0.350 X2 + 1.479 X3 - 0.409 X4 - 0.598 X5 + 0.241 X6

Table 3. Function of Pasumpahan Island Travel Request with Travel Cost Method

| Variabel         | Coeff | Std. Error | t-Stat | p-Value | VIF |
|------------------|-------|------------|--------|---------|-----|
| Intercept        | 8.258 | 6.549      | 1.261  | 0.261   |     |
| Travel Cost      | -1.103| 0.332      | -0.327 | 0.002   | 9.801|
| Income           | 0.350 | 0.226      | 1.548  | 0.131   | 7.642|
| Education        | 1.479 | 0.571      | 2.590  | 0.014   | 4.962|
| Age              | -0.409| 0.271      | -1.512 | 0.140   | 3.707|
| Mileage          | -0.598| 0.199      | -3.008 | 0.005   | 9.219|
| Gender           | 0.241 | 0.105      | 2.298  | 0.028   | 1.143|

R2         | 0.9801 | DW | 2.095 |
R2(adj)    | 0.9534 | Fstat | 134.053 |
Sig. F     | 0.0000 |

*Research data (2018)

From the regression results, the $R^2$ value is 98.01% and $R^2$ (adj) is 95.34% (Table 3). It can be interpreted that the diversity of demand for the number of visits to Pasumpahan Island can be explained by the independent variables in the model at 98.01% and the remaining 1.99% explained by variables not included in the model. In addition, from the results of the regression analysis it is stated that there is no violation of OLS assumptions (Ordinary Least Square) such as the presence of multicollinearity, heteroscedasticity and autocorrelation.

Based on Table 3, it can be seen the variables that are significant at the test level are 5%, that is travel cost, education, mileage and gender. While the rest, that is income and age variables did not have a significant effect on the 5% test but only had a significant effect on the 15% test. It can be interpreted that the two variables only affect 75% of the frequency of visits.

A variable will have a significant effect on the partial test if the value of t count is greater than the value of t table. In this case to facilitate conclusions, we can see it from a significance value, which must be smaller than $\alpha$. Variable travel cost, education, mileage and gender were significant at $\alpha = 5\%$.

This means that the four variables 95% partially have a significant effect on the frequency of visits. From the analysis of the results of the t-test conducted, there are two independent variables which apparently have no significant effect on the dependent variable. The two variables are total income and age. This is because the p-value of both is greater than $\alpha$, so it does not meet the significant requirements.

For the overall test of the regression model, in the sense that all coefficients involved jointly have a significant influence on the dependent variable, F. statistical tests are carried out. In the table the results of multiple linear regression indicate that the calculated f value is greater than the f table or significance value smaller than $\alpha$. The value of significance in the model shows the number 0.000 which means that all the independent variables in this regression model simultaneously or together have a significant effect on the dependent variable. The variable travel cost, income, education, age, mileage and gender in this regression model has a significant influence on the frequency of visits to Pasumpahan Island. The variable travel cost, education, distance and gender can be used as a consideration for carrying out activities to Pasumpahan Island, this is indicated by the p-value $\sim$ smaller than $\alpha$ used.

The calculation of the value of U is the area of value under the shaded demand curve as shown in Figure 1, the technique for calculating the integral value of the shaded area is as follows:

$$U = \left[ \frac{1.963.760.53}{1 - 0.91} \right]^{x_{\text{1-0.91}}} = 25.768.886.52$$
1. Calculate the average cost of a tourist trip (C). Where value V is the average number of visits, so the calculation results are as follows:

\[ C = \left( \frac{V}{a} \right)^{\frac{1}{n}} = \left( \frac{V}{a} \right)^{\frac{1}{1103974}} = 367.559,78 \]

2. Calculate the area of a curve below the boundary price with the formula \( R = V \cdot C \)

\[ R = 6.35 \times 367.559,78 = 2.334.004,61 \]

3. Calculate consumer surplus value (CS) with the formula \( CS = U - R \)

\[ CS = Rp23.434.881,61 \]

The travel cost approach is the basis for estimating the size of the consumer surplus. The tourist demand model has been obtained through regression analysis used to calculate consumer surplus. Consumer surplus value is obtained through integral calculation with the upper limit, namely the maximum cost paid by the respondent and the lower limit, namely the minimum cost paid by the respondent. Based on the survey results in the field, it is known that the maximum cost incurred by the respondent is IDR 1,124,250.00 and the minimum cost incurred by the respondent is IDR 312,400.00. So that the consumer surplus value based on the formula is IDR 23,434,004.91 per individual per year or IDR 3,390,532.58 per individual per visit. This value is higher than the actual average cost incurred by all respondents, amounting to IDR 626,215.00 per individual per visit. If the two values are compared then it can be concluded that visitors get the benefits of environmental services that are greater than the costs incurred by visitors in one visit.

Value of Consumen Surplus (CS) is an indirect value received by each visitor during a tourist activity on Psumpahan Island with an area of 5 ha. The economic value of the Psumpahan Island is the value of calculating the actual number of visitors who come based on visitor record data managed by Psumpahan Island. The number of visitors to Psumpahan Island based in 2017 is 22,129 people. Then the economic value of Psumpahan Island is viewed from a tourist perspective, amounting to IDR 103,718,100,344.63. This value indicates that if Psumpahan Island tourism is carried out an increase in infrastructure and supporting facilities as well as other factors that can increase the interest of pengungung will be able to allow the economic value of Psumpahan Island to be even greater.
4. Conclusions

Respondent characteristics that the respondents dominate the most who visit Pasumpahan Island with ages 26 to 35 years with a percentage of 42.50%, the most dominant gender are male with a percentage of 70.00%, taking education for 13 to 16 years as much as 65%, the most dominant type of work is entrepreneur as much as 50.00% with income of IDR 3,000,000 to IDR 4,500,000, 32.50%, the area of origin of the respondents is the most dominant, namely from West Sumatra Province with a distance of less than or equal to 150 kilometers which is as much as 62.50%, the most dominant way to visit is to come with a family of 55.00% with the type of vehicle used is a private car with a percentage of 52.50%. The most dominant visiting destination is for a 55.50 family picnic.

The results of the analysis of individual travel costs are known to be Consumer Surplus (CS) of IDR 23,434,881.91 per individual per year or in the amount of IDR 3,690,532.58 per individual per one visit. So that the Economic Value of the existence of Pasumpahan Island is obtained from a tourist point of view of IDR 103,718,100,344.63 per year.

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