Economic value analysis of Simarjarunjung Nature Tourism Area, Simalungun Regency, North Sumatera

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Abstract. Indonesia’s natural potential is very diverse, one of which is the natural tourism potential of the provinces in Indonesia. Sumatra, especially North Sumatra, is currently developing its natural potential, namely the Simarjarunjung Nature Tourism Area. This area is a magnet for tourists, because the hill is one of the ideal locations to see the landscape of Lake Toba. This study is aimed to analyze the total economic value with the travel method (Travel Cost Method) and the factors that influence tourists’ visits to the Simarjarunjung Natural Tourism Area. The method used to estimate the economic potential of tourism activities in the Simarjarunjung Nature Tourism Area is the individual travel cost method, while to determine the factors that affect the intensity of tourist visits to the Simarjarunjung Nature Tourism Area, it is determined by multiple linear regression analysis. The research data were obtained by asking questions on the questionnaire to the visitors. The results showed that the economic potential of the Simarjarunjung Nature Tourism Area reached IDR. 6,207,894,000/year, and the variables that had a significant effect on the intensity of tourists’ visits to the Simarjarunjung Nature Tourism Area were travel costs, age, and distance variables.

1. Introduction

The tourism sector can also be poverty alleviation, and a job creator [1]. Indonesia with a land area of 1,913,578.68 square kilometers, is rich in culture and folk arts, and the beauty of its nature is the main attraction [2]. With Indonesia’s tourism potential, tourism is an important force in development. It is located a long equator, with a unique tropical climate that can create a variety of flora and fauna that can attract tourist to visit Indonesia. Beautiful nature and diverse culture are the main reasons for the presence of tourists [3].

Indonesia’s nature potential is very diverse, one of which is the natural tourism potential of the provinces in Indonesia. Besides Java and Bali, Sumatera is the main destination that attracts tourists through its natural wealth. Sumatera, especially North Sumatera, is currently developing its natural potential, one of which is Lake Toba which is one of the largest caldera lakes in the world, located in North Sumatera Province, 176 km to the west of Medan. Lake Toba is the largest lake in Indonesia (90 x 30 km2) and is also the largest quaternary volcanic-tectonic caldera (giant volcanic crater) in the world. This caldera was formed by the collapse process after the eruption of the ancient Toba supervolcano, then filled with rainwater [4].

Parapat, Simarjarunjung, Tanjung Camel, Haranggaol and many other villages are some of the tourist destinations around Lake Toba [5]. One of the natural attractions that is being developed is Bukit Indah Simarjarunjung (02°50’09.8”N; 98°45’32.6”E) at an altitude of 1479 masl [6]. This natural tourist attraction is a magnet for tourists because this mountain is one of the suitable places to enjoy the natural panoramic view of Lake Toba [7]. The hill is used as a tourist destination because of the beautiful scenery, and the location that is still around Lake Toba area whose natural beauty is widely known. Bukit Indah Simarjarunjung was formed from the massive eruption of Mount Toba about 75 thousand years ago, and forms hills around the area, one of which is Bukit Indah Simarjarunjung. Before being used as a tourist attraction, Bukit Indah Simarjarunjung was a hill that functioned as a stopover or rest area for visitors who would continue their journey to Parapat. Because Bukit Indah Simarjarunjung has interesting natural scenery and relatively cool climatic conditions, tourists are interested in making a stopover to this place. Many visits to the place gave an idea for the land owner to make the place a tourist spot.
Cost is needed as a value that can be used to estimate the use value or benefits to the environment. In this case, the travel cost approach is a method used in estimating the value of a tourist object using various variables [8]. This travel cost method is used to estimate the economic value of a tourist area based on the assessment given by each individual or visitor from the costs paid during a visit to a tourist area. Thus, visitors' willingness to pay to visit a tourist area can be estimated based on the components of travel costs.

Therefore, a study is needed to analyze the total economic value using the Travel Cost Method and the factors that influence the intensity of tourist visits to the Simarjarunjung Nature Tourism Area, Simalungun Regency, North Sumatra.

2. Methods

This research was conducted in the Simarjarunjung Nature Tourism Area, Simalungun Regency, North Sumatra. It was conducted from February until June, 2021.

2.1. Research methods

Data collection includes primary data and secondary data. Primary data collection was carried out using accidental sampling technique (respondent is someone who happened to be met or met at that time with special considerations that respondents interviewed were limited to visitors aged 17-65 years) through interviews with the help of a questionnaire. Secondary data were obtained from the Simarjarunjung Natural Tourism Area Management, the Central Statistics Agency, and other relevant agencies. This data includes the characteristics of recreational objects such as location, area, biological condition, tourism potential, accessibility, recreational facilities, number of visitors each year, number of residents, area of origin and number of residents per sub-district and per district of visitors.

From the data on the population of visitors to the Simarjarunjung Nature Tourism Area, the number of samples is determined by the Slovin formula which is based on [9] as follows :

$$n = \frac{N}{1 + Ne^2}$$
Note:
\( n \) = number of samples
\( N \) = number of population
\( e \) = fault tolerance limit (0,1)

2.2. Data Analysis

2.2.1. Travel Cost Analysis. To estimate the economic value of ecotourism, a travel cost approach can be used. The stages in calculating the economic value of the Simarjarunjung Nature Tourism Area are as follows:

1. Counting the number of visitors from each region of origin (zone) based on interviews with respondents

\[
Z_i = P_i \times \sum Y
\]

Note:
\( Z_i \) : Number of visitors from zone \( i \)
\( P_i \) : Percentage of visits from zone \( i \)
\( \sum Y \) : Total number of visits

2. Determining the average travel costs of the total travel costs incurred during travel or recreational activities.

\[
ATC = TC + D + CC + OC
\]

Note:
\( ATC \) : Average travel cost (IDR/person)
\( TC \) : Transportation costs (IDR/person)
\( D \) : Documentation fee (IDR/person)
\( CC \) : Consumption costs during the trip (IDR/person)
\( OC \) : Other costs (IDR/person)

1. Determining the average travel cost of zone \( i \)

\[
Xli = \frac{\sum Bpi}{Ni}
\]

Note:
\( Xli \) : Average travel cost of origin \( i \)
\( Bpi \) : Sampling travel costs
\( Ni \) : Total population of the area of origin \( i \)

4. Determining the rate of visits per 1000 zone \( i \) people in one year

\[
LKi = \frac{\sum JPi}{\sum JPT \times 1000}
\]

Note:
\( LKi \) : Zone \( i \) visitor visit rate
\( JPi \) : Number of visitors zone \( i \)
\( JPT \) : Total visitor population for zone \( i \)

5. Determining the Total Economic Value generated for a year by tourism objects, is formulated as follows

\[
NET = \text{Average Travel Cost} \times \text{Average Number of Visitors}
\]

2.2.2. Analysis of Factors Affecting Visit Intensity. To determine the socio-economic factors that influence the intensity of tourist visits, multiple linear analysis is used. The general model of multiple linear regression is:

\[
Y = \alpha + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + \beta_6x_6 + \beta_7x_7 + \beta_8x_8
\]

Note:
\( Y \) = Visit intensity
\( \alpha \) = Intercept constant
\( \beta_1, \beta_2 = \) independent variable regression coefficient

\( X_1 = \) Travel cost

\( X_2 = \) Age

\( X_3 = \) Education

\( X_4 = \) Income

\( X_5 = \) Distance

\( X_6 = \) Number of Members

\( X_7 = \) Length of Journey

\( X_8 = \) Free Time

In order to produce unbiased data, the multiple regression analysis model was evaluated by econometric evaluation with classical assumptions, namely multicollinearity test, heteroscedasticity test, and autocorrelation test.

### 3. Result and Discussion

#### 3.1. Socio-Economic Characteristics of Respondents

The characteristics of the respondents can describe the profile of visitors who travel to the Simarjarunjung Nature Tourism Area. Tourists visiting the Simarjarunjung Nature Tourism Area are domestic tourists who come from the area around the Simarjarunjung Natural Tourism Area such as Pematangsiantar, Parapat, Tigaras, Tiga Balata, Haranggaol, Raya, Balige, Tebing Tinggi, Indrapura, Kabanjahe, Kisaran, Medan, PekanBaru and some areas in North Sumatra.

Tourism Area are dominated by women. This is due to female visitors who prefer to spend time on light, relaxed and contemporary recreation. It can be seen that the difference in the percentage of male and female visitors is not more than 4%. This can provide information that the interests and desires about the type of tourism preferred between women and men are not much different.

| No | Age (Year) | Number (Person) | Percentage (%) |
|----|------------|-----------------|----------------|
| 1  | 17-26      | 51              | 51             |
| 2  | 27-36      | 24              | 24             |
| 3  | 37-46      | 7               | 7              |
| 4  | 47-56      | 12              | 12             |
| 5  | 57-65      | 6               | 6              |
|    | Total      | 100             | 100            |

The majority of the visitors are in the age range of 17-26 years, which is 51%, while the relatively minority age is in the age range of 57-65 years (Tabel 1). According to [11] in this age group, the young age range are the people who like to travel tourist attractions with friends or partners. Generally, this group namely productive age with good health, so it is estimated people are getting more journey. On the other hand, the old age group both in term of health and productivity has decreased.

| Education            | Percentage (%) |
|----------------------|----------------|
| Primary school       | 2              |
| Junior high school   | 5              |
| Senior high school   | 50             |
| Bachelor’s Degree   | 41             |
| Postgraduate         | 2              |
| Total                | 100            |

The highest education level of respondents is Senior high school, which is as much as 50%. In general, the education level of the respondents is relatively good because most of them have completed at least 12 years of basic education.
Table 3. Tabulation of respondents' income levels.

| Income Level          | Percentage (%) |
|-----------------------|----------------|
| ≤ IDR 500.000         | 17             |
| IDR 500.000 – IDR 2,000.000 | 30             |
| IDR 2,000.000 – IDR 3,500.000 | 20             |
| IDR 3,500.000 – IDR 5,000.000 | 23             |
| IDR 5,000.000 – IDR 7,500.000 | 7              |
| ≥ IDR 7,500.000       | 3              |
| Total                 | 100            |

The majority of visitors to the Simarjarunjung Nature Tourism Area are in the income level range of IDR 500,000 – IDR 2,000,000 with a percentage of 30%. This shows that visitors to the Simarjarunjung Nature Tourism Area are dominated by visitors with moderate income. The level of visitor income will affect the considerations for allocating the tourism budget, including for transportation, consumption and accommodation during the tour.

Table 4. Data Tabulation of Residential Distance from Tourist Areas.

| No | Distance          | Number (Person) | Percentage (%) |
|----|-------------------|-----------------|----------------|
| 1  | ≤ 30 km           | 3               | 3              |
| 2  | 31 - 50 km        | 71              | 71             |
| 3  | 51 - 70 km        | 3               | 3              |
| 4  | 71 - 100 km       | 11              | 11             |
| 5  | 101 - 200 km      | 9               | 9              |
| 6  | > 200 km          | 3               | 3              |
|    | Total             | 100             | 100            |

Based on Table 4, it can be seen that there are 6 groups of residence distances from the Simarjarunjung Nature Tourism Area. The six distance ranges are: 30 km; 31-50 km; 51 – 70 km; 71 – 100 km; 101 – 200 km; > 200 km. Based on the six distance ranges, the majority of visitors have a residence distance of 31-50 km from the Simarjarunjung Nature Tourism Area with a percentage of 71%. There are 5 areas that are the origin of visitors who are included in this distance range, namely: Pematangsiantar, Parapat, Tiga Balata, Haranggaol, and Raya. This shows that the largest percentage of visitors came from among the five regions, namely: Pematransiantar. The lowest percentage of the distance range is visitors who come from areas that are 30 km away; 51 - 70 km; > 200 km from Simarjarunjung Nature Tourism Area. From this distance range, there are 3 areas that are the origin of visitors, namely Tigaras, Kabanjahe, and Pekan Baru.

Table 5. Data Tabulation of the Number of Tour Groups.

| No | Arrival | Number (Person) | Percentage (%) |
|----|---------|-----------------|----------------|
| 1  | Alone   | 2               | 2              |
| 2  | Family  | 57              | 57             |
| 3  | Group   | 41              | 41             |
|    | Total   | 100             | 100            |

Based on Table 5, it can be seen that the majority of visitors chose to visit with their families as much as 57%. As many as 41% prefer to travel in groups, namely with friends. Then as many as 2% of visitors come alone. This shows that tourism is not only an interest of a few people but has become a trend of necessity for the majority of individuals, especially for those who have high working hours and feel they do not get enough time off every week.

Based on Table 6, it can be seen that there are 5 groups of travel length ranges, namely: < 1 hour, 1-2 hours, 3-4 hours, 5-6 hours, > 7 hours. Of the five groups of free time, the majority of visitors to the Simarjarunjung Nature Tourism Area with a percentage of 49% have to spend 1-2 hours traveling to get to tourist sites, then the next 24% take < 1 hour, 22% take 3 hours. 4 hours and 3% takes >7 hours. Meanwhile, at the lowest percentage, there are 2% of visitors who have to spend 5-6 hours traveling time. Based on the data in the table, it can be seen that the majority of visitors who travel to the Simarjarunjung Nature Tourism
Area are visitors with the closest distance from the location with a short travel time to get to the tourist area location.

Table 6. Length of Journey Data Tabulation.

| No | Length of journey | Number (Person) | Percentage (%) |
|----|-------------------|----------------|----------------|
| 1  | < 1 hours         | 24             | 24             |
| 2  | 1 – 2 hours       | 49             | 49             |
| 3  | 3 – 4 hours       | 22             | 22             |
| 4  | 5 – 6 hours       | 2              | 2              |
| 5  | > 7 hours         | 3              | 3              |
|    | Total             | 100            | 100            |

Based on Table 7, it can be seen that there are 5 groups of free time spans, namely: < 1 hour, 1-2 hours, 3-4 hours, 5-6 hours, > 7 hours. The largest percentage of visitors to the Simarjarunjung Nature Tourism Area have 3-4 hours of free time, which is 42%, then 25% have more than 7 hours of free time, 18% have 1-2 hours of free time, 14% have 5-6 hours of free time. Meanwhile, the smallest percentage is 1% of visitors with less than 1 hour of free time. The length of free time has the potential to influence visitors to travel and choose the type of tourism that suits their needs.

Table 7. Data Tabulation of Visitors' Free Time.

| No | Free time | Number (Person) | Percentage (%) |
|----|-----------|----------------|----------------|
| 1  | < 1 hours | 1              | 1              |
| 2  | 1 – 2 hours | 18             | 18             |
| 3  | 3 – 4 hours | 42             | 42             |
| 4  | 5 – 6 hours | 14             | 14             |
| 5  | > 7 hours | 25             | 25             |
|    | Total     | 100            | 100            |

3.2. Analysis of the Economic Value of the Simarjarunjung Nature Tourism Area

To find out the value of the intangible benefits of a recreation area, it can be done through the travel cost method approach [12]. The economic assessment of the Simarjarunjung Nature Tourism Area is collected in the form of information on the origin of visitors, the cost of round trips for visitors, consumption costs spent during ecotourism activities, ticket prices to enter tourist areas, as well as other costs such as parking fees, lodging fees, equipment rental fees, and documentation costs.

Table 8. Recapitulation of respondent data based on average travel costs.

| No | Visitor Origin | Transportation cost ( IDR) | Consumption cost ( IDR) | Entertainment cost ( IDR) | Ticket cost ( IDR) | Other costs ( IDR) | Average total cost ( IDR) |
|----|----------------|---------------------------|-------------------------|--------------------------|-------------------|-------------------|--------------------------|
| 1  | Balige         | 100,000                   | -                       | -                        | 5,000             | 25,000            | 130,000                  |
| 2  | Haranggaol     | 50,000                    | 47,500                  | 40,000                   | 5,000             | 5,500             | 148,000                  |
| 3  | Indrapura      | 50,000                    | 80,000                  | 10,000                   | 5,000             | 6,000             | 151,000                  |
| 4  | Kabanjahe      | 46,667                    | 26,667                  | 23,333                   | 5,000             | 7,000             | 108,667                  |
| 5  | Kisaran        | 50,000                    | 90,000                  | 25,000                   | 5,000             | 12,000            | 182,000                  |
| 6  | Medan          | 60,000                    | 88,000                  | 24,000                   | 5,000             | 3,600             | 180,600                  |
| 7  | Parapat        | 20,000                    | 57,500                  | 26,667                   | 5,000             | 8,750             | 117,917                  |
| 8  | Pekan Baru     | 283,333                   | 33,333                  | 15,000                   | 5,000             | 6,333             | 342,999                  |
| 9  | P, Siantar     | 43,617                    | 41,063                  | 20,851                   | 5,000             | 10,042            | 120,573                  |
| 1  | Raya           | 21,000                    | 50,000                  | 34,000                   | 5,000             | 7,200             | 117,200                  |
| 1  | T, Tinggi     | 49,000                    | 55,000                  | 25,000                   | 5,000             | 6,200             | 140,200                  |
| 1  | Tiga Balata   | 26,667                    | 36,667                  | 50,000                   | 5,000             | 9,000             | 127,334                  |
| 1  | Tigaras       | 10,000                    | 25,000                  | 13,333                   | 5,000             | 1,667             | 55,000                   |
|    | Average       | 58,977                    | 48,517                  | 23,629                   | 5,000             | 8,330             | 147,807                  |
Based on the data recapitulation of the costs incurred by visitors to carry out tourism activities according to the total travel costs, the total economic value of the Simarjarunjung Nature Tourism Area is IDR. 6,207,894,000,-/year. This value is obtained from the result of multiplying the average value of travel costs incurred by the respondents, which is IDR. 147,807,-/visit with an average number of visits every year, namely the data on the number of visits used according to [13] is the average data from the last two years starting in 2018-2019, which is 42,000 visits.

If this value is compared with the revenue obtained by the manager only from the admission ticket of IDR. 5,000,-/person/visit, it can be calculated that the amount of income earned by the manager from this tourist area is equal to IDR 210,000,000,-/year. This is not small as a manager's income. According to [14], the impact of tourism on the economy can be both positive and negative. Ecotourism in many conservation areas tends to be an alternative conservation approach to improve livelihoods. The economic value of ecotourism is expected to increase public awareness for conservation as well. These impacts can be divided into public income, employment opportunities, prices and tariffs, distribution of benefits, ownership and control, development and government revenues.

3.3. Factors Affecting Visit Intensity

Prior to the regression test, an econometric evaluation was carried out with the classical assumption test including the multicollinearity test, heteroscedasticity test and autocorrelation test. The results of the multicollinearity test showed that the VIF value was less than 10 and the tolerance was less than 1 for all research variables.

Heteroscedasticity test showed that the significance value of the eight independent variables was greater than 0.05 (sig>0.05).

The autocorrelation test using the Durbin Watson test shows that the Durbin-Watson value (d) is greater than the upper limit (du) less than 4 – du. Then referring to the basis of decision making in the Durbin-Watson test, where du < d < 4 – du, it can be concluded that there are no problems or symptoms of autocorrelation.

Thus, the multiple linear regression analysis can be continued. In general, the test results state that there is no violation of assumptions so that it is feasible to proceed to the next testing stage. This is in accordance with the statements of [15, 16, 17]. In general, the test results state that there is no violation of the classical assumptions so that it is feasible to proceed to the next testing stage.

Table 9. F test result.

| Model     | Sum of Squares | Df | Mean Square | F     | Sig. |
|-----------|----------------|----|-------------|-------|------|
| Regression| 70.292         | 8  | 8.786       | 5.601 | .000 |
| 1 Residual| 142.748        | 91 | 1.569       |       |      |
| Total     | 213.040        | 99 |             |       |      |

The F test results in Table 9 show that the calculated F value is 5.601 and the $F_{table}$ value = 2.04. The calculated F value is greater than the table F. This shows that the independent variables together have an influence on the dependent variable, namely the intensity of tourist visits. However, the results of the F test have not been able to determine for sure which independent variables have a direct and significant effect on the dependent variable (visit intensity). Therefore, it is continued with the t-test to determine the independent variables that have a real influence on the dependent variable.
Based on Table 10, the regression equation can be obtained as follows:

\[ Y = 6,066 + 6.749E-6X_1 - 0.487X_2 - 0.392X_3 + 0.180X_4 - 0.472X_5 + 0.022X_6 - 0.211X_7 - 0.058X_8 \]

The equation above shows that the constant value is 6,066, mathematically the value of this constant states that when travel costs, age, education level, income level, distance, number of members and length of trip are zero (0), then the intensity of visits has a value of 6,066 times in the last one year.

Overall, these independent variables have a significant effect on the dependent variable, namely the intensity of visits. However, through partial testing, it was found that not all of these independent variables had an effect on the intensity of visits. The test results show that of the eight socio-economic independent variables observed in this study, there are only three of them that have a significant effect (\(\alpha=0.05\)) on the level of tourist visits to the Simarjarunjung Nature Tourism Area.

The three variables are the variables of travel costs, age and distance. This can be seen in the Sig column which displays the three independent variables having a significance value below 0.05, namely travel costs (0.013), age (0.000) and distance (0.013) which means that travel costs, age and distance have a significant effect on intensity visit to the Simarjarunjung Nature Tourism Area. The travel cost variable is positive, the age variable and the distance variable are negative, indicating that if the age of visitors is getting younger and the distance is getting closer, the intensity of the visit will increase. This is in accordance with the statement of [18] which states that age can indirectly influence tourists to visit a tourist spot. Because age is related to activities and leisure time as well as the ability to make tourist visits. Distance is something that is very influential on the selection of tourist attractions. According to Becker in [19] this is because visitors are more interested in tourist attractions that are closer to where they live.

The other five variables, namely education, income, number of members, length of trip and length of leisure time did not have any significant effect (\(\alpha=0.05\)) on the intensity of tourist visits. In general, the pattern in traveling is to travel en masse on weekends and national holidays. At such times, most people will plan trips to tourist attractions that provide recreational attractions to visitors so that education, income, number of members, length of trip and length of leisure time tend not to be taken into consideration by tourists.

Through the value of the coefficient of determination (\(R^2\)), all independent variables are only able to explain the change in visit intensity by 33%. With tourism in the vicinity of certain people's residences such as the Simarjarunjung Nature Tourism Area, the community also benefits. This is because the Simarjarunjung Nature Tourism Area provides a good social and economic impact for managers, government, visitors, and local community. The existence of this tour provides business

| Variable          | Koeff. | Standard Error | t     | Sig.  | Description   |
|-------------------|--------|----------------|-------|-------|---------------|
| (Constant)        | 6.066  | 1.298          | 4.675 | .000  |               |
| Travel cost       | 6.749E-6 | .000          | 2.544 | .013  | Significant   |
| Age               | -0.487 | .118           | -4.129| .000  | Significant   |
| Education         | -0.392 | .283           | -1.385| .169  | Not significant|
| Income            | 0.180  | 0.152          | 1.180 | .241  | Not significant|
| Distance          | -0.472 | 0.186          | -2.542| .013  | Significant   |
| Number of members | 0.222  | 0.282          | 0.079 | .937  | Not significant|
| Length of journey | -0.211 | 0.253          | -0.833| .407  | Not significant|
| Free time         | -0.058 | 0.147          | -0.399| .691  | Not significant|

\( R^{Adjusted} \) 0.271
\( R^2 \) 0.330
opportunities for the surrounding community. This is in accordance with the statement of [20] which states that the existence of natural tourism areas is very influential on the state and condition of the community around tourist attractions.

4. Conclusions
The economic value of the Simarjarunjung Nature Tourism Area, Simalungun Regency, North Sumatra by using the travel cost method is IDR. 6,207,894,000/year. Three independent variables simultaneously affect the intensity of visits significantly, namely travel costs, age and distance.

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