Integration of conservation and economic development in Gunung Leuser National Park

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Abstract. Sumatran Elephant has economic benefits as an ecotourism attraction. The most appropriate tourism management is making the tour package attractive, safe, and sustainable. The increasing number of visitors to natural destinations has a significant impact. Feasibility studies can be used to consider making a decision, either rejecting, accepting, retaining, and stopping the effort. Therefore, a financial feasibility analysis is required to see the feasibility of using Sumatran elephants as an ecotourism package. The study was conducted for four months (November 2019 to February 2020) to determine the level of financial feasibility and financial benefits to Sumatran elephant people as a tour package in Tangkahan Ecotourism Area, Gunung Leuser National Park. Respondents were the actors in ecotourism management, including community institutions (LPT), 2 NGOs (CRU and VESSWIC), and the national park authority (GLNP). Data was collected by interviewing the actors. Research methods used descriptive analysis and financial analysis with NPV, BCR, and IRR parameters. The results show the interest rate of 6.56%, obtained NPV value of IR 181,021,329,- BCR of 3.806, and IRR of 117.3%. It means that this tourism package is financially worthy of being continued and developed. The calculation of the financial benefits of Sumatran elephant use as community-based ecotourism gave the revenue of IR 697,214,755,-.

1. Introduction

Gunung Leuser National Park (GLNP) is the native habitat of big mammals, such as Sumatran elephants (Elephas maximus sumatranus). It’s nearly 65% or 129 mammal species from 205 species of mammals large and small in Sumatra are recorded in GLNP [1]. The Sumatran elephant (Elephas maximus sumatranus) has important benefits for human life ecologically, economically, and socio-culture [2,3,4]. Unfortunately, the Sumatran elephant (Elephas maximus sumatranus) is classified as a Critically Endangered Species in the Red List of the International Union for Conservation of Nature and Natural Resources [5] in 2011. Wildlife habitat conditions in Mount Leuser which is currently fragmented by various human activity has become a major threat for wildlife survival [6].

Sumatran Elephant has been popular maskot of Tangkahan Ecotourism area [7]. It is located in Batang Serangan District, Langkat Regency as part of GLNP. Since tourists have been there both domestic and overseas, ecotorism has generated local community economically. Formerly local community surrounding the area was illegal logger that has converted their activity from destructing forest to conserve forest by implementing community base ecotourism [8], [9], [10]. Therefore it really required to assess the financial aspect of tourism business in Tangkahan Ecotourism Area that has been running since 2004 to be evaluated of its implementation. The previous study concerned in social aspect about community participation and benefit distribution of ecotourism in Tangkahan...
generally and hasn’t mentioned about the feasibility study of using elephant in ecotourism activity. In
[11] feasibility studies can be used as consideration in making a business decision, either rejecting or
accepting a business plan, and maintaining or discontinuing an existing business.

The objectives of this study is to know the level of financial viability and benefits of sumatran
elephant as a tourist attraction and how to integrate this in term of conservation and economic
development in Tangkahan Ecotourism Area of Gunung Leuser National Park.

2. Methods
This research was conducted in the Tangkahan Ecotourism Area, Gunung Leuser National Park,
Langkat Regency, North Sumatra Province. This research was conducted from November 2019 to
February 2020. The sampling used in this research is purposive with judgement sampling method.
Data collection was carried out through interviewing key person of each actors those were from LPT,
CRU, VESSWIC and GLNP management. Observation and recording of available document sources
at both the individual and agency levels. The data collected in the form of primary data and secondary
data.

Analysis of financial aspects using descriptive methods is used to identify and analyze data
collected from interviews, observations and literature studies. Indicator was divided into benefit and
cost categories [12]. Benefit indicator consist of elephant grazing/washing/tracking, while cost
indicator consist of feed, care and health, training and support.

Financial feasibility analysis is carried out to determine the benefits, costs incurred, and the
investment interest rate that provides benefits. The results of the data obtained from data collection and
analysis are in the form of expenditures (costs) and income (receipts) expressed in tabulated form. The
current calculated value by calculating the value of money based on the time element is carried out by
applying the discount factor (Discount rate) to the prevailing real interest rate. The formula used are as follow:

a. Calculating the real interest rate is done using the following Heers and Lefers formula.

\[ i = m - f \]  \hspace{1cm} (1)

Note:
\( i \) = Real interest rates (%)
\( f \) = Average inflation per year (%)
\( m \) = Market interest rates (%)

b. Net Present Value (NPV), the current value of the activity or business of utilizing the Sumatran
elephant as a tourist attraction is calculated using the following formula:

\[ NPV = \sum_{t=1}^{n} \frac{B_t - C_t}{(1+i)^t} \]  \hspace{1cm} (2)

Note:
NPV = Current net worth
\( B_t \) = Benefit in year t
\( C_t \) = Cost in year t
\( i \) = Applicable bank interest rates
\( t \) = Period of time

c. Benefit Cost Ratio (BCR), the comparison of the benefits to the costs of an activity or business
using the Sumatran elephant as a tourist attraction, is calculated using the following formula:

\[ BCR = \frac{B_t}{C_t} \]  \hspace{1cm} (3)

Note:
BCR = Comparison between income and expenses
\( B_t \) = Benefit in year t
\( C_t \) = Cost in year t
d. **Internal Rate of Return (IRR)**, is a parameter at the interest rate at which the utilization of Sumatran elephants as a tourist attraction is profitable, calculated by the following formula:

\[
\text{IRR} = I_1 + \left( I_2 - I_1 \right) \frac{\text{NPV}_1}{\text{NPV}_1 - \text{NPV}_2}
\]

**Note:**
- IRR = Profit rate
- NPV\(_1\) = Positive NPV value at a certain interest rate
- NPV\(_2\) = Negative NPV at a certain interest rate
- I\(_1\) = The first interest rate is NPV positive
- I\(_2\) = The first interest rate is negative NPV

The integration of economic development and conservation is carried out by looking at the financial feasibility variable of elephant ecotourism development on the sustainability of elephant ex-situ conservation efforts itself. The assessment is carried out collaboratively based on actor’s agreement of benefit share.

3. **Result and Discussion**

Management of Tangkahan Ecotourism Area was run by a collaboration between GLNP authority and LPT (Lembaga Pariwisata Tangkahan). Other NGOs (Non Governmental Organizations) which also signed an MoU with GLNP to enhance conservation through sumatran elephant conservation program namely Tangkahan Conservation Response Unit (CRU) and the Veterinary Society for Sumatran Wildlife Conservation (VESSWIC). This all bodies collaborate to support a mission in integrating conservation and livelihood in one package through a community based ecotourism.

3.1. **Benefit Analysis**

The main income of management by utilizing elephants as tourist attraction derived from elephant washing, elephant grazing and elephant tracking that has run since 2004. This ecotourism packages has attracted many tourist from domestic and foreign countries. The total income of all tour packages in Tangkahan from January to December 2019 is shown in Table 1.

| No | Tour packages    | Tourist Domestic | Tourist Foreign | Amount (IR)       |
|----|------------------|------------------|-----------------|------------------|
| 1  | Elephant Washing | 1400             | 3503            | 1.015.750.000    |
| 2  | Elephant Grazing | 4                | 285             | 216.170.000      |
| 3  | Elephant Tracking| 55               | 627             | 624.731.250      |
|    | Total            | 1459             |                 | 1.856.651.250    |

3.2. **Cost Analysis**

The cost analysis in managing elephant tourism in Tangkahan consist of the cost of elephant feed, elephant health costs, mahout training costs, and supporting costs. All costs are calculated for 1 year and sourced from the sale of the package. Although package sales are the main source of income, therefore it depend on market tourism. The better situation of tourism, the longer benefit can be reached by the community. Inspite of this situation, the manager pays attention very much to the welfare of the elephants itself and also the balance of the environment carrying capacity. For example, in terms of trekking, the manager pays attention to track conditions, because excessive use of the tracks has the potential to damage the stability of the soil. In this part, all cost will be described for each.

Regarding elephant feed cost, it’s involved to fixed costs. Elephant feeding is given in cages only 10% of all consumption and the rest will be released in the wild for food themselves in the morning until the afternoon. In line with this activity, it can also be follow by offering other elephant’s
package such as elephant grazing and tracking to visitors. The cost of elephant feed in Tangkahan during 2019 is presented in the following Table 2.

Table 2. Elephant Feed Expenditure Costs in 2019.

| No  | Kind of Care     | Unit       | Price Unity (IR) | Count | Cost (IR)     | Period       |
|-----|------------------|------------|------------------|-------|--------------|--------------|
| 1   | Staple Food      |            |                  |       |              |              |
| 1.1 | Palm oil rim     | Trunk      | 800              | 2400  | 1,920,000    | Per Month    |
| 1.2 | Grass            | Kilogram   | 1,000            | 12750 | 12,750,000   | Per Month    |
| 2   | Exercises Food   |            |                  |       |              |              |
| 2.1 | Banana           | Bunch      | 4,500            | 400   | 1,800,000    | Per Month    |
| 2.2 | Pineapple        | Piece      | 5,000            | 200   | 1,000,000    | Per Month    |
| 2.3 | Pumpkin          | Kilogram   | 3,000            | 1000  | 3,000,000    | Per Month    |
| 3   | Supplements      |            |                  |       |              |              |
| 3.1 | Green beans      | Kilogram   |                  |       |              | Per Month    |
| 3.2 | Bran             | Kilogram   |                  |       |              | Per Month    |
| 3.3 | Glutinous rice   | Kilogram   |                  |       | 2,700,000    | Per Month    |
| 3.4 | White sugar      | Kilogram   |                  |       |              | Per Month    |
| 3.5 | Mineral Powder   | Bungkus    |                  |       |              | Per Month    |
|     |                  |            |                  |       | Total 19,450,000 | Per Month    |
|     |                  |            |                  |       | Total 233,400,000 | Per Year     |

Source: Data from CRU (2019) and processed by the author.

Concerning elephant health in Tangkahan assigned to two veterinarians from VESSWIC who have become health saviors for Sumatran elephants including those in Tangkahan. Elephant Health Costs are fixed costs in Elephant Health care as well as those related to Elephant health, while the costs incurred for elephant health costs in Tangkahan are presented in Table 3 below.

Table 3. Elephant Health Costs in 2019.

| No  | Unit Cost       | Visit | Cost (IR)      | Cost (IR)       | Information         |
|-----|-----------------|-------|----------------|-----------------|---------------------|
| 1   | Medicines       | 2     | IR. 13,632,500 | IR. 27,265,000  | Per year            |
| 2   | Transport and Logistics | 2     | IR. 2,000,000  | IR. 4,000,000   | Per year            |
| 2.1 | Transport       | 2     | IR. 1,500,000  | IR. 3,000,000   | Per year            |
| 2.2 | Logistics       | 2     | IR. 8,000,000  | IR. 16,000,000  | Per year            |
| 3   | Doctor Services | 2     | IR. 50,265,000 | Per year        |                     |

Source: VESSWIC data on spending on routine health visits Elephant Tangkahan in 2019

Beside elephant management, capacity building of human resources also has an important role as one of ecotourism successful key. It related with elephant training that needs skillful mahout to do it. Elephant training is part of fixed cost. All costs incurred for elephant training costs in Tangkahan are presented in the following Table 4.

Table 4. Elephant Training Costs in 2019.

| No   | Unit Cost         | Much | Cost (IR)  | Cost (IR) | Information       |
|------|-------------------|------|------------|-----------|-------------------|
| 1    | Mahout Assistant  | 5    | IR. 2,000,000 | IR. 10,000,000 | Per month        |
| 2    | Daily money       | 10   | IR. 15,000  | IR. 150,000 | Per day          |
|      |                   |      | IR. 4,500,000 | IR. 4,500,000 | Per month        |
|      | Total             |      | IR. 14,650,000 | Per month   |                   |
|      | Total             |      | IR. 175,800,000 | Per year    |                   |

Source: Data from CRU (2019) and processed by the author.
Mahout in Tangkahan as many as 5 peoples with civil servant status who are paid by the government. For mahout assistants are CRU employees as many as 5 people whose salary is two million rupiah per month. Mahout and Assistant Mahout alternately work as many as 15 days a month each. And earn an average daily money of fifteen thousand per day.

Elephant support costs in Tangkahan are allocated to goods and tools used to and for Elephants in training as well as in mahout facilities to carry out their duties. These costs are fixed costs or costs incurred only once and incurred again in the event of addition or replacement of such items may be caused by damage, or loss. This supporting fee is incurred by CRU at a gradual time until this data can be obtained and has been used by the Manager in running this Elephant Management either in tourist attractions or in its duties as an NGO in the field of conservation. Supporting costs are fixed costs and are incurred only once, while the costs to support elephant activities are presented in Table 5.

Table 5. Supporting costs for Elephants in 2019

| No | Material              | Unit Price (IR) | Unit | Cost (IR)  |
|----|-----------------------|-----------------|------|------------|
| 1  | Elephant Clothes      | 800.000,00      | 5    | 4.000.000,00 |
| 2  | Wreaths               | 150.000,00      | 2    | 300.000,00  |
| 3  | Unloading Ladder      | 3.400.000,00    | 2    | 6.800.000,00 |
| 4  | Plana                 | 2.800.000,00    | 5    | 14.000.000,00 |
| 5  | Permanent Stairs      | 3.000.000,00    | 1    | 3.000.000,00  |
|    | Total                 |                 |      | 28.100.000,00 |

Source: Data Conservation Response Unit (CRU) 2019 and processed by the author

The total cost for sumatran elephants (*Elephas maximus sumatranus*) in Tangkahan Ecotourism collected from all managers who have taken care in the management of these elephants is as follows assuming that the costs incurred are the same since ecotourism was carried out To know the level of financial profit utilization of Elephants in Tangkahan ecotourism, used investment analysis parameters namely NPV (Net Present Value), BCR (Benefit Cost Ratio), and IRR (Internal Rate of Return).

The calculation of this feasibility analysis is based on the data that has been presented in 2019. For the calculation of rill interest rate is done since the opening of gajah tour package until now. The profit level is done by taking into account the discount rate. The calculation of the average real interest rate is presented in Table 6.

Table 6. Cumulative cost expenditure for elephants in 2019

| No | Unit Cost | Cost (IR)       | Information |
|----|-----------|-----------------|-------------|
| 1  | Feed      | 233,400,000.00  | Per year    |
| 2  | Health    | 50,265,000.00   | Per year    |
| 3  | Training  | 175,800,000.00  | Per year    |
| 4  | Supporting| 28,100,000.00   | Per year    |
|    | Total     | 487,565,000.00  | Per year    |

The biggest expense for Elephants is the elephant feeding cost that provided other than the natural forest directly or during the tourist attraction. Supporting costs are fixed costs incurred only once and incurred again in the event of addition or replacement of such items.

3.3. Financial Analysis of Elephant Utilization

Financial analysis is a parameter used to determine the feasibility of an activity related to finance. To determine the level of financial feasibility of using elephants in Tangkahan ecotourism, investment analysis parameters are used, namely NPV (Net Present Value), BCR (Benefit Cost Ratio), and IRR (Internal Rate of Return).
3.3.1. Net Present Value (NPV)
Net Present Value (NPV) calculates the difference between the present value of costs incurred for Elephant Management and the present value of net cash receipts from the use of Elephants in Tangkahan in 2019. Calculating the present value is necessary with a real interest rate of 6.56%. Regarding calculation, the NPV value by calculating the calculated interest rate is IR. 181,021,329, - assuming that the costs incurred (Cost) of income (Benefit) are the same since the ecotourism was started. According to Nasution (2019), this value shows the NPV Analysis. It turns out that NPV> 0 at an Interest Rate of 6.56%, means that the project is profitable and feasible to run. By calculating these criteria, it shows that this tourism produces a surplus with a positive NPV that this project is good enough to do.

3.3.2. Benefit Cost Ratio (BCR)
The calculation of the Benefit-Cost Ratio (BCR) is carried out to see how many benefits received by the manager to emphasize the comparison value between the benefits aspects of the elephant that will be obtained with the aspects of the costs to be borne by the Sumatran Elephant in Tangkahan with this investment. The value of BCR with the revenues and expenses incurred is 3,806 with the assumption that the costs incurred (Cost) of income (Benefits) are the same since the ecotourism was started. According to Nasution (2019), this value shows feasibility because it provides a ratio value greater than one. The BCR value of 3,806 means that each project expenditure of IR. 1 will generate benefits of IR. 3,806.

3.3.3. Internal Rate of Return (IRR). The Internal Rate of Return is the interest rate (discount rate) that can make the NPV price of a project zero, or the BC Ratio equal to one. In this IRR calculation, it is assumed that each year's net benefit is automatically reinvested in the following year and obtains the same rate of return as previous investments.

\[
\text{Benefit} = \text{IR. 1,856,086,250} \quad \text{Disc Factor (6.56\%)} = 0.938 \\
\text{Cost} = \text{IR. 487,565,000} \quad \text{NPV}_1 = \text{IR 1,283,672,932.5} \\
\text{Ratio} = \text{IR. 1,368,521,250} \quad \text{Disc Factor (8.56\%)} = 0.921 \\
\text{NPV}_2 = \text{IR 1,260,408,071.2}
\]

Calculation of the discount factor (r1) which gives a positive NPV (NPV1) or from the calculated real interest rate and takes another discount factor (r2) that is greater than r1, resulting in a negative NPV at (NPV2) to get a positive NPV value, at a certain interest rate. And the NPV2 is added 2 to make the NPV negative but not too high. The IRR value obtained is 117.3% with the assumption that the costs incurred (Cost) and income (Benefit) are the same since the ecotourism was started. The IRR value shows feasible because the value position is greater than the prevailing interest rate, namely 6.56%. This high value of IRR is caused the calculation neglected elephant value, due to this is a grant. According to [13], this value shows the ability of capital to generate profits because the IRR value is higher than the loan interest rate or the opportunity cost of capital (OCC) and actually shows the ability of capital to generate income.

3.4. Integration of Conservation and Economic Development
According to [14], the impact of tourism on the economy can be positive and also negative. Ecotourism in many conservation areas tend to be alternative of conservation approach for raising livelihood. The economic value of ecotourism hopefully can enhance community awareness for conservation as well. These impacts can be divided into public income, job opportunities, prices and tariffs, distribution of benefits, ownership and control, development and government revenue.

The impact on community income from the use of elephants in Tangkahan is big enough, especially for the community of Namo Sialang Village and the people of Sei Serdang Village who use the sumatran elephants in Tangkahan. much to society in particular. The percentage distribution of income from tour packages both domestic and foreigner to local community especially for LPT, guide and land owner through path donation is presented in Table 7.
### Table 7. Percentage share of revenue for local community based on tour package price

| Tour Packages       | Origin  | Financial Benefits |
|---------------------|---------|--------------------|
|                     |         | LPT    | Guide   | Path Donation |
| Elephant Washing    | Local   | 13.4 % | 25.0 % | 6.00 %        |
|                     | Foreign | 13.2 % | 20.0 % | 2.40 %        |
| Elephant Grazing    | Local   | 28.6 % | 16.5 % | 1.00 %        |
|                     | Foreign | 16.4 % | 13.3 % | 0.80 %        |
| Elephant Tracking (Low) | Local | 30.8 % | 12.2 % | 0.90 %        |
|                     | Foreign | 25.2 % | 10.0 % | 0.75 %        |
| Elephant Tracking (High) | Local | 29.5 % | 13.0 % | 7.10 %        |
|                     | Foreign | 24.9 % | 11.0 % | 6.00 %        |

The percentage distribution in Table 7 is based on the price of tour packages by dividing by the total cost of the tour packages and determining the percentage of each distribution to calculate the financial benefits to the community directly from the tour packages used by sumatran elephants in Ecotourism Tangkahan, Taman Gunung Leuser National. The calculation of the community's financial income from the Sumatran Elephant will take into account the welfare of the surrounding community with the use of the sumatran elephant as a tourist attraction in Tangkahan Ecotourism, especially for the people who get the distribution, is presented in Table 8.

### Table 8. Community income from the Tangkahan Elephant tour package

| Tour Packages       | Origin  | Financial Benefits |
|---------------------|---------|--------------------|
|                     |         | LPT (IR) | Guide (IR) | Path (IR) | Count (IR) |
| Elephant Washing    | Local   | 18,760,000 | 35,000,000 | 8,400,000 | 62,160,000 |
|                     | Foreign | 115,599,000 | 175,150,000 | 21,018,000 | 311,767,000 |
| Elephant Grazing    | Local   | 692,120 | 399,300 | 24,200 | 1,115,620 |
|                     | Foreign | 35,055,000 | 28,428,750 | 1,710,000 | 65,193,750 |
| Elephant Tracking (Low) | Local | 5,850,460 | 2,317,390 | 170,955 | 8,338,805 |
|                     | Foreign | 28,828,800 | 11,440,000 | 858,000 | 41,126,800 |
| Elephant Tracking (High) | Local | 6,294,193 | 2,773,712 | 1,514,873 | 10,582,780 |
|                     | Foreign | 117,030,000 | 51,700,000 | 28,200,000 | 196,930,000 |
| Total               |         | 328,109,573 | 307,209,152 | 61,896,028 | 697,214,755 |

Based on table 8 above, it shows a very large income to the surrounding community from the elephant tourism attractions that are utilized, namely IR. 697,214,755,-. The use of sumatran elephant attractions in Tangkahan is in accordance with [15] where ecotourism is an alternative program that can be applied to improve the welfare of the local community as well as an effort that can be made to raised local participation in conservation. By developing economic based conservation is an alternative way to avoid environmental damage. This is because environmental damage will have a significant impact on development and economic growth in an area according to [16], [17]. Therefore, conservation and economic development is a package that can’t be separated each other.

### 4. Conclusions

Financial Feasibility Analysis based on the interest rate of 6.56% obtained the NPV value of IR. 181,021,329,- BCR amounting to 3.806 and IRR of 117.255%. Therefore, based on NPV, BCR, and IRR’s financial feasibility parameters, it is concluded that the Utilization of Sumatran Elephants (Elephas maximus sumatranus) in the Tangkahan ecotourism area is financially feasible to continue and be developed. The result of calculating the financial benefits of utilizing Sumatran Elephants as tour attractions in Tangkahan by people who get the results of this ecotourism is IR 697,214,755,-. All economic benefits for the local community from the ecotourism of the Sumatran elephant package tour in Tangkahan could be a potential effort to enhance conservation surrounding Gunung Leuser National Park.
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