

## **ENVIRONMENTAL ECONOMIC VALUATION at GEMBIRA LOKA ZOO YOGYAKARTA**

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### **ABSTRACT**

The Gembira Loka Zoo (GLZoo) in Yogyakarta is not only a major tourist destination but also functions as a protected forest that requires environmental conservation through environmental economic valuation. This study aims to calculate the total economic value of GLZoo's environment and provide suggestions to managers to realize sustainable environmental management. The methods used include a direct approach to market value, a travel cost method, a contingent assessment method (CVM), and prevention costs to assess the benefits generated by GLZoo. The results of the analysis show that the total environmental economic valuation of the Gembira Loka Zoo area is IDR 317,258,381,923.00. These values include direct use value, indirect use value, and preservation value. The study highlights the importance of GLZoo in supporting biodiversity conservation, environmental education, and local economic contribution. Thus, the results of this study provide a quantitative basis for more sustainable management policies in the future.

Keywords: economic valuation, environment, travel cost method, contingent assessment method, Gembira Loka Zoo, sustainable management

### **INTRODUCTION**

Gembira Loka Zoo (GLZoo), located in Yogyakarta, Indonesia, is one of the main tourist destinations that brings together education, conservation, and recreation. This zoo has a variety of animal species that attract the attention of local and international visitors. In the context of environmental economics, zoos have an important role in promoting environmental awareness, supporting biodiversity conservation, and contributing to the local economy (Atkinson et al., 2012; Fisher & Dills, 2012; Munandar et al., 2024). Based on the GLZoo 2023 Annual Report, after the Covid-19 pandemic, the number of visitors from 2021 to 2023 continued to increase to reach 890,128 visitors. The high number of visitors will affect the income of the zoo's environmental management system and require economic instruments to be able to evaluate the efficiency and management of natural resources (Sang Ayu Putu Thania Parameswari Eka Putri & Rafika Yuniasih, 2020).

One of the economic instruments that is the basis for considering natural resource management is the economic valuation of the environment. Environmental economic valuation is a method to measure the economic value of environmental benefits that are not traded in the market and is a guideline in the management of natural resources (Kementerian Negara Lingkungan Hidup, 2007). This includes benefits from habitat conservation, environmental education, and animal welfare. This approach is particularly relevant for zoos because they not only serve as recreational places but also as centers for education and research (Hidayati et al., 2023). However, special research on the

environmental economic valuation of zoos in Indonesia, especially the Gembira Loka Zoo, is still limited. Several reports on the economic valuation in zoos have been carried out by Hidayati et al. (2023) and Irsanti et al. (2020). Of the two studies, it is still limited to the aspect of travel costs and has not yet examined the overall environmental benefits of zoos.

Several other reports on comprehensive environmental economic valuation using the total economic value approach have been carried out on several natural tourism such as natural tourism parks, national parks, urban forests, and botanical gardens (Afifudin et al., 2022; Mamat et al., 2020; Masiun & Tobing, 2023; Masyruroh & Rahmawati, 2021; Munandar et al., 2024; Roslinda, 2019; Safri & Nurhayani, 2020) Several environmental benefits or services have been included in these reports on direct and indirect use value variables such as fisheries productivity, wood products, agriculture, tourism, honey, water resources, oxygen productivity, water intake, and carbon reserves. The overall economic value of each environmental service reflects rationality and is the basis for natural resource management (Kementerian Negara Lingkungan Hidup, 2007).

The environmental economic valuation of Gembira Loka Zoo is important to provide quantitative evidence about the environmental services of the existence of GLZoo. This can be used as a basis for more sustainable conservation and development policies for zoos. Thus, this study aims to evaluate the economic value of the environment through a total economic value approach to examine the environmental services of the existence of the Gembira Loka Zoo.

## **RESEARCH METHOD**

Data collection includes primary data and secondary data. Primary data collection techniques are carried out through survey methods and interviews in the form of onsite questionnaires. This study uses a direct approach with market value, surrogate market through the travel cost method, and contingency valuation method as well as to assess the benefits (products and services) produced by GLZoo. All data are then presented in a table with both single and cross-tabulation for question items that are considered to correlate with each other. To calculate the economic value of recreation places, namely by using the Total Economic Value (Kementerian Negara Lingkungan Hidup, 2007; Roslinda, 2019) which is calculated as follows:

**Total of Economic Value = Direct Use Value + Indirect Use Value + Preservation Value**

Direct use value = Pre-trip Fee + Admission Revenue

Indirect use value = Economic value of carbon absorption and water infiltration

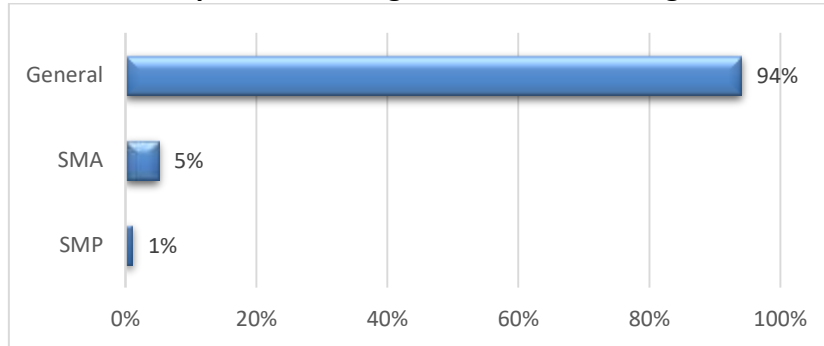
Preservation value = Operational and maintenance costs

## **RESULT AND DISCUSSION**

### **Identification of Visitor Characteristics**

One of the purposes of conducting interviews with visitors or tourists is to find out the characteristics of tourists who visit the GLZoo area based on several characteristics such as age group, region of origin, destination of visit, and frequency of visit. Based on the age group, tourists who visit the GLZoo tourist attraction area are divided into five age groups, including PAUD/ TK (3-6 years old), SD (7-12 years old), SMP (13-15 years old), SMA (16-18 years old), and general (>18 years old). Then the following data was obtained.

**Graph 1. Percentage of GLZoo Visitor Age**

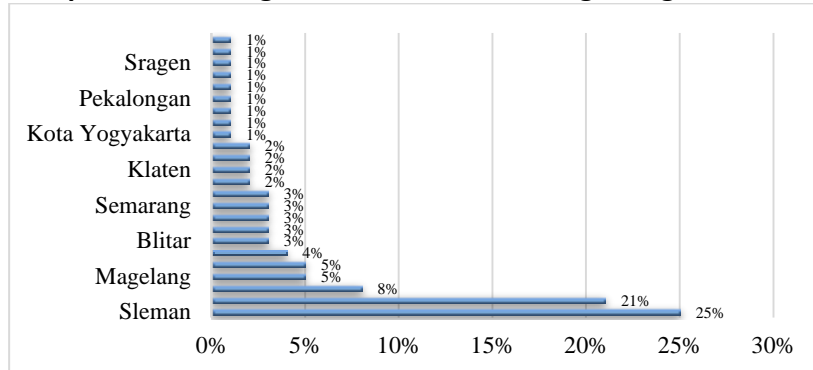


(Source: Primary Data Analysis, 2024)

Based on the results in Graph 1, it was found that the number of respondents over the age of 18 years was the majority as GLZoo visitors. The visitors of PAUD/ Kindergarten age must be escorted by adults. This shows that the majority of respondents are in the productive age range, which shows that respondents are still actively working and have the opportunity to take care of the existence of GLZoo.

Based on the results in Graph 2, it show that the most visitors came from Sleman Regency as much as 25% of the total respondents. Even some also come from outside DI. Yogyakarta.

**Graph 2. Percentage of GLZoo Visitor's Origin Region**

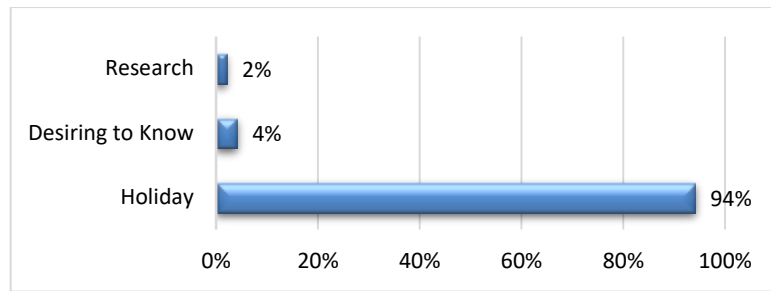


(Source: Primary Data Analysis, 2024)

Graph 2 shows that the interest of the community outside the location of the tourist attraction is large because of the need for family recreation related to nature and animal education which is increasingly difficult to obtain due to the increasingly widespread residential and industrial activities.

The results of interviews with visitors visiting the GLZoo area show that most visitors have the goal of traveling or vacationing either with family or with colleagues, which is 94% of the total respondents. The following Graph 4 presents data on the purpose of GLZoo visitors' visits.

**Graph 4. Percentage of Visitor's Purpose**

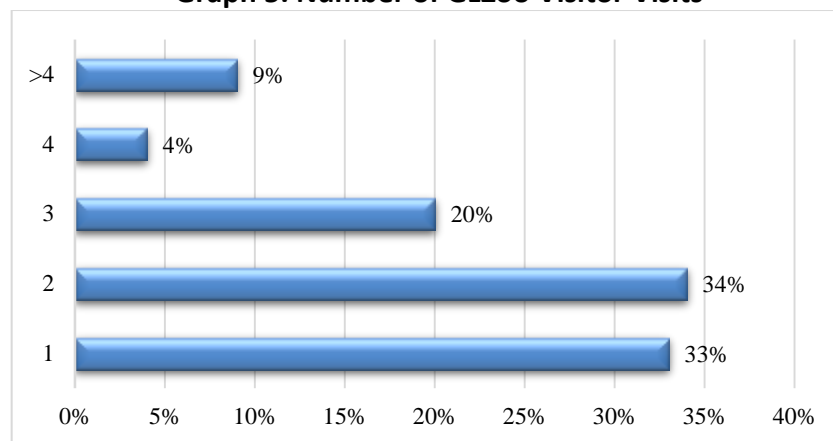


(Source: Primary Data Analysis, 2024)

Graph 4 shows that the GLZoo area is not only a tourist attraction for vacation purposes, but this tourist attraction has an attraction to be used as a research object. This condition is evidenced by the results of interviews where visitors who have the purpose of conducting research in the zoo area are 2% of the total respondents interviewed.

The number of visits to the tourist attraction area is an important thing to ask visitors. This can be used to find out about the attraction of tourist attractions according to the visitor's perspective. Here Graph 5 shows the number of visits to GLZoo visitors..

**Graph 5. Number of GLZoo Visitor Visits**



(Source: Primary Data Analysis, 2024)

Based on the results of the interview, it is known that several tourists have visited the tourist attraction area more than once, which is more than 60% of the total respondents, and some have even visited the tourist attraction area more than four times. The existence of more than one tourist visit shows that tourist attractions have interesting potential to be revisited. This condition can be used as a good opportunity for tourist attraction managers and people who are directly involved in tourism activities to further increase the potential and quality of tourist attractions so that they are increasingly in demand by many tourists.

**Direct Use Value**

**Average of Travel Cost**

Primary data from the average travel expense consists of transportation and consumption costs. Table 1 presents the data.

**Table 1. Visitors Travel Cost**

Nilai	Travel Cost of GLZoo Visitors		
	Transportation	Consumption	Total

Maximum	IDR	750,000.00	IDR	300,000.00	IDR 850,000.00
Average	IDR	153,500.00	IDR	77,500.00	IDR 231,000.00
Minimum	IDR	20,000.00	IDR	20,000.00	IDR 50,000.00

(Source: Primary Data Analysis, 2024)

### Revenue of GLZoo

The analysis of revenue was carried out by collecting secondary data and projecting secondary data in GLZoo's annual report, which is 2023. The ticket price from Monday to Friday is IDR. 60,000.00 while on Saturday and Sunday, it is IDR. 75,000.00 so the average price is IDR. 64,285.00

**Table 2. Ticket Revenue of GLZoo Year 2023**

The number of Visitor Year 2023	Ticket Price		Total
	IDR	IDR	
890,128	64,285.00		57,221,878,480.00

(Source: Secondary Data Analysis, 2024)

The calculation in Table 2 shows that GLZoo's revenue from admission tickets in 2023 is IDR. 57,221,878,480.00, where this value will be used as an economic valuation calculation.

The average travel cost that has been calculated is used to calculate the total travel cost and then added up with revenue from tickets or tickets so that the useful value is obtained directly from GLZoo. The following table 3 presents the average data on the direct use value in 2023 obtained from travel expenses with entrance ticket revenue.

**Table 3. Direct Use Value Year 2023**

Outcome	Average		The Number of Visitors	Direct Use Value	
Ticket	IDR	64,285.00	890,128	IDR	57,221,878,480.00
Travel Cost	IDR	231,000.00	890,128	IDR	205,619,568,000.00
<b>Total</b>				IDR	262,841,446,480.00

(Source: Primary Data Analysis, 2024)

The direct use value of GLZoo used for the calculation of total economic value is a use value of IDR 262,841,446,480.00

### Indirect Use Value

GLZoo has an area of 20.43 ha. Assuming 11 ha is a forest area with trees with a dense canopy and grasslands covering an area of 4.9 ha. The calculation of the total area of forest and grassland areas was measured by manual interpretation of the imagery and processed using the Geographic Information System (GIS) using Arc Gis 10.2 software. The results of spatial data processing of the total area of forests and grasslands in GLZoo can be seen in Figure 1 and Table 4 below.

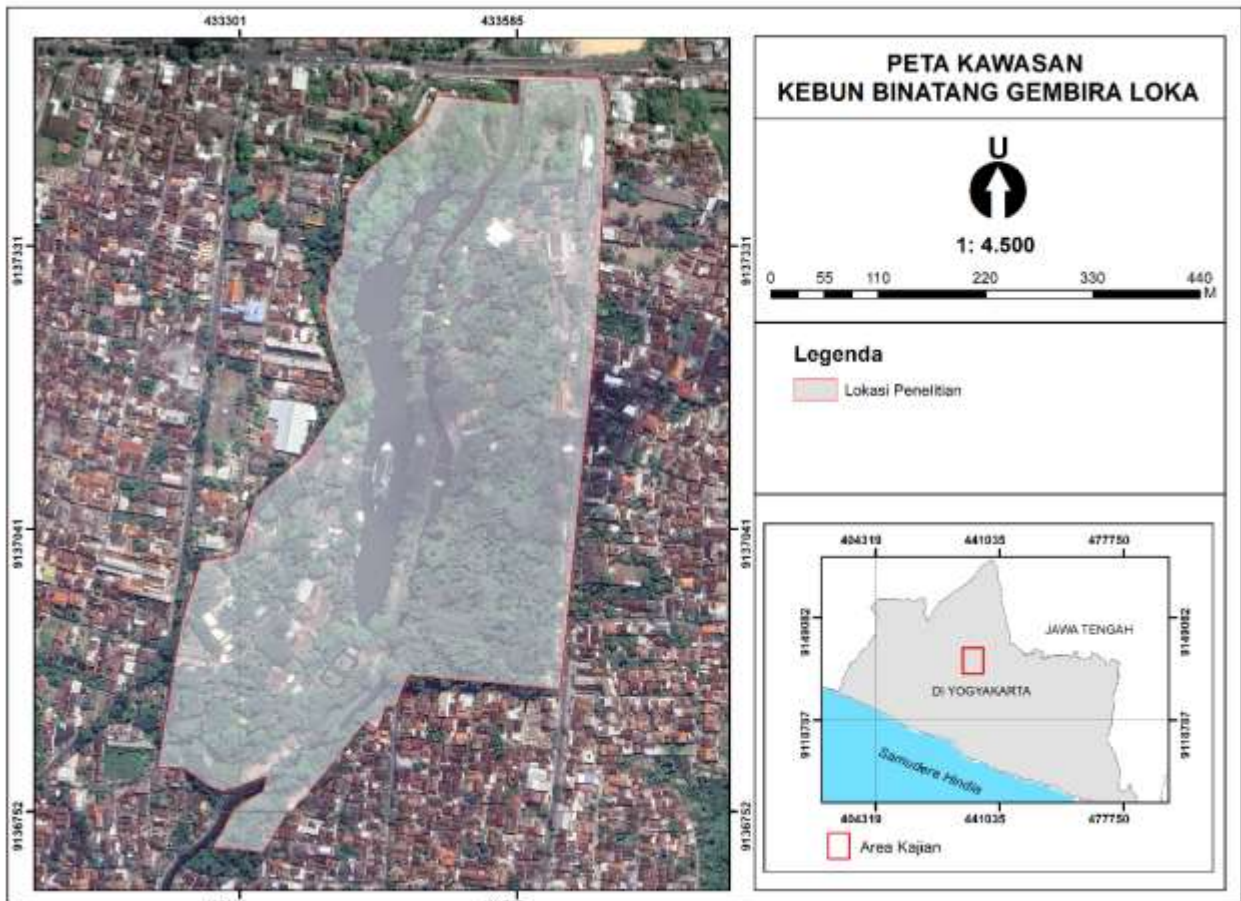
**Table 4. The Measurement of GLZoo Area**

No	Land Use	Area (Ha)
1	Water	1.83
2	Forest	11
3	Grass	4.9
4	River	1.21
5	Building	1.49
<b>Total</b>		<b>20.43</b>

(Source: Secondary Data Analysis, 2024)

The calculation of the total value of forest and grass area in this area is used to calculate the indirect use value of this area, namely regarding the economic value of CO<sub>2</sub> absorption and the economic value of water intake.

**Figure 1. GLZoo Map**



(Source: Data Analysis, 2024)

### **Economic Value of CO<sub>2</sub> Absorption**

Based on the results of Prasetyo's (2002 in Velayati, 2012) research, there are differences in carbon sequestration capabilities between forest areas, grasslands, shrubs, and agricultural land. The following is Table 5 regarding the carbon absorption capacity of various types of vegetation areas.

**Table 5. Carbon Reserves and Absorbency of Different Types of Vegetation Cover**

Cover Types	Gas CO <sub>2</sub> Absorbency (kg/ha/hour)	Gas CO <sub>2</sub> Absorbency (ton/ha/year)
Trees/ Forest	129.92	56.07
Bush	12.56	55
Meadow	2.74	12
Agricultural Land	2.74	12

(Source: Prasetyo, 2002 in Velayati, 2012)

Referring to the calculation in Table 5, the CO<sub>2</sub> gas absorption value in the Gembira Loka Zoo area is obtained which is presented in Table 6 as follows.

**Table 6. Total CO<sub>2</sub> Gas Absorption**

Type of Land Cover	A rea (Ha)	Gas CO <sub>2</sub> Absorbency (ton/ha/year)	Total of Gas CO <sub>2</sub> Absorbency (ton/ha/year)
Trees	1	569.07	6259.77

	4.		
Meadow	9	12	58.8
<b>Total</b>			<b>6318.57</b>

(Source: Secondary Data Analysis, 2024)

Furthermore, to calculate the economic value of carbon sequestration in the GLZoo area, the regular market price of carbon as of February 12, 2024, is IDR 58,800.00 or USD 3.79 per ton, so it is obtained as follows.

$$\begin{aligned} \text{Economic value of carbon sequestration} &= 6318.57 \times \text{Rp } 58,800.00 \\ &= \text{IDR } 36,074,476.00 \text{ per year} \end{aligned}$$

### **Economic Value of Water Infiltration**

The location of GLZoo is in the middle of Yogyakarta City and is an urban forest area that is still preserved. Based on a study conducted by Pancawati (2013)), urban forests can store as much groundwater as 900 m<sup>3</sup>/ha/tahun. Furthermore, to calculate the economic value of water absorption, the guideline used is Yogyakarta Mayor Regulation Number 46 of 2022 concerning Drinking Water Tariffs of PDAM Tirtamartha Yogyakarta. This regulation regulates the amount of costs incurred by Yogyakarta City residents for the use of clean water, which is Rp. 13,000.00 m<sup>3</sup>/month. From these guidelines, the results of the calculation of the economic value of forest areas as water catchment amounted to IDR 127,530,000.00.

#### *Calculation of Indirect Use Value*

From the results of the calculation of the economic value of carbon absorption and water absorption of GLZoo, the results of the indirect use value are obtained as follows in Table 7.

**Table 7. Calculation Indirect Use Value**

<b>Benefit</b>	<b>Economic Value</b>	
CO2 Absorption	IDR	368,074,476.00
Water Absorption	IDR	127,530,000.00
<b>Total</b>	<b>IDR</b>	<b>495,604,476.00</b>

(Source: Secondary Data Analysis, 2024)

### **Preservation Value**

The calculation of conservation costs or maintenance costs in economic valuation aims to calculate how much costs are incurred to improve the environment until it reaches its original condition. The approach used is the cost of prevention by calculating the actual expenditure to prevent environmental damage (Kementerian Negara Lingkungan Hidup, 2007). In this indicator, the aspects calculated are operational and maintenance costs including the cost of animal food, maintenance of animals and their habitats, asset maintenance, field operations, employee burden to the cost of visitor facilities, and promotions. From the results of data collection, it was obtained that the expenses borne by GLZoo in 2023 for operational and maintenance costs amounted to Rp. 53,921,330,967.00.

#### **Total of Economic Value**

Based on the calculation of Direct Use Value, Indirect Use Value, and Preservation, the total Economic Value of Gembira Loka Zoo is obtained as follows in Table 8.

**Table 8. Total Economic Value of GLZoo**

<b>Benefit</b>	<b>Economic Value</b>	
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Direct Use Value	IDR 262.841.446.480,00
Direct Use Value	IDR 495.604.476,00
Preservation Value	IDR 53.921.330.967,00
<b>Total</b>	<b>IDR 317.258.381.923,00</b>

From the calculation results, it was found that the Total Economic Value of GLZoo was **IDR 317,258,381,923.00**.

## CONCLUSION

Based on the results of the analysis, the economic value of the Gembira Loka Zoo area can be concluded as follows.

1. The direct use value of Gembira Loka Zoo in 2023 is IDR 262,841,446,480.00 and is obtained from the calculation of travel expenses incurred by respondents with total entrance ticket revenue.
2. The indirect use value of the Gembira Loka Zoo in 2023 is IDR 495,604,476.00 and is obtained from the economic assessment of the ecological benefits of forest areas in the zoo, namely as carbon sinks and water catchment.
3. The economic value of preservation is calculated based on the approach of operational costs incurred by the Gembira Loka Zoo.
4. The total conservation value is IDR 53,921,330,967.00 The total economic valuation of Gembira Loka Zoo is IDR 317,258,381,923.00

## SUGGESTION

Based on the results of the research analysis, the author can provide the following suggestions.

1. The addition of online promotion intensity, especially through social media, so that information about opening schedules, ticket prices, performances, and types of animals can be known by the public.
2. The addition of offline promotion intensity, for example, installing a welcome billboard at GLZoo at a strategic door when entering Yogyakarta City.
3. Maintaining care for the fauna and flora that is currently very good.

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