AN ECONOMIC AND ECOLOGICAL VALUATION OF MANGROVE ECOTOURISM USING A CHOICE MODELLING APPROACH TO ASSESS COMMUNITY PREFERENCES IN EAST KALIMANTAN

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ABSTRACT

The objective of this study is to estimate the community's willingness to pay (WTP) and to identify the factors that influence their preferences in efforts to improve the environmental quality of mangrove ecotourism areas in East Kalimantan. This research employs the choice modelling method to explore public preferences regarding the attributes of mangrove ecosystems that hold both economic and ecological value. The sample was obtained using a random sampling method, specifically by randomly selecting visitors to the mangrove ecotourism area. Data analysis was carried out using a choice modelling approach, particularly employing binary logistic regression to examine the influence of various attributes on respondents' choices. The results indicate that the average WTP for improving the environmental quality of mangrove areas is IDR 7,500. Moreover, community preferences in supporting environmental improvements are significantly influenced by several factors, including travel costs to the location, the current condition of the mangrove forest ecosystem, respondents' education levels, and the ecological and social attributes of the mangrove ecotourism site.

Keywords: *Mangrove Ecotourism, Willingness to Pay, Economic Valuation, Ecological Value, Choice Modelling, Binary Logistic Regression*

INTRODUCTION

The mangrove ecosystem is one of the most vital coastal ecosystems, playing a crucial role in maintaining environmental balance and providing economic benefits to local communities. Its ecological functions include protecting shorelines from erosion, serving as breeding grounds for various marine species, and acting as an effective carbon sink. In addition, mangroves support economic activities such as fisheries, forestry, and nature-based tourism. Indonesia hosts the largest area of mangrove forests in the world, with East Kalimantan being one of

the provinces possessing significant mangrove coverage. However, increasing pressure from human activities—such as land conversion and resource exploitation—has led to the degradation of mangrove ecosystems, posing a threat to their sustainability.

One of the key strategies for mangrove conservation is the development of sustainable ecotourism. Mangrove ecotourism not only provides opportunities for recreation and education but also serves as an alternative source of income for local communities. To develop ecotourism optimally, it is essential to understand the economic value embedded in mangrove ecosystems as well as community preferences regarding their management and conservation. The choice modelling approach offers an effective method for exploring public preferences for various mangrove ecosystem attributes.

This method enables researchers to identify the community's willingness to pay (WTP) for changes or improvements in mangrove ecosystem management. Several previous studies have assessed the economic value of mangrove ecosystems in East Kalimantan. For instance, Firman et al. (2024) conducted an economic valuation of mangrove ecosystems in Tanjung Limau Village, Muara Badak District, Kutai Kartanegara Regency, and found that the indirect benefits of mangrove ecosystems amounted to IDR 63.9 billion per year, highlighting their significance to surrounding communities. Similarly, Yusuf et al. (2023) evaluated the economic value of mangrove ecotourism in Mangrove Edu Park, Berbas Pantai, Bontang City, and discovered that the average visitor WTP was IDR 12,083.33, with annual economic value reaching IDR 248 to 261 million. However, there remains a gap in research that deeply integrates the choice modelling approach to investigate community preferences regarding specific mangrove ecosystem attributes in East Kalimantan.

This study aims to conduct an economic valuation of mangrove ecotourism and its ecological value using a choice modelling approach to uncover community preferences in East Kalimantan. The findings of this study are expected to serve as

a foundation for formulating sustainable mangrove ecotourism management policies that emphasize both conservation and community welfare

METHOD

1. Research Subjects and Location

This study was conducted in a mangrove ecotourism area located along the coast of East Kalimantan. The area serves as a popular destination for nature-based recreation, environmental education, and coastal ecosystem conservation. The research subjects consisted of visitors actively engaged in ecotourism activities and directly utilizing mangrove ecosystem services.

2. Types and Sources of Data

This research utilized both primary and secondary data. Primary data were collected through direct interviews and structured questionnaires administered to respondents. Meanwhile, secondary data were obtained from governmental institutions, official publications, conservation documents, and scientific references relevant to the economic valuation and mangrove ecotourism context.

3. Sampling Technique

The sampling method employed in this study was Random Sampling, which involves randomly selecting individuals from the population of ecotourism visitors. This method ensures that each individual has an equal chance of being selected, promoting fairness and objectivity in data representation.

4. Research Variables

This study involved several key variables:

1). Willingness to Pay (WTP): Measures the amount respondents are willing to pay for improvements in the mangrove environment.
2). Visitor Choice: Represents the alternative chosen by the respondent, coded as 0 = did not choose the improvement scenario, and 1 = chose the improvement scenario.
3). Recreation Cost: The amount of money spent by visitors on tourism activities.

4). Condition Perception: Visitors' assessment of mangrove forest conditions, coded as 1 = good, 0 = poor.
5). Education Level: Measured based on years of formal education, ranging from primary school (6 years) to undergraduate degree (16 years).
6). Location Attributes: Visitor preferences regarding infrastructure improvements, such as road development; coded as 1 = agree, 0 = disagree.
7). Analytical Approach: Choice Modelling
8). Choice Modelling (CM): This was the main approach used in the study. CM focuses on assessing individual preferences for a set of attributes structured into hypothetical choice scenarios. Respondents were asked to choose one among several scenario combinations, each representing different levels of ecosystem attributes.

5. Utility Function and Logit Model

Within the Choice Modelling framework, each alternative is assumed to have a utility value composed of two components:

$$\mathbf{Uin = Vin + \varepsilon in}$$

Dengan fungsi Vin dirumuskan sebagai:

$$\mathbf{Vin = \beta 1X1 + \beta 2X2 + ... + \beta kXk}$$

Probabilitas pemilihan suatu alternatif kemudian dihitung menggunakan rumus logistik:

$$\mathbf{P(i) = e^Vi / (e^V1 + e^V2 + ... + e^Vn)}$$

RESULTS AND DISCUSSION

1. Choice Modelling Analysis (CM)

The Choice Modelling (CM) analysis in this study was conducted to examine community preferences regarding the management and improvement of

environmental quality in mangrove ecotourism areas in East Kalimantan. Data were collected through direct interviews and questionnaire responses from 150 visitors actively engaged in ecotourism activities. After a validation process and the elimination of outlier data, a total of 141 respondent datasets were used to obtain a more stable and representative regression model.

The Choice Modelling method was applied to construct choice scenarios that reflected combinations of mangrove ecosystem attributes such as environmental condition, cost, and facilities. Respondents were asked to choose between two alternative scenarios. These choices served as the basis for indirectly estimating the Willingness to Pay (WTP).

The results of the logistic regression estimation showed the following:

1). Recreation Cost (Cost): This variable had a positive coefficient, with an Exp(B) value of 1.000. This suggests that the higher the cost incurred by visitors, the greater the likelihood they would choose the improvement scenario (Alternative A).

2). Mangrove Condition (Condition): This variable also showed a positive coefficient, with an Exp(B) value of 3.507. This indicates that visitors who perceived the mangrove forest condition as good were 3.5 times more likely to choose Alternative A compared to those who perceived it as poor.

3). Education Level (Education): This variable had a negative coefficient, with an Exp(B) value of 0.711. This implies that the higher the level of education, the lower the tendency to choose the improvement scenario—possibly because more educated visitors are more critical of the proposed environmental improvement measures.

4). Location Attributes (Attribute): This variable showed a negative coefficient, with an Exp(B) value of 0.298. This suggests that visitors who preferred improvements in public facilities *other than road access* were more likely to choose Alternative A.

Based on the logistic model results, the Willingness to Pay (WTP) was calculated using the formula recommended by Putrantomo (2010). The average

WTP of visitors to support environmental improvements in the mangrove ecosystem of East Kalimantan was estimated at IDR 7,500 per individual. With a sample size of 141 respondents, the estimated total economic value of community support for this area reached IDR 777,756. This result indicates that the public is willing to make a tangible economic contribution to the conservation of mangrove forests, forming a critical foundation for the formulation of conservation-oriented ecotourism policies in East Kalimantan.

2. Discussion

1) Influence of Recreation Cost on Visitor Choice

The findings show that recreation cost has a positive and significant influence on visitors' decisions to choose the environmental improvement scenario. The greater the cost borne by the visitor, the more likely they are to choose Alternative A. This supports the initial hypothesis that recreation costs are positively associated with visitor participation in conservation efforts. Visitors who incur higher expenses often demonstrate stronger commitment to their tourism experience and are more likely to support additional contributions, including WTP for environmental sustainability.

2) Influence of Mangrove Ecosystem Condition on Visitor Choice

The condition of the mangrove ecosystem, as perceived to be good by visitors, was found to significantly and positively influence their likelihood of selecting the improvement scenario. Visitors who find the ecosystem to be well-maintained and visually appealing tend to feel a stronger sense of responsibility and motivation to support conservation efforts. The presence of a clean, natural, and aesthetically pleasing environment often evokes satisfaction and appreciation, making visitors more inclined to support its continued sustainability.

3) Influence of Education Level on Visitor Choice

Contrary to the initial hypothesis, the results indicate a negative and significant relationship between education level and the likelihood of choosing the improvement scenario. That is, visitors with higher levels of education are less

likely to choose Alternative A. This may be explained by the possibility that highly educated individuals have more complex expectations of environmental programs. They may perceive the proposed improvements as insufficiently convincing in terms of effectiveness, transparency, or long-term impact.

4) Influence of Location Attributes on Visitor Choice

The location attribute, in this case referring to preferences for infrastructure improvements such as road access, showed a negative and significant impact on the selection of the improvement scenario. This suggests that most visitors do not prioritize road access as the main factor in supporting environmental enhancements. Instead, they may be more concerned with aspects such as educational facilities, environmental comfort, or long-term conservation values. While physical factors like muddy roads during the rainy season are notable, they are not the primary determinants in visitors' willingness to support conservation scenarios.

CONCLUSION

1. Estimated Economic Value of Mangrove Ecotourism

The analysis revealed that visitors' Willingness to Pay (WTP) for improving the environmental quality of mangrove ecotourism in East Kalimantan was IDR 7,500 per person per visit. With a total of 141 valid respondents, the estimated aggregate economic value of the mangrove ecotourism area reached approximately IDR 777,756.

2. Effect of Recreation Cost on Visitor Preferences

The recreation cost variable had a positive and significant influence on visitors' preferences toward supporting the improvement scenario. This implies that the higher the cost incurred, the greater the probability that visitors would select a better environmental management option, reflecting their higher engagement and commitment.

3. Effect of Mangrove Ecosystem Condition on Visitor Choices

Visitors' perceptions of the current condition of the mangrove ecosystem also had a positive and significant impact on their support for conservation efforts.

Those who perceived the mangrove condition as good were more willing to contribute to maintaining and enhancing environmental quality.

4. Effect of Education Level on Preferences

The education level of visitors showed a negative and significant relationship with their tendency to choose the improvement scenario. Visitors with higher educational backgrounds appeared to be more selective or critical in supporting conservation programs—possibly due to higher expectations regarding environmental management quality and transparency.

5. Effect of Location Attributes on Visitor Choices

Preferences for location attributes, especially those related to infrastructure improvements (e.g., access roads), had a negative and significant effect on the selection of conservation scenarios. This indicates that visitors do not prioritize physical infrastructure as a key factor in supporting environmental protection efforts, and may instead value other aspects such as environmental quality and educational or interpretive facilities.

6. Dominance of the Environmental Improvement Scenario (Alternative A)

The majority of respondents expressed a stronger preference for Alternative A, which offered environmental quality improvements. This highlights broad public support for the preservation of mangrove ecosystems in East Kalimantan, providing a critical foundation for formulating sustainable ecotourism management policies that align with both ecological conservation and community interests.

REFERENCES

BPS Provinsi Kalimantan Timur. (2020). *Statistik Daerah Provinsi Kalimantan Timur 2020*. Samarinda: Badan Pusat Statistik Kalimantan Timur.

FAO. (2007). *The World's Mangroves 1980–2005*. Rome: Food and Agriculture Organization of the United Nations.

Hutapea, A.B. (2009). *Partisipasi Masyarakat dalam Pelestarian Hutan Mangrove (Studi Kasus: Desa Paluh Sibaji Kecamatan Pantai Latu Kabupaten Deli Serdang, Provinsi Sumatera Utara)*. Skripsi. Medan: Universitas Sumatera Utara.

Jakfar, M. (2015). *Tinjauan Ilmiah Konservasi Alam*. Artikel. Jakarta: Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia, Badan Penyuluhan dan Pengembangan SDM.

Kustiwi, I. A., Hwihanus, H. 2023. Sistem Informasi Akuntansi Dari Sisi Audit Internal. JPEKBM (Jurnal Pendidikan Ekonomi, Kewirausahaan, Bisnis, dan Manajemen, Vol 7, No 2.

Lestari, I., & Putra, R. (2021). *Penerapan Choice Modelling dalam Menilai Preferensi Masyarakat terhadap Ekowisata Mangrove di Kalimantan*. Jurnal Ekonomi Lingkungan, 12(1), 43–55.

Noor, Y., Khazali, M., & Suryadiputra, I.N.N. (2006). *Panduan Pengenalan Mangrove di Indonesia*. Bogor: Wetland International Indonesia Programme & Ditjen PHKA.

Putrantomo, F. (2010). *Aplikasi Contingent Choice Modelling (CCM) dalam Valuasi Ekonomi Terumbu Karang Taman Nasional Karimunjawa*. Thesis. Bogor: Institut Pertanian Bogor.

Rachmawati, R., & Soedjono, E.S. (2017). *Valuasi Ekonomi Mangrove di Pesisir Kalimantan Timur: Kajian Terhadap Nilai Ekologis dan Kesesuaian Lahan Ekowisata*. Jurnal Ekosistem Pesisir, 5(2), 117–125.

Setyawan, E. (2015). *Strategi Pengelolaan Ekowisata Hutan Mangrove Berdasarkan Kesesuaian dan Daya Dukung Kawasan di Desa Pasar Banggi Kabupaten Rembang Provinsi Jawa Tengah*. Thesis. Semarang: Universitas Diponegoro.

Ulfah, S., & Zen, M. (2015). *Valuasi Ekonomi Hutan Mangrove di Pulau Dompak Kota Tanjung Pinang Provinsi Kepulauan Riau*. Skripsi. Kepri: Universitas Maritim Raja Ali Haji.

Undang-Undang Republik Indonesia Nomor 26 Tahun 2007 tentang *Penataan Ruang*. Jakarta.