

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

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ABSTRACT: Mangroves play a vital role in maintaining coastal ecosystem balance, protecting shorelines, and mitigating the impacts of disasters such as tsunamis and sea-level rise. Considering the significant contributions of mangroves to human life, the conservation of mangrove ecosystems is essential one way of achieving this is through the involvement of tourists who choose mangrove areas as ecotourism destinations. This study analyzes the factors influencing tourists' willingness to participate in the conservation of Mangrove Ecotourism, using a case study in Jerowaru Village, East Lombok. By employing the Choice Modeling approach to estimate the economic value of Bale Mangrove Ecotourism, the study found that its economic value reaches IDR 79,478,000 per month, with a Willingness to Pay (WTP) of IDR 11,354 per person. This WTP is influenced by travel costs, environmental awareness, and age.

KEYWORDS: Mangrove Conservation, Choice Modelling, Recreational Value

I. INTRODUCTION

Indonesia has the largest mangrove forests in the world (Hamzah et al., 2023; Quevedo et al., 2023), covering approximately 3.31 million hectares or about 22.6% of the total global mangrove area (Pratiwi et al., 2022). These mangrove forests are distributed along coastlines from Sumatra to Papua, making them one of Indonesia's greatest natural assets. This reflects the vast and complex nature of mangrove ecosystems in Indonesia, which serve as crucial habitats for various flora and fauna, carbon sinks, and natural coastal protectors (Akram et al., 2023; de Jong et al., 2021). Presidential Regulation No. 73 of 2012 established the National Strategy for Mangrove Ecosystem Management (SNPEM) to ensure the sustainable management of mangrove ecosystems for the well-being of the community. SNPEM includes policies, programs, and strategic actions that involve coordination between the central government, regional authorities, and various related sectors.

Mangrove forests in Indonesia are distributed across various regions with differing sizes. In Papua, mangrove forests cover an area of 1,562,905 hectares, while Sumatra has 660,445 hectares. Kalimantan possesses the largest mangrove area, totaling 688,025 hectares. Maluku has approximately 224.46 hectares of mangroves, Java around 56,500 hectares, and Bali and the Nusa Tenggara region collectively cover 39,974 hectares (Purnama et al., 2023)

However, mangrove forests face serious threats (Cahyo Wulandari, 2023; Meera et al., 2022; Syahrial et al., 2020), as their condition is often neglected due to the prevailing perception that they provide limited economic benefits and are better converted into aquaculture ponds or other land uses deemed more profitable (Diswandi & Saptutyningasih, 2019). In reality, without mangroves, coastal areas become more vulnerable to erosion and flooding, which can damage infrastructure and threaten the well-being of local communities. Currently, the condition of mangrove forests is becoming increasingly critical, necessitating serious attention to ensure the preservation of their ecological functions. Mangroves play a vital role in maintaining coastal ecosystem balance and provide significant benefits (Firdaus et al., 2021). One of their primary benefits is protecting shorelines from erosion and abrasion (Wattimena et al., 2021), as well as reducing the impact of natural disasters such as tsunamis, storms, and sea-level rise (Koh et al., 2018).

This situation urges decision-makers to make effective choices regarding the sustainability of conservation programs by taking into account local community preferences toward mangrove attributes. To achieve this goal, the Choice Modeling (CM) method one of the commonly used non-market valuation techniques has been widely applied (Ibrahim et al., 2019). Identifying tourists' preferences for destinations and natural environments is essential to improving services and facilities in tourism areas using the choice modeling approach (Saptutyningasih & Duanta, 2021). Various studies have shown that tourists visiting a destination tend to be financially willing to contribute to the preservation and maintenance of the places they visit (Othman et al., 2004). This

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

willingness is often driven by increased awareness (Saptutyningsih & Duinta, 2021) of the importance of protecting natural beauty and environmental sustainability, especially in nature-based tourist destinations such as ecotourism areas.

Furthermore, several researchers have found that tourists are willing to contribute to conservation efforts (Safa'atin & Shofwan, 2024), with higher-income tourists showing greater willingness to pay (Chang et al., 2021), as well as younger tourists (Petcharat et al., 2020). In addition, tourists with higher levels of education tend to demonstrate a greater willingness to pay for improved facilities (Chen & Zhang, 2023), and the general public is also willing to pay more for enhanced ecosystem services (Obeng et al., 2021).

Jerowaru Village in East Lombok possesses an exceptional mangrove ecosystem, which is currently being utilized for the development of an ecotourism area. The presence of extensive and thriving mangrove forests in this village offers significant opportunities for the development of sustainable, nature-based tourism. With its abundant natural potential, the mangroves in Jerowaru not only serve as coastal protection and habitats for various species, but also act as a major attraction for tourists interested in ecotourism. This initiative aims to promote the natural beauty and biodiversity of the mangroves while simultaneously providing economic benefits to the local community through the enhancement of environmentally friendly tourism activities.

The Bale Mangrove Ecotourism area in Jerowaru records a significant number of visitors, reaching approximately 7,000 people each month (Primadya, 2024). This figure reflects the considerable potential of the area as a nature-based tourism destination. However, the number of visitors could be further increased if supporting facilities such as accessibility and recreational amenities are improved and managed effectively.

Therefore, to support community welfare, it is essential to consider the sustainability of tourism. Although numerous studies on the mangrove economy have been conducted across various parts of the world, specific research on the mangroves in the Bale Mangrove ecotourism area in Jerowaru, East Lombok, using the Choice Modelling approach remains limited. This study aims to estimate the non-market value assigned by visitors to the mangrove ecosystem using the Choice Modelling method. This approach allows for the evaluation of various mangrove forest attributes with high analytical flexibility and reduces potential framing bias through a questionnaire design that accounts for substitution effects.

II. METODOLOGY

A. Research Location

This study is focused on the Bale Mangrove Ecotourism area, located in Jerowaru, East Lombok.



B. Research Method

This study uses a descriptive quantitative method. According to (Creswell, 2013), descriptive quantitative research is an approach used to describe the characteristics of a population or phenomenon in a systematic and measurable way.

C. Data Collection Techniques

This study employed a direct survey of visitors to the Jerowaru mangrove ecotourism area to understand their preferences regarding the improvement of mangrove forest quality. Data were collected through a questionnaire consisting of three sections: Section A focused on the respondents' socio-economic characteristics; Section B covered their visitation experience and site attributes; and Section C applied choice modelling to identify the factors most valued by visitors in relation to mangrove forest quality.

D. Data Analysis

The collected data were analyzed using Choice Modelling (CM), a method for assessing individual preferences toward non-market resources by presenting alternative choices consisting of various attributes and levels. CM allows for direct evaluation of the characteristics and marginal changes of each attribute, rather than just the overall product.

The hypothesis underlying the Choice Modelling (CM) framework relates to choice situations, where individual decisions toward each alternative are measured based on attractiveness or utility. This model focuses on analyzing consumer choices to

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

maximize their satisfaction in utilizing natural resources. Consumers act as decision-makers who select the alternative that provides the highest utility.

The attributes offered are as follows:

Attribute	Initial Condition	Option A	Option B
Entrance Fee	 IDR5,000	 IDR10,000	 IDR15,000
Parking Fee	 Free Parking	 IDR 1,000 (Motorcycle) IDR 3,000 (Car)	 No Parking Fee
Trash Bin	 There are few trash bins, so visitors sometimes litter carelessly.	 Adding 3 trash bins to maintain the cleanliness of the mangrove forest area.	 Adding 5 trash bins to maintain the cleanliness of the mangrove forest area.
Road	 The road is still made of dirt and stones.	 No improvements have been made to the entrance road of the mangrove forest area.	 There have been improvements to the entrance road of the mangrove forest area.
Wooden Swing	 There is 1 wooden swing.	 There are 2 wooden swings.	 There are 3 wooden swings.
Mangrove Forest Ranger	 There is no guard or staff to monitor incoming visitors.	 There is 1 guard or staff member to monitor and supervise incoming visitors.	 There are 2 guards or staff members to monitor and supervise incoming visitors.

Based on empirical studies, the regression model in this research is as follows:

Choice = f (cost vector, socio-demographic vector, community perception vector, attribute vector)

Choice = f ($\beta_0 + \beta_1 \text{TravelCost} + \beta_2 \text{Gender} + \beta_3 \text{Age} + \beta_4 \text{MaritalStatus} + \beta_5 \text{Education} + \beta_6 \text{Income} + \beta_7 \text{VisitFrequency} + \beta_8 \text{OtherMangroveVisits} + \beta_9 \text{EnvironmentalAwareness} + \beta_{10} \text{Facilities}$)

Visitor Choice Probability

To calculate the probability of visitors choosing a given alternative, the formula used is as follows (Widodo, 2013):

$$p = \frac{e^L}{1 + e^L}$$

III.RESULT AND DISCUSSION

Out of 100 respondents, 60 visitors (60 percent) chose option A, while 40 visitors (40 percent) chose option B. This indicates that visitors' awareness of improving mangrove forest quality still needs to be enhanced.

Variabel	Coefficient	Exp(B)
Gender	-0.389 (0.586)	0.678

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

Age	-0.088* (0.054)	0.916
Marital Status	0.638 (0.921)	1.893
Education	-0.056 (0.110)	0.945
Income	0.000 (0.000)	1.000
Travel Cost	0.000** (0.000)	1.000
Visit Frequency	0.024 (0.314)	1.024
Other Mangrove Visits	-0.073 (0.532)	0.929
Environmental Awareness	0.696*** (0.205)	2.006
Facilities	-0.037 (0.093)	0.963
Constant	-5.954 (2.708)	0.003

Dependent Variable: Choice (1 if the respondent chooses Option B; 0 if choosing Option A)

() indicates standard error values

*significant at $\alpha=10\%$; **significant at $\alpha=5\%$; ***significant at $\alpha=1\%$

Exp(B) for the gender variable is 0.678 with a negative regression coefficient, indicating that male visitors tend to have a lower probability of choosing alternative B compared to female visitors. The age variable has an Exp(B) of 0.916 with a negative regression coefficient, meaning that the older the visitor, the less likely they are to choose alternative B. Marital status has an Exp(B) of 1.893 with a positive coefficient, showing that married visitors are more likely to choose alternative B compared to those who are unmarried. The education variable has an Exp(B) of 0.945 with a negative coefficient, implying that the higher the education level, the lower the probability of choosing alternative B. Income has an Exp(B) of 1.000 with a positive coefficient, indicating that visitors with higher income have about the same likelihood of choosing alternative B. Travel cost also shows an Exp(B) of 1.000 with a positive coefficient, suggesting that as travel cost increases, the probability of choosing alternative B remains the same. Visit frequency has an Exp(B) of 1.024 with a positive coefficient, indicating that the more frequently visitors come, the greater the chance they choose alternative B. Experience visiting other mangrove ecotourism sites has an Exp(B) of 0.929 with a negative coefficient, meaning that visitors who have been to similar places tend to prefer alternative A. Environmental awareness has an Exp(B) of 2.006 with a positive coefficient, showing that visitors with higher environmental awareness are more likely to choose alternative B. Finally, the facilities variable has an Exp(B) of 0.963 with a negative coefficient, meaning that the better the perceived facilities, the less likely visitors are to choose alternative B, and vice versa.

Indirect willingness to pay value

$$WTP = \left[\frac{\sum_i \exp \beta_1}{\sum_i \exp \beta_1} + \dots + \frac{\sum_i \exp \beta_n}{\sum_i \exp \beta_1} \right]$$

$$WTP = \frac{ExpTC}{ExpTC} + \frac{ExpGender}{ExpTC} + \frac{ExpAge}{ExpTC} + \frac{ExpMS}{ExpTC} + \frac{ExpEduc}{ExpTC} + \frac{ExpIncome}{ExpTC} + \frac{ExpVF}{ExpTC} + \frac{ExpOMV}{ExpTC} + \frac{ExpEA}{ExpTC} + \frac{ExpFacilities}{ExpTC}$$

$$WTP = \frac{1,000}{1,000} + \frac{0,678}{1,000} + \frac{0,916}{1,000} + \frac{1,893}{1,000} + \frac{0,945}{1,000} + \frac{1,000}{1,000} + \frac{1,024}{1,000} + \frac{0,929}{1,000} + \frac{2,006}{1,000} + \frac{0,963}{1,000}$$

$$WTP = 11,354$$

The visitors' Willingness to Pay (WTP) for improving the environmental quality at Bale Mangrove Ecotourism is IDR11,354 per person. When multiplied by the monthly number of visitors, which is 7,000 people, the total reaches IDR79,478,000 per month.

The travel cost variable has a positive and significant effect on visitors' decisions to choose alternative B, which contributes to efforts to improve the environmental quality of the Bale Mangrove ecotourism in Jerowaru, East Lombok. The higher the travel

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

cost incurred, the greater the likelihood that visitors will choose this alternative, as higher expenditures reflect a strong level of commitment and interest in conserving the mangrove area. This finding is consistent with the study by (Saptutyningsih & Diswandi, 2019) in West Lombok, which also found that travel cost has a positive and significant impact on visitors' preferences in supporting mangrove forest conservation.

The gender variable has a negative but not significant effect on visitors' decisions to choose alternative B, which contributes to the improvement of the environmental quality of the Bale Mangrove ecotourism in Jerowaru, East Lombok. This insignificance indicates that gender differences do not substantially influence visitors' preferences in supporting the conservation of the mangrove area. This finding differs from the study by (Xu et al, 2020) at the Zhalong National Nature Reserve, China, which found that gender had a positive and significant effect, where women were more likely to choose options that support the improvement of ecological conditions and recreational facilities.

The age variable has a negative and significant effect on visitors' decisions to choose alternative B, which contributes to efforts to improve the environmental quality of the Bale Mangrove ecotourism in Jerowaru, East Lombok. This means that the older the visitors are, the less likely they are to choose a management alternative that supports mangrove conservation. This finding contradicts the results of the study by (Tesfaw et al, 2022) in the Eucalyptus Highlands, Ethiopia, which showed that older visitors tend to be more concerned about sustainability due to their life experiences. In the context of Bale Mangrove ecotourism, these results indicate that younger visitors tend to show a greater inclination to contribute to environmental conservation, possibly because they are more exposed to sustainability information through digital media, education, or environmental campaigns, so age cannot be considered a primary indicator of visitors' environmental awareness.

The marital status variable has a positive but not significant effect on visitors' decisions to choose alternative B, which contributes to efforts to improve the environmental quality of the Bale Mangrove ecotourism in Jerowaru, East Lombok. Visitors who are married tend to have a higher likelihood of choosing to contribute to mangrove conservation, but statistically, the effect is not significant. This means that marital status is not a determining factor in the decision-making process regarding environmental contributions. This finding aligns with the results of the study by Saptutyningsih & Diswandi (2019) in the mangrove forests of West Lombok Regency, which also showed an insignificant effect. Married visitors generally have more complex economic considerations, such as household needs and family responsibilities, making them more selective in allocating expenses for tourism activities, including environmental contributions.

The education level variable has a negative and not significant effect on visitors' decisions to choose alternative B, which contributes to efforts to improve the environmental quality of mangrove ecotourism at Bale Mangrove, Jerowaru, East Lombok. The higher the education level, the lower the likelihood that visitors will choose to contribute; however, this effect is not statistically significant. This means that education level is not a primary factor directly influencing the preference for supporting environmental conservation. This finding aligns with the results of the study by (Lee et al, 2019) in Jangsaengpo, Ulsan, South Korea, which showed that education had no significant effect on ecological tourism decisions. However, it contrasts with the findings of (Alcon et al, 2019) in southeastern Spain, which found that education significantly influenced support for changes in park management.

The income variable has a positive but not significant effect on visitors' decisions to choose alternative B, which contributes to efforts to improve the environmental quality of mangrove ecotourism at Bale Mangrove, Jerowaru, East Lombok. Although higher visitor income tends to increase the likelihood of choosing to contribute, this effect is not statistically strong enough. This indicates that income is not a primary factor directly influencing preferences for mangrove ecosystem conservation. This finding differs from the results of the study by (Tesfaw et al., 2022) in the Ethiopian highlands, which stated that income has a positive and significant effect because higher-income households are more capable of funding ecological improvement programs.

The variable of visit frequency has a positive but not significant effect on visitors' decisions to contribute to improving the environmental quality of Bale Mangrove ecotourism, Jerowaru, East Lombok. The positive coefficient indicates that the more frequently a person visits, the greater their tendency to choose alternative B, which reflects support for environmental improvement. However, the insignificance of this result shows that visit frequency is not yet a strong enough factor to significantly influence visitors' preferences. This aligns with the view that frequent visitors do not necessarily feel compelled to contribute because they perceive the current conditions as adequate or simply regard their visits as purely recreational activities (Castellanos-Verdugo et al., 2016; Jayasekara et al., 2024).

The variable of visiting other mangrove ecotourism sites has a negative but not significant effect on visitors' decisions to contribute to efforts to improve the environmental quality of Bale Mangrove ecotourism, Jerowaru, East Lombok. The negative coefficient indicates that visitors who have previously visited other mangrove ecotourism sites tend to have a lower likelihood of choosing alternative B, which reflects support for environmental improvement efforts. However, this effect is not statistically significant, meaning that experience at other mangrove ecotourism sites does not substantially influence their decision to support environmental conservation at Bale Mangrove. This finding aligns with the notion that although visitors have similar experiences

Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

at other mangrove ecotourism sites, they tend to focus more on recreational aspects rather than contributing to conservation (Amir et al., 2024).

The variable of environmental awareness has a positive and significant effect on visitors' decisions to contribute to efforts to improve the environmental quality of Bale Mangrove ecotourism, Jerowaru, East Lombok. The higher the visitors' environmental awareness, the greater their likelihood of choosing alternative B, which indicates their support for conservation efforts and environmental quality improvement. This finding aligns with the hypothesis that environmental awareness positively influences visitors' preferences in supporting the sustainability and preservation of the Bale Mangrove ecotourism environment, Jerowaru, East Lombok. The result also supports the findings of research by (Saptutyningasih & Duanta, 2021), which stated that greater environmental awareness encourages tourists to choose alternatives that better support nature conservation, even at higher costs.

The facility variable has a negative and insignificant effect on visitors' decisions to contribute to efforts to improve the environmental quality of Bale Mangrove ecotourism, Jerowaru, East Lombok. The negative coefficient indicates that visitors who are dissatisfied with the existing facilities tend to be more likely to choose alternative B, although the effect is not statistically significant. This suggests that while facilities may influence visitor comfort, this factor does not substantially affect their willingness to support the sustainability and conservation of the Bale Mangrove ecotourism environment. This result differs from the findings of (Safa'atin & Shofwan, 2024), which stated that good and adequate facilities provide comfort and have a positive and significant effect on visitors' willingness to support better management.

Visitor choice probability

Visitors of Bale Mangrove Ecotourism tend to choose alternative A with a probability of 0.6, while the probability of choosing alternative B is 0.4. This choice indicates that the majority of visitors prioritize the lower entrance fee over more complete facilities. The low environmental awareness is a factor causing visitors to be less concerned about the alternative that better supports the improvement of the mangrove forest's environmental quality.

IV. CONCLUSION

This study found that the economic value of Bale Mangrove Ecotourism from a visitor's perspective is IDR 79,478,000 per month. Meanwhile, the willingness to pay for facility improvements is IDR 11,354 per person. Travel costs and environmental awareness have a positive and significant influence on visitors' choice of alternatives, whereas age has a significant negative effect. The majority of visitors choose alternative A because of the lower entrance fee, despite the facilities being less complete.

To increase visitor participation in ecosystem conservation, improvements in accessibility through road infrastructure and public transportation are needed. Additionally, interactive education such as mangrove tours can raise environmental awareness, encourage more visits, and support conservation efforts.

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Analysis of the Recreational Value of Mangrove Ecotourism Using a Choice Modeling Approach: A Case Study of Bale Mangrove Ecotourism, Jerowaru, East Lombok

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