Exploring Tourists' Knowledge, Perceptions and Willingness to Pay on Biodiversity Conservation: Insights from Kinabalu Park, Borneo

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Abstract. The richness of biodiversity and ecotourism development in Malaysia has contributed to economic growth and human well-being. In this context, Kinabalu Park, Borneo, offers the uniqueness of biodiversity as the main attraction to local and foreign tourists. However, the economic value of biodiversity is difficult to quantify due to the non-existent market for these resources. This study explored the tourists' knowledge and perception regarding the biodiversity issues and estimated the Willingness to Pay (WTP) for Kinabalu Park's biodiversity conservation using the Contingent Valuation Method (CVM). A total of 250 questionnaires with five bid prices were distributed to local (RM3, RM6, RM9, RM12, and RM15) and international tourists (RM15, RM30, RM45, RM60, and RM75). This study reported that more than half of the respondents are willing to pay for the conservation of biodiversity. Most local and international tourists are willing to pay RM5 and RM84.05 per person, respectively. The Principle Component Analysis (PCA) in Factor Analysis showed that the "environmental" factor had the highest eigenvalue compared to the "social" factor. This finding shows that tourism has a very significant environmental attitude and preferences towards the conservation of biodiversity. The financial planning management can help the stakeholders in biodiversity conservation programs at Kinabalu Park for better governance in the future.

Keywords. willingness to pay, contingent valuation methods, biodiversity conservation, Kinabalu Park

1. Introduction
Tourism has continued to grow to become one of the largest and fastest-growing sectors in this decade. In 2018, the number of tourists crossing international borders was reported to be two years ahead of forecasts [1]. The emergence of new destinations triggers this increasing demand for traveling opened in Asia, Africa, the Middle East, and The Pacific [2, 3]. In line with being one of the largest industries, tourism is associated with the world's prime sectors such as economy, social, and environment. Therefore, the diversification of tourism is needed to meet the demand and preferences of tourists. Notably, tourism that focuses on natural ecosystems, better known as ecotourism or nature-based tourism, plays a vital role in modern tourism, which has become rapidly expanding in the recent decade in many parts of the world [4]. According to [5], ecotourism involves sustainable management and preservation of the environment and socio-culture in tourist destinations. [6] defined ecotourism as activities related to the conservation of natural areas, educating visitors on sustainability, and benefiting
local people, especially in developing countries. The natural resources contribute to direct and indirect impacts [7] in the form of ecological, economic, and sociological on humans and ecosystems. From a recreation perspective, recreational location vacations significantly contribute to economic growth and natural resources conservation [8].

In this context, nature-based tourism is vital, as it is an approach tackling the economic, social, and environmental challenges faced by rural communities. Nowadays, forest and green spaces become a way to escape from the ongoing urbanization and modern life [9]. The recreation based on nature and biodiversity has gained popularity over the year as people seek for the scenic and aesthetic value that nature held [10]. Besides that, people also seek nature experience to improve their psychological health as well as environmental stewardship. Hence tourist attractions destination based on affluent biodiversity areas have become extremely popular, especially for urban inhabitants [11,12].

Generally, Malaysia is one of the world's megadiverse countries. It is ranked the 12th globally by the National Biodiversity Index and fourth in Asia behind China, India, and Indonesia [13,14]. Indonesia, Malaysia, and the Philippines were also named the three-megadiverse countries in Southeast Asia that encompasses about 20 percent of global species [15]. In Sabah, Malaysia, Danum Valley is described as a tropical Eden serving the best nature together with the Amazon and Congo Basin [16]. Significantly, this makes Malaysia a great destination for nature lovers and thus increases the potential of ecotourism development. A few famous Malaysia ecotourism destinations are Bako National Park in Sarawak, Pahang National Park, and Kinabalu Park [17]. To alleviate poverty in rural areas, the Malaysian government has encouraged the local community to participate in the ecotourism industry [18]. Communities living close to ecotourism areas get a chance to improve their livelihood by opening small businesses like food stalls, accommodations, and gift shops [19]. These ecotourism destinations have successfully and continuously generated income for local communities over the years.

However, recently, biodiversity decline in Southeast Asia, including Malaysia, is spreading fast and has now become a severe issue. The main factor that contributes to the destruction of nature is human activities. Agricultural expansion, wood extraction, biomass burning, illegal hunting, and pollution cause biodiversity loss [15]. To some extent, the rise of the ecotourism industry has also contributed to the destruction of nature. Unsustainable management and development of resources have led to environmental pollution, landslides, floods, and river sedimentation that alter flora and fauna [20, 21]. The underlying factor that drives this scenario is the lack of awareness about the importance of biodiversity. In Malaysia, public awareness of biodiversity conservation is still considered low. A study in Sabah on indigenous people's knowledge about biodiversity shows that their knowledge is at the average level, although they have lived and connect with nature for a long time [14]. Besides that, the non-existence of a market to determine biodiversity's economic evaluation makes it challenging to determine a biodiversity area's economic value. Therefore, policymakers and governments are unable to carry out holistic biodiversity conservation.

One of the ways to support biodiversity conservation is through fundraising from entrance fees charged in ecotourism destinations. Therefore, a reasonable fee needs to be well calculated to cover the area's cost of conservation. Research and study on the value of biodiversity-rich areas must be conducted to estimate the value, thus gives a rough vision to the government and non-government agencies on the cost required for conservation, maintenance, and development. Hence, this value proves and convinces the public of how priceless biodiversity is, thus increasing their awareness and concern for nature. This awareness will then affect the public's perception and attitude in environmental stewardship. Therefore, this study has been initiated to explore the knowledge, perception, and willingness to pay at Kinabalu Park, Borneo, using the Contingent Valuation Method (CVM).
2. Materials and Method

2.1 Study Area
This study was conducted in Kinabalu Park, Sabah (6° 9' 0" N; 116° 39' 0" E), which covers an area of 754 square kilometers [22]. Seven sub-stations are administered by Kinabalu Park, namely Mesilau Sub-station, Poring Sub-station, Mongis Sub-station, Serinsim Sub-station, Nalapak North Sub-station, Wing Sub-station, Kota Belud and Panalaban Sub-station [23]. Each of these sub-stations has a different function as it is located in a different area and has its topography. Kinabalu Park is the first national park gazetted in Sabah in 1964 [24] and has also been recognized as the first World Heritage Site in Malaysia by the UNESCO World Heritage Committee in 2000 [25]. Kinabalu Park has the criteria of various ecosystems that function naturally and have various types of flora, mostly endemic species. These ecosystems are functioning in various ways due to the diverse topography factors in the area, such as the different climate and geological diversity of the mountains. Other than that, Mount Kinabalu is the highest mountain in Southeast Asia, which is 4, 095 meters above sea level (26) and the significant ecotourism attraction among local and international tourists. Kinabalu Park has been established as a Plant Diversity Center for Southeast Asia with various flora and fauna [25]. This study area has a vast habitat from the forest floor, understory, canopy layer, and emergent layer with rich tropical biodiversity.

2.2 Data Collection
One of the stated preference methods indicated is the Contingent Valuation Method (CVM), which could be used to discover the willingness to pay persons in a hypothetical scenario [27] by assessing the economic value of various non-tradable goods [28]. The willingness to pay for biodiversity conservation both between local and international tourists has been estimated using CVM. Questionnaires surveys were randomly distributed to 250 respondents at Kinabalu Park Complex from June to August 2019. During the data collection, tourists were shown visual materials to help comprehend the questions to be asked and get a deeper understanding of biodiversity. Using the Slovin formula [29, 30], the respondents' sample size was demonstrated at a 93% confidence level, and the random sampling method was used to determine the respondents. Five sections of the questionnaire were drawn up using the English and Malay languages of Part A (Sociodemographic Respondents), Part B (general knowledge on biodiversity conservation), Part C (tourists' perception on the importance of biodiversity), Part D (tourists' satisfaction on the facilities and services of the Taman Kinabalu Complex) and Part E (tourists' willingness to pay of biodiversity conservation). This study's bid prices differed based on citizenship with RM3, RM6, RM9, RM12, and RM15 for local visitors, while for foreign visitors the bids were RM15, RM30, RM45, RM60, and RM75.

2.3 Data Analysis
Using IBM SPSS Statistics Software Version 25, the data obtained were analyzed based on descriptive and statistical analysis. The descriptive analysis was conducted to obtain information on the level of knowledge and appreciation of visitors to biodiversity and willingness to pay for biodiversity conservation in Taman Kinabalu. Meanwhile, this study's statistical analysis suggests factor analysis in determining tourists' attitudes and perceptions towards the importance of biodiversity with the analysis of items/variables for the attitudinal index were carried out to achieve this goal. In order to understand the fundamental value of environmental concern among humans, the measurement of tourists' attitudes towards the environment is highly emphasized [31,32]. Previous studies have emphasized socio-psychological elements related to awareness and attitudes among individuals towards the environment to increase understanding of the environment's assessment concerning humans' attitudes [33].

The Principal Component Analysis (PCA) was used as a factor extraction technique to identify the extracted factor's eigenvalues, contributing most to the underlying factor in the ten items in this study. The attitudinal concept's score could be determined when the items fall under the factor with the highest eigenvalue, based on the items' relative factor loading, usually greater than 1.0 [34]. However, in
determining and selecting index variables for the factor loading of the statements, a value greater than 0.3 was assumed to be a significant factor [35]. Therefore, when the factor loading had a higher value, the ten items contributed significantly to the total score factor.

3. Results and Discussions

3.1 Tourist’s Biodiversity Awareness and Knowledge Level
The information on the knowledge level and awareness among respondents are highly relevant because human attitudes and preferences would be reflected in their willingness to pay for biodiversity conservation at Kinabalu Park. A total of local and international tourists selected for these studies were 200 and 50 respondents, respectively. Based on this study, the majority of the respondent was aware or has heard the term “biodiversity” (77.6 percent) and knows about the biodiversity itself (71.2 percent) (Figure 1). Not surprisingly, this scenario happens because most of the respondents are highly educated and obtained tertiary education. According to [36], formal education is essential to exposure to biodiversity conservation among society. These findings proved that the higher the level of education, the higher the public awareness of nature preservation, and they are more willing to spend some money for conservation purposes [37, 38, 39].

Besides, the result showed that most of the respondents aware and concerned about conserving biodiversity are crucial at Taman Kinabalu, Sabah, and must be implemented because of the respondents knowing that the biodiversity is under threatened [40]. The majority of respondents also know the ways of biodiversity conservation, such as not cutting down trees and replanting trees that have been cut down for environmental sustainability. Previous studies showed that a high level of education also gives the communities more knowledge on current issues regarding biodiversity that is happening on this earth and its benefit [41, 42, 43].

![Figure 1. Respondents' awareness regarding biodiversity.](image-url)
3.2 Willingness to Pay for Biodiversity Conservation

The aim of offering the bid price in this study was to conveniently estimate the tourist's willingness to pay for biodiversity conservation in monetary terms. The respondents randomly would be asked the stated bid price to determine their willingness to pay for biodiversity conservation according to respondents' categories to both local (RM3, RM6, RM9, RM12, and RM15) and international tourists (RM15, RM30, RM45, RM60, and RM75). Currently, the Sabah Park's management has charged RM3 for local tourists and RM15 for international tourist who visited the Kinabalu Park as conservation fees. The conservation fees are one way of raising funds for conservation, education, and development purposes. Since the UNESCO World Heritage Committee gazetted at Kinabalu Park as a World Heritage Site in 2000, the conservation fee has not been changed [23]. This study can indirectly provide an overview of the Sabah Park's management to revise conservation fees to increase conservation fund at Kinabalu Park.

The study's findings found that the total of respondents willing to pay for biodiversity conservation is higher than those who disagree. A total of 146 respondents are willing to pay, while only 104 respondents are unwilling to pay (Figure 2). This study's findings have similarities with some previous studies [41, 42, 44, 45]. The majority of both respondents (local and international) are willing to pay for biodiversity conservation. The total of international respondents who are not willing to pay for biodiversity conservation is lower than domestic respondents. This scenario happens because international respondents' income is higher than local respondents due to the low exchange rate [46]. Therefore, it is not surprising if international respondents are willing to pay the stated bid price. It is believed that most of the respondents are willing to pay because most of them ensuring biodiversity could be sustained for the next generation. The results were in line with other factors that influenced their willingness to pay, comprising the age, education level, job, and income [36, 43, 39, 47, 48].

![Figure 2. WTP for biodiversity conservation among local and international tourist.](image-url)
Apart from that, respondents were asked to explore their environmental attitude towards conserving biodiversity by their maximum willingness to pay. Most local respondents willing to pay a maximum of RM5 per person (29%) more than the current RM3 conservation fee for the conservation of biodiversity at Kinabalu Park (Figure 3). Based on their education level and job, in which the majority of the respondents were graduates from university and are currently employed, the respondents argued that RM5 is a reasonable conservation fee at Kinabalu Park, which is in line with the entry fee in other tourist destinations. [49] suggested that the bid price has a significant role in measuring the level of respondents’ willingness to pay. Another study showed that the higher the bid price, the fewer respondents are willing to pay [50,51].

Results also indicated that most international respondents are willing to pay a maximum of RM84.05 per person, which exceeded the current conservation fee of RM15 for international tourists (Figure 4). Furthermore, there is an international respondent offers the highest maximum willingness to pay of RM420.26 per person. In this context, Mount Kinabalu as the highest mountain in Southeast Asia located in this study area, is a significant contributing factor in respondents’ arrival at Kinabalu Park [25]. The study conducted by [53] reported that most respondents are willing to pay conservation fees to protect and improve the sustainability of the biodiversity areas. Therefore, respondents are willing to pay to maintain and conserve the study area. This study has similarities with the study done by [54] regarding the respondents’ willingness to spend a certain amount of money for biodiversity conservation. The main reason for this occurs because the respondents’ desire to maintain and use nature for an extended period has prompted the respondents to be willing to pay conservation fees [40].

![Figure 3. Maximum WTP of local tourist for biodiversity conservation.](image-url)
3.3 Factor Analysis of Tourist's Biodiversity Perception

This study used the Factor Analysis in determining the respondents' perception of the importance of biodiversity at Kinabalu Park. The findings of this study showed that the "environmental" factor had the highest eigenvalues, 5.768 compared to the "social factor," 1.141 (Table 1). [55] reports that the most prevalent behaviors influence each section in choosing the type of factor. Consequently, the human more prefers respectful the natural environment rather than doing the consumptive activities. Regarding the "environmental" factor, the respondent perceived the importance of biodiversity, including ensuring the environmental value is maintained for future use, conserving the water catchment area, protecting wildlife habitats, and maintaining the unique and exotic plants, education and research purpose, and improving air quality. In maintaining the unique and exotic plants, Kinabalu Park is well known for harboring Rafflesia, pitcher plants, 800 orchids, and 500 ferns species [56]. Therefore, biodiversity should be well managed and conserved for future generations' educational purpose and aesthetic value [57]. Humans argue that the environment's biodiversity is ecologically vital to maintaining and air quality besides protecting flora and fauna [58]. However, in the "social" factor perspective, the respondents' perception towards the importance of biodiversity comprising recreational purpose and generating ecotourism, but from the interview conducted during the data collection, most of the respondents believed that the ecotourism sector could slowly damage the biodiversity. These findings are similar to a previous study conducted by [59] which revealed that the biodiversity loss happen caused by human such as tourism activities.
### Table 1. Factor analysis of biodiversity contribution.

| Items                                                      | Factor Loadings | Mean | Standard deviation | Eigenvalue | Varians | Cronbach’s Alpha |
|------------------------------------------------------------|-----------------|------|--------------------|------------|---------|-----------------|
| **Factor 1: Environmental**                               |                 |      |                    |            |         |                 |
| Ensuring the environmental value is maintained for the future use | 0.857           | 4.69 | 0.64               | 5.768      | 57.679  | 0.902           |
| Conserving the water catchment area                       | 0.844           | 4.64 | 0.65               |            |         |                 |
| Protection of wildlife habitat                            | 0.816           | 4.68 | 0.68               |            |         |                 |
| Maintaining the unique and exotic plants                  | 0.792           | 4.64 | 0.69               |            |         |                 |
| Education and research                                    | 0.769           | 4.58 | 0.70               |            |         |                 |
| Improving the air quality                                 | 0.695           | 4.64 | 0.68               |            |         |                 |
| **Factor 2: Social**                                      | 1.141           | 11.406 | 0.860         |            |         |                 |
| Recreational purpose                                     | 0.937           | 4.28 | 0.85               |            |         |                 |
| Giving aesthetic value to visitors                        | 0.839           | 4.36 | 0.86               |            |         |                 |
| Generating ecotourism                                     | 0.741           | 4.30 | 0.82               |            |         |                 |
| Creating an interesting natural scenery                    | 0.680           | 4.42 | 0.86               |            |         |                 |

### 4. Conclusions

Biodiversity contributes to the community's environment, economy, and social aspects. This study has discovered tourists' knowledge and perception of the importance of biodiversity and their willingness to pay (WTP) for biodiversity conservation in monetary terms. This study showed that most of the respondents were aware and concerned about the significance of conserving biodiversity that exists in Kinabalu Park. The majority of local visitors and international tourists are willing to pay RM5 and RM84.05, respectively, exceeding the current entry fee charged in Kinabalu Park, which is RM3 and RM15, respectively. Factor Analysis showed that the environmental factor had the highest eigenvalue compared to the social factor. These findings reflected the visitors' awareness of the crucial relationship between biodiversity and environmental benefits and their intention to conserve the area for future generations. Therefore, based on this study, the Kinabalu Park management and policymaker can revise the entry fee to meet this willingness to pay values.
Moreover, government and non-government organizations should cooperate to promote and increase public awareness of biodiversity conservation. The forest is very vulnerable to human activities. The conserved area's degree of vulnerability depends on the degree of implementation done in the area. Therefore, park management should be more responsible for managing the resources to guarantee this ecotourism industry will continue prospering and providing social and economic benefits in the coming years. The scenario that could lead to disturbance and destruction of biodiversity should be mitigated to maintain the recognition of Kinabalu Park as a World Heritage Site in the future. Thus, law enforcement and public awareness are practical approaches to change this phenomenon by creating a more sustainable and responsible community. Society's perception and attitude toward nature will improve along with the knowledge and awareness on ecosystem importance, and it will then increase their willingness to pay or contributes to environmental stewardship, thus ensure a better future for our forest.

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