Exploring community preference for urban forest ecotourism in Palangka Raya: The role of ecosystem service awareness for sustainable city

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Abstract. This research explores community support for ecotourism programs in Himba Kahui Urban Forest, Palangka Raya, Indonesia. The urban forest, which offers numerous environmental services, is a vital component in the realization of a sustainable city. The community's role dictates the urban forest's function, including ecotourism. This study utilizes binary logit regression to measure community preference for the Urban Forest Ecotourism (UFE) program. Results showed significant positive impacts from Provisioning Services and Regulating Services, while Cultural Services had substantial negative impacts. The implication is that policymakers must consider community preferences for ecotourism programs, especially in urban forest management. This study contributes to understanding community awareness of ecosystem services and its implications on the sustainability of UFE management.

1 Introduction

Urban forests encompass the entirety of trees and vegetation within city environments, serving a vital function in delivering a variety of ecosystem services that enhance the well-being and longevity of cities [1, 2]. The urban forest fosters ecological civilization and green economic and social development by appreciating and coexisting with nature [3-5]. The extent to which urban forests benefit can differ based on the type of land use and the species present. Effective urban forest management necessitates the monitoring and quantification of ecosystem services, a process that is frequently intricate and demands substantial allocation of resources [6-8]. In addition, climate change may affect the types of trees that can survive in urban environments. One of the new uses of urban forests is as a natural recreation site called ecotourism.

Forest ecotourism programs are faced with a number of challenges that require serious attention. First, defining and implementing sustainable practices in the context of forest ecotourism is difficult without clear guidelines, especially in maintaining a balance between economic growth and ecological integrity [9]. Second, finding the right balance between

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conservation efforts and tourism development is a significant challenge that requires deep thinking. Furthermore, inadequate infrastructure issues, including lack of transportation facilities, sanitation, improper waste management, and sustainable energy systems, can lead to adverse environmental degradation [10]. Finally, political instability and social problems can be serious obstacles to the implementation of forest ecotourism projects. A study from [11] noted that understanding and fulfilling public preferences are critical to the success of these projects. Therefore, comprehensive planning and implementation of forest ecotourism management strategies are indispensable to overcome these challenges and ensure the long-term sustainability of urban forest utilization.

Within the field of forest ecotourism and community preferences, particularly in the context of urban forest management and urban planning and their connection to understanding forest ecosystem services, there are various areas of research that have not been adequately explored, as indicated by the existing literature. Study [12] used scientometrics to conduct an in-depth systematic review of research and development in the field of ecotourism. This provides insight into the evolution of ecotourism and its impact on sustainable development. Furthermore, a study from [13] examined the importance of community involvement in the successful development of the ecotourism industry. This study used the strengths, weaknesses, opportunities, and threats methodology and analytical network process techniques to determine the importance of strategies that deal directly with local communities compared to other ecotourism development strategies. Then, the study of [14] was analytical in nature and based on the process of practical planning and environmental design. This paper discusses the principles and criteria of ecotourism planning for sustainable development. Based on several references to previous research, there is still a need for a study that provides an overview of community preferences for urban forest utilization programs as ecotourism. The role of public awareness of forest ecosystem services is thought to have an impact on these preferences [15], but so far there are still rare studies that look at this aspect as a driver of community adoption. Therefore, further research is needed to understand public preferences in the context of urban forest management and urban planning, including their impact on the success of forest ecotourism projects and their integration into urban forest management strategies. These gaps indicate the need for a more holistic approach to urban forest management and urban planning that involves active community participation, with a focus on understanding and addressing urban forest services and disservices from the perspective of public preferences.

This study examines residents' attitudes regarding urban forest ecotourism. The analysis's findings aim to help urban forest managers and decision-makers sustainably manage urban forests according to community wishes. This investigation focuses on the Himba Kahui urban forest located in Palangka Raya City, Central Kalimantan Province, Indonesia. As per Decree number 98 of the Mayor of Palangka Raya (2010), the Himba Kahui urban forest is designated as an Urban Forest Ecotourism (UFE) destination. Public studies, notably those on bordering community preferences and forest ecosystem service awareness, have not been included in the implementation. This study assesses community attitudes towards the UFE program and forest ecosystem services. Policymakers can improve urban forest management sustainability by addressing and comprehending local citizens' wishes.

2 Method

2.1 Location, sample and survey

The study was conducted in the Himba Kahui urban forest of Palangka Raya city, which is situated in the province of Central Kalimantan. The Himba Kahui urban forest is situated at
the following geographic coordinates: 113° 52' 01" to 113° 55' 27", East, and 2° 8' 25" to 2° 11' 15", LS [16]. The Himba Kahui urban forest area is administratively situated in the villages of Palangka, Petuk Katimpun, Bukit Tunggal, and Petuk Katimpun, all of which are located in the Jekan Raya District, and Tumbang Rungan, which is situated in the Pahandut District. The respondents targeted for this investigation are urban forest-dwelling residents. A convenience sampling technique was used to capture respondents, meaning that only residents who were willing to answer questions were included in the analysis of this study. The survey was conducted from August to October 2023.

Fig. 1. Map of Himba Kahui Urban Forest, Palangka Raya City, Central Kalimantan

2.2 Questionnaires and data analysis

Responses were gathered from participants via a structured questionnaire. The survey comprised a number of inquiries pertaining to the social attributes of the participants, their level of knowledge regarding forest ecosystem services, and their inclination towards UFEs. Google Forms was utilized to disseminate the questionnaire in order to streamline the process of data entry. Descriptive statistics were subsequently applied to the gathered data in order to ascertain the distribution profile of the respondents with respect to their social attributes; the results are presented in the form of frequency and mean. By utilizing frequency and mean, descriptive statistics can offer a comprehensive depiction of the data's characteristics and distribution. In addition, assessments of validity and reliability were performed to determine the appropriateness of instruments utilized in the context of forest ecosystem service awareness.

In order to estimate the preferences of respondents regarding the UFE program, binary logistic regression was applied to the "Agree" and "Disagree" responses that were collected. Answers indicating disagreement were assigned the value 0, whereas answers indicating agreement were assigned the value 1. The primary aim of binary logit regression is to calculate the likelihood that the dependent variable, which in this instance represents agreement with the UFE program, will assume the value 1 (indicating agreement), by considering the independent or predictor variables that are associated with it [17].
Alternatively stated, binary logit regression facilitates comprehension of the degree to which specific variables impact an individual's propensity to "Agree" with the UFE program. Predictions can be made and a greater understanding of the factors that influence respondents' preference for UFE programs can be gained from the findings of this analysis.

The covariates examined in this study to impact the choices of residents are three variables related to awareness of forest ecosystem services: provisioning services, regulating services, and cultural services. The variables were extracted from reference [3]. The study will evaluate the influence of each of these characteristics on the likelihood that an individual will "Agree" to take part in the UFE program. The coefficients for each of these parameters can be derived from the results of the binary logit regression analysis.

A positive coefficient would indicate that the factor has a positive impact on the likelihood of "Agree," while a negative coefficient would indicate a negative impact. For example, if the coefficient for Provisioning Services is positive and significant, then this indicates that the higher the level of awareness of forest ecosystem services related to Provisioning Services, the more likely they will "Agree" to the UFE program. Similarly, if the coefficients for Regulating Services or Cultural Services are positive and significant, the same applies to these factors. In addition, the binary logit regression analysis can also provide information on how strongly each factor influences residents' preferences. This can be evaluated by looking at the significance value and odds ratio for each coefficient.

3 Result

The variables examined in the table pertain to economic factors, demographic characteristics, and preferences. With regard to gender, the proportion of male respondents is the most significant (64.706%), whereas the total number of female respondents amounts to approximately 35.294%. The highest level of education attained by the majority of respondents is a Master's (46.569%) or Bachelor's (46.078%), respectively, signifying a background in higher education. The data regarding the respondents' marital status reveals that the married constitute the majority (83.333%). With 84.804% of the respondents being civil servants (PNS), this is the most prevalent occupation. With respect to their inclination towards Himba Kahui Ecotourism, the majority of participants (91.667%) expressed their support. Himba Kahui Forest is situated 3.51 kilometers from the mean residence of respondents, with a standard deviation of 2.29 kilometers. The respondents' mean age was recorded as 43.85 years, accompanied by a standard deviation of 6.76. In contrast, their mean monthly income was approximately IDR 9,005,000, with a standard deviation of IDR 3,967,000. This result indicates that the findings of this study are more representative of the views and understanding of the highly educated group. The demographic characteristics dominated by respondents with higher education backgrounds suggest that the survey results tend to reflect a more educated perspective. As such, these results can be considered as a more in-depth representation of the mindset and preferences of individuals who have gone through higher education. The implications of these findings can provide an in-depth look into ecotourism preferences and participation among people with higher education backgrounds, certain employment statuses, and different marital conditions.

The outcomes of interitem correlations on the Awareness of Forest Ecosystem Services instrument, comprising three primary factors—Provisioning Services, Regulating Services, and Cultural Services—are displayed in Table 1. All statements within the Provisioning Services factor exhibit significant and positive correlations (p < 0.001). This suggests that there is a tendency for respondents who concur with one statement in this factor to also agree with the remaining statements. An illustration of this can be seen in the significant positive correlation between the statement pertaining to the role of urban forests in the production of wood and wood products and the statement concerning urban forests' provision of fruits, nuts,
or other food items. Positive and statistically significant correlations were also identified among all statements on the Regulatory Services factor (p < 0.001). This finding suggests that favorable attitudes towards one facet, such as the capacity of urban forests to mitigate flood hazards, are positively associated with attitudes toward other aspects, including local climate regulation or the role played in carbon sequestration. In the context of the Cultural Services factor, correlations between all statements were found to be positive and statistically significant (p < 0.001). This finding indicates that participants who acknowledge the therapeutic and meditative advantages of urban forests are also more likely to appreciate their cultural significance and function as community gathering spaces.

Table 1. Characteristics of respondent visits.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Mean</th>
<th>Corr.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Provisioning Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban forests produce wood and wood products.</td>
<td>4.52</td>
<td>0.78***</td>
</tr>
<tr>
<td>Urban forests provide fruits, nuts, or other forageable food.</td>
<td>4.37</td>
<td>0.83***</td>
</tr>
<tr>
<td>Trees in urban forests support bee populations and produce local honey.</td>
<td>4.66</td>
<td>0.60***</td>
</tr>
<tr>
<td>Mushrooms and medicinal plants can be gathered from urban forests.</td>
<td>4.54</td>
<td>0.68***</td>
</tr>
<tr>
<td>Urban forests enhance air quality by producing oxygen and filtering air pollution.</td>
<td>4.79</td>
<td>0.31***</td>
</tr>
<tr>
<td><strong>Regulating Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban forests lower flood risk by absorbing rainwater and reducing water flow.</td>
<td>4.64</td>
<td>0.67***</td>
</tr>
<tr>
<td>Urban forests regulate local climate, offering shade and cooling in hot weather.</td>
<td>4.56</td>
<td>0.71***</td>
</tr>
<tr>
<td>Trees in urban forests sequester carbon, lessening climate change impact.</td>
<td>4.74</td>
<td>0.61***</td>
</tr>
<tr>
<td>Urban forests prevent soil erosion, preserving soil fertility and structure.</td>
<td>4.59</td>
<td>0.69***</td>
</tr>
<tr>
<td>Urban forests serve as noise barriers, reducing urban activities' noise pollution.</td>
<td>4.56</td>
<td>0.68***</td>
</tr>
<tr>
<td><strong>Cultural Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban forests enhance mental well-being by offering spaces for relaxation and meditation.</td>
<td>4.55</td>
<td>0.66***</td>
</tr>
<tr>
<td>Urban forests host events and celebrations, contributing to the city's cultural identity.</td>
<td>4.41</td>
<td>0.69***</td>
</tr>
<tr>
<td>Trees in urban forests offer chances for outdoor education and nature appreciation.</td>
<td>4.56</td>
<td>0.66***</td>
</tr>
<tr>
<td>The aesthetic beauty of the urban forest inspires tranquility and creativity.</td>
<td>4.57</td>
<td>0.66***</td>
</tr>
<tr>
<td>Urban forests act as community gathering places, fostering social cohesion.</td>
<td>4.49</td>
<td>0.68***</td>
</tr>
</tbody>
</table>

Note: Corr. = Correlation; *** significance at 99% level; ** significance at 95% level; * significance at 90% level.

In this investigation, awareness of forest ecosystem services is assessed using three variables [3]. Overall, respondents are aware of urban forest ecosystem services. Urban woods produce timber and wood products efficiently, indicating a high level of consciousness (4.52 on the Likert scale for Provisioning Services). The mean awareness score for urban woods' ability to produce fruits, berries, and other food sources was 4.37. With an average rating of 4.66, statements regarding the contribution of urban forests to local bee populations and honey production were also well received. Urban forests supply non-timber forest products like medicinal plants and fungi, scoring 4.54. Urban woods reduce flood danger, regulate climate, and sequester carbon, making them effective Regulators. The Likert scale averaged 4.64, 4.56, and 4.74 for these assertions. This shows a good understanding of urban
forests' disaster risk management, climate change mitigation, and cooling impacts. Furthermore, urban forests are judged to function as a pollution barrier (4.56 on average) and prevent soil erosion (4.59 on average). Within the realm of cultural services, urban forests were lauded for their capacity to furnish areas conducive to tranquillity and contemplation (mean 4.55), accommodate festivities and gatherings that enrich the cultural identity of the municipality (mean 4.41), and offer prospects for outdoor education and the cultivation of an appreciation for nature (mean 4.56). With an average rating of 4.57, the aesthetic appeal of urban forests is also acknowledged as a wellspring of inspiration for serenity and innovation. With an average score of 4.49, urban forests are also regarded as community gathering places that promote social cohesion.

The outcomes of the logit regression estimation are displayed in Table 2. These results provide insight into the impact of the forest ecosystem service awareness factor on preferences for UFEs. The McFadden R² value of 0.195 and the Nagelkerke R² value of 0.243 offer insights into the model's ability to account for the variability observed in community preferences regarding the Himba Kahui Ecotourism program. Despite their comparatively low values, the McFadden and Nagelkerke R² coefficients continue to provide insights into the fluctuations observed in community preferences. The present study employed logit regression to examine the impact of environmental service variables on individuals' inclinations towards endorsing ecotourism in urban forests. The independent variables in this model include Provisioning Services, Regulating Services, and Cultural Services, with people's preference for ecotourism (agree or disagree) as the dependent variable. The results of the analysis show that Provisioning Services, which includes benefits such as the provision of clean water and food, has a significant positive coefficient (0.36, p<0.001), signifying that an increase in this type of service increases the log odds of preference for ecotourism by 36%, with an odds ratio of 1.44. This indicates that the more provisioning benefits people perceive, the higher the likelihood of their support for ecotourism. Meanwhile, Regulating Services also showed a significant positive effect (0.31, p<0.01) on ecotourism support, with a 31% increase in log odds for each unit increase in regulating services, such as flood and climate control, reflected in an odds ratio of 1.37. In contrast to these two service types, Cultural Services proved to have a significant negative influence (-0.38, p<0.01) on ecotourism preferences, with a 38% decrease in log odds for each unit increase, interpreted through an odds ratio of 0.69. These results suggest that the higher the perception of cultural services provided by the forest, the lower the community support for ecotourism, indicating a potential conflict between the preservation of cultural values and the development of ecotourism.

### Table 2. Coefficient estimate of the impact of ecosystem service awareness on community preferences for the Himba Kahui ecotourism program.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Estimate</th>
<th>Odds Ratio</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>-4.21</td>
<td>0.02</td>
<td>4.29</td>
</tr>
<tr>
<td>Provisioning Services</td>
<td>0.36***</td>
<td>1.44</td>
<td>0.09</td>
</tr>
<tr>
<td>Regulating Services</td>
<td>0.31**</td>
<td>1.37</td>
<td>0.19</td>
</tr>
<tr>
<td>Cultural Services</td>
<td>-0.38**</td>
<td>0.69</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Notes: Agree answer coded with 1; Disagree coded with 0; McFadden R² = 0.195; Nagelkerke R² = 0.243; *** significance at 99% level; ** significance at 95% level; * significance at 90% level.

### 4 Discussion

Ecosystem provisioning services provide humans with food, water, timber, and other goods. These services are vital to ecotourism and other tourism sectors. This study found that service visibility enhances UFE approval. UFE tourism requires food, water, and energy
provisioning. This supports the findings of [18] which states that natural resource dependency creates a direct correlation between provisioning services and ecotourism. In addition, [19] adds to the discussion that perceptions of landscape change, such as forest loss or land use intensification, can affect the flow of ecosystem services, including provisioning services. Ecotourism relies on natural resources; therefore, these changes can damage it. Provisioning services are key to ecotourism and must be managed sustainably. Over-exploitation of these services can lead to environmental degradation, which in turn can negatively impact ecotourism [20].

The findings of this study show that regulating services affect community preferences for forest ecotourism programs. Regulating services are derived from the regulation of processes in ecosystems, especially in forest ecosystems including climate regulation, flood control, water filtration, carbon capture, and soil fertility maintenance. This illustrates how ecotourism, a form of tourism that focuses on ecological and social sustainability, relies heavily on these regulating services. For example, forests play an important role in regulating local and global climate, creating a favourable environment for ecotourism activities [21]. In addition, ecotourism often encourages forest conservation efforts, which in turn contribute to carbon capture [22]. However, it is important to remember that ecotourism must also play a role in conserving these services, as overexploitation can result in ecosystem degradation that negatively impacts the environment and the ecotourism industry in the long run. Therefore, sustainable practices in ecotourism to maintain a balance between tourism benefits and ecosystem preservation need to be emphasized in forest ecotourism programs.

Cultural services—spiritual enrichment, cognitive development, contemplation, recreation, and aesthetic experiences—can occasionally reduce people's inclination for forest ecotourism. According to this study, the more people value cultural services, the less likely they are to vote for forest ecotourism. This is in line with the literature review of [23] which states that some of the main reasons include the degradation of natural resources due to increased tourism, which can damage the attractiveness of the natural environment by disturbing vegetation and causing other ecological impacts. In addition, forest ecotourism can lead to the commodification of local culture, where local traditions and customs are modified or presented for tourist consumption, which can result in a loss of cultural authenticity and negatively impact the attractiveness of the destination [24]. Increased tourism can also lead to social and cultural problems such as begging and increased theft, which can damage perceptions of the destination and deter potential visitors. In addition, ecotourism can sometimes exacerbate power imbalances related to race, nationality, caste/class status, and gender, which can cause tensions between visitors and local communities, with negative impacts on the visitor experience [25]. Finally, infrastructure development to support ecotourism can alter the natural landscape and reduce its attractiveness. In conclusion, while cultural services can enhance the attractiveness of forest ecotourism, they can also have negative impacts if not managed sustainably.

5 Conclusion

The study revealed that environmental services, which include provisioning services, regulating services, and cultural services, have different influences on people's preferences for forest ecotourism. Provisioning services, which include providing food, clean water, and other goods, significantly positively impact support for ecotourism. This indicates that the higher the perception of provisioning benefits, the higher the likelihood of individuals supporting ecotourism. Regulating services, which involve climate regulation, flood control, and water filtration, also significantly impact ecotourism preference. This suggests that awareness of the importance of ecosystem regulation in maintaining the sustainability of ecotourism positively influences people's choice of it. However, cultural services, including
spiritual enrichment, cognitive development, reflection, and aesthetic experience, significantly negatively impact ecotourism preferences. The higher the value of cultural services the community perceives, the lower their likelihood of supporting ecotourism. This finding indicates a potential conflict between the preservation of cultural values and ecotourism development. Therefore, understanding the role of various environmental services in influencing community preferences for forest ecotourism is essential in designing sustainable ecotourism management and promotion strategies. Practical policy implications for Kahui Forest managers are to promote provisioning services, properly manage and regulate services, preserve local cultural values, sustainably develop infrastructure, and increase education and awareness about environmental and cultural values. With this approach, managers can establish sustainable ecotourism, optimize the potential of ecological services, and maintain the integrity of the ecosystem and local culture, with benefits for the tourism industry, local communities, and environmental conservation.

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