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Ecotourism as a Strategy for Tourism Development in the Blumbang Gede lake area, Soso Village, Blitar Regency, Indonesia

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Abstract

The Blumbang Gede lake area in Soso Village, Blitar Regency, holds great potential for ecotourism development due to its natural beauty and biodiversity. This area is designated as a lake conservation zone in the Blitar Regency Spatial Plan and faces issues such as poor waste management, inadequate infrastructure, and insufficient governance. Although ecotourism in protected areas has been widely discussed, few studies have linked the concept of ecotourism to priority-based strategic planning for lake ecosystems. This study aims to formulate tourism development guidelines for the Blumbang Gede lake area. Data were collected through in-depth interviews with four key informants, field observations, and a literature review. Content Analysis (CA) was used to determine ecotourism characteristics, while the Analytic Hierarchy Process (AHP) was used to identify priority development aspects. The integration of CA and AHP facilitated the transfer of qualitative ideas from stakeholders into quantifiable priority weights, thereby enhancing analytical precision and reducing subjectivity. The formulation of development guidelines was conducted using a qualitative descriptive method to process data regarding characteristics, priority criteria, and current best practices. This study identified 20 characteristics in the Blumbang Gede lake area, with conservation as the highest priority (0.338) to maintain water quality, prevent erosion, and preserve ecosystem balance. The development direction is toward sustainable ecotourism. Theoretically, this study contributes to the development of an integrated analytical framework, and practically, it provides a prioritization model to guide resource allocation and conservation-oriented ecotourism planning in the lake area.

Keywords: Blumbang Gede lake area, Conservation, Community Participation, Ecotourism, Tourism Development

1. Introduction

Ecotourism involves traveling to natural destinations to preserve the natural environment and protect the lives and well-being of local communities [1]. The development of ecotourism aims to preserve and protect biodiversity and natural ecosystems while creating sustainable economic opportunities for local communities [2]. Ecotourism can be a source of income for local communities while protecting local culture and the environment [3]. Active community participation in the development of ecotourism will ensure that tourism activities do not damage the environment but rather support conservation efforts [4].

Ecotourism differs from conventional tourism in that it does not require expensive or wasteful subsistence. All equipment is adapted to the landscape and ecosystem. The implementation is simple, and the main attraction of ecotourism is the authenticity of the environment, flora and fauna, preservation of traditional arts and culture, and the creation of a peaceful balance between human and natural life [5]. Ecotourism offers the opportunity for everyone to see, learn, and experience nature and the intellectual and cultural wealth of local communities in a tangible way [6]. The development of the ecotourism concept is regarded as a governance approach aimed at bridging ecological and economic interests. However, in practice, ecotourism development is often confronted with a dilemma between conservation objectives and commercialization issues. This situation makes it difficult to maintain long-term sustainability. Therefore, implementing ecotourism requires priority-based management mechanisms that can systematically balance these competing interests.

Among the districts where the concept of ecotourism can be developed is the municipality of Blitar in East Java [7]. One of the ecotourism potentials in Blitar Regency is the Blumbang Gede Lake area. Blumbang Gede lake area, also known as Nyunyur Reservoir, is a tourist attraction located in Soso Village, Gandusari District, Blitar Regency. According to the Blitar Regency Tourism Development Master Plan (RIPPARKAB) for 2021-2035, the Blumbang Gede lake area is included in the Special Tourism Strategic Area (KSPK) of Mount Kelud-Sirah Kencong-Rambut Monte and its surrounding area and in the Special Development Area (DPK) of Kelud-Kawi Slope [8]. Blumbang Gede lake area, known as Nyunyur Reservoir, is categorized as a protected area based on the Blitar District Spatial Plan [9]. As a protected area, all activities and developments are strictly regulated to limit environmental impacts. The lake area is within the lake area border protection area and has a spring on its north side [10]. Therefore, the zoning laws suggest that the boundary marking is crucial for the protection of springs and the promotion of ecotourism activities.

The Blumbang Gede lake area in Blitar Regency has a significant potential for ecotourism, supported by its natural beauty and different ecosystems. The lake is situated in a protected area, providing a unique visitor experience and highlighting the significance of conservation. The region of this lake has been a popular attraction for local tourists, who come largely for its tranquil surroundings and views of Mount Kelud [11]. The lake region often serves as a natural development of the community for fishing and family picnics. Its strategic location on the tourism route of the subdistrict of Gandusari, close to the tourist settlements of Semen and Rambut Monte, and easy access from several sites in the Blitar district further reinforce its attraction. The destination also benefits from ecotourism activities like stand-up paddle boarding and SAR training. The potential of the Blumbang Gede lake area, if managed properly, can be a very gratifying tourism destination for lovers of nature. Blumbang Gede lake area is being developed as a major tourist attraction. The government support might be illustrated by the pilot project on priority areas for agricultural changes in the village of Soso [9].

The Blumbang Gede lake area has a very good potential for ecotourism, however several concerns have not been overcome yet. The main issues are environmental preservation, waste management and lack of services such as basic catering and parking. Observations indicate the presence of litter and algae, which degrade the purity and quality of the lake water. The sustainability of ecotourism development is weakened by poorly integrated waste management, which affects environmental quality and the reputation of tourist locations [12]. The tourism industry is also affected by algal growth in lake waters. A decline in the lake area's aesthetic appeal as a natural tourist destination, disturbance of the aquatic ecosystem, and decreased visitor comfort, which shortens visitors' stays, are just a few of the effects of the algae growth explosion on the tourism industry [13]. In terms of accessibility, there is still a need for improvement because some of the paths leading to the lake area are village roads that do not adequately accommodate the comfort of large numbers of visitors [11]. In addition to potentially decreasing interest in going, these issues affect how comfortable travellers are when they are there. On the other hand, the management of the destination is unclear, whether it is under village or local government control. Collaboration between the government, destination managers, and the community is essential to overcome this challenge in lake areas.

Given the potential, challenges, and support of the local authorities and the research center in the protected area, it is necessary to steer the development of tourism towards conservation, both for managers and visitors. Therefore, the development concept for the Blumbang Gede lake area is to adopt ecotourism. The urgency of developing tourism using this concept is to preserve the natural environment and biodiversity and raise awareness among the public and tourists of the importance of protecting the environment. This effort is also aimed at becoming one of the regional developments of Soso Village, turning the Blumbang Gede Lake area into an attractive, environmentally friendly natural tourism destination, and improving the local community's economic well-being through sustainable tourism activities.

Although many studies related to ecotourism have been conducted, research using the concept of ecotourism as a guideline for tourism development in the Blumbang Gede lake

area has never been done before. This study uses the Content Analysis (CA) method to identify the characteristics of the Blumbang Gede lake area and the Analysis Hierarchy Process (AHP) method to quantitatively prioritize ecotourism development. Unlike other ecotourism studies, this study facilitates decision-making based on stakeholders' perspectives. In this study, the AHP method was used as an approach to multi-criteria decision-making. Theoretically, this study contributes to the literature on ecotourism model development through a priority analysis approach that qualitatively links ecotourism characteristics.

2. Materials and Methods

2.1. Description of Research Location

The research site is in Soso Hamlet and covers the Blumbang Gede lake area in Soso village, Gandusari Subdistrict, Blitar Regency. Geographically, the village is situated on the slopes of a mountain, and most of its surface is covered by plantations and farmland (Figure 1). Most villagers in Soso rely on subsistence farming, plantations, and fish farming. The Blumbang Gede lake area alone covers 5,244 hectares. This area is free land, which has not been certified, and is the inverse of the land redistributed in 2022. Meanwhile, the surrounding area has been certified with a Certificate of Ownership (SHM).

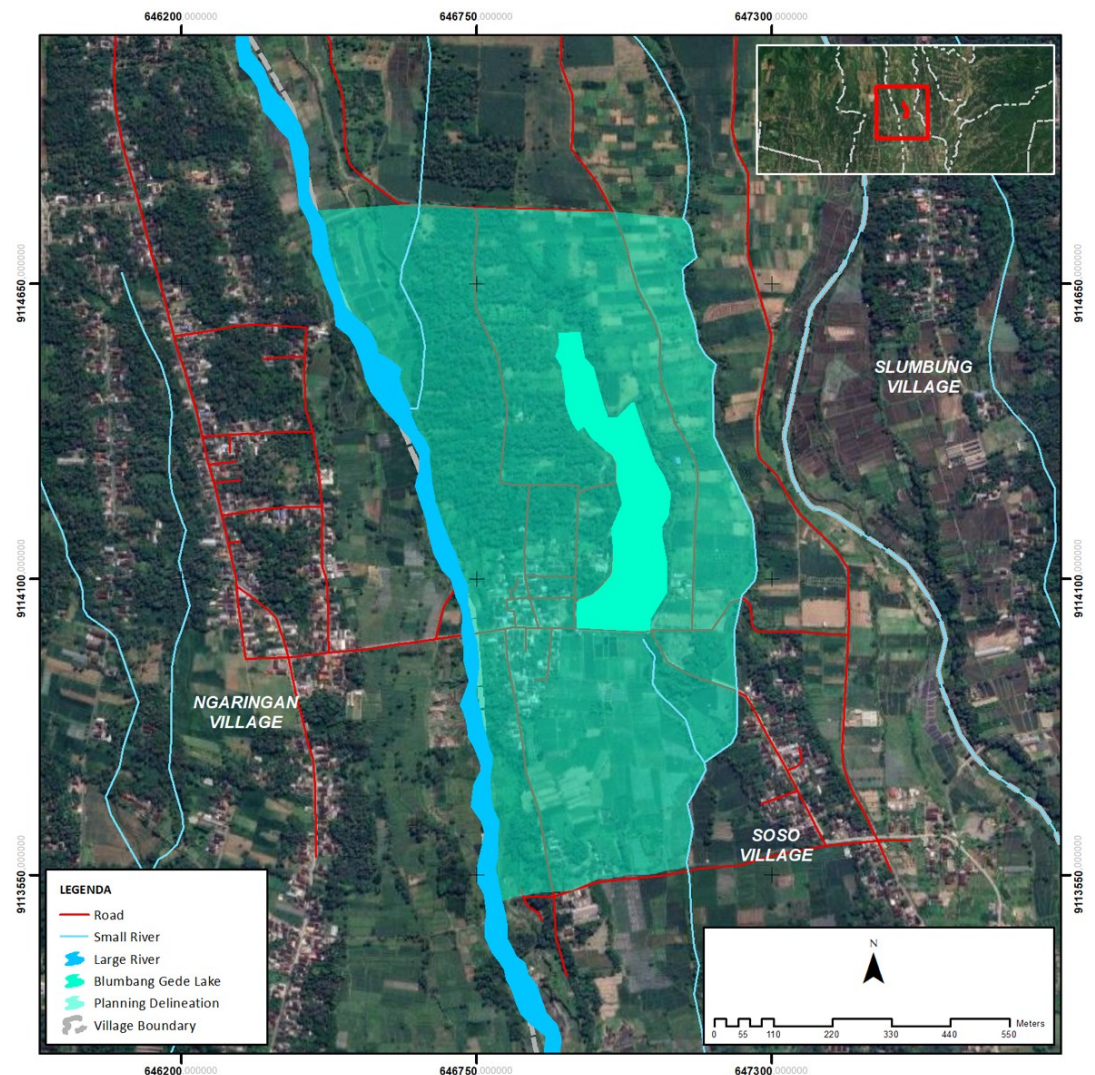


Figure 1. Administrative boundaries of the research area at Blumbang Gede lake area. The figure shows the spatial location of the study area, which is situated in Soso Village, Gandusari District, Blitar Regency, where most of the area consists of plantations and agricultural land.

2.2. Research Variables

Based on the literature review, five variables were obtained, comprising 12 exploratory sub-variables, which formed the basis for achieving the objectives of this study. These variables were used as reference points in the data collection process and were further supported by data analysis using specific methods. The objectives of Objective 1 and Objective 2 in this study used the same variables. The parameters and variables used in this study included the following (Table 1).

Table 1. Research Variables. The table 1 present five primary parameters: conservation, education, local economy, community participation, and tourism. Each parameter is accessed by various variable that indicate relevant parameters.

Parameter	Variable
Conservation	Efforts to Prevent Damage
	Efforts to Maintain Sustainability
Education	Educational facilities
	Types of educational activities
Local Economy	Business opportunities
	Community income
Community Participation	Local community involvement
	Community empowerment
Tourism	Attraction
	Amenities
	Accessibility
	Ancillary (Institutional)

2.3. Research Respondents

In this study, purposive sampling was utilised, which is the selection of samples based on the consideration of the researcher on stakeholders who have competence and relevance to the research issue. The technique involves the researcher making a selected choice of samples, taking into account factors considered vital and relevant for the study [14]. The sample consisted of four stakeholders that satisfied the informant requirements stated (Table 2). The study guaranteed dependability despite the restricted number of informants ($n = 4$) by selecting decision-makers with high levels of specialisation, who represented government, local authority and community-based tourism institutions. This is in line with AHP standards which give preference to expertise over sample size. Stakeholder views were triangulated by structured discussion to cross-verify outcomes of pairwise comparison to ensure consistency among institutional views to enhance validity. Furthermore, a sensitivity analysis was conducted for the stability of the priority rankings in alternative weighting scenarios, which improves the resilience and dependability of the AHP results.

Table 2. Selected research stakeholders based on purposive sampling results. The table presents four selected stakeholders along with the criteria used to identify them as key informants in the CA and AHP analyses.

Institution	Criteria For Informan
Regional Development Planning, Research and Development Agency (Bappedalitbang) of Blitar District	Bappedalitbang, as a regional development policymaker, functions to coordinate all development planning activities related to the physical and economic fields, including one of the political actors in tourism development at Blumbang Gede lake area.
Office of Culture and Tourism in Blitar District	The Blitar Regency's Culture and Tourism Office is an organization that is knowledgeable about the region's

Institution	Criteria For Informan
Head of Soso Village	tourism conditions, including the Blumbang Gede Lake area. The head of the tourist destination village is expected to explain the conditions and constraints that exist in the Blumbang Gede Lake area.
Tourism Awareness Group (Pokdarwis) Blumbang Gede lake area	It is a form of community empowerment that aims to develop and promote tourism in the area.

2.4. Data Collection Methods

The data collection methods in this study are divided into two types: primary and secondary. The primary data collection method was through in-depth interviews with four key informants and observations to obtain an accurate picture of the research area. In-depth interviews with key informants were conducted to obtain their opinions on all ecotourism parameters (Table 1). Field observations were conducted by directly observing all variables at the research location, such as existing facilities and waste management activities, using a checklist and rating scale. Moreover, priority factors influencing the development of ecotourism in the Blumbang Gede Lake area were identified through structured interviews using the AHP questionnaire. In this study, secondary data collection was conducted by conducting surveys at institutions related to the research topic and through literature reviews to obtain information relevant to the focus of the research.

2.5. Data Analysis Method

2.5.1. Identification of Characteristics of the Blumbang Gede Lake Area Through an Ecotourism Approach.

This objective was achieved using the content analysis technique of in-depth interviews. Content analysis is a research method that examines documents to examine the nature and experiences of respondents [15]. The content analysis method enables researchers to provide a comprehensive picture of the characteristics and dynamics of ecotourism in the literature. The conclusions of the content analysis were validated using the observations' outcomes to support them.

2.5.2. Priority Identification of Influential Factors in Ecotourism Development in the Blumbang Gede lake area

This objective is achieved through an analysis method based on the Analysis Hierarchical Process (AHP) using *Expert Choice* software. The existence of many criteria permits to implement a decision support system to help choose amongst various decisions. The availability of numerous criteria allows the application of the analytical hierarchy process (AHP) for effective decision making. The first phase of the Analytical Hierarchy Process (AHP) is decomposition, which is the process of breaking down complicated, unstructured situations into smaller, more manageable parts and then ordering them in a hierarchy down to the smallest elements for analysis. The criteria and alternatives after the hierarchy was constructed, were evaluated by pairwise comparison of the relative importance of the items at each level of the hierarchy using a scale of importance from 1-9. Then, the pairwise comparisons results are processed to obtain eigenvalues. This is done by manipulating the matrices so as to find the relative weights or priority of each criterion and alternative. The last step in the AHP method is a consistency test that uses the Consistency Ratio (CR) value to determine how consistent the informant's assessment is. If the CR value is less than 0.1, the measurement matrix is deemed acceptable; if it is greater than 0.1, the assessment or hierarchical structure compiled needs to be reviewed.

2.6. Formulation of Strategic Development

The strategy formulation aims to set the direction for tourism development in the Blumbang Gede Lake area, Sosos, by using ecotourism concepts. A qualitative descriptive analysis was used to achieve this goal. The analysis was based on in-depth interviews with respondents who were well acquainted with the conditions in the area studied. To achieve this objective,

independent field observations were carried out using ecotourism criteria (Table 1) that have been analyzed previously and have had an impact on the development of ecotourism. The method was also compared with the existing best practices at other locations.

3. Results and Discussion

3.1. Results

3.1.1. Characteristics of the Blumbang Gede lake area Through the Ecotourism Approach

The characteristics of the Blumbang Gede lake area were identified using the content analysis method from transcripts obtained from interviews with 4 key informants. The resource persons included the Regional Development Planning, Research and Development Agency, Tourism and Culture Office, Soso Village, and Pokdarwis. The coding framework used in this content analysis is based on word frequency. All interview transcripts were analyzed by counting the occurrences of keywords representing the research variables, such as conservation, tourism, community participation, the local economy, and education. To ensure the validity of the findings, the source triangulation principle was applied, whereby the characteristics of Lake Blumbang Gede were considered valid and significant if confirmed by at least two different key informants. This approach ensures that the identified characteristics of the area represent patterns mutually agreed upon by stakeholders rather than merely individual views. The following are the results of the characteristics of the Blumbang Gede lake area that have been carried out on the information obtained from the four key informants (Table 3).

Table 3. Characteristics of the Blumbang Gede lake area. The table presents the results of the Content Analysis (CA) based on information obtained from four key informants. Overall, the identification of the characteristics of Telaga Blumbang Gede was carried out for each research variable.

Variable	Characteristics	Source			
		B	P	S	D
Efforts to Prevent Damage	Tree planting around the lake area to prevent landslides and sedimentation by Pokdarwis and assistance from the local government.	√		√	√
Efforts to Maintain Sustainability	Conservation around the spring is an effort to preserve the lake area.	√		√	√
Educational facilities	There are no educational facilities yet.	√	√	√	√
Types of educational activities	There are no educational activities provided.	√	√		√
	Several communities and institutions utilize Blumbang Gede lake area as a water sports education facility.	√	√	√	√
Business opportunities	In the Blumbang Gede lake area there are business opportunities for street sellers or small businesses.		√	√	
	There are business opportunities in the Blumbang Gede lake area, but they have not been fully maximized.			√	√
Community income	Community income with the existence of Blumbang Gede lake area is still relatively low.		√	√	√
Local community involvement	Local community involvement does not yet exist.	√	√	√	√
Community empowerment	Community empowerment does not yet exist.	√	√	√	√
Attraction	The view around Blumbang Gede lake area is an attraction.	√	√	√	√
	Water tourism		√	√	√
	Camping ground				√
	Fishing				√
Amenities	Available worship facilities (prayer room/mushola)	√	√	√	√
	Parking facilities available	√			√
	Food facilities are available in Blumbang Gede lake area.		√		

Variable	Characteristics	Source			
		B	P	S	D
Accessibility	Road access is good.	√		√	√
	Close to long-distance and short-distance stop stations.	√			
	The types of vehicles entering are still limited.		√	√	
Ancillary	Institutions available in the form of Pokdarwis.	√	√	√	√
	Pokdarwis has not moved massively due to unclear management licenses.		√		√

Information on Key Informants:

B : Regional Development Planning, Research and Development Agency

P : Culture and Tourism Office

S : Soso Village

D : Tourism Awareness Group (Pokdarwis)

1. Conservation

Conservation efforts in the Blumbang Gede lake area include several important actions to protect and mitigate environmental damage. According to Pokdarwis (one of the key informants), tree planting around the lake area is being done to prevent landslides and sedimentation by the local government with their help. Meanwhile, efforts are being made to conserve the lake area, which is a reserve water source for agricultural irrigation in the Maguan and Ngaringan hives, through spring harvesting.

2. Education

The Blumbang Gede lake area does not yet have the physical facilities to support educational activities, so education is mainly provided through Pokdarwis' appeals and outreach to the local community. However, some community-based training activities, such as stand-up paddleboarding and SAR training by the TNI and BPBD, provide training opportunities in water sports and life-saving skills.

3. Local Economy

The local economic growth of Blumbang Gede lake area is still in its infancy. The lake region offers commercial opportunities for the local population, such as selling street food and renting boats. However, the economic potential of the area is not completely realised because of the uncertainty of the governance arrangements. This resulted in minimal tourism revenue. Local potential is also in the form of processed chips, popular local memento.

4. Community Participation

Community participation in the management of the Blumbang Gede Lake area is limited. Although community participation in major events such as Soso Berdayung is ensured, participation in planning and day-to-day management is not yet organized. This is due to the unclear status of lake area management, which has prevented the village administration from drafting specific action plans for the lake. Local communities and Pokdarwis could not move with ease due to permit restrictions, and cooperation with other institutions or communities was not consistently established.

5. Tourism

The Blumbang Gede lake area has significant tourism potential due to its diverse natural attractions. The beautiful scenery of Mount Keludo and Mount Kawi, as well as the lake area, which is a major tourist attraction, offers an interesting experience of nature tourism. Activities such as water tourism, fishing, and camping have begun to attract visitors (Figure 2). Supporting facilities such as parking, worship areas, and minimal refreshments are also available (Figure 3).



Figure 2. Fishing Activities Carried Out by Visitors at Blumbang Gede lake area. The figure shows one of the tourism activities that is highly favored by visitors. This fishing activity takes place in the lake area, which covers approximately 3 hectares with a depth of around 5 meters, making it a popular fishing spot in Gandusari District.



Figure 3. Places to eat in Blumbang Gede lake area. The figure shows a tourism amenity at Blumbang Gede lake area in the form of a food stall. Visitors to Telaga Blumbang Gede can enjoy both main dishes and light snacks available at the stall.

The accessibility of the Blumbang Gede lake area is quite good with paved and gravel roads, which make it easy for tourists to reach the place. Its location near the Wlingi railway station, approximately 19 to 25 minutes away (Figure 4), makes the lake area easily accessible to local tourists and those from outside Blitar Regency. However, accessibility is still limited to two-wheeled vehicles and standard cars, and large vehicles such as buses are not allowed.

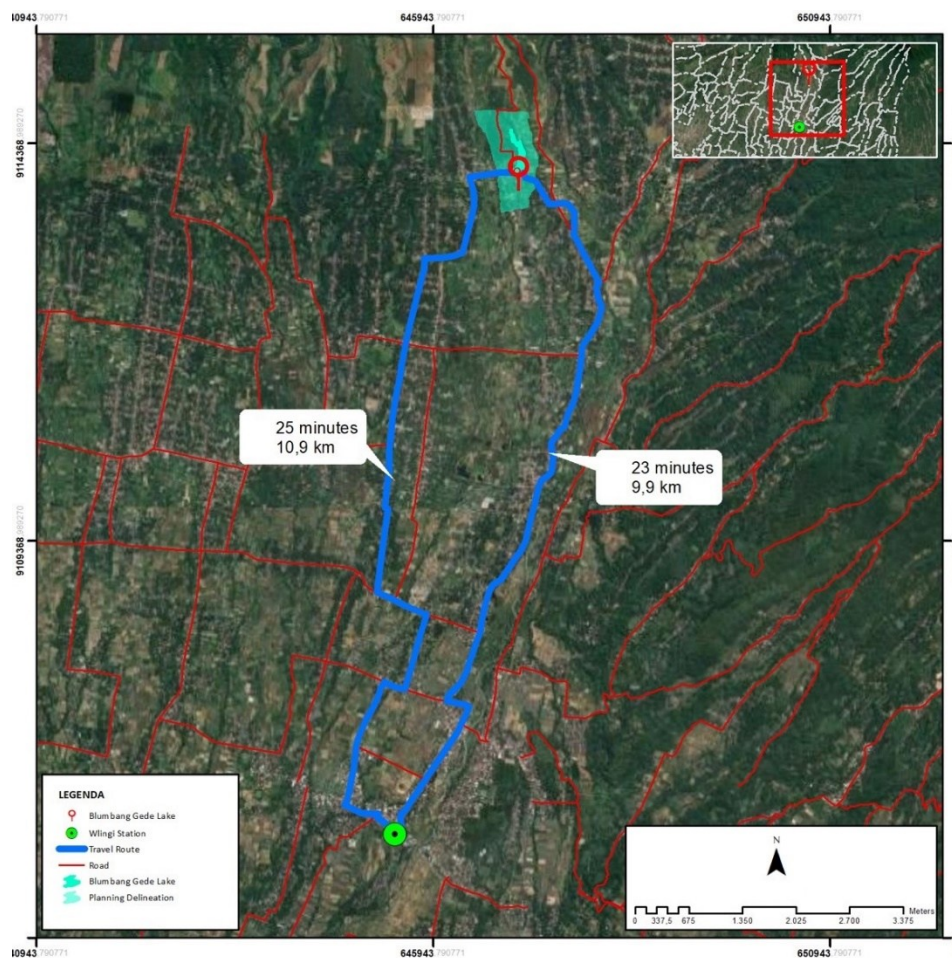


Figure 4. Distance from Wlingi Station to Blumbang Gede lake area. The figure shows the accessibility of Blumbang Gede lake area, which can be reached by train by visitors from outside Blitar Regency. The travel time from Wlingi Station to Blumbang Gede lake area is approximately 25 minutes by car or motorcycle.

3.1.2. Priority Factors Affecting Ecotourism Development in the Blumbang Gede lake area

The following are the results of the AHP analysis obtained from the four selected key informants: This analysis shows an error rate (IR) of 0.02, indicating an error rate of only 2%, which is well below the acceptable threshold of 0,10. The low IR indicates that the data collected from respondents are highly consistent and that the results of this analysis can be relied upon to set priorities for the development of the lake-area-based tourism sector in the Blumbang Gede lake area. Decisions made following the results of this analysis should be made with a high level of rigor and in accordance with the principles of ecotourism to promote more effective and efficient tourism management.

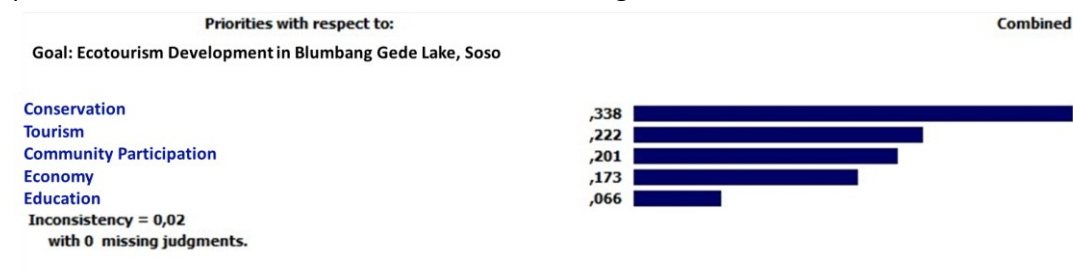


Figure 5. Results of AHP Analysis. This bar chart displays the priority variables for ecotourism development in the Blumbang Gede Lake area: conservation is ranked highest, followed by tourism, community participation, economy, and education.

According to the AHP analysis (Figure 5), conservation was the most significant factor, with a weight of 0.338. Tourism was the second most important aspect, with a value of 0.222. Community participation was ranked third, with a weight of 0.201. The fourth and fifth most important factors were economics (0.173) and education (0.066).

Based on the AHP analysis, the main priority for the development of ecotourism in the Blumbang Gede Lake area is the protection of the natural environment. This is reflected in the main sub-variable, namely, the effort to maintain sustainability, which has a weighting of 0.338. This shows the agreement of the four informants that the focus of the management of this area should be on environmental protection, particularly in view of the increasingly alarming environmental conditions. Conservation is a priority for the development of ecotourism in the Blumbang Gede Lake area, as it is a major water source for irrigation and a protected natural habitat. Conservation of the environment helps maintain the quality and availability of water, prevents erosion, and restores the integrity of the ecosystem. Conservation also ensures that natural beauty remains a tourist attraction, promotes environmental education, and empowers local communities.

Based on the sensitivity analysis, it was found that adjusting the criteria weights by $\pm 10\%$ did not change the order of priority. This shows that conservation remains the top priority for ecotourism development. This result is in line with Almansa-Sánchez et al.'s (2022) [16], which states that conservation is the top priority, especially in destinations located in protected areas. Overall, the quantitative results of the AHP analysis confirm that the development of ecotourism in the Blumbang Gede Lake area must implement conservation as a priority strategy, where tourism, economic, and educational activities must be carried out within clear environmental boundaries (tourism activity zoning).

3.2. Discussion

Blumbang Gede lake area is a planned sustainable ecotourism destination with an emphasis on natural protection, sustainable tourism development, and community participation. This vision should have significant impacts on environmental conservation, local economic development through tourism and community involvement in the management and benefits of this tourist destination. The development of ecotourism in the Blumbang Gede lake area might be directed as follows:

3.2.1. Conservation

The AHP analysis results show that this factor is the most important (weight 0.338). This shows that environmental conservation, for both management and visitors, must be a top priority in the development of tourism in the Blumbang Gede Lake area. Good protection promotes the sustainability of the ecosystem and ensures that the Blumbang Gede lake area, with its own spring water source, remains sustainable and supports the life of the surrounding areas. Ecotourism, which focuses on environmental conservation, can significantly improve the ecological conditions of tourist destinations and is an important factor in ecotourism development [17].

Various development efforts focusing on priority conservation factors have been conducted in various regions. For example, the Green School of Bali, where students and visitors plant bamboo and native trees to promote reforestation, and In the Bromo Tengger Semeru National Park, the local community and tourists regularly organize Clean-up Bromo activities to keep the tourist area in a good state. In Mount Rinjani National Park, a nature education program is in place to help visitors understand the mountain ecosystem and the importance of conservation [18]. In Komodo National Park, tourists are invited to participate in monitoring the Komodo dragon population and marine ecosystem [19]. On the island of Weh, tourism managers provide free water refills and campaign for plastic-free tourism. In Raja Ampat, tourists can participate in a coral reef protection program that includes planting and monitoring artificial reefs [20].

Success in conservation is not only a matter of a set of actions but also governance that integrates ecological elements with social institutions. In the case of the Blumbang Gede lake area, the high weight of conservation probably indicates a basic need for adaptive control of water resources, where spring protection forms the foundation of all tourism operations.

This suggests that conservation is “natural capital” to be managed through sound governance principles, not merely a straightforward list of environmentally friendly actions.

Furthermore, the study challenges the assumptions of traditional models for ecotourism development, which tend to emphasise conservation over commercial interests and the experience of the visitor. The results of the AHP analysis show a change in priorities, namely the stakeholders in the Blumbang Gede Lake area no longer perceive conservation as a limitation or a complement to growth, but as the major foundation of other areas (such as the economy and education) to develop sustainably.

Conservation development may be carried out by the management and tourists by utilising the uniqueness of the Blumbang Gede lake area and many best practices of conservation that have been created such as intensified tree planting operations around the springs. It is important to choose plants that will reduce erosion and keep the soil intact. Sengon trees are good for this purpose. An excellent strategy to preserve the condition of the aquatic ecosystem is to involve tourism management and tourists in keeping the spring, lake and surrounding regions clean of waste and aquatic plants. Furthermore, environmental education should be enhanced through the organization of environmental education programs for tourists, including lectures, guided tours and interactive activities, to promote awareness for the importance of nature protection. Another important method is to involve the community and visitors in biodiversity protection efforts through the implementation of a flora and fauna monitoring program such as bird watching and plant identification. The limitation of the use of ecologically friendly materials in good ecotourism governance is a vital issue. The management might also urge people to bring their own water bottles and cloth bags to decrease the use of single-use plastics. Furthermore, environmental conservation can only be implemented with the collaboration of local people and organisations to encourage their engagement in the process. Therefore, all the actions mentioned are a form of practical support for environmental preservation in the vicinity of Blumbang Gede Lake.

3.2.2. Tourism

The AHP analysis indicates that the tourist component has a weight of 0.222 and is the second most important factor after the conservation factor. Tourism-related features include accessibility, auxiliary facilities, and amenities and attractions. Due to the unique characteristics of the study location, the development of nature-based tourist attractions is still ongoing and access is still limited. For example, in Mount Rinjani National Park in Lombok, a hiking trail is continually rebuilt to ensure tourist safety using natural materials with minimal environmental impact [18]. Trekking and birdwatching are popular pastimes in Sumatra's Mount Leuser National Park, where knowledgeable local guides lead informative tours for visitors [21]. Similarly, in Ubud, Bali, pedestrian and cycling routes link key tourist spots, which are identified by signage and provide specific information about the sights along the way [22]. Furthermore, providing environmentally friendly transportation, real-time information to help travelers navigate and understand tourist destinations, and sufficient parking facilities are excellent initiatives [23]. Consequently, it is necessary to develop a Nature Tourism strategy that leverages natural features, such as designing trekking routes with paths built from natural materials and providing educational information about flora, fauna, and lake-area ecosystems along the way.

Environmental responsibility in resource utilisation. The same applies to Lake Toba, North Sumatra, where tourists can enjoy water-based recreational facilities such as paddle boats and canoes, but have to comply with strict laws to maintain the cleanliness and condition of the lake [24]. A similar situation exists at Lake Bratan, Bali, where tourists can kayak and canoe while enjoying the beauty of the surrounding terrain, and the water quality is exceptional there. Therefore, the next tourism strategy is to develop water tourism by maximizing the potential of water resources without disrupting the ecosystem, such as stand-up paddle boarding, canoeing, rowing, and fishing in the lake area, which are governed by strict rules to ensure cleanliness and safety, and fishing and photography tours that allow visitors to appreciate the beauty of the landscape and biodiversity. These activities require

trained tour guides who can provide educational information about the lake area's vegetation, wildlife and surroundings.

To increase the tourism attractions, cultural and traditional events like dance performances, regional music and local festivals can be organised regularly to attract the tourists while maintaining the local culture. In a similar way, the Penglipuran tourist village in Bali allows tourists to see and participate in a range of cultural activities including traditional ceremonies and dance performances [25]. In Yogyakarta's Pentingsari Tourist Village, serving traditional food cooked with organic products from local gardens supports both the economy and the environment [26]. The local items are culinary as well as cultural. The development of a culinary center that will provide traditional regional gastronomy and drinks with organic and environmentally friendly materials is projected to have a positive impact on the local economy, local community, and the visitor experience in the Blumbang Gede Lake area.

Other natural tourist sites can be established such as Kampoeng Kopi Banaran Agrowisata in Central Java where travellers can visit the coffee plantations, learn about the coffee manufacturing process and harvest coffee right from the trees [27]. Agrotourism such as organic vegetable gardens, tea plantations or coffee plantations made for tourists to visit, gives an instructive and pleasant experience, especially through garden tours and harvest picking activities, and supports the local economy. Agrotourism is one of the strategies to be used.

The fact that tourism is secondary to conservation presents a significant opportunity to revisit the link between these two pillars in ecotourism governance theory. In the context of the Blumbang Gede lake area, this finding implies a more integrated and sequential logic: conservation is not only a coexisting factor, but the foundational prerequisite that allows all proposed tourism activities from trekking and water sports to agrotourism to be viable and sustainable. Thus a robust governance framework must be conservation-led, i.e. planning and management of each of the tourist components (access, amenities and attractions) must be filtered through the primary lens of protection of the spring-water ecosystem.

While tourism strengthens local economies and increases regional appeal, it must overcome considerable institutional hurdles. The Pokdarwis program is not functioning properly due to unclear administration, which impedes the successful implementation of tourism development goals and initiatives in Bali. Gunung Leuser National Park in Sumatra is managed by the National Park Service in partnership with local communities and non-governmental organizations (NGOs) [25]. Collaborations between the government, universities, and non-governmental organizations have successfully boosted marine resource management and ecotourism development in Sulawesi's Wakatobi National Park [28]. Creating branding and marketing that emphasizes cultural and environmental sustainability in Bali's Penglipuran tourist town can attract eco-conscious visitors [25]. The Nglanggeran tourist hamlet in Yogyakarta is actively managed by the local community, from providing guides to administering accommodation and environmental preservation activities [29]. To boost contributions and collaboration among stakeholders, the tourism sector should prioritize clear institutional and governance frameworks. The formation of an integrated management body, partnerships with educational and research institutions, long-term promotion and marketing, and community involvement in management are all required governance measures.

3.2.3. Community Participation

The community participation weight is 0.201, the third priority factor based on the AHP results. For ecotourism to be successful, it requires the active participation of local populations, who are the key managers of local landscapes and traditions. Tourism development is made congruent with their interests and their welfare when communities are empowered to make decisions and implement tourism projects. According to Auri et al. (2022), the involvement of local community in ecotourism development is crucial for planning, implementation, and monitoring and evaluation of tourism activities. Community participation improves tourist management and ensures that the development of ecotourism is consistent with local requirements and contributes to community well-being [30].

The multiplier effect of community participation depends on the empowerment and training of the local population. The local communities in the Bromo Tengger Semeru National Park are trained in tourist guiding and community tourism management to improve their skills and income [31]. In Bali, the community in the tourist hamlet of Penglipuran engages in discussion forums to plan tourism growth so that every choice represents local needs and goals [25]. The local inhabitants in the Pentingsari Tourism area in Yogyakarta work as tour guides, homestay managers, and culinary providers, promoting economic sustainability and environmental protection in the area [32]. In Ujung Kulon National Park, the environmental improvement program is based on community involvement in conservation activities like as forest patrols and wildlife protection education [33]. A community center was created in the Sembungan tourist town in Central Java to be a meeting space, training and common activities for the community and tourists [32].

Participation of the community is not an isolated process, but an operational bridge between the goals of conservation (first priority) and tourism growth (second priority). Put differently, the local community is the primary agent in translating conservation concepts into everyday practice. The weight of 0.201 shows the understanding that conservation measures would be difficult to achieve without significant community participation, and tourism development may become exclusive or unsustainable.

The proposals of enhancing community involvement in the Blumbang Gede Lake area based on the characteristics and best practices of other locations can be realised participatively and sustainably. Relevant ecotourism training such as tour guiding, guesthouse management and handicraft production should be provided in order to develop local community capability. In addition the community has to be actively involved in decision making through discussion forums, regular meetings and public consultations to guarantee that the course of development of the region is consistent with local requirements and community aspirations. It is important also to set up ecotourism projects at the community level, with the participation of community people as tour guides, service providers and facility managers, so that local communities can benefit economically in a direct way. Such efforts need to be reinforced by environmental outreach and education to promote public knowledge of the benefits of nature protection and sustainable resource management. Community infrastructure such as community centres, meeting rooms and training facilities are also important to increase community involvement and independence in ecotourism development.

3.2.4. Local Economy

The local economic factors have a weight of 0.173. The economic aspect is important to ensure the tourism activities produce long term economic advantages to the neighbouring community. Economic development through tourism should be designed to minimise environmental damage and at the same time generate appropriate income to local people to ensure sustainability. This is in line with Wardan (2025) who observed that economic aspects are an important component of tourist development since they can increase revenue, offer job opportunities and encourage MSMEs in local areas. This also has to be complemented with sustainable tourist planning and administration, so that the economic benefits do not come at the expense of the local environment and culture [34].

Community income and entrepreneurship are key assets to local economies. A home-and-food market is managed by locals in the tourist hamlet of Nglanggeran, Yogyakarta, selling local cuisine and crafts with the help of the government and non-governmental organisations (NGOs) [30]. Kampoeng Kopi Banaran Agrotourism has been producing coffee and doing agrotourism by local farmers in Central Java. The farmers earn additional incomes by offering tours of the plantation and selling coffee goods [27]. Penglipuran, a resort hamlet in Bali, Indonesia, provides presents to travellers made and sold by the community after training from the village and local government [25].

The local economy is not considered as an aim in itself, but rather as an instrument or a result that is generated by effective conservation governance and community participation. In the Blumbang Gede Lake area, the collective understanding among stakeholders that economic advantages should follow conservation success, not the other way around, is given a weight

of 0.173. This is a critical finding that demonstrates the maturity of stakeholders' thinking in prioritizing long-term sustainability over short-term financial gain.

Local economic development can be achieved by developing ecotourism-based micro, small, and medium enterprises (MSMEs) that leverage the best practices and features of the Blumbang Gede lake area. This is accomplished by encouraging local communities to open homestays, food stalls, and craft shops. MSMEs will also receive training in company management, marketing, and customer service to aid in their growth. Farmer empowerment and agrotourism development, which integrates agrotourism operations with local agricultural activities, can drive further growth. Communities can create organic gardens, fruit orchards, and herbal gardens for tourists to enjoy them. Local handicrafts and souvenirs are also being developed to foster the growth of locally produced items for sale to tourists.

3.2.5. Education

The least important priority criteria was education (0.066). The goal is to teach visitors and local people about the importance of conservation and sustainable practices. A good education makes us aware of the importance and appreciate the value of protecting the environment and local customs. In education, development of educational facilities and activities is required. For example, in the Bogor Botanical Gardens, an educational trail with boards explaining different plant species and ecosystems provides visitors with first-hand knowledge of biodiversity [35]. The educational tourism program at Gede Pangrango National Park includes animal observation and conservation education programs that actively engage visitors in conservation efforts [36,37]. Together with institutions, training programs can be offered to local populations to educate them on conservation and biodiversity issues. It allows them to be role models and tour guides for guests. Besides supplying local people with supplies and training, the construction of educational and informational pathways is crucial for raising tourist awareness and participation, such as educational pathways around the lake area with information boards on flora and fauna, and ecosystem processes. Future developments may include educational tourism programs and field activities for tourist participation. The activities include animal watching, tree planting and water quality checks. These presentations can be adapted for different groups such as schools and families.

Education is not an end, but a strategic instrument to assist and reinforce the other three criteria. The weight of 0.066 does not mean that education is not important, but rather that education is understood to be indirect: education is the catalyst that makes conservation (priority 1) effective, tourism (priority 2) responsible, community participation (priority 3) conscious and the local economy (priority 4) sustainable.

4. Conclusions

The area of Blumbang Gede Lake has a lot of promise but has not been fully realised. The first priority for ecotourism development is conservation. The improvement of the preservation of the environment in this area is intended to help the maintenance of the environmental quality, erosion prevention, the balance of the ecosystem, ensuring that the natural beauty remains a tourist attraction, and the optimal management of waste from tourism operations. The second objective is tourist development, including infrastructure changes for better accessibility and providing guests with unique experiences through natural tourism growth. The third priority is to strengthen active participation of local communities, as their role is decisive in the success of ecotourism; local communities are the first custodians of the local environment and culture and are able to manage tourism development initiatives according to their own interests and financial well-being. This is significant for the primary aim of ecotourism, which is the conservation of nature and the life and health of the local population. In the future, the Blumbang Gede lake area can be a sustainable ecotourism destination with an emphasis on environmental protection, sustainable tourism development, and increasing community participation. However, the growth of ecotourism in the Blumbang Gede lake area still has several issues, among others the lack of resources and the use of rules that can alter. In addition, the active involvement of the community should be increased to confront the social and economic obstacles that may face the implementation of this strategy. The study is constrained by the relatively small number of

expert responders (n=4) and this may have an impact on the generalisability of the findings, even if the main decision-makers were rigorously selected. Future study should involve more stakeholders, and incorporate quantifiable ecological variables such as biodiversity status, water quality, and the ecosystem carrying capacity into the decision-making model to improve the analytical comprehensiveness and empirical robustness.

Autors Contributions

HI: Conceptualization, Methodology, Supervision, Writing - Review & Editing. ST: Conceptualization, Data curation, Methodology, Writing – original draft; YS: Writing - Review & Editing

AI Writing Statement

During the preparation of this work, the authors used ChatGPT and DeepL for language editing, specifically to refine word choice and rephrase potentially ambiguous sentences to enhance clarity for the reader. Following the use of this tool, the authors reviewed and edited the content as necessary and accept full responsibility for the published work.

Conflicts of interest

There are no conflicts to declare.

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