

Geo-Ecotourism and Community Stewardship: A Framework for Sustainable Water-Based Tourism at Paisupok Lake, Central Sulawesi

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Abstract

Paisupok Lake in Central Sulawesi represents one of Indonesia's most promising yet understudied freshwater-based geo-ecotourism destinations. As a karstic inland lake characterized by high ecological sensitivity and distinctive geomorphological features, it holds significant potential to advance sustainable tourism development in peripheral island regions. However, the absence of formal governance mechanisms and limited local institutional capacity have impeded the establishment of a coherent long-term stewardship model. This study aims to conceptualize a community-driven framework for sustainable geo-ecotourism governance at Paisupok Lake by synthesizing insights from secondary data, prior field documentation, and recent literature on geoheritage and community-based tourism. Adopting a qualitative-descriptive design supported by interpretive content analysis, the research integrates environmental, socio-economic, and governance dimensions. The scope includes assessing visitor market potential, identifying existing community stewardship practices, and formulating adaptive pathways for eco-geo management. Findings indicate that the integration of geoheritage conservation and community stewardship can simultaneously enhance environmental protection and livelihood diversification. The proposed conceptual model identifies three interrelated pillars of sustainability: (1) ecological integrity through adaptive conservation, (2) socio-cultural empowerment via participatory stewardship, and (3) economic viability anchored in low-impact tourism activities. The study concludes that freshwater-based geo-ecotourism, when embedded within community-led governance systems, offers an innovative and scalable approach to sustainable destination management across ASEAN's inland regions. Policy recommendations underscore the importance of inclusive governance frameworks, capacity-building for local stakeholders, and the integration of geotourism values into regional development strategies.

Keywords: geo-ecotourism; community stewardship; freshwater tourism; sustainable governance; Paisupok Lake

A. INTRODUCTION

In recent years, the way we think about nature-based tourism has shifted. What once may have been a simple scenic getaway is evolving into deeper experiences that connect people, place, and purpose. Concepts such as geo-ecotourism, community stewardship, and freshwater destination management reflect this shift. Rather than treating the environment merely as a backdrop for recreation, the emerging discourse positions nature as a partner in tourism, with local communities playing an active, hands-on role (Samal, 2023). Indonesia is uniquely positioned in this evolution. With its thousands of islands, extensive karst formations, and many lakes and springs, the country offers remarkable natural assets. Yet despite this richness, many freshwater sites remain under-developed in terms of sustainable tourism planning and

community-based management. Among these, Paisupok Lake (also known as “Mirror Lake”), in Luk Panenteng Village, Banggai Kepulauan Regency, Central Sulawesi, stands out. Here, crystal-clear water reveals ancient submerged tree trunks, and the surrounding karst landscape offers both ecological fragility and visual beauty. This makes the lake not only a site of aesthetic value, but also one of geological and ecological significance.

Despite this promise, the tourism-development footprint at Paisupok Lake remains minimal. Institutional coordination is weak, visitor management is informal at best, and the governance model has yet to integrate community stewardship fully. At the same time, the local community already practices traditional forms of environmental care, trees around the spring are protected, certain harvesting activities are restricted, and the lake is treated as a place of cultural significance. This existing stewardship ethic suggests a powerful latent capacity which, if harnessed, could form the basis of a more formal, sustainable tourism governance model. In the academic literature, eco- and geo-tourism have been well-documented with respect to terrestrial and marine landscapes, but freshwater contexts remain under-explored (Samal, 2023). Meanwhile, community-based tourism and community participation strategies are widely affirmed as crucial for sustainable outcomes, but many studies stop short of forging a clear link to water-based destinations or geosite governance (Tiwari et al., 2024). Likewise, geotourism research often emphasises geological asset management and interpretive value but seldom links these to community stewardship and water-based tourism dynamics (Prakoso et al., unpublished). As such, three main gaps emerge:

1. Freshwater geosites as destinations for low-impact tourism remain less studied than terrestrial or marine equivalents.
2. While community stewardship is celebrated in conservation literature, its integration into tourism governance frameworks, especially for water-based geo-destinations, is limited.
3. There is a need for a holistic framework that interlocks ecological integrity, socio-cultural empowerment, and economic viability in community-driven freshwater tourism settings.

To address these gaps, this study aims to conceptualize a community-driven framework for sustainable geo-ecotourism governance at Paisupok Lake, Central Sulawesi. Specifically, the research seeks to: 1) Identify the ecological, socio-cultural, and market potentials of Paisupok Lake as a freshwater-based geo-ecotourism destination; 2) Examine existing community stewardship practices and governance gaps in the destination; and 3) Propose an adaptive model that integrates environmental integrity, participatory stewardship, and low-impact tourism development.

B. RESEARCH METHOD

2.1 Research Approach and Design

This study utilises a qualitative, descriptive research design to explore the interplay between ecological features, community stewardship practices, and tourism governance at Paisupok Lake in Central Sulawesi. The choice of this approach reflects the need to understand the site’s unique context from multiple vantage points: environmental, social-cultural, and market-oriented. The study follows an interpretive qualitative design, aiming to build a conceptual framework grounded in empirical evidence and local realities. This approach aligns with established qualitative methods in tourism and community-based research (Miles, Huberman & Saldaña, 2014). Data collection and analysis were structured to capture rich descriptive detail, rather than aiming for statistical generalisation.

2.2 Study Site and Subjects

The research site is Paisupok Lake, located in Luk Panenteng Village, North Bulagi District, Banggai Kepulauan Regency. The lake is embedded in a karstic landscape with unique hydrology and rich biodiversity. The subjects of study included various stakeholders: community members (such as customary wardens, local tourism-practitioners), local government officers, and planning documents pertaining to the site's tourism potential. Purposive sampling was applied to select respondents who had deep familiarity with community stewardship practices and tourism development initiatives; snowball sampling then identified additional key informants through participant referral, enhancing depth of insight.

2.3 Materials and Instruments

The materials comprised a mixture of documents (government reports, planning proposals, demographic and ecological data), transcripts of semi-structured interviews, field observation notes, and archival photographs of the site. The instrument for interviews was an interview guide organised around three major domains: (1) environmental integrity and stewardship; (2) community participation and local norms; and (3) tourism development potential and governance structures. The guide was piloted with two local informants to ensure clarity and cultural relevance.

2.4 Data Collection Procedure

Data collection proceeded in three sequential yet interconnected phases:

- 1) Document review and desktop analysis, assembling and organising environmental baseline data, tourism feasibility reports and community profiles.
- 2) Field visits and interviews, conducting semi-structured interviews (approximately 30-45 minutes each) with 15 selected stakeholders, supplemented by participant observation of local stewardship practices (e.g., community forest monitoring, visitor behaviour around the lake).
- 3) Triangulation and validation, cross-checking interview insights with observed practices and documentary evidence to ensure credibility. Member checking (returning to key informants with draft summaries) was used to reduce interpretation bias.

2.5 Data Analysis Technique

Data were analysed using an interpretive content-analysis approach (Miles et al., 2014). Thematic coding was conducted manually and via qualitative-analysis software, organised around the three dimensions of interest: ecological integrity, socio-cultural empowerment, and tourism governance. Patterns and themes emerging from the data were iteratively compared across sources (documents, interviews, observations) to identify consistencies, contradictions and governance gaps. Finally, the synthesis of these themes informed the construction of a conceptual framework for water-based geo-ecotourism governance.

2.6 Ethical Considerations

The study maintained ethical rigour by anonymising respondents and attributing coded references rather than names. Participation was voluntary and consent was obtained verbally before interviews. While the study primarily relied on publicly available documents and non-

sensitive interviews, respect for local customs and cultural protocols was observed throughout the fieldwork.

C. FINDINGS AND DISCUSSION

3.1 Ecological Integrity: Clarity, Fragility, and Stewardship

Field observations and document analyses revealed that Paisupok Lake maintains remarkable water clarity, characterized by submerged hardwood trunks that have resisted decay for decades. This ecological condition is sustained by the karst hydrological system and the local community's self-regulated conservation behaviour. Residents of Luk Panenteng Village routinely protect vegetation around the lake and refrain from extractive practices such as wood collection or unregulated fishing.

These informal stewardship norms, embedded in local values, have maintained the ecological balance of the lake. Such actions mirror the global evidence that locally driven environmental care enhances ecological resilience and supports biodiversity protection (Crawford, Smith, & Jones, 2024). The findings here confirm that sustainable freshwater tourism depends not only on regulations but also on cultural ethics that foster continuous stewardship.

Studies in other Asian freshwater destinations show that when community participation is limited, water degradation and overcrowding often follow (Wang et al., 2023). In contrast, Paisupok demonstrates an inverse pattern: ecological quality remains high due to grassroots involvement even in the absence of formal governance. However, the sustainability of this balance remains fragile; without structured visitor management, increasing tourist inflows could threaten the integrity that currently defines the site.

3.2 Socio-Cultural Empowerment: Community Stewardship in Practice

Interviews with 15 key stakeholders revealed three recurring themes that define community engagement:

1. Custodianship and identity, residents perceive the lake as a sacred and life-sustaining space rather than a mere resource.
2. Tourism enthusiasm, younger villagers show a genuine interest in developing guiding, homestay, and small-enterprise opportunities related to the lake.
3. Institutional disconnect, community members, despite their contributions, are seldom involved in official planning or tourism coordination.

These themes indicate a readiness for participatory governance. The combination of spiritual attachment and economic curiosity creates fertile ground for empowerment. As noted in community-based tourism literature, such bottom-up motivation can transform local custodians into partners of sustainable destination management (Muda, 2025). While similar stewardship patterns are found in rural Java and Bali, most lack mechanisms to formalize participation (Noerkaisar, 2025). The Paisupok case, therefore, presents an opportunity to institutionalize what has long been practiced informally. The next challenge is to translate stewardship into structured decision-making through local committees, community rangers, or integrated benefit-sharing models.

3.3 Economic Viability: Visitor Preferences and Market Potential

From the economic perspective, the findings point to a promising but underdeveloped tourism market. Based on planning documents and feasibility studies, domestic tourist

projections reach around 13,000-15,000 visitors annually, mostly from Central Sulawesi and nearby provinces. Respondents in exploratory surveys expressed strong interest in canoeing, paddling, glamping, and nature immersion, aligning with low-impact recreational patterns observed in other freshwater ecotourism sites.

Importantly, Nanita, Nugroho, and Yasin (2025) provide complementary empirical evidence from a quantitative survey of 200 respondents, showing that 81 % of potential visitors seek relaxation and healing, while 69 % prioritise ecotourism and nature exploration. Their findings further identify young professionals aged 24-35 with middle-to-upper incomes as the dominant market segment, placing Paisupok Lake firmly within Indonesia’s growing eco-luxury tourism category. This aligns with global shifts towards slow travel and mindful leisure (Rezapouraghdam, 2024).

The data suggest that Paisupok’s attraction lies not in mass visitation, but in its ability to deliver intimate, restorative experiences. Visitors’ emphasis on comfort, privacy, and environmental quality implies a strong potential for tourism models that merge ecological ethics with leisure value. These patterns are consistent with recent studies highlighting glamping as a bridge between comfort and conservation (Hien & Chu, 2024). However, Paisupok differs in that its market demand precedes its infrastructural readiness whereas in most cases, supply precedes demand. Thus, governance and design frameworks must be proactive, ensuring that development follows environmental capacity rather than the reverse.

Economic viability here is contingent upon institutional preparedness. Without clear visitor-capacity thresholds and reinvestment mechanisms, tourism could erode rather than sustain ecological and social assets. Integrating the stewardship ethos into business planning by engaging local cooperatives and reinvesting profits into conservation could anchor Paisupok’s transition from an emerging destination to a model of responsible eco-luxury tourism.

Research Objective	Key findings	Interpretation / Implication
Identify ecological, socio-cultural, and market potentials of Paisupok Lake	The lake’s water remains clear and stable; local people maintain vegetation and follow customary restrictions; visitor interest focuses on low-impact activities	High ecological integrity supported by informal stewardship; strong market alignment with sustainable tourism trends
Examine existing community stewardship and governance gaps	Community shows custodial values and desire for tourism involvement but lacks institutional inclusion	Indicates readiness for participatory governance but need for policy formalization
Propose an adaptive geo-ecotourism framework	Integration of environmental, social, and market pillars yields a tri-pillar governance model	Suggests potential replication in other freshwater sites across Indonesia

3.4 Toward an Integrated Geo-Ecotourism Framework

Synthesizing across the ecological, social, and economic dimensions reveals a coherent pattern: Paisupok Lake’s sustainability hinges on connecting local stewardship with destination governance and market readiness. The conceptual framework emerging from this study proposes three interdependent pillars:

- Ecological integrity, maintained through karst ecosystem protection and low-impact recreation;
- Socio-cultural empowerment, achieved through community-based decision-making and training;
- Economic viability, realized via visitor experience design, capacity management, and benefit redistribution.

Empirical insights from Nanita et al. (2025) support this integration by confirming that visitor motivations and stewardship values naturally converge. Tourists seek environmental learning and authenticity, while locals seek recognition and equitable participation. Aligning these aspirations through adaptive governance could transform Paisupok from a passive natural attraction into a co-managed geo-ecotourism living laboratory.

By merging stewardship and market logic, the framework transcends the traditional sustainability triad of “people, planet, profit.” It emphasises relational sustainability and how ecological systems and social identities evolve together through tourism. This resonates with adaptive destination governance frameworks that advocate for dynamic community participation and flexible policy design (Crawford et al., 2024; Noerkaisar, 2025). Yet, Paisupok’s freshwater context adds novelty to this discourse by illustrating how environmental fragility and cultural stewardship can coexist with emerging forms of eco-luxury tourism.

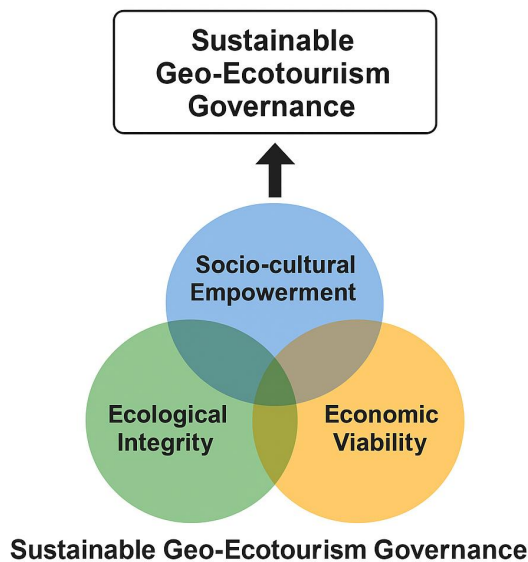


Figure 1. Conceptual Framework of Community-Driven Geo-Ecotourism Governance
Source: Author’s conceptualization based on Crawford et al. (2024), Hien & Chu (2024), and Nanita et al. (2025).

D. CONCLUSION

This study set out to (1) identify the ecological, socio-cultural, and market potentials of Paisupok Lake as a freshwater-based geo-ecotourism destination; (2) examine existing community stewardship practices and governance gaps; and (3) propose an adaptive framework that integrates environmental integrity, participatory stewardship, and low-impact tourism development. The findings show that Paisupok Lake holds significant promise across all three dimensions:

- Ecologically, the lake demonstrates high water clarity, karst-based geological integrity, and local stewardship practices that preserve vegetation and natural features.
- Socio-culturally, the local community displays a strong custodial mindset, an emerging interest in tourism roles (guides, hospitality), and a desire for recognition though formal governance mechanisms remain weak.
- Economically, the market research (including data from Nanita, Nugroho & Yasin, 2025) indicates an appetite among mostly young, middle-income domestic tourists for slow, immersive, nature-based experiences.

Together, these patterns support the proposed tri-pillar framework of ecological integrity, socio-cultural empowerment, and economic viability. When viewed as an integrated system rather than separate domains, this framework offers a concrete model for sustainable governance of water-based geo-ecotourism in peripheral island settings. Importantly, this conclusion goes beyond repeating results: it highlights the synergy among the three dimensions, and the governance gap as the fulcrum for moving from potential to realised sustainability. In other words, while conditions are favourable, they will not automatically converge into a sustained model unless community stewardship is formalised, visitor management is disciplined, and benefit-sharing mechanisms are embedded into tourism governance.

For practitioners and destination managers, the study suggests three key actions: 1) Establish a community-based management committee that gives local actors a formal role in decision-making and monitoring; 2) Design tourism products centred on slow, nature-immersive experiences (canoeing, bird-watching, glamping) aligned with carrying-capacity limits; 3) Reinvest a portion of tourism revenues into conservation of the lake's hydrology and karst vegetation, thereby closing the loop between visitor benefit and environmental maintenance. For academic and policy research, several avenues remain open:

- A pilot implementation study at Paisupok Lake that applies the framework in practice, monitors outcomes over time (ecological, social, economic) and refines the model based on feedback loops.
- A comparative study of other freshwater geo-ecotourism destinations (in Indonesia or other archipelagic countries) to test the framework's transferability across different cultural and biophysical contexts.
- Quantitative modelling of visitor behaviour and ecological dynamics (for example, the impact of visitor access routes or visitor density on water clarity) to supplement the qualitative findings and help establish threshold values for carrying capacity.

In closing, Paisupok Lake is not only a natural gem, but also a living laboratory for the next generation of sustainable water-based tourism. By bridging local stewardship, destination governance, and visitor-market readiness, there is a real opportunity to transform this site into an exemplar of responsible geo-ecotourism, one that serves nature, community and tourism in harmony.

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