

Commitment to environmental preservation in The Nglanggeran ancient volcano ecotourism area

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Abstract: This study investigates the commitment to environmental preservation in the Nglanggeran Ancient Volcano Ecotourism Area, located in Gunungkidul, Yogyakarta, Indonesia. As a community-managed ecotourism destination experiencing rapid visitor growth, Nglanggeran presents a valuable case for examining the implementation of sustainable tourism principles in practice. The research aims to identify the extent to which environmental conservation strategies adopted by local management align with the core tenets of sustainable tourism. Using a qualitative descriptive method, data were collected through in-depth interviews with key stakeholders, direct field observations, and analysis of supporting documents. A purposive sampling approach was applied to select 12 participants actively involved in ecotourism and environmental management. Data were analyzed thematically to uncover patterns related to planning, biodiversity protection, waste management, and environmental education. Findings indicate that Nglanggeran's management demonstrates a strong environmental ethic through practices such as ecological zoning, reforestation, collaborative conservation efforts, and the integration of education into tourism experiences. These initiatives reflect a practical application of sustainable tourism at the grassroots level. However, challenges remain in areas such as waste reuse and recycling, which require further community engagement and institutional support. This study contributes theoretically by contextualizing sustainable tourism in a localized, community-driven setting, and offers practical insights for policymakers and tourism stakeholders aiming to replicate such models in other destinations.

Keywords: Community-Based Tourism, Conservation Practices, Ecotourism, Environmental Preservation, Sustainable Tourism, Tourism Planning

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Introduction

Tourism is a complex, multi-dimensional phenomenon that significantly influences economic, social, cultural, and environmental systems worldwide (Gössling & Hall, 2019). Tourism, while contributing significantly to economic development, has increasingly come under scrutiny for its environmental impact. In particular, the tension between tourism expansion and environmental degradation highlights the urgent need for sustainable practices. In response, tourism scholars and practitioners have turned their attention to more responsible models namely, ecotourism and sustainable tourism that aim to harmonize tourism growth with environmental protection and community empowerment (Fennell, 2021; Salazar, 2020). It has the potential to foster environmental conservation while delivering community-based economic benefits. However, the reality is more complex poorly managed ecotourism can degrade the very natural resources it aims to protect (Baloch et al., 2023; Das & Chatterjee, 2015).

Ecotourism, broadly defined as responsible travel to natural areas that conserves the environment and improves the well-being of local people, is grounded in three interrelated principles: conservation, education, and community empowerment (TIES, 2015). While theoretically appealing, empirical studies suggest that ecotourism's promises are not always realized in practice. Several studies have shown that ecotourism initiatives often fall short due to commercialization, limited local participation, and inadequate environmental monitoring

(Salazar, 2020; Tosun, 2021; Stone & Nyaupane, 2018). These contradictions have generated debates about whether ecotourism, in its current practice, truly delivers on its sustainability promises (Fletcher et al., 2019; Fennell, 2021). It points to a broader challenge in aligning ecotourism ideals with on-the-ground realities, especially in developing contexts.

Ecotourism presents a paradox. On the one hand, it is seen as a tool for sustainable development, particularly in rural and ecologically sensitive areas. On the other hand, if implemented without a strong environmental commitment, it risks becoming another vector for environmental degradation. Damage from tourism activities may not be immediately visible, but cumulative impacts over time such as deforestation, water pollution, and loss of biodiversity can be significant and, in some cases, irreversible. Therefore, a proactive and sustained commitment to environmental preservation is essential for long-term ecotourism sustainability.

To address this, the broader framework of sustainable tourism offers an integrative model that emphasizes the long-term viability of tourism destinations through environmental integrity, social equity, and economic feasibility (UNWTO, 2019). Sustainable tourism underscores key principles such as stakeholder participation, environmental monitoring, equitable benefit-sharing, resource conservation, cultural sensitivity, and long-term destination viability (Jamal & Higham, 2021; Dodds & Butler, 2019). Despite its wide acceptance, the concept remains contested. Some argue that it has become a vague policy slogan rather than a rigorous operational model (Butler, 2018; Saarinen, 2021). Others note that efforts to make tourism sustainable often fail to address deeper systemic issues such as tourism's dependence on carbon-intensive travel and global inequities (Gössling, Scott, & Hall, 2020; Higgins-Desbiolles, 2020).

In light of these conceptual tensions, community-based ecotourism offers a practical and locally grounded model for sustainability. By embedding tourism development within local governance structures and cultural values, such initiatives have the potential to promote long-term environmental stewardship (Stone & Nyaupane, 2018; Chan, Marzuki, & Mohtar, 2021). In Indonesia, where rural communities are often custodians of biodiversity-rich landscapes, community-managed tourism can play a vital role in aligning environmental protection with economic opportunity (Budiarti, 2020; Nurhidayati, 2021). One such case is the Nglanggeran Ancient Volcano Ecotourism Area in Gunungkidul, Yogyakarta, Indonesia. Since its grassroots development in 2007, the site has transformed from a degraded landscape into a nationally recognized tourism village, attracting over 150,000 visitors annually. While the destination's popularity suggests successful development, it also raises questions about the extent to which environmental conservation is prioritized amid growing tourism activity.

While ecotourism in Indonesia has been widely studied from the perspectives of development planning, tourist satisfaction, and community participation (Afriasih & Watye, 2023; Baloch et al., 2023; Budiarti, 2020), empirical studies focusing specifically on research focusing on actual conservation commitment and practices at the site level, particularly in community-managed ecotourism destinations remain limited (Butler, 2018; Tsaur, Lin, & Lin, 2006). This study addresses that gap by exploring how the Nglanggeran Ecotourism Management demonstrates its environmental conservation efforts in line with sustainable tourism principles. It specifically aims to identify the extent to which the principles of sustainable tourism are implemented in environmental management practices within the Nglanggeran area. Furthermore, the study analyzes the concrete mechanisms and strategies adopted to ensure environmental protection, and explores the roles played by local stakeholders, including the community and management staff, in maintaining ecological sustainability. By investigating these aspects, the study provides a deeper understanding of how environmental stewardship is operationalized in a real-world, community-driven ecotourism setting.

The significance of this study is twofold. Theoretically, it contributes to ecotourism and sustainability scholarship by offering empirical insights into how grassroots environmental governance is enacted within a tourism context. Practically, it provides lessons for destination managers, policymakers, and development organizations seeking to replicate sustainable, community-led tourism models. By focusing on Nglanggeran, this study illustrates how environmental preservation can be rooted in local knowledge and collective action, offering an alternative to top-down sustainability frameworks. This study is scoped as a single-site case study and does not attempt to generalize findings to all ecotourism contexts in Indonesia. However, it

provides a grounded example of how sustainability practices are negotiated in real-world settings. Limitations related to scale, subjectivity, and site-specific variables are addressed through triangulation of data sources, reflexive analysis, and recognition of contextual factors that shape environmental decision-making.

Methodology

This study employed a qualitative descriptive approach to explore and interpret the environmental preservation efforts within the Nglanggeran Ancient Volcano Ecotourism Area. The qualitative method was chosen because it enables a detailed investigation of complex, context-specific phenomena such as community-based conservation practices that cannot be easily quantified. In particular, it allows for a deeper understanding of the values, motivations, and institutional commitments that underpin ecotourism management. This approach is appropriate for addressing the research objective, which seeks to understand how sustainable tourism principles are operationalized at the grassroots level.

A purposive sampling technique was used to identify key informants with direct involvement in environmental management and ecotourism activities. Participants were selected based on their roles in planning, implementing, or overseeing tourism-related environmental programs in Nglanggeran. These included community leaders, local tourism organizers, and government tourism officials. A total of 12 participants were selected, and this sample size was considered adequate based on the principle of data saturation, where no new information emerges from additional interviews (Guest et al., 2006).

Data collection was conducted using three main techniques: in-depth semi-structured interviews, non-participant observation, and document analysis. Interviews were conducted in person and followed a flexible guide focusing on environmental initiatives, perceptions of sustainability, and stakeholder participation. Each interview lasted between 45 and 90 minutes and was recorded with the participant's consent. Observational data were gathered during field visits to key zones of the ecotourism site, such as hiking trails, conservation areas, and community waste management sites. These observations provided contextual understanding and helped validate claims made during interviews. In addition, documents such as local tourism guidelines, management reports, and conservation plans were reviewed to triangulate findings and verify consistency.

The collected data were analyzed using thematic analysis, following the six phases proposed by Braun and Clarke (2006). After transcribing the interviews, the researcher familiarized themselves with the data, generated initial codes, and grouped similar codes into broader themes. These themes were refined through iterative reading and were interpreted in relation to the sustainable tourism framework, particularly the environmental dimension. While coding was conducted manually due to the manageable size of the dataset, the rigor of the process was maintained through systematic comparison and memo writing. To enhance the credibility of the findings, member checking was conducted with several participants, allowing them to review and confirm the accuracy of the interpretations.

Ethical approval was obtained from the relevant institutional review board. All participants gave written informed consent and were assured of confidentiality. While this study focused on a single case, which may limit generalizability, this limitation was addressed through in-depth contextual analysis and triangulation. Potential biases in self-reported data were mitigated by validating interview findings with direct observation and supporting documentation.

Results and Discussions

Results

The beginning of the development of tourism in Nglanggeran was inspired by the awareness of several communities to turn deforested forests and arid mountains green so that they can hold a lot of water that can give rise to springs that can be used for clean water consumption and agricultural irrigation. Since the early 90s residents have been committed to reforesting forests and mountains and also not cutting down trees massively. This awareness

inspired the members of the youth organization to turn the Nglanggeran area into a nature tourism destination that offers the beauty and authenticity of mountain nature in the countryside.

The development of the Nglanggeran Ancient Volcano Ecotourism Area was initiated by the Nglanggeran Village Youth Organization group since 1999. An area of 48 hectares began to be greened with cooperation between the youth organization and the community. After the natural conditions at Nglanggeran Ancient Volcano began to show positive results, namely that what was previously arid began to be covered by trees, the Gunungkidul Budpar Office provided support through promotion (FAM Tour) in 2007.

Prior to 2007 there was a vacuum of management activity right after the earthquake on May 26, 2006. After receiving support from the Budpar Gunungkidul Office, tourism activities began to be intensified again with the creation of a BPDW (Tourism Village Management Agency) that involved almost all components of the community. PKK women, farmer groups, village government and youth organizations united and together revived tourism at Nglanggeran Ancient Volcano.

From the formation of BPDW, it was agreed that the technical management of the field was handed over to the youth of the youth organization as the management of the Nglanggeran Ancient Volcano Ecotourism Area. The Gunungkidul Budpar Office and the DIY Tourism Office provide training to the managements plus some administrators who also get knowledge from universities, causing the development of tourism in this area to develop with a positive trend.

Decades since the pioneering of tourism activities at Nglanggeran Ancient Volcano, the commitment to preserve nature on the basis of reforestation remains a guide for Nglanggeran managements to maintain the sustainability of their area. One of the most frequent activities carried out until now to preserve nature is still the same as in the past, namely planting trees. Usually at the beginning of the rainy season, Management and Nglanggeran villagers plant trees together. This tree planting is not only in areas that are tourism attractions but also on lands owned by the residents themselves. For some residents who own land in the forest, they also do not cut down on a large scale. They themselves have realized to plant one new tree for one tree that was cut down. Actually, selling forest products used to be a means for people to get money quickly, but along with the development of tourism and the concept of Ecotourism offered by the Management, the community was gradually given direction not to cut down trees continuously and fortunately the community itself agreed with the Management so that nature in the Nglanggeran Ancient Volcano area is still maintained in its beauty today.

In addition, there is also a positive impact of tourism development in Nglanggeran on environmental management, namely the awareness of the Nglanggeran community to actively participate in maintaining the quality of their environment. This is indicated by their participation in keeping their home environment and farmland green and clean. The residents themselves realize that if their environment is dirty and the trees growing on their lands are cut down en masse, the beautiful natural conditions of the countryside will be damaged and of course can damage the image of rural nature that most tourists are looking for. To be able to maintain the quality of their nature so that tourists still come and enjoy the unspoiled nature of the countryside, residents in Nglanggeran village together with the Management are committed to maintaining the beauty, authenticity and cleanliness of their environment. This commitment will have a huge impact on the sustainability of tourism there, the adverse impact on the environment with tourism is expected to be minimized as much as possible with this collective awareness.

Discussions

This study set out to explore the extent of environmental conservation commitment in the Nglanggeran Ancient Volcano Ecotourism Area, assessing how closely the management's practices align with the principles of sustainable tourism. Drawing on qualitative data from interviews and observations, the findings reveal a multifaceted approach to sustainability that encompasses environmental planning, biodiversity preservation, waste management, and education. The following discussion interprets these findings in relation to the research questions, evaluates them against relevant theoretical frameworks, and compares them with previous studies in the fields of ecotourism and sustainable tourism. In doing so, it identifies both the

strengths and limitations of Nglanggeran's ecotourism model, offering insight into its broader implications for sustainable destination management.

Environmental Planning of the Management

The current planning for preserving the tourism environment in Nglanggeran is based on zoning. This zoning aims to limit which areas can be explored by tourists, so that the monitoring system for environmental quality can be more efficient. In addition, zoning can also be a way to maintain areas that are prone to natural damage so that they can still be sustainable. Zoning at Nglanggeran Ancient Volcano consists of areas that are allowed and intended for general tourists to trek from the bottom to the top. There are also zones that are not open to the public and are just left alone and the plan is not to be opened by the public but can be researched if there are parties from outside who want to do research there. There is also a zoning that is prepared to be an educational tourist attraction for students. This zoning will be shaped like a botanical garden. From these zones, the management hopes that environmental sustainability can be maintained because negative impacts on the environment can be minimized.

Habitat/Ecosystem/Wildlife Maintenance and Enhancement

Management' efforts to maintain and improve the quality of habitats or ecosystems is to condition the mountains and forests as they are. In the past, the focus of Management was on forest plants or perennials, but now because there are also animals such as monkeys, birds and so on, Management finally planted fruit trees. The purpose of planting these trees is to provide food for wild animals so that wild animals will not come down the mountain to look for food anymore. It also prevents wild animals from destroying people's crops.

Furthermore, the effort to maintain ecosystems in forests and mountains is to prohibit residents from cutting down trees carelessly in these areas. Even at the beginning of the development of tourism in Nglanggeran, the Management used income from tourists to buy plots of land from residents along with the trees contained therein so that they would not be cut down. The management' goal was to keep the land as forest. Since then, the community has realized not to cultivate areas in the forest and mountain because most of the land at Nglanggeran Ancient Volcano is Sultan Ground so that after being managed by Management, the community can no longer carelessly cut down the forest.

In addition, the Management also holds a mountain sweeping program which is held every 2 weeks every Wednesday and Saturday. This program aims to clean up garbage from the summit to the entrance and also check if there is damage or conditions that could endanger habitat or flora and fauna. From mountain sweeping activities, various kinds of data can be obtained. Such as data on the volume of garbage each week, data on damage or vandalism in the Ecotourism area, the existence of protected plants, and others.

Land use that is used to build amenity also does not harm or sacrifice the environment. Like the parking lot, which is now increasingly full, but the management deliberately did not change some agricultural land to be used as parking lots. One of the methods used if the parking lot is full is to move the car or tour bus to the yard or yard of a large resident. The management will rent the land used as a parking lot so that this is also good for leveling the income from tourism activities. From all these types of maintenance, it can be seen that the Management has worked hard to keep the Ancient Volcano area from damage.

Biodiversity Conservation Efforts by Managements

Efforts made by the Management to conserve biodiversity include collaborating with academics and NGOs to conduct research at Nglanggeran Ancient Volcano. Some of the research that has been conducted aims to map the diversity of flora and fauna in Nglanggeran. For example, research from UIN Biology mapped rare plants and herbarium efforts while UGM Biology conducted research and mapping on Orchids. During this research and mapping, the Management accompanied the researchers so that the Management could directly receive education from the researchers.

One of the results of the academics' research is the provision of Latin names from the academics to the management. The management then follows up by labeling the rare plants that have been identified. This step is taken so that the plants are not damaged or accidentally cut down.

Efforts to Reduce Waste

So far, the efforts made by the Management in reducing the volume of waste generated from tourism activities at Nglanggeran Ancient Volcano are to provide guidance and install warning boards along the Nglanggeran Ancient Volcano hiking trail. One of the interviewees said that there was an incident that inspired them to further improve nature conservation and reduce the volume of waste. The incident happened when two foreign tourists from Japan visited Nglanggeran. At that time, the two tourists asked to be accompanied to climb to the top of Nglanggeran Ancient Volcano. On the way up, the two visitors walked slowly while picking up cigarette butts that were scattered along the hiking trail. The Management was embarrassed when foreign tourists went to such lengths to keep the environment of Nglanggeran Ancient Volcano clean from litter. Since the incident, the Management has committed to educating tourists as much as possible not to litter. The efforts of the Management have now paid off because in 2013, the number of trash bags that had to be brought down when sweeping the mountain could be as many as 16 pieces, but now it has decreased a lot to only about 4 pieces.

One of the reasons for the decline in the volume of waste, apart from educating tourists and increasing the number of prohibition boards, is also due to the decline in the number of tourists visiting Nglanggeran. The decrease in the number of tourists visiting Nglanggeran is not good news in terms of income, but of course it is good news for the environmental conditions in Nglanggeran, especially in terms of waste generated. The management itself is also not worried about the reduction in regular tourists. This is because the management no longer targets regular tourists who only come to visit and then go home, but the management focuses on bringing in tourists who take live-in packages. From this package, the income earned by the management and the community will be much more than regular visitors.

Application of Reduce, Reuse, Recycle Principles

The 3 R's principle has begun to be implemented by managements as evidenced by efforts to reduce the volume of waste and also the utilization of waste for resale. However, waste reuse and recycling are not yet practiced in Nglanggeran. In addition, the 3 R's principle is also not yet visible among the local population. They still use the traditional management method of burning waste in their yards which is commonly called *Jugangan* in Javanese. This private landfill usually takes the form of a large hole in the ground in their backyard. If the garbage collected is already quite a lot, they will burn the garbage.

Waste Management Mechanism

Waste management in Nglanggeran is advanced because they have their own waste management site. This site was only built in 2015 but previously all plastic bottle waste from 2013 was collected in one of the residents' yards. And when the site was completed, the plastic bottles were moved to this facility.

For the collection process, first the waste that has been brought down from the top to the bottom is collected at the TPS. Then the waste management officers sort the waste according to its type, namely organic and non-organic. For organic waste, if it can be used, it will be processed into fertilizer while the non-organic type, which mostly consists of used water bottles, is planned to be used as handicrafts but until now this has not been realized due to the constraints of the absence of people who are willing and able to make it as handicrafts. In the future, the Management plans to organize training so that residents can be taught to make handicrafts. Currently, all plastic bottle waste is still sold to collectors.

Materials Used to Build Facilities and Amenities

So far, there has been an effort from the management to build facilities using natural materials. Gazebos and seats around the area are made of used and new wood. The utilization of used wood to become this facility shows that the management already understands the principle of sustainability. Materials that can still be reused are not thrown away or burned but instead creatively utilized into facilities. The gazebo is also built using materials that are all made of wood. Managements build facilities for tourists by prioritizing the principle of sustainability and almost all of them are made from natural materials. Materials that are not environmentally friendly or unnatural are deliberately avoided so that the Nglanggeran Ancient Volcano area still looks natural.

Education for Visitors About Environmental Sustainability

Education for visitors is something that managements find quite difficult to do. Various ways are done to foster awareness of environmental love to tourists but until now there are still tourists who ignore it. Although the efforts made by the management to raise awareness of tourists can already be felt, especially in the amount of garbage volume, until the time this research was conducted there were still tourists who deliberately threw garbage in areas that were not visible and sometimes unreachable.

Education that has been given by the management to tourists can be in the form of oral or written appeals. Due to the limitations of the management, oral appeals cannot be delivered one by one to tourists, therefore they put up warning boards in the Nglanggeran Ancient Volcano area. These warning boards contain messages for visitors not to litter, damage nature or commit acts of vandalism. If the above prohibitions are not heeded, tourists are obliged to pay a fine as well as restore the damaged infrastructure back to its original state.

By far the most severe incident was the burning of one of the gazebos by tourists. At the time of the incident, local residents saw two young men burning the gazebo near the exit zone of the Nglanggeran Ancient Volcano area. The residents immediately secured the perpetrators of the vandalism and handed them over to the management. Firm action was taken by imposing a fine of Rp. 2 million and requiring the perpetrators to replace the Gazebo that they had burned to its original condition.

The same thing is also applied to vandalism perpetrators who scribble on rocks and gazebos. One of the perpetrators who was caught crossing out rocks in the Ancient Volcano area was required to clean the stone until it returned to its original state. These strict actions from the management are expected to provide a deterrent effect for the perpetrators and also a strong warning to other tourists not to carry out activities that can damage infrastructure and nature.

Especially for tourists who take the live-in education package can be delivered directly. Usually before carrying out activities in nature, the management will first provide directions so that nothing untoward happens. This verbal direction will further emphasize for visitors that the management is really serious in trying to create an environment that is free from damage or disturbance. Oral and written directions must be used together so that tourists will increasingly understand and obey the appeal.

Education for staff/workers about environmental aspects.

There are several collaborations between managements and government agencies, academics and private institutions in relation to training and seminars on increasing the capacity of managements in environmental aspects.

Some cooperation is as follows:

1. UGM Forestry Community Forest research team 2006-present.
2. Team PKMM UAD "Green Culture Team" in 2009 on Capacity Building for Tourism Management, PKK and Farmer Groups.
3. UGM Asia-Pacific Research Team with ex-Korean workers.
4. UIN Sunan Kalijaga Research Team majoring in Biology on the identification of Flora and Fauna of Nglanggeran Ancient Volcano in 2009.

5. UPN research team (Geology) on Flora and Fauna Identification of Nglanggeran Ancient Volcano.
6. Cooperation with IOM Yogyakarta in cocoa management capacity building and disaster response 2010-present.
7. Certification of Ecotourism Guiding in Jomblang Cave.

In addition to the trainings mentioned above, the management also relies on the collective awareness of all staff to be a role model for tourists. With their position as responsible for maintaining the area, it would be ironic if they themselves carried out activities that were detrimental to nature. With their position, they will inevitably have the awareness to preserve nature.

Many staff not only rely on tourism activities at Nglanggeran Ancient Volcano as a side job, but as one of their main sources of income. From this fact, they will automatically try to maintain the image of the area with a positive image, such as clean, green, and beautiful so that tourists get a satisfying experience. The two factors above are the driving force for staff to maintain their area so that it remains a tourist destination that does not diminish its environmental quality.

The findings from this study confirm a strong alignment between the environmental management practices in the Nglanggeran Ancient Volcano Ecotourism Area and the principles of sustainable tourism. In relation to the research question whether the area demonstrates a genuine commitment to environmental conservation in accordance with sustainable tourism principles the results offer compelling evidence of such commitment. The use of environmental zoning, reforestation initiatives, biodiversity conservation, and community-based environmental education all point to a deeply rooted environmental ethic within the community and management.

The implementation of zoning systems represents a strategic environmental planning tool that mirrors recommendations from the World Tourism Organization (2004), which advocates for minimizing ecological impact while promoting educational and cultural engagement. In this context, the division of land into general tourism, restricted, and educational zones reflects a deliberate effort to balance environmental integrity with visitor engagement. This approach echoes previous studies emphasizing the importance of spatial planning in ecotourism (Baloch et al., 2023; Das & Chatterjee, 2015).

One of the unique contributions of this study lies in its identification of grassroots environmental stewardship, particularly the long-standing tradition of tree planting and forest preservation initiated by local residents. Unlike many top-down ecotourism initiatives, the Nglanggeran case illustrates a bottom-up commitment that began even before formal tourism structures were established. This local ownership and active participation resonate with the populist and educational dimensions of ecotourism outlined by Afriasih and Watye (2023) and support the Quebec Declaration's emphasis on community involvement and heritage transmission.

An unexpected but enlightening finding was the degree to which foreign tourists influenced local management practices specifically the incident involving Japanese visitors collecting litter, which catalyzed stronger waste education campaigns. This points to a dynamic feedback loop between tourists and hosts, suggesting that environmental awareness is not only top-down or bottom-up, but can be externally triggered and locally internalized. This nuance adds depth to existing literature on visitor impact, often focused on negative environmental footprints rather than positive behavioral contagion.

In contrast to other ecotourism areas where economic pressures have led to environmental compromise (Butler, 2018; Tsaur et al., 2006), Nglanggeran shows a prioritization of sustainability even when faced with decreased tourist numbers. While a drop in visitors might be seen as economically detrimental, the management's pivot toward live-in educational tourism over mass visitation exemplifies adaptive, sustainability-oriented thinking. This aligns with the findings of Chan, Marzuki, and Mohtar (2021), who emphasize that small-scale ecotourism initiatives with active local community participation are more effective in achieving sustainable tourism outcomes than larger, externally driven projects.

However, some contradictions emerge. While the management practices incorporate waste collection and reduction strategies, the principles of reuse and recycling (3Rs) remain

underdeveloped, especially among residents who still rely on traditional waste-burning methods. This gap suggests a partial, rather than full, implementation of sustainable waste practices. It highlights a critical area for future intervention, particularly in community-based waste innovation and education.

Similarly, while the commitment to biodiversity conservation is commendable evidenced by collaborations with academic institutions such efforts appear to rely heavily on external actors. A more internally-driven scientific monitoring system could enhance resilience and ensure continuous biodiversity management, particularly in the face of fluctuating institutional support.

Overall, this study contributes to the tourism and ecotourism literature by offering an in-depth, community-centric case that exemplifies how sustainable tourism principles can be operationalized at a local level. It showcases how grassroots commitment, adaptive management, and education both for locals and visitors can work synergistically to promote environmental sustainability. It also provides a practical reference for ecotourism areas navigating the balance between environmental conservation and tourism growth, while highlighting areas that require continued development to ensure holistic sustainability.

Conclusions

This study set out to assess the extent to which the management of the Nglanggeran Ancient Volcano Ecotourism Area demonstrates a commitment to environmental conservation aligned with the principles of sustainable tourism. The findings confirm that the area has consistently integrated key sustainability practices such as zoning for environmental protection, biodiversity conservation, community-based waste management, and environmental education for tourists and staff into its operational framework. These practices reflect a strong alignment with sustainable tourism indicators as outlined by the World Tourism Organization (2004).

Theoretically, this study contributes to the growing body of literature that emphasizes the importance of community-driven ecotourism. Unlike many ecotourism models which rely heavily on external regulation or top-down interventions, Nglanggeran represents a successful grassroots initiative where environmental stewardship emerges from collective community consciousness. This aligns with and extends the frameworks proposed by Das and Chatterjee (2015) and Afriasih and Watye (2023), offering a grounded example of how local values and socio-environmental awareness can drive long-term sustainability.

From a practical standpoint, this case provides valuable lessons for tourism planners, local governments, and ecotourism operators. First, it illustrates that environmental sustainability can coexist with economic development when local communities are empowered and involved in tourism governance. Second, it highlights the potential of targeted educational initiatives and adaptive management to maintain environmental quality even in the face of tourism growth or decline. Tourism stakeholders should consider adopting zoning policies, reforestation programs, and proactive community education as core strategies in ecotourism management.

Future research should explore the long-term ecological outcomes of these practices, particularly how biodiversity and habitat quality change over time in community-managed ecotourism areas. It would also be beneficial to investigate the scalability of Nglanggeran's model in other regions with different socio-political and ecological contexts. In addition, further studies could examine the role of visitor feedback especially from international tourists as a catalyst for improving environmental standards and management behaviors.

In conclusion, the Nglanggeran Ancient Volcano Ecotourism Area serves as a compelling example of how ecotourism, when rooted in strong local commitment and adaptive management, can advance the goals of sustainable tourism. Its success offers both theoretical insight and practical inspiration for future efforts to balance tourism development with environmental preservation in similar contexts across the globe.

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