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Assessing tourist experience and willingness to pay for biodiversity conservation at Mongkrang Hill, Mount Lawu, Central Java, Indonesia

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Abstract. *Wulandari AA, Mukarromah AN, Dzihni A, Azzam AK, Deristani A, Sunarto, Setyawan AD. 2025. Assessing tourist experience and willingness to pay for biodiversity conservation at Mongkrang Hill, Mount Lawu, Central Java, Indonesia. Nusantara Bioscience 17: 277-288.* Highland ecosystems are ecologically sensitive environments increasingly pressured by nature-based tourism. Mongkrang Hill, located on the southern slopes of Mount Lawu in Karanganyar District, Central Java, Indonesia, has experienced rapid visitor growth, raising concerns regarding vegetation disturbance, waste accumulation, and declining habitat quality. This study assesses tourist experience and Willingness to Pay (WTP) for conservation by integrating the Experiential Value Scale (EVS) with economic valuation. A total of 60 visitors were surveyed using structured questionnaires, supported by field observations and semi-structured interviews. Multiple regression analysis showed that all four EVS dimensions—hedonic, novelty, interaction, and comfort—significantly influenced visitor satisfaction, with novelty and hedonic value being the strongest predictors. Satisfaction, in turn, had a positive and significant effect on WTP ($\beta = 0.90$), explaining 80.1% of its variance. The average additional WTP of IDR 15,840 indicates substantial potential for conservation-based financing. Observations further revealed ecological pressures related to trail erosion, vegetation trampling, and improper waste disposal, alongside community benefits through local economic activities and circular economy practices such as plastic waste recycling. The integrated EVS–WTP approach highlights how enhanced visitor experience can strengthen pro-conservation behavior and provide actionable pathways for sustainable ecotourism management. These findings support the development of experience-based conservation strategies for biodiversity protection in highland ecosystems.

Keywords: Biodiversity conservation, circular economy, experiential value scale, highland ecotourism, visitor satisfaction

INTRODUCTION

Highland ecosystems are among the most ecologically sensitive environments because their steep slopes, shallow soils, and narrow habitat distributions make vegetation and wildlife highly vulnerable to disturbance. The natural environment provides essential ecosystem services that support human well-being, including water regulation, carbon storage, microclimate stabilization, and cultural benefits derived from nature-based recreation (Yee 2020). In Indonesia where mountainous landscapes, montane forests, and savanna grasslands form key ecological assets nature-based tourism has grown rapidly and now plays an important role in local development (Gupta et al. 2023). However, increased tourism pressure in fragile ecosystems often leads to vegetation trampling, soil erosion, wildlife displacement, and reductions in habitat quality, indicating that ecological thresholds are being approached or exceeded (Li et al. 2023; Nguyen et al. 2023).

Mongkrang Hill, situated on the southern flank of Mount Lawu in Central Java, Indonesia, exemplifies this dual role as both an ecological hotspot and an increasingly popular nature-based tourism destination. Originally characterized by open grassland savannas and patches of pine vegetation, the area has recently experienced a rapid increase in visitor numbers, driven by the emergence of hiking, camping, and landscape photography trends (Kencana and Azizah 2022). While this growth has stimulated the local economy and expanded community-based tourism opportunities, it has simultaneously intensified ecological pressures, including vegetation loss on frequently used trails, waste accumulation, and declining habitat quality for native flora and fauna. Studies in similar settings show that unmanaged tourism can trigger trade-offs among ecosystem services, reducing regulating and supporting functions while increasing short-term cultural use (Liu et al. 2022; Li et al. 2023). These symptoms highlight the need to integrate ecological considerations into tourism planning at Mongkrang Hill.

In tourism and environmental valuation research, two complementary concepts have been widely applied to understand visitor behavior: the Experiential Value Scale (EVS) and Willingness to Pay (WTP). EVS focuses on how visitors derive value from their experiences through hedonic enjoyment, novelty, interaction, and comfort (Gallarza et al. 2021; Stienmetz et al. 2021). High experiential value often strengthens emotional engagement, enhances satisfaction, and shapes behavioral intentions such as revisit likelihood or support for environmental programs (Petrick and Backman 2002). Novelty one of EVS's strongest dimensions has been

shown to influence behavioral intentions through memorable and emotionally engaging experiences in natural settings (Skavronskaya et al. 2020; Blomstervik et al. 2021). At the same time, hedonic value, service quality, and interaction with fellow visitors and staff contribute to a more meaningful and satisfying experience (Larsen et al. 2019; Ponsignon et al. 2024).

WTP, on the other hand, provides an economic measure of visitors' support for environmental management, particularly through conservation fees, donations, or increased entrance charges. Previous studies show that tourists are often willing to contribute financially to preserve environmental quality when they perceive clear ecological benefits, such as improved waste management, vegetation rehabilitation, or reduced crowding (Casey et al. 2009; Rahmati et al. 2023). WTP is therefore widely used as a proxy for the economic value of ecosystem services in tourism destinations, particularly those experiencing ecological pressure from increasing visitor flows (Bani et al. 2020; Mohamad and Lahay 2021).

Despite Mongkrang Hill's growing importance as a highland ecotourism area, little is known about how visitors' experiential perceptions influence their willingness to support biodiversity conservation financially. Existing studies on the site primarily examine management arrangements and tourism development (Estiyantara 2022; Kencana and Azizah 2022), yet none have assessed the socio-ecological mechanisms linking visitor experience with conservation-oriented economic behavior. Moreover, although EVS and WTP have been widely studied separately in various ecotourism contexts, their integration remains limited, especially in highland ecosystems where environmental sensitivity is high and the need for effective conservation financing is urgent.

Given these research gaps, this study aims to integrate the Experiential Value Scale and Willingness to Pay approaches to assess the experiential and economic dimensions of ecotourism at Mongkrang Hill. Specifically, the study seeks to: (i) Analyze visitors' experiential values across hedonic, interaction, novelty, and comfort dimensions, (ii) Evaluate visitor satisfaction and its determinants based on EVS, (iii) Estimate visitors' WTP to support biodiversity conservation, and (iv) Examine the relationship between experiential value, satisfaction, and WTP. By linking visitor experience with economic support for conservation, this research provides insights for designing sustainable tourism strategies that enhance visitor satisfaction while strengthening biodiversity protection in the Mongkrang Hill ecosystem.

MATERIALS AND METHODS

Study area

This study was conducted in March 2025 at Mongkrang Hill, located in Karanganyar District, Central Java, Indonesia (Figure 1). The site lies on the southwestern slope of Mount Lawu at an elevation of approximately 2,194 m and covers an area of 108.10 ha. The landscape is characterized by open grassland savanna interspersed with patches of *Pinus merkusii* Jungh. & de Vriese and other montane vegetation, forming a mosaic ecosystem typical of highland environments. The climate is cool and humid, with temperatures ranging from 14-24°C and relatively high annual rainfall, creating suitable conditions for diverse flora and fauna. However, the combination of steep slopes, fragile grassland substrates, and increasing tourism pressure makes the area ecologically sensitive to vegetation trampling, soil erosion, and wildlife disturbance. Mongkrang Hill has rapidly developed as a popular destination for hiking and photography, attracting both beginner and experienced visitors. Its growing popularity underscores the need to evaluate visitor experience and conservation-supporting behavior to inform sustainable ecotourism management.

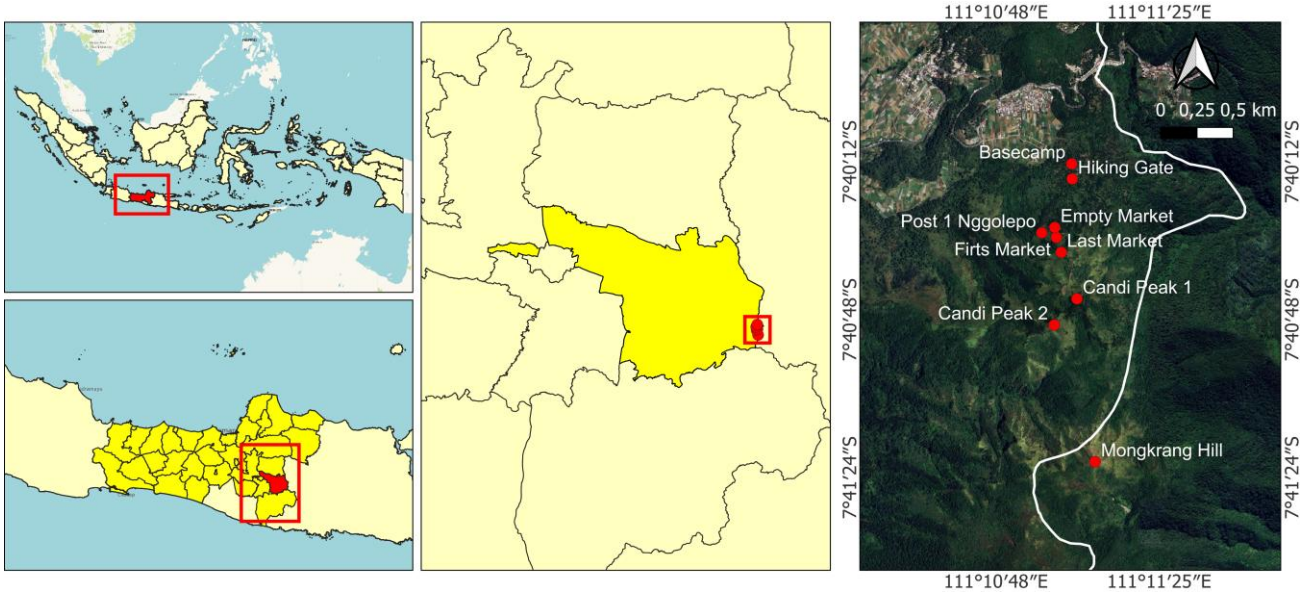

Figure 1. Map of study area in Mongkrang Hill, Mount Lawu, Karanganyar District, Central Java, Indonesia

Research design

This study employed an exploratory–quantitative research design to assess how experiential dimensions influence visitor satisfaction and their willingness to pay for biodiversity conservation. The Experiential Value Scale (EVS) framework was used to capture hedonic, interaction, novelty, and comfort dimensions (Prebensen and Rosengren 2016; Gallarza et al. 2021), while WTP was measured through the Contingent Valuation Method (Hanemann 1991). The conceptual pathway assumes that EVS dimensions shape overall satisfaction, which subsequently affects WTP a mechanism commonly used in ecotourism valuation studies (Mohamad and Lahay 2021).

Sampling Procedure

Respondents were selected using a systematic random sampling technique to enhance the representativeness of the sample. Data collection was conducted during peak visiting hours (10:00-15:00) over several days in March 2025. The sampling procedure was as follows: (i) researchers positioned at the main trailhead estimated the visitor flow during the data collection window; (ii) based on preliminary observations, the total number of visitors passing during the sampling period was approximated; (iii) a sampling interval (k) was calculated by dividing the estimated total visitor population by the target sample size (N = 60); (iv) the first respondent was selected randomly from the first k visitors, and every k-th visitor thereafter was invited to participate, provided they met the minimum age requirement of 18 years. This method ensured that all visitors during the sampling period had an equal probability of being selected, thereby reducing selection bias inherent in convenience or accidental sampling approaches.

Data collection

Questionnaire development

The questionnaire was designed to measure three main constructs: Experiential Value Scale (EVS), visitor satisfaction, and Willingness to Pay (WTP). EVS items captured four experiential dimensions hedonic value, interaction, novelty, and comfort following conceptual frameworks used in previous tourism experience studies (Prebensen and Rosengren 2016; Gallarza et al. 2021). Visitor satisfaction was assessed using global evaluative items, while WTP was measured using fixed monetary categories adapted from Contingent Valuation Method guidelines (Hanemann 1991; Bani et al. 2020). All items employed a five-point Likert scale to ensure consistency and ease of interpretation. Content validity was ensured through expert review involving ecotourism researchers and local site managers, who examined wording clarity, contextual relevance, and the alignment of each item with study objectives. Prior to full distribution, the questionnaire underwent a small pilot test to refine ambiguous statements.

Field observation

Field observations were conducted to document ecological and infrastructural conditions along the Mongkrang Hill trail. Key environmental variables observed included vegetation composition, slope stability, visible erosion, trail width, and signs of habitat disturbance, which are common pressures in mountain ecotourism areas (Kencana and Azizah 2022; Estiyantara 2022). Waste accumulation, noise levels, and crowding at rest points were also recorded to contextualize visitor satisfaction and WTP responses. Observations related to tourism facilities such as shelters, sanitation units, stalls, signage, and parking areas were used to assess comfort attributes and triangulate questionnaire results. Photographic documentation supported the qualitative description of ecological conditions.

Semi-structured interviews

Semi-structured interviews were conducted with tourism managers, Perhutani staff, and community members from Gondosuli Village to obtain contextual insights on conservation practices, visitor management, and local governance. Interview questions explored topics such as reforestation programs, waste management strategies, community participation, and perceived ecological pressures associated with increasing tourism (Estiyantara 2022; Tiwari et al. 2024). This approach allowed flexibility for respondents to elaborate on site-specific challenges, including trail erosion, weekend overcrowding, and the displacement of wildlife. Information from interviews was used to enrich the interpretation of EVS and WTP findings and to ensure that the quantitative analysis was grounded in the socio-ecological realities of Mongkrang Hill.

Measurement of key variables

Experiential Value Scale (EVS)

EVS was operationalized into four dimensions representing different aspects of tourist experience. Hedonic value captured emotional enjoyment and pleasure derived from landscape appreciation (Park and Ahn 2022; Trabandt et al. 2024). Novelty assessed visitors' perceptions of newness and uniqueness during their visit (Skavronskaya et al. 2020; Blomstervik et al. 2021). Interaction measured social engagement among visitors and communication with site managers (Zwart and Hines 2022). Comfort evaluated ease of movement, facility adequacy, and environmental convenience along the trail. Each dimension was measured using multiple Likert-based indicators.

Visitor satisfaction

Visitor satisfaction was assessed using global evaluative items summarizing perceived quality of the ecotourism experience. Scores ranged from 1 (very dissatisfied) to 5 (very satisfied). Higher satisfaction values indicated more positive evaluations of environmental conditions, facilities, and service attributes influencing behavioral intentions (Habibi et al. 2024).

Willingness to Pay (WTP)

WTP was measured using the Contingent Valuation Method (CVM), asking respondents to select a monetary amount they were willing to contribute for conservation-oriented improvements (Hanemann 1991; Bani et al. 2020). Fixed nominal categories (IDR 10,000-50,000) were chosen to reduce strategic bias, align with typical entrance fees, and reflect realistic spending capacity among visitors.

Data analysis

Descriptive statistical analysis

Descriptive statistics were used to summarize visitors' characteristics and perceptions through frequency distributions, percentage tabulation, and graphical visualization. These procedures enabled the identification of patterns across EVS dimensions, satisfaction levels, and WTP categories, providing an initial overview of visitor responses and behavioral tendencies (Rafitanuri et al. 2022). Tabulated WTP distributions helped reveal the central tendency and range of conservation-related monetary support.

Regression analysis

Two regression models were employed to examine the structural relationships among key variables, using Statistical Package for the Social Sciences (SPSS) version 25 for analysis. Multiple linear regression assessed how the four EVS dimensions collectively influenced satisfaction, using standardized coefficients and significance values to identify the strongest predictors (Chan and Saikim 2022; Deng et al. 2023). A second simple regression model examined the effect of Satisfaction on WTP, enabling the estimation of behavioral elasticity in conservation support. Model diagnostics ensured robustness and validity of findings.

Integration of EVS and WTP results

EVS–WTP integration provided socio-ecological insights into how experiential quality drives financial support for conservation, informing biodiversity-friendly tourism strategies.

Ethical considerations

All participants provided informed consent prior to survey completion, and confidentiality of personal information was strictly maintained. Data collection complied with ethical research standards and received permission from the Mongkrang Hill management and relevant local authorities (Estiyantara 2022; Perhutani 2022).

RESULTS AND DISCUSSION

Visitor demographic characteristics

Visitor demographics at Mongkrang Hill indicate a clear dominance of young adults, with the majority of respondents (90%) falling within the 18-30 age group, as shown in Table 1. This age structure reflects a strong interest in highland ecotourism among younger visitors who tend to seek nature-based recreation, physical challenges, and scenic photography opportunities. The gender distribution shows that females (65%) substantially outnumber males (35%), suggesting that the site has broad appeal among young women, consistent with trends in recreational hiking and social-media-driven tourism in Indonesia.

In terms of occupation, university students represent the largest group (45%), followed by private-sector employees (30%), entrepreneurs (13.3%), and school students (10%). Only one respondent identified as a state civil servant. This occupational distribution suggests that visitors are primarily individuals with moderate disposable income but high interest in outdoor experiences and aesthetic enjoyment—factors that shape both experiential values and willingness to pay for environmental services.

Visit frequency patterns further emphasize Mongkrang Hill's attractiveness to first-time tourists: 55% of respondents were visiting for the first time, while the remaining 45% had visited between two and five times. This mix of new and returning visitors provides insight into the site's experiential appeal and potential for visitor loyalty.

Collectively, these demographic features indicate that Mongkrang Hill attracts a youthful, experience-oriented visitor base whose perceptions of ecological quality, comfort, and novelty strongly influence their overall satisfaction. Young visitors especially students also tend to be more receptive to conservation messages, implying significant opportunities for environmental education and responsible tourism campaigns tailored to this demographic segment. The demographic profile presented here reflects visitors sampled systematically during peak hours in March 2025 and is representative of that specific visitor flow.

Willingness to Pay (WTP) for conservation

Visitor willingness to financially support conservation at Mongkrang Hill shows clear variability, with WTP values ranging from IDR 10,000 to IDR 50,000, as illustrated in Figure 2. The most frequently selected contribution was IDR 15,000, chosen by 37 respondents, while only two visitors expressed the highest WTP of IDR 50,000. The calculated average WTP is IDR 15,840, which exceeds the current entrance fee of IDR 10,000. This indicates that visitors generally recognize the value of ecological services and are willing to pay a modest premium to support conservation-oriented improvements.

Several factors appear to influence WTP. Demographic patterns from Table 1, particularly the predominance of young university students, suggest that visitors have limited financial capacity but relatively high environmental awareness. Perceived experiential quality especially related to novelty, hedonic aspects, and comfort also shapes WTP, as supported by regression results presented later in Table 3.

Table 1. Demographic characteristics of informants

Parameter	Specification	Quantity or number	Percentage (%)	Total
Sex	Female	39	65.0	60
	Male	21	35.0	
Age	18-30	54	90.0	60
	31-50	6	10.0	
Profession	Student (school)	6	10.0	60
	University student	27	45.0	
	Private sector employee	18	30.0	
	Entrepreneur	8	13.3	
	State civil apparatus	1	1.7	
Visit frequency	1 time	33	55.0	60
	2 times	11	18.3	
	3 times	10	16.7	
	4 times	3	5.0	
	5 times	3	5.0	

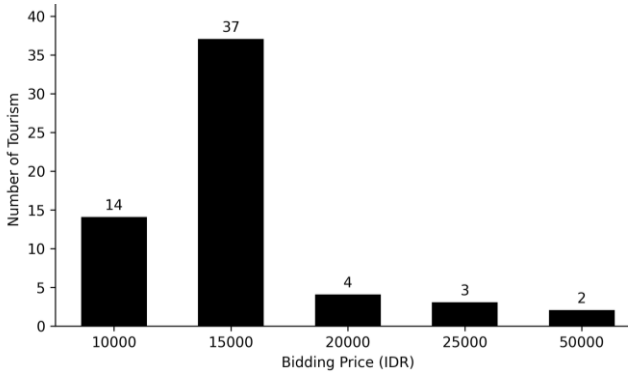

Figure 2. Willingness to pay maximum tourism to buy entrance tickets to Mongkrang Hill, Karanganyar District, Indonesia

Field observations reveal that environmental and facility conditions strongly affect visitor willingness to pay. Scattered trash along trails, damaged or unclear signage, and limited interpretive facilities were frequently noted on-site. These deficiencies likely suppressed higher WTP values, as visitors tend to base their economic support on perceived service quality and environmental integrity. Despite these constraints, the presence of an average WTP above the standard fee suggests significant potential for implementing conservation levies, voluntary donations, or tiered pricing. If managed transparently, such revenue could directly support waste management, vegetation recovery, and trail maintenance addressing the very issues that currently limit visitor satisfaction and maximum WTP.

Experiential Value Scale (EVS) outcomes

Descriptive patterns of EVS dimensions

Visitor perceptions across the four EVS dimensions hedonic value, novelty, interaction, and comfort show consistently positive trends based on descriptive tabulations and field observations. Hedonic value emerged as one of the strongest experiential components, with many visitors expressing enjoyment from panoramic scenery, cool highland temperatures, and opportunities for relaxation. Novelty was also highly rated, particularly among first-time visitors (33 individuals), reflecting the appeal of Mongkrang Hill's open savanna landscape and distinctive views of Mount Lawu (Table 1).

Interaction values were shaped by social exchanges along the hiking trail and brief but meaningful encounters with site staff, as illustrated in Figure 3, which displays signage and reminders that support visitor behavior. Comfort perceptions were influenced by basic facilities shelters, stalls, sanitation and the relatively easy trail conditions. However, comfort tended to decrease during peak periods when the summit became crowded. Overall, descriptive patterns indicate that visitors perceived Mongkrang Hill as emotionally engaging, visually unique, socially supportive, and generally comfortable, forming a strong experiential basis for satisfaction.

Regression model: EVS and satisfaction

The regression analysis presented in Table 2 demonstrates that all four EVS dimensions significantly influence visitor satisfaction, with p-values < 0.001 across all predictors. Standardized beta coefficients show clear variation in predictive strength: novelty (β = 0.47) and hedonic value (β = 0.46) are the most influential determinants of satisfaction, suggesting that emotional engagement and unique landscape experiences play central roles in shaping positive visitor perceptions. Interaction (β = 0.42) also contributes strongly, indicating that social encounters and interpersonal communication enhance the ecotourism experience. Comfort has the lowest, yet still substantial, influence (β = 0.34), reflecting the importance of basic infrastructure and environmental conditions.

High t-values for each variable confirm the robustness of these effects, and the model structure aligns with EVS theory, where diverse experiential components collectively shape visitor satisfaction. The strength of novelty and hedonic factors highlights the ecological significance of maintaining landscape quality, scenic viewpoints, and tranquil natural settings. Meanwhile, the importance of interaction and comfort emphasizes the need for improved visitor services, better trail signage, and well-maintained rest facilities. Together, these findings support the interpretation that enhancing experiential value directly elevates satisfaction, which subsequently increases willingness to contribute financially to conservation programs.

Relationship Between Visitor Satisfaction and WTP

The simple regression analysis testing the influence of visitor satisfaction on Willingness to Pay (WTP) demonstrates a strong and statistically significant relationship, as shown in Table 3. Satisfaction exhibits a positive regression coefficient of 0.41 ($p < 0.001$), indicating that every one-unit increase in satisfaction leads to an estimated 0.41-unit increase in WTP. The model's explanatory power is notably high, with an R^2 value of 0.801, meaning that satisfaction accounts for 80.1% of the variation in visitors' willingness to contribute financially to conservation efforts at Mongkrang Hill.

Table 2. Regression coefficients of comfort, novelty, hedonic, and interaction on the dependent variable

Model	Unstd. B	Std. Error	Beta	t	Sig.
(Constant)	0.06	0.30	--	0.19	0.849
Comfort	0.95	0.06	0.34	16.66	< 0.001
Novelty	1.05	0.05	0.47	21.60	< 0.001
Hedonic	1.01	0.04	0.46	23.21	< 0.001
Interaction	0.98	0.05	0.42	20.66	< 0.001

Note: All predictors were statistically significant ($p < 0.001$)

Table 3. Regression coefficient of satisfaction on WTP in Mongkrang Hill, Karanganyar District, Indonesia

Model	Unstd. B	Std. Error	Beta	t	Sig.
(Constant)	-3.41	0.44	--	-7.84	< 0.001
Satisfaction	0.41	0.03	0.90	15.27	< 0.001

Note: R^2: 0.801

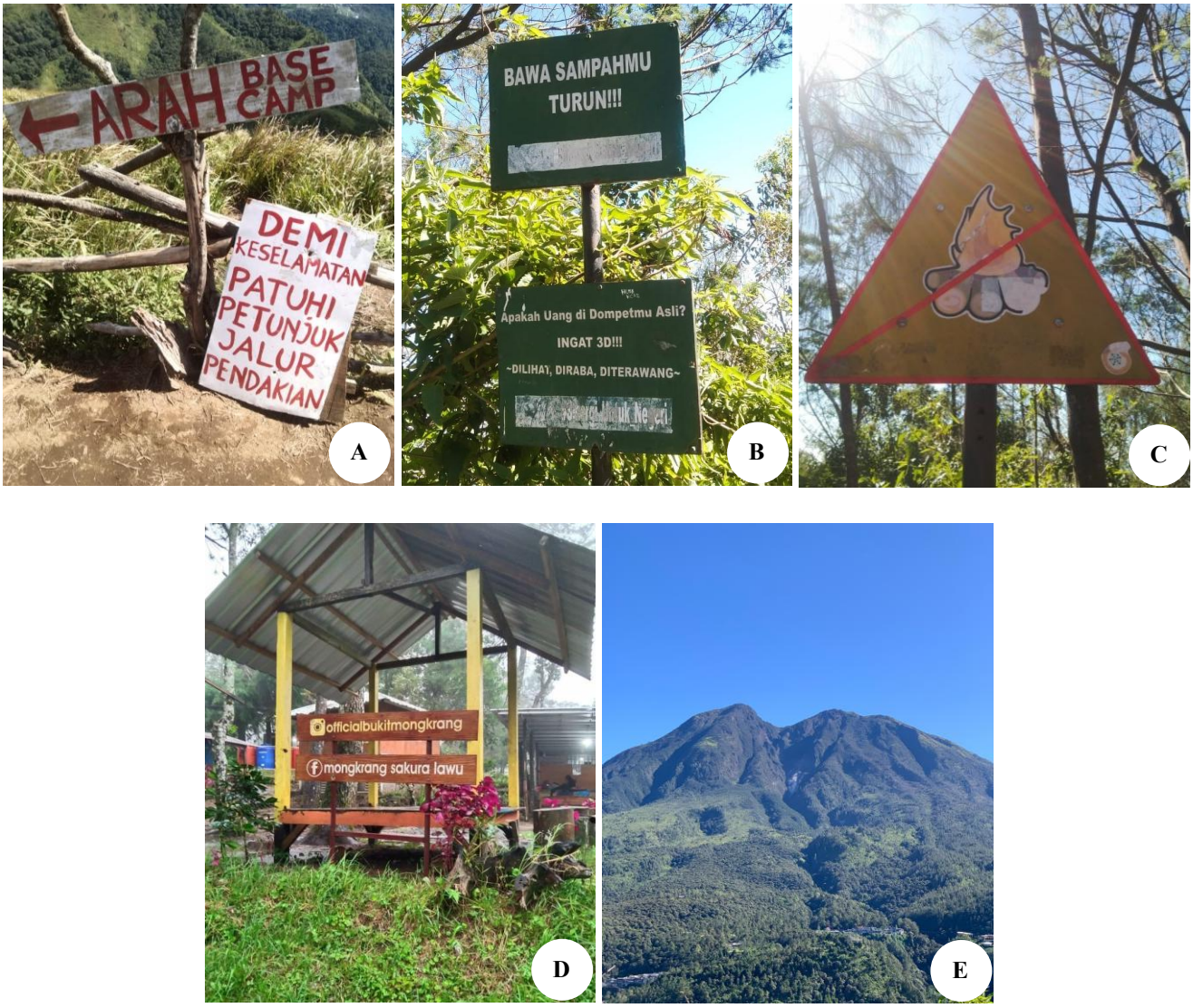

Figure 3. Hiking facilities, environmental regulation signs, and landscape views of Mongkrang Hill, Mount Lawu, Karanganyar District, Indonesia, including trail guidance and conservation reminders (A-C), the basecamp area (D), and the summit view of Mount Lawu (E)

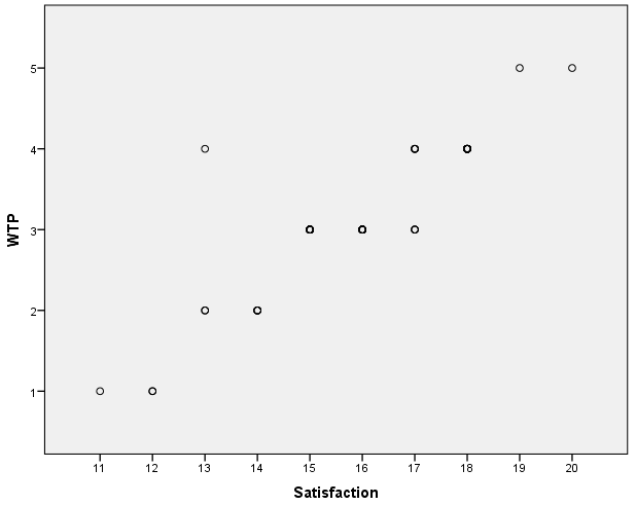

Figure 4. EVS-WTP relationships in Mongkrang Hill, Karanganyar District, Indonesia

This strong relationship is further illustrated in Figure 4, where the scatterplot displays a clear upward trend linking higher satisfaction scores to higher WTP values. The tight clustering of points along the regression line reinforces the practical relevance of satisfaction as a behavioral driver in ecotourism contexts.

These findings imply that enhancing experiential quality through better environmental cleanliness, improved signage, stable trail conditions, and maintained scenic viewpoints can directly increase visitor support for conservation funding. Higher satisfaction amplifies perceived value, making visitors more willing to pay for ecological protection initiatives such as vegetation restoration, waste management, or habitat monitoring. Thus, satisfaction serves not only as an indicator of service quality but also as a strategic leverage point for sustaining biodiversity conservation financing in community-managed mountain ecotourism areas.

Tourism attributes and ecological conditions

Tourism attributes at Mongkrang Hill combine scenic landscape quality, visitor-supporting facilities, and relatively easy accessibility, forming a strong basis for nature-based recreation. As illustrated in Figure 3.E, the site offers panoramic views of Mount Lawu and several surrounding peaks, making landscape aesthetics one of its core attractions. The trail is accessible via fully paved village roads, and the short walking distance from the parking area to the basecamp increases inclusiveness for various visitor groups. Facilities such as rest shelters, small food stalls, toilets, and designated parking areas were observed to contribute positively to visitor comfort, aligning with the importance of amenities in shaping satisfaction reported in earlier studies (Kusumawardhani 2022).

Field observations revealed a vegetation composition dominated by *Casuarina junghuhniana* Miq., *P. merkusii*, *Ficus* spp., *Inocarpus fagifer* (Parkinson ex F.A.Zorn) Fosberg, and *Falcataria falcata* (L.) Greuter & R.Rankin, providing partial canopy cover and stabilizing slopes. However, signs of ecological stress were evident. Along several trail sections, trampling had reduced ground cover and exposed compacted soil, indicating early-stage erosion risk. Litter accumulation especially plastic bottles and snack wrappers was observed near rest points and scenic spots, suggesting inadequate waste compliance despite existing reminders displayed in Figure 3.B. These conditions indicate that visitor pressure has begun to exceed the site's ecological carrying capacity in certain zones.

Additional pressures include noise, off-trail shortcuts, and vegetation damage at crowded viewpoints, particularly during weekends. Such disturbances may affect ground-dwelling fauna and reduce long-term vegetation resilience. Without improved management, these impacts could escalate and diminish both ecological quality and experiential value. The interplay between strong tourism appeal and mounting ecological pressures highlights the need for integrated management strategies that balance accessibility and visitor enjoyment with habitat protection and long-term ecological stability.

Local economic impacts of tourism activities

Tourism activities at Mongkrang Hill generate meaningful economic benefits for the surrounding community, functioning as an important complementary livelihood source. Based on observations and interviews, residents participate in various income-generating services, including food and beverage stalls, parking management, sanitation facilities, guiding assistance, and rental of hiking equipment. These community-managed services create a decentralized economic structure in which profits circulate locally rather than flowing outward, aligning with the principles of community-based tourism (Nyamboke 2023). The presence of multiple rest stalls along the trail, as also depicted in, further strengthens microenterprise opportunities for local households.

A notable aspect of local economic resilience is the adoption of circular economy practices. Plastic bottle waste is collected, sorted, and resold, with proceeds used to fund operational needs and minor infrastructure repairs. This practice reduces environmental burden while simultaneously generating financial value from materials that would otherwise contribute to trail-side pollution. Such initiatives demonstrate how circular economy strategies can be integrated into ecotourism management to reduce waste, encourage responsible visitor behavior, and support small-scale community enterprises (Androniceanu et al. 2021; Rosa et al. 2023). Tourism has strengthened household income diversification, increased the flow of local transactions, and enhanced community engagement in managing Mongkrang Hill. These economic dynamics reinforce the social foundation needed for long-term conservation, as communities that benefit economically are more likely to support ecological protection and sustainable visitor management systems.

Discussion

Interpreting visitor demographics and behavioral patterns

The demographic profile of visitors to Mongkrang Hill reveals a predominantly young and student-dominated population, with 90% aged 18-30 years and 55% being first-time visitors (Table 1). This age structure aligns with national patterns in nature-based tourism, where younger individuals tend to exhibit higher exploratory motivation and stronger interest in low-cost outdoor recreation (Kusherdyana et al. 2020; Zwart and Hines 2022). The high proportion of university students also corresponds with previous findings that younger tourists value novelty, emotional engagement, and opportunities for personal escape factors closely linked to experiential value and satisfaction (Larsen et al. 2019; Habibi et al. 2024).

The dominance of early-career visitors (students and private-sector employees) suggests a visitor segment with moderate purchasing power but strong environmental attitudes, making them a key demographic for developing WTP-based conservation schemes. Their frequent engagement in hiking and photography, as observed during field visits, supports the idea that experiential dimensions such as landscape aesthetics and social interaction are central drivers of their visitation decisions. Such behavioral tendencies mirror the findings of Windira et al. (2017), who reported that hedonic and interactional experiences strongly predict revisit intention in youth-oriented tourist destinations.

Visit frequency data, with more than half being first-time visitors, implies that Mongkrang Hill remains an emerging tourism site with untapped potential for building visitor loyalty. However, the relatively low proportion of repeat visitors (Table 1) may indicate limitations in amenities or ecological conditions, echoing studies emphasizing the role of service quality and environmental management in sustaining long-term visitation (Kusumawardhani 2022 and Nurmala et al. 2022). This demographic structure has direct implications for conservation financing: younger visitors may show willingness to contribute financially, but pricing strategies must remain sensitive to their income levels. The demographic patterns observed here illustrate both the opportunities and limitations of leveraging visitor

characteristics to support ecotourism sustainability in highland environments.

Understanding WTP dynamics in a highland ecotourism context

The distribution of Willingness to Pay (WTP) values for conservation at Mongkrang Hill indicates strong visitor support for environmental protection, with contributions ranging up to IDR 50,000 and a clear concentration in intermediate categories (Figure 2). The regression model demonstrates that visitor satisfaction significantly and positively influences WTP ($\beta = 0.90$, $p < 0.001$), highlighting satisfaction as a key psychological driver of financial contributions (Table 3). This pattern is consistent with findings from Mohamad and Lahay (2021), who reported that higher satisfaction levels in coastal ecotourism sites correspond to greater willingness to support environmental programs. Similar trends were observed by Pertiwi et al. (2022) in agrotourism settings, reinforcing that visitors who derive meaningful experiences from natural landscapes tend to perceive conservation fees as justified and necessary.

The relatively high WTP values observed in Mongkrang Hill can be attributed to several contextual factors. First, the site offers unique highland scenery and microclimatic conditions, which enhance aesthetic appreciation and emotional engagement both known predictors of pro-environmental financial behavior (Vittersø et al. 2017; Park and Ahn 2022). Second, visitors were exposed to explicit conservation messaging on waste management and trail discipline (Figure 3.B), which has been shown to increase perceived environmental responsibility and willingness to contribute to preservation efforts (Putranto et al. 2020; Zuska et al. 2024). Third, the relatively young demographic dominated by students and early-career professionals aligns with past studies indicating that younger tourists, despite limited income, often demonstrate stronger pro-environmental attitudes and a readiness to participate in small but meaningful financial contributions (Ashar et al. 2023; Habibi et al. 2024).

The WTP dynamics observed here also reflect broader patterns in developing-country ecotourism contexts, where visitors tend to contribute more when environmental degradation is visible or when conservation needs are clearly communicated (Bani et al. 2020; Rahmati et al. 2023). Field observations indicated signs of erosion, vegetation disturbance, and waste accumulation conditions that may enhance visitors' awareness of ecological vulnerability and thus increase their support for conservation funding. The alignment of satisfaction-driven WTP with ecological concern underscores an important implication: Mongkrang Hill holds substantial potential to establish a sustainable conservation financing mechanism if visitor experience quality and environmental management are simultaneously strengthened.

These results suggest that WTP in Mongkrang Hill is not merely a function of economic capacity but is strongly shaped by experiential, emotional, and ecological cues. Such insights provide a robust empirical foundation for designing conservation-oriented ticketing schemes, community-based funding models, and targeted communication strategies that encourage sustained visitor participation in highland conservation efforts.

EVS as a predictor of visitor satisfaction and pro-conservation behavior

The Experiential Value Scale (EVS) results show that all four experiential dimensions hedonic value, novelty, interaction, and comfort significantly shape visitor satisfaction at Mongkrang Hill. Regression outcomes (Table 2) confirm strong positive effects, with novelty ($\beta = 0.47$, $p < 0.001$) and hedonic value ($\beta = 0.46$, $p < 0.001$) emerging as the most influential predictors. These findings align with previous research noting that unique, emotionally engaging experiences are central to shaping positive tourist evaluations in natural settings (Prebensen and Rosengren 2016; Gallarza et al. 2021). The prominence of novelty reflects the role of scenic landscapes, panoramic viewpoints, and the distinct highland atmosphere, which collectively enhance cognitive stimulation and emotional uplift core elements of experiential value identified by Skavronskaya et al. (2020). Likewise, the strong effect of hedonic enjoyment underscores the contribution of mood, pleasure, and aesthetic immersion, consistent with studies demonstrating that affective engagement strongly predicts visitor satisfaction in nature-based tourism (Vittersø et al. 2017; Park and Ahn 2022).

Interaction and comfort also exert significant influence on satisfaction, though to a slightly lesser extent. Interaction ($\beta = 0.421$, $p < 0.001$) reflects social engagement among hikers and helpful communication from staff forms of social capital that reinforce responsible visitor norms (Hasanah et al. 2023). Comfort ($\beta = 0.342$, $p < 0.001$) relates to micro-environmental conditions, trail usability, and basic facilities, which have been documented as key satisfaction determinants in outdoor recreation (Kusumawardhani 2022). The strong combined influence of these four dimensions suggests that visitor satisfaction at Mongkrang Hill is shaped not only by natural scenery but also by emotional, social, and practical components of the visitation experience.

The link between EVS and pro-conservation behavior becomes clearer when viewed alongside the satisfaction–WTP regression model (Table 3). Satisfaction strongly predicts visitors' willingness to pay for conservation ($\beta = 0.90$, $p < 0.001$), affirming the experiential pathway in which positive experiences translate into financial support for environmental protection. Comparable results have been reported in ecotourism contexts where satisfaction enhances perceived value and encourages voluntary contributions (Mohamad and Lahay 2021; Pertiwi et al. 2022). This pattern supports theoretical propositions that experiential quality can foster stewardship behaviors, particularly in landscapes where ecological vulnerability is visible (Putranto et al. 2020).

The integration of EVS and WTP therefore highlights a socio-ecological mechanism: when visitors feel emotionally rewarded, cognitively stimulated, socially connected, and physically comfortable, they become more willing to invest in the sustainability of the destination. This reinforces the importance of visitor experience design as a conservation

strategy. Enhancing the experiential dimensions identified here—especially hedonic and novelty value can strengthen both satisfaction and financial support, creating a self-reinforcing cycle that benefits long-term biodiversity conservation at Mongkrang Hill.

Ecological implications of increasing tourism pressure

The escalation of visitor numbers at Mongkrang Hill has produced noticeable ecological pressures across the savanna slopes, hiking trails, and summit areas (Figure 3.A). Field observations revealed vegetation trampling along narrow ridgelines, soil compaction on frequently used paths, and localized erosion on steeper segments patterns commonly associated with unmanaged highland tourism. Such impacts are typical in fragile montane environments where grasses possess shallow root systems and soil layers are thin, making them highly susceptible to disturbance from repeated foot traffic (Putranto et al. 2020). The presence of exposed patches and widening of informal trails indicates the early stages of landscape fragmentation, which, if left unregulated, may accelerate the decline of native plant cover.

Waste accumulation represents an additional ecological burden. Despite signage encouraging responsible behavior (Figure 3.B), plastic bottles and food packaging were observed in rest areas and along the trail. This aligns with findings from other Indonesian mountain tourism sites, where littering has emerged as a persistent challenge due to limited waste management infrastructure and fluctuating visitor flows (Putranto et al. 2020). Compounding this issue is the occurrence of open waste burning near basecamp areas, a practice known to release harmful pollutants such as carbon monoxide and particulate matter (Faridawati and Sudarti 2021) and to increase the risk of vegetation fires during dry periods (Jakhar et al. 2023). These environmental hazards not only degrade ecological quality but also diminish the aesthetic and recreational value of the destination.

Wildlife disturbance is another emerging concern. As visitor movement increases, noise levels and human presence disrupt the natural behavior of fauna historically inhabiting the area, such as montane bird species and small mammals (Elena 2024). Similar patterns of wildlife displacement have been reported in other ecotourism landscapes where uncontrolled visitor density alters habitat suitability and reduces ecological resilience (Estiyantara 2022). In Mongkrang Hill, the combination of habitat compression, waste pollution, and trampling signals that the ecological carrying capacity may be approaching its threshold.

If tourism growth continues without improved management, long-term ecological consequences are likely. These include reduced vegetation regeneration, expansion of erosion-prone surfaces, decline in biodiversity, and weakening of ecosystem services such as slope stabilization and microclimate regulation. International studies indicate that once highland ecosystems reach a critical level of degradation, recovery becomes slow and often incomplete due to harsh climatic conditions and limited soil fertility (Li et al. 2023). Thus, proactive measures such as trail zoning, vegetation restoration, stricter waste regulation, and visitor capacity limits—are essential to prevent Mongkrang Hill from experiencing irreversible ecological decline.

Policy implications for WTP-based conservation funding

The WTP values identified in this study (Figure 2) provide an important baseline for designing conservation financing mechanisms at Mongkrang Hill. The regression results in Table 3 demonstrate that visitor satisfaction is a strong and significant predictor of WTP ($\beta = 0.90$, $p < 0.001$), confirming that improvements in environmental quality and service delivery can translate directly into higher financial support for conservation initiatives. Similar patterns have been observed in other tourism contexts, where visitors demonstrate higher WTP when ecological benefits are tangible and service attributes meet or exceed expectations (Arimurti et al. 2021; Pertiwi et al. 2022). This consistency suggests that Mongkrang Hill has substantial potential to adopt a structured funding model based on experiential value.

A practical implication of these findings is the feasibility of introducing a conservation ticket scheme, where a modest increase in entrance fees is earmarked specifically for ecosystem management. Evidence from environmental economics shows that earmarked conservation fees lead to greater public acceptance and transparency because visitors know exactly how their contributions are used (Hanemann 1991; Rahmati et al. 2023). Given the average visitor WTP of IDR 15,840 well above the current fee implementing a differentiated tariff structure, such as weekday–weekend pricing or optional conservation add-ons, could generate sustained funding without reducing visitation.

Another policy avenue is the adoption of Payment for Ecosystem Services (PES) principles. Under this approach, tourists act as direct beneficiaries and contributors to ecosystem protection, similar to models applied in groundwater conservation (Bani et al. 2020) and sustainable tourism initiatives in ecologically sensitive regions (Li et al. 2024). At Mongkrang Hill, PES could be operationalized through voluntary contributions for trail restoration, vegetation rehabilitation, or waste management programs, with periodic reporting to ensure accountability.

Visitor quotas also emerge as a relevant policy tool. As tourism pressure increases, limiting daily hikers through a regulated ticketing system can reduce ecological strain while maintaining the perceived exclusivity and quality of the visitor experience. This approach aligns with global best practices that balance economic benefits with ecological carrying capacity constraints (Nguyen et al. 2023). The WTP results indicate that visitors are willing not only in principle but also financially to support conservation at Mongkrang Hill. Policies that leverage this willingness, designed with transparency, fairness, and ecological necessity, can establish a long-term, community-supported funding model for highland biodiversity conservation.

Strengthening ecotourism management through visitor experience enhancement

The results of this study show that experiential value particularly hedonic enjoyment, novelty, comfort, and

social interaction—plays a central role in shaping visitor satisfaction and subsequent support for conservation. The aesthetic landscape of Mongkrang Hill, combined with its accessible trails and panoramic viewpoints, constitutes the core of the visitor experience. These findings are consistent with studies demonstrating that emotional engagement and sensory appeal are dominant predictors of positive tourism experiences and behavioral intentions (Prebensen and Rosengren 2016; Vittersø et al. 2017). Similarly, novelty-driven experiences have been shown to enhance memorability and stimulate pro-environmental behavior, aligning with the perspectives of Skavronskaya et al. (2020) and Blomstervik et al. (2021).

In the context of Mongkrang Hill, improvements to tourism infrastructure such as clearer signage, well-maintained rest shelters, and safe trail conditions have direct implications for comfort, which in turn elevates satisfaction levels. This agrees with findings from Kusumawardhani (2022) and Nurmala et al. (2022), who emphasize that adequate facilities are essential for maintaining service quality and sustaining visitor loyalty. The current reminders posted on-site (Figure 3.C), including waste-related advisories and safety notices, indicate ongoing efforts to shape responsible visitor behavior. However, the persistence of litter and erosion hotspots suggests that complementary interpretive strategies may be necessary.

Environmental interpretation, whether through guided trails, informational panels, or digital media, has been shown to strengthen experiential value by transforming passive sightseeing into meaningful engagement (Chan and Saikim 2022; Deng et al. 2023). As shown in Figure 3.D, social media platforms that can be used to promote Mongkrang Hill are identified. At Mongkrang Hill, interpretive materials could highlight local flora such as *C. junghuhniana* and *Schima wallichii* (DC.) Korth., ecological vulnerabilities of highland savannas, and the cultural significance of Mount Lawu. Such content would reinforce the novelty and hedonic dimensions while fostering ecological awareness.

Furthermore, enhancing on-site interaction whether through ranger presence, volunteer guides, or community-based interpretation could strengthen the interaction dimension of EVS, which this study found to be significantly associated with satisfaction. As highlighted by Kusherdyana et al. (2020), meaningful human interaction in tourism settings promotes positive behavioral intentions and supports sustainable tourism outcomes. The integration of experiential design principles into ecotourism management at Mongkrang Hill is crucial. By improving facilities, enhancing interpretive content, and promoting responsible visitor behavior, managers can amplify experiential value, which, as demonstrated in this study, translates into stronger satisfaction and higher willingness to support biodiversity conservation.

Integrating circular economy into ecotourism practices

The field observations reveal that local communities around Mongkrang Hill are already implementing basic circular economy practices, particularly through the sorting and resale of plastic bottle waste collected from tourist areas. Although modest, this activity demonstrates an important foundation for transforming waste into economic value while reducing the environmental burden associated with growing tourist numbers. Such initiatives resonate with broader circular economy frameworks, which emphasize resource recirculation, waste minimization, and economic value creation through sustainable practices (Androniceanu et al. 2021; Lahane and Kant 2022). In the context of ecotourism, integrating circular systems is increasingly recognized as a strategic pathway for improving environmental performance while generating additional livelihood opportunities (Rosa et al. 2023).

At Mongkrang Hill, the existing practice of plastic waste sorting can be expanded into more structured community-based waste enterprises. For example, recycling cooperatives managed by local residents could collect, sort, and process recyclables, thereby creating additional income streams while supporting cleaner hiking trails. This approach is consistent with findings by Kurnia et al. (2023), who argue that circular solutions contribute directly to decent work and economic growth by strengthening local entrepreneurship an important element for rural communities dependent on tourism.

Circular economy implementation can also extend to organic materials. Food waste, which is currently problematic along the hiking routes and near basecamp, could be composted and used to support the ongoing reforestation initiatives undertaken by Perhutani and student conservation groups. Such integration would close nutrient loops and reduce the reliance on synthetic inputs for seedling cultivation. Similar initiatives have shown success in other community-based tourism sites where organic waste composting not only reduces pollution but also supports agroforestry or greening programs (Rosa et al. 2023; Wahyudi et al. 2023).

Moreover, adopting circular practices can enhance visitor experience by reinforcing perceptions of environmental responsibility. Studies on sustainable tourism indicate that visible sustainability actions such as recycling stations, signage promoting waste reduction, or community-led conservation programs increase visitor appreciation and strengthen pro-environmental behavior (Nyamboke 2023). For Mongkrang Hill, creating a "circular visitor pathway" that visually communicates how waste is collected, reused, and reinvested into conservation could deepen visitor engagement and strengthen the experiential value dimensions identified earlier in this study.

Integrating circular economy principles into ecotourism management not only mitigates ecological pressures but also supports local livelihoods and reinforces conservation-oriented visitor behavior. As tourism demand continues to rise, circular economy strategies will become increasingly essential for sustaining both the ecological integrity and the socio-economic benefits of Mongkrang Hill.

Study limitations and future research directions

This study has limitations. First, while systematic random sampling enhanced within-period representativeness, the sample (N=60) and its confinement to peak hours in

March limit generalizability across different times and seasons. Second, as a single-site study, findings may not directly transfer to other highland destinations with differing conditions. Third, self-reported data are susceptible to biases like social desirability and hypothetical bias in WTP measures. Fourth, the lack of biophysical data (e.g., soil compaction, vegetation cover) limits objective validation of ecological impacts. Future research should: (i) Adopt longitudinal mixed-methods designs linking larger, temporally stratified visitor surveys with ecological monitoring, (ii) Conduct comparative multi-site studies to identify context-specific factors influencing EVS and WTP, (iii) Triangulate stated WTP with experimental or revealed preference methods to enhance valuation robustness.

Conclusion, this study demonstrates that experiential quality plays a central role in shaping visitor satisfaction and willingness to pay for conservation at Mongkrang Hill, a rapidly developing highland ecotourism site in Central Java. The four dimensions of the Experiential Value Scale hedonic value, novelty, interaction, and comfort significantly enhance satisfaction, which subsequently increases visitors' financial readiness to support biodiversity protection. The average additional WTP of IDR 15,840 indicates meaningful potential for establishing conservation-based funding mechanisms that can strengthen habitat restoration, improve visitor management, and maintain ecological integrity. Field observations further reveal that tourism pressure is escalating, underscoring the need for improved waste management, erosion control, and environmental education. By integrating experiential value assessment with economic valuation, this research provides an applied socio-ecological framework for developing community-based, circular-economy-oriented ecotourism policies that support long-term sustainability in highland ecosystems such as Mongkrang Hill.

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