

## **Local Satisfaction as an Evaluation Framework for Co-Created Sustainable Tourism in Pangururan**

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### **Abstract**

This paper evaluates local satisfaction as an evaluation framework for co-created sustainable tourism in Pangururan, Lake Toba. A mixed-methods design combines a household survey of 355 residents with interviews and field observations to assess satisfaction with tourism impacts, participation and sustainable tourism development. Findings show moderate to high satisfaction with socio-economic and cultural outcomes, but only moderate satisfaction with participation and environmental management. Co-creation is strongest among organised community groups. The study highlights local satisfaction as a practical diagnostic tool for strengthening governance, inclusive benefit distribution, and environmental performance in emerging tourism destinations.

**Keywords:** Community-Based Tourism; Quality of Life (QoL); Monitoring of Sustainable Tourism; Social Sustainability

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### **1.0 Introduction**

Lake Toba has been designated as one of Indonesia's national priority tourism destinations and has been proposed as a UNESCO Global Geopark since 2016. Within this regional framework, Pangururan, the capital of Samosir Regency, has become a strategic node for tourism development due to its central location, geothermal attractions, Batak cultural heritage, and improved accessibility. The construction of the Pangururan waterfront (2020–2024) and the revitalisation of traditional villages and cultural spaces reflect a strong policy direction to enhance destination attractiveness and accelerate regional development. Since 2017, Pangururan has also been part of the UN Tourism International Network of Sustainable Tourism Observatories (INSTO), which requires regular monitoring of sustainability indicators.

Sustainable tourism development emphasises balancing economic, social, cultural, environmental, and institutional dimensions while maintaining long-term benefits for host communities. Recent reviews highlight that subjective measures, residents' perceptions, satisfaction, and quality of life—are essential complements to objective environmental and economic indicators, especially in emerging destinations (Franzoni, 2015). Local satisfaction influences community support for tourism, perceptions of benefits and costs, and willingness to engage in tourism-related activities (Cifci et al., 2023; Halim et al., 2022). In the Lake Toba context, it is critical because

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tourism is expected to contribute not only to economic growth but also to social cohesion, cultural revitalisation, and improved living conditions (Ginting et al., 2023).

Tourism development is increasingly framed through co-creation, in which value is jointly generated by multiple actors rather than delivered unilaterally by the state or private sector. Service-dominant logic conceptualises tourism experiences as co-created through interactions and resource integration among communities, tourists, governments, and businesses (Vargo & Lusch, 2008; Ramaswamy & Özcan, 2018). Recent tourism research suggests that actors value outcomes more when contributing to co-creation, and that active participation enhances perceived value and subjective well-being (Rong-Da Liang et al., 2023). In destinations where communities co-design tourism products, events, and governance arrangements, local satisfaction therefore reflects both tourism outcomes and the effectiveness of co-creation.

In Pangururan, tourism development has been explicitly framed as a co-creation process. Local government, village authorities, community-based tourism groups (Pokdarwis), village-owned enterprises (BUMDes), tourism entrepreneurs, youth organisations, and cultural communities collaborate to plan and manage initiatives such as waterfront public spaces, cultural festivals, creative economy clusters, and revitalised heritage areas. Co-creation is expected to strengthen local ownership, expand livelihood opportunities, and support more inclusive governance. However, there is a need to systematically evaluate whether these co-created innovations are perceived as beneficial and fair by residents, and to what extent they contribute to perceived quality of life.

Despite these advances, several gaps remain. First, while co-creation in community-based tourism and destination innovation has been conceptually and experimentally explored, relatively few empirical studies systematically link co-created tourism interventions with residents' satisfaction and quality of life in the Global South, especially in mid-sized urbanising districts like Pangururan (Rong-Da Liang et al., 2023; Marinello et al., 2023). Second, INSTO and the Global Sustainable Tourism Council (GSTC) frameworks highlight local satisfaction as a core dimension of sustainable tourism monitoring, but empirical applications that use resident-based indicators to evaluate specific co-created projects at the district scale remain limited (Miller & Torres-Delgado, 2023; Torres-Delgado et al., 2021). Third, in the Indonesian policy context, multi-stakeholder and co-creation approaches are increasingly promoted, yet systematic evidence on how residents experience these approaches and how they contribute to perceived improvements in quality of life is still emerging (Ginting et al., 2023, 2024).

This study positions local satisfaction as an evaluation framework for co-created sustainable tourism innovation in Pangururan. The study aims to evaluate the effectiveness of tourism development implemented through co-creation by assessing local satisfaction across multiple sustainability dimensions. Specifically, the objectives are: (1) to identify local perceptions of recent tourism innovations in Pangururan; (2) to measure satisfaction levels relating to economic opportunities, social and cultural impacts, governance and participation, environmental conditions and perceived quality of life; and (3) to examine how co-creation processes influence community participation, sense of ownership and support for tourism development.

## 2.0 Literature Review

Recent studies argue that destinations must move beyond fragmented indicator sets and adopt integrated perspectives that connect governance, tourism innovation, and community well-being (Miller & Torres-Delgado, 2023; Cifci et al., 2023). Three bodies of work are central to this study: sustainable tourism governance and indicator systems; co-creation and community-based tourism innovation; and empirical research linking local satisfaction and quality of life to community support for tourism and perceived development outcomes (Rong-Da Liang et al., 2023; Halim et al., 2022; Ginting et al., 2024). Together, they provide the conceptual basis for treating local satisfaction as an evaluation framework for co-created sustainable tourism innovation in Pangururan.

### 2.1 Sustainable tourism, governance, and local satisfaction

Sustainable tourism has evolved from a predominantly environmental focus to a broader governance agenda that integrates social equity, economic resilience, and community well-being (Becken & Loehr, 2022; Farsari, 2023). Destinations are increasingly seen as governance arenas where actors negotiate visions, resources, and benefits (Torres-Delgado et al., 2021), and residents are recognised as key stakeholders whose perceptions and satisfaction influence the legitimacy of tourism development and their willingness to support it (Cifci et al., 2023; Tiwari et al., 2021).

Local satisfaction is closely tied to quality of life, encompassing perceived changes in income, employment, services, environmental conditions, cultural continuity, and sense of place (Halim et al., 2022; Pai et al., 2022). When residents perceive tourism as improving their quality of life, they are more likely to support growth and participate in decision-making; dissatisfaction can trigger resistance or disengagement (Eyisi et al., 2021). In Lake Toba, governance quality, stakeholder engagement, and benefit distribution strongly shape local perceptions and acceptance of projects, highlighting the need for participatory and adaptive governance models aligned with GSTC criteria on community involvement and benefit sharing (GSTC, 2019; Kemenparekraf, 2021; Ginting et al., 2023, 2024).

### 2.2 Co-creation, community-based tourism, and innovation

Co-creation views value as co-produced through interactions among stakeholders, rather than delivered unilaterally (Vargo & Lusch, 2008). Community-based tourism (CBT) refers to the joint design and implementation of experiences that mobilise local cultural and natural assets while addressing visitor expectations (Campos et al., 2018). Co-creation can strengthen community ownership and capacity but remains difficult to operationalise due to capacity constraints (Mohammadi et al., 2021; Rong-Da Liang et al., 2023; Park et al., 2019).

To address these constraints, design tools such as storytelling, service blueprinting, and customer journey mapping have been incorporated into CBT capacity-building, offering concrete methods to structure co-created experiences (Liang, 2017; Mohammadi et al., 2021). Experimental evidence from Taiwan shows that combining service-dominant logic with customer journey mapping in co-designed community tours increases tourist satisfaction, perceived life enrichment, and revisit intentions, linking co-created experiences to tourists' quality-of-life evaluations (Liang, Tung, & Wang, 2023). In Indonesia, co-creation is promoted in tourism village programmes and priority destinations to strengthen local value chains and diversify products. However, empirical evidence on how residents evaluate these innovations remains limited. Research in Lake Toba's traditional villages (e.g., Huta Siallagan) shows that multi-stakeholder governance and co-produced revitalisation can improve environments and visitor experiences. However, long-term success depends on how communities perceive their roles and the benefits they derive (Ginting et al., 2024).

### 2.3 Sustainable tourism indicators, observatories, and resident-based measures

Sustainable tourism indicator work has shifted from single-impact measures to integrated sets that link environmental, economic, and socio-cultural dimensions, often aligned with the SDGs (Miller & Torres-Delgado, 2023). Many systems, however, still prioritise macro or supply-side metrics and underrepresent residents' perceptions, satisfaction, and quality of life (Marinello et al., 2023). INSTO explicitly identifies "local satisfaction with tourism" as a core theme (UN Tourism, 2022), and observatories are most effective when resident-based indicators are embedded within governance frameworks and used to trigger concrete management responses (Torres-Delgado et al., 2021; Becken & Loehr, 2022).

In Indonesia, GSTC-aligned indicators have been applied to evaluate sustainable tourism governance, including destination management structures, stakeholder engagement, and pressure-change management (Ginting et al., 2024). Studies on tourism villages and urban heritage sites show that continuous monitoring can function as an early-warning system for emerging tensions and as a basis for adaptive planning interventions (Ginting et al., 2023).

### 2.4 Local satisfaction as an evaluation framework for co-created innovation

Empirical research connects resident satisfaction and quality of life with support for tourism and perceived co-benefits from development interventions (Eyisi et al., 2021; Cifci et al., 2023; Tiwari et al., 2021). In CBT and co-creation contexts, residents act as co-designers and co-managers of tourism products, so their satisfaction reflects both the distribution of tangible benefits and the extent to which they are empowered to influence development trajectories (Campos et al., 2018; Rong-Da Liang et al., 2023).

When co-creation processes are transparent, inclusive, and linked to capacity-building, residents report stronger place attachment, higher perceived quality of life, and greater willingness to collaborate with external actors (Rong-Da Liang et al., 2023; Halim et al., 2022). Where co-creation is tokenistic or investor-driven, local satisfaction declines even if visitor numbers increase (ĐurkinBadurina et al., 2022; Sharpley, 2022). Local satisfaction can therefore be treated not only as an outcome variable but also as a diagnostic framework for assessing whether co-created innovations reinforce sustainable development pathways. In Lake Toba, previous work on community participation and the economic aspects of sustainable tourism in Balige, and on governance in post-revitalisation traditional villages, underscores the importance of multi-stakeholder collaboration, fair benefit distribution, and continuous dialogue (Ginting et al., 2023, 2024). Building on these insights, this study positions local satisfaction as an evaluation lens for co-created tourism innovations in Pangururan, an INSTO-observed and strategic waterfront node in the Lake Toba priority tourism area.

## 3.0 Methodology

This study employs a mixed-methods case study design to evaluate local satisfaction as an assessment framework for co-created sustainable tourism innovation in Pangururan. A mixed-methods strategy is suitable because it allows quantitative patterns in residents' satisfaction to be complemented by qualitative insights into how people interpret tourism-related change in their daily lives (Creswell & Plano Clark, 2018; Yin, 2018). Pangururan was selected as a strategic node within Indonesia's Lake Toba priority tourism area and part of INSTO, where co-created initiatives such as waterfront development, cultural revitalisation, and creative economy programmes have been actively promoted. The research design integrates surveys, interviews, and field observations within a coherent, resident-oriented analytical framework (Miller & Torres-Delgado, 2023; Cifci et al., 2023).

Quantitative data were collected through a structured household survey administered to 355 residents of Pangururan. Respondents were selected using purposive cluster sampling, designed to capture variation across residential locations and levels of involvement in tourism activities. Clusters were identified based on neighbourhood location and dominant livelihood characteristics, ensuring representation. Eligible respondents were adult residents who had lived in Pangururan for at least one year, ensuring sufficient exposure to local tourism development. The questionnaire was structured around key dimensions derived from internationally recognised sustainable tourism and quality-of-life frameworks, including economic opportunities, social and cultural impacts, governance and participation, environmental conditions, and perceived quality of life (GSTC, 2019; UN Tourism, 2022). Items were measured using a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

Qualitative data were obtained through semi-structured interviews and systematic field observations to enrich and contextualise the survey findings. A total of 10 key informants were purposively selected based on their direct involvement and decision-making roles in tourism development and co-creation initiatives in Pangururan. The key informants comprised local government officials, village and customary leaders, Pokdarwis representatives, BUMDes managers, tourism entrepreneurs, and youth and cultural actors, ensuring representation of governance, community, and operational perspectives. Interviews explored perceptions of tourism development, experiences of co-creation, perceived benefits and risks, and expectations for future change. Qualitative material was analysed using

thematic coding, with iterative reading, categorising, and comparison of transcripts and field notes to identify recurring themes and contrasts (Nowell et al., 2017; Hennink et al., 2020). Triangulation across survey, interview, and observational data enhanced the credibility of the findings, and all research activities were conducted with informed consent and in accordance with local cultural norms.

#### 4.0 Findings

Table 1 summarises the average satisfaction scores across three main dimensions derived from the questionnaire: (1) perceived impact of tourism on residents' lives and place, (2) participation and involvement in tourism, and (3) satisfaction with sustainable tourism development and environmental management. Scores are based on a five-point Likert scale (1 = strongly disagree/very poor, 5 = strongly agree/very good).

Table 1. Summary of local satisfaction scores by dimension

Dimension of Local Satisfaction	Number of items	Mean score	Share of respondents with high satisfaction (mean $\geq$ 4)
Tourism impact on life & living place	6	3.82	$\approx$ 55%
Participation & involvement	7	3.34	$\approx$ 29%
Sustainable tourism & environment	18	3.47	$\approx$ 37%

(Source: Author, 2025)

Overall, residents express moderate-to-high satisfaction with the impacts of tourism, moderate satisfaction with their own participation, and mixed but generally positive satisfaction with sustainable tourism development and environmental conditions.

##### 4.1 Local satisfaction with the impacts of tourism

This sub-dimension captures how residents perceive tourism's effects on their lives, local services, and cultural continuity. Mean scores for the six items range between 3.70 and 3.98, indicating generally positive satisfaction. Residents agree that tourism improves living conditions and benefits livelihoods, with both items scoring 3.70. In contrast, tourism's contribution to service development is slightly higher ( $\approx$ 3.85), reflecting perceived improvements in facilities, accessibility, and basic services. Cultural aspects are also viewed positively: the item on traditions and history being preserved scores 3.83, and feeling satisfied or comfortable living in a tourism area records one of the highest means ( $\approx$ 3.98), signaling broad contentment with a tourism-intensive environment despite some pressures.

These quantitative results match observations and interviews. Waterfront development, better public spaces, more pedestrian areas, and new commercial nodes have made the town centre more vibrant and functional for both tourists and locals. Entrepreneurs and residents cite new income streams—homestays, culinary businesses, guiding, transport, and creative products—and greater visibility of Pangururan as a regional centre. Some interviewees note an uneven distribution of benefits, favouring those with better capital, networks, or locations. However, tourism is still widely seen as improving the quality of life and reinforcing Pangururan's attractiveness as a place to live.

Qualitative evidence from interviews and field observations supports these quantitative patterns. Key informants noted that tourism development in Pangururan has expanded beyond newly developed waterfront areas to include established destinations such as hot springs, Pasir Putih Parbaba, and Huta Raja, contributing to more diversified tourism activity across the district. Interviewees highlighted that ongoing infrastructure improvements, planned revitalisation of the Tano Ponggol bridge area, and the integration of public spaces with UMKM zones are perceived to enhance local economic opportunities and social vitality. Field observations confirmed increased commercial activity, improved public-space use, and greater interaction between residents and visitors, reinforcing residents' generally positive assessment of tourism's contribution to living conditions and local quality of life.

##### 4.2 Local satisfaction with participation and co-creation

This dimension reflects residents' views of their participation and involvement in tourism development and decision-making. Average scores are more moderate, with a mean of 3.34 and only about one in three respondents reaching high satisfaction (mean  $\geq$  4), suggesting that residents are engaged but feel limited influence over tourism. Participation in tourism-related activities is relatively positive: "I participate in activities related to tourism" scores around 3.62, indicating involvement as volunteers, event organisers, or informal workers. By contrast, items on being actively involved in planning and managing tourism and in decision-making are lower ( $\approx$ 3.03 and 2.94), while sharing views with policy-makers is moderate ( $\approx$ 3.21), pointing to partial, but not widespread, strategic participation.

Residents nonetheless express strong agreement with the following regulations to advance tourism ( $\approx$ 3.82) and with participating in sustainable tourism plans and development ( $\approx$ 3.46), suggesting general compliance and receptiveness to sustainability, even when they feel less included in formal decisions. Interviews with government officials, Pokdarwis leaders, and BUMDes managers describe an increasingly strong network of community-based organisations that act as intermediaries between residents and formal institutions. Co-creation is most visible within these organised groups, which design programmes, manage events, and maintain sites. Community members outside these circles often perceive participation as concentrated among a small group of "active people", while others see themselves mainly as beneficiaries. Observations confirm that public forums exist but are frequently led by a limited set of local champions. As a result, satisfaction with participation remains moderate rather than high: residents recognise opportunities yet perceive engagement as uneven and in need of broadening.

Insights from semi-structured interviews with key informants provide further explanation for the moderate satisfaction scores related to participation and co-creation. Interviewees reported that formal participation is most active among organised community groups such as Pokdarwis and BUMDes, which function as intermediaries between residents and government institutions. Several informants described negotiated governance arrangements, such as the management of tourism activities in Huta Raja, where BUMDes oversees operations while customary leaders retain cultural authority as evidence of collaborative decision-making. However, both interviewees and field observations indicated that participation remains concentrated among a limited group of active actors, while many residents engage primarily as beneficiaries rather than decision-makers, helping to explain why satisfaction with participation is moderate rather than high.

#### 4.3 Local satisfaction with sustainable tourism development

This dimension captures satisfaction with sustainable tourism development, particularly environmental protection, conservation programmes, resource management, and externalities such as noise and traffic. The average score is 3.47, indicating moderate satisfaction with variation across items. Residents see tourism as broadly aligned with environmental goals: items on increased environmental awareness and on tourism being developed in harmony with natural conservation score around 3.76 and 3.90, respectively. In contrast, satisfaction with natural heritage and biodiversity protection ranges from 3.78 to 3.84, reflecting recognition of efforts to preserve Lake Toba's landscape and ecotourism potential. Satisfaction with specific conservation and resource management measures—wildlife monitoring, energy efficiency programmes, and renewable energy infrastructure—is slightly lower but still positive ( $\approx 3.54$ – $3.68$ ), indicating awareness of conservation-oriented actions even if residents are not always directly involved.

By contrast, basic environmental infrastructure and risk management receive lower ratings. Satisfaction with toilets and septic systems, solid waste disposal, and wastewater treatment records some of the lowest means in this dimension ( $\approx 3.06$ – $3.22$ ), and satisfaction with disaster mitigation and environmental risk management is only moderate ( $\approx 3.18$ – $3.40$ ). These scores are consistent with observations of visible solid waste in some waterfront and neighbourhood areas, limited waste segregation, and direct wastewater discharge into surface waters. Interviews with community leaders and officials confirm that initiatives to improve waste management and preparedness exist, but are uneven and constrained by resources. Perceptions of negative externalities are reflected in items on transport and light/noise pollution, both around 2.9, suggesting that while residents are not extremely disturbed, they are not entirely comfortable; traffic, congestion, and nightlife-related noise are emerging concerns during peak seasons. Overall, residents view tourism development in Pangururan as broadly consistent with sustainable tourism principles but identify environmental infrastructure and externalities as priority areas for improvement.

Qualitative findings and field observations clarify residents' mixed evaluations of environmental sustainability. Interviews revealed emerging community-led initiatives in solid waste management, including the experimental conversion of plastic waste into alternative fuel through small-scale pyrolysis, indicating local innovation and environmental awareness. At the same time, informants consistently identified liquid waste management and water quality as persistent challenges, with untreated household and tourism-related wastewater still entering Lake Toba in some areas. Observations of waste accumulation, limited sanitation infrastructure, and uneven implementation of filtration systems corroborate these concerns, explaining why residents express only moderate satisfaction with environmental management despite recognising conservation efforts and environmental campaigns.

## 5.0 Discussion

The discussion is structured around four analytical dimensions—governance, socio-economic, cultural, and environmental—to provide a coherent interpretation of the findings within established sustainable tourism and co-creation frameworks. This classification is theoretically and methodologically grounded in internationally recognised sustainable tourism governance models, particularly the GSTC destination criteria, the INSTO framework, and the triple-bottom-line approach extended to include governance and culture in tourism sustainability research.

Methodologically, these four dimensions also reflect the design of the survey instrument and qualitative inquiry, which measured local satisfaction across economic opportunities, social and cultural impacts, governance and participation, and environmental conditions. Organising the discussion along these dimensions therefore enables a direct linkage between empirical findings and the conceptual foundations of sustainable tourism, while allowing the role of co-creation to be examined across governance arrangements, benefit distribution, cultural reproduction, and environmental management. This integrated structure is consistent with prior studies that analyse residents' quality of life and support for tourism through multi-dimensional sustainability lenses (Rasoolimanesh et al., 2023; Miller & Torres-Delgado, 2023; Ginting et al., 2024).

### 5.1 Governance

The governance discussion is supported by interview evidence indicating negotiated and collaborative decision-making structures, such as the shared management arrangements between BUMDes, Pokdarwis, and customary leaders in destinations like Huta Raja. Field observations further confirm that government institutions primarily act as facilitators rather than direct operators, aligning with co-creation and participatory governance models discussed in sustainable tourism literature. From a governance perspective, the findings indicate a partial but evolving co-creation regime. Residents report moderate satisfaction with their participation and involvement (mean  $\approx 3.34$ ). Many engage in tourism activities and follow tourism-related regulations, but fewer feel actively involved in planning or decision-making. Co-creation appears strongest among institutionalised actors—Pokdarwis, BUMDes, and village Leadership—who act as intermediaries between local government and the wider community, while broader resident participation remains limited.

This pattern resonates with work on sustainable tourism governance, which argues that inclusive co-creation requires formal participatory spaces, combined with capacity-building, transparent information flows, and mechanisms that enable diverse community voices to influence strategic decisions (Cifci et al., 2023; Ginting et al., 2024). In Pangururan, community forums and collaborative programmes indicate that the infrastructure for co-creation is in place. However, moderate satisfaction scores for involvement in planning and decision-making suggest it is not yet fully accessible to all. Local satisfaction functions as a diagnostic tool: lower satisfaction with participation signals governance gaps such as uneven representation or limited feedback mechanisms. For Pangururan, the next step in strengthening co-created governance is to broaden and deepen participation so that governance is perceived as fair, inclusive, and responsive.

### 5.2 Socio-economic dimension

Evidence from interviews with local officials and tourism actors demonstrates that socio-economic benefits are primarily generated through community-led enterprises. These empirical findings support the discussion of co-created economic value, where locals function as active producers rather than passive beneficiaries, consistent with community-based tourism and co-creation theory. The socio-economic dimension is evaluated positively, with the highest satisfaction scores among the three major dimensions. Most respondents perceive tourism as improving living conditions, providing livelihood opportunities, and contributing to better services and local facilities. These findings are consistent with studies showing that perceived economic benefits and improved infrastructure are key determinants of resident support in developing destinations (Eyisi et al., 2021; Halim et al., 2022). Waterfront development, increased commercial activity, and the growth of small businesses have generated livelihood opportunities. Stakeholders often describe tourism as "opening new doors" for youth and households that previously relied mainly on agriculture, echoing earlier studies in Lake Toba that highlight tourism's potential to diversify rural economies and strengthen resilience (Ginting et al., 2023).

At the same time, local satisfaction data reveal concerns about distribution. Interviews suggest that economic gains are more accessible to those with strategic assets and families already linked to tourism. This reflects the co-creation literature, which cautions that without deliberate Equity mechanisms, co-created innovations can reproduce or amplify existing inequalities (Rong-Da Liang et al., 2023; Sharpley, 2022). Using local satisfaction as an evaluative lens, Pangururan's socio-economic performance can be interpreted as strong but uneven, pointing to the need for policies that support broader inclusion in tourism value chains, particularly for less-connected households and peripheral neighbourhoods.

### 5.3 Culture

Interview findings reveal that cultural sustainability is maintained through customary authority, local norms, and negotiated tourism practices, rather than formal regulation alone. Observations of cultural sites and community-managed attractions indicate that tourism development in Pangururan reinforces cultural continuity while allowing adaptive use for tourism purposes, supporting theoretical arguments that co-creation strengthens cultural resilience when local actors retain control. Culturally, the findings suggest that tourism innovation in Pangururan has strengthened local identity and pride. Residents report relatively high satisfaction with the preservation of traditions and history, as well as with the condition of natural and cultural heritage assets. Interview narratives describe pride in revitalised cultural spaces, traditional villages, and events that showcase Batak heritage, as well as a strong sense of belonging to the Lake Toba landscape.

Tourism development has leveraged cultural assets through festivals, performances, heritage interpretation, and everyday practices embedded in tourism experiences. This aligns with research on co-created cultural tourism, which suggests that when communities actively contribute stories, rituals, and local knowledge, tourism can support cultural renewal and intergenerational transmission rather than mere commercial display (Campos et al., 2018; Ginting et al., 2024). In Pangururan, co-creation between local artists, cultural custodians, and tourism actors has helped reinterpret Batak culture for visitors in ways that resonate with residents' values.

Moderate rather than very high satisfaction scores indicate that cultural sustainability remains a dynamic process. Interviews point to concerns about superficial performances or the risk that, in the future, commercial pressures may prioritise visitor preferences over local meanings. Local satisfaction, therefore, serves as a sensitive indicator of residents' perceptions of the balance between cultural preservation and adaptation. Continuous monitoring can alert decision-makers when cultural tourism begins to erode from community expectations, enabling adjustments that keep co-created cultural innovation both authentic and empowering.

### 5.4 Environment

The environmental discussion is grounded in qualitative evidence from interviews and field observations, which highlight both innovative community-led solid waste initiatives and persistent challenges in liquid waste and water management. These findings explain the moderate levels of environmental satisfaction reported in the survey and reflect broader sustainability debates regarding the gap between local environmental awareness and infrastructural capacity in developing tourism destinations. The environmental dimension emerges as the most ambiguous in the evaluation framework. Residents express relatively positive satisfaction with environmental awareness, the alignment of tourism development with conservation, and programmes protecting natural heritage and biodiversity, but only moderate satisfaction with core environmental services. They also report noticeable disturbance from transport and noise/light pollution.

This pattern reflects that environmental discourses and programmes may be in place, while infrastructure and enforcement often lag (Marinello et al., 2023). In Pangururan, interviewees describe campaigns for environmental awareness and some conservation-related allocation of tourism revenue, yet also point to visible waste in public spaces, direct wastewater discharge into canals or the lake, and

limited disposal capacity. Lower satisfaction with toilets, septic systems, solid waste disposal, and landfill conditions is consistent with these observations.

Local satisfaction helps differentiate between symbolic and substantive environmental performance. High scores on items linked to awareness and conservation narratives indicate that co-creation has embedded environmental themes into local discourse and some practices. Lower scores for infrastructure and externalities signal gaps between environmental ideals and everyday realities. From a co-creation perspective, this suggests the need to move from primarily programme-based environmental actions (campaigns, awareness, symbolic conservation) toward co-created solutions for basic services and risk management, in which residents participate in designing, implementing, and monitoring practical interventions. Addressing these environmental weaknesses will be crucial to ensure that Pangururan's co-created tourism innovation remains sustainable and credible in the long term.

## 6.0 Conclusion and Recommendations

This study evaluated local satisfaction as an evaluation framework for co-created sustainable tourism innovation in Pangururan, Lake Toba. Using a mixed-methods case study design that combined a household survey of 355 residents with semi-structured interviews and field observations, the research assessed local satisfaction across three interrelated dimensions: (1) the impacts of tourism on residents' lives and place, (2) participation and involvement in tourism development, and (3) perceptions of sustainable tourism development, with particular attention to environmental management. The findings indicate that co-created tourism development in Pangururan has generated broadly positive socio-economic and cultural outcomes, while also revealing governance and environmental challenges that require further attention to ensure long-term sustainability. Overall, residents report moderate to high levels of satisfaction with tourism's impacts, particularly in terms of improved living conditions, livelihood opportunities, services, and public spaces, alongside enhanced place pride and a stronger image for Pangururan within the Lake Toba destination. These outcomes reflect the tangible benefits of co-created tourism initiatives and support arguments in the literature that resident-oriented development can strengthen local quality of life and destination legitimacy.

At the same time, satisfaction with participation and co-creation remains more moderate. While many residents are involved in tourism-related activities and generally comply with local regulations, fewer perceive themselves as actively engaged in planning, management, or decision-making processes. Co-creation practices are strongest among organised groups such as Pokdarwis, BUMDes, and community leaders, who function as intermediaries between government institutions and the wider community. This pattern suggests a partial rather than fully inclusive co-creation regime, in which benefits are widely felt but decision-making influence remains unevenly distributed. Residents also recognise efforts to align tourism development with environmental awareness and conservation, and they express general satisfaction with the protection of natural and cultural heritage. However, comparatively lower satisfaction with solid waste management, sanitation, wastewater treatment, disaster risk reduction, and emerging concerns related to traffic congestion and noise or light pollution indicate that environmental performance lags behind socio-economic and cultural gains. These findings suggest that ecological sustainability has not yet been fully achieved and remains the most critical area for improvement in Pangururan's tourism development trajectory.

Based on these findings, several policy and management recommendations are proposed. From a governance perspective, existing co-creation structures should be strengthened by expanding meaningful participation to a broader cross-section of residents through more inclusive public consultations, targeted capacity-building for marginalised groups, and clearer feedback mechanisms that demonstrate how community input informs tourism decisions. To consolidate socio-economic benefits, policies should promote broader inclusion in tourism value chains by improving access to training, microfinance, and market information for small-scale entrepreneurs and residents in peripheral neighbourhoods. Cultural sustainability should be maintained through continued collaboration with customary authorities, cultural custodians, and youth groups, ensuring that tourism activities reinforce rather than dilute local meanings, practices, and identities. Environmentally, more substantive co-created interventions are required to improve waste management, sanitation, wastewater treatment, and disaster risk reduction through coordinated investment and collaboration among government, communities, and private-sector actors.

The study demonstrates that local satisfaction functions as a sensitive, multi-dimensional monitoring lens for evaluating co-created tourism innovation. Indicators related to participation and environmental management, in particular, can provide early signals of emerging challenges and guide adaptive governance responses. Integrating local satisfaction into ongoing INSTO monitoring systems can therefore support more responsive and inclusive sustainable tourism governance in Pangururan and the wider Lake Toba region.

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## Paper Contribution to the Related Field of Study

This paper advances sustainable tourism and destination governance by framing local satisfaction as an evaluative lens for co-created

tourism innovation, integrating resident perceptions across governance, socio-economic, cultural, and environmental dimensions within a single model. Methodologically, it demonstrates how mixed methods can operationalise global sustainability and INSTO/GSTC concepts through locally grounded, resident-based indicators in a geopark context. Empirically, the study provides context-sensitive insights for mid-sized urbanising districts in the Global South, showing that co-created tourism in Pangururan delivers socio-economic and cultural benefits while revealing governance and environmental gaps requiring targeted intervention. Collectively, these findings offer a replicable framework for destinations seeking to embed community perspectives in sustainable tourism monitoring and policy.

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