



When Tourism Exceeds Carrying Capacity: Implications for Sustainable Community-Based Tourism in Waerebo Village. East Indonesia

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Abstract: *This study examines the implications of mass tourism for sustainable tourism in the Wae Rebo Cultural Village using the Importance Performance Analysis (IPA) approach. The research aims to analyze the impacts of mass tourism on the economic, socio-cultural, and environmental dimensions of sustainability while identifying management priorities to support sustainable destination development. Data were collected from local community perceptions and analyzed by comparing the importance and performance of each indicator. The findings indicate that mass tourism contributes positively to the local economy, with economic well-being achieving performance levels close to community expectations. However, increased tourism activities also influence socio-cultural conditions, particularly through the dominance of mass tourism and changes in community social life. Environmental issues emerged as the greatest concern, with environmental pressure, infrastructure pressure, and overcrowding showing the largest performance gaps. Based on the IPA results, management priorities include controlling visitor intensity and tourist density, reducing environmental pressure, improving infrastructure capacity, and addressing overcrowding through sustainable destination management. Recommended strategies include implementing a quota-based reservation system aligned with carrying capacity, strengthening environmentally friendly infrastructure and waste management, and providing continuous visitor education on cultural and environmental conservation. This study contributes to the literature by integrating mass tourism and sustainable tourism within a single analytical framework, offering practical guidance for policymakers and destination managers in achieving balanced and sustainable tourism development.*

Keywords: *Mass Tourism; Sustainable Tourism; Tourism Village; Tourism; Wae Rebo.*

Abstrak: Penelitian ini mengkaji implikasi pariwisata massal terhadap pariwisata berkelanjutan di Desa Wisata Budaya Wae Rebo dengan menggunakan pendekatan *Importance Performance Analysis* (IPA). Penelitian ini bertujuan untuk menganalisis dampak pariwisata massal terhadap dimensi ekonomi, sosial budaya, dan lingkungan dalam keberlanjutan pariwisata, sekaligus mengidentifikasi prioritas pengelolaan untuk mendukung pengembangan destinasi yang berkelanjutan. Data dikumpulkan berdasarkan persepsi masyarakat lokal dan dianalisis dengan membandingkan tingkat kepentingan dan kinerja setiap indikator. Hasil penelitian menunjukkan bahwa pariwisata massal memberikan kontribusi positif terhadap perekonomian lokal, dengan kesejahteraan ekonomi menunjukkan tingkat kinerja yang mendekati harapan masyarakat. Namun, peningkatan aktivitas pariwisata juga memengaruhi kondisi sosial budaya, terutama melalui dominasi pariwisata massal dan perubahan dalam kehidupan sosial masyarakat. Permasalahan lingkungan menjadi perhatian terbesar, dengan tekanan lingkungan, tekanan terhadap infrastruktur, dan kepadatan pengunjung menunjukkan kesenjangan kinerja yang paling besar. Berdasarkan hasil IPA, prioritas pengelolaan meliputi pengendalian intensitas dan kepadatan wisatawan, pengurangan tekanan terhadap lingkungan, peningkatan kapasitas infrastruktur, serta penanganan kepadatan pengunjung melalui pengelolaan destinasi yang berkelanjutan. Strategi yang direkomendasikan mencakup penerapan sistem reservasi berbasis kuota yang disesuaikan dengan daya dukung destinasi, penguatan infrastruktur ramah lingkungan dan pengelolaan sampah, serta pemberian edukasi berkelanjutan kepada pengunjung mengenai pelestarian budaya dan lingkungan. Penelitian ini memberikan kontribusi terhadap literatur dengan mengintegrasikan pariwisata massal dan pariwisata berkelanjutan dalam satu kerangka analisis, serta menawarkan panduan praktis bagi pembuat kebijakan dan pengelola destinasi dalam mewujudkan pembangunan pariwisata yang seimbang dan berkelanjutan.

Kata Kunci: Desa Wisata; Pariwisata Berkelanjutan; Pariwisata Massal; Pariwisata; Wae Rebo.

1. INTRODUCTION

Tourism is widely recognized as a dynamic economic sector that experiences significant global and national growth, recording Indonesian tourism foreign exchange earnings of Rp 25.4 trillion in 2024 (Kemenpar, 2024; Marlina & Hidayati, 2023). This achievement highlights the role of tourism as an economic driver that generates a direct financial dynamic and broad multiplier effects across supporting sectors (Dinan et al., 2025). Dynamic growth does not always proceed in harmony with destination sustainability principles (Susanti et al., 2023). A fundamental debate surrounds whether volume-driven tourism expansion can coexist with long-term site viability. Central to this debate are the complex interactions between mass tourism, overtourism, carrying capacity, and destination sustainability. Mass tourism is no longer confined to macro-urban or coastal resorts, as recent phenomena show its critical emergence in spatially constrained heritage sites (Darmayasa et al., 2025). High visitation intensity creates severe friction between short-term economic gains and physical or social endurance limits. Establishing a balance between growth volumes and multi-dimensional sustainability remains the core challenge of modern destination governance.

Theoretical models of destination evolution center on Butler's Tourism Area Life Cycle (TALC), which outlines progression through exploration, involvement, development, consolidation, and stagnation phases (Butler, 2008). Destinations undergoing development and consolidation exhibit rapid increases in visitor volume, spatial saturation, and intensive resource exploitation, shifting operations toward mass tourism ((Bernini & Cracolici, 2015; Hartman, 2023)). Conventional TALC and carrying capacity theories suffer from a major theoretical gap by treating carrying capacity as a static numerical threshold applied primarily to macro-scale destinations. Existing conceptual frameworks fail to explain how overcapacity dynamically interacts across economic, socio-cultural, and environmental sustainability dimensions simultaneously within indigenous micro-destinations. Current literature treats overtourism as a spatial or contextual variation rather than modeling the systemic structural feedback loops triggered when capacity is breached in small-scale environments. Conducting research in Wae Rebo addresses this theoretical gap by evaluating how overcapacity-induced tourism pressure reshapes multi-dimensional sustainability within a hyper-fragile, community-based ecosystem.

Wae Rebo exemplifies the structural pressure of an indigenous micro-destination transitioning rapidly into high-density tourism. Official data from the Culture and Tourism Office of Manggarai Regency shows tourist arrivals shifting from 6,922 in 2019 down to 87 in 2020 due to pandemic restrictions, followed by a rebound to 2,282 in 2021 and 5,486 in 2022

(Dinas Kebudayaan dan Pariwisata Kabupaten Manggarai, 2024). Arrivals spiked to 11,461 visitors in 2023, representing a 108.9% year-on-year increase and generating an average daily intensity of 31 tourists per day (Dinas Kebudayaan dan Pariwisata Kabupaten Manggarai, 2024). High visitation intensity concentrated in small geographic spaces demonstrates the physical manifestation of mass tourism ((Paulino et al., 2021; Utama et al., 2024) Visitation numbers have historically been treated strictly as indicators of success rather than structural pressure metrics. Lack of empirical integration between growth metrics and capacity limits leaves the destination vulnerable to structural decline.

Comparing actual visitation against empirical carrying capacity evaluations highlights a severe structural breach in Wae Rebo. Official calculations set the Physical Carrying Capacity (PCC) at 28 visitors per day, reducing to a Real Carrying Capacity (RCC) of 25 visitors per day after applying a Correction Factor (CF) of 0.36 (UPT Badan Pelestarian Kebudayaan Bali Nusra, 2024). Theoretical Effective Carrying Capacity (ECC) stands at 9 visitors per day, while operational ECC is capped at 5 visitors per day (UPT Badan Pelestarian Kebudayaan Bali Nusra, 2024). The 2023 daily average of 31 visitors consistently exceeds ideal RCC limits by 6 visitors daily and severely violates conservative operational thresholds. Infrastructure constraints compound this strain, as only two of the seven traditional Mbaru Niang houses host tourists, with an ideal capacity of 20 overnight guests ((Nadiastuti et al., 2025). Overnight averages reaching 30 guests per day in 2024 confirm that Wae Rebo operates under chronic overcapacity.

Persistent overcapacity directly causes physical degradation within the sensitive ecological landscape of Wae Rebo. High-intensity visitation exceeding carrying capacity limits accelerates environmental degradation, solid waste production, and localized resource depletion ((Ciangă & Sorocovschi, 2017). The fragile mountain ecosystem surrounding the traditional structures faces severe foot-traffic erosion, trail damage, and habitat disturbance. Inadequate sanitation facilities fail to process peak visitor volumes, directly threatening environmental health. Enclosed basin geography accelerates the accumulation of unmanaged waste and water strain. Environmental degradation undermines the natural assets supporting Wae Rebo's ecotourism model. Protecting natural capital requires enforcing daily capacity limits rooted in ecological tolerances.

Unchecked mass tourism generates severe socio-cultural stress within the resident indigenous community. High tourist density in community-based sites alters traditional values, disrupts daily routines, and strains local socio-cultural structures ((Ciangă & Sorocovschi, 2017; Noosut et al., 2023). Intensive visitor interaction in Wae Rebo risks commercializing

living traditions and diluting indigenous heritage. Shared domestic spaces inside the Mbaru Niang create overcrowding that invades community privacy. Tourist reviews confirm that sanitation shortages and overcrowding degrade visitor experience and signal cultural strain. External cultural influences permeating daily life threaten long-term community cohesion. Preserving intangible heritage requires balancing tourist access with social endurance limits.

Structural tourism pressure alters local economic resilience and introduces long-term economic vulnerabilities. Intense visitor concentration creates spatial saturation and excessive economic dependence on tourism ((Rogowski, 2025)). Over-reliance on tourist revenue displaces traditional self-sustaining agricultural practices. Revenue generated from high tourist volumes is unequally distributed across households, heightening local economic inequality. High-volume, low-yield mass tourism maximizes environmental costs while diminishing proportional economic returns per tourist. Sudden drops in future visitor numbers could trigger severe economic distress for dependent residents. Transitioning toward a high-value, capacity-managed economic model is essential for community survival.

Addressing these challenges requires answering four specific research objectives to resolve existing theoretical and empirical gaps ((Noosut et al., 2023)). The first objective analyzes the impact of mass tourism on the economic dimension of Wae Rebo, focusing on income stability, enterprise opportunities, and benefit distribution. The second objective evaluates socio-cultural impacts, examining shifting values, community involvement, and host-guest dynamics. The third objective assesses environmental impacts, measuring ecosystem changes, waste generation, and sustainability awareness. The fourth objective formulates actionable management strategies to mitigate overcapacity and ensure destination sustainability. Theoretical contributions advance academic discourse at the Bali Tourism Polytechnic by offering an integrated model of carrying capacity and sustainability in micro-destinations. Practical outcomes provide the Regional Government of West Manggarai, Wae Rebo custom leaders, and the Cultural Heritage Preservation Board (BPK) with empirical backing to enforce daily quotas and sustainable policies.

2. RESEARCH METHOD

This research uses a mixed-methods design driven primarily by an Importance-Performance Analysis (IPA) framework to evaluate the impact of mass tourism on destination sustainability in Wae Rebo. Wae Rebo was chosen because it represents a community-based cultural heritage site experiencing severe tourism pressure in Manggarai Regency, Flores. The determination of the sample size was based on Hair et al. (2022), who stated that the sample

size in quantitative research should be at least 5–10 times the number of indicators used. As there are 12 indicators in this study, the minimum sample size is 60 respondents and the ideal sample size is 120 respondents. Operational of Definition Variable

Table 1. Operational Definition of Variable.

No	Variabel	Indikator	Definisi Operasional	Pernyataan	Sumber
1	<i>Mass tourism</i>	Tourist density	High number of tourists at a given time in a destination	The tourist area frequently experiences tourist overcrowding	(Blázquez-Salom et al., 2023)
		Visit intensity	Frequency of visitation levels	Tourist visits occur continuously in large numbers	
		Environmental carrying capacity pressure	Number of tourists compared to the environmental capacity	The number of tourists often exceeds the environmental capacity	
		Pressure on infrastructure	Tourist load on public facilities	Public facilities are often overwhelmed when serving tourists	
		Pressure on socio-culture	Impact of tourist volume on the socio-cultural life of the community	The presence of large numbers of tourists affects the social life of the community	
		Overcrowding	Overcrowded conditions that disrupt comfort	Tourist density disrupts comfort in the tourist area	
		Dominance of mass tourism	Large-scale tourist activities concentrated in one location	Tourist activities in this area are dominated by large groups of tourists	
2	Tourism Sustainability	Local economic prosperity	Prosperity level of the local community's economy	The level of local economic prosperity (local prosperity) generated by tourism activities in this destination	(Javed & Tučková, 2025)
		Environmental pressure	Environmental pressure generated by tourism activities	Environmental pressure generated by tourism activities in the destination	
		Social life of local communities	Condition of local communities' social life	Condition of the social life of local	

	Development of small towns	Development of surrounding small towns	communities surrounding the tourist destination The influence of tourism on the development of small towns surrounding the destination
	Technology in destination protection and management	Utilization of technology in protecting and managing tourist destinations	Utilization of technology in protecting and managing tourist destinations

Source: Data Processed (2026)

The research population consists of 120 local residents affected by tourism (Sekaran & Bougie, 2020). Sampling was conducted in 2025 using a purposive sampling technique based on residency, tourism involvement, and impact exposure (Sugiyono, 2020), securing 120 respondents to satisfy IPA sample stability requirements (Hair et al., 2022). Data collection was carried out through structured 5-point Likert-scale questionnaires (Sugiyono, 2020) designed to measure both Importance (community expectations) and Performance (actual current conditions) across Mass Tourism ((Blázquez-Salom et al., 2023) and Sustainability indicators (Javed & Tučková, 2025).

All survey items were validated via IBM SPSS Version 29 and met high internal reliability with Cronbach's Alpha scores above 0.60 (Sugiyono, 2020). Based on Tabel 2 below.

Table 2. Results of the Instrument Validity Test.

NO	Variabel	Performance			
		Item	Calculated r-value	Critical r-value	Decision
1	<i>Mass tourism</i>	X1.1	0.819	0,1793	Valid
		X1.2	0.833	0,1793	Valid
		X1.3	0.858	0,1793	Valid
		X1.4	0.833	0,1793	Valid
		X1.5	0.851	0,1793	Valid
		X1.6	0.786	0,1793	Valid
		X1.7	0.776	0,1793	Valid
2	Sustainable Tourism	Y1.1	0.912	0,1793	Valid
		Y1.2	0.923	0,1793	Valid
		Y1.3	0.914	0,1793	Valid
		Y1.4	0.929	0,1793	Valid
		Y1.5	0.945	0,1793	Valid
3	<i>Masss Tourism</i>	Importance Satisfaction			
		Item	R Hitung	R Tabel	Keterangan
		X1.1	0.849	0,1793	Valid
		X1.2	0.827	0,1793	Valid
		X1.3	0.834	0,1793	Valid
		X1.4	0.820	0,1793	Valid
		X1.5	0.820	0,1793	Valid
		X1.6	0.853	0,1793	Valid

4.	Sustainable Tourism	X1.7	0.810	0,1793	Valid
		Y1.1	0.811	0,1793	Valid
		Y1.2	0.873	0,1793	Valid
		Y1.3	0.928	0,1793	Valid
		Y1.4	0.911	0,1793	Valid
		Y1.5	0.931	0,1793	Valid

Source: Processed data, 2026.

Table 3. Result Reliability Test

Variabel	Nilai Cronbach's Alpha	Standar	Decision
<i>Mass tourism</i> X.1 (Kinerja)	0,919	0.6	Reliabel
<i>Sustainable Tourism</i> Y.1 (Kinerja)	0,957	0.6	Reliabel
<i>Mass tourism</i> X.1 (Kepuasan)	0,925	0.6	Reliabel
<i>Sustainable Tourism</i> (Kepuasan) Y.1	0,934	0.6	Reliabel

Data analysis was carried out using data reduction methods, data presentation and drawing conclusions. Data collected through interviews and observations were tested using IPA Analysis, which aims to see significant differences between the productivity of manual embroidery and digital embroidery. This test helps measure the level of sophistication of digital embroidery in improving company performance by testing hypotheses regarding the comparison of the productivity of the two methods. The results of the analysis are expected to analysing the impact of mass tourism on the sustainability of tourism in Wae Rebo.

3. RESULTS AND DISCUSSION

Overview of the Research Location

This research was conducted in Wae Rebo Traditional Village, located in West Satarmese District, Manggarai Regency, East Nusa Tenggara Province. Geographically, Wae Rebo is situated at an altitude of approximately 1,100–1,200 meters above sea level, characterized by a mountainous topography, cool climate, and dense tropical rainforest ecosystem. The village functions as a buffer zone for Komodo National Park. Access to Wae Rebo is spatially constrained vehicular transport terminates at Denge Village, requiring a 2-to-3-hour trek (approximately 7 kilometers) through steep mountain trails. This geographic isolation has historically preserved indigenous lifestyles, social structures, and traditional architecture.

Importance-Performance Analysis (IPA)

Evaluation of 12 destination attributes (7 Mass Tourism attributes, X1. 5 Destination Sustainability attributes, Y1) was executed using Importance-Performance Analysis (IPA). Mean score evaluations for expectation (Importance) and actual operational reality (Performance) are detailed below.

Descriptive Assessment of Expectation (Importance)

Community importance scores reflect idealized thresholds for destination management, as shown in Table 4.

Table 4. Descriptive Statistics of Mass Tourism and Sustainable Tourism Indicators in Wae Rebo Cultural Tourism Village.

Code	Attribute Description	N	Min	Max	Mean (Y)	Std. Dev
X1.1	Tourist Density	120	1	5	3.90	0.94
X1.2	Visitation Intensity	120	1	5	3.92	0.93
X1.3	Environmental Carrying Capacity Pressure	120	1	5	3.83	0.91
X1.4	Infrastructure Strain	120	1	5	3.89	0.87
X1.5	Socio-Cultural Pressure	120	1	5	3.92	0.92
X1.6	Overcrowding	120	1	5	3.90	0.94
X1.7	Mass Tourism Dominance	120	1	5	3.98	0.85
Y1.1	Local Economic Prosperity	120	1	5	3.96	0.91
Y1.2	Environmental Pressure	120	1	5	3.90	0.95
Y1.3	Social Life of Locals	120	1	5	3.73	0.99
Y1.4	Peripheral Settlement Development	120	1	5	3.72	1.01
Y1.5	Technology in Destination Management	120	1	5	3.74	0.95

Mass Tourism Dominance (X1.7, Mean=3.98) and Local Economic Prosperity (Y1.1, Mean=3.96) recorded the highest importance scores, followed by Visitation Intensity (X1.2, Mean=3.92) and Socio-Cultural Pressure (X1.5, Mean=3.92). These figures demonstrate strong community prioritization of economic stability and cultural protection.

Descriptive Assessment of Operational Performance

Performance scores represent community evaluation of actual field conditions, as documented in Table 5.

Table 5. Descriptive Statistics of Importance Ratings for Mass Tourism and Sustainable Tourism Indicators in Wae Rebo Cultural Tourism Village.

Code	Attribute Description	N	Min	Max	Mean (X)	Std. Dev
X1.1	Tourist Density	120	1	5	3.53	0.97
X1.2	Visitation Intensity	120	1	5	3.51	0.95
X1.3	Environmental Carrying Capacity Pressure	120	1	5	3.80	0.92
X1.4	Infrastructure Strain	120	1	5	3.65	0.93
X1.5	Socio-Cultural Pressure	120	1	5	3.87	0.94
X1.6	Overcrowding	120	1	5	3.67	0.96
X1.7	Mass Tourism Dominance	120	1	5	3.86	0.98
Y1.1	Local Economic Prosperity	120	1	5	3.88	0.91
Y1.2	Environmental Pressure	120	1	5	3.60	0.94
Y1.3	Social Life of Locals	120	1	5	3.68	0.99
Y1.4	Peripheral Settlement Development	120	1	5	3.62	1.02
Y1.5	Technology in Destination Management	120	1	5	3.71	0.96

Conformity Level and Gap Analysis

The gap between performance (X) and importance (Y) indicates operational deficits across measured parameters, as shown in Table 6.

Table 3. Importance–Performance Analysis (IPA) of Mass Tourism and Sustainable Tourism Indicators in Wae Rebo Cultural Tourism Village.

Code	Attribute Description	Mean Y (Importance)	Mean X (Performance)	Gap Score (X - Y)	Conformity Level (%)
X1.1	Tourist Density	3.90	3.53	-0.37	90.51%
X1.2	Visitation Intensity	3.92	3.51	-0.41	89.54%
X1.3	Environmental Carrying Capacity Pressure	3.83	3.80	-0.03	99.22%
X1.4	Infrastructure Strain	3.89	3.65	-0.24	93.83%
X1.5	Socio-Cultural Pressure	3.92	3.87	-0.05	98.72%
X1.6	Overcrowding	3.90	3.67	-0.23	94.10%
X1.7	Mass Tourism Dominance	3.98	3.86	-0.12	97.09%
Y1.1	Local Economic Prosperity	3.96	3.88	-0.08	97.98%
Y1.2	Environmental Pressure	3.90	3.60	-0.30	92.31%
Y1.3	Social Life of Locals	3.73	3.68	-0.05	98.66%
Y1.4	Peripheral Settlement Development	3.72	3.62	-0.10	97.31%
Y1.5	Technology in Destination Management	3.74	3.71	-0.03	99.20%

Negative gap values across all 12 attributes indicate that operational performance remains below community expectations. The largest performance deficits are concentrated in Visitation Intensity X1.2 (-0.41), Tourist Density X1.1 (-0.37), Environmental Pressure Y1.2 (-0.30), and Infrastructure Strain X1.4 (-0.24). This discrepancy may indicate that, although local communities recognise the importance of environmental protection, the rapid growth of tourism activities may place pressures that exceed existing environmental management capacity. This gap may be linked to the increasing intensity of tourism activities and the existing capacity of environmental management systems to respond to these pressures. As visitor numbers and tourism-related activities increase, so too does the demand for resources and supporting infrastructure. When tourism growth exceeds the capacity of environmental management systems, a discrepancy may arise between the level of importance attached to environmental sustainability and perceived performance.

Table 7. Cartesian Diagram Analysis: Building Conceptual Argument.

Cartesian Quadrant	Strategic Classification	Mapped Attributes	Conceptual Argument on Destination Sustainability
Quadrant I	Top Priority (Concentrate Here)	X1.1 (Density), X1.2 (Intensity), X1.4 (Infrastructure), X1.6 (Overcrowding), Y1.2 (Environmental Pressure)	Demonstrates an ecological and physical carrying capacity crisis. Unmanaged visitation exceeding operational capacity (5 visitors/day threshold vs 31 visitors/day actual average) creates structural strain on physical assets and natural resources.
Quadrant II	Maintain Performance (Keep Up Good Work)	X1.7 (Mass Tourism Dominance), X1.5 (Socio-Cultural Pressure), Y1.1 (Local Economic Prosperity)	Reflects economic resilience and cultural institutional adaptation. Community-Based Tourism generates direct economic returns, while traditional governance mitigates cultural erosion.
Quadrant III	Low Priority	Y1.3 (Social Life of Locals), Y1.4 (Peripheral Settlement Development)	Represents attributes currently viewed as secondary by residents, though cumulative socio-spatial changes require ongoing monitoring.
Quadrant IV	Possible Overkill	X1.3 (Environmental Carrying Capacity Pressure), Y1.5 (Technology in Management)	Indicates stabilized technical management parameters relative to immediate community expectations, enabling resource reallocation toward Quadrant I priorities.

Qualitative Data Triangulation

To contextualize the IPA matrix findings, qualitative data gathered from key informant interviews (customary leaders, homestay operators, guides, and residents) were triangulated with quantitative outputs, as detailed in Table 8.

Table 8. Empirical Validation of Importance–Performance Analysis (IPA) Findings Through Informant Interviews in Wae Rebo Cultural Tourism Village.

No	Attribute Dimension	Informant Code	Selected Descriptive Interview Transcript	Empirical Alignment with IPA Matrix
1	Density and Overcrowding (X1.1, X1.6)	I1, I6	"During peak seasons, tourist arrivals are extremely high, making the central village grounds feel congested and disrupting daily resident activities."	Validates Quadrant I: High visitor concentration causes spatial saturation and reduces residential comfort.
2	Intensity and Physical Strain (X1.2, X1.3)	I2, I3	"Tourists arrive almost daily now. We observe physical trail degradation along the mountain trekking route due to continuous foot traffic."	Validates Quadrant I: Continuous daily visitation accelerates environmental and physical path wear.
3	Infrastructure Strain (X1.4)	I4	"During peak days, basic sanitation facilities and accommodation capacity within the Mbaru Niang houses are overwhelmed."	Validates Quadrant I: Overnight arrivals exceeding 30 guests/day breach the ideal limit of 20 guests/day.
4	Environmental Waste (Y1.2)	I9	"Higher tourist volume results in increased inorganic waste accumulation, straining local management capacity."	Validates Quadrant I: Solid waste generation exceeds self-contained village disposal capacity.
5	Economic Benefit Distribution (Y1.1)	I8	"Increased tourist presence has raised household incomes through	Validates Quadrant II: Demonstrates active economic multiplier effects

6	Socio-Cultural Resilience (X1.5, Y1.3)	15, 110	homestays, guiding fees, and handicraft sales." "Tourism increases openness to external cultures, but strict customary rules must be enforced to protect indigenous traditions."	under Community-Based Tourism. Validates Quadrant II: Traditional customary governance manages cultural interaction dynamics.
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Theoretical Synthesis and Strategic Action Plan

Mass Tourism Implications on Local Economy

Local Economic Prosperity (Y1.1) is located in Quadrant II with a minimal gap score (-0.08) and a 97.98% conformity rate. This empirical finding supports Tourism-Led Development theory and Community-Based Tourism (CBT) principles. Managing accommodation rights and guiding services directly through customary management ensures that tourism revenue benefits homestay operators, porters, weavers, and food suppliers (Novelli et al., 2025; Wijaya et al., 2025). However, high economic reliance on tourism revenues introduces structural vulnerability if traditional agricultural activities are displaced.

Mass Tourism Implications on Socio-Cultural Dynamics

Socio-Cultural Pressure (X1.5) mapped to Quadrant II (gap -0.05) alongside Social Life of Locals (Y1.3) in Quadrant III demonstrates high community resilience. Although host-guest interactions are frequent, traditional governance directed by customary leaders (*Tua Golo*) acts as a cultural buffer (Rasoolimanesh et al., 2023; Koens et al., 2022). Nevertheless, high visitor volume in shared residential spaces within the *Mbaru Niang* requires structured access rules to protect domestic privacy and sacred cultural practices.

Mass Tourism Implications on Local Environment

The IPA framework positions Environmental Pressure (Y1.2) in Quadrant I with a significant performance deficit (-0.30), supported by gaps in Tourist Density X1.1 (-0.37) and Visitation Intensity X1.2 (-0.41). This confirms carrying capacity breaches under the Tourism Area Life Cycle model (Butler, 2008; Ciangă & Sorocovschi, 2017). An annual influx reaching 11,461 visitors in 2023 (averaging 31 visitors/day) exceeds both Real Carrying Capacity (RCC = 25 visitors/day) and operational Effective Carrying Capacity (ECC = 5 visitors/day). Consequently, unmanaged waste generation, trail erosion, and resource strain require direct capacity management interventions (A. Rogowski, 2025; Sari & Putra, 2025).

Strategic Action Plan for Sustainable Destination Governance

Synthesizing quantitative IPA outputs and qualitative interview evidence yields a six-pillar action plan to manage visitor volume and support long-term sustainability in Wae Rebo:

Table 9. Strategic Action Plan.

No	Strategic Pillar	Action Plan Implementation	Target Performance Indicator
1	Capacity Control and Quota Allocation	Enforce a strict maximum cap of 25 daily visitors (matching RCC standards) and limit overnight stays to 20 guests per night.	Elimination of seasonal overcrowding spikes.
2	Digital Pre-Booking System	Mandate an advance digital reservation system at Denge Base Camp prior to mountain trail access.	Even temporal distribution of tourist arrivals throughout the year.
3	Customary Waste and Trail Conservation	Enforce a single-use plastic ban for visitors and establish structured trail maintenance schedules.	Reduction of inorganic waste volume within core heritage grounds.
4	Sustainable Infrastructure Upgrade	Construct low-impact composting sanitation systems that preserve architectural authenticity.	Improved resident and visitor satisfaction with basic utility infrastructure.
5	Cultural Orientation and Visitor Education	Implement mandatory cultural briefing sessions at Denge Base Camp before mountain ascent.	Increased visitor compliance with indigenous customs and environmental guidelines.
6	Multi-Stakeholder Governance Monitoring	Form a destination monitoring board comprising the Regional Government, BPK, and Wae Rebo Customary Council.	Publication of annual destination sustainability index reports.

The very increase in tourism activity that generates economic opportunities can also increase pressure on environmental resources. Consequently, the challenge of sustainability is not merely to reduce tourism activity, but to ensure that economic benefits can be maintained whilst environmental pressures remain within the destination's management capacity.

These findings highlight the importance of aligning tourism growth with environmental management capacity. Sustainable tourism development requires not only the maintenance of the economic benefits generated by tourism, but also the strengthening of environmental management to ensure that the benefits of tourism do not damage the environmental resources on which the destination relies in the long term.

4. CONCLUSION

This study examined the implications of tourism exceeding carrying capacity thresholds on sustainable Community-Based Tourism (CBT) in Wae Rebo, addressing four primary research objectives through Importance-Performance Analysis (IPA) and qualitative data triangulation. First, regarding economic implications, the findings confirm that Community-Based Tourism generates direct financial benefits, as evidenced by Local Economic Prosperity (Y1.1) mapping to Quadrant II (Keep Up the Good Work) with a high conformity level (97.98%). Tourism revenue has successfully improved household incomes through homestay

management, guiding services, local catering, and handicraft sales. However, high economic reliance on tourism creates long-term structural vulnerability if traditional agriculture is displaced. Second, regarding socio-cultural implications, traditional governance structures directed by customary leaders (Tua Golo) act as a resilient cultural buffer, placing Socio-Cultural Pressure (X1.5) in Quadrant II (Keep Up the Good Work). While host-guest interactions foster openness and cultural exchange, high tourist concentration inside the shared Mbaru Niang residential structures poses risks of domestic privacy invasion and cultural commodification. Third, regarding environmental implications, the study identifies a severe ecological carrying capacity crisis. Attributes such as Tourist Density (\$X1.1\$), Visitation Intensity (X1.2), Infrastructure Strain (X1.4), Overcrowding (X1.6), and Environmental Pressure (Y1.2) are mapped to Quadrant I (Concentrate Here), exhibiting the largest performance gaps (up to -0.41). The 2023 actual visitation average of 31 tourists per day violates both the Real Carrying Capacity (25 visitors/day) and operational Effective Carrying Capacity (5 visitors/day), resulting in unmanaged inorganic waste accumulation, sanitation strain, and physical mountain trail degradation. Fourth, to restore destination sustainability, a multi-stakeholder action plan is required. Key strategies include enforcing a strict daily quota of 25 visitors, implementing a digital pre-booking system, establishing a single-use plastic ban, upgrading low-impact composting sanitation infrastructure, conducting mandatory visitor cultural orientation, and forming a joint monitoring board comprising local government, heritage preservation bodies, and customary authorities.

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