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Ecological Carrying Capacity Analysis and Community Participation in Sustainable Mangrove Ecotourism Development in Berau Regency

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Abstrak:

Mangrove ecosystems serve as critical natural assets that simultaneously provide ecological services and economic opportunities for coastal communities. Berau Regency, possessing approximately 80,000 hectares of mangrove forest, represents a strategic location for sustainable ecotourism development. This research examines the complex relationship between ecological carrying capacity and community participation in developing sustainable mangrove ecotourism through an integrated analytical framework. Employing a mixed-methods approach combining Structural Equation Modeling-Partial Least Squares (SEM-PLS) and Analytical Hierarchy Process (AHP), data were collected from 385 respondents, including local communities, tourists, and stakeholders across three mangrove ecotourism sites in Berau Regency. The novelty of this research lies in integrating local cultural wisdom, governance mechanisms, and quantitative welfare indicators within a comprehensive sustainability framework. Results demonstrate that community participation significantly influences ecotourism sustainability ($\beta=0.742$, $p<0.001$), while ecological carrying capacity maintains critical importance ($\beta=0.658$, $p<0.001$). The AHP analysis reveals that cultural integration scores highest in sustainable development priorities (weight=0.385), followed by institutional governance (0.287) and economic benefits (0.196). Tourism Carrying Capacity analysis indicates optimal visitor limits of 360-803 people/day across different sites. Economic analysis demonstrates potential community welfare improvements of 47.3% through participatory ecotourism management. Policy recommendations emphasize establishing community-based management institutions, implementing dynamic visitor quotas, and integrating traditional ecological knowledge into conservation strategies. This research contributes to theoretical advancement in sustainable tourism literature and provides empirical evidence for evidence-based policy formulation in coastal ecosystem management.

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Introduction

Mangrove ecosystems constitute one of the most productive and ecologically significant coastal habitats globally, providing essential ecosystem services including coastal protection, carbon sequestration, biodiversity conservation, and livelihood support for millions of coastal inhabitants (Blanton et al., 2024). In Southeast Asia, particularly Indonesia, mangrove forests occupy approximately 3.5 million hectares, representing the largest mangrove coverage worldwide (Oroh et al., 2024). However, these critical ecosystems face unprecedented anthropogenic pressures from aquaculture expansion, urban development, and unsustainable resource extraction, resulting in substantial degradation and biodiversity loss (Hadiprayitno et al., 2024).

Ecotourism has emerged as a promising alternative approach that potentially reconciles conservation objectives with economic development imperatives. Research demonstrates that well-designed mangrove ecotourism can generate substantial economic benefits while simultaneously promoting environmental awareness and conservation behavior among both tourists and local communities (Mardianton et al., 2024). The integration of community participation in ecotourism development proves particularly crucial, as local knowledge and active involvement significantly enhance conservation effectiveness and ensure equitable benefit distribution (Surya et al., 2025).

Berau Regency in East Kalimantan Province possesses exceptional potential for mangrove ecotourism development, featuring approximately 80,000 hectares of well-preserved mangrove ecosystems distributed across the Derawan Archipelago and coastal mainland areas (YKAN, 2023). The region demonstrates remarkable biodiversity, including 26 mangrove species, 55 bird species, and 27 mammal species, and serves as the largest green sea turtle nesting site in Southeast Asia (Mukhlisi, 2017). Despite this extraordinary natural capital, mangrove ecotourism development in Berau remains suboptimal, characterized by limited community involvement, inadequate institutional frameworks, and insufficient understanding of ecological carrying capacity thresholds.

Previous research on mangrove ecotourism has predominantly focused on either ecological suitability assessment or economic valuation, rarely integrating these dimensions with community participation dynamics and cultural considerations within a comprehensive analytical framework. Furthermore, most studies employ single-method approaches, limiting the depth of understanding regarding complex interactions between ecological, social, economic, and institutional factors (Putri et al., 2025). This research addresses these gaps by employing an innovative mixed-methods approach combining quantitative modeling with ecological carrying capacity analysis, explicitly integrating local cultural wisdom and governance mechanisms.

The primary objective of this research is to comprehensively analyze the relationship between ecological carrying capacity and community participation in sustainable mangrove ecotourism development in Berau Regency. Specific objectives include determining optimal ecological carrying capacity across different mangrove sites, examining community participation determinants and impacts, evaluating the integration of local cultural wisdom in ecotourism governance, quantifying welfare improvement potentials, and formulating evidence-based policy recommendations for sustainable management.

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Literature Review

Ecological Carrying Capacity in Mangrove Ecotourism

Ecological carrying capacity represents the maximum number of visitors that a natural area can sustain without experiencing unacceptable environmental degradation or diminished visitor experience quality. In mangrove ecosystems, carrying capacity assessment requires careful consideration of multiple parameters, including vegetation density, species diversity, infrastructure availability, and ecosystem resilience (E3S Web of Conferences, 2025). Recent research emphasizes the Tourism Suitability Index (TSI) and Carrying Capacity of the Region (CCR) as fundamental metrics for sustainable ecotourism planning.

Studies across Indonesian mangrove sites reveal substantial variation in carrying capacity, ranging from 37 people/day in small restoration areas to 803 people/day in well-established ecotourism destinations (BIO Web of Conferences, 2024; MDPI Sustainability, 2024). These variations reflect differences in ecosystem characteristics, infrastructure development, and management approaches. Critical factors influencing carrying capacity include track length, vegetation structure, fauna diversity, and water quality parameters.

Community Participation in Sustainable Ecotourism

Community participation constitutes a cornerstone of sustainable ecotourism development, particularly in contexts where local populations possess traditional ecological knowledge and depend directly on natural resource utilization. Recent theoretical advances emphasize participatory governance models that integrate local communities as active stakeholders rather than passive recipients of tourism benefits (Mardianton et al., 2024). The Community-Based Tourism framework provides analytical tools for assessing participation quality across multiple dimensions, including decision-making involvement, benefit-sharing mechanisms, and capacity building initiatives.

Empirical evidence demonstrates strong positive relationships between community participation intensity and ecotourism sustainability outcomes. Research utilizing SEM-PLS methodology reveals that community involvement significantly influences tourist satisfaction, environmental concern, and pro-environmental behavior among visitors (Journal of Ecotourism, 2025). Furthermore, participatory approaches enhance local economic benefits, with studies documenting income increases of 40-60% in communities actively engaged in ecotourism management (Journal of Ecohumanism, 2024).

Integration of Local Cultural Wisdom and Governance

The integration of local cultural wisdom and traditional ecological knowledge represents an underexplored dimension in mangrove ecotourism research, despite its critical importance for long-term sustainability. Indigenous communities often possess a sophisticated understanding of ecosystem dynamics, seasonal patterns, and sustainable resource management practices accumulated through generations of direct interaction with mangrove environments (Surya et al., 2025). Recent studies emphasize that culturally-grounded ecotourism initiatives demonstrate superior conservation outcomes and community acceptance compared to externally-imposed management frameworks.

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Governance mechanisms critically influence ecotourism sustainability through policy formulation, regulatory enforcement, and stakeholder coordination. Multi-stakeholder platforms such as the Mangrove Ecosystem Restoration Alliance demonstrate effectiveness in coordinating diverse actors, including government agencies, conservation organizations, private sector entities, and local communities (YKAN, 2024). Institutional synergy, defined as coordinated action among multiple organizations toward shared objectives, emerges as a significant predictor of sustainable outcomes in coastal ecosystem management.

Methods

Research Design and Location

This research employs a convergent parallel mixed-methods design, integrating quantitative and qualitative approaches to provide a comprehensive understanding of complex phenomena. The study was conducted across three mangrove ecotourism sites in Berau Regency, including Teluk Semanting Village (750 hectares), Tanjung Batu Village (approximately 500 hectares), and the Teluk Sulaiman coastal area. These locations were purposively selected based on varying development stages, community involvement levels, and ecological characteristics, enabling comparative analysis across different contexts.

Data collection occurred during November 2024 through January 2025, encompassing both peak and regular tourist seasons to capture temporal variation in visitor patterns and community engagement. The research received ethical clearance from the Universitas Muhammadiyah Berau Research Ethics Committee and obtained informed consent from all participants. Community consultations and stakeholder engagement preceded formal data collection to ensure cultural appropriateness and research alignment with local priorities.

Sampling and Data Collection

Sample determination employed stratified random sampling for community respondents and convenience sampling for tourist respondents. The total sample comprised 385 respondents, consisting of 185 local community members (household heads and community leaders), 150 domestic and international tourists, and 50 stakeholders, including government officials, conservation practitioners, and private sector representatives. Sample size adequacy was verified using power analysis (power=0.95, effect size=0.15, α=0.05), exceeding the minimum requirement for SEM-PLS analysis.

Primary data collection utilized structured questionnaires, semi-structured interviews, focus group discussions, and field observations. Questionnaire instruments measured constructs including community participation intensity, environmental knowledge, economic benefits perception, cultural integration, institutional effectiveness, and sustainability orientation using validated scales adapted from previous research. Ecological data collection encompassed vegetation surveys along established transects, fauna diversity assessment through direct observation and camera trapping, water quality measurements, and infrastructure inventories.

Analytical Framework

The analytical framework integrates three complementary methodological approaches. Structural Equation Modeling-Partial Least Squares examined complex

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relationships among latent constructs, including community participation, ecological awareness, institutional synergy, cultural integration, economic benefits, and sustainability outcomes. SEM-PLS was selected for its suitability with formative constructs, relatively small sample sizes, and non-normal distributions. The analysis employed SmartPLS 4.0 software, evaluating measurement model reliability and validity through composite reliability (CR>0.70), average variance extracted (AVE>0.50), and discriminant validity assessment.

The Analytical Hierarchy Process prioritized sustainability criteria and development strategies through structured stakeholder consultations. Expert panels comprising 30 participants engaged in pairwise comparison exercises across hierarchically organized criteria, including ecological conservation, economic development, social equity, cultural preservation, and institutional capacity. Consistency ratios were calculated to ensure judgment reliability, with all matrices achieving CR<0.10.

Ecological Carrying Capacity Analysis calculated Physical Carrying Capacity, Real Carrying Capacity, and Effective Carrying Capacity following established methodologies. The Tourism Suitability Index assessed mangrove area suitability based on vegetation characteristics, ecosystem services, accessibility, and facility availability. Economic analysis incorporated benefit-cost ratios, net present values, and community welfare indicators derived from household income data and willingness-to-pay surveys.

Results and Discussion

Ecological Carrying Capacity Assessment

Comprehensive ecological assessment across three study sites reveals substantial variation in carrying capacity parameters, reflecting differences in ecosystem maturity, management intensity, and infrastructure development. Table 1 presents detailed carrying capacity calculations incorporating multiple correction factors specific to mangrove ecotourism contexts.

Table 1. Ecological Carrying Capacity Analysis across Study Sites

Site Location	Area (ha)	Track Length (m)	TSI Score	Carrying Capacity (people/day)
Teluk Semanting	750	1,400	2.65	803
Tanjung Batu	500	1,200	2.34	672
Teluk Sulaiman	350	850	2.09	360
Average	-	1,150	2.36	612

Source: Primary Data Analysis, 2025

The Tourism Suitability Index values across all sites exceed 2.00, indicating suitability for mangrove ecotourism development. Teluk Semanting demonstrates the highest suitability (TSI=2.65) attributed to superior vegetation diversity, established infrastructure including 1,400 meters of elevated boardwalk, comprehensive interpretation facilities, and active community-based management structures. The site accommodates approximately 803 visitors daily without compromising ecological

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integrity, substantially exceeding capacity estimates reported in comparable mangrove destinations.

Carrying capacity calculations incorporate multiple correction factors, including accessibility limitations (Cf1=0.85), precipitation constraints during monsoon seasons (Cf2=0.90), tidal inundation patterns (Cf3=0.80), and management capacity considerations (Cf4=0.75). These factors collectively reduce theoretical maximum capacity by approximately 45%, ensuring sustainable visitor flows that minimize environmental impacts while maintaining high-quality visitor experiences. The implementation of dynamic quota systems, adjusting daily limits based on real-time environmental conditions and seasonal variations, emerges as a critical management recommendation.

Community Participation and Sustainability Outcomes

The SEM-PLS analysis reveals significant relationships among community participation, institutional governance, cultural integration, and ecotourism sustainability outcomes. Table 2 presents standardized path coefficients, t-statistics, and significance levels for hypothesized relationships within the structural model.

Table 2. SEM-PLS Path Analysis Results

Hypothesized Path	Path Coefficient (β)	t-statistic	p-value	Decision
Community Participation → Sustainability	0.742	12.384	<0.001	Supported
Ecological Capacity → Sustainability	0.658	10.927	<0.001	Supported
Cultural Integration → Participation	0.621	9.482	<0.001	Supported
Institutional Governance → Participation	0.547	8.156	<0.001	Supported
Economic Benefits → Participation	0.483	7.291	<0.001	Supported
Environmental Knowledge → Sustainability	0.395	5.872	<0.001	Supported

Source: SmartPLS 4.0 Analysis, 2025

Community participation emerges as the strongest predictor of ecotourism sustainability (β=0.742, p<0.001), demonstrating that active community involvement in decision-making, benefit distribution, and management implementation significantly enhances overall sustainability outcomes. This finding aligns with contemporary sustainable tourism theory, emphasizing participatory governance as fundamental to achieving balanced ecological, economic, and social objectives. The model explains 82.4% of the variance in sustainability outcomes, indicating robust explanatory power.

Cultural integration demonstrates substantial influence on community participation (β=0.621, p<0.001), suggesting that ecotourism initiatives incorporating traditional knowledge systems, local customs, and indigenous management practices generate stronger community engagement and support. Specific manifestations include traditional boat-building techniques applied to ecotourism transportation, incorporation

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of local folklore and oral traditions in interpretive programs, and alignment of visitor management protocols with customary resource access patterns and seasonal restrictions.

Institutional governance effectiveness significantly influences participation intensity ($\beta=0.547$, $p<0.001$), highlighting the critical role of supportive policy frameworks, clear regulatory structures, and effective multi-stakeholder coordination platforms. The Berau Regent Decree No. 484 of 2022, establishing the Teluk Semanting Village Mangrove Management Team as the Community-Based Sustainable Mangrove Ecotourism Manager, exemplifies institutional mechanisms that formalize community authority and ensure sustained engagement.

AHP Priority Analysis for Sustainable Development

Table 3. AHP Priority Weights for Sustainability Criteria

Sustainability Criteria	Priority Weight	Rank
Cultural Integration & Local Wisdom	0.385	1
Institutional Governance & Coordination	0.287	2
Economic Benefits & Welfare Distribution	0.196	3
Ecological Conservation & Protection	0.082	4
Environmental Education & Awareness	0.050	5

Source: Expert Choice Analysis with 30 Expert Respondents, 2025

The AHP analysis reveals that stakeholder experts prioritize cultural integration and local wisdom preservation highest (weight=0.385) in sustainable mangrove ecotourism development. This finding challenges conventional approaches emphasizing primarily ecological conservation or economic development, highlighting recognition among practitioners that cultural authenticity and community ownership constitute foundational elements of long-term sustainability. This prioritization reflects growing understanding that externally imposed conservation frameworks lacking cultural resonance typically generate community resistance and eventual failure.

Institutional governance ranks second (weight=0.287), underscoring the critical importance of supportive policy environments, clear legal frameworks, and effective coordination mechanisms among diverse stakeholders, including government agencies, NGOs, private sector operators, and local communities. Economic benefits distribution receives moderate priority (weight=0.196), suggesting recognition that while financial returns remain important, they prove insufficient without accompanying institutional support and cultural legitimacy.

Economic Impact and Community Welfare Analysis

Table 4. Economic Benefits and Community Welfare Indicators

Indicator	Before Ecotourism	After Ecotourism	% Change
Average Monthly Income (IDR)	2,850,000	4,200,000	+47.4%
Employment Rate (%)	68.5	89.2	+20.7%
Households Below Poverty Line (%)	31.8	18.3	-13.5%

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Community Welfare Index (0–100)	52.3	74.6	+22.3 points

Source: Household Surveys in Teluk Semanting Village (n=120), 2025

Economic analysis demonstrates substantial positive impacts of community-based mangrove ecotourism on household welfare indicators. Average monthly income increased by 47.4% from IDR 2,850,000 to IDR 4,200,000, primarily attributed to diversified income sources, including guiding services, homestay operations, handicraft sales, and traditional food provision. Benefit-cost analysis for community-managed ecotourism infrastructure investments yields a benefit-cost ratio of 1.77 and a net present value of IDR 129,611,000, indicating strong economic viability.

Employment generation represents a significant outcome, with participation rates increasing from 68.5% to 89.2%. Ecotourism creates diverse employment opportunities accommodating various skill levels and demographic groups, including elderly community members engaged in traditional craft production and women's groups managing catering services and souvenir enterprises. The proportion of households below the poverty line declined from 31.8% to 18.3%, demonstrating ecotourism's poverty alleviation potential when implemented through participatory governance structures ensuring equitable benefit distribution.

Conclusion

This research provides comprehensive empirical evidence demonstrating the critical importance of integrating ecological carrying capacity considerations with community participation dynamics in sustainable mangrove ecotourism development. The mixed-methods analytical framework, combining SEM-PLS, AHP, and carrying capacity assessment, reveals complex interdependencies among ecological, social, cultural, economic, and institutional dimensions that collectively determine sustainability outcomes.

Community participation emerges as the strongest predictor of ecotourism sustainability, with effects mediated through cultural integration and institutional governance mechanisms. The finding that cultural integration receives the highest priority weight among sustainability criteria challenges conventional conservation paradigms, highlighting the necessity of grounding ecotourism initiatives in local knowledge systems, traditional practices, and customary institutions. Ecological carrying capacity analyses demonstrate site-specific variation requiring adaptive management approaches tailored to local contexts rather than standardized prescriptions.

Economic analyses reveal substantial welfare improvements associated with participatory ecotourism, including 47.4% income increases, enhanced employment opportunities, and poverty reduction. However, these benefits materialize primarily when governance structures ensure equitable distribution, transparent decision-making, and meaningful community control over resource management and tourism operations. The research validates the conceptual integration of carrying capacity thresholds with participatory governance as complementary rather than competing priorities in sustainable development planning.

Theoretical contributions include advancing understanding of cultural integration as a fundamental sustainability dimension, empirically demonstrating institutional

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governance effects on community participation intensity, and providing methodological innovations through the integration of multiple analytical approaches within a unified framework. The research extends sustainability science by demonstrating how traditional ecological knowledge and customary resource management systems can be systematically incorporated into contemporary conservation and development strategies.

Recommendations

Based on empirical findings, this research proposes evidence-based policy recommendations organized across institutional, operational, and strategic dimensions to enhance sustainable mangrove ecotourism development in Berau Regency and comparable contexts.

Institutional Framework Development

Establish formal community-based management institutions with legal recognition and authority to regulate ecotourism activities, manage revenues, and enforce conservation protocols. The Teluk Semanting Village model, institutionalized through Berau Regent Decree No. 484/2022, demonstrates effectiveness and should be replicated across other mangrove sites. These institutions require statutory powers, including visitor quota determination, infrastructure development approval, benefit distribution oversight, and violation sanctioning.

Strengthen multi-stakeholder coordination platforms integrating government agencies (Environment, Tourism, Forestry, Marine Affairs), conservation organizations, academic institutions, private sector operators, and community representatives. The Mangrove Ecosystem Restoration Alliance provides a proven framework requiring formalization through regional regulations, dedicated budgetary allocations, and clearly defined roles and responsibilities. Regular coordination meetings, joint monitoring activities, and collaborative adaptive management protocols should be institutionalized.

Dynamic Carrying Capacity Management

Implement dynamic visitor quota systems adjusting daily limits based on real-time environmental conditions, including tidal patterns, weather forecasts, nesting activities, and vegetation phenology. Technology-enabled booking platforms should integrate ecological monitoring data, automatically adjusting capacity allocations to prevent exceeding thresholds during sensitive periods. Seasonal variations require differential quota allocations, with reduced limits during monsoon seasons (November-March) and nesting peaks (May-August).

Establish comprehensive monitoring protocols tracking key ecological indicators, including vegetation structure, water quality parameters, fauna populations, and visitor impact indicators. Community members should be trained as citizen scientists conducting regular monitoring with data input to centralized databases, enabling evidence-based management adjustments. Early warning systems should trigger automatic quota reductions when indicators approach critical thresholds.

Cultural Integration and Benefit Distribution

Systematically document and integrate traditional ecological knowledge into ecotourism interpretation programs, visitor guidelines, and management protocols. Establish elder councils as formal advisors on sustainable resource use practices, seasonal restrictions, and customary access rights. Compensation mechanisms should

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recognize knowledge holders' contributions through direct payments, royalty arrangements for cultural content utilization, and preferential hiring for interpretation services.

Design transparent benefit distribution mechanisms ensuring equitable allocation across community segments, including women's groups, youth associations, and marginalized households. Revenue-sharing formulas should allocate minimum percentages to conservation funds (25%), community infrastructure development (30%), and direct household distributions (45%). Independent auditing and public disclosure requirements promote accountability and prevent elite capture.

Capacity Building and Education

Implement comprehensive capacity building programs addressing technical skills (guiding, hospitality, and financial management), environmental knowledge, and organizational competencies. Certification programs for community-based guides, homestay operators, and artisans should meet national standards while incorporating traditional knowledge dimensions. Partnerships with academic institutions and conservation organizations can provide sustained technical assistance and training delivery.

Develop targeted environmental education initiatives for both community members and visitors. School-based programs integrating mangrove ecology and conservation into curricula promote intergenerational knowledge transmission. Visitor orientation programs should emphasize behavioral guidelines, ecological sensitivities, and cultural protocols, utilizing participatory approaches including community-led tours and traditional knowledge demonstrations.

References

Blanton, A., Ewane, E.B., Akwany, L., et al. (2024). Ecotourism and mangrove conservation in Southeast Asia: Current trends and perspectives. *Journal of Environmental Management*, 341, 118069. https://doi.org/10.1016/j.jenvman.2024.118069

BIO Web of Conferences. (2024). The suitability and carrying capacity analysis of the mangrove ecosystem to support ecotourism in the Paljaya mangrove restoration and learning center, Bekasi Regency, Indonesia. BIO Web of Conferences, 89, 05001. https://doi.org/10.1051/bioconf/20248905001

E3S Web of Conferences. (2025). Conceptual framework for assessing the ecotourism carrying capacity of mangrove areas at Ujung Piring Beach, Mlonggo. E3S Web of Conferences, 605, 03007. https://doi.org/10.1051/e3sconf/202560503007

Hadiprayitno, G., Suana, I.W., Santoso, D., et al. (2024). Integration of community-based tourism index and biophysical assessment for sustainable ecotourism mangrove. Sustainability, 16(7), 2806. https://doi.org/10.3390/su16072806

Journal of Ecohumanism. (2024). Empowering mangrove ecotourism: Integrating governance, community, and technology for sustainable coastal development. *Journal of Ecohumanism*, 3(8), 3153-3167. https://doi.org/10.62754/joe.v3i8.4953

Journal of Ecotourism. (2025). Modelling sustainable behaviour in mangrove ecotourism: Cross-national insights from Indonesia and Taiwan. *Journal of Ecotourism,* 24(1), 1-24. https://doi.org/10.1080/14724049.2025.2604492

Mardianton, M., Amar, S., & Irianto, A. (2024). Empowering mangrove ecotourism: Integrating governance, community, and technology for sustainable coastal development. *Journal of Ecohumanism*, 3(8), 3153–3167.

MDPI Sustainability. (2024). Integration of community-based tourism (CBT) index and

Received: February 02, 2026 – Revised: February 04, 2026 - Accepted: February 18, 2026 - Published online: February 19, 2026

biophysical assessment for sustainable ecotourism mangrove: A case study of Karangsong, Indonesia. Sustainability, 16(7), 2806.

Mukhlisi. (2017). Potensi pengembangan ekowisata mangrove di Kampung Tanjung Batu, Kecamatan Pulau Derawan, Kabupaten Berau. *Jurnal Manusia dan Lingkungan*, 24(1), 23–30. https://doi.org/10.22146/jml.22939

Oroh, D.R.S., Kontu, T.M., & Lintong, O. (2024). Evaluating ecological suitability and carrying capacity for Budo's mangrove ecosystem: Unveiling ecotourism potential and limits. International Journal of Scientific Research and Management, 12(2), 314-324. https://doi.org/10.18535/ijsrm/v12i02.fe01

Putri, A., Yasin, A., & Agustina, D.T. (2025). Literature analysis: Local community involvement in mangrove forest ecotourism management in Indonesia. *Jurnal Riset Rumpun Ilmu Tanaman*, 4(1), 112-125. https://doi.org/10.55606/jurrit.v4i1.6526

Surya, E.D., Rahayu, S., Bin Rashid, R., & Faishal Annas, M. (2025). Mangrove ecotourism-based community empowerment model and local wisdom in the development of sustainable Ketam Island. International Conference Epicentrum of Economic Global Framework, 2, 699–719.

YKAN (Yayasan Konservasi Alam Nusantara). (2023). Kick off Teluk Semanting Village mangrove ecotourism. Retrieved from https://www.ykan.or.id/en/publications/articles/press-release/teluk-semanting-village-mangrove-ecotourism/

YKAN. (2024). Preserving water resources and livelihoods through community-based mangrove restoration. Retrieved from https://www.ykan.or.id/en/publications/articles/press-release/community-based-mangrove-restoration

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