

An Integrated Socio-Ecological Framework for Sustainable Coastal and Marine Tourism in Indonesia

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ABSTRACT

This study develops an integrated socio-ecological framework for sustainable coastal and marine tourism in Indonesia. An integrative literature review was conducted using Scopus, Web of Science, and Google Scholar, with 16 empirical and review-based publications forming the core evidence. A hybrid deductive-inductive thematic approach synthesized evidence across five interrelated dimensions: biodiversity and ecological integrity, tourism suitability and carrying capacity, coastal livelihoods, community empowerment, and local wisdom and governance. The findings reveal reciprocal interactions through feedbacks, trade-offs, synergies, and adaptive responses, while external pressures include tourism demand, pollution, coastal development, climate-related change, and institutional policies. The framework provides a conceptual basis for more integrated, context-sensitive, and adaptive coastal and marine tourism planning

INTRODUCTION

Coastal and marine tourism represents an important interface between environmental resources and human well-being because its development depends directly on the quality, accessibility, and attractiveness of coastal and marine ecosystems. Beaches, coral reefs, mangroves, seagrass beds, estuaries, and associated biodiversity provide ecological functions as well as recreational, cultural, and aesthetic services that support tourism activities. From a social-ecological perspective, however, these environments cannot be regarded merely as tourism assets because ecological conditions, resource users, institutions, and economic activities interact dynamically and influence one another (Ostrom, 2009). Tourism development may also alter the provision of coastal ecosystem services through infrastructure expansion, pollution, habitat disturbance, and increasing pressure on natural resources (Baltranaitė et al., 2025). Consequently, sustainable coastal tourism depends not only on economic benefits but also on the capacity of destination systems to maintain ecological functions while accommodating human use.

This challenge is particularly relevant in Indonesia, where marine tourism develops across ecologically diverse coastal landscapes that are simultaneously used for fisheries, settlements, conservation, recreation, and other economic activities. Such multiple uses create opportunities for local development but also generate competition for space and resources. Indonesian studies show that the presence of attractive natural resources alone does not guarantee sustainable destination development. At Madasari Beach in Pangandaran, for example, tourism development is influenced not only by natural attractions but also by accessibility, amenities, and destination-management conditions (Annida et al., 2024). Research in Karimunjawa similarly demonstrates the importance of balancing conservation, community welfare, and tourism infrastructure (Setiyanto et al., 2023). These findings suggest that coastal tourism planning requires a broader perspective than approaches focused primarily on destination attractiveness or visitor growth.

One important ecological consideration is the capacity of coastal destinations to accommodate tourism activities without exceeding environmental and spatial limits. Tourism suitability and carrying capacity provide useful approaches for determining whether particular coastal spaces are appropriate for recreational activities and how intensively they can be used. Studies in Pangandaran demonstrate that suitability and carrying capacity vary according to beach characteristics, available space, and tourism activities such as recreation, swimming, and camping (Annida et al., 2025; Annida et al., 2026b). These findings emphasize that a destination may possess strong tourism potential while still requiring careful visitor management. Development that exceeds ecological or spatial limits may progressively degrade the environmental qualities on which tourism itself depends.

Ecological capacity, however, represents only one dimension of coastal sustainability. Coastal destinations are also livelihood landscapes where fisheries and other marine-resource-dependent activities often predate tourism development. Tourism is frequently promoted as an alternative or

supplementary livelihood for coastal communities, particularly where resource-based livelihoods face economic and environmental uncertainty. Yet livelihood transitions are rarely simple or linear. Studies of coastal communities indicate that tourism can contribute to income diversification while also influencing occupational practices, identity, and community well-being (Kimbu et al., 2022). Evidence from Indonesia further suggests that maintaining multiple livelihood strategies can strengthen the ability of coastal households to cope with economic disruption and external shocks (Suradja et al., 2024). Therefore, tourism should be considered in relation to existing livelihood systems rather than as a replacement for fisheries or other coastal activities.

The sustainability of marine tourism also depends on the extent to which local communities participate in, benefit from, and influence tourism development. Community empowerment is important because local residents directly experience changes in resource use, infrastructure, tourist activity, environmental quality, and local economies. Scheyvens (1999) emphasizes that tourism development should not be evaluated solely through employment or income generation, but also through the ability of communities to exercise meaningful control and receive equitable benefits. Evidence from Pari Island illustrates how community involvement in marine tourism may expand economic opportunities while challenges related to unequal access and environmental sustainability remain (Annida & Taofiqurohman, 2024). Tourism may also influence social relations and cultural practices, as observed in Tanjung Lesung, highlighting the need to balance economic development with social and cultural sustainability (Baihaqi & Annida, 2024).

Beyond participation and economic empowerment, culturally embedded values and institutions may provide important mechanisms for governing relationships between communities and coastal resources. Local wisdom can contain norms relating to resource use, environmental stewardship, collective responsibility, and acceptable forms of development. In Bali, Tri Hita Karana illustrates a cultural philosophy that connects relationships among humans, society, spirituality, and nature, while customary institutions such as *awig-awig* provide locally recognized rules for regulating community behavior and resource use (Wiwin, 2021; Annida, et al., 2026c). These examples demonstrate that coastal sustainability cannot be separated from the cultural and institutional contexts through which natural resources and tourism activities are governed.

Taken together, previous studies demonstrate that sustainable coastal and marine tourism is influenced by several interdependent dimensions. Biodiversity and ecological integrity provide the environmental foundation of tourism; tourism suitability and carrying capacity define ecological and spatial limits; coastal livelihoods shape socioeconomic dependence and resilience; community empowerment influences participation and benefit distribution; and local wisdom and governance provide culturally embedded mechanisms for managing human-environment relationships. However, these dimensions are frequently examined through relatively specialized perspectives. Environmental studies commonly emphasize ecosystem conditions and tourism pressures, livelihood studies focus on economic adaptation and resilience, while

community-based tourism research tends to emphasize participation and empowerment. Indonesian empirical studies have similarly produced substantial evidence on individual dimensions, but their relationships remain insufficiently integrated within a single conceptual structure.

Accordingly, this study adopts a social-ecological systems perspective to develop an integrated conceptual framework for sustainable coastal and marine tourism in Indonesia. The framework brings together five interrelated dimensions: biodiversity and ecological integrity, tourism suitability and carrying capacity, coastal livelihoods, community empowerment, and local wisdom and governance. Rather than treating these dimensions as separate components, the study examines how they interact through feedback mechanisms, trade-offs, synergies, and adaptive responses. The contribution of this study lies in synthesizing these relationships within a single framework that explains how ecological resources and limits interact with livelihood strategies, community agency, cultural institutions, and governance mechanisms. Through this integration, the study seeks to provide a conceptual basis for more context-sensitive, inclusive, and ecologically responsible coastal and marine tourism planning in Indonesia.

LITERATURE REVIEW

Biodiversity and Ecological Integrity

Coastal and marine tourism depends fundamentally on the ecological integrity of coastal environments. Beaches, estuaries, coral reefs, mangroves, seagrass beds, and associated biodiversity provide ecological functions as well as recreational, aesthetic, and cultural services that support tourism activities. From a social-ecological perspective, these ecosystems are interconnected with human activities, institutions, and economic interests; consequently, ecological change can directly affect both ecosystem functioning and human well-being (Ostrom, 2009; Baltranaitė et al., 2025).

Biodiversity therefore represents more than a tourism attraction. It constitutes part of the natural capital that sustains coastal tourism over time. Empirical evidence from Indonesia illustrates this interdependence. Estuarine ecosystems in Cikaso and Cimandiri support diverse fish assemblages and fisheries activities, demonstrating the multiple ecological and socioeconomic functions of coastal environments (Annida et al., 2021). At the same time, environmental pressures such as coastal litter and plastic pollution may reduce ecological quality and diminish the attractiveness and functionality of tourism destinations (Taofiqurohman et al., 2024). These findings indicate that biodiversity conservation and ecological integrity should be regarded as the environmental foundation of sustainable coastal and marine tourism.

Tourism Suitability and Carrying Capacity

Ecological quality alone does not determine whether a coastal destination can support tourism sustainably. Tourism suitability evaluates whether environmental and physical characteristics are appropriate for particular recreational activities, while carrying capacity concerns the level of use that can

be accommodated without creating unacceptable environmental, spatial, or experiential impacts.

Carrying capacity should not be interpreted merely as a fixed numerical limit. Rather, it needs to be considered in relation to environmental conditions, available space, management objectives, tourism activities, and acceptable levels of change (McCool & Lime, 2001). Evidence from Pangandaran and Sukabumi demonstrates that tourism suitability and carrying capacity vary considerably among locations and activities, including beach recreation, swimming, and camping (Annida et al., 2025; Annida et al., 2026a; Annida, et al., 2026b). Consequently, areas considered highly suitable for tourism may still require visitor management because their ecological and spatial capacities remain limited. Tourism suitability and carrying capacity therefore function as important boundaries connecting tourism potential with responsible destination management.

Coastal Livelihoods and the Tourism–Fisheries Nexus

Coastal tourism frequently develops within landscapes where communities already depend on fisheries and other marine-resource-based livelihoods. Tourism should therefore not be regarded as an activity introduced into an economically unused space. Instead, it interacts with pre-existing livelihood systems, resource dependence, and local economic practices.

The sustainable livelihoods perspective suggests that households commonly combine multiple livelihood activities and that tourism may contribute most effectively when it complements rather than entirely replaces existing sources of income (Tao & Wall, 2009). This perspective is particularly relevant to Indonesian coastal communities, where fishing activities and tourism often occupy the same spaces. Studies from Palabuhanratu demonstrate that fishing livelihoods remain influenced by seasonal variability, productivity, and business feasibility (Annida & Baihaqi, 2024, 2025). Tourism may consequently offer additional sources of income, but livelihood diversification is generally more realistic than complete occupational transformation.

Evidence from Indonesian coastal communities further indicates that maintaining multiple livelihood strategies can strengthen resilience to economic disruptions and external shocks (Suradja et al., 2024). Accordingly, the relationship between fisheries and tourism is better understood as a tourism–livelihood nexus, in which tourism diversification, resource dependence, livelihood resilience, and access to coastal resources interact dynamically.

Community Empowerment and Participation

The sustainability of coastal tourism also depends on the extent to which local communities participate in and benefit from tourism development. Community empowerment extends beyond income generation and employment by including social, psychological, economic, and political dimensions, particularly the ability of local people to influence decisions affecting their resources and livelihoods (Scheyvens, 1999).

This distinction is important because participation in tourism activities does not automatically guarantee equitable access to benefits or meaningful decision-making authority. Evidence from Pari Island shows that community involvement can expand local participation in tourism businesses such as homestays and equipment rental, although unequal access to economic opportunities and environmental challenges may remain (Annida & Taofiqurohman, 2024). Similarly, marine tourism at Tanjung Lesung has generated economic opportunities while simultaneously contributing to changes in social interaction and cultural practices (Baihaqi & Annida, 2024).

These findings suggest that empowerment should be understood as a mechanism that links tourism development with local agency, benefit distribution, community capacity, and social sustainability. A sustainable destination therefore requires not only community participation, but also meaningful opportunities for local communities to influence how tourism resources and benefits are managed.

Local Wisdom and Community-Based Governance

Local wisdom represents another important dimension of coastal sustainability because interactions between communities and natural resources are often shaped by culturally embedded values, traditional knowledge, and customary institutions. Traditional ecological knowledge may support resource management through accumulated environmental understanding, collective learning, local practices, and socially recognized rules for responding to ecological change (Berkes et al., 2000).

In tourism settings, local cultural institutions may complement formal governance by connecting conservation objectives with locally accepted norms and social responsibilities. Tri Hita Karana in Bali illustrates a value-based approach emphasizing harmonious relationships between humans, spirituality, society, and nature. Its application to ecotourism demonstrates how cultural values can support environmental responsibility and tourism sustainability (Wiwin, 2021).

Local wisdom may also be institutionalized through customary rules such as *awig-awig*, which regulate community behavior, natural-resource use, collective responsibility, and environmental management. Recent studies suggest that such institutions may continue to contribute to ecological, social, and economic balance, although their effectiveness can be influenced by tourism intensification, globalization, institutional interaction, and generational change (Annida et al., 2026c). Local wisdom therefore operates both as a cultural value system and as a practical mechanism of community-based governance.

Integrating the Socio-Ecological Dimensions

The literature demonstrates that sustainable coastal and marine tourism cannot be adequately understood through ecological, economic, social, or institutional dimensions in isolation. Biodiversity and ecological integrity provide the environmental foundation of tourism, while tourism suitability and carrying capacity establish limits to resource use. Coastal livelihoods determine how tourism interacts with existing resource-dependent economies, community

empowerment shapes participation and benefit distribution, and local wisdom and governance provide culturally embedded mechanisms for managing relationships among people, tourism, and coastal resources.

These dimensions interact through reciprocal rather than linear relationships. Environmental degradation may reduce biodiversity, fisheries productivity, and tourism attractiveness simultaneously. Excessive tourism activity may exceed ecological capacity and increase pressure on coastal resources, while livelihood insecurity may intensify dependence on natural resources. Conversely, appropriate visitor management, diversified livelihoods, community empowerment, and effective local institutions may strengthen destination resilience.

Such interactions are consistent with the social-ecological systems perspective, which understands sustainability as an outcome of relationships among ecological resources, resource users, governance arrangements, and external pressures (Ostrom, 2009; Folke, 2006). This conceptual understanding provides the basis for examining coastal and marine tourism as an interconnected system rather than as a collection of independent sustainability components.

METHODOLOGY

This study employed an integrative literature review to synthesize multidisciplinary knowledge concerning sustainable coastal and marine tourism from a socio-ecological perspective. The integrative review approach was selected because it allows empirical and conceptual literature derived from different research designs and disciplinary perspectives to be combined within a single synthesis and can support the development of broader conceptual interpretations (Whittemore & Knafl, 2005). This approach was considered appropriate because sustainable coastal and marine tourism involves interactions among environmental conditions, tourism activities, fisheries and coastal livelihoods, community participation, cultural institutions, and resource governance.

Relevant literature was identified through searches of Scopus, Web of Science, and Google Scholar. Scopus and Web of Science were used as the principal sources for internationally indexed peer-reviewed literature, while Google Scholar was used as a supplementary source to identify relevant Indonesian and locally published studies. The search combined terms related to coastal and marine tourism with ecological, socioeconomic, community, cultural, and governance dimensions. Search terms included combinations of "coastal tourism," "marine tourism," "marine ecotourism," "biodiversity," "ecological integrity," "tourism suitability," "carrying capacity," "coastal livelihood," "fisheries livelihood," "community empowerment," "community participation," "local wisdom," "traditional ecological knowledge," "coastal governance," and "Indonesia." Boolean operators AND and OR were used to combine related concepts and refine the search. The literature search was conducted during manuscript preparation in 2026 and included publications available at the time of analysis.

Publications were considered relevant when they: (1) addressed coastal, marine, island, or marine-tourism contexts; (2) examined ecological, spatial, livelihood, community, cultural, or governance dimensions associated with tourism sustainability; and (3) provided empirical, review-based, or conceptual evidence relevant to understanding interactions within coastal socio-ecological systems. Studies focusing primarily on tourism marketing, visitor satisfaction, hospitality operations, or other topics without a clear relationship to coastal socio-ecological sustainability were excluded from the analytical focus. Indonesian studies were prioritized for empirical contextualization, while international literature was incorporated to provide theoretical foundations and broader comparative perspectives.

Following the removal of duplicate references and assessment of their relevance to the analytical scope, 16 empirical and review-based publications constituted the core evidence for the thematic synthesis. These publications covered coastal biodiversity and environmental conditions, tourism suitability and carrying capacity, fisheries and livelihood dynamics, community participation and empowerment, sociocultural change, local wisdom, customary institutions, and coastal-tourism governance. The core evidence was complemented by theoretical and conceptual literature concerning social-ecological systems, resilience, community empowerment, traditional ecological knowledge, tourism carrying capacity, and sustainable livelihoods.

The selected literature was analyzed using a hybrid deductive–inductive thematic approach, adapted from the integration of theory-driven and data-driven thematic analysis described by Fereday and Muir-Cochrane (2006). The deductive component was organized around five broad analytical dimensions derived from the theoretical and empirical literature: (1) biodiversity and ecological integrity, (2) tourism suitability and carrying capacity, (3) coastal livelihoods, (4) community empowerment, and (5) local wisdom and governance. These dimensions served as initial analytical categories rather than as predetermined research outcomes. Within and across these categories, the literature was examined inductively to identify recurring relationships, feedback mechanisms, synergies, and potential trade-offs. Particular attention was given to interactions among ecological conditions, tourism intensity, resource dependence, livelihood strategies, community agency, cultural institutions, and governance arrangements.

The final stage involved conceptual integration through a social-ecological systems perspective (Ostrom, 2009). Relationships identified across the five analytical dimensions were interpreted together with external pressures, including tourism demand, pollution, coastal development, climate-related change, and institutional policies. The resulting synthesis was used to develop an integrated conceptual framework in which sustainable coastal and marine tourism is understood as an emergent outcome of reciprocal interactions among ecological integrity, tourism-use limits, coastal livelihoods, community empowerment, and culturally embedded governance. Accordingly, the framework emphasizes feedback mechanisms, trade-offs, synergies, and

adaptive responses rather than assuming a linear pathway toward tourism sustainability.

RESEARCH RESULT

Thematic Synthesis of Sustainable Coastal and Marine Tourism

The integrative review synthesized the evidence across five interrelated dimensions that consistently influence the sustainability of coastal and marine tourism: (1) biodiversity and ecological integrity, (2) tourism suitability and carrying capacity, (3) coastal livelihoods, (4) community empowerment, and (5) local wisdom and governance. These dimensions represent ecological, socioeconomic, community, cultural, and institutional components of coastal tourism systems. The synthesis further showed that they do not operate independently; changes in one dimension may generate direct or indirect consequences for the others.

Biodiversity and ecological integrity emerged as the environmental foundation of coastal and marine tourism. Coastal ecosystems simultaneously support tourism attractions, fisheries, biodiversity, and ecosystem services. Evidence from Indonesian coastal environments shows that ecological quality may be affected by resource use, pollution, and other anthropogenic pressures, which in turn influence both environmental functions and tourism attractiveness (Annida et al., 2021; Taofiqurohman et al., 2024).

Tourism suitability and carrying capacity function as ecological and spatial boundaries to tourism development. The reviewed studies indicate that tourism potential varies according to environmental characteristics, available space, and type of recreational activity. Importantly, areas considered suitable for tourism do not necessarily possess unlimited capacity for visitor use. Studies from Pangandaran and Sukabumi demonstrate variations in suitability and carrying capacity among locations and tourism activities, indicating the need to align tourism intensity with site-specific environmental and spatial conditions (Annida et al., 2025; Annida, et al., 2026a; Annida et al., 2026b).

Coastal livelihoods constitute the socioeconomic component of the system. Tourism frequently develops in areas where fishing and other marine-resource-dependent activities are already established. The synthesis indicates that tourism may create opportunities for income diversification, but does not necessarily replace existing livelihoods. Evidence from Indonesian coastal communities suggests that maintaining multiple livelihood strategies can strengthen resilience to seasonal variability, economic uncertainty, and external shocks (Annida & Baihaqi, 2024, 2025; Suradja et al., 2024).

Community empowerment emerged as the mechanism through which local communities participate in tourism development and gain access to its benefits. The reviewed evidence distinguishes economic participation from meaningful involvement in decision-making. Tourism may create business and employment opportunities, while unequal access to benefits, limited decision-making authority, and sociocultural changes may persist. Findings from Pari Island and Tanjung Lesung illustrate the importance of considering economic

participation together with social inclusion, local agency, and cultural consequences (Annida & Taofiqurohman, 2024; Baihaqi & Annida, 2024).

Local wisdom and governance provide culturally embedded mechanisms for regulating relationships among communities, tourism activities, and natural resources. Cultural values and customary institutions may influence environmental responsibility, collective action, resource use, and acceptable forms of tourism development. Tri Hita Karana and awig-awig illustrate how local values and customary arrangements can contribute to the governance of tourism and natural resources, although their effectiveness may also depend on their capacity to adapt to contemporary social and tourism pressures (Wiwin, 2021; Annida et al., 2026c).

Table 1. Thematic Synthesis of the Socio-Ecological Dimensions of Sustainable Coastal and Marine Tourism

Dimension	Synthesized Finding	Role in the Socio-Ecological System
Biodiversity and ecological integrity	Coastal ecosystems support tourism, fisheries, biodiversity, and ecosystem services, but are vulnerable to pollution and resource pressures.	Environmental foundation
Tourism suitability and carrying capacity	Tourism potential and visitor capacity vary according to environmental characteristics, available space, and activity type.	Ecological and spatial boundary
Coastal livelihoods	Tourism coexists with fisheries and may supplement rather than replace existing livelihood activities	Socioeconomic resilience
Community empowerment	Participation may expand tourism benefits, but access, agency, and decision-making remain important determinants of social sustainability.	Community agency and inclusion
Local wisdom and governance	Cultural values and customary institutions shape resource use, collective responsibility, and tourism management.	Culturally embedded governance

Cross-Dimensional Interactions

The synthesis revealed that the five dimensions are connected through reciprocal relationships, feedback mechanisms, trade-offs, and synergies. Environmental degradation can simultaneously reduce biodiversity, fisheries productivity, and tourism attractiveness. Increasing tourism intensity may place additional pressure on ecosystems and exceed local carrying capacity, while livelihood insecurity may increase dependence on coastal resources. At the social and institutional levels, limited community participation can reduce local legitimacy and weaken the effectiveness of destination management.

Conversely, positive interactions were also identified. Appropriate carrying-capacity management can reduce pressure on tourism resources; livelihood diversification can decrease economic vulnerability; community empowerment can strengthen local participation and benefit distribution; and culturally embedded governance can support collective responsibility for

natural-resource management. These relationships indicate that improvements in one component may reinforce other components when tourism management is coordinated across ecological, socioeconomic, and institutional dimensions.

The reviewed evidence also identified several external pressures that may influence these relationships, particularly tourism demand, pollution, coastal development, climate-related change, and institutional policies. These factors can alter ecological conditions, resource availability, livelihood strategies, and governance responses, thereby affecting the overall sustainability of coastal destinations.

Integrated Socio-Ecological Framework

Based on these findings, this study proposes an Integrated Socio-Ecological Framework for Sustainable Coastal and Marine Tourism (Figure 1). The framework positions the five dimensions within a reciprocal system rather than a linear development pathway. Biodiversity and ecological integrity provide the natural-resource base, while tourism suitability and carrying capacity establish boundaries for resource use. Coastal livelihoods connect tourism development with existing resource-dependent economies, community empowerment influences participation and benefit distribution, and local wisdom and governance provide cultural and institutional mechanisms for managing interactions among communities, tourism, and coastal resources.

Within the framework, sustainability emerges from the capacity of these components to respond collectively to internal interactions and external pressures. The framework therefore represents sustainable coastal and marine tourism as an outcome of balancing ecological limits, livelihood needs, community agency, and governance responses through adaptive management.

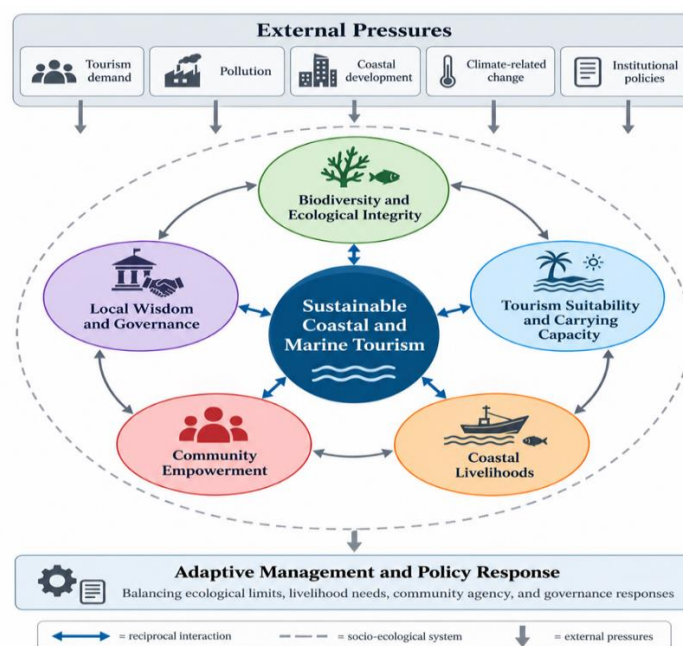


Figure 1. Integrated Socio-Ecological Framework for Sustainable Coastal and Marine Tourism

DISCUSSION

Sustainable Coastal and Marine Tourism as a Socio-Ecological System

The findings demonstrate that sustainable coastal and marine tourism cannot be adequately understood through ecological, economic, social, or institutional dimensions in isolation. Rather, sustainability emerges from interactions among ecological integrity, tourism-use limits, coastal livelihoods, community agency, and governance arrangements. This interpretation is consistent with the social-ecological systems perspective, which emphasizes that natural resources, resource users, governance systems, and external pressures interact dynamically in determining sustainability outcomes (Ostrom, 2009). It also reflects resilience thinking, which views the capacity of a system to persist and adapt as dependent on relationships between ecological and social processes rather than on individual components alone (Folke, 2006).

In coastal tourism systems, ecological integrity provides the environmental basis for tourism and other marine-dependent activities, while tourism suitability and carrying capacity establish limits to the intensity and spatial extent of recreational use. These ecological dimensions are closely connected to local livelihoods because coastal communities often depend simultaneously on fisheries, tourism, and other resource-based activities. Consequently, environmental degradation may reduce not only tourism attractiveness but also fisheries productivity and resource availability. Conversely, excessive tourism development may generate short-term economic benefits while increasing pressure on ecosystems and coastal space.

The distinction between tourism suitability and carrying capacity is particularly important. A coastal area may be environmentally suitable for tourism while still possessing limited capacity to accommodate increasing visitor numbers. Empirical studies from Pangandaran and Sukabumi demonstrate that suitability and carrying capacity differ among locations and recreational activities, indicating that tourism development should be adjusted to site-specific ecological and spatial conditions (Annida et al., 2025; Annida al., 2026a). This finding supports McCool and Lime's (2001) argument that carrying capacity should not be interpreted simply as a fixed numerical threshold but should be incorporated into an adaptive management process that considers environmental conditions, visitor use, and management objectives.

Trade-Offs, Synergies, and Adaptive Responses

The proposed framework highlights that relationships among the five dimensions may generate both trade-offs and synergies. Tourism expansion, for example, can diversify local income and create new economic opportunities, but increasing visitor intensity may simultaneously generate pollution, resource pressure, and competition for coastal space. If these pressures reduce environmental quality, tourism may gradually undermine the ecological resources on which destination attractiveness depends. Sustainability therefore requires attention to the feedback relationships between tourism development and environmental conditions.

Similar trade-offs occur between tourism and coastal livelihoods. Tourism is frequently promoted as an alternative livelihood for fishing communities, yet

the reviewed evidence suggests that livelihood change is more complex than a simple transition from fisheries to tourism. Research from Indonesian coastal communities indicates that households often maintain several livelihood activities simultaneously, particularly when fisheries are affected by seasonal variation and economic uncertainty (Annida & Baihaqi, 2024, 2025; Suradja et al., 2024). Tourism may therefore be more appropriately understood as a complementary source of livelihood rather than a universal substitute for fisheries.

Such diversification may strengthen socioeconomic resilience by reducing dependence on a single source of income. However, tourism can also create new vulnerabilities if communities become overly dependent on visitor demand. The COVID-19 experience, for example, demonstrated how disruptions to tourism can affect coastal communities that increasingly depend on tourism-based income (Suradja et al., 2024). Accordingly, livelihood resilience requires maintaining economic flexibility, access to coastal resources, and opportunities for communities to combine tourism with other livelihood strategies.

Community empowerment can create important synergies within this system. Meaningful community participation may improve benefit distribution while strengthening the legitimacy and effectiveness of destination management. Scheyvens (1999) emphasizes that empowerment involves not only economic benefits but also psychological, social, and political dimensions. This distinction is important because involvement in tourism enterprises does not necessarily provide communities with influence over decisions affecting coastal resources. Evidence from Pari Island shows that tourism can expand local involvement in businesses such as homestays and equipment rental, although unequal access to economic opportunities and environmental challenges may remain (Annida & Taofiqurohman, 2024). Sustainable community participation therefore requires both economic opportunities and genuine involvement in decision-making. Local wisdom and community-based institutions may further reinforce these relationships by providing culturally legitimate mechanisms for environmental stewardship and collective action. Traditional ecological knowledge can support adaptive resource management through accumulated environmental understanding and locally developed rules (Berkes et al., 2000). In Indonesia, cultural systems such as *Tri Hita Karana* and customary institutions such as *awig-awig* illustrate how local values can connect environmental responsibility, social relationships, and resource governance (Wiwin, 2021; Annida et al., 2026a).

However, local institutions should not be assumed to be static or automatically effective. Their contribution to sustainability depends on their capacity to respond to tourism intensification, social change, formal governance systems, and changing environmental conditions. This reinforces the importance of adaptive governance, in which formal management arrangements and community-based institutions respond to changes within the socio-ecological system.

Implications for Coastal Tourism Planning in Indonesia

The integrated framework has several implications for coastal and marine tourism planning in Indonesia. First, destination management should move beyond sectoral approaches in which conservation, tourism development, livelihood programs, and community participation are implemented separately. Because the five dimensions are interdependent, interventions in one area may generate consequences for others.

For example, carrying-capacity assessments should not be used only to determine visitor limits but should also be linked with ecological monitoring and the spatial needs of local livelihoods. Similarly, community-based tourism initiatives should not focus exclusively on increasing the number of local tourism businesses; they should also consider equitable benefit distribution, access to resources, local decision-making authority, and environmental responsibility. Second, management strategies should be adapted to local contexts. Indonesian coastal destinations differ substantially in ecological characteristics, tourism intensity, livelihood structures, and community institutions. Evidence from Pangandaran, Sukabumi, Pari Island, Tanjung Lesung, and Bali illustrates that sustainability challenges and governance responses vary between locations. The framework should therefore be interpreted as an analytical structure rather than as a uniform management model.

Third, tourism performance should not be evaluated solely through increases in visitors, infrastructure, or tourism revenue. Such outcomes may represent economic growth but do not necessarily indicate sustainability if they are accompanied by ecological degradation, excessive resource use, livelihood displacement, or weak community participation. Sustainable tourism planning consequently requires the simultaneous consideration of ecological conditions, tourism intensity, socioeconomic resilience, community agency, and institutional capacity.

Conceptual Contribution of the Framework

The contribution of this study lies not in identifying biodiversity, carrying capacity, livelihoods, empowerment, or local wisdom as entirely new dimensions of sustainable tourism. These concepts have already been extensively discussed in previous literature. The contribution instead lies in integrating them into a single socio-ecological framework and clarifying their functional relationships.

Within the proposed framework, biodiversity and ecological integrity provide the environmental foundation; tourism suitability and carrying capacity establish ecological and spatial boundaries; coastal livelihoods represent socioeconomic dependence and resilience; community empowerment reflects local agency and access to benefits; and local wisdom and governance provide culturally embedded institutional mechanisms. These components are linked through feedbacks, trade-offs, synergies, and adaptive responses and are simultaneously influenced by external pressures including tourism demand, pollution, coastal development, climate-related change, and institutional policies. These external pressures were also identified in the synthesis underlying the proposed framework.

The framework therefore conceptualizes sustainable coastal and marine tourism as an emergent property of an interconnected socio-ecological system, rather than as the achievement of separate environmental, economic, or social objectives. Nevertheless, the framework represents a conceptual synthesis rather than a tested causal model. Further empirical research is required to examine the strength, direction, and contextual variability of the relationships proposed among its components.

CONCLUSIONS AND RECOMMENDATIONS

This study demonstrates that sustainable coastal and marine tourism is best understood as an interconnected socio-ecological system rather than as the outcome of separate environmental, economic, social, or institutional factors. The integrative review synthesized evidence across five interrelated dimensions: biodiversity and ecological integrity, tourism suitability and carrying capacity, coastal livelihoods, community empowerment, and local wisdom and governance. These dimensions interact through feedback mechanisms, trade-offs, synergies, and adaptive responses, while also being influenced by external pressures such as tourism demand, pollution, coastal development, climate-related change, and institutional policies. The proposed framework therefore positions sustainable coastal and marine tourism as an emergent outcome of the ability of destinations to balance ecological limits, livelihood needs, community agency, and governance responses. This integrated perspective provides a conceptual basis for understanding sustainability challenges in Indonesian coastal destinations and emphasizes that tourism development cannot be separated from the wider ecological and social systems in which it occurs.

Based on these findings, coastal and marine tourism planning should adopt a more integrated and context-sensitive approach. Destination management should combine ecological assessment and carrying-capacity considerations with livelihood resilience, meaningful community participation, and locally embedded governance. Carrying-capacity assessments should inform visitor management and ecological monitoring, while tourism development should support livelihood diversification rather than displacing existing coastal activities. Community-based tourism initiatives should also strengthen local decision-making, equitable access to benefits, and environmental responsibility. Where relevant, local wisdom and customary institutions should be incorporated into formal tourism and resource-management arrangements. Because ecological, socioeconomic, and institutional conditions differ among destinations, the proposed framework should be applied adaptively rather than as a uniform management model.

Finally, the framework should be interpreted as a conceptual synthesis rather than a tested causal model. Its primary contribution lies in integrating previously fragmented sustainability dimensions and clarifying their functional relationships within coastal and marine tourism systems.

ADVANCED RESEARCH

This study is limited by its conceptual and literature-based design, as the proposed socio-ecological framework has not yet been empirically tested across different coastal tourism destinations. Future research should therefore validate the relationships among biodiversity and ecological integrity, tourism suitability and carrying capacity, coastal livelihoods, community empowerment, and local wisdom and governance through case studies, quantitative analysis, qualitative inquiry, or mixed-methods approaches. Comparative studies across destinations with different ecological, socioeconomic, and institutional characteristics would also be valuable for assessing the applicability and adaptability of the framework in diverse coastal and marine tourism contexts.

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