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Research Article

Integrating community empowerment, ecotourism, and maritime resilience for a sustainable blue economy

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Abstract

This study proposes an integrated framework for advancing the blue economy at the village level, with a case study in Samber Binyeri Village, Biak Numfor Regency, Papua, Indonesia. Although national policies aim to promote sustainable marine development, remote communities continue to face significant barriers, including institutional fragmentation, infrastructure limitations, and socio-economic exclusion. Through qualitative fieldwork- comprising two focus group discussions (FGDs) involving 25 participants and participatory observation- this study identifies structural constraints and emergent opportunities in cooperative fisheries, community-led ecotourism, and resilience planning. The findings underscore underutilized cooperative systems, inadequate post-harvest infrastructure, and fragmented tourism coordination. By linking community empowerment, ecological resilience, and inclusive development, this study contributes a place-based operational model for implementing blue economy strategies in underserved coastal contexts.

1. Introduction

The blue economy has gained traction in global sustainability discourse as a transformative model that balances marine-based economic development with environmental stewardship and social inclusion. It is increasingly seen as a key framework to address climate resilience, food security, and livelihood diversification in coastal regions (Lee et al., 2020; UNCTAD, 2021). While early literature largely focused on sectoral potential- such as fisheries, marine transport, and energy- recent studies emphasize the need for integrative approaches that connect ecological, social, and institutional dimensions (Wang et al., 2024; Nejjari & Elyousfi, 2023). The blue economy is increasingly promoted as a development strategy that aligns economic growth with ecosystem stewardship in emerging maritime economies (Su et al., 2022; Carrasco-Bahamonde & Casellas, 2024).

Community empowerment is widely recognized as a fundamental driver of success in blue economy initiatives. Empowered coastal communities are more likely to adopt sustainable practices, co-manage marine resources, and participate in local decision-making (Setyowati & Kusumawardhani, 2023; Angel, 2024). However, implementation in remote or under-resourced regions remains limited, often due to centralized governance structures, lack of access to capital, and weak institutional frameworks (Matovu et al., 2025; Carrasco-Bahamonde & Casellas, 2024; Baldeón et al., 2023). These previous studies underscore the importance of local communities governance

mechanisms and equitable stakeholder inclusion in operationalizing blue economy principles at the grassroots level.

Ecotourism has emerged as a complementary sector within this framework, offering opportunities for sustainable development by leveraging natural and cultural assets. When effectively designed, it can generate alternative livelihoods, incentivize environmental conservation, and promote indigenous knowledge (Louey, 2022; Rengkung et al., 2023). However, many ecotourism projects in the Global South still fall short in engaging local communities meaningfully, often resulting in extractive or externally driven models of 'sustainability' (Kim et al., 2024; Zhang et al., 2023). Growing evidence highlights that ecotourism improves when local communities are really involved- from planning and decision-making to benefiting from inclusive value chains and skill development. When people are empowered to take part, ecotourism not only becomes more sustainable, but also helps protect marine biodiversity, while creating meaningful income for the community (Kim et al., 2024; Zhang et al., 2023).

A growing body of literature also underscores the importance of maritime resilience, particularly in the context of climate vulnerability, overfishing, and economic shocks. Resilience thinking calls for adaptive governance, diversified income sources, and social capital as key factors that enable coastal communities to withstand and recover from environmental and economic stressors (Cahyaningsih et al., 2022; Murray et al., 2022). However, much of this work remains conceptual or focused on national-level strategies, with fewer empirical models illustrating how these principles can be operationalized at the village level. Recent frameworks view resilience through lenses of equity, institutional learning, and risk governance (Murray & D'Anna, 2022; Cahyaningsih et al., 2022).

The global urgency to adopt sustainable development models has renewed interest in the ocean economy, especially in light of escalating climate risks, biodiversity loss, and persistent socio-economic inequalities in coastal areas (Wang et al., 2024; Zhang et al., 2023). Conventional "brown economy" models, based on extractive practices, have accelerated environmental degradation (Choudhary et al., 2021). In contrast, the blue economy has emerged as a viable alternative that seeks to align economic development with ecological preservation. The concept broadly refers to the sustainable utilization of marine resources for inclusive economic growth, livelihood enhancement, and ecosystem health (Lee et al., 2020; Nejjari & Elyousfi, 2023).

While early blue economy discourses centered on sectoral potentials such as fisheries, marine transport, and biotechnology, recent studies advocate for more inclusive, community-based approaches, particularly in archipelagic and small-island contexts (Baldeón et al., 2023; Angel, 2024). However, operationalizing these frameworks remains challenging- especially in marginalized and remote areas- due to governance fragmentation, infrastructure deficits, and limited grassroots engagement (Mdlalose, 2022; Zhang et al., 2023).

Indonesia, a nation of over 17,000 islands, has embraced a blue economy vision through the Indonesia Blue Economy Roadmap 2023-2045. While Indonesia's blue economy roadmap sets an ambitious vision for sustainable marine-based development, its implementation in eastern regions- such as Papua- often overlooks the socio-cultural context and fails to meaningfully engage local communities. This disconnect is particularly evident in resource-rich yet marginalized areas like Biak Numfor where, despite abundant marine biodiversity and fisheries potential, chronic infrastructural neglect and social inequality persist. The gap between national policy and local realities underscores the need for more inclusive, place-based strategies that address the unique challenges of these regions (Kim et al., 2024).

This study focuses on Samber Binyeri Village in Biak Numfor Regency (**Figure 1**), Papua Province, a peripheral tuna-producing area located in Fisheries Management Area WPPNRI 717. Despite its strategic position in Indonesia's tuna export economy, the village suffers from low institutional support, limited post-harvest facilities, and socio-economic marginalization. Biak Numfor's economy is heavily reliant on small-scale fisheries, with over 3,600 active fishing units,

yet the benefits from marine development are not equitably distributed (Badan Pusat Statistik Kabupaten Biak Numfor, 2024).

Figure 1 Fishermen village in Sumberi, Biak Numfor- the study site, characterized by artisanal fishers, low infrastructure access, and proximity to marine biodiversity zones.

This research seeks to fill a critical empirical and geographic gap in the blue economy literature by identifying and constructing an ideal integration model tailored to the unique characteristics of Biak's remote and underdeveloped coastal region. The aim is not only to examine existing limitations but also to propose an operational, community-focused framework that can serve as a practical blueprint for sustainable marine development in similarly underserved contexts across Indonesia. This framework emphasizes localized implementation by synergizing community empowerment, ecotourism development, and maritime resilience at the village level. In doing so, the study responds to increasing calls for bottom-up, decolonized approaches to marine sustainability that are sensitive to local institutions, indigenous knowledge, and community aspirations.

2. Methodology

This study employed a qualitative case study design to explore how integrated community empowerment, marine resource management, and ecotourism strategies can enhance sustainable maritime economies in eastern Indonesia. The study site, Samber Binyeri Village in Biak Numfor Regency, Papua Province, is a coastal area within Fisheries Management Area (WPPNRI 717), notable for its tuna fisheries and marine biodiversity. This location was selected due to its ecological significance, development challenges, and relevance to Indonesia's blue economy agenda.

This study also employed participatory observation to capture local practices and socio-economic dynamics related to the blue economy. The researcher engaged directly with community settings by visiting traditional fish markets, fisheries villages, and local fish warehouses. These visits were not limited to passive observation; rather, they involved informal conversations with fishers, traders, and community members, as well as observing the daily routines, tools, and spatial arrangements that shape local livelihoods. This approach provided first-hand insights into the lived experiences and institutional realities of coastal communities in Biak, complementing data collected through interviews and focus group discussions.

Qualitative data collection was conducted between April and September 2024 through two focus group discussions (FGDs) involving 25 participants, supported by participatory observation. Participants included artisanal fishers, village and sub-district officials, cooperative Village-Owned Enterprise (BUMD) leaders, community elders, and informal tourism stakeholders. A purposive sampling strategy was used to ensure diverse representation of key community actors involved in fisheries, ecotourism, and governance.

All FGDs were held in Indonesian language (Bahasa Indonesia) and recorded with informed consent. Discussions explored three core topics: (1) community engagement in fisheries and tourism; (2) institutional enablers and barriers to empowerment; and (3) perceptions of marine risks and adaptation. Observational data included visits to fish landing sites, markets, cold storage units, and cultural tourism areas.

Data reliability was enhanced through triangulation of FGD transcripts, observational notes, village development plans, and secondary statistics (Badan Pusat Statistik Biak Numfor, 2024). Member-checking was conducted via a village feedback session, enabling participants to validate or clarify interpretations.

Thematic analysis was conducted using NVivo software, guided by the conceptual framework's three dimensions: empowerment (capacity, organization, inclusion), ecotourism (participation, conservation, identity), and resilience (infrastructure, networks, risk perception). Emerging patterns were analyzed to identify opportunities and barriers for operationalizing blue economy strategies at the village level.

3. Results

3.1 Limited engagement with cooperatives

Although cooperatives were formally introduced in Samber Binyeri to support collective marketing and local savings systems, participants expressed limited trust and weak engagement. Most community members felt excluded from decision-making processes or were skeptical about promised benefits. A facilitator shared, "We had 89 members on paper, but most didn't pay monthly contributions or attend meetings. Only a few were truly active."

Youth participants noted that many of their peers joined the cooperative only nominally. One noted, "They signed us up, but I don't even know when the meetings happen." Elders cited previous failed initiatives and unmet expectations, which have undermined confidence in institutional arrangements that are perceived as externally imposed.

3.2 Value chain constraints and market access

Fishers described a marketing chain dominated by tengkulak (middlemen), with minimal price control and inadequate facilities. Even with abundant catch, they felt they lacked bargaining power. A participant explained, "We sell tuna for IDR 9,000 per kilo, but in the market it reaches IDR 14,000 to 17,000 (**Figure 2**). We lose too much in between."

Several informants also pointed to insufficient post-harvest infrastructure. One woman fish processor shared, "Sometimes our fish just spoils- no ice, no proper place to store it. We're forced to sell it quickly at any price." The cooperative's arrangement with PNJ, while promising, was also viewed as rigid and difficult to access.

3.3 Ecotourism aspirations and institutional gaps

Ecotourism was widely recognized as an untapped opportunity, especially among youth and women. Local biodiversity, coral reefs, and World War II heritage sites were seen as valuable assets. However, efforts to develop tourism were stymied by poor institutional coordination and lack of skills training. A local official noted, "There are five dive centers, but no promotion or training for locals."

Participants described a fragmented landscape of overlapping programs from different agencies. A community leader said, "Everyone comes with their own plan- tourism office, fisheries, cooperatives- but they never sit together." This lack of synergy has created confusion and stunted local initiative.

3.4 Gender dynamics and social disruption

The shift toward cooperative-based marketing has altered traditional gender roles. Previously, women were central to selling fish in local markets and contributed significantly to household income. One facilitator reflected, "Now the husbands sell to the cooperative, and the wives feel left out. Some even said, 'I miss the gossip at the market (**Figure 3**)!'"

Figure 2 Yellowfin tuna sold for as low as 90.000 IDR per meter at the traditional market in Biak Numfor.

Figure 3 Traditional market in Biak Numfor, where small-scale fishers sell directly to local traders with minimal processing or price control.

While some efforts are underway to include women in processing and governance roles, these initiatives remain limited. A female participant stated, "We'd like to help more, but no one invites us to meetings or trainings." Gender-sensitive planning was largely absent from institutional agendas.

3.5 Perceived resilience and infrastructure readiness

Participants associated resilience with infrastructure, access to markets, and preparedness for future risks. Many expressed concerns over climate impacts, declining fish stocks, and unreliable logistics. An academic participant stated, "Biak was ready for cargo flights to Japan, but the airport was downgraded. Now everything routes through Manokwari."

Despite local readiness in areas such as roads and cold storage, national-level investment was viewed as lacking. These governance and investment gaps were seen as critical barriers to realizing Biak's potential as a blue economy hub.

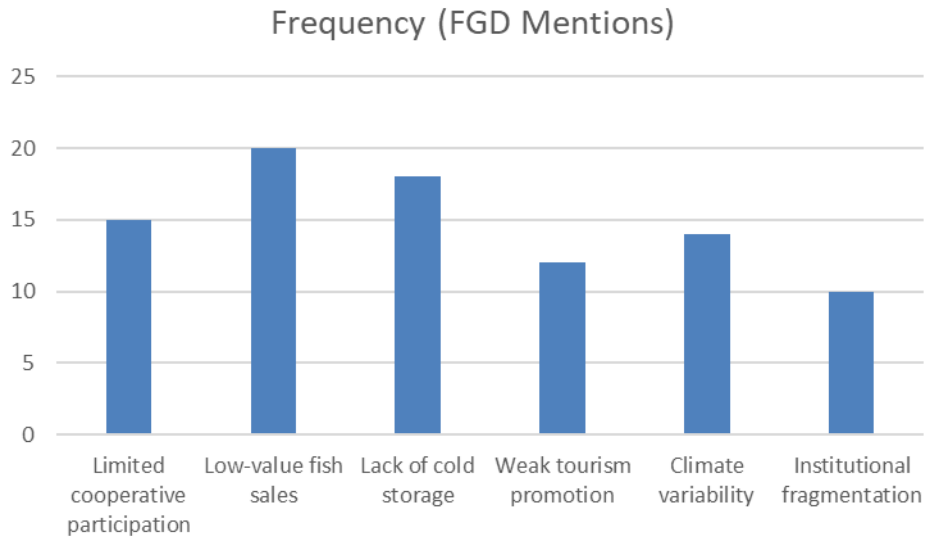

Figure 4 Key challenges in implementing an integrated blue economy model.

To better understand the community's perception of resilience-related barriers, participants in both FGDs were asked to identify key structural and institutional challenges facing Samber Binyeri Village. **Figure 4** summarizes the most frequently mentioned issues.

The most common concern was the persistent low market value for fish products, mentioned in both groups as a critical disincentive to sustainable fishing practices. Lack of cold storage followed closely, revealing widespread post-harvest loss due to inadequate infrastructure.

Participants also frequently cited limited cooperative participation as a constraint, particularly in terms of collective bargaining and market access. Climate variability was acknowledged as a growing risk, especially in relation to unpredictable fishing seasons and coastal erosion.

Notably, institutional fragmentation and weak tourism promotion were also identified as systemic obstacles, indicating the need for better inter-agency coordination and support for ecotourism initiatives. These findings reinforce the earlier thematic insights and demonstrate how infrastructure and governance are directly tied to local perceptions of resilience capacity.

4. Discussion

The case of Samber Binyeri Village reveals the complex and layered realities of implementing blue economy principles in remote and underserved coastal communities. Although national policy frameworks articulate ambitions for sustainability, community empowerment, and inclusive development, these top-down aspirations often confront ground-level constraints. Infrastructural

deficits, fragmented institutional arrangements, and entrenched socio-cultural dynamics significantly mediate how such frameworks are understood, negotiated, and enacted at the village level.

First, the limited engagement with cooperatives in Samber Binyeri highlights a broader disconnect between externally promoted economic models and the lived realities of community members. Although cooperatives were formally introduced to support collective marketing and savings systems, participants expressed skepticism and disengagement- often citing a lack of transparency, exclusion from decision-making, and past institutional failures. One facilitator noted, "We had 89 members on paper, but most didn't pay monthly contributions or attend meetings," while another participant remarked, "They signed us up, but I don't even know when the meetings happen." These sentiments reflect not only logistical gaps, but also deeper issues of social trust and perceived legitimacy. As Carrasco-Bahamonde and Casellas (2024) argue, sustainable blue economy models must be rooted in local norms, histories, and participatory governance practices. Theoretically, these findings point to the centrality of institutional trust and procedural inclusion in shaping collective action. Also, Sofyani et al. (2022) argued that village community trust is highly associated with transparency. Practically, this highlights the need for co-designed cooperative models that prioritize transparency, local leadership, and culturally informed engagement strategies, rather than top-down enrollment campaigns that risk nominal compliance without genuine participation.

Second, barriers to market access and value chain participation were widely acknowledged by fishers in Samber Binyeri, who described persistent price asymmetries, dependency on tengkulak (middlemen), and inadequate infrastructure. One participant explained, "We sell tuna for IDR 9,000 per kilo, but in the market it reaches IDR 14,000 to 17,000. We lose too much in between," reflecting both a loss of value and a sense of disempowerment. These accounts align with broader patterns observed in remote maritime economies, where limited cold storage, transportation, and processing infrastructure constrain bargaining power and deepen structural dependence (Kim et al., 2024). While the PNJ cooperative agreement aimed to stabilize pricing and offer collective benefits, several informants described it as rigid and difficult to access- particularly for smaller-scale or irregular fishers. This illustrates how formalized partnerships, if poorly aligned with local rhythms of production and socio-economic diversity, can unintentionally reinforce existing inequities. Regassa (2022) argue in the context of the Laga-Dambi gold mine in Ethiopia that exclusionary modes of engagement- rooted in top-down institutional logics and macro-political alliances- often marginalize local actors by treating resource-rich territories as "frontiers", to be administered rather than inhabited. Theoretically, this highlights how value chain exclusion and asymmetrical power relations continue to shape the distribution of economic benefits in peripheral coastal contexts. From a practical standpoint, these findings suggest that inclusive market strategies must prioritize adaptive pricing systems, flexible cooperative entry points, and significant investment in post-harvest infrastructure to enable fishers to retain more value and negotiate on more equal terms.

Third, while participants widely recognized the ecotourism potential of Samber Binyeri- highlighting its coral reefs, biodiversity, and World War II heritage sites- efforts to develop this sector have been impeded by fragmented leadership, poor coordination among government agencies, and the absence of targeted capacity-building. A community leader remarked, "Everyone comes with their own plan- tourism office, fisheries, cooperatives- but they never sit together," illustrating the institutional silos that have stifled integrated planning. Youth and women, who expressed strong interest in tourism opportunities, reported being sidelined due to a lack of training, promotion, and structured entry points. These dynamics reinforce critiques in the literature that ecotourism initiatives in the Global South often operate as top-down interventions disconnected from local realities (Su et al., 2022; Zhang et al., 2023).

Theoretically, this case exemplifies how institutional fragmentation and externally designed programming can create a form of governance inertia, where overlapping mandates and rigid delivery mechanisms inhibit long-term progress. Similar to the findings of Amankwa et al. (2023) in the Solomon Islands, donor-driven approaches and entrenched socio-institutional dynamics can interact

to form institutional traps- patterns of stagnation that persist even in the face of evident potential. In the context of Samber Binyeri, this trap is evident in the proliferation of disconnected tourism programs that fail to empower local actors or reflect community narratives. Practically, revitalizing ecotourism in such settings requires not only infrastructure or branding, but locally adaptive strategies, cross-sectoral collaboration, and participatory design frameworks that can overcome institutional inertia and foster inclusive development.

Fourth, gender dynamics emerged as a critical yet underexplored domain in the transformation of Samber Binyeri's fisheries sector. The shift toward cooperative-based marketing- originally intended to improve efficiency and income- has unintentionally disrupted women's traditional roles in the fish value chain. Previously central to market transactions and household livelihoods, many women now find themselves excluded from spaces of economic and social interaction. As one facilitator noted, "Now the husbands sell to the cooperative, and the wives feel left out. Some even said, 'I miss the gossip at the market!'" These shifts illustrate how institutional reforms, when designed without a gender lens, can displace rather than empower.

This case mirrors broader patterns in blue economy interventions where modernization efforts often bypass informal labor systems and ignore gendered social norms (Matovu et al., 2025). Women in the village reported not being invited to meetings or included in decision-making processes related to cooperatives or tourism. Lal and Kour's (2023) study on financial exclusion among marginalized communities in India highlights similar dynamics, showing how socio-cultural factors like caste and gender systematically restrict access to formal institutions, despite national-level empowerment agendas. Both cases underscore the limitations of top-down inclusion models that fail to account for intersecting forms of exclusion rooted in local social hierarchies.

Theoretically, this affirms the need to apply feminist and intersectional frameworks when designing governance systems that aim for inclusion. Women's exclusion in Samber Binyeri was not only economic but also social- disrupting community networks, informal power, and everyday agency. Practically, blue economy interventions must go beyond gender parity metrics and commit to inclusive governance processes, gender-targeted training, and the recognition of informal roles that sustain livelihoods and resilience at the community level.

Third, while participants widely recognized the ecotourism potential of Samber Binyeri- highlighting its coral reefs, biodiversity, and World War II heritage sites- efforts to develop this sector have been impeded by fragmented leadership, poor coordination among government agencies, and the absence of targeted capacity-building. A community leader remarked, "Everyone comes with their own plan- tourism office, fisheries, cooperatives- but they never sit together," illustrating the institutional silos that have stifled integrated planning. Youth and women, who expressed strong interest in tourism opportunities, reported being sidelined due to a lack of training, promotion, and structured entry points.

These dynamics reinforce critiques in the literature that ecotourism initiatives in the Global South often operate as top-down interventions disconnected from local realities (Su et al., 2022; Zhang et al., 2023). A similar pattern was observed by Jaya et al. (2024) in a tourist village in Central Java, where ecotourism brought some benefits- such as community cohesion and awareness of environmental conservation- but was undermined by corruption, planning opacity, and local distrust toward government-led programs. In both cases, ecotourism becomes a contested field, promising socio-economic upliftment while simultaneously revealing institutional fragilities.

Theoretically, the Samber Binyeri case underscores how institutional fragmentation and externally designed programming can create a form of governance inertia, where overlapping mandates and rigid delivery mechanisms inhibit long-term progress (Amankwa et al., 2023). Practically, revitalizing ecotourism in such settings requires not only infrastructure and branding, but also locally adaptive strategies, cross-sectoral collaboration, and participatory design frameworks that are transparent, culturally embedded, and inclusive of youth and women as key stakeholders.

Together, these findings confirm the importance of integrated, place-based models that are socially embedded and responsive to the lived experiences of coastal communities. The Samber Binyeri case offers insights not only into the barriers faced by marginal island regions but also the complex dynamic in coastal communities.

The proposed integration model combines community empowerment (through cooperative systems and inclusion), ecotourism (as a culturally rooted, alternative livelihood), and maritime resilience (through diversified infrastructure and governance support). These components must not only be contextually embedded and co-developed with local actors for operational success, but also attention must be given to creative solutions emerging from within the community itself.

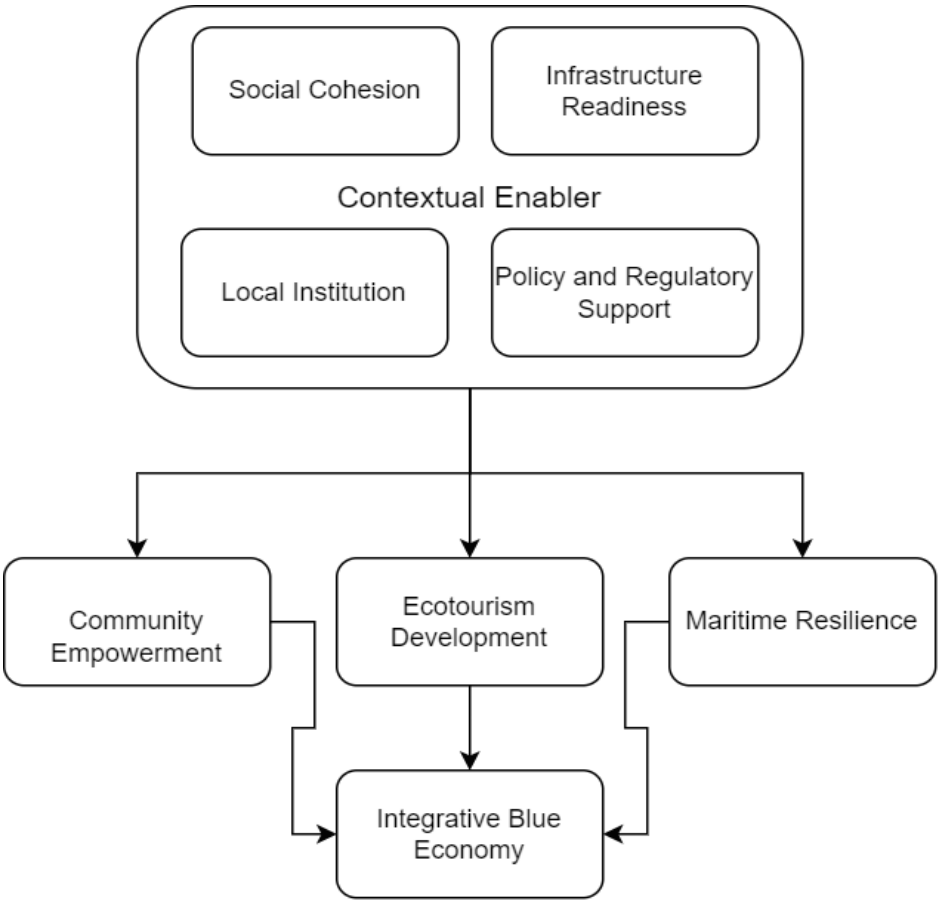

Figure 5 Synergistic model of empowerment, ecotourism, and resilience toward a localized blue economy.

Based on these findings, an integrative framework (**Figure 5**) is proposed for operationalizing integrative blue economy strategies at the village level. The model synthesizes the three core domains identified- community empowerment, ecotourism, and maritime resilience- while embedding them within a set of contextual enablers that emerged from participant insights.

While this study offers in-depth insights into the dynamics of ecotourism, maritime resilience, and community empowerment in a remote coastal village, it is not without limitations. First, the research is based on a single case study in Samber Binyeri, which limits the generalizability of findings to other regions. Second, the data is time-bound, and does not capture changes over time, pointing to the need for longitudinal research. Third, while diverse participants were included, some community voices- particularly marginalized subgroups- may remain underrepresented. These

limitations open space for future comparative and cross-regional studies that explore the transferability and evolution of localized blue economy models.

5. Conclusions

This study explored the interconnected dynamics of ecotourism, maritime resilience, and community empowerment in advancing blue economy objectives at the village level. Drawing on qualitative data from Samber Binyeri Village, the findings reveal how efforts to implement the blue economy are shaped by institutional fragmentation, infrastructural limitations, and socio-cultural exclusion- particularly in remote island settings.

The findings revealed five key barriers: (1) limited engagement with cooperatives due to distrust and exclusion, (2) value chain constraints and asymmetrical market access, (3) fragmented ecotourism governance and institutional silos, (4) gender-based disruptions in traditional livelihoods, and (5) low perceived resilience stemming from infrastructural and policy gaps.

Theoretically, the study contributes to a more grounded understanding of the blue economy as a multi-dimensional construct requiring the integration of social trust, gender-responsive governance, and localized institutional capacity. Ecotourism, when culturally embedded and locally managed, offers more than income- it becomes a tool for stewardship and identity-building. Maritime resilience, similarly, depends not just on infrastructure, but on systemic coordination across governance levels. Community empowerment emerges as the connective tissue through which both ecotourism and resilience efforts are legitimized and sustained.

Moving forward, deeper engagement is needed through longitudinal and comparative research to test the adaptability of such integrative models in diverse coastal contexts. For policymakers and development practitioners, the findings reinforce the need to move beyond sectoral interventions and adopt multi-dimensional, place-based strategies that align infrastructure, governance, and community priorities in pursuit of a sustainable blue economy.

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