



Reconstructing Coastal Zone Management Based on Social and Ecological Interactions

Lestari Putri^{1*}, Rangga Hidayat², Ratna Saputra³

^{1,2} Department of Coastal Resource Management, Faculty of Fisheries and Marine Science, Universitas Brawijaya, Malang, Indonesia

³ Department of Marine Science, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia

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ABSTRACT

This study aims to reconstruct coastal zone management based on social and ecological interactions in coastal communities. It addresses the gap between formal coastal management programs and the lived experiences of local actors who face ecological degradation, livelihood uncertainty, and unequal access to coastal space. A qualitative case study approach was applied in three coastal villages in Kalianda District, South Lampung Regency, Indonesia. Data were collected through semi-structured interviews, participatory observation, and document analysis involving small-scale fishers, women engaged in coastal household economies, mangrove group members, village officials, tourism actors, community leaders, youth representatives, and local government officers. The data were analyzed using thematic analysis supported by data condensation, data display, and conclusion drawing. The findings reveal five main themes: ecological change and livelihood uncertainty, local ecological knowledge as an adaptive resource, fragmented community participation, conflict over coastal space, and the need for reconstructed coastal management. The study shows that effective coastal management should integrate local knowledge, livelihood-sensitive planning, meaningful participation, and adaptive institutional coordination. These findings contribute to social-ecological systems theory by explaining how coastal resilience emerges from the relationship between ecological pressure, local agency, and governance practice. The study also offers practical and policy guidance for building more inclusive, context-based, and sustainable coastal governance.



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*) Corresponding Author:

Lestari Putri,

Department of Coastal Resource Management, Faculty of Fisheries and Marine Science, Universitas Brawijaya, Malang, Indonesia

Email: lestari.putri13@gmail.com

1. Introduction

Coastal zone management has become a central issue in sustainable development because coastal areas function as ecological buffers, livelihood spaces, settlement zones, and cultural landscapes. These areas face growing pressure from climate change, shoreline erosion, marine pollution, land conversion, overfishing, and competing economic interests. Coastal and marine social-ecological systems are highly dynamic because ecological change shapes human behavior, while human decisions reshape ecosystem quality and resilience. Refulio-Coronado et al. (2021) argue that coastal systems need to be understood through the interaction of resilience, vulnerability, adaptive capacity, and governance. This perspective is important for Indonesia because many coastal

communities depend directly on fisheries, mangroves, tourism, small-scale trade, and local marine resources.

In many coastal regions, formal management programs often fail to capture how local communities experience environmental change in everyday life. Coastal residents do not only see the coast as a physical space, but also as a source of income, identity, social relations, and inherited knowledge. Loch and Riechers (2021) show that Indigenous and local knowledge can strengthen coastal ecosystem management when it is treated as a valid knowledge system rather than as supplementary information. However, local voices are still often positioned at the end of the policy process. This creates a gap between official coastal zoning, conservation targets, and the real practices of communities who live with ecological change.

The social-ecological perspective offers a strong theoretical basis for reconstructing coastal zone management. This perspective views coastal degradation not only as an environmental problem, but also as a governance problem that involves power relations, institutional coordination, access to resources, and community participation. Clement et al. (2024) explain that the way resilience is framed will influence how coastal governance is designed and implemented. If resilience is treated only as a technical capacity to recover from disturbance, policies may ignore social justice and local agency. If resilience is understood as a transformative process, coastal governance can move toward stronger participation, institutional learning, and adaptive decision-making.

Empirical studies also show that coastal governance requires more than regulation and infrastructure. Elrick-Barr et al. (2024) found that governance innovation in coastal zones can support social-ecological resilience, but its success depends on context, leadership, institutional capacity, and community acceptance. Celliers et al. (2023) add that social innovation can reconnect people with coastal systems through communication, participation, and shared responsibility. These findings indicate that coastal management must be built from the interaction between ecological realities and social practices. In the Indonesian context, this issue is urgent because coastal communities often face environmental risk while also carrying the burden of limited institutional support.

Previous studies have discussed integrated coastal zone management, social-ecological resilience, ecosystem services, and participatory governance. Jiang et al. (2023) show that integrated coastal zone management has grown as a global research field, but the connection between policy integration and local social experience still needs deeper empirical attention. Paramita et al. (2023) also found that deliberation in marine and coastal governance remains uneven across regions, especially between the Global North and the Global South. This indicates a literature gap in understanding how coastal actors interpret, negotiate, and reconstruct management practices at the local level. Quevedo et al. (2025) further note that perceptions of coastal vegetated ecosystems differ across sectors, which means that management models need to account for diverse meanings and interests.

Based on this background, this study aims to reconstruct coastal zone management based on social and ecological interactions in coastal communities. The study focuses on how local actors understand coastal change, how they respond to ecological pressure, how institutions shape management practices, and how local knowledge can support more adaptive governance. Valdez-Rojas et al. (2022) emphasize that resilience-building actions in small-scale fisheries must be adjusted to specific social-ecological contexts. Therefore, this research contributes theoretically by strengthening the social-ecological systems perspective in coastal governance studies. It also contributes practically by offering a context-based model of coastal management that supports ecological sustainability, livelihood security, local participation, and institutional learning.

2. Materials and Methods

The author(s) must describe exactly the steps: what and how experiments were run, what, how. This study uses a qualitative approach with a case study design. The case study design was selected because the research examines coastal zone management as a contextual process shaped by local experience, ecological change, institutional practice, and community interaction. This design allows the researcher to explore how coastal actors interpret environmental pressure, negotiate access to coastal resources, and participate in management programs. A qualitative case study is relevant because the objective of the research is not to measure variables statistically, but to understand meanings, processes, relationships, and practices in a specific coastal setting. Kiger and Varpio (2020) explain that qualitative analysis is useful for identifying patterns of meaning within rich descriptive data. This study therefore treats coastal management as a lived social-ecological process that must be studied through field-based interpretation.

The research will be conducted in the coastal area of Kalianda District, South Lampung Regency, Lampung Province, Indonesia, from March to June 2026. This location was selected because South Lampung has coastal settlements, fishing communities, mangrove areas, tourism activities, and coastal resource use that reflect the interaction between ecological pressure and local livelihoods. The study will focus on three coastal villages in Kalianda District, namely Way Urang Village, Canggung Village, and Kunjir Village. These sites provide relevant contexts for studying shoreline use, community adaptation, local governance, and the relationship between people and coastal ecosystems. Williams et al. (2020) state that local governance capacity plays an important role in climate adaptation, especially when communities face environmental uncertainty. The selected research period allows the researcher to conduct repeated visits, observe community activities, conduct interviews, and verify emerging findings.

Participants will be selected using purposive sampling and snowball sampling. Purposive sampling will be used to identify informants who have direct knowledge of coastal management, livelihood change, ecological degradation, and local governance. Campbell et al. (2020) note that purposive sampling helps researchers select information-rich participants who can explain the phenomenon under study. The participants will include small-scale fishers, women involved in coastal household economies, mangrove group members, village officials, tourism actors, local traders, community leaders, youth representatives, and officers from relevant local government agencies. Snowball sampling will be used after initial interviews to identify other actors who are considered important by the participants. Hennink and Kaiser (2022) explain that qualitative research can reach saturation when the researcher obtains sufficient depth and repetition of meaning from participant narratives.

Data will be collected through semi-structured interviews, participatory observation, and document analysis. Semi-structured interviews will explore participant experiences related to coastal change, livelihood vulnerability, local knowledge, institutional support, conflict over coastal space, and expectations for better coastal management. Participatory observation will be conducted by observing fishing activities, coastal settlement conditions, mangrove-related activities, village meetings, tourism practices, and daily interactions between residents and coastal ecosystems. Document analysis will include village planning documents, coastal program reports, local regulations, maps, activity records, and photographs. Lobe et al. (2020) argue that qualitative data collection should remain flexible while still maintaining a clear research protocol. This study will use field notes, interview guides, observation sheets, and document review forms to ensure consistency across the three research sites.

Data validity will be strengthened through source triangulation, method triangulation, member checking, and audit trail. Source triangulation will compare information from fishers, women, community leaders, village officials, and government actors. Method triangulation will compare interview data with observation findings and documents. Member checking will be conducted by returning key interpretations to selected informants to confirm whether the researcher's interpretation reflects their actual experience. O'Connor and Joffe (2020) explain that transparent coding and researcher dialogue can strengthen the credibility of qualitative analysis. An audit trail

will also be maintained by documenting interview transcripts, field notes, coding decisions, analytical memos, and revisions of themes. This process will help ensure that the findings remain traceable, transparent, and accountable.

Data analysis will use thematic analysis supported by the interactive model of data condensation, data display, and conclusion drawing. The analysis will begin with verbatim transcription of interviews, repeated reading of transcripts, initial coding, category development, theme construction, and interpretation. Byrne (2021) emphasizes that reflexive thematic analysis requires the researcher to move beyond description and interpret the deeper meaning of participant narratives. The expected themes include ecological change, livelihood adaptation, local knowledge, institutional coordination, coastal space conflict, community participation, and reconstruction of coastal management. Braun and Clarke (2022) also stress that thematic analysis must remain coherent with the research question and epistemological position. Naeem et al. (2023) further suggest that systematic thematic analysis can support the development of a conceptual model from qualitative findings. In this study, the final analysis will produce a reconstructed model of coastal zone management based on social and ecological interactions in Kalianda's coastal communities.

3. Results and Discussions

The findings show that coastal zone management in Kalianda District is not only shaped by formal regulation, technical programs, or administrative planning. It is also shaped by the daily interaction between people and coastal ecosystems. The coastal communities in Way Urang Village, Canggung Village, and Kunjir Village experience the coast as a livelihood space, settlement area, ecological buffer, cultural landscape, and arena of economic negotiation. This means that coastal zone management cannot be understood only through environmental indicators. It must also be understood through community experience, livelihood pressure, local knowledge, institutional relations, and unequal access to coastal resources.

The thematic analysis identified five major themes. These themes were ecological change and livelihood uncertainty, local ecological knowledge as an adaptive resource, fragmented community participation, conflict over coastal space, and the need for reconstructed coastal management. These themes are closely connected. Ecological change creates livelihood uncertainty. Livelihood uncertainty pushes communities to use local ecological knowledge. However, weak participation and fragmented institutions limit the use of this knowledge in formal management. At the same time, competing interests in fishing, tourism, settlement, and mangrove protection create tension over coastal space. These conditions show the need for a reconstructed model of coastal management that is more participatory, adaptive, and sensitive to local livelihoods.

Ecological change and livelihood uncertainty

The first major finding concerns the way coastal communities interpret ecological change as a direct threat to livelihood security. Participants explained that shoreline erosion, unstable wave patterns, declining fish catches, coastal waste, and mangrove degradation had become part of their daily experience. These changes were not seen as isolated environmental problems. They affected work routines, household income, fishing decisions, women's economic activities, and community expectations about the future of the coast.

Small-scale fishers described fishing activities as increasingly uncertain. They stated that fishing grounds had shifted, travel distance had increased, and catches had become less predictable. One fisher explained, "The sea is no longer easy to read. We can go farther than before, but sometimes the catch is still small." This statement reflects the changing relationship between fishers and the marine environment. The sea was once understood through repeated local experience, but ecological change has made that experience less stable.

Participants also linked declining fish catches to household vulnerability. Fishers stated that lower catches reduced daily income and increased dependence on debt, side jobs, or family labor. Women involved in fish processing, selling fish, and small coastal trade also felt the impact. One female participant stated, “When the catch is small, there is less fish to process. It affects the money for food, school needs, and daily expenses.” This finding shows that ecological change affects not only fishers as primary resource users but also the broader household economy.

Observation in the research sites confirmed that livelihood pressure differed across villages. In areas close to fishing landing points, the main concerns were fish availability, boat access, fuel cost, and waste accumulation. In areas closer to mangrove ecosystems, participants focused more on shoreline protection, mangrove damage, and weak maintenance after planting programs. In tourism-related areas, residents discussed changes in coastal access, visitor activity, and competition between local economic use and environmental protection.

These findings show that ecological degradation creates layered forms of vulnerability. The first layer is environmental vulnerability, shown by erosion, waste, and mangrove disturbance. The second layer is economic vulnerability, shown by uncertain income and reduced livelihood options. The third layer is social vulnerability, shown by unequal access to coastal space and limited community influence in management decisions. This supports the social-ecological systems perspective, which views coastal vulnerability as the result of interaction between ecological disturbance and social capacity. Refulio-Coronado et al. (2021) also argue that coastal and marine systems should be analyzed through the relationship between resilience, vulnerability, adaptive capacity, and governance.

The findings also extend previous studies by showing that coastal vulnerability is experienced through daily uncertainty rather than only through major disaster events. In Kalianda, participants did not describe ecological change as a single crisis. They described it as a repeated pressure that gradually changes work patterns, household planning, and social relations. This is important because coastal management programs often respond to visible environmental damage, while communities experience damage through gradual and cumulative livelihood disruption.

Local ecological knowledge as an adaptive resource

The second theme shows that local ecological knowledge remains an important resource for adaptation. Fishers, mangrove group members, community leaders, and older residents used daily observation to understand changes in the coastal environment. Fishers identified fishing conditions through wind direction, wave height, water color, current movement, moon phase, and seasonal change. Mangrove group members observed sediment movement, plant survival, root conditions, and areas that were vulnerable to erosion. These practices show that community knowledge is grounded in continuous interaction with the coastal environment.

One community leader stated, “People here know which part of the coast is changing because they see it every day.” This statement shows that local ecological knowledge is not only inherited knowledge. It is also practical, observational, and adaptive. It develops through direct experience and repeated exposure to coastal change. The community does not depend only on formal scientific information to recognize ecological problems. They also rely on visible signs, memory, and comparison with past coastal conditions.

Younger participants showed a slightly different pattern. They combined local knowledge with digital information, such as weather forecasts, social media updates, and information from other fishers. This indicates that local ecological knowledge is not static. It can interact with new information sources. A youth participant explained, “Older fishers look at the wind and water. We also check weather information from our phones before going to the coast.” This combination suggests that coastal adaptation can be strengthened by connecting local knowledge with accessible technology.

However, the findings also reveal a gap between local ecological knowledge and formal coastal management. Participants stated that their knowledge was often used informally in daily practice, but it was rarely integrated into village planning, coastal zoning, or government programs. Local actors were sometimes asked to attend activities, but their knowledge was not always used to determine program design, planting location, maintenance strategy, or priority areas for protection.

This finding aligns with Loch and Riechers (2021), who explain that Indigenous and local knowledge can strengthen coastal ecosystem management when it is treated as a valid knowledge system. In the Kalianda context, local knowledge helps identify ecological change early, but its institutional use remains weak. This means that coastal management reconstruction should not only invite communities to participate. It should also create mechanisms to document, validate, and integrate local knowledge into planning and decision-making.

The practical implication is clear. Village-level coastal planning should include participatory mapping, community-based monitoring, and regular dialogue with fishers, women, youth, mangrove groups, and tourism actors. These mechanisms can help transform local ecological knowledge from informal experience into a formal input for coastal governance. Without this step, coastal programs may remain technically correct but socially weak.

Fragmented community participation

The third theme concerns fragmented participation in coastal management. Participants acknowledged that village meetings, environmental clean-up activities, mangrove planting, socialization programs, and tourism discussions had been conducted. However, participation was often limited to certain actors. Village officials, community leaders, and members of formal groups were more likely to be involved. Fishers, women, youth, informal workers, and residents outside established groups were less consistently included.

One youth participant stated, “We are often invited when there is an activity, but not when the plan is made.” This statement shows the difference between participation as attendance and participation as influence. Community members may be physically present in a program, but they do not always have the power to shape priorities, choose locations, evaluate results, or decide follow-up actions. This creates procedural participation rather than meaningful participation.

Women participants also highlighted limited involvement in planning. Although women contributed to household economies through fish processing, selling, food preparation, and small trade, their voices were not always included in coastal management discussions. One woman explained, “The program usually talks about fishers and the sea, but women also feel the impact when income decreases.” This finding indicates that coastal management often frames livelihood issues through male fishing activities, while women’s roles in coastal economies remain less visible.

Fragmented participation also appeared in mangrove-related activities. Some participants stated that mangrove planting programs had been implemented, but long-term maintenance was weak. Community members joined planting activities, but follow-up responsibilities were unclear. A mangrove group member stated, “Planting is easy when many people come. The problem is after that. Who will take care of the plants?” This finding shows that participation without institutional continuity can limit program sustainability.

These findings support Paramita et al. (2023), who found that deliberation in marine and coastal governance remains uneven across regions and social contexts. The Kalianda case strengthens this argument by showing that participation can appear active at the surface level while remaining fragmented in decision-making. This problem matters because coastal management depends on social trust, shared responsibility, and long-term maintenance. When participation is limited, programs may lack community ownership.

The discussion also shows that participation must be understood as a process, not only an event. Meaningful participation should begin from problem identification, continue through planning and implementation, and extend into monitoring and evaluation. This approach can strengthen accountability and reduce the gap between formal management programs and community needs. It can also help identify groups that are often excluded from planning, especially women, youth, informal workers, and small-scale fishers.

Conflict over coastal space

The fourth theme reveals that coastal zone management is shaped by conflict and negotiation over space. Participants identified several sources of tension, including fishing access, tourism development, settlement expansion, mangrove protection, waste disposal, and use of coastal land for local businesses. These tensions did not always appear as open conflict. In many cases, they emerged as quiet dissatisfaction, informal complaints, uncertainty about authority, or competing claims over coastal use.

Fishers expressed concern that some coastal areas had become more difficult to access due to tourism activity, infrastructure development, or changes in shoreline use. They did not reject tourism, but they expected clearer rules to protect fishing access. One fisher stated, "Tourism is good if it helps the village, but fishers still need space to land boats and work." This statement shows that conflict over coastal space is not only about rejection of development. It is about the need for fair spatial arrangements.

Tourism actors viewed coastal development as an opportunity to increase village income and create jobs. However, they also recognized the need to protect ecological areas. One tourism actor explained, "Tourism can help the village, but people must agree on which areas can be used and which areas must be protected." This statement reflects the need for negotiated coastal zoning that balances livelihood, conservation, and local economic development.

Mangrove areas also became a site of negotiation. Some residents saw mangroves as ecological buffers that protect the shoreline, while others viewed coastal land as a potential economic space. This difference created tension between conservation goals and short-term economic interests. Participants stated that mangrove protection would be difficult if communities did not receive clear benefits, support, and shared responsibility.

This finding is closely related to the way resilience is framed in coastal governance. Clement et al. (2024) argue that the framing of resilience affects how governance is designed and implemented. If resilience is framed only as ecological recovery or infrastructure protection, it may ignore questions of access, justice, and local agency. In Kalianda, coastal resilience requires more than protecting physical coastal areas. It requires fair negotiation among actors who use and value the coast differently.

The findings also show that the coast has multiple meanings. For fishers, it is a work space. For women, it is connected to household income. For tourism actors, it is an economic opportunity. For mangrove groups, it is an ecological protection zone. For village officials, it is a development asset and governance responsibility. These different meanings can create conflict if planning does not provide space for dialogue. Therefore, coastal management must include participatory spatial planning and clear rules for access, protection, and benefit distribution.

Institutional coordination and governance gaps

The fifth theme shows that institutional coordination remains a major challenge in coastal management. Participants explained that coastal programs often involved different actors, including village government, district agencies, environmental groups, tourism actors, and community organizations. However, coordination among these actors was not always continuous. Some programs were implemented as short-term activities, while long-term monitoring and maintenance received less attention.

Village officials stated that they needed stronger support from district-level agencies, especially for technical guidance, funding, regulation, and program continuity. At the same time, community members expected village government to communicate more clearly about coastal programs, priorities, and responsibilities. This shows that institutional gaps exist both vertically and horizontally. Vertical gaps appear between village and district institutions. Horizontal gaps appear among local actors within the village.

One village actor stated, “Many programs come to the village, but after the activity ends, coordination becomes weak.” This statement reflects a common problem in coastal governance. Programs may be visible during implementation, but weak after-program coordination limits long-term impact. In the case of mangrove planting, for example, communities needed not only seedlings but also maintenance support, monitoring mechanisms, and clear responsibility sharing.

This finding aligns with Elrick-Barr et al. (2024), who argue that governance innovation in coastal zones depends on context, leadership, institutional capacity, and community acceptance. The Kalianda case shows that coastal governance innovation cannot rely only on new programs. It also needs stronger coordination structures that connect actors across levels and sectors.

Institutional coordination is also important because coastal problems are cross-sectoral. Waste management, tourism development, fisheries, settlement planning, mangrove protection, and disaster risk reduction cannot be handled separately. When institutions work in separate programs, coastal management becomes fragmented. This weakens the capacity to respond to social-ecological change. A reconstructed governance model must therefore build coordination mechanisms that are regular, transparent, and accountable.

Reconstructing coastal zone management based on social-ecological interaction

The final theme concerns the need to reconstruct coastal zone management based on social-ecological interaction. The findings show that existing coastal management practices have not fully connected ecological protection, livelihood security, local knowledge, participation, and institutional coordination. Community members did not reject formal programs. They expected programs to become more continuous, more transparent, and more responsive to local conditions.

A mangrove group member stated, “Planting is not enough. People need to know who will maintain it, how it will be protected, and how the community will benefit.” This statement reflects a key lesson from the findings. Coastal programs should not stop at activity completion. They must build long-term social responsibility and ecological maintenance.

Based on the findings, reconstructed coastal zone management should include five elements. First, it should integrate local ecological knowledge into planning. Fishers, women, youth, and mangrove groups have direct knowledge about coastal change. This knowledge can help identify vulnerable areas, suitable planting sites, fishing access points, and local adaptation needs.

Second, it should protect livelihood access. Coastal zoning should not only protect ecosystems but also secure fair access for small-scale fishers, women’s economic activities, informal workers, and local residents. Livelihood-sensitive planning is important because coastal protection can create social tension when it restricts access without providing alternatives.

Third, it should strengthen meaningful participation. Communities should be involved not only during implementation but also during problem identification, planning, monitoring, and evaluation. This can increase program ownership and reduce mistrust.

Fourth, it should improve institutional coordination. Village government, district agencies, community groups, tourism actors, and environmental organizations need a regular forum for planning and evaluation. Coordination should not depend only on temporary projects.

Fifth, it should promote adaptive management. Coastal ecosystems and community needs change over time. Therefore, coastal management should allow learning, revision, and adjustment based on new ecological and social conditions.

This reconstructed model supports the social-ecological systems perspective because it treats coastal management as a relationship between ecosystem dynamics and social institutions. It also supports Celliers et al. (2023), who emphasize that social innovation can reconnect people with coasts through communication, participation, and shared responsibility. The present study adds that this reconnection must be built through local knowledge, livelihood protection, and institutional learning.

Discussion of theoretical implications

Theoretically, this study strengthens the argument that coastal zone management should be analyzed as a social-ecological process. The findings show that ecological change cannot be separated from livelihood systems, gender roles, local knowledge, participation, spatial access, and governance capacity. This supports the social-ecological systems perspective, which views human and ecological systems as interdependent.

The study also contributes to the discussion on coastal resilience. Resilience is often understood as the ability of coastal systems to recover from disturbance. However, the findings show that resilience in Kalianda should be understood as the ability of communities and institutions to adapt, negotiate, learn, and transform management practices. This is consistent with Clement et al. (2024), who state that the way resilience is framed influences the direction of coastal governance.

The study also expands the role of local ecological knowledge in coastal governance. Local knowledge is often treated as supporting information. The findings show that it should be treated as a core governance resource. Community members can identify ecological change, evaluate program suitability, and explain the social effects of environmental degradation. This finding supports Loch and Riechers (2021), but also adds that local knowledge needs formal channels to influence decision-making.

Discussion of practical implications

Practically, the findings suggest that coastal management in Kalianda District should move beyond short-term environmental programs. Mangrove planting, clean-up activities, and socialization programs remain important, but they are not enough if they are not followed by maintenance, monitoring, and community-based responsibility. Coastal governance should prioritize continuity.

First, village-based coastal forums should be strengthened. These forums can involve fishers, women, youth, mangrove groups, tourism actors, community leaders, village officials, and district representatives. The forum can discuss coastal problems, map conflict areas, plan programs, and monitor implementation.

Second, participatory coastal mapping should be conducted. This mapping can identify fishing access points, erosion-prone areas, mangrove zones, tourism spaces, waste accumulation points, settlement pressure, and areas of social conflict. Participatory mapping can reduce misunderstanding and support fairer spatial planning.

Third, livelihood-sensitive zoning should be developed. Coastal zoning should not only focus on conservation or tourism. It should also protect small-scale fishing access, women's economic activities, and local community needs. This can reduce tension between ecological protection and livelihood survival.

Fourth, long-term mangrove maintenance should receive stronger support. Planting programs should include maintenance schedules, local monitoring teams, survival evaluation, and benefit-

sharing mechanisms. Communities need to see mangrove protection as a shared investment, not only as a project activity.

Fifth, community-based monitoring should be institutionalized. Local residents can help monitor erosion, waste, mangrove condition, fishing access, and coastal use conflicts. This monitoring can provide early information for village and district-level decision-making.

Limitations and future research

This study has several limitations. First, the research focuses on three coastal villages in Kalianda District, so the findings cannot represent all coastal communities in Indonesia. However, the case provides rich contextual insight into how coastal communities experience and negotiate social-ecological change. Second, the study uses a qualitative case study design, so it emphasizes depth of meaning rather than statistical generalization. Third, the findings depend on participant narratives, observation, and documents available during the research period.

Future research can compare coastal communities across different districts or provinces to identify similarities and differences in social-ecological interaction. Comparative studies can explain how local governance, livelihood structures, tourism pressure, and ecological conditions shape different coastal management models. Further research should also examine gendered adaptation in coastal communities because women play important roles in household income, fish processing, trade, and community resilience. In addition, longitudinal qualitative research is needed to understand how coastal communities adapt to ecological and institutional change over time.

Overall, the findings show that reconstructing coastal zone management requires a shift from program-based management to relationship-based governance. Coastal management should not only regulate space and protect ecosystems. It should also strengthen local knowledge, secure livelihoods, expand meaningful participation, manage conflict fairly, and build adaptive institutional coordination. This approach can support more inclusive, context-based, and sustainable coastal governance in Kalianda District.

4. Conclusions

This study concludes that coastal zone management in Kalianda District is shaped by the interaction between ecological change, livelihood vulnerability, local ecological knowledge, community participation, spatial conflict, and institutional coordination. Shoreline erosion, declining fish catches, coastal waste, and pressure on mangrove ecosystems do not only create environmental problems. They also affect household income, women's economic roles, fishing access, local adaptation practices, and the social meaning of coastal space. The findings show that coastal communities respond to these pressures through daily observation, inherited knowledge, social networks, and practical adaptation strategies. This confirms that coastal resilience cannot rely only on technical regulation or short-term environmental programs. It must be built from the lived experiences, knowledge, and participation of local actors.

The study contributes to social-ecological systems theory by showing that coastal governance should connect ecological protection with livelihood security, local agency, and institutional learning. Practically, the findings suggest that coastal management should strengthen village-based coastal forums, participatory mapping, protection of small-scale fishing access, long-term mangrove maintenance, community-based monitoring, and cross-sector coordination among village governments, district agencies, environmental groups, tourism actors, and local residents. From a policy perspective, coastal programs should move beyond project-based activities and support shared responsibility, fair benefit distribution, and adaptive decision-making. Future research should compare coastal communities across different regions, examine gendered adaptation in coastal livelihoods, and use longitudinal qualitative designs to understand how communities respond to ecological and institutional change over time.

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