p-ISSN: 2088-8449
e-ISSN: 2527-4805

Socioeconomic Conditions and Cooperative Capacity in Shaping Mangrove Carbon Governance in Coastal Indonesia

***Muhammad Helmi Falah[1], Fety Widianti Aptasari[2], dan Cawalinya L. Hasyim[1]**

[1]Politeknik Perikanan Negeri Tual
Jl. Raya Langgur Sathean No.Km. 6, Langgur, Kabupaten Maluku Tenggara, Maluku, Indonesia

[2]Universitas Mataram
Jl. Majapahit No.62, Gomong, Kec. Selaparang, Kota Mataram, Nusa Tenggara Barat, Indonesia

ARTICLE INFO

Date submitted : 7 Juni 2026
Articel revision : 24 September 2026
Accepted Articel : 3 November 2026

*Author correspondence:
Email: mhelmi.falah@polikant.ac.id

DOI: http://dx.doi.org/10.15578/jsekp.v21i2.19932

ABSTRAK

Mangrove ecosystems play an important role in climate change mitigation due to their high carbon sequestration potential while also supporting the livelihoods of coastal communities. However, the participation of small-scale fishing communities in mangrove-based carbon incentive programs remains limited due to socioeconomic constraints and weak institutional capacity. This study examines how socioeconomic conditions shape community participation in mangrove conservation and carbon incentive initiatives, explores the role of fishermen's cooperatives in supporting mangrove carbon governance, and investigates how cooperative institutions connect socioeconomic conditions with local governance outcomes. A qualitative case study was conducted in coastal communities in West Nusa Tenggara Province, Indonesia, using in-depth interviews, field observations, and secondary data. The data were analyzed using thematic analysis. The findings indicate that socioeconomic constraints, including low educational attainment, unstable incomes, limited access to financial resources, and patron–client relationships, constrain community engagement in long-term environmental programs. In contrast, strong social cohesion supports collective action in mangrove management. The findings also show that fishermen's cooperatives have considerable potential to function as intermediary institutions in mangrove carbon governance, although their capacity is constrained by limited managerial skills, weak technical knowledge, and inadequate institutional readiness. Cooperative capacity appears to facilitate community engagement by strengthening coordination, access to information, and collective action. Strengthening fishermen's cooperatives is therefore important for connecting coastal communities with emerging carbon incentive mechanisms and supporting more inclusive and sustainable blue carbon governance.

Keyword: blue carbon; mangroves; cooperative capacity; fisheries governance; socioeconomic conditions

INTRODUCTION

The ecosystem on the coast of Indonesia has role crucial in mitigation change global climate through capacity storage carbon very high blue. In 2021, Indonesia had around 3.63 million hectares mangrove forests, which represent more from 20 percent of the total area mangrove forests in the world (KLHK, 2023). Ecosystem This capable store and absorb carbon with rate three up to five times more tall than Lots forest tropical (Fitria & Dwiyanoto, 2021). The economic potential of carbon credits offers new opportunities to fund environmental conservation while improving the well-being of coastal communities. However, in the complex landscape of carbon governance, small-scale fishers are often isolated from the benefit chain due to capacity, literacy, and structural constraints. Therefore, the successful implementation of blue carbon governance at the grassroots level requires the presence of strong local intermediary institutions, such as fishing cooperatives, to act as intermediaries, organizing community collaboration capacity and collectively managing carbon initiatives from the outset.

To date, carbon incentive schemes and global carbon market mechanisms have tended to develop using a mechanistic, top-down approach, as if providing financing alone is sufficient to address forest degradation. The Paris Agreement has indeed encouraged countries to develop low-emission mitigation strategies and financial mechanisms that value environmental conservation (Maruf & Putera, 2022). However, this economy-centric approach ignores fundamental challenges at the grassroots level: the lack of local institutional arrangements capable of organizing collective action among economically vulnerable fishers. Without local institutions such as fishing cooperatives that actively develop rules, educate members, and lower institutional transaction costs, mangrove carbon protection initiatives at the community level will easily collapse due to conflicts over short-term subsistence interests.

In fact, in addition to their carbon sequestration capacity, mangrove forests provide crucial ecosystem services as fishery spawning grounds, shoreline protection from erosion, and

support for local livelihoods (Horn et al., 2025). Unfortunately, these ecosystems continue to experience severe degradation due to uncontrolled land conversion for fish ponds and mass tourism (CNN Indonesia, 2022). Policy interventions often rush to offer market incentive schemes as a quick fix to curb the rate of land conversion. This approach overlooks the root of the problem, which lies in the failure of local institutional governance to stem the exploitation of open access. Without strong community institutional arrangements, mangrove areas are treated as ownerless public goods (res nullius) freely exploited for short-term gain. When formal central government regulations fail to address the daily dynamics of coastal areas, a tragedy of the commons is inevitable. The solution cannot be achieved simply by injecting funds; it must begin with restoring local institutional governance to limit this open access.

The socioeconomic conditions of fishing communities further complicate these governance challenges. Small-scale fishers remain one of the most economically vulnerable groups in Indonesia, with approximately two million contributing significantly to national poverty statistics (KNTI, 2020; Wasiaturrahma et al., 2020). However, these socioeconomic conditions encompass dimensions far broader than simply unstable monthly incomes and low levels of education. Their vulnerability is exacerbated by low levels of formal financial inclusion and minimal diversification of alternative livelihoods beyond direct exploitation of coastal resources. Limited access to market information and weak participation in formal institutions also erode their social capital and adaptive capacity to ecological change and climate regulation. Consequently, communities living below the poverty line have limited knowledge of carbon markets, which limits their ability to effectively participate in environmental incentive mechanisms (Hernanz et al., 2025). These multidimensional factors force fishers to make regressive decisions for immediate income, even at the expense of mangrove sustainability.

West Nusa Tenggara (NTB) Province provides a relevant context for examining the interplay of these dimensions. While the province boasts extensive coastal resources and substantial mangrove ecosystems, its coastal communities continue to face economic vulnerability, high dependence on nature, and coastal development pressures. Recent studies have shown that the effectiveness of carbon incentive schemes is strongly influenced by public awareness, governance transparency, and equitable benefit distribution (Hernanz et al., 2025). Furthermore, reviews of forest carbon governance in Southeast Asia continue to identify issues of institutional fragmentation, inequitable benefit sharing, weak local participation, and elite capture (Lau et al., 2025). The complexities of NTB make it an important case study for understanding how local institutional capacity can organize collective action, reduce transaction costs, and ensure equitable benefit distribution (Horn et al., 2025).

In this context, fishermen's cooperatives may function as bridging intermediaries that connect coastal communities with carbon incentive initiatives (Lau et al., 2025). Cooperatives can strengthen collective bargaining power, coordinate conservation activities, and facilitate information exchange. Previous studies on the carbon economy have largely focused on technical-economic approaches, carbon accounting, and macro-policy perspectives on emissions systems (Lohmann, 2009; Corbera & Jover, 2012; Lovell, 2013; Asiyanbi & Lund, 2020). However, attention to the role of fishermen's organizations and cooperative capacity in poverty-reduction-oriented coastal carbon schemes remains limited in Indonesia. This study addresses this gap by examining how socioeconomic conditions and cooperative capacity interact in shaping community participation and mangrove carbon governance. Specifically, this study aims to: (1) analyze the socioeconomic and institutional conditions shaping community participation; (2) identify opportunities and challenges for fishermen's cooperatives; and (3) formulate institutional strategies to strengthen cooperatives as an institutional mechanism for developing inclusive and sustainable mangrove carbon incentives.

RESEARCH METHODS

This study used a qualitative case-study approach to examine the potential role of fishermen's cooperatives as institutional mechanisms for supporting mangrove-based carbon incentive governance in coastal communities. The qualitative approach was selected to explore socioeconomic conditions, institutional dynamics, and stakeholder perceptions related to mangrove conservation, cooperative development, and carbon incentive programs.

Research Location

The Study This done in the community fisherman coast selected in West Nusa Tenggara Province (NTB), Indonesia. NTB Province was selected in a way intentionally (purposive) because own characteristics unique spatial, ecological, and

p-ISSN: 2088-8449
e-ISSN: 2527-4805

institutional conditions, which make it studies ideal case for researching governance mangrove carbon through strengthening capacity cooperative fisherman.

The justification for selecting the research location in NTB Province is based on the main pillars that are in line with the objectives of this research:

1. Mangrove Distribution and Blue Carbon Potential: Indonesia holds significant potential due to its extensive coastal forest ecosystems, with mangrove forests being among the most important blue carbon ecosystems in the world (KLHK, 2023). These ecosystems are capable of storing and sequestering carbon at rates three to five times higher than many terrestrial tropical forests (Fitria & Dwiyanoto, 2021). Regionally, West Nusa Tenggara Province boasts significant mangrove ecosystem distribution on both Lombok and Sumbawa Islands, making it a crucial area for implementing climate mitigation.
2. Governance Challenges at the Site Level: In addition to their carbon sequestration capacity, mangrove forests in the study area provide essential ecosystem services to support biodiversity conservation and sustain local livelihoods (Horn et al., 2025). However, the mangrove ecosystem in the NTB coast continues to face the threat of severe degradation due to uncontrolled land conversion for fishponds and mass tourism (CNN Indonesia, 2022). This dynamic has triggered conflicts over open access that formal government regulations have failed to contain, thus urging the urgent restoration of local institutional governance.
3. Multidimensional Socioeconomic Context: Coastal communities in NTB reflect the characteristics of small-scale fishers in Indonesia, who are among the most economically vulnerable groups, with unstable incomes, low levels of education, and dependence on seasonal marine resources (KNTI, 2020; Wasiaturrahma et al., 2020). These multidimensional vulnerabilities (including low financial inclusion and minimal livelihood diversification) limit their knowledge of carbon markets, thereby reducing their ability to participate effectively in environmental incentive mechanisms (Hernanz et al., 2025).
4. Development of Fishermen's Cooperatives: This region has a strong institutional base for fishermen in the form of cooperatives, which are being encouraged to act as bridging intermediaries to connect coastal communities with government systems and broader carbon policy networks (Lau et al., 2025). Effective participation in environmental incentive programs requires institutional arrangements capable of organizing collective action, reducing transaction costs, and ensuring equitable distribution of benefits (Horn et al., 2025). The presence of cooperatives in NTB provides an empirical basis for analyzing the strengthening of such collaborative capacity at the local level.

To provide a broader socioeconomic context for the study, Figure 1 presents the distribution of priority districts and cities for the acceleration of extreme poverty eradication in Indonesia in 2022, including the location of West Nusa Tenggara Province. The figure is used to illustrate the socioeconomic context underlying the selection of the study area.

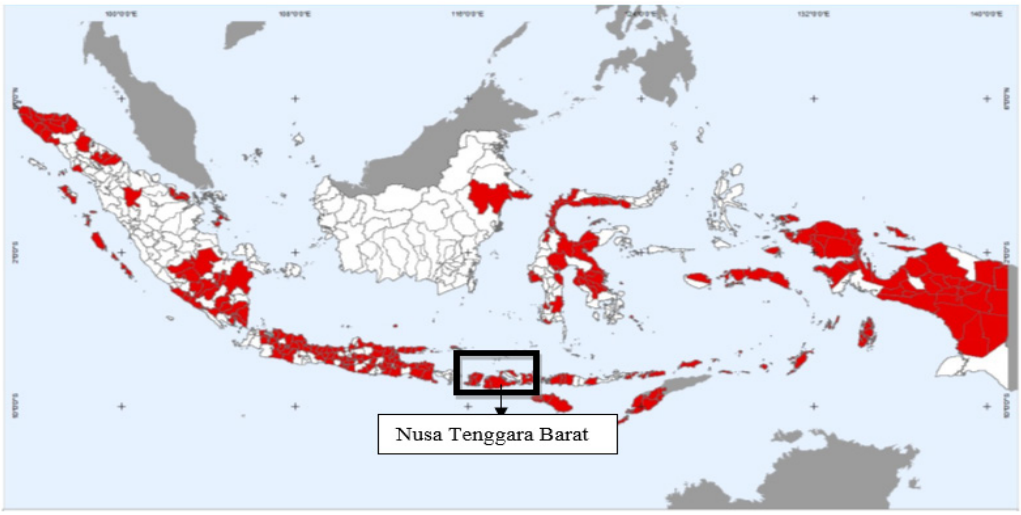


Figure 1. Distribution of Priority Districts and Cities For the Acceleration of Extreme Poverty Eradication in Indonesia, 2022.
Source: TNP2K (2022).

Data Collection

Data were collected through in-depth interviews, field observations, and secondary data review

In-depth Interviews

Purposive sampling was used to select informants with direct knowledge and experience related to fisheries livelihoods, cooperative management, coastal resource governance, community development, and environmental conservation. A total of 16 key informants participated in this study, consisting of seven fishermen (F1–F7), two community leaders (CL1–CL2), two cooperative managers (CM1–CM2), one non-governmental organization representative (NGO1), two cooperative office heads (HD1–HD2), one government regulator (R1), and one fisheries and cooperative policy stakeholder (R2).

The selection of 16 informants was based on the criteria of governance representativeness, not statistical population representation. Representation was measured by the actors' direct involvement, authority, and multi-layered understanding of the mangrove carbon ecosystem and the fishermen's cooperative institutions at the study site. The distribution of the 16 informants was deliberately designed proportionally to capture perspectives from three main actor levels: the grassroots level (fishermen and community leaders), intermediary institutions (cooperative managers and cooperative office heads), and the policy and technical level (NGOs, regulators, and policy stakeholders).

Semi-structured interviews were conducted using an interview guide that allowed flexibility to explore emerging issues while maintaining consistency across informants. Interviews focused on four main themes: (1) the socioeconomic conditions of fishing households, (2) community participation in mangrove conservation, (3) the institutional capacity of fishing cooperatives, and (4) opportunities and challenges associated with mangrove-based carbon incentive programs. Data adequacy in this study was measured by achieving data saturation (thematic saturation), at which point the data collection process was stopped because additional in-depth interviews with these actors had become repetitive and no longer yielded substantial new information or themes. Through this composition, the 16 selected informants provided a rich and in-depth variety of perspectives to fully and validly analyze institutional mechanisms.

Field Observation

Field observations were conducted to complement and verify the information obtained through interviews. Observations focused on the condition of the mangrove ecosystem, community economic activities, cooperative operations, resource utilization practices, and local institutional arrangements. Observational data was used to provide contextual understanding and support data triangulation

Secondary Data

Secondary data was collected from government reports, fisheries statistics, poverty reports, policy documents, cooperative development reports, scientific publications, and previous studies related to mangrove governance, blue carbon initiatives, fisheries development, and coastal community empowerment. This data was used to support the interpretation of the primary findings and provide broader contextual information.

Data Analysis

The data were analyzed using thematic analysis with a hybrid approach that combines deductive and inductive reasoning. Interview transcripts, observation notes, and secondary documents were reviewed repeatedly to gain a deeper understanding of the data. The data were then coded and organized into themes aligned with the research objectives.

This analysis is carried out in five systematic stages as follows:

1. Data Familiarization: The researcher thoroughly reread all interview transcripts and field notes to build familiarity with the raw data.
2. Initial Coding: The coding process was guided deductively by the conceptual framework. This means that the initial codes did not start from scratch, but rather used the main concepts in the analytical framework as category anchors, namely multidimensional socioeconomic conditions, cooperative institutional capacity, and the effectiveness of mangrove carbon governance.
3. Theme Development: The initial set of codes was grouped into broad themes. At this stage, the researcher also worked inductively, allowing for new themes that emerged unexpectedly from informants' accounts in the field (such as terminology barriers to fishermen's carbon literacy) that were not yet accommodated within the standard theoretical framework.

p-ISSN: 2088-8449
e-ISSN: 2527-4805

4. Review and Refinement of Themes: The identified themes were re-examined to ensure their suitability with the raw data and research objectives.
5. Interpretation of Findings: In this final stage, the conceptual framework serves as a compass to ensure the analysis is relational and explanatory. Each theme is systematically linked to explain the relationship between socioeconomic vulnerability, the internal dynamics of cooperatives, and mangrove carbon governance. The analysis focuses on how socioeconomic conditions influence the capacity of fishing cooperatives and how this capacity supports collective action and the strengthening of effective mangrove carbon governance at the grassroots level.

To enhance credibility, triangulation was applied by comparing data across informant groups, field observations, and secondary sources. These themes were interpreted using relevant theories on collective action, common-pool resource governance, community-based conservation, cooperative development, and blue carbon governance.

Research Objectives and Analytical Framework

This study aims to:

1. Analyze the multidimensional socio-economic conditions of fishing communities that influence participation in mangrove conservation and carbon incentive programs;
2. Examine the institutional capacity of fishermen's cooperatives in supporting mangrove-based carbon initiatives; and
3. Formulate institutional policies and strategies to optimize mangrove carbon incentives through fishermen's cooperatives to support sustainable coastal development and poverty reduction.

Based on the relational conceptual framework developed, this study does not employ a linear quantitative causal model. Instead, it adopts a process tracing and explanation-building approach to qualitatively examine the relationships and institutional pathways through which socioeconomic conditions appear to shape mangrove carbon governance. This analytical framework positions the capacity of fishing cooperatives as an institutional mechanism and bridging intermediary that connects socioeconomic conditions with mangrove carbon governance through three related institutional process streams

Thus, the model can be summarized as follows:

1. Socio-economic conditions → Cooperation capacity
2. Cooperation capacity → Mangrove carbon governance
3. Socio-economic conditions → Mangrove carbon governance

This model guides thematic analysis by structuring empirical findings according to these relational dimensions.

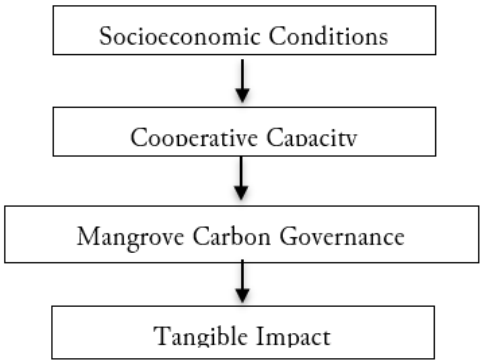


Figure 2. Socioeconomic–Institutional Pathway Model for Mangrove Carbon Governance.

RESULTS AND DISCUSSIONS

The research results are presented based on three research objectives: (1) examining the socio-economic conditions that influence community participation in mangrove-based carbon initiatives; (2) analyzing the institutional capacity of fishermen's cooperatives in supporting mangrove governance and carbon incentive programs; and (3) formulating policy strategies to strengthen fishermen's cooperatives as intermediary institutions in developing a mangrove-based carbon economy

Socioeconomic and Environmental Characteristics of the Study Area

West Nusa Tenggara (NTB) Province is one of Indonesia's most important coastal regions, boasting abundant fisheries resources and mangrove ecosystems that support local livelihoods. The province boasts extensive coastal and marine areas, where capture fisheries are a major source of employment and income for coastal households. However, several coastal districts continue to experience poverty rates above the national average, indicating persistent socioeconomic vulnerability among fishing communities. Dependence on seasonal fishing activities, limited access to capital, market uncertainty, and climate variability

contribute to livelihood insecurity and impact community participation in long-term environmental programs.

From an environmental perspective, mangrove ecosystems in several coastal areas of West Nusa Tenggara (NTB) continue to face pressures from land conversion, tourism development, residential expansion, and unsustainable resource utilization. These pressures threaten the ecological functions of mangrove forests, including coastal protection, biodiversity conservation, and carbon sequestration. Therefore, NTB provides a relevant setting for examining the relationship between community well-being, cooperative development, mangrove conservation, and carbon incentive governance.

Socioeconomic Conditions, Mangrove Governance, and Carbon Incentive Opportunities

The findings suggest that socioeconomic conditions shaped community participation in mangrove conservation and carbon incentive initiatives. Interviews with fishers (F1–F7) revealed that most respondents had relatively low levels of education, which limited their access to information related to environmental governance, carbon markets, and alternative livelihood opportunities.

This lack of formal education was closely associated with limited understanding of abstract concepts such as 'carbon trading,' 'carbon credits,' or 'global climate mitigation.' While secondary literature often concludes these relationships theoretically (e.g., Hernanz et al., 2025), empirical evidence in the field suggests that these limitations are not due to fishermen's reluctance to learn, but rather because these technical terms are too unfamiliar to their daily lives, as they generally only have a basic education.

This cognitive barrier is clearly reflected in a statement by one of the traditional fishermen at the research site: "I don't know what 'carbon' is. When it comes to planting mangroves to hold back waves or for crabs to lay eggs, we all understand and do it often. But if you say planting these trees can make money out of thin air, we don't understand where the money comes from." (Interview with F3, Traditional Fisherman, NTB, 2024). This statement demonstrates that although fishermen possess strong local ecological knowledge about the physical functions of mangroves, they experience a carbon literacy deficit due to academic terminology constraints.

This lack of information ultimately forces communities to prioritize short-term livelihood strategies that generate immediate income, rather than participating in long-term conservation activities. This pattern is consistent with national evidence showing that the majority of small-scale fishers in Indonesia have only a junior high school education or less (Mongabay, 2023). It also aligns with previous research that found that low awareness of carbon credit mechanisms among

Table 1. Characteristics of Key Informants.

Informant Code	Category	Main Occupation/Position	Interview Purpose
F1–F7	Fishermen	Capture Fisheries	Livelihood conditions, mangrove utilization, cooperative participation, and awareness of carbon incentive programs
CL1–CL2	Community Leaders	Community Representatives	Local social conditions, collective action, and community perspectives on mangrove conservation
CM1–CM2	Cooperative Managers	Fishermen's Cooperative Management	Cooperative performance, institutional capacity, and challenges in carbon governance
NGO1	NGO Representative	Coastal and Environmental Program Manager	Community empowerment, mangrove conservation, and carbon incentive implementation
HD1–HD2	Heads of Cooperative Offices	Cooperative Development Officials	Cooperative development policies, institutional strengthening, and support mechanisms
R1	Government Regulator	Fisheries and Coastal Governance Regulator	Regulatory framework, carbon governance, and environmental policy implementation
R2	Fisheries and Cooperative Policy Stakeholder	Fisheries and Cooperative Policy Expert/Stakeholder	Policy recommendations, financing mechanisms, and carbon incentive allocation strategies

p-ISSN: 2088-8449
e-ISSN: 2527-4805

economically vulnerable communities significantly limits participation and weakens the effectiveness of carbon credit programs (Hernanz et al., 2025).

Social cohesion emerged as a crucial factor supporting collective action. Informants reported that ease of initial coordination was generally found in long-established coastal communities characterized by strong social trust, shared cultural values, and relatively homogeneous social structures. According to HD1, traditions such as collective ceremonies, mutual aid, and customary practices strengthened initial cooperation among community members. These findings support previous studies emphasizing the importance of local knowledge and social capital in coastal resource governance (Queiroz et al., 2014; Taherong et al., 2023; Mikulecký et al., 2023; Thurber et al., 2022).

However, this relationship is not deterministic, as social homogeneity does not automatically guarantee cooperative success. Field data shows that the sustainability of cooperative institutional performance in managing carbon incentives is much more dependent on leadership integrity, transparent internal governance, and external support in the form of policy guidance and market integration.

In contrast, communities experiencing rapid migration and increasing social diversity often face greater challenges in organizing collective action. Informants noted that cultural heterogeneity, informal land occupations, and competing resource claims can increase the likelihood of conflict and weaken community coordination. Similar observations have been reported by Sairiltiata (2023), Ashmarita (2020), and Maksum et al. (2022), who highlight the relationship between social diversity, potential conflict, and collective resource management.

Further findings indicate that socioeconomic pressures contribute to mangrove forest degradation. Informant CM2 explained that mangrove forest conversion often occurs when short-term economic interests are prioritized over conservation considerations. Based on in-depth interviews with cooperative administrators and corroborated by field observations in coastal areas, mangrove ecosystems tend to be better maintained in communities characterized by strong social cohesion and effective collective management. Conversely, informant perceptions and visual observations in the field confirm that degradation is more frequently observed in areas experiencing rapid economic expansion and the increasing influence of large-scale investors who unilaterally acquire land for corporate businesses without involving local institutions.

This observation reflects the broader characteristics of coastal resources as open-access systems, where weak governance can encourage overexploitation and unsustainable resource use (Kristian, 2019; Kurniawan, 2020). Similar findings have been reported by Prasetyo (2019) and Sanjatmiko (2018), who argue that open-access conditions often encourage resource extraction driven by short-term economic interests. Consequently, ecosystem degradation can reduce ecological resilience and undermine long-term livelihood security (Haghshenas et al., 2021; Zhang, 2021).

Another important finding relates to the sustainability of patron-client relationships. According to CM2, investor-supported land conversion and unequal access to capital often increase fishers' dependence on local patrons. Such relationships may provide temporary economic support but often reinforce structural poverty and reduce community bargaining power (Geofrey & Kungu, 2020; Adawiyah et al., 2021; Pinem et al., 2019).

Despite these socioeconomic constraints, informants (F1–F7; CL1–CL2) expressed strong interest in mangrove-based carbon incentive programs. Interview findings indicate that carbon incentives are viewed as an opportunity to diversify household incomes while strengthening incentives for mangrove conservation. This potential is closely linked to the capacity of mangrove ecosystems to sequester and store carbon, which is increasingly recognized as a critical component of global decarbonization pathways and a form of negative emissions technology (Wedding et al., 2021).

However, realizing these benefits requires supportive institutional arrangements. Informants (CM1–CM2; NGO1) emphasized the importance of strong community institutions, transparent and equitable benefit-sharing mechanisms, and effective cooperative organizations to facilitate access to information, coordinate conservation activities, reduce transaction costs, and connect local communities to emerging carbon economy opportunities. Without adequate institutional support, the benefits of carbon incentive schemes may not be distributed equitably, thus limiting conservation outcomes and improving community well-being.

Current Condition of Cooperatives

Most existing fishing cooperatives were established primarily to meet economic needs, specifically savings and loan services, collective

marketing of fish catches, and access to production inputs. Informant CL1 explained that environmental conservation was rarely the primary motivation behind cooperative formation. As a result, cooperative activities generally remained focused on short-term economic goals rather than broader sustainability objectives.

These findings indicate that the institutional capacity of fishermen's cooperatives remains relatively weak. In this qualitative study, institutional capacity was assessed across three main dimensions: (1) administrative and managerial capacity, including the conduct of annual membership meetings, board management certification, and clarity of the articles of association and bylaws (AD/ART); (2) financial and networking capacity; and (3) environmental governance capacity. Cooperatives were categorized as having "weak" institutional capacity based on evidence from interviews and document review. This assessment was supported by several institutional limitations, including frequently delayed annual membership meetings, manual and unaudited financial records, managers without management expertise certification, and the absence of local written rules governing mangrove utilization.

These capacity limitations were further analyzed using the Institutional Analysis and Development Framework presented in Figure 3. The model presented in *Understanding Institutional Diversity* (Ostrom, 2005) is derived from: (a) the concept of the action arena; and (b) the institutional analysis framework. According to informant CM1, the energy of cooperative organizations is currently depleted in the action arena to maintain the liquidity of members' daily businesses. As a result, most cooperatives in the study locations are only able to carry out basic economic roles, such as providing working capital and accommodating catches, but have limited capacity to implement Principle 7 of the ICA (*Concern for Community*).

These institutional constraints highlight the need for strategies that strengthen cooperative capacity and improve access to institutional, financial, and technical support. Such support is important to enable fishermen's cooperatives to facilitate community participation and contribute to more inclusive mangrove-based carbon governance.

Weakness institutional This the more confirmed when analyzed use approach exogenous and rules of the game in Ostrom's framework (2005). Cooperatives fisherman Not yet capable formulate clear group boundary rules for determine who is entitled utilizing mangroves, as well as not yet own mechanism monitoring sanctioned for offender rule environment. As a result, although cooperative own legitimacy social as receptacle action collective,

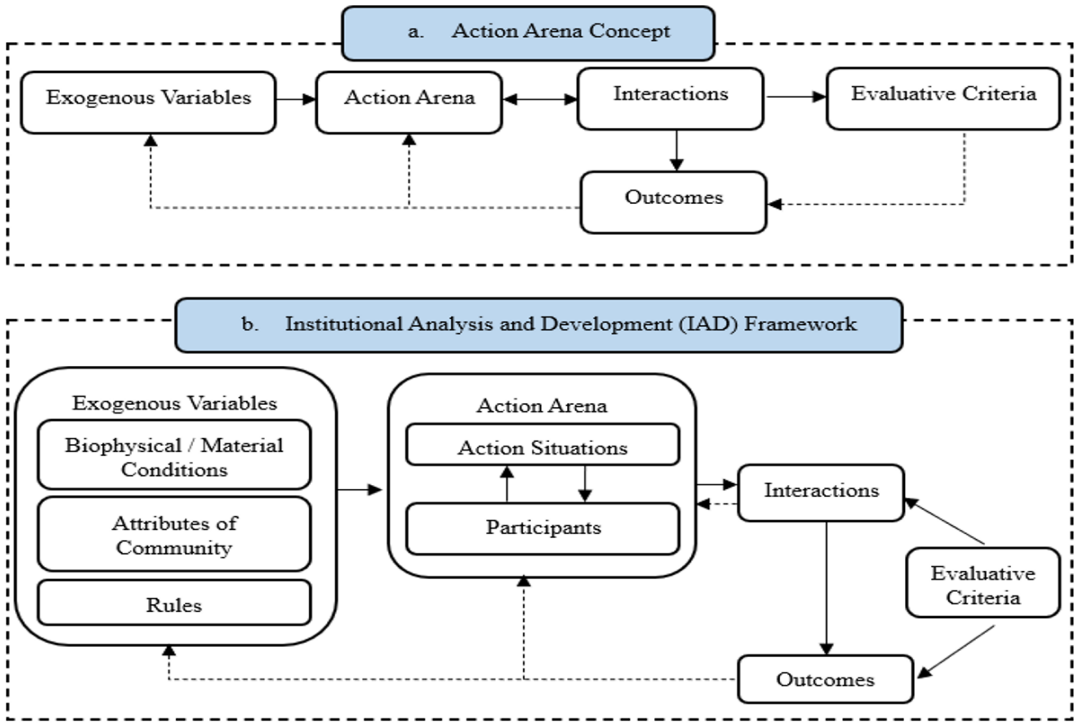


Figure 3. Institutional Analysis Models Based on the Action Arena Concept and the Institutional Analysis and Development (IAD) Framework.
Source: Adapted from Ostrom (2005).

p-ISSN: 2088-8449
e-ISSN: 2527-4805

involvement real they in governance environment, conservation source power and initiative related incentive carbon still very limited consequence absence design institutional solid local.

Several factors limit the development of cooperatives. Internally, limited managerial skills, low education levels among members, inadequate financial resources, and weak organizational governance limit the ability of cooperatives to expand their functions beyond basic economic activities. Externally, cooperatives face regulatory uncertainty, limited technical assistance, competition from private actors, and limited access to financing mechanisms that can support conservation-based businesses.

Previous research has shown that income levels significantly influence awareness of carbon credit mechanisms, indicating that economically vulnerable communities often have limited access to environmental information and participation opportunities (Hernanz et al., 2025). This finding is consistent with observations from this study, where institutional constraints emerged as a major barrier to participation in mangrove carbon incentive programs. Informant R1 emphasized that most fishing cooperatives currently lack the technical capacity, legal readiness, and administrative systems necessary to effectively engage in carbon economy initiatives.

These limitations are further exacerbated by regulatory arrangements that are still poorly integrated with fisheries and cooperative development policies. Similar governance challenges have been documented across Southeast Asia, where institutional fragmentation and weak cross-sectoral coordination often limit the implementation of carbon governance programs (Lau et al., 2025). Furthermore, blue carbon initiatives often prioritize technical carbon accounting and scientific monitoring while paying less attention to local livelihoods, which can undermine community engagement and program effectiveness (Song et al., 2021).

Another concern highlighted by informant R1 relates to the emergence of informal and unregulated carbon transactions involving mangrove resources. These practices can reduce potential benefits for local communities and limit public oversight of carbon-related activities. This finding underscores the importance of strengthening cooperative institutions as transparent intermediary organizations capable of ensuring equitable benefit sharing and community participation in future carbon incentive schemes.

Overall, the findings suggest that fishing cooperatives have considerable potential to support mangrove-based carbon governance; however, substantial institutional strengthening is needed before they can function effectively as intermediaries connecting coastal communities to emerging carbon economy opportunities.

cooperatives remain limited in both number and institutional capacity. Although approximately 13 percent of villages in Indonesia are categorized as fishing villages, fishermen's cooperatives account for only around 0.2 percent of all cooperatives nationwide (KKP, 2022a; DPRRI, 2018). Field observations indicate that active cooperatives are more commonly found in older coastal communities characterized by relatively homogeneous social structures and stronger traditions of collective action.

Most existing fishermen's cooperatives were established primarily to address economic needs, particularly savings and loan services, collective marketing of fish catches, and access to production inputs. Informant CL1 explained that environmental conservation is rarely the primary motivation behind cooperative formation. As a result, cooperative activities generally remain focused on short-term economic objectives rather than broader sustainability goals.

Policy and Financing Strategies for Mangrove-Based Carbon Incentives

The findings suggest that developing a mangrove-based carbon incentive program requires integrated policy interventions that address the socioeconomic constraints and institutional limitations faced by fishing communities. Informants (CM1–CM2; NGO1) highlighted that many coastal development initiatives continue to rely on top-down approaches that inadequately incorporate local aspirations and community participation, thus reducing program effectiveness (Hermes, 2017). Consequently, efforts to strengthen fishing cooperatives must be supported by adaptive and participatory policies that are responsive to local needs and conditions.

This recommendation aligns with previous research showing that local communities are often treated as instruments to achieve project objectives, rather than as equal partners in governance and decision-making processes (Song et al., 2021). Therefore, greater community involvement in planning, implementation, and benefit-sharing mechanisms is crucial to enhancing the effectiveness

and legitimacy of mangrove-based carbon governance initiatives.

One of the most critical challenges identified is limited access to financing. Informant R1 explained that existing financing schemes, including the People's Business Credit (KUR) program, do not adequately accommodate the characteristics of small-scale fishers. Financial institutions often consider capture fisheries a high-risk sector due to income uncertainty and limited collateral availability (Sumantika & Ardiyanto, 2018). As a result, banks tend to be reluctant to provide credit to fishermen due to concerns about their ability to repay (Valentina, 2018; Masyhuri, 2017).

This situation is reflected in national financing data, which shows that the fisheries sector receives only 0.41 percent of the total productive credit distributed in Indonesia, one of the lowest proportions among major economic sectors (Otoritas Jasa Keuangan, 2023). This finding highlights the need for financing mechanisms specifically designed for fishing communities and cooperative-based businesses. Similar concerns have been highlighted by Bruchac (2014), who argues that coastal communities often lack adequate resources to address socioeconomic and environmental challenges.

Another important issue identified by informants relates to the distribution of carbon incentive benefits. Informants NGO1 and R2 emphasized that community participation in mangrove conservation is strongly influenced by perceptions of fairness in benefit-sharing arrangements. When carbon incentive schemes provide limited or unequal benefits, community commitment to conservation activities can decline, increasing the potential for social conflict and weakening collective participation.

Conversely, transparent and equitable benefit-sharing mechanisms can strengthen trust, support collective action, and encourage long-term engagement in conservation programs. This finding is consistent with previous research showing that inequitable distribution of carbon benefits can reduce community motivation and ultimately undermine the effectiveness of environmental service programs (Hernanz et al., 2025). Therefore, ensuring fairness and transparency in benefit allocation is crucial for maintaining community participation and achieving the goals of mangrove-based carbon governance.

Evidence from Indonesia's Forest Carbon Partnership Facility (FCPF) program in East Kalimantan illustrates the importance of benefit-sharing mechanisms. Under the proposed allocation framework, a portion of carbon incentives is directed to villages and indigenous communities that contribute to maintaining forest cover, while the remaining allocation is used for operational and performance-based activities (KLHK, 2023). While the implementation contexts differ, this example demonstrates the importance of designing carbon incentive schemes that deliver tangible benefits to local communities while maintaining accountability and environmental performance.

Overall, the findings suggest that an effective mangrove-based carbon incentive program requires three interrelated policy priorities: (1) the development of fisheries-specific financing mechanisms; (2) transparent and equitable carbon benefit-sharing arrangements; and (3) a stronger institutional role for fishers' cooperatives as intermediary organizations connecting coastal communities with carbon governance initiatives. Strengthening these components can increase community participation, improve mangrove conservation outcomes, and support sustainable coastal development.

Mangrove-Based Livelihood Opportunities and Sustainable Development

Interview findings indicate that mangrove ecosystems provide opportunities to diversify coastal livelihoods beyond capture fisheries. This is particularly important because fishing incomes are often uncertain and highly dependent on weather conditions and resource availability (Nainggolan, 2021; Rahim et al., 2018). According to informant HD2, several assisted communities have generated additional income from mangrove-based economic activities, including mangrove honey production, crab cultivation, and the processing of mangrove fruits such as *Sonneratia caseolaris* into food products. These activities demonstrate that mangrove conservation can generate direct economic benefits while supporting ecosystem protection.

Informant HD2 further emphasized that mangrove rehabilitation programs should consider species suitability and ecological functions. Inappropriate species selection may reduce conservation effectiveness and limit the economic benefits that local communities can obtain from mangrove ecosystems.

Beyond direct products, mangrove ecosystems also create opportunities for ecotourism development. Coastal landscapes characterized by mangroves, coral reefs, seagrass ecosystems, and local cultural attractions represent important

p-ISSN: 2088-8449
e-ISSN: 2527-4805

assets for sustainable tourism development (Pineda et al., 2023). Ecotourism can contribute to local economic growth while simultaneously supporting conservation objectives (Mäntymaa et al., 2018; Kurniawan et al., 2023; Montemayor et al., 2019). However, sustainable tourism development requires effective spatial planning and management to prevent environmental degradation and maintain ecosystem functions (Pineda et al., 2023).

The findings suggest that mangrove ecosystems should be viewed not only as carbon assets but also as productive resources capable of generating sustainable livelihood opportunities. Integrating mangrove conservation, carbon incentives, and community-based economic activities may strengthen both environmental sustainability and community welfare.

Institutional Support and Cooperative Assistance

The findings also highlight the importance of institutional support in strengthening fishermen's cooperatives. Informant HD2 emphasized that closer collaboration between fisheries agencies and village development institutions could improve the effectiveness of cooperative development programs in coastal communities. In particular, increasing the availability and capacity of village facilitators is considered essential for providing technical assistance, organizational mentoring, and community empowerment support. This observation is consistent with previous studies that emphasize the important role of local community leaders and facilitators in disseminating environmental information and encouraging participation in carbon-related programs (Hernanz et al., 2025).

However, the effectiveness of cooperative development is also shaped by local social structures. Informant R1 explained that cooperative governance in coastal communities is often influenced by patron–client relationships and hierarchical decision-making patterns that characterize local social systems (Tanjung, 2023). Such conditions may restrict broader community participation and weaken democratic governance within cooperatives. Similar findings were reported by Suarjaya (2021), who observed that decision-making processes in some rural communities tend to be dominated by a limited number of influential actors. These governance challenges suggest that strengthening fishermen's cooperatives requires not only technical and institutional support but also efforts to promote more inclusive and participatory decision-making processes

Therefore, strengthening fishermen's cooperatives requires not only financial support but also continuous institutional mentoring, leadership development, and community facilitation. Improved assistance mechanisms can help cooperatives enhance organizational capacity, strengthen collective action, and participate more effectively in mangrove-based carbon governance initiatives.

CONCLUSIONS AND POLICY RECOMMENDATION

Conclusion

This study examined the relationship between socioeconomic conditions, cooperative capacity, and mangrove-based carbon governance in coastal communities in West Nusa Tenggara, Indonesia. The findings suggest that socioeconomic conditions shape community participation in mangrove conservation and carbon incentive programs. Low educational attainment, income insecurity, limited access to formal financial services, and patron–client relationships constrain long-term engagement, while strong social cohesion supports collective action. Fishermen's cooperatives may function as intermediary institutions that strengthen coordination, information access, and collective action in mangrove carbon governance. However, their capacity remains constrained by limited managerial skills, weak technical understanding of carbon mechanisms, and inadequate access to financial and regulatory support. Strengthening cooperative capacity may therefore support more inclusive and sustainable blue carbon governance.

This study contributes to the literature on common-pool resource governance and blue carbon systems by highlighting fishermen's cooperatives as institutional actors that can connect socioeconomic conditions with community-based environmental governance. The findings suggest that effective mangrove carbon governance requires not only ecological and financial interventions but also institutional strengthening to support collective action and community participation.

Policy Recommendation

To strengthen fishing cooperatives in mangrove forest carbon governance, four policy priorities are recommended. First, institutional capacity-building programs are needed to improve cooperative governance, financial management, environmental awareness, and technical knowledge of carbon mechanisms. Second, financing schemes tailored to fishing communities should be developed

to reduce reliance on informal credit systems and support conservation-based livelihoods.

Third, carbon incentive schemes must ensure transparent and equitable benefit-sharing mechanisms to ensure meaningful community participation and reduce potential conflict. Fourth, government agencies must promote collaborative governance involving cooperatives, local communities, government agencies, academics, and NGOs through a co-management approach based on local knowledge and participatory principles.

These steps will ensure that mangrove-based carbon incentives contribute not only to climate mitigation, but also to institutional strengthening, poverty reduction, and the sustainability of coastal community livelihoods.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all research informants, particularly fishermen, community leaders, cooperative representatives, and relevant stakeholders in West Nusa Tenggara, Indonesia, for their valuable time, insights, and contributions to this study.

AUTHORS CONTRIBUTION STATEMENT

We hereby declare that the contributions of each author to the writing of this paper are: Muhammad Helmi Falah as the main contributor, Fety Widianti Aptasari as the member, and Cawalinya L. Hasyim as the member.

REFERENCES

Adawiyah, S. E., Hermanto, A., Yasya, W., Kristanti, R., & Chrisye, M. (2021). Akses terhadap sumber daya alam pada kemiskinan dan ketahanan pangan. Sosio Informa: Kajian Permasalahan Sosial dan Usaha Kesejahteraan Sosial, 7(2), 172–185. https://doi.org/10.33007/inf.v7i2.2664.

Ashmarita. (2020). Street vendors based on tribal groups in Kendari City, Indonesia. Indonesian Journal of Social and Environmental Issues, 1(3), 174–181. https://doi.org/10.47540/ijsei.v1i3.99.

Asiyanbi, A. P., & Lund, J. F. (2020). Policy persistence: REDD+ between stabilization and contestation. Journal of Political Ecology, 27(1), 378–400. https://doi.org/10.2458/v27i1.23493.

Bruchac, M. (2014). Indigenous knowledge and traditional knowledge. Dalam Smith, C. (Ed.), Encyclopedia of global archaeology (3814–3824). Springer.

CNN Indonesia. (2022, July 19). 700 ribu hektare hutan mangrove rusak, mayoritas di area tambak. CNN Indonesia. https://www.cnnindonesia.com/nasional/20220719152602-20-823402/700-ribu-hektare-hutan-mangrove-rusak-mayoritas-di-area-tambak.

Corbera, E., & Jover, N. (2012). The undelivered promises of the clean development mechanism: Insights from three projects in Mexico. Carbon Management, 3(1), 39–54. https://doi.org/10.4155/cmt.11.74.

DPRRI. (2018). Penguatan Peran Koperasi Nelayan: Manifestasi Ekonomi Kerakyatan. Buletin APBN Pusat Kajian Anggaran Badan Keahlian DPR RI, 3.

Falah, M. H., & Aptasari, F. W. (2023). Tantangan koperasi nelayan sebagai penyeimbang rezim pengelolaan sumber daya kelautan dan perikanan di Indonesia. In K. Amri, H. Latuconsina, & R. Triyanti (Ed.), Pengelolaan sumber daya perikanan laut berkelanjutan (507–548). Penerbit BRIN. https://doi.org/10.55981/brin.908.c765.

Fitria, A. & Dwiyanoto, G. (2021). Ekosistem Mangrove dan Mitigasi Pemanasan Global. Jurnal Ekologi, Masyarakat, & Sains, 2(1), 29-34.

Geofrey, T. & Kungu, J. N. (2020). The Implication of Political Patron-Client Linkages On Democratic Governance In Developing Democracies. International Journal of Innovative Research and Advanced Studies (IJIRAS), 7(4), 211-218.

Haghshenas, E., Gholamalifard, M., & Mahmoudi, N. (2021). Ecosystem services trade-offs informing impacts of marine aquaculture development in the southern Caspian Sea. Marine Pollution Bulletin, 171, 112792. https://doi.org/10.1016/j.marpolbul.2021.112792.

Hermes. (2017). Model pengelolaan pembangunan wilayah berbasis penanggulangan kemiskinan di Kota Bengkulu [Disertasi]. Institut Pertanian Bogor.

Hernanz, V., Quiroga, S., Suarez, C., & Aguino, J. E. (2025). Evaluating the merit of carbon credits: Is there a lack of effectiveness in transitioning from direct payments for ecosystem services to REDD+ community-based incentives? Environmental and Sustainability Indicators, 25, 100591.

Horn, S., Nat, S., & Hun, H. (2025). Human–forest interactions: Community-based management, indigenous knowledge, livelihoods and social–ecological systems. In Journal of Agriculture and Environment (Vol. 2, Chapter 12, pp. 144–154). https://doi.org/10.5281/zenodo.17922013.

KKP. (2022a). Penangkapan ikan terukur berbasis kuota utamakan nelayan kecil. https://kkp.go.id/djpt/artikel/38384-penangkapan-ikan-terukur-berbasis-kuota-utamakan-nelayan-kecil.

KKP. (2022b, 10 Januari). Punya Potensi Besar, KKP Siap Akseelrasi Ekspor Perikanan NTB. https://www.kkp.go.id/bkipm/punya-potensi-besar-kkp-siap-akseelrasi-ekspor-perikanan-ntb65c341ebf0111/detail.html.

p-ISSN: 2088-8449
e-ISSN: 2527-4805

KKP. (2023). Jumlah nelayan budidaya di Indonesia (2012-2020). https://Statistik.Kkp.Go.Id/Home.Php?M=Nelayan&I=6#Panel-Footer.

KLHK. (2023). Indonesia Terima Pembayaran Pertama Untuk Pengurangan Emisi Dari Deforestasi dan Degradasi Hutan di Kalimantan Timur. https://ppid.menlhk.go.id/berita/siaran-pers/7067/indonesia-terima-pembayaran-pertama-untuk-pengurangan-emisi-dari-deforestasi-dan-degradasi-hutan-di-kalimantan-timur.

KNTI - Kesatuan Nelayan Tradisional Indonesia. (2020, 9 April). Analisis Dampak Covid-19 Terhadap Kehidupan Sosial-ekonomi Nelayan dan Pembudidaya. https://knti.or.id/analisis-dampak-covid-19-terhadap-kehidupan-sosial-ekonomi-nelayan-dan-pembudidaya/

Kristian, I. (2019). Pengelolaan wilayah pesisir secara terpadu dan berkelanjutan yang berbasis masyarakat. Jurnal Rasi, 1(1), 49–63.

Kurniawan, A., Nurdin, A. S., Marasabessy, M. H., Ashari, R., Tamge, F., Utami, N. N., & Gunawan, G. (2023). Strategi pengembangan ekowisata di pulau-pulau kecil kawasan KPHL Ternate-Tidore Maluku Utara. Dalam Prosiding Seminar Nasional Agribisnis (Ed. 3, Vol. 1).

Kurniawan, K. (2020). Resolusi konflik pemanfaatan sumber daya pesisir antara nelayan dengan penambang timah inkonvensional. Society, 8(1), 13–22.

Lau, Y., Kenney-Lazar, M., Bashir, S. N., Cole, R., Gevaña, D. T., Lee, J., Marks, D., Miller, M. A., Ren, Y., Taylor, D., & Zhou, Y. (2025). Challenges in forest carbon governance: Insights from Southeast Asia. Wiley Interdisciplinary Reviews: Climate Change, 16(5). https://doi.org/10.1002/wcc.70018.

Lohmann, L. (2009). Toward a different debate in environmental accounting: The cases of carbon and cost–benefit. Accounting, Organizations and Society, 34(3–4), 499–534. https://doi.org/10.1016/j.aos.2008.03.002.

Lovell, H. (2013). Measuring Forest Carbon. In: Stripple J, Bulkeley H, eds. Governing the Climate: New Approaches to Rationality, Power and Politics. Cambridge University Press, 175-196.

Maksum, A., Wibisono, M. Y., Miharja, D. (2022). Religion and Culture in Social Transformation of Subang North Coast Community. Jurnal Iman dan Spiritualitas, 2(4), 521-530. http://dx.doi.org/10.15575/jis.v2i4.20674.

Mäntymaa, E., Ovaskainen, V., Juutinen, A., & Tyrväinen, L. (2018). Integrating Nature-Based Tourism and Forestry in Private Lands Under Heterogeneous Visitor Preferences for Forest Attributes. Journal Environment Plan Management, 61, 724–746. https://doi.org/10.1080/09640568.2017.1333408.

Maruf, M. W. & Putera, A. M. (2022). Potensi Pendapatan Ibu Kota Negara: Nusantara Dari Perdagangan Karbon dalam Bunga Rampai Ibu Kota Negara Nusantara. Politeknik Keuangan Negara STAN

Masyhuri. (2017). Pembiayaan non formal usaha perikanan tangkap: Kasus Muncar dan Bitung. Jurnal Ekonomi dan Pembangunan, 22(2), 135–148.

Mikulecký, P., Punčochářová, A., Babič, F., Bureš, V., Čech, P., Husáková, M., Mls, K., Nacházel, T., Ponce, D., Štekerová, K., Triantafyllou, I., Tučník, P., Sunanda, V., & Zanker, M. (2023). Dealing with risks associated with tsunamis using indigenous knowledge approaches. International Journal of Disaster Risk Reduction, 86, 103534. https://doi.org/10.1016/j.ijdrr.2023.103534.

Mongabay. (2023). Outlook KNTI: 80% Nelayan Kecil Berpendidikan di bawah SMP. https://www.mongabay.co.id/2023/02/17/outlook-knti-80-nelayan-kecil-berpendidikan-di-bawah-smp/.

Montemayor, C. A. M. (2019). A Blue Economy: Equitable, sustainable, and viable development in the world's oceans. Dalam Predicting Future Oceans (395–404). Elsevier.

Nainggolan, H. L., Aritonang, J., Ginting, A., Sihotang, M. R., Gea, M. A. P. (2021). Analysis and Strategies to Increase Income of Traditional Fishers in Coastal Areas at District of Serdang Bedagai, North Sumatera. Jurnal Sosial Ekonomi Kelautan dan Perikanan, 16(2), 237-256. http://dx.doi.org/10.15578/jsekp.v16i2.9969

Ostrom, E. (2005). Understanding Institutional Diversity. Princeton university press.

Otoritas Jasa Keuangan. (2023). Statistik Perbankan Indonesia 2023. Otoritas Jasa Keuangan.

Pineda, F., Padilla, J., Granobles-Torres, J. C., Echeverri-Rubio, A., Botero, C. M., & Suarez, A. (2023). Community preferences for participating in ecotourism: A case study in a coastal lagoon in Colombia. Environmental Challenges, 11, 100713.

Pinem, E. Y., Widiono, S. W., & Irnad, I. (2019). Kemiskinan struktural komunitas nelayan di Kelurahan Sumber Jaya, Kecamatan Kampung Melayu, Kota Bengkulu. Jurnal Sosiologi Nusantara, 5(2), 91–112. https://doi.org/10.33369/jsn.5.2.91-112.

Prasetyo, K. C. (2019). Mencegah "tragedy of the commons" di Teluk Sawai dengan Sasi pada era otonomi daerah. Journal of Governance Innovation, 1(1), 13–28. https://doi.org/10.36636/jogiv.v1i1.294.

Queiroz, R. E., Guerreiro, J., & Ventura, M. A. (2014). Demand of the tourists visiting protected areas in small oceanic islands: The Azores case-study (Portugal). Environment, Development and Sustainability, 16, 1119–1135.

Rahim, A. (2018). The empowerment strategy of the traditional fisherman's wives in the coastal area of Barru Regencey, South Sulawesi. Journal of

Socioeconomics and Development, 1(1), 1–6. http://eprints.unm.ac.id/18251/.

Sairiltiata, S. (2023). Eksistensi sasi perempuan sebagai kearifan lokal adat dan budaya di Desa Moning Pulau Wetar Kecamatan Wetar Timur Kabupaten Maluku Barat Daya. Indonesia Journal of Business Law, 2(2), 47–57. https://doi.org/10.47709/ijbl.v2i2.2317.

Sanjatmiko, P. (2018). A critical review of Hardin's tragedy of the commons model (1968): A case study of the Segara Anakan Community, Cilacap, Central Java. Antropologi Indonesia, 39(1), 1. https://doi.org/10.7454/ai.v39i1.10952.

Song, A. M., Dressler, W. H., Satizábal, P., & Fabinyi, M. (2021). From conversion to conservation to carbon: The changing policy discourse on mangrove governance and use in the Philippines. Journal of Rural Studies, 82, 184–195. https://doi.org/10.1016/j.jrurstud.2021.01.008.

Suarjaya, IK (2021). Partisipasi Masyarakat dalam Penyusunan Rencana Pembangunan Jangka Menengah Desa Di Desa Sangeh Kecamatan Abiansemal Kabupaten Badung. Widyanata, 18 (1), 30 - 37. https://doi.org/10.54836/widyanata.v18i1.602.

Sumantika, A., & Ardiyanto, F. (2018). Penurunan bunga KUR dan dampak negatifnya terhadap loyalitas nasabah UMKM bank non penyalur KUR pada sektor mikro kecil. Jurnal Modus, 30(2), 110–121. https://doi.org/10.24002/modus.v30i2.1699.

Taherong, R., Herlina, H., Kurniawan, U. T., Edison, E., & Widya, M. (2023). Bentuk adaptasi masyarakat Suku Bajo terhadap pola ruang permukiman di pesisir Desa Waburense Kecamatan Mawasangka Buton Tengah. Innovative: Journal of Social Science Research, 3(3), 10205–10218. https://doi.org/10.31004/innovative.v3i3.3362.

Tanjung, N. S. (2023). Struktur Sosial Dalam Masyarakat Nelayan di Rempang Kepulauan Riau. Jurnal Hukum dan HAM Wara Sains, 2(11), 1073–1080. https://doi.org/10.58812/jhhws.v2i11.801.

Thurber, K. A., Brinckley, M. M., Jones, R., Evans, O., Nichols, K., Priest, N., Guo, S., Williams, D. R., Gee, G. C., Joshy, G., Banks, E., Thandrayen, J., Baffour, B., Mohamed, J., Calma, T., & Lovett, R. (2022). Population-level contribution of interpersonal discrimination to psychological distress among Australian Aboriginal and Torres Strait Islander adults, and to Indigenous–non-Indigenous inequities: Cross-sectional analysis of a community-controlled First Nations cohort study. The Lancet, 400(10368), 2084–2094. https://doi.org/10.1016/S0140-6736(22)01639-7.

TNP2K. (2022). Ringkasan Kebijakan Penentuan Wilayah Prioritas Kemiskinan Ekstrem 2021-2024. Tim Nasional Percapatan Penanggulangan Kemiskinan.

Utami, K. D. (2022, 31 Agustus). Penangkapan ikan terukur dinilai rugikan nelayan kecil di Pantura. Kompas. https://www.kompas.id/baca/nusantara/2022/08/31/penangkapan-ikan-terukur- dinilai-smerugikan-nelayan-kecil.

Valentina, R. A. (2018). Kebijakan bagi nelayan tradisional. Masalah-Masalah Hukum, 47(3), 184–197. https://ejournal.undip.ac.id/index.php/mmh/article/view/18814.

Wasiaturrahma, Sulisttyowati, C., Heryati, D., & Ajija, S. R. (2020). Improving the cooperative performance through financial management assistance in Koperasi 64 Surabaya. Jurnal Berdaya Mandiri, 2(1), 256–267. https://jurnal.unpad.ac.id/jpk/article/view/1415#:-:text=Hasil%20penelitian%20menunjukkan%20bahwa%20kontribusi,tangga%20didominasi%20oleh%20wanita%20nelayan.

Zhang, H. (2021). Understanding the tragedy of the commons in the South China Sea fisheries: The prisoner's dilemma model revisited. Marine Policy, 125, 104376. https://doi.org/10.1016/j.marpol.2020.104376.