

# Social-ecological and institutional dimensions of small-scale fisheries: a global review of governance, sustainability, adaptation

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**Abstract.** Small-scale fisheries (SSF) is a strategic sector in providing food and nutrition needs, helping the welfare of the local economy, providing millions of jobs, and preserving marine ecosystems. But behind the strategic function of SSF itself, this sector lacks facilities and policy support from the government, besides the involvement of local communities is still low in the management of SSF. The complex workings of ecological, social, and institutional roles in the sustainable management of SSFs also pose challenges. This article aims to thoroughly and deeply analyze the relationship of these aspects using the method of systematic review. This systematic review process is carried out by identifying, evaluating, and synthesizing relevant research results in a structured manner so as to answer specific research questions regarding SSF in the context of management, socio-ecological sustainability, and institutional roles. The results of this study found that the sustainability of the SSF sector is strongly influenced by the preservation of marine ecosystems as a provider of catches, the involvement of small fishermen, as well as the role of institutions in regulating and overseeing the management of small-scale fisheries. Access and government policies that support small fishermen are also criteria for successful SSF management.

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## 1 Introduction

Small-Scale Fisheries (SSF) play a central role in food security, livelihoods, and culture in many of the world's coastal communities, yet the sector often receives less policy attention than the industrial sector despite its significant contribution to global catches and community nutrition [1]. The sector accounts for more than 50% of the global Catch for human consumption and involves about 90% of the fisheries workforce, especially in developing countries. Currently, the amount of production from the small-scale capture fisheries sector according to the FAO reaches 37 million tons per year, representing about 40% of the total global catch (92 million tons per year) consisting of 68% of Marine Fisheries and 32% of land fisheries. Meanwhile, in Indonesia, based on KKP data, the total number of fishermen in the capture fisheries sub-sector has reached  $\pm 2.40$  million people. Of these, 85% are small-scale fishermen (small-scale fisheries) operating on the coast with vessels of 5 GT or without motor ships, mostly without large capital [2].

The sustainability of Small-scale Fisheries does not depend on the number of fish, it is the result of a complex relationship between ecological conditions, local socio-economic practices, and institutional structures that govern access, rules, and enforcement of such factors [3]. The combination of these factors determines the vulnerability and adaptability of fishing communities. In practice, ecological and social outcomes are often influenced by a combination of formal institutions and informal institutions. So the ability to harmonize these two domains is very important for fair and effective governance. In a global context, a number of studies have shown that non-inclusive institutions can make it difficult for access between small fishermen and companies [4]. As a result, this can reduce the ability of coastal communities to adapt to market and ecological changes. Conversely, when formal institutions such as government policies can adapt to local rules and local wisdom, fisheries governance tends to be more consistent and responsive to community needs.

The definition of small-scale fisheries is very diverse in various countries, but in general this definition refers to fishing activities with a small vessel capacity of 10 GT or below 12 meters, low capital investment, simple technology, family or community-based labor, focusing on local catches whose fishing activities are only around coastal waters and focusing on meeting daily needs [5]. On an international scale, in 2017 the United Nations designated 2022 as the IYFA (International Year of Artisanal Fisheries and Aquaculture) which aims to improve global understanding and action to support small-scale fisheries, fish farmers, and fishery workers in food and nutrition security, poverty alleviation, and sustainable use of Natural Resources ("International Year of Artisanal Fisheries and Aquaculture 2022," 2023). IYFA stressed how important small-scale fisheries and aquaculture are to achieve the 2030 agenda for Sustainable Development and the targets of the Sustainable Development Goals (SDGs). This is reflected in FAO's aspiration of four better things: better production, better nutrition, a better environment, and a better quality of life. The Blue transformation vision supports successful action towards the SDGs and four Better Things [6].

In a theoretical context, there are two main perspectives that can be used to understand small-scale fisheries: the socio-ecological dimension, which focuses on human interaction with the marine environment; and the institutional dimension, which focuses on the role of formal and informal rules in resource management. These two perspectives are interrelated and are critical to understanding sustainable fisheries governance. The socio-ecological approach emphasizes how important it is to consider small-scale fisheries as economic enterprises and breeding systems in which the social welfare of coastal communities is directly influenced by the sustainability of marine ecosystems. With the socio-ecological approach (SES), small-scale fisheries are defined as the relationship between humans and the natural environment. In accordance with FAO SSF guidelines, this structure emphasizes the rights and participation of fishermen, the importance of livelihoods for food security, and

ecosystem conservation. SES helps maintain sustainability, empowers local fishermen, addresses structural weaknesses, and integrates social, ecological, economic, and institutional aspects in broader fisheries governance through adaptive management and Cross-Sector Coordination. Meanwhile, institutional perspectives show how local laws, regulations, and traditions can shape ways of access, Benefit Sharing, and resource management. The purpose of Blue Economy programs supported by governments and international institutions is one form that formal institutions have taken a role in supporting Small-Scale Fisheries [7]. Where the purpose of the Blue Economy program is to realize a healthy ocean and encourage fishery products as a global solution for food security. In addition, governments and international institutions often provide financial, technical, and empowerment support, such as the construction of advanced fishing villages, to improve the welfare of small fishermen [8].

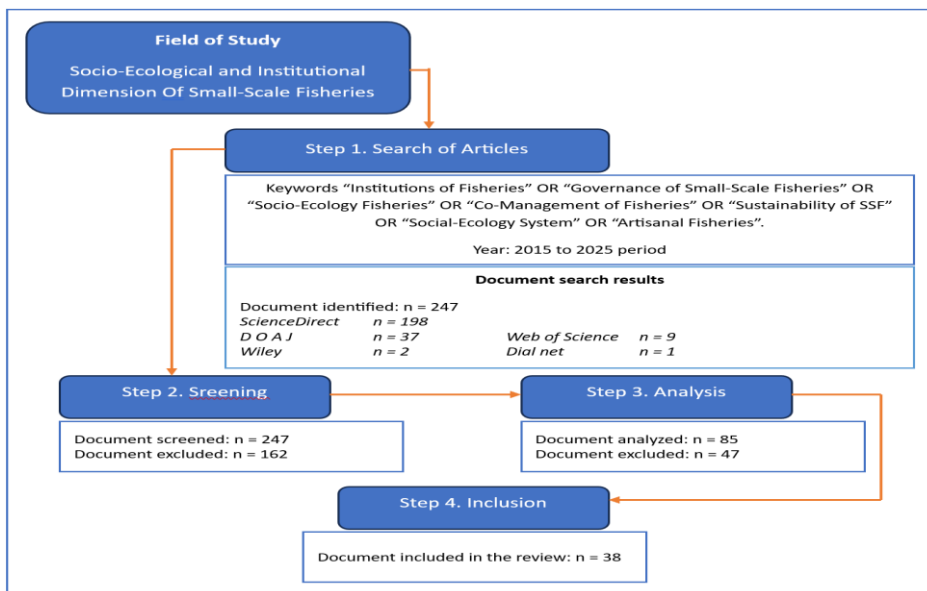
The main challenges faced by the small-scale fisheries sector are not only related to ecological pressures (overfishing and habitat degradation), but fishermen also face social problems (poverty, weak market access, and low education), as well as the weak bargaining position of small fishermen in institutional structures both in terms of rules and governance. A number of studies affirm that participation-based governance, recognition of access rights, and collaboration between formal and informal institutions are key to achieving the sustainability of Small-Scale Fisheries [9]. However, the application of this management model still suffers from constraints due to power imbalances, exclusive practices and globalization dynamics that have an impact on the uneven distribution of benefits. In a global context, various studies show that the success of small-scale fisheries management is largely determined by the extent to which governance is able to integrate socio-ecological aspects with adaptive institutions. The governance framework based on community-based management and co-management is a widely applied approach to strengthen the adaptation capacity of fishermen to environmental changes and socio-economic dynamics [10].

The main objective of this article is to synthesize various research findings related to complex interactions between social, ecological, and institutional aspects in small-scale fisheries management in various global contexts. This article aims to study : (1) a more comprehensive understanding of how institutional dynamics, governance practices, and socio-ecological factors influence the sustainability of fisheries resources and the resilience of coastal communities, (2) look at the challenges and adaptation opportunities faced by the small-scale fisheries sector in the face of social and ecological change while offering a conceptual framework that can be a reference in the formulation of more inclusive, adaptive, and sustainable policies. By highlighting experiences from different parts of the world, this article seeks to identify common patterns as well as contextual differences that can be valuable lessons in building small-scale fisheries adaptation strategies at the global and local levels.

## **2 Methodology**

This methodology is based on a way to discover, evaluate and interpret all available research related to the formulation of a problem or research topic [11]. Systematic reviews regulate how to review articles that are done in a structured and planned manner. Systematic review is able to increase the depth of review and create rigor in research evidence [12]. Systematic reviews function to be research results, minimize review bias, synthesize results, and find research gap. Systematic reviews are also often required to determine a research agenda, as part of a thesis or dissertation, and as part of the research grant application process [13]. Research that uses systematic review methods or techniques will use data from the available literature, so that researchers do not need to conduct observations, interviews, or other primary data collection methods . In general, systematic reviews are used by researchers to find out the findings of previous research on a relevant subject and to obtain additional data

that will help them understand the topic, phenomenon or problem they are studying. The following is the process of review analysis conducted for the search and selection of articles related to the field of study in the small-scale fisheries sector, especially those that discuss social, ecological, and institutional roles:



**Figure 1.** Systemic review process  
 Source : compiled by the author

## 2.1 Sources and Methodology of Systemic Reviews

The research method used is systematic Review, which is by presenting data, combining theories, results, and other research sources from several scientific research articles to become the basis of research. The synthesized research articles are in the time range of 2016 to 2025 related to the socio-ecological and institutional dimensions of small-scale fisheries. In addition, to emphasize the main reference sources, supporting data were added from BPS data (Central Bureau of Statistics) and FAO data (Food and Agriculture Organization). To obtain relevant literature, we searched for scientific journal articles through Web of Science (WoS), ScienceDirect, and DOAJ using the keywords Institution of fisheries, governance of small-scale fisheries, socio-ecology fisheries, co-management fisheries, sustainability fisheries, social-ecology system (SES), and artisanal fisheries. These keywords are chosen to ensure coverage of common terms used today and terms that were popular in previous decades' publications. Web of Science (WoS), ScienceDirect, and DOAJ are the most widely used and preferred databases in the search for systematic literature and scientometric studies, including fisheries research reviews.

Given that the time required to find articles relevant to the focus of the study is quite short, then a stratified random sample is used to select articles for in-depth coding. Due to the uneven distribution of articles over time, sampling was grouped by year and varying degrees of sampling intensity were used. As a rule, we take a sample of 20% of articles per year.

### 3 Results

The results of this systematic review include 38 articles (see Table 1), the results of the analysis of these major journals are briefly described and presented in the form of data ranging from Journal sources, research topics covered, research time periods, research areas, and focus on discussing the contents of documents.

#### 3.1 Character study reviewed

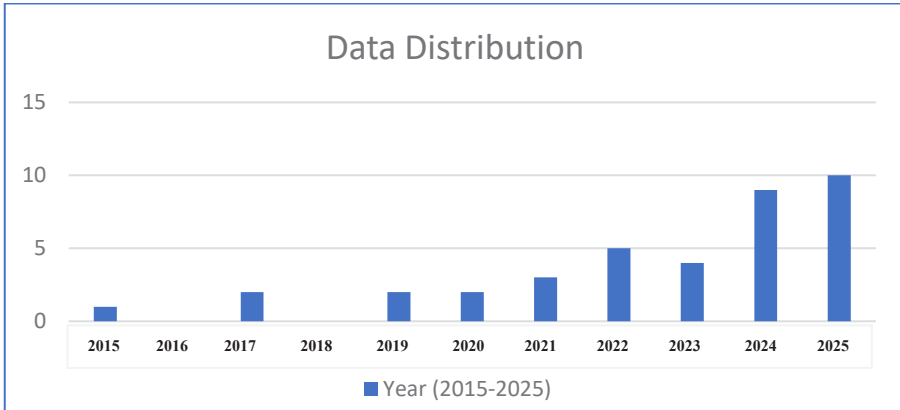
The most discussed journals related to this research topic socio-ecological and institution dimension of small-scale fisheries are the journal Marine Policy (as many as 19 journals) and the journal Ocean & Coastal Management (as many as 7 journals), of the two journals, the research results focus more on the role of governance of government agencies and communities in the small-scale fisheries sector. Then in the next Journal such as the journal Environmental Impact Assessment Review and Ecology & Society each 2 articles, we found a diversity of FOCUS studies that discuss the social-ecology system (SES) and co-management as a form of adaptation of fishermen to the sustainability of small-scale fisheries. And in other journals (Jurnal kelautran tropis, Frontiers in Marine Science, Global Enviromental Change, Jounal Of Rural studies, International Journal of Climate Change Strategies and Management, Applied Geography, and Regional Studies in Marine Science we find diverse fields and only occasionally focus on small-scale fisheries institutions.

**Table 1.** Document reviewed articles (2015 to 2025)

No	Journal	Abbreviated title	Year of publication	Authors	Journal
1	Ecology and Society	Enforcement, deterrence, and compliance in co-managed ssf	2024	Liliana Sierra Castillo	California America
2	Jurnal kelautran tropis	Mapping Interactive Governance of Small-Scale Ecosystem Provisioning Services	2025	Mathori abdul wahid	Lombok timur, Indonesia
3	Ecology and Society	Toward understanding the long-term persistence of a local governance system among artisanal fishers	2021	Jaime A. Aburto	Chile, South America
4	Frontiers in Marine Science	Social-ecological vulnerability to climate change and risk governance in coastal fishing communities	2023	Rumana Sultana	Bangladesh South Asia
5	Environmental Research Letters	the role of institutions in mediating intersectoral conflict, cooperation, and competition in a globalized fishery	2023	Katherine L Seto	Ghana
6	Marine policy	Assessing the performance of a participatory governance transformation in small-scale fisheries	2024	Sofia Bausero	Uruguay
7	Marine Policy	Challenges for good governance in coastal socio-ecological systems	2025	Angelina Del Carmen	Meksiko
8	Global Enviromental Change	Self-governance mediates small-scale fishing strategies, vulnerability and adaptive response	2024	Timothy H	Meksiko
9	Marine policy	Governance analysis of a community managed small-scale crab fishery in Madagascar	2021	Stephen long	Madagascar
10	Marine Policy	Social-ecological shifts, traps and collapses in small-scale fisheries	2022	Sebastian villasante	Ecuador
11	Ocean & Coastal Management	Seventy years of small-scale fisheries in Uruguay	2025	Sofia Bausero	Uruguay
12	Jounal Of Rural studies	The role of family in shaping adaptation and adaptive capacity in small-scale fishing communities	2025	Farah el shaheb	Uruguay
13	International Journal of Climate Change Strategies and Management	Enhancing climate change adaptation governance through transforming institutions	2022	Richard Kwame Adom	Kwa-Zulu Natal, South Africa
14	Ocean & Coastal Management	Institutional design of SSF in marine protected areas applied to sustainable territorial development	2017	Rodrigo Rodrigues	Brazil
15	Marine Policy	The formation of institutional socio-ecological traps	2025	Gerardo Damonte	Peru
16	Ocean & Coastal Management	An overview of social-ecological impacts of the El Niño-Southern Oscillation and climate change	2024	Mauricio C	Peru
17	Ocean & Coastal Management	Unlocking sustainability in China's small-scale fisheries	2024	Shu Su	China
18	Marine Policy	Power relations in Sub-Saharan African small scale fisheries and conservation	2025	K. Senghor	Sub-Shara Africa
19	Marine Policy	Capacity deficit and marginalisation of artisanal fishers hamper effective fisheries governance	2023	Isaac Okyere	Ghana

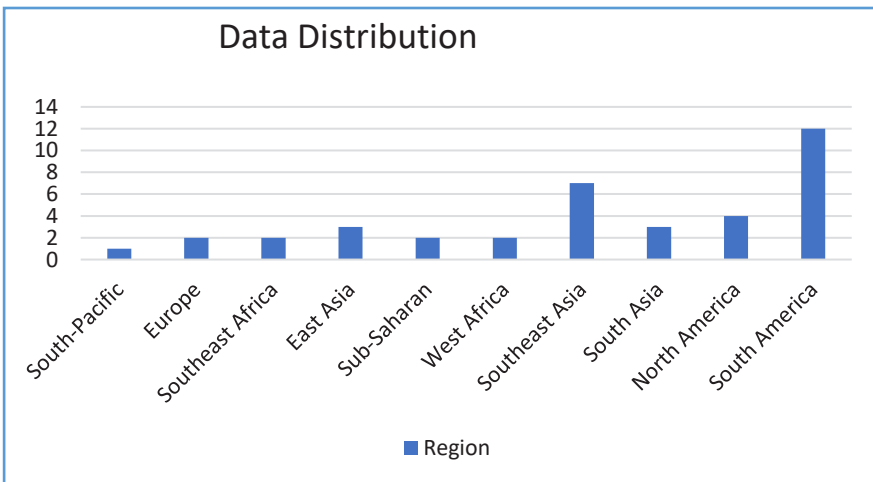
20	Marine Policy	Temporal changes in a small-scale artisanal reef fishery	2024	Mariana Ferreira da Silveira	Brazil
21	Marine Policy	Towards an ecosystem approach to fisheries	2025	Mauricio C	Galapagos, Ekuador
22	Oceana & Coastal Management	Fisher participation in the territorial use rights	2025	Lei Zhang	China
23	Marine Policy	Achieving governance synergies through institutional interactions among non-state and state actors in small-scale marine fisheries	2022	K.K Baiju	India
24	Journal of Environmental Management	The dynamics of institutional innovation: Crafting co-management	2019	Marc Leopold	South Pacific
25	Marine Policy	The interplay between formal and informal institutions and the potential for co-management	2020	Kara E.Pellowe	Meksiko
26	Applied Geography	Governance potential for cetacean bycatch mitigation in small-scale fisheries	2015	Tara Sayuri	Asia Tenggara
27	Regional Studies in Marine Science	The Galapagos small-scale fishing sector collaborative governance network	2023	R. Caceres	Galapagos, Ekuador
28	Marine Policy	Stakeholder perceptions of blue economy governance networks and their equity implications	2024	Jewel Das	Bangladesh
29	Marine Policy	Social-ecological vulnerability to climate change in small-scale fisheries managed under spatial property rights systems	2020	Raquel Ruiz	Spanyol
30	Ocean & Coastal Management	Struggles for inclusive development in small-scale fisheries	2017	Luciana Gomes	Brazil
31	Marine Policy	Adaptative processes in small-scale traditional fishermen's organisations. The case of <i>Cofradias</i>	2019	Iria Garcia	Spanyol
32	Environmental Impact Assessment Review	Understanding water governance based on the social-ecological system framework integrating stakeholder perspective	2025	Liting Xu	China
33	Ocean & Coastal Management	Progress and challenges for the establishment of a sustainable blue economy	2024	Francisco Jose	Chile
34	Marine Policy	Ecosystem approach to enhanced traditional demersal fisheries management	2025	Nur Ismu Hidayat	Papua, Indonesia
35	Marine Policy	Patron-client relationships shape value chains in an Indonesian island-based fisheries system	2022	Nicky Roberts	Indonesia
36	Marine Policy	Flexibility through bundles of capital: The capabilities of Indonesian small-scale headline tuna fishers under voluntary sustainability certification	2024	Puspi Eko Wiranthi	Maluku, Indonesia
37	Marine Policy	Calling for institutional arrangements in Napoleon Wrasse conservation and management in Indonesia	2022	Siti Arieta	Anambas, Indonesia
38	Marine Policy	Stakeholder participation in management planning for grouper and snapper fisheries	2021	Heidi Retnoningtyas	NTB, Indonesia

The number of documents found by year can be seen in Figure 2. Based on the search results and review articles on small-scale fisheries, there is a trend of increasing the number of publications from 2015 to 2025. In the early period (2015-2017), the number of articles published was still relatively small and dominated by conceptual studies and local studies in certain coastal areas. Entering 2019-2020, publications began to increase consistently, along with increasing attention to sustainability issues, Resource Governance, and the role of fishing communities in the socio-ecological system of Fisheries. This trend continues until the period 2021-2025, which indicates a peak in the number of publications. In this phase, research topics become increasingly diverse, including ecosystem approaches in fisheries management (EAFM), adaptation to climate change, as well as social network analysis in fisheries systems. The increase in the number of articles in the last decade illustrates that academic attention to small-scale fisheries is increasing, both in terms of methodology, coverage of study areas, and depth of analysis. These results are in line with which states that academic attention to small-scale fisheries has increased in recent years and said the publication in this top journal also signals increased attention and research priority on small-scale fisheries also said over the past few decades, the field of Fisheries has attracted the attention of researchers, a shift in trends in recent years, focusing on topics related to sustainability and climate change, among many other themes.



**Figure 2.** Documents found by year  
 Sources : *compiled by the author*

From the results of the analysis of the documents found, it is known that the trend of research on socio-ecology and institution of fisheries shows a fairly wide but uneven distribution of the region. Most of the studies are in Southeast Asia, African states, and South America, especially Indonesia, Brazil, Ghana, Madagascar, Peru, and Uruguay, which are known to have intensive coastal fishing activities and dense small-scale fishing communities, there has been an increase in the number of publications in the last decade, especially related to issues of Resource Governance, Sustainability, and socio-economic resilience of small fishermen. On the other hand, studies from the South-Pacific region and Europe are relatively less where it is usually related to policy analysis and cross-country comparative approaches. This pattern illustrates that global research attention to SSFS is growing, moving away from merely biological aspects and towards socio-ecological and governance dimensions in a variety of geographical contexts. As stated by that improving community-based governance is the key to SSF sustainability. In his book many as 95 percent of the world's fishing population is in Asia, Africa, and Latin America, while 87 percent of the world's total fishing population is only in Asia also states worldwide it is estimated that around 38 million people become fishermen and fish farmers, about 95% (36 million) of whom come from Africa, Asia, and Latin America.



**Figure 3.** Documents found by region  
 Sources : *compiled by the author*

### **3.1.1 Integration of social and ecological dimensions in small-scale fisheries governance**

In the management of small-scale fishery resources, integration between social and ecological aspects is essential to ensure that complex and interrelated fishery systems continue to operate properly. This method emphasizes how important it is to understand how the socio-economic dynamics of fishing communities correlate with coastal ecosystem conditions, so that governance policies and practices focus on the sustainability of fish resources and the well-being and resilience of coastal communities. Journal by [4] in his research assessed the elements of local governance that play a role in bycatch mitigation. The results show that the effectiveness and coordination of Coastal Resource Management agencies varies between locations, influencing the success of mitigation efforts. Bridging organizations play an important role in conservation activities, but the involvement of local communities and the support of external agencies are also crucial. This approach provides an important lesson for other regions in understanding the governance elements that support bycatch mitigation and sustainably strengthen conservation capacity. Journal compiled by small-scale fisheries (SSF) that are an important source of livelihood for coastal communities are particularly vulnerable to climate change. This study assesses socio-ecological vulnerability through TURF (Territorial Use Rights in Fisheries) approach by considering exposure to climate hazards, social sensitivity, and adaptive capacity. The results emphasize the importance of increasing adaptive capacity based on local knowledge to support sustainable and resilient fisheries management against climate change.

Journal [14] describes each fishing community as having unique characteristics formed from the interaction between social and ecological factors in their region. For example, San Pedro fishermen demonstrate adaptation to the environment through attachment to fishing grounds, migration patterns, and ways of managing resources. Local ecological knowledge (LEK) gained from long experience interacting with coastal ecosystems plays an important role in understanding these patterns. Therefore, the integration of LEK in the fisheries management system is very important so that the resulting policy is more contextual, relevant, and in accordance with local socio-ecological conditions. And Journal [5] studying rigid SSF management and not considering socio-ecological interactions often weakens system resilience, whereas participatory governance is better able to generate collective adaptive responses. Journal lack of funding and investment in climate change issues is a major obstacle that affects the implementation of climate change governance. In conclusion, governments cannot provide all the financial resources needed to effectively address climate issues. The journal found the history of overfishing of adult fish has shifted to larval capture, compounding the damage to resources.

Journal [15] this study shows that natural disasters and warming seas deprive fishermen of catch and income, and provoke conflicts. Fishermen also lack modern tools, financial access, and organizational support. They adapt in ways that maintain ecosystems, plant, move temporarily, or help each other. The Bangladeshi government helps with social programs and fishing rules, but implementation is still weak. The journal extreme El Niño events have altered marine ecosystems and increased the vulnerability of fishermen. Ecosystem-based management, strengthening local capacity, and community involvement are needed to maintain Galapagos ' socio-ecological resilience. Journal strengthen property rights governance, build inclusive decision-making processes for SSF fishermen, provide policy and financial support in favor of the most vulnerable SSF actors, and incorporate the role of SSF in the broader socio-ecological system and its interaction with other components of management. The journal States the formation of TURF and ECMPO indicates progress towards ecosystem recovery. Effective integrated management needs to understand the CAISC as a socio-ecological system without borders, with a holistic and interdisciplinary

approach that integrates social, cultural, ecological and economic aspects to realize a sustainable blue economy.

Journal examines Peru's industrialization of the fisheries sector with the goal of sustainability, but the policy actually triggers socio-ecological traps due to power inequality and weak governance. Industrial groups and some small fishermen (bolichito) are increasingly dominant, while traditional fishermen are marginalized. A mix of formal, informal, and illegal institutions reinforces injustice and weakens law enforcement. Although strict rules have existed, implementation is weak and often favours strong actors. The journal found if power relations in fisheries and conservation in Sub-Saharan Africa are affected by governance structures, socio-economic systems, and external influences that determine resource access and control. Power inequality often undermines inclusive governance, although power is also needed to maintain sustainability. The analysis shows that centralized control and traditional authority often reinforce inequities and limit the participation of small fishermen. Therefore, governance needs to be more transparent, accountable, and empower local communities.

The journal [6] found the Galapagos Marine Reserve (GMR) faces overfishing and the economic vulnerability of small fishermen. The study proposes an ecosystem approach (EAF) to strengthen governance, restore fish stocks, and shift fishing to large pelagic species. Its strategy includes regulatory reform, market incentives, adaptive co-management, climate-friendly fleet modernization, and economic diversification through ecotourism and value-added products. This approach aims to balance the conservation and welfare of fishermen, making GMR a global model of sustainable fisheries. The journal [7] states ecological performance takes priority over social performance. Fish farmers' perceptions change with policy implementation, with support and satisfaction levels lower than their response rates. Governments play a major role in encouraging collective action, while fair compensation is a key success factor. The results of this study highlight the importance of understanding the dynamics of SES and the perceptions of actors to improve sustainability as well as socio-ecological benefits in water governance.

### *3.1.1.1 Institutional dynamics in the socio-ecological system of capture fisheries*

In the small-scale fisheries sector, the contribution of institutions is an important factor to understand the relationship and adaptation of social and ecological systems to changes that occur. Institutions not only create official and unofficial regulations governing the behavior of fishermen, but also reflect the values, norms, and power structures that exist in coastal communities. Environmental degradation, resource pressures, and local economic changes often force institutions to transform so as to maintain a balance between sustainable ecosystems and social well-being. As obtained in some of these scientific journals, Marine Protected Areas (MPAs) are seen as institutional innovations that can support systemic regional development to prevent resource degradation and marginalization of fishermen. This sustainable development approach emphasizes the importance of regional identity, integrated production systems, and innovation, with the aim of shifting the focus of Fisheries Management from productivity to improving the quality of management. Journal stated that recent institutional changes have opened up opportunities for small-scale fishermen to engage in setting policies, management practices, and monitoring strategies. However, their participation is often hampered by conservation policies that restrict access to captured territories. Studies in Paraty, Brazil's southeast coast, show that innovations such as Fishing Accords, Terms of agreements, and Management Councils of Protected Areas have increased recognition of small fisheries. Even so, weak institutional capacity, power inequality, limited decentralization, and lack of long-term resources are still obstacles to the realization of inclusive coastal fisheries governance in Brazil.

Journal States the importance of consolidating institutional changes to strengthen the resilience of Fisheries systems to various pressures, as well as offering a systematic methodology for assessing institutional dynamics and the sustainability of co-management in complex socio-ecological systems. The journal discusses how fishing groups adapt to institutional and economic changes, with a focus on resource sustainability. The case in Galicia (northwestern Spain) serves as an important example, where small-scale fisheries are managed through a system of public-private hybrid associations called *cofradías*, which have a long history and a central role in the governance of local fisheries. Journal, effective institutions are essential to maintain the economic and cultural value of these fisheries for local communities. A polycentric and learning-based governance approach that involves community participation can improve management effectiveness, especially through co-management, where power and responsibility are shared between the government and fishermen. However, the non-involvement of small fishermen and current economic constraints reduce adherence to formal rules. Journal despite efforts such as mangrove reforestation and fishing gear restrictions, challenges such as market influence and migration cannot be controlled locally. Therefore, government, industry and NGO support is needed to strengthen incentives and integrate top-down and bottom-up approaches, in order to achieve resilience through a diversity of actors and strategies.

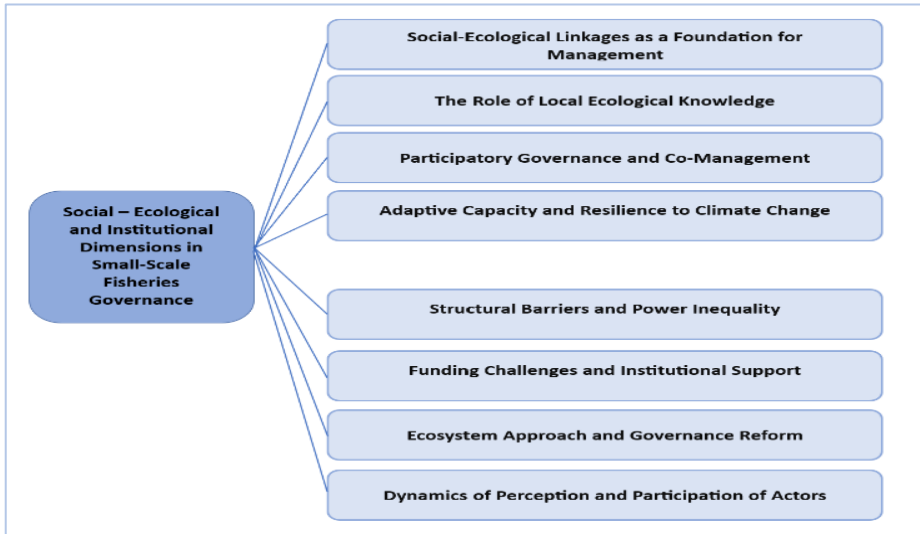
Journal by found a profit inequality between patrons and fishermen, where patrons obtained higher income and bargaining power. Research has also found that off-island Auctioneers and traders have a key role in controlling fish flows and markets. Therefore, the improvement of fisheries governance is recommended to focus on the main trade actors in this network to make management more effective and fair. The journal wrote, involving various stakeholders for two years was proven to increase a sense of belonging, strengthen the implementation of scientific recommendations, and facilitate the acceptance of new rules. Journal, showing that equitable governance, building Cross-Group cooperation, and strengthening institutions across scales can help manage resource systems that are now a hybrid of traditional and industry. Journal a top-down governance system keeps small fishermen from being involved in decision-making and from understanding regulations, thus decreasing participation and compliance. As a result, fishermen are increasingly marginalized and the resources of small pelagic fish are increasingly threatened. Journal suggesting that key inter-actor interactions and specific network configurations could potentially strengthen the collaboration and adaptability of small fishermen to future crises, such as pandemics, climate change, and other human pressures.

The journal despite limited resources and collaboration between institutions, the co-management mechanism has succeeded in encouraging resource recovery, empowerment of fishermen, and institutional learning towards sustainable fisheries management. Journal [9] showed that variations in governance forms, capture strategies, and organizational structures affect the level of impact and adaptability to environmental change. The journal points out that technological innovations are changing fishing practices, increasing opportunistic catches, as well as causing the loss of experienced fishing traditions. Many fishermen turned to tourism as a new source of income, but this change weakened the social and cultural value of traditional fisheries. Without national monitoring and institutional support, fishing communities are vulnerable. Therefore, the empowerment and involvement of traditional fishermen in fisheries policy needs to be strengthened. Journal point to power Gaps, marginalization, and excessive focus on economic growth. The study recommends a multi-stakeholder approach, strengthening the role of the Blue Economy Cell (BEC), as well as more inclusive and sustainable governance to realize a fair and credible BE in Bangladesh. Journal shows that the implementation of sustainability standards needs to be more flexible and contextual, in order to truly support the improvement of the capabilities and welfare of small-scale fishermen.

Journal affirms the need for adaptive governance strategies that integrate collaboration between communities, governments, and stakeholders, in order to maintain ecosystem sustainability while supporting the well-being of coastal communities. Journal to achieve good governance, it is necessary to have the participation of all actors, support for community initiatives, as well as collaboration between institutions to strengthen the social capacity of coastal areas. The journal found a 70-year analysis of small-scale capture fisheries in Uruguay demonstrated the positive impact of policy reforms on key sector indicators. This improvement reflects the impact of the policy formalization and institutionalization of participatory governance. Access to Social Security, targeted economic incentives. Journal the positive relationship between family ties and governance, knowledge, and work-sharing networks shows how families shape collaborative efforts and adaptive processes within SSF communities. Journal social networks, beliefs and social norms have a significant positive influence on the participation of fishermen. In addition, functional, emotional and cognitive values also increase the willingness to participate. Journal strengthening the management of resources, habitats, fishing techniques, and institutions to maintain the sustainability of local fisheries.

## **4 Discussion**

The sustainability of small-scale fisheries requires an approach that integrates social and ecological aspects, because the management of fish resources is inseparable from the interaction of fishing communities with the coastal environment. Socio-economic dynamics, such as dependence on catches, migration patterns, and power relations, affect marine ecosystems that are vulnerable to climate change and exploitation, so understanding socio-ecological relationships is key to assessing the adaptive capacity and resilience of Fisheries systems. In the context of institutions and governance, various studies have shown that the effectiveness of management depends largely on how formal and informal institutions interact with each other. In addition, the level of community participation in the decision-making process also plays an important role. Research highlights the importance of local governance and the role of liaison organizations in improving coordination and mitigation of ecological impacts such as bycatch and climate change. Participatory governance, as outlined by strengthen the adaptive response of fishing communities through co-management, which provides space for local communities to participate in determining the direction of resource management. Responsive and inclusive institutions are proven to be able to strengthen adaptive capacity and accelerate the transformation process towards sustainable fisheries.



**Figure 4.** Indicators of socio - ecological and institutional apex success in small-scale fisheries management

Socio-ecological factors play an important role in determining the effectiveness of these institutions. Each fishing community has a Local Ecological Knowledge (LEK) that is formed from the experience of long-term interaction with coastal ecosystems. This knowledge becomes valuable social capital in understanding resource dynamics and in designing local context-based management strategies. When LEK is integrated into formal policies, governance becomes more relevant, contextual, and accepted by communities, thereby strengthening socio-ecological resilience. This approach has also proven important in the face of climate change pressures, such as ocean warming and natural disasters, that affect fishermen's catches and incomes.

However, the sustainability of Fisheries systems cannot be separated from the dynamics of power and social inequality that affect access and control of resources. Studies show that the dominance of industry actors and weak enforcement reinforce structural injustices that marginalize small fishermen. In this context, power can be a factor that weakens governance inclusiveness, but it can also be directed towards strengthening transparency, accountability, and empowerment of local communities. Governance reforms should be directed towards balancing these power relations in order to create a more equitable and sustainable system. To ensure long-term sustainability, an Ecosystem Approach to Fisheries (EAF) is needed that brings together social, economic, and ecological aspects within a single management framework. This approach, as described, emphasizing the importance of institutional reform, climate-friendly fleet modernization, and diversification of coastal economies. Community engagement and public policy support lay the foundations for resilient socio-ecological systems. Furthermore, as shown, the success of governance also depends on the perception and participation of actors in the field. When fishermen feel they have a role to play and are fairly compensated, levels of compliance, collaboration, and sustainability increase significantly.

Overall, the interaction between institutional dynamics, governance practices, and socio-ecological factors forms the foundation for the sustainability of fishery resources and the resilience of coastal communities. Adaptive, local knowledge-based and participatory institutions enable more resilient management of environmental and social pressures. From here, a conceptual framework can be offered regarding the management of small-scale capture fisheries through strong and participatory institutions that are able to serve as a bridge

between social needs and ecological management. Adaptive capacity is built through social learning and adaptive management, where social learning emphasizes the process of exchanging knowledge, experience, and collective reflection among actors in the fisheries system such as fishermen, governments, and local institutions, so as to create mutual understanding and local innovation in the face of uncertainty. Meanwhile, adaptive management can be done with an approach that combines repeated actions, monitoring, and evaluation so that resource management strategies can be adapted to changing conditions. The combination of these two approaches allows the socio-ecological and institutional systems of small-scale fisheries to be more resilient, responsive to change, and able to maintain a balance between resource sustainability and the well-being of coastal communities.

## 5 Conclusion

The sustainability of small-scale fisheries depends on the ability to integrate social, ecological, and institutional dimensions within a framework of adaptive and inclusive governance. The interaction between the fishing community and the coastal environment forms an important basis for the sustainable management of fish resources. Socio-economic dynamics such as dependence on catches, power relations, and fishing mobility also affect the condition of marine ecosystems that are vulnerable to environmental pressures and climate change. Therefore, participatory governance through co-management and strengthening the role of local institutions are the main keys to strengthening adaptive capacity and improving the effectiveness of resource management. Institutions that are able to respond quickly to change and involve the community in the decision-making process are proven to create a more resilient socio-ecological system. In addition, the integration of local ecological knowledge into formal policies enriches the management base and increases the legitimacy of governance at the community level. This approach not only strengthens socio-ecological resilience to climate change, but also opens up space for more equitable and transparent institutional reforms. However, ideal sustainability demands a shift from top-down governance towards systems that are collaborative and based on social learning.

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