

Optimizing community-based artisanal fisheries approach to improve coastal resilience and community livelihoods

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Abstract. Coastal ecosystems and the livelihoods of communities dependent on them face growing threats from overfishing, habitat loss, and climate change. Artisanal fisheries, community-driven fishing practices, offer a potential solution for promoting both environmental conservation and economic resilience. This paper explores the optimization of community-based (CB) artisanal fisheries management as a means to enhance coastal resilience and improve livelihoods. By integrating traditional ecological knowledge with modern sustainable fishing techniques, communities can develop adaptive strategies to mitigate the impacts of environmental changes while ensuring the sustainable use of marine resources. The approach focuses on community-based participatory governance, where communities and stakeholders at the grassroots level are actively involved in decision-making processes, leading to more equitable resource distribution and a stronger sense of ownership over the marine resources around them. Furthermore, locally relevant innovations, such as local marine protected areas and seasonal fishing bans, have been shown to increase fish stocks, enhance biodiversity, and stabilize incomes. Case studies from coastal areas under the Wallacea II Partnership Program highlight this approach's positive outcomes, demonstrating its potential as a replicable model for balancing conservation and socio-economic development. The paper concludes with recommendations for replicable community-based small-scale fisheries governance approaches to support broader coastal resilience strategies.

1 Introduction

The Wallacea hotspot is famous for its biodiversity with high levels of endemism. This region is also a center of unique cultures, in which abundant resources are integral to people's daily lives. This natural wealth, however, brings along with it challenges of protection amid rapid, even at times destructive, development. Indeed, in many parts of Wallacea, the biodiversity is degrading or is under threat of extinction.

The coastal ecosystems in Wallacea play a vital role in sustaining marine biodiversity, regulating the global climate, and supporting the livelihoods of millions of people worldwide, particularly in the Wallacea area that consists of Nusa Tenggara, Sulawesi, and Moluccas.

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These ecosystems provide essential services such as food security, income generation, and cultural identity for coastal communities. However, they face increasing threats from overfishing, habitat degradation, and the growing impacts of climate change. For communities engaged in artisanal fisheries—small-scale, locally driven fishing practices rooted in traditional knowledge—these environmental challenges are deeply intertwined with economic and social vulnerabilities. Artisanal fisheries, due to their close connection with local ecosystems and community structures, hold significant potential for addressing these complex challenges through participatory and adaptive management approaches.

Despite the acknowledged value of artisanal fisheries, research has not sufficiently explored how these systems can be scaled and sustained through community-based governance models. Previous studies have primarily focused on either the ecological impacts of artisanal fishing or the social dynamics of coastal communities, but few have comprehensively examined the intersection of traditional ecological knowledge (TEK), modern sustainable fishing practices, and inclusive governance structures. This research gap is particularly critical given the rising pressures from industrial fishing, habitat loss, and climate variability, all of which threaten the viability of small-scale fisheries. Therefore, this study aims to fill this gap by analyzing the practical and academic relevance of integrating TEK and scientific approaches in artisanal fisheries management, and by demonstrating how such integration can contribute to both conservation outcomes and socio-economic resilience.

A key component of this study is the Wallacea II Partnership Program (PKW-II), implemented by Burung Indonesia in collaboration with local civil society organizations (CSOs). The program operates across seven priority marine corridors—Togean-Banggai, Pangkajene Kepulauan, South Sulawesi, North Sulawesi, Solor-Alor, and Southeast Sulawesi—and builds on lessons learned from its predecessor, PKW-I. These site-level initiatives emphasize community-based coastal resource management, leveraging local participation to implement adaptive strategies such as community-managed marine protected areas (MPAs), seasonal fishing bans, and selective fishing gear that align with both ecological and socio-economic objectives.

This study adopts a mixed-methods approach to evaluate the effectiveness of PKW-II interventions. Data collection involved a combination of household surveys, semi-structured interviews with fishers and local leaders, participatory mapping, and analysis of secondary data from project reports and monitoring systems. These methods enable an in-depth understanding of the ecological and social impacts of community-based management and the role of traditional knowledge in fostering adaptive and resilient coastal governance.

By presenting case studies from the PKW-II program, this paper explores how integrating TEK with modern scientific knowledge enhances the capacity of artisanal fisheries to respond to environmental challenges while ensuring sustainable livelihoods. The findings contribute to the broader discourse on coastal resilience, offering replicable models for participatory governance that can be applied in similar socio-ecological contexts worldwide.

2 Method

This study was conducted under the Wallacea II Partnership Program (PKW-II), a grant initiative supported by the Critical Ecosystem Partnership Fund (CEPF). The program aims to conserve critical ecosystems and promote the sustainable use of natural resources across key biodiversity hotspots in Wallacea. The methodology integrates a community-based and human-centered design approach, which emphasizes participatory governance, collaboration, and inclusivity at the grassroots level. By placing coastal communities at the core of project design and implementation, the approach ensures that interventions are context-specific, locally owned, and sustainable.

The program operates within the framework of the Marine Ecosystem Profile Update 2020, which outlines six priority investment strategies: species and habitat protection, site governance, community engagement, strengthening community-based protected areas, private sector engagement, and capacity building. These strategies guided project activities across seven ecologically and socio-economically significant marine corridors: Togean-Banggai, Pangkajene Kepulauan, South Sulawesi, North Sulawesi, Southeast Sulawesi, Solor-Alor, and the Buru Seascape. Site selection was based on their biodiversity value, the presence of artisanal fisheries, and the reliance of local communities on marine resources for their livelihoods.

To assess the success and impact of the program, the study employed a mixed-methods approach, combining qualitative and quantitative data collection and analysis. The evaluation process was structured across four main project phases—planning, implementation, monitoring, and evaluation—spanning from October 2020 to September 2024. Data collection was anchored on baseline and endline assessments, which served as key reference points to measure changes in ecological conditions, community engagement, and socio-economic indicators over time.

The primary data collection tools included; Surveys and structured interviews with community members, fishers, local CSOs, and government stakeholders; Focus group discussions to explore community perspectives and validate findings; Participatory mapping and community-led resource monitoring, drawing on traditional ecological knowledge (TEK); Secondary data analysis from project reports, monitoring logs, and ecological assessments conducted by local CSOs.

Quantitative data from surveys and project monitoring were analyzed using pivot tables to identify trends, correlations, and changes over time. These data sets were integrated and managed through ConservationGrants, a dedicated platform for grant tracking, reporting, and learning used throughout the PKW-II program.

To ensure data accuracy and validity, the project implemented a routine data verification process, which included regular data cleaning meetings held every three months, six months, and at the end of the project cycle. These sessions brought together implementing partners and program staff to review inconsistencies, cross-check documentation, and refine data inputs before final analysis.

Overall, this comprehensive and participatory methodology allowed for a holistic evaluation of the program's impact, capturing both measurable outcomes and community-driven insights critical to the adaptive management of small-scale fisheries in Wallacea.

3 Results and Discussion

3.1 Strengthening governance through community-based fisheries management

The PKW-II program has significantly advanced the practice of community-based fisheries management (CBFM) in Wallacea. It has successfully distributed a total of USD 2,690,000 to 46 unique organizations in Wallacea, funding 61 projects through both small and large grants. These projects span seven priority marine corridors, addressing critical coastal ecosystem management and sustainable artisanal fisheries practices.

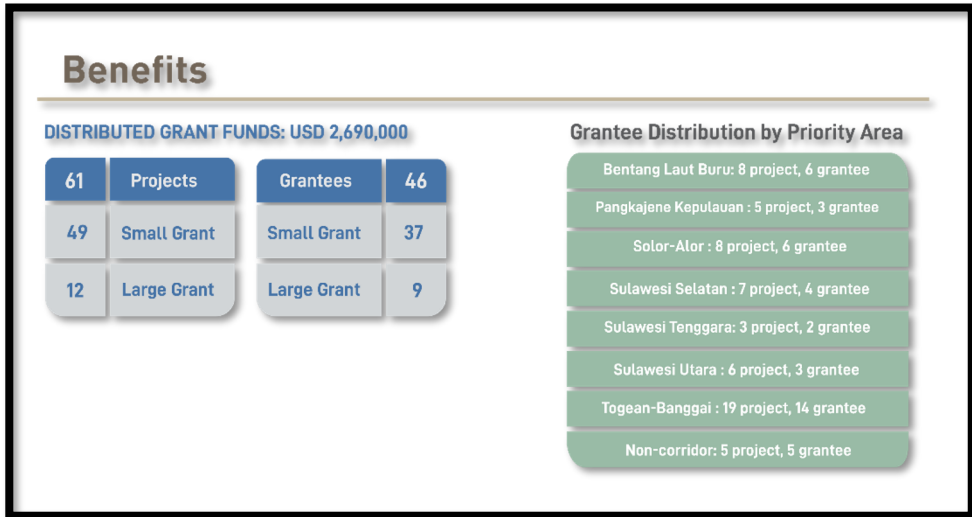


Fig. 1. Project Benefits

The establishment of Community-Based Marine Protected Areas (CB-MPAs), implementation of seasonal fishing bans, and revitalization of traditional governance systems—such as Muro, Ombo, and Kebang Lewa Lolon—exemplify the practical application of common-pool resource (CPR) theory. These initiatives demonstrate how communities can effectively manage shared resources through locally defined rules, community-led monitoring, and enforcement mechanisms. The success of these models lies in their cultural relevance and adaptability to local ecological conditions.

The program’s reach—protecting over 10,000 hectares of CB-MPAs, managing 7,000 hectares of fishing grounds, and enhancing conservation within 25,000 hectares of Key Biodiversity Areas (KBAs)—also reflects the core tenets of resilience-based fisheries management (RBFM).

By incorporating traditional knowledge into adaptive management frameworks, communities have become more resilient to both ecological variability and socio-economic pressures. Initiatives such as rotational closures, seasonal bans, and locally enforced gear restrictions are evidence of a shift toward adaptive governance that reinforces both ecological health and community well-being.

3.2 Behavioral shifts and long-term sustainability

The program has led to observable behavioral changes in coastal communities, such as a reduction in destructive fishing practices and greater community involvement in governance. Endline assessments and interviews indicate improved environmental awareness and a stronger sense of resource stewardship. However, ensuring the longevity of these changes remains a challenge. Sustained behavioral change will depend on continued institutional support, the formal integration of governance models into village regulations (Perdes), legal recognition by higher levels of government, and access to long-term financial mechanisms. Embedding community-led models into regional marine spatial planning frameworks is also critical for ensuring their sustainability.

3.3 Challenges in implementation

While PKW-II has produced many positive outcomes, implementation was not without its challenges:

1. **Technology adoption:** Some communities initially resisted sustainable fishing technologies due to high upfront costs, unfamiliarity, or skepticism about their effectiveness. Targeted mentoring, peer learning, and on-site demonstrations were effective in increasing adoption.
2. **Multi-stakeholder coordination:** Balancing the interests of fishers, village leaders, local government, and the private sector was often complex. In several areas, competing agendas—such as between tourism development and conservation—led to tensions. Facilitated dialogues and conflict resolution workshops helped mediate these challenges and align priorities.
3. **Institutional gaps:** In some regions, weak regulatory frameworks or inconsistent government support slowed the scaling of successful approaches. The program addressed these gaps by strengthening CSO advocacy and supporting the co-creation of local marine policies with community and government stakeholders.

3.4 Lessons in Collective Action and Networked Approaches

What sets the PKW-II program apart is its networked approach, aggregating dozens of localized initiatives into broader ecological and policy outcomes. The model leverages the collective capacity of local CSOs through a flexible re-granting mechanism, enabling knowledge sharing, co-learning, and synchronized action across multiple seascapes. This has amplified impact beyond individual project sites and contributed to regional-level shifts in policy and practice.

The program demonstrates that small-scale, community-driven initiatives, when coordinated and supported through shared platforms, can shape broader coastal governance frameworks. This suggests potential for replication across other regions in Indonesia, particularly those facing similar ecological and governance challenges.

The program's outcomes reinforce the validity of hybrid governance models rooted in CPR and RBFM frameworks. By combining customary governance with formal institutional processes, PKW-II builds adaptive capacity while ensuring local legitimacy. These findings support ongoing efforts to decentralize marine resource management and elevate the role of communities as key stewards of biodiversity.

From a policy standpoint, the PKW-II model offers a compelling case for expanding direct-to-community funding mechanisms. Supporting local CSOs through re-granting has proven effective in delivering both ecological and socio-economic results. Policymakers and donors should prioritize long-term, flexible funding schemes, formal recognition of community-based governance systems, and participatory approaches in the design and implementation of marine policies.

4 Conclusion

Over four years of implementation, the Wallacea II Partnership Program (PKW-II) has demonstrated that community-based small-scale fisheries management, when grounded in traditional ecological knowledge and supported through targeted capacity-building, can be both ecologically effective and socially transformative. This approach has resulted in measurable conservation outcomes, such as the establishment of community-based marine protected areas (CB-MPAs), improved governance over traditional fishing grounds, and the protection of critical ecosystems and endangered species.

Several key findings emerged from this program:

1. Scientific baseline data and local knowledge are essential for targeted and context-relevant grant-making. The use of the updated Marine Ecosystem Profile enabled effective prioritization of biodiversity-rich areas and community needs.
2. Gender inclusion enhances sustainability, as projects that strengthened women's leadership in fisheries management demonstrated higher community engagement and broader impact.
3. Replicability and scalability of community-based governance models have been confirmed across diverse ecological and socio-cultural contexts in Wallacea.
4. Collective impact was significantly amplified by leveraging local civil society organizations (CSOs) through re-granting, enabling policy engagement and innovation beyond site-level outcomes.

Importantly, the PKW-II model offers critical insights for the broader theory of common-pool resource management and resilience-based fisheries: empowering local actors with the tools, knowledge, and governance mechanisms to manage their resources leads to durable ecological and socio-economic resilience. However, the long-term sustainability of these efforts depends on continuous support, policy alignment, and strong inter-stakeholder collaboration.

5 Recommendations

5.1 For Policymakers and NGOs

- Institutionalize community-based management within local and national marine conservation policies.
- Develop funding schemes that support long-term sustainability and capacity development of local CSOs and community institutions.
- Promote co-management frameworks that legally recognize and empower traditional governance systems.

5.2 For Local Communities and CSOs

- Strengthen inter-village networks and fisher cooperatives to promote knowledge exchange, collective bargaining, and collaborative monitoring.
- Invest in local leadership and youth involvement to ensure generational continuity of conservation efforts.

5.3 For Future Research:

1. Examine the durability of behavior change post-project, particularly in relation to sustainable harvesting practices and community governance.
2. Conduct comparative analyses with similar models in other regions (e.g., the Philippines, Eastern Indonesia) to refine best practices and understand context-specific challenges.
3. Explore the integration of climate resilience frameworks into community-based fisheries to prepare for long-term environmental change.

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