

Local Ecological Knowledge in Coastal Resource Management: A Comparative Study of Maluku and Bajo Communities


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ABSTRACT

Background: Coastal ecosystems in Indonesia hold significant ecological and economic value and are managed traditionally by many indigenous communities. Among them, the Indigenous Peoples of Maluku and the Bajo people have long maintained sustainable practices rooted in local ecological knowledge. This study aims to explore how their traditional wisdom contributes to coastal resource management amid modern environmental challenges. A brief review of existing studies highlights the effectiveness of customary marine governance systems and the resilience of these communities. **Methods:** This study uses a literature review, examining peer-reviewed journal articles, research reports, and policy documents published within the last five years. The analysis is grounded in the theoretical framework of community-based resource management and employs a qualitative-descriptive approach to interpret patterns and principles in local ecological knowledge. **Findings:** The Maluku communities utilize the Sasi system, a customary rule that temporarily restricts resource access to allow ecosystem regeneration, demonstrating collective compliance and ecological sensitivity. In contrast, the Bajo people emphasize adaptive mobility and traditional navigation techniques, aligning their fishing practices with natural marine cycles. Both groups exhibit dynamic socio-environmental interactions that enhance ecological resilience. The findings confirm the relevance of indigenous knowledge systems in supporting sustainable coastal management and suggest their compatibility with modern policy frameworks. **Conclusion:** Local ecological knowledge practiced by the Maluku and Bajo communities effectively promotes the sustainability of coastal ecosystems through restriction-based and adaptation-based strategies. These systems offer viable models for integrating customary practices into national environmental policies. **Novelty/Originality:** This study presents a comparative analysis of two distinct indigenous ecological systems, highlighting the complementary roles of spatial restriction (Sasi) and ecological mobility in traditional coastal management, a topic rarely addressed in current literature.

 **KEYWORDS:** Adaptive management; Bajo; Coastal ecosystem; Indigenous knowledge; Maluku

1. INTRODUCTION

Indonesia, as an archipelagic nation, possesses an exceptionally rich and diverse coastal ecosystem. These coastal zones not only function as vital ecological buffers but also serve as primary sources of livelihood for millions of local inhabitants. Over centuries, indigenous communities inhabiting these areas have cultivated sophisticated systems of local ecological knowledge, passed down through generations as part of their cultural heritage. This knowledge encompasses sustainable resource use practices, customary marine governance systems, and conservation strategies rooted in cultural norms.

Among the many coastal communities in Indonesia, the Indigenous Peoples of Maluku and the Bajo Tribe stand out for their longstanding traditions in managing marine environments. The Maluku communities practice Sasi, a customary regulatory system that governs the timing and method of natural resource exploitation. The Sasi system seeks to maintain ecological equilibrium by temporarily closing off marine areas to allow for regeneration, while also imposing sanctions for rule violations (Adhuri, 2013). Beyond regulatory functions, Sasi also includes traditional ecological knowledge in the form of marine area mapping, enabling communities to locate productive fishing grounds without harming sensitive habitats (Nuraini, 2015).

In contrast, the Bajo people, often described as “sea nomads,” exemplify a mobile and adaptive approach to marine resource use. Their deep familiarity with ocean currents, wind patterns, and fish behavior informs their sustainable fishing practices. The Bajo worldview emphasizes reverence for the sea as a life-giving force, discouraging exploitative behaviors. Their skills in boatbuilding and intergenerational transmission of marine spatial knowledge reflect a high level of ecological literacy and environmental adaptation (Clifton, 2013).

This study aims to analyze how local ecological knowledge informs coastal resource management practices in these two culturally distinct communities. Through a structured literature review, the research synthesizes academic studies, policy documents, and indigenous narratives to examine the effectiveness and relevance of traditional systems such as Sasi and Bajo adaptive strategies. The findings are expected to highlight the contributions of indigenous knowledge to coastal sustainability and offer valuable insights for the formulation of community-based marine policies.

2. MATERIALS AND METHODS

This study adopts a literature review methodology to explore local ecological knowledge in coastal resource management as practiced by the Indigenous Peoples of Maluku and the Bajo Tribe. Data were sourced from peer-reviewed scientific journals, academic books, research reports, and relevant policy documents, primarily published within the last five years to ensure contemporary relevance.

The collected literature was systematically categorized into key thematic areas: (1) customary-based resource management systems, (2) sustainable and traditional fishing techniques, and (3) the ecological impact of indigenous knowledge on coastal ecosystems. These themes provided the analytical framework for comparing the two communities.

A descriptive-qualitative approach was employed to interpret and synthesize the selected materials. This approach enabled a contextualized understanding of indigenous ecological practices, focusing on the principles, beliefs, and governance structures embedded in the communities' traditional knowledge systems. Particular attention was paid to how these practices remain

relevant within contemporary coastal management frameworks. To ensure data credibility and consistency, the study conducted cross-validation by comparing findings from multiple sources. This triangulation process helped identify recurring patterns and discrepancies, thereby enhancing the reliability of the conclusions drawn. Additionally, the inclusion of foundational scientific literature strengthened the theoretical grounding of the analysis. Overall, the methodology was designed to capture a comprehensive and nuanced understanding of how local wisdom continues to shape the sustainable management of Indonesia's coastal ecosystems, and to identify lessons that may inform broader policy development in marine governance.

3. RESULTS AND DISCUSSION

3.1 Local Ecological Thinking in the Sasi System (Maluku Communities)

Sasi is a customary system for managing coastal resources in Maluku, grounded in ecological thinking that recognizes the need to limit exploitation to prevent resource depletion. The practice restricts access to marine areas for specific periods, allowing ecosystems to regenerate naturally. This temporal closure applies to resources such as fish, sea cucumbers, and pearls (Gunawan, 2012).

Sasi's success depends heavily on community compliance. When the system is observed strictly, resource stocks tend to recover, indicating effective regeneration. However, non-compliance, often driven by economic pressures or external interventions, leads to overexploitation and ecological degradation. Therefore, Sasi not only regulates access but also reinforces social cohesion through shared ecological responsibility.

The Sasi mechanism operates through two main functions:

- a. **Control of Exploitation:** By enforcing temporal restrictions (Sasi closed/open periods), the community prevents overharvesting and aligns resource use with natural reproductive cycles.
- b. **Strengthening Collective Awareness:** Sasi fosters a sense of collective stewardship. The community is educated to view ecosystem health as a shared obligation, upheld through customary rituals and social sanctions (Gunawan, 2012).

This approach exemplifies how the Maluku people integrate social norms and ecological understanding to manage coastal resources. Their environmental ethics emphasize balance, restoration, and social consensus as core principles of sustainability.

3.2 The Bajo Tribe's Ecological Thinking: Adaptation and Mobility

The Bajo people represent a contrasting model of ecological management. Instead of restricting access, they practice ecological adaptation and spatial mobility. Their traditional knowledge includes expertise in navigation, interpretation of ocean currents, seasonal fish behavior, and the use of sustainable fishing tools (Halim & Mous, 2012).

The Parika system, an informal division of marine territories, exemplifies how the Bajo manage access without rigid rules. It helps prevent overexploitation by limiting the number of fishers in specific zones over time (Nurdin & Grydehøj, 2014).

Key components of the Bajo ecological mindset include:

- a. **Dynamic Resource Use:** The Bajo understand that marine ecosystems are constantly shifting. Rather than enforce restrictions, they move in response to changes in fish availability.
- b. **Mobility as a Conservation Tool:** Instead of exhausting one area, they rotate fishing grounds. This indirect form of regeneration allows previously used areas to recover naturally.

This strategy is especially effective for a nomadic maritime culture. The Bajo demonstrate that sustainability can be achieved not only through regulation but also through spatial flexibility and environmental sensitivity.

3.3 Comparative Analysis: Sasi vs. Bajo Mobility

While both communities aim to achieve sustainability, their methods differ significantly (Table 1):

Table 1.

| Aspect | Maluku (<i>Sasi</i>) | Bajo Tribe |
|----------------------|--------------------------------------|---|
| Ecological Strategy | Temporal restriction | Spatial mobility |
| Governance System | Customary rules and sanctions | Informal, flexible social coordination |
| Community Type | Settled | Semi-nomadic |
| View of Resources | Require regulation and recovery time | Naturally dynamic and migratory |
| Compliance Mechanism | Collective enforcement, rituals | Real-time observation and adaptive behavior |

The Sasi system is better suited to settled communities with established social institutions. In contrast, the Bajo model offers adaptability in dynamic marine environments where fixed rules may not be practical. Both systems represent localized responses to ecological challenges, demonstrating the diversity of indigenous environmental governance in Indonesia.

3.4 Social and Environmental Interactions

In both cases, social systems and environmental awareness are deeply intertwined.

1. **Maluku (Sasi):** The effectiveness of Sasi depends on collective compliance and the authority of customary leaders. Rituals marking the opening and closing of Sasi reinforce spiritual and communal ties to nature. Violators often face not only material sanctions but also social stigma, reflecting the system's reliance on communal ethics (Lampe, 2012).
2. **Bajo:** Social structures among the Bajo are more flexible. Cooperation occurs within kinship groups and fishing collectives, relying on shared environmental knowledge and informal agreements rather than formal

rules. Information about fish abundance and environmental conditions is shared in real-time, allowing rapid adjustment to ecological signals (Rahail, 2016).

These examples illustrate that indigenous ecological knowledge is not just technical but also socially embedded in relationships, cultural values, and community institutions.

4. CONCLUSION

This study highlights how the Indigenous Peoples of Maluku and the Bajo Tribe apply distinct yet equally valuable forms of local ecological knowledge in managing coastal resources. The Sasi system in Maluku exemplifies a regulation-based model rooted in communal enforcement and temporal access restrictions, while the Bajo's strategy relies on mobility and real-time adaptation to ecological dynamics. Both communities demonstrate that indigenous knowledge systems are not static traditions, but living frameworks capable of responding to environmental change. Their approaches promote ecological resilience and sustainability by integrating cultural values, traditional practices, and social cooperation into marine resource management. These findings suggest that incorporating local ecological knowledge into national and regional environmental policies can significantly enhance the effectiveness and cultural relevance of coastal conservation efforts. Customary systems like Sasi and adaptive practices such as Bajo mobility offer tested models for managing complex marine ecosystems in ways that align with both ecological principles and local realities. Future research should explore how these systems can be scaled or adapted to broader governance frameworks, particularly in the context of climate change, marine spatial planning, and indigenous rights protection.

5. CONFLICT OF INTEREST

The author declares no conflict of interest regarding the publication of this article. All research activities, data interpretation, and conclusions were conducted independently and without any financial or personal relationships that could have influenced the outcomes of this study.

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