

REFINING LIVELIHOODS AND SUSTAINABILITY: SOCIO-ECONOMIC CONFLICTS IN MANGROVE CHARCOAL PRODUCTION OF BATU AMPAR, WEST KALIMANTAN

Putra Readyazmara^{1*}, Oki Anggara², Nanik Shobikah³

^{1,2}English Education Study Program, Faculty of Education and Teacher Training, State Islamic Institute of Pontianak, Pontianak, INDONESIA

Abstract

This paper examines the socio-economic and environmental conflicts arising from conventional mangrove charcoal production in Batu Ampar Village, Kubu Raya, West Kalimantan. For decades, mangrove charcoal has been the primary source of livelihood for rural communities in the area. However, the recent tightening of conservation enforcement has resulted in vessel seizures and widespread protests. This study aims to analyze the intricate interplay between economic dependence, regulatory constraints, and sustainability imperatives. A qualitative descriptive method was employed through field observations, semi-structured interviews with producers, community leaders, and local authorities, as well as an analysis of relevant policy documents. Findings indicate that insufficient dissemination of legal frameworks and the lack of viable economic alternatives have exacerbated community resistance and economic vulnerability. Moreover, inadequate institutional support and unclear licensing pathways hinder the transition toward sustainable resource management. The study recommends an integrated approach that includes capacity building for community-based mangrove stewardship, diversification of rural incomes through silvofisheries and ecotourism, and regulatory reforms to harmonize conservation objectives with local livelihoods. These findings highlight the urgent need for ethical and participatory strategies that balance environmental preservation with socio-economic justice.

Keywords:

Mangrove Charcole, Rural Livelihoods, Enviromental Governance, Sustainability.

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^{1*}Contact: readyazdroronoa@gmail.com

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INTRODUCTION

For many years, the manufacturing of charcoal from mangroves has been a vital part of rural lives in Batu Ampar, Kubu Raya Regency, West Kalimantan. With its vast mangrove forests, this region has long provided premium mangrove charcoal, especially from *Rhizophora* species, to both domestic and foreign markets. In East Asian nations, the product is favored for industrial and culinary applications because to its low smoke emissions and extended burning characteristics. Charcoal manufacture is a cultural practice ingrained in social relationships, local identity, and the transfer of skills between generations for many local households.

However, Indonesia's changing environmental governance over the past 20 years has drastically changed the environment in which charcoal producers operate. The Indonesian government has attempted to stop mangrove degradation and restore lost forest cover through programs like the National Mangrove Rehabilitation Movement and the creation of the Peatland and Mangrove Restoration Agency (BRGM) under Presidential Regulation No. 120/2020. This is in line with international pledges to mitigate climate change by protecting biodiversity, coastal resiliency, and sequestering blue carbon. Mangroves are known to provide important ecological services, including as stabilizing shorelines, serving as fish nidification grounds, and storing up to four times as much carbon as terrestrial forests.

While such policies are laudable from an environmental perspective, they have inadvertently generated socio-economic tensions at the local level. For Batu Ampar's communities, the abrupt restriction or criminalization of mangrove harvesting, coupled with limited alternative income opportunities, has created livelihood insecurity. Field reports and local media coverage document cases of confiscated charcoal, penalized producers, and heightened distrust between enforcement agencies and villagers. The tension is further complicated by overlapping jurisdiction between forestry, marine, and local governance authorities, leading to inconsistent messaging on what constitutes legal versus illegal production.

Even while these regulations are admirable from an environmental standpoint, they have unintentionally led to socioeconomic conflicts locally. Communities in Batu Ampar are experiencing livelihood insecurity as a result of the sudden prohibition or criminalization of mangrove harvesting and the scarcity of other sources of income. Cases of confiscated charcoal, fined producers, and increased mistrust between the villagers and law enforcement are documented in field reports and local media coverage. Overlapping jurisdiction between local governance forestry, and marine authorities

exacerbates the conflict and results in conflicting messages about what is considered lawful vs illicit production.

Therefore, the problem statement is twofold: (1) how to balance the long-term necessity of ecosystem restoration with the immediate economic needs of households that depend on mangroves; and (2) how to overcome the institutional and regulatory fragmentation that presently impedes community-led solutions.

This paper aims to address these issues by:

1. Examining the socio-economic dependency of Batu Ampar communities on mangrove charcoal production;
2. Identifying the regulatory and ecological challenges arising from current governance frameworks; and
3. Proposing transition pathways toward sustainable, legality-aligned, and diversified livelihoods particularly through Associated Mangrove Aquaculture (AMA) and community-based management models.

By grounding the analysis in field observations, interviews, and document review, this study contributes to both academic understanding and policy discourse on sustainable coastal resource management. It also aligns with the conference sub-theme of *Green Economy and Social-Humanities with Environmental Ethics*, offering a case study that integrates ecological preservation with socio-economic justice.

METHODS

The socioeconomic, legal, and ecological aspects pertaining to Batu Ampar's mangrove charcoal manufacturing is captured by this study using a qualitative descriptive methodology. Because the study subject encompasses human views, lived experiences, and institutional contexts that are not entirely amenable to quantitative measurement alone, a qualitative framework was used. While using factual information from government reports, policy documents, and spatial analyses, descriptive analysis enables in-depth descriptions of livelihood strategies, conflict narratives, and governance systems.

One of the coastal subdistricts in Indonesia's Kubu Raya Regency's West Kalimantan is Batu Ampar. It is distinguished by vast mangrove habitats that are dominated by *Avicennia marina* and *Rhizophora apiculata*. A number of settlements, including Batu Ampar, Nipah Panjang, and Teluk Nibung, serve as centres for the manufacture of charcoal, and the region is reachable by river and coastal waterways. In addition to its ecological significance, the mangrove forests in this area provide the majority of households with their main source

of income, especially through felling, operating charcoal kilns, and downstream trading.

Data were collected between January and March 2025 through three complementary methods: The first is non-participant observation. Researchers went to important production locations, such as loading ports, wood storage facilities, and charcoal kilns. Daily operations, raw material flow, kiln technology, and patterns of interaction between employees, traders, and municipal authorities were the main subjects of the observations. Visible ecological effects, including clear-cut areas, replanting initiatives, and erosion-prone areas, were also noted in field notes. The second is semi-structured interviews. Charcoal producers (small-scale kiln owners and laborers) to understand livelihood dependency and operational constraints; Community leaders and elders to capture historical perspectives on resource use and cultural significance; Village officials to map local governance structures; Provincial and district forestry officers. A total of 15 interviews were conducted with diverse stakeholders: to gather insights on regulatory enforcement and restoration programs. Interview guides were designed to be flexible, allowing participants to elaborate on themes such as licensing processes, market demand, and perceptions of sustainability. The third is document analysis. Key documents reviewed included national regulations, such as Presidential Regulation No. 120/2020 establishing BRGM and associated mangrove rehabilitation policies; Technical guidelines on Associated Mangrove Aquaculture (AMA) published by Wetlands International and EcoShape; Provincial mangrove management plans and Kubu Raya's forestry statistics; Media reports and NGO publications documenting recent enforcement actions, community responses, and pilot restoration efforts in West Kalimantan.

RESULTS AND DISCUSSION

Livelihood Dependence and Informal Access

Charcoal manufacturing continues to be the main source of income for the majority of households in the villages that are close to mangroves in Batu Ampar, according to field observations and interview data. Small-scale kiln owners typically run three to six kilns, each of which produces 1.2 to 1.5 metric tons of charcoal every burning cycle. These kilns, which have an estimated 20–25 days cycle, provide consistent but modest financial flows, frequently providing for extended families.

There is little income diversification; additional pursuits like trading, small-scale fishing, and crab collecting are mostly seasonal and cannot fully replace revenue

from charcoal. Wood harvesters feed kiln owners, who then sell to intermediaries or exporters, usually at Pontianak or via coastal shipping routes to Malaysia and Singapore. This tight value chain is another characteristic of the charcoal trade. But there are issues with timber extraction's legal standing. Due to the high transaction costs, administrative obstacles, and unclear eligibility criteria, many growers do not have formal harvesting permits. Therefore, harvesting is theoretically prohibited because it often takes place in conservation zones or protected forest regions. This informality fuels cycles of mistrust between local communities and law enforcement, putting producers at danger of confiscation, penalties, or incarceration.

This reliance serves as an example of a resource trap from a socioeconomic standpoint: although mangrove charcoal offers security for sustenance, its illegality and environmental effects jeopardize sustainability over the long run. This supports the conclusions of more recent studies by Putra Publisher (2025) and Prasetyamartati et al. (2008), which emphasize how livelihoods and access regulations are interwoven in Batu Ampar.

Regulatory Landscape and Enforcement Gaps

In Indonesia, the regulations governing the use of mangroves are complicated. While other regulations such as the decrees of the Ministry of Environment and Forestry—manage forest exploitation, licensing, and conservation, Presidential Regulation No. 120/2020 creates BRGM with a mandate for peatland and mangrove restoration. In actuality, several agencies share jurisdiction: Forestry Department regulates forest classification and resource extraction; The Marine and Fisheries Department oversees coastal and aquaculture zones; Local governments handle spatial planning, economic permits, and smallholder support.

This multi-tiered governance frequently leads to conflicting enforcement and overlapping mandates. One village chief, for instance, stated that forestry officials had prohibited harvesting in specific areas, but at the same time, a district-level initiative promoted community-based reforestation without making it clear if selective cutting was acceptable. Additionally, enforcement measures are not always consistent. While some manufacturers operate openly without consequence, others seize charcoal shipments without warning, suggesting selective enforcement that may be related to informal agreements or resource limitations. Such uncertainty deters compliance and calls into question the validity of conservation initiatives.

These results are consistent with international research on common-pool resource governance, which shows that conflict and resource degradation are frequently made worse by ambiguous property rights and dispersed authority (Ostrom, 1990; Agrawal & Gibson, 1999). The absence of an easily accessible and reasonably priced licensing system in Batu Ampar feeds socio-environmental tensions and sustains informality.

Environmental Conditions and Pressures

Although Kubu Raya has one of West Kalimantan's largest contiguous mangrove belts, there are also areas of degradation, according to satellite photography and provincial forestry statistics. Mangrove cover in some Batu Ampar zones decreased by as much as 20% between 1990 and 2020, mostly as a result of coastal erosion, charcoal harvesting, and pond conversion. Field observations during this study noted several ecological stressors: Clear-cut patches near kiln clusters, sometimes lacking signs of natural regeneration; Erosion and sedimentation altering tidal flows, particularly in areas with heavy logging; Intrusion of *Nypa fruticans* in disturbed sites, altering species composition.

In addition to human activity, West Kalimantan mangroves are threatened by biotic factors such as bug outbreaks (*Bruguiera* defoliators), which are recorded in provincial forestry reports. When taken together, these stresses weaken mangrove ecosystems' resilience, which may compromise their ability to safeguard the shoreline and serve as fisheries nidification habitats.

The environmental aspect of the livelihood argument is crucial since deterioration threatens not only ecosystem services but also the sustainability of charcoal production in the long run. The long-term economic costs of losing mangroves, such as decreased fisheries, greater storm damage, and carbon release, frequently surpass the short-term benefits of extraction, according to international research on blue carbon stress.

Transition Pathways: From Charcoal to AMA and Diversified Incomes

Associated Mangrove Aquaculture (AMA) is a type of silvofishery that combines aquaculture output and mangrove restoration, making it one of the most promising models for balancing livelihood and conservation goals. Mangroves reforest between 30 and 50 percent of the pond area in AMA, with the remaining portion being used for shrimp or fish farming. This design preserves (and occasionally increases) aquaculture production while restoring ecological functions. Technical guidelines from Wetlands International and EcoShape provide detailed prescriptions for AMA implementation: Hydrology-first approach to ensure tidal flushing and nutrient flow; Strategic bund placement to balance mangrove survival and pond productivity; Mixed planting of *Rhizophora* and *Avicennia* to optimize ecological resilience.

Pilot projects in the Philippines and Central Java have shown that AMA may diversify household economies, produce steady revenue, and be eligible for carbon credit programs. The difficulty for Batu Ampar is in modifying these models to fit local land tenure circumstances, market demand, and tidal patterns.

At the same time, Community-Based Mangrove Management (CBMM) offers an institutional framework for local stewardship. Successful CBMM initiatives in Central Java combine specific tenure rights with benefit-sharing agreements, enabling communities to earn consistent income from non-timber products including honey and handicrafts as well as ecotourism (Damastuti et al., 2022).

Institutional Support, Sequencing, and Financing

Transitioning from charcoal dependence to sustainable livelihoods requires a sequenced approach: Short-term legality bridges Temporary or conditional permits allowing continued harvesting under strict quotas and replanting obligations; Capacity-building Training on AMA techniques, business planning, and eco-tourism management; Pilot diversification projects Small grants or micro-loans for alternative enterprises (e.g., mangrove honey production, crab fattening, handicraft workshops); Scaling and financing Leveraging corporate social responsibility (CSR) funds, provincial budgets, and results-based payments from blue carbon markets.

At the village or sub-district level, a "one-stop" licensing and advice service would expedite the process of obtaining permits and limit prospects for rent-seeking. Additionally, access to financial and technical assistance is guaranteed when local programs are in line with BRGM's national goals.

This transition method tackles the structural and proximate causes of unsustainable charcoal production by combining ecological, economic, and institutional aspects. Additionally, it establishes Batu Ampar as a model for striking a balance between socioeconomic fairness and environmental preservation, which is a key objective of Indonesia's green economy plan.

CONCLUSION

Batu Ampar's charcoal sector is legally and ecologically precarious. The following are essential for a just transition: (i) establishing clear access and licensing guidelines with credible short-term legality paths; (ii) quickly piloting CBMM and AMA/silvofishery; and (iii) integrating restoration and diversification into a planned, funded roadmap that is in line with national rehabilitation objectives. This strikes a compromise between socioeconomic justice and environmental preservation, and it fits in with the conference's sub-themes on the development of the green economy and the integration of social-humanities and environmental ethics.

The mangrove charcoal industry of Batu Ampar exemplifies a well-known resource dependency conundrum: it supports local sociocultural identity and generates necessary revenue, but it is also enmeshed in a precarious legal and ecological environment. The results of this investigation demonstrate that: 1.) High livelihood dependence.

The majority of households rely on charcoal production for daily subsistence, with minimal diversification options and strong market demand sustaining the value chain; 2.) Regulatory ambiguity and enforcement

inconsistency. Overlapping mandates among government agencies, coupled with unclear licensing pathways, create a governance vacuum that fosters informality and conflict; 3.) Ecological pressures. Significant degradation patches are visible in harvesting areas, threatening long-term ecosystem services and the viability of charcoal as a livelihood; 4.) Feasible transition pathways exist. Models like Associated Mangrove Aquaculture (AMA) and Community-Based Mangrove Management (CBMM) have demonstrated potential to balance conservation with income generation when adapted to local contexts. These findings highlight the urgency of a just transition one that simultaneously secures household welfare, restores ecological integrity, and aligns with Indonesia's national and international environmental commitments.

The broader implication is that sustainable resource governance in coastal communities must go beyond prohibition and enforcement. It requires institutional innovation, participatory decision-making, and multi-source financing to bridge the gap between environmental objectives and socio-economic realities.

The case of Batu Ampar offers lessons applicable to many coastal communities in Southeast Asia facing similar livelihood–conservation trade-offs. By moving toward legality-aligned, ecologically sound, and economically viable models, it is possible to transform a contested resource economy into a cornerstone of sustainable development.

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