

Mangrove Restoration as an Implementation of Environmental Legal Responsibility: a Critical Analysis of Law No. 32 Of 2009 on Environmental Protection and Management

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Article Info	ABSTRACT
<p>Keywords: Mangrove restoration, environmental law, Law No. 32 of 2009, legal responsibility.</p>	<p>Mangrove ecosystems play a crucial role in maintaining coastal ecological balance, protecting biodiversity, and mitigating the impacts of climate change. However, increasing environmental degradation and land-use changes have led to severe mangrove deforestation in Indonesia. This paper critically analyzes the implementation of Law No. 32 of 2009 on Environmental Protection and Management in relation to mangrove restoration efforts. By adopting a juridical-normative approach combined with a socio-legal perspective, the study explores the extent to which legal frameworks have been effectively translated into actionable restoration programs. The analysis highlights both the strengths and gaps in the current regulatory system, including the lack of law enforcement, weak institutional coordination, and limited community participation. It is found that while the law provides a strong foundation for environmental responsibility, its practical implementation remains inconsistent and fragmented. Strengthening policy integration, enhancing local governance, and promoting collaborative restoration initiatives are key to ensuring that mangrove rehabilitation aligns with Indonesia's legal obligations. This study contributes to the discourse on environmental governance by emphasizing the need for legal reforms and policy coherence in achieving sustainable coastal ecosystem restoration.</p>
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INTRODUCTION

Mangrove forests, located in coastal zones, constitute critical ecosystems that contribute significantly to maintaining environmental equilibrium. Their ecological functions include serving as natural buffers against coastal erosion, breeding grounds for marine biodiversity, absorbers of carbon emissions, and protective barriers against natural disasters such as tsunamis and tidal flooding (Gunawan, 2022). Moreover, mangroves provide substantial economic value to coastal communities through fisheries, aquaculture, and ecotourism activities.

Despite their importance, mangrove ecosystems in Indonesia face severe degradation, primarily due to land conversion for aquaculture, infrastructure expansion, illegal logging, and insufficient regulatory enforcement. These anthropogenic pressures not only undermine the protective and ecological functions of mangroves but also threaten biodiversity and climate resilience. According to data cited by Majid et al. (2016) in Gunawan (2022), approximately 68%—equivalent to 5.9 million hectares—of Indonesia's 8.6 million hectares of mangrove forests are in a critically damaged state. This alarming condition underscores the urgent need for comprehensive and sustainable restoration strategies involving multi-stakeholder collaboration, including the government, private sector, and local communities.

One prominent example of such collaborative efforts is the mangrove restoration initiative spearheaded by Yagasu (Yayasan Gajah Sumatera), a non-governmental organization focused on environmental conservation and community empowerment. Yagasu adopts a community-based approach, actively engaging local populations in the reforestation and maintenance of degraded mangrove areas. These efforts not only contribute to ecological recovery but also offer socio-economic benefits to the local communities, thereby promoting sustainable development.

Yagasu's restoration activities are closely linked to the legal dimension of environmental protection, particularly in the context of Law No. 32 of 2009 on Environmental Protection and Management (UU PPLH). This legislation mandates that individuals or entities responsible for environmental degradation are legally obliged to undertake restoration measures. It further emphasizes the shared responsibility of both state and society in environmental stewardship. Accordingly, mangrove restoration initiatives can be interpreted not only as environmental or social actions but also as legal obligations within Indonesia's environmental governance framework.

This study aims to critically examine the intersection between Yagasu's mangrove restoration initiatives and the enforcement of environmental legal responsibility under Law No. 32/2009. It seeks to assess how legal provisions are operationalized in community-based environmental programs and to what extent public participation contributes to fulfilling statutory environmental duties. The findings are expected to offer insights into the practical implementation of environmental law in Indonesia and highlight the role of legal instruments in supporting sustainable ecological restoration.

Literature Review

Environmental Law

Environmental law is a branch of the legal discipline that is concerned with the legal regulation of the behavior or activities of legal subjects in the utilization and protection of natural resources and the environment as well as the protection of humans from negative impacts arising from the utilization of natural resources. (Rahmadi, 2012) The substance of environmental law is not always limited to regulations concerning environmental protection in the sense of environmental preservation, but rather encompasses a number of legal provisions related to efforts to prevent and address environmental problems, particularly those caused by human activity. Environmental problems for humans can be seen in the

decline in environmental quality. Environmental quality concerns the environment's value for human health, well-being, and well-being. Environmental law has two dimensions: the first contains provisions on community behavior, all of which aim to regulate community members in fulfilling environmental law, meaning that it guides the community regarding what is prohibited and permitted for the environment.

The second dimension grants rights, obligations, and authority to government agencies to manage the environment. Environmental management in Indonesia must be protected and managed properly based on the principles of state responsibility, sustainability, and justice. Furthermore, environmental management must be able to provide economic, social, and cultural benefits based on the principles of prudence, environmental democracy, decentralization, and recognition and appreciation of local wisdom and environmental wisdom. This is a manifestation of environmental sustainability.

Law No. 32 of 2009 concerning Environmental Protection and Management

Law No. 32 of 2009 is the primary legal umbrella for environmental management in Indonesia. The legal definition of the environment is regulated in Article 1, point 1 of Law No. 32 of 2009 concerning Environmental Protection and Management (hereinafter abbreviated as UUPPLH), which is defined as a spatial unity with all objects, forces, conditions, and living creatures, including humans and their behavior, which affect nature itself, the continuity of life, and the well-being of humans and other living creatures. All elements of the environment are a unity that together form a series of balances within the ecosystem.(Koeswadji, 1993). Then in (Article 69 and Article 74 of Law 32/2009), an important provision that must be implemented is the legal responsibility of individuals, corporations, and the state in preventing and remediating environmental damage.

Mangrove Ecosystem

The mangrove ecosystem is a unity between mangroves, animals and other organisms that interact with each other and their environment (Minister of Forestry Regulation No. P35 of 2010). The ability of each type of adaptation to environmental conditions causes differences in the composition of mangrove forests with distinctive boundaries. This is a result of the influence of soil conditions, salt content, duration of inundation and tidal currents. The ecological functions of mangroves include: as a coastline protector, can prevent seawater intrusion, as a habitat for many biota, a place to find food (feeding ground), a place for care and growth (nursery ground), a spawning ground (spawning ground) for various aquatic biota. Kustanti (2011) in(Donny Juliandri Prihadi, 2018)states that there are two groups of fauna in the mangrove ecosystem: terrestrial fauna and aquatic fauna. Terrestrial fauna do not have special adaptations for living in mangrove forests, for example: insects, snakes, primates, and birds. Meanwhile, aquatic fauna consists of two types: (a) fauna that lives in the water column, primarily various types of fish and shrimp; and (b) those that inhabit the substrate, primarily crabs, shellfish, and various types of invertebrates.

Mangrove restoration is an effort to restore damaged or lost mangrove forest ecosystems so that they can function again ecologically, socially, and economically.

Mangroves play a vital role in maintaining environmental balance, such as providing habitat for various species of fish, crabs, shrimp, and birds, absorbing carbon to mitigate the impacts of climate change, protecting coastlines from abrasion and storms, and filtering pollutants to maintain water quality. The mangrove restoration process begins with identifying the damaged location and analyzing the causes of the damage, such as reclamation, land conversion to fishponds, or pollution. Afterward, an environmental analysis is conducted to ensure that soil conditions, salinity, and tidal systems support mangrove growth.

Restoration Planning.

Restoration planning involves selecting mangrove species appropriate to local conditions and engaging the surrounding community to ensure sustainable restoration. Mangrove planting can be done using various techniques, such as direct planting of seedlings or propagules, while maintaining optimal spacing. After planting, regular monitoring and maintenance are carried out, such as replacing dead seedlings and protecting the area from disturbance. Challenges in mangrove restoration include planting failure due to unsuitable environmental conditions, lack of community participation, long-term programs that are not properly monitored, and development pressures. Therefore, empowering local communities and providing outreach to the community are crucial for mangrove restoration to become a sustainable, long-term solution. Mangrove restoration has increasingly become a focus of both environmental science and legal discourse, particularly in countries vulnerable to coastal degradation such as Indonesia. Numerous studies highlight the critical role mangroves play in ecological resilience, coastal protection, and carbon sequestration (Alongi, 2008; Donato et al., 2011). Mangroves act as natural defenses against storm surges and erosion while supporting marine biodiversity and community livelihoods. However, mangrove ecosystems remain among the most threatened due to anthropogenic pressures, including land conversion, urbanization, aquaculture, and weak governance (Giri et al., 2011; Primavera et al., 2005). The legal basis for environmental protection in Indonesia is primarily established through Law No. 32 of 2009 on Environmental Protection and Management (UU PPLH). This law emphasizes the principle of environmental responsibility, which includes the obligation to restore damaged environments as a legal consequence of environmental degradation (Article 53–54). The concept is in line with the “polluter pays” principle, widely recognized in international environmental law, which holds that entities causing environmental damage must bear the costs of mitigation and restoration (Birnie, Boyle, & Redgwell, 2009).

The implementation of this legal mandate, however, faces challenges in practice. Scholars such as Siti Sundari (2017) and Nurul Huda (2020) argue that despite the comprehensive legal framework, weak law enforcement, insufficient institutional capacity, and the lack of public awareness hinder effective environmental governance in Indonesia. Local governments often lack the resources or political will to ensure compliance, especially in coastal and remote areas. Community-based restoration models have emerged as a complementary approach to state-driven environmental management. According to

Armitage et al. (2009), the involvement of local communities in ecosystem restoration leads to more sustainable and context-sensitive outcomes. The success of such models depends on legal recognition, participatory governance, and socio-economic incentives. The mangrove rehabilitation program initiated by Yagasu (Yayasan Gajah Sumatera) is an example of such community-based legal fulfillment. Their approach combines ecological restoration with legal compliance and livelihood development, aligning with the integrated environmental responsibility mandated by law.

Previous studies on Yagasu's work (Gunawan, 2022; Yagasu Annual Reports) indicate that their programs not only improve environmental conditions but also contribute to public legal awareness and promote community participation in environmental restoration. Nonetheless, there is limited academic analysis linking such practices directly with the implementation of environmental legal obligations under Law No. 32/2009. Therefore, this study aims to fill the gap by examining the intersection of environmental law enforcement and community-driven mangrove restoration. By contextualizing empirical restoration activities within the framework of statutory environmental duties, the research seeks to evaluate the extent to which environmental law in Indonesia has been translated into tangible ecological outcomes.

METHOD

This research uses a sociological juridical method, an approach that examines law not only as written norms (law in books) but also in the context of its application in society (law in action). This approach was chosen because the issues studied relate not only to the legal norms in Law Number 32 of 2009 concerning Environmental Protection and Management, but also to their implementation in mangrove restoration activities as a form of environmental legal responsibility. This research uses a juridical-sociological method, an approach that examines law not only as written norms (law in books), but also in the context of its application in society (law in action). This approach was chosen because the problems studied are not only related to legal norms in Law Number 32 of 2009 concerning Environmental Protection and Management, but also to their implementation in mangrove restoration activities as a form of environmental legal responsibility. Data collection techniques were carried out through document studies, which included analysis of regulations, restoration project reports, and relevant academic literature, and also through field observations to directly observe the condition of the restoration area and the level of community involvement in the process. The data obtained were then analyzed qualitatively using a descriptive-analytical method, namely by presenting data based on the findings and systematically linking them to relevant legal theories and norms, in order to assess the extent to which mangrove restoration has become a real form of implementation of environmental legal responsibility as regulated in Law Number 32 of 2009. This study employs a qualitative legal research design with a juridical-normative approach, supported by a socio-legal perspective to examine the implementation of environmental legal responsibilities in mangrove restoration practices. The juridical-normative approach focuses

on analyzing statutory regulations, particularly Law No. 32 of 2009 on Environmental Protection and Management, alongside related environmental and coastal management policies. This approach involves a comprehensive interpretation of legal texts, principles, and doctrines that define environmental obligations and restoration mandates. To complement the normative analysis, a socio-legal lens is applied to assess the practical implementation of these legal provisions within community-based mangrove restoration efforts, particularly the initiatives carried out by Yagasu (Yayasan Gajah Sumatera).

This dual-method framework allows the study to bridge the gap between legal norms and field realities. The data were analyzed using content analysis and comparative legal analysis, focusing on three key aspects:

1. the consistency of restoration activities with legal obligations,
2. the effectiveness of legal enforcement mechanisms, and
3. the role of community participation in fulfilling environmental responsibilities.

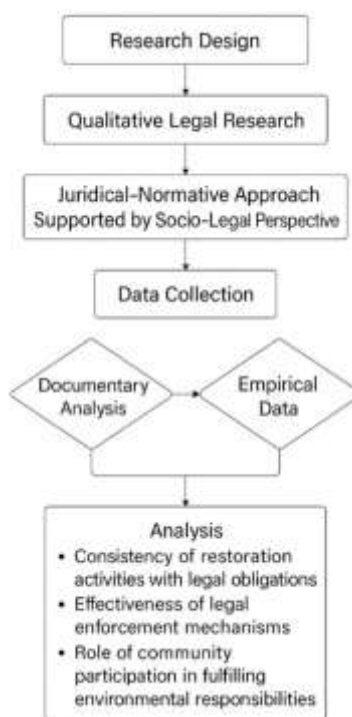


Figure 1. Flowchart System.

Triangulation was applied to validate the findings from normative sources and field-based observations. The integration of legal theory with empirical insights enables a more comprehensive understanding of how environmental law operates in practice, particularly in the context of ecosystem restoration and coastal governance.

RESULTS AND DISCUSSION

The results of this study reveal a complex interplay between legal mandates and the practical implementation of mangrove restoration efforts in Indonesia. Through an analysis

of statutory frameworks and community-based restoration initiatives, particularly the case of Yagasu (Yayasan Gajah Sumatera), three key findings emerged:

Legal Consistency of Mangrove Restoration Practices

The activities undertaken by Yagasu align substantially with the provisions outlined in Law No. 32 of 2009, particularly those relating to environmental restoration obligations. Article 53 of the law explicitly mandates that individuals or entities responsible for environmental degradation must undertake recovery efforts. Yagasu's programs, although not implemented by perpetrators of damage, fulfill the legal objective of ecological restoration and demonstrate how civil society can support the state's responsibility in enforcing environmental protection. However, the law lacks specific operational guidelines for NGO-led restoration, creating ambiguity in the formal recognition of such efforts under legal frameworks. Mangrove ecosystems, which grow in coastal areas, play a crucial role in environmental balance, both ecologically and economically. Mangroves serve as a barrier to abrasion, coastal protection from tsunamis and strong winds, carbon sinks that mitigate the effects of climate change, and play a vital role in the development of coastal fisheries (Heriyanto and Subiandono, 2012) in (Anisa Fitria 2021).

Based on the results of document studies and field observations conducted, it was found that the implementation of mangrove restoration had been carried out, the Ministry of Finance of the Republic of Indonesia, represented by the Ministry of Finance of North Sumatra, and the Sumatran Elephant Foundation (YAGASU), collaborated to organize a mangrove planting activity as part of environmental conservation and climate change mitigation efforts. The activity took place on Saturday, October 21, 2023, in Rugemuk Village, Pantai Labu District, Deli Serdang, North Sumatra. This restoration began with a mangrove seedling planting activity which was carried out in stages and continuously with the planting of 500 *Rhizophora* mangrove seedlings planted simultaneously by the participants. *Rhizophora* was chosen because of its strong roots, which are effective in fighting coastal erosion and providing protection for fish and other marine biota.



Figure 2. Mangrove Planting

Despite the existence of a robust legal structure, implementation is hindered by weak enforcement mechanisms. Local governments often lack the institutional capacity, financial resources, or political will to monitor, sanction, and enforce restoration obligations. This has resulted in inconsistent application of the law across regions. In practice, much of the restoration is left to NGOs and donor-funded programs. While these initiatives fill critical gaps, they highlight the insufficiency of state-driven enforcement and the need for improved coordination among government agencies. Yagasu's approach emphasizes community participation through training, employment in planting efforts, and shared decision-making, aligning with Article 70 of Law No. 32/2009, which encourages public involvement in environmental protection.

Mangrove Planting

This program's implementation doesn't stop at the planting stage. Yagasu develops a sustainable approach by involving the community in the nursery, maintenance, and monitoring of mangrove growth. Training and outreach programs are also provided to local communities on the importance of protecting coastal areas.

Some important points conveyed in the socialization are:

1. The public is provided with information about the various ecological and economic benefits of mangroves. Mangroves function as abrasion barriers that protect the coast from erosion, water filters that reduce pollution, and breeding grounds for fish and other marine life that provide a livelihood for coastal communities.
2. Explain that illegal logging not only damages the environment but can also reduce biodiversity in the area. The loss of mangroves will reduce the number of species living within them, disrupt the sustainability of marine ecosystems, and can threaten the livelihoods of communities that depend on these ecosystems, such as fishermen.

Illegal logging also exacerbates the potential for natural disasters, such as worsening coastal erosion, which can damage settlements and agricultural land.

3. During the outreach, the Sumatran Elephant Foundation also encouraged the community to collaborate with the government and non-governmental organizations in managing and preserving mangroves. This collaboration is crucial to ensure that mangrove conservation is not solely the responsibility of one party but rather a shared responsibility.



Figure 3 Socialization regarding mangroves

In addition, local community groups have been facilitated and their capacity strengthened to become driving forces for restoration at the community level. The existence of these community groups is crucial for maintaining the sustainability of the program and for realizing community participation, as mandated by Article 70 of the Environmental Management Law (UUPPLH), which regulates the rights and roles of communities in environmental protection and management.

However, in practice, implementing environmental legal responsibilities through mangrove restoration also faces challenges such as mangrove logging, pests, and wildlife such as monkeys. Furthermore, ecological constraints such as coastal erosion, tidal changes, and high levels of plastic waste pollution in coastal areas hinder the growth of mangrove seedlings. This is exacerbated by weak legal oversight and a lack of technical regulations at the village level, such as village regulations (Perdes) on mangrove conservation areas or household waste management in coastal areas.

Despite the challenges, Yagasu's mangrove restoration remains an effective implementation of environmental legal responsibility. The activities undertaken by Yagasu and its partners reflect fundamental principles such as responsibility, precautionary principle, and environmental justice. This restoration not only fulfills the legal obligation to restore damaged environments but also builds legal and social awareness among coastal

communities. Furthermore, this activity has facilitated the development of local institutional innovations in the form of Village Regulations (Perdes) on mangrove protection, which are a crucial component of environmental law implementation at the village level.

This program has successfully translated the legal norms contained in the UUPPLH into concrete actions in the community. This is evident in the synergy between the government, non-governmental organizations, and local communities, who are actively involved in all stages of the activity, from planning and implementation to maintenance of restoration results. This activity also demonstrates that the implementation of environmental law is not solely carried out through repressive mechanisms, but through a preventive and participatory approach. By empowering local communities and strengthening social institutions at the village level, this program demonstrates that environmental law can be implemented effectively when supported by a shared commitment and an inclusive approach.

It can be concluded that the mangrove restoration by Yagasu in Rugemuk Village, Pantai Labu District, Deli Serdang, North Sumatra is an example of the real implementation of environmental law provisions stipulated in Law No. 32 of 2009. However, to ensure its sustainability, it is necessary to strengthen local regulations through the issuance of a special Village Regulation on the protection of mangrove ecosystems, strengthening the capacity of local institutions, and providing sufficient resources for supervision and maintenance. Local governments are also advised to form an environmental monitoring team or appoint Civil Servant Investigators (PPNS) who are authorized to take action against violations in the restoration area. Thus, this restoration activity is not only a symbol of commitment to environmental law, but also an integral part of just and sustainable environmental governance.

CONCLUSION

The implementation of mangrove restoration as a form of environmental legal responsibility based on Law No. 32 of 2009 still faces various challenges in its implementation. Legally, regulations have provided a clear basis regarding the obligation to protect and restore the environment. However, in practice, implementation in the field has not been effective due to weak law enforcement, lack of synergy between government agencies, and low community participation. Restoration efforts are often not a priority, and their implementation remains unsustainable. Therefore, in order for the implementation of mangrove restoration in accordance with the mandate of Law No. 32 of 2009, institutional strengthening, increased human resource capacity, consistency in law enforcement, and integration of restoration programs into sustainable development policies at the national and regional levels are needed.

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