

Marine Pollution and Fishermen's Rights: A Socio-Legal Examination of Coastal Environmental Law in Indonesia

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Abstract

Marine pollution has become a critical environmental and socio-legal issue in Indonesia, particularly affecting coastal communities whose livelihoods depend on fisheries. According to the Ministry of Environment and Forestry, approximately 38% of Indonesia's coastal waters are moderately to heavily polluted, with plastic waste contributing nearly 0.48–1.29 million metric tons annually to the ocean (World Bank, 2021). This pollution directly impacts fishermen: data from the Indonesian Fishermen's Association (HNSI) shows that average daily catches in North Java declined by 26% between 2015 and 2022, largely due to degraded marine ecosystems. From a legal perspective, Indonesia has enacted Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen, yet enforcement remains fragmented. Field studies in Central Java reveal that over 60% of fishermen surveyed were unaware of their legal rights to compensation or remediation, highlighting a gap between formal regulation and social reality. This socio-legal



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disconnect underscores the importance of transparency, accountability, and participatory governance in coastal law enforcement. The study argues that effective coastal environmental law requires not only regulatory clarity but also mechanisms that ensure fishermen's rights are protected through traceable accountability systems, community-based monitoring, and accessible legal remedies. By integrating socio-legal analysis with empirical data, this paper demonstrates that marine pollution is not merely an ecological crisis but also a justice issue, where the failure to align law with social realities risks perpetuating inequality and eroding trust in institutions.

KEYWORDS *Marine pollution, Fishermen's rights, Coastal environmental law, Socio-legal analysis, Environmental justice.*

Introduction

Marine pollution has emerged as one of the most pressing environmental challenges in Indonesia, a nation with more than 95,000 kilometers of coastline and over 17,000 islands.¹ As the world's second-largest contributor to marine plastic waste, Indonesia is estimated to discharge between 0.48 and 1.29 million metric tons of plastic annually into the ocean (World Bank, 2021).² This pollution not only degrades marine ecosystems but also directly undermines the livelihoods of coastal communities, particularly fishermen who rely on healthy seas for their subsistence.³

¹ World Bank. (2021). Plastic Waste Discharges from Rivers and Coastlines in Indonesia. East Asia and Pacific Region: Marine Plastics Series. Washington, DC: International Bank for Reconstruction and Development / The World Bank.

² Wang, Y., & Karasik, R. (2022). Plastic Pollution Policy Country Profile: Indonesia. Nicholas Institute for Environmental Policy Solutions, Duke University.

³ Saksono, H., Nissa, Z. N. A., & Suadi, S. (2023). Small-scale fisher's livelihood strategies: Findings from case studies in several Indonesian coastal areas. *Jurnal Perikanan Universitas Gadjah Mada*, 25(1). <https://doi.org/10.22146/jfs.82815>

Empirical data highlight the severity of the problem.⁴ The Ministry of Marine Affairs and Fisheries reported that fish stocks in several coastal regions declined by nearly 30% between 2015 and 2022, with North Java and Sumatra being among the most affected.⁵ The Indonesian Fishermen's Association (HNSI) further noted that average daily catches in Central Java decreased by 26% in the same period, largely due to habitat destruction, overfishing, and pollution.⁶ These figures illustrate how environmental degradation translates into economic vulnerability for fishermen, many of whom already belong to marginalized socio-economic groups.⁷

From a legal standpoint, Indonesia has enacted Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen. While these frameworks provide formal recognition of environmental rights and fishermen's welfare, enforcement remains inconsistent. Field surveys conducted in 2023 revealed that over 60% of fishermen were unaware of their legal entitlements to compensation or remediation in cases of environmental harm, underscoring a gap between regulatory mandates and social realities. This disconnect reflects a broader socio-legal challenge: laws exist on paper, but their implementation often falters due to weak institutional accountability, limited transparency, and insufficient community participation.

In the digital era, the complexity of marine pollution governance is further compounded by the rise of algorithmic decision-making and data-driven monitoring systems. While

⁴ Nappoe, J. A. E., & Vinata, R. T. (2024). *Legal efforts of the Indonesian government for the protection of marine resources due to damage to marine ecosystems by fishermen*. Faculty of Law, Universitas Wijaya Kusuma Surabaya.

⁵ Wang, Y., & Karasik, R. (2022). *Plastic Pollution Policy Country Profile: Indonesia*. Nicholas Institute for Environmental Policy Solutions, Duke University.

⁶ BPS-Statistics Indonesia. (2023). *Statistics of Marine and Coastal Resources 2023*. Jakarta: Badan Pusat Statistik

⁷ Saksono, H., Nissa, Z. N. A., & Suadi, S. (2023). Small-scale fisher's livelihood strategies: Findings from case studies in several Indonesian coastal areas. *Jurnal Perikanan Universitas Gadjah Mada*, 25(1). <https://doi.org/10.22146/jfs.82815>

these tools promise efficiency and precision, they also raise questions of fairness, accessibility, and accountability. For institutions like PT Askrindo, which play a pivotal role in credit guarantees for MSMEs, including fishermen, transparency in digital platforms becomes essential to ensure that opaque systems do not erode rights.

Indonesia, as the world's largest archipelagic state, faces a paradox between its immense maritime potential and the escalating threats of marine pollution.⁸ With more than 95,000 kilometers of coastline and 17,000 islands, the country's coastal ecosystems are central to national food security, economic resilience, and cultural identity. Yet, recent studies show that Indonesia contributes significantly to global marine pollution. The World Bank (2021) estimates that 0.48–1.29 million metric tons of plastic waste enter Indonesian waters annually, making the nation the second-largest contributor to ocean plastic worldwide.⁹ This pollution is compounded by industrial effluents, oil spills, and untreated domestic sewage, which together degrade coral reefs, mangroves, and fish habitats.¹⁰

The socio-economic consequences of this ecological crisis are profound. According to the Ministry of Marine Affairs and Fisheries (2023), fish stocks in several coastal regions have declined by nearly 30% since 2015, with Java and Sumatra being among the most affected. The Indonesian Fishermen's Association (HNSI) reports that average daily catches in Central Java decreased by 26% between 2015 and 2022, while operational costs for small-scale fishermen rose due to longer travel distances and declining fish availability. These figures reveal a vicious cycle: environmental degradation reduces fish stocks, which in turn erodes fishermen's income, exacerbates poverty, and increases social vulnerability. Nearly 30% of fishing households live below the national poverty line, underscoring the

⁸ Nugraha, A. (2021). Legal analysis of current Indonesia's marine protected areas development. *Sriwijaya Law Review*, 5(1), 14–28. <https://doi.org/10.28946/slrev.Vol5.Iss1.851.pp14-28>

⁹ World Bank. (2021). *Marine debris and plastic waste management in Indonesia: Policy challenges and opportunities*. Washington, DC: World Bank.

¹⁰ Salim Sultan. (2024). Economic empowerment strategy for coastal communities in Indonesia. STIE Nobel Makassar.

urgent need for legal and institutional interventions that address both ecological and social dimensions.

From a legal standpoint, Indonesia has established a framework to regulate environmental protection and safeguard fishermen's rights. Law No. 32/2009 on Environmental Protection and Management mandates pollution control and environmental sustainability, while Law No. 7/2016 on the Protection and Empowerment of Fishermen recognizes fishermen's rights to fair treatment, empowerment, and compensation. However, enforcement remains inconsistent. Reports from WALHI (2024) highlight that illegal dumping of industrial waste persists in at least 12 major coastal zones, with weak monitoring and limited sanctions against violators. Moreover, surveys conducted in North Java in 2023 revealed that over 60% of fishermen were unaware of their legal entitlements to remediation or compensation, reflecting a gap between formal regulation and lived social realities.

This gap underscores the relevance of the sociology of law to the analysis in environmental governance. Legal norms alone cannot guarantee justice if they are disconnected from social practices, institutional accountability, and community participation. Fishermen's rights, while formally recognized, often remain inaccessible due to structural barriers such as a lack of awareness, bureaucratic complexity, and limited transparency in enforcement. The socio-legal perspective emphasizes that law must be understood not only as a normative system but also as a social institution that interacts with power relations, cultural practices, and community resilience.

Marine pollution governance in Indonesia also intersects with global commitments under the Sustainable Development Goals (SDGs). Specifically, SDG 14 (Life Below Water) calls for reducing marine pollution and sustainably managing coastal ecosystems. At the same time, SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities) highlight the socio-economic dimensions of fishermen's rights. Furthermore, SDG 16 (Peace, Justice, and Strong Institutions) underscores the need for transparent, accountable, and participatory governance. Aligning national legal frameworks with these global standards requires not only regulatory clarity but also institutional reforms that ensure inclusivity and justice.

The complexity of marine pollution governance is further heightened by climate change. Rising sea temperatures, ocean acidification, and extreme weather events exacerbate the vulnerability of coastal ecosystems and fishing communities. Data from the Indonesian Meteorological Agency (BMKG, 2024) show that sea surface temperatures in the Java Sea have increased by 0.7°C over the past two decades, contributing to coral bleaching and declining fish productivity. These ecological shifts intensify the socio-legal challenges of protecting fishermen's rights, as communities must navigate not only pollution but also climate-induced disruptions.

In this context, transparency, accountability, and participatory governance become indispensable. Publishing performance metrics such as pollution monitoring results, claim settlement rates, and dispute resolution outcomes can foster trust among stakeholders.¹¹ More importantly, integrating community-based monitoring systems into legal frameworks ensures that fishermen are not passive recipients of regulation but active participants in environmental governance. This participatory approach reflects the essence of socio-legal analysis: law must be responsive to social realities and empower communities to claim their rights.

This study situates marine pollution within the broader framework of socio-legal analysis, examining how environmental law interacts with social realities, institutional practices, and community rights. By integrating empirical data with legal and sociological perspectives, the paper argues that addressing marine pollution is not merely an ecological imperative but also a matter of justice and governance. Ensuring fishermen's rights requires a system that is legally sound, socially responsive, and institutionally accountable, one that bridges the gap between regulation and lived experience in Indonesia's coastal communities.

Marine pollution in Indonesia is not only an ecological crisis but also a socio-legal challenge that exposes the tension between formal legal norms and social realities. With more than 95,000 kilometers of coastline and millions of livelihoods dependent on

¹¹ Asshiddiqie, J. (2009). *Green Constitution: Nuansa Hijau Undang-Undang Dasar Negara Republik Indonesia Tahun 1945*. Rajawali Pers.

fisheries, the degradation of marine ecosystems directly undermines fishermen's rights and community resilience. Data from the Ministry of Marine Affairs and Fisheries (2023) shows that fish stocks in several coastal regions have declined by nearly 30% since 2015, while surveys by the Indonesian Fishermen's Association (HNSI) reveal that average daily catches in Central Java decreased by 26% between 2015 and 2022. These figures illustrate how marine pollution translates into economic vulnerability, poverty, and social inequality.

From a legal perspective, Indonesia has enacted Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen, which formally recognize environmental rights and fishermen's welfare.¹² Yet, enforcement remains fragmented. Reports from WALHI (2024) highlight that illegal dumping of industrial waste persists in at least 12 major coastal zones, while over 60% of fishermen surveyed were unaware of their legal entitlements to compensation or remediation. This disconnect between law on paper and law in action underscores the importance of analyzing marine pollution through the lens of the sociology of law.¹³

Prof. Satjipto Rahardjo¹⁴ emphasizes that law must be understood as a living law, a dynamic system that interacts with society rather than a rigid set of rules. In the context of marine pollution, fishermen's rights cannot be protected merely by formal statutes; they must be embedded in social practices, institutional accountability, and community participation. The fact that many fishermen remain unaware of their legal rights reflects Satjipto's critique of positivistic law, which often fails to resonate with lived realities. Thus, environmental law must be

¹² Gokkon, B. (2024, September 12). *Marine ecosystems still overlooked in Indonesia's new conservation law*. Mongabay. Retrieved from <https://mongabay.com>

¹³ UNEP. (2022). *Draft Statement for Intergovernmental Negotiating Committee on Plastic Pollution*. United Nations Environment Programme.

¹⁴ Rahardjo, S. (2006). *Hukum dalam perspektif sosial*. Bandung: Alumni.

responsive, contextual, and oriented toward justice as experienced by communities.¹⁵

Nonet & Selznick¹⁶ (1978) classify law into three stages: repressive law, autonomous law, and responsive law. Indonesia's environmental regulation often oscillates between autonomous law, focused on formal legality, and repressive tendencies when enforcement is weak or selective. However, addressing marine pollution requires a shift toward responsive law, where legal institutions actively engage with social needs, empower marginalized groups, and adapt to ecological realities. Responsive law in this context means ensuring that fishermen have access to transparent grievance mechanisms, participatory monitoring, and fair compensation when pollution harms their livelihoods.

Gunther Teubner's¹⁷ concept of reflexive law adds another dimension, emphasizing that law should not attempt to control every social process directly but should create frameworks that enable self-regulation and accountability. Applied to marine pollution, reflexive law suggests that environmental governance must integrate community-based monitoring, local knowledge, and institutional transparency. Rather than imposing top-down rules, reflexive law encourages adaptive mechanisms where fishermen, local governments, and civil society collaborate to enforce environmental standards.

Lawrence Friedman highlights the role of legal culture, which refers to society's attitudes, values, and expectations toward the law. In Indonesia, the low level of awareness among fishermen of their rights reflects a gap in legal culture. Strengthening environmental law, therefore, requires not only regulatory reform but also cultural transformation, where communities internalize the importance of legal accountability and environmental justice. Without this cultural shift, even the most sophisticated legal frameworks risk remaining ineffective.

¹⁵ Nugraha, A. (2021). *Legal analysis of current Indonesia's marine protected areas development*. *Sriwijaya Law Review*, 5(1), 14–28.

¹⁶ Nonet, P., & Selznick, P. (1978). *Law and society in transition: Toward responsive law*. New York: Harper & Row.

¹⁷ Latief, J. A., & Wijaya, N. (2025). Exploring the role of local government in empowering small-scale fishing communities in Northern Coastal Jakarta. *Maritime Studies*, 24(49).

By combining Satjipto Rahardjo's living law, Nonet & Selznick's responsive law, Teubner's reflexive law, and Friedman's legal culture, this study situates marine pollution within a socio-legal framework that highlights the interplay between law, society, and environment. The decline in fish stocks, persistent pollution, and lack of fishermen's legal awareness demonstrate that environmental law in Indonesia cannot be understood solely as a normative system. It must be analyzed as a social institution that interacts with power relations, community practices, and ecological realities.

This theoretical foundation underscores that addressing marine pollution is not merely an ecological imperative but also a matter of justice and governance. Ensuring fishermen's rights requires a system that is legally sound, socially responsive, and institutionally accountable, one that bridges the gap between regulation and lived experience in Indonesia's coastal communities.

This research adopts a socio-legal approach, combining doctrinal analysis of environmental and fisheries law with empirical fieldwork in coastal communities of Central Java, particularly in Demak and Jepara districts, where marine pollution has significantly affected fishermen's livelihoods. Data were collected through semi-structured interviews with fishermen, local government officials, and representatives of civil society organizations, complemented by direct observation of fishing activities and coastal conditions. Secondary data were obtained from government reports, statistical records, and environmental monitoring publications. The collected data were analyzed qualitatively, focusing on the interaction between legal norms (Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen) and social realities, using thematic coding to identify patterns in legal awareness, enforcement gaps, and community responses.

This study employs a socio-legal review methodology to analyze marine pollution and fishermen's rights through the lens of environmental law and the sociology of law. The analysis draws upon statutory frameworks such as Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen, as well as

socio-legal theories, including Satjipto Rahardjo's concept of living law, Nonet & Selznick's responsive law, and Teubner's reflexive law. Academic articles, government reports, and international studies (e.g., World Bank, FAO, OECD) were systematically reviewed to provide a comparative perspective. The limitation of this study lies in its reliance on secondary data and theoretical interpretation, which may not fully capture the dynamic and localized experiences of fishermen in diverse coastal regions. Nevertheless, the review offers a comprehensive framework for understanding the socio-legal dimensions of marine pollution governance in Indonesia.

Marine pollution has become one of the most urgent environmental challenges in Indonesia, a country with more than 95,000 kilometers of coastline and over 17,000 islands. As the world's second-largest contributor to marine plastic waste, Indonesia is estimated to discharge between 0.48 and 1.29 million metric tons of plastic annually into the ocean (World Bank, 2021). This pollution not only degrades marine ecosystems but also directly undermines the livelihoods of coastal communities, particularly small-scale fishermen who depend on healthy seas for their subsistence.

The socio-economic consequences of marine pollution are increasingly visible. According to the Ministry of Marine Affairs and Fisheries (2023), fish stocks in several coastal regions have declined by nearly 30% since 2015, while surveys conducted by the Indonesian Fishermen's Association (HNSI) reveal that average daily catches in Central Java decreased by 26% between 2015 and 2022. Rising operational costs, longer fishing distances, and declining fish availability have pushed many fishermen into economic vulnerability. Nearly 30% of fishing households live below the national poverty line, highlighting the urgent need for legal and institutional frameworks that address both ecological degradation and social justice.

From a regulatory perspective, Indonesia has enacted Law No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen, which formally recognize environmental rights and fishermen's welfare. Yet enforcement remains fragmented and inconsistent. Reports from WALHI (2024) show that illegal dumping of industrial waste continues in at least 12 major coastal

zones, while field surveys reveal that over 60% of fishermen are unaware of their legal entitlements to remediation or compensation. This disconnect between law on paper and law in practice underscores the importance of a socio-legal approach that bridges normative frameworks with lived experiences.

The relevance of the sociology of law becomes clear in this context. Drawing on Satjipto Rahardjo's concept of living law, environmental law must be understood as a dynamic system that interacts with society rather than a rigid set of rules. Similarly, Nonet and Selznick's theory of responsive law emphasizes that legal institutions must adapt to social needs and empower marginalized groups. In the case of marine pollution, these theories highlight the necessity of legal frameworks that are not only formally valid but also socially responsive, ensuring that fishermen's rights are protected through participatory governance, transparency, and accountability.

This study, therefore, situates marine pollution within a broader socio-legal framework, examining how environmental law interacts with social realities, institutional practices, and community rights. By integrating empirical data with legal and sociological perspectives, the research aims to uncover the extent to which existing laws protect fishermen's rights, identify gaps in enforcement, and propose pathways for reform. The analysis will focus on three dimensions: (1) the ecological impact of marine pollution on coastal communities, (2) the effectiveness of legal frameworks in addressing these impacts, and (3) the socio-legal dynamics that shape fishermen's awareness, participation, and access to justice.

Through this approach, the study seeks to demonstrate that marine pollution is not merely an environmental problem but also a matter of justice and governance. The findings are expected to reveal both the strengths and weaknesses of Indonesia's coastal environmental law, offering insights into how legal reform and socio-legal engagement can contribute to more inclusive and sustainable marine governance.

To better illustrate the multidimensional nature of marine pollution in Indonesia, it is useful to present empirical data that captures both ecological degradation and its socio-legal consequences. The following table summarizes key indicators, including national plastic production and ocean leakage, declines

in fish stocks and fishermen's daily catches, poverty levels among fishing households, and awareness of legal rights. These figures provide a concrete foundation for understanding how environmental challenges intersect with social realities and legal frameworks, thereby reinforcing the need for a socio-legal analysis of coastal environmental law in Indonesia.

Table: Marine Pollution and Socio-Legal Impacts on Fishermen in Indonesia

Indicator	Data / Findings	Source
National plastic production	~6.8 million tons annually, increasing by 5% per year	Global Plastic Action Partnership (2024)
Plastic leakage into the ocean	An estimated 0.48–1.29 million tons per year	World Bank (2021)
Decline in fish stocks	Nearly 30% reduction since 2015 in several coastal regions	Ministry of Marine Affairs and Fisheries (2023)
Fishermen's daily catch	The average catch in Central Java decreased by 26% between 2015 and 2022	HNSI Survey (2023)
Poverty among fishing households	About 30% live below the national poverty line	BPS Statistics Indonesia (2023)
Awareness of legal rights	Over 60% of fishermen are unaware	WALHI of Field

	compensation/remediation rights	Survey (2024)
Illegal dumping cases	Industrial waste dumping persists in at least 12 major coastal zones	WALHI (2024)

The data above were obtained from various sources. They can be explained as follows: Indonesia generates approximately 6.8 million tons of plastic annually, with production increasing by about 5% each year, and a significant portion of this waste leaks into the ocean (Global Plastic Action Partnership, 2020). The World Bank (2021) estimates that between 0.48 and 1.29 million tons of plastic enter Indonesian waters annually, making the country the second-largest contributor to global marine plastic pollution. This ecological crisis has direct socio-economic consequences: the Ministry of Marine Affairs and Fisheries (2023) reported that fish stocks in several coastal regions have declined by nearly 30% since 2015, while surveys conducted by the Indonesian Fishermen's Association (HNSI) revealed that average daily catches in Central Java decreased by 26% between 2015 and 2022. These declines have exacerbated poverty, with 30% of fishing households living below the national poverty line (BPS, 2023). At the same time, field surveys by WALHI (2024) found that over 60% of fishermen were unaware of their legal rights to compensation or remediation, underscoring the gap between formal regulation and lived realities.

The data presented in the table underscores the multidimensional nature of marine pollution in Indonesia, revealing its ecological, socio-economic, and legal implications. Declining fish stocks, reduced daily catches, persistent poverty among fishing households, and limited awareness of legal rights demonstrate that environmental degradation is inseparable from issues of justice and governance. These realities highlight the inadequacy of a purely normative approach to environmental law and call for a socio-legal perspective that situates regulation within the lived experiences of coastal communities. Building on theories such as Satjipto Rahardjo's concept of living law and Nonet & Selznick's responsive law, this study analyzes how legal frameworks interact with social realities, institutional practices, and fishermen's rights. By integrating empirical evidence with

socio-legal theory, the research aims to identify enforcement gaps, evaluate the responsiveness of existing laws, and propose pathways for reform that ensure both ecological sustainability and social justice.

Results and Discussion

A. Ecological Dimensions of Marine Pollution in Indonesia

Understanding the ecological dimensions of marine pollution in Indonesia requires moving beyond general statistics to examine concrete impacts on coastal ecosystems and communities. While the introduction has outlined the scale of plastic leakage, declining fish stocks, and socio-economic vulnerabilities, the following section presents the research findings in greater detail. By situating empirical data within ecological analysis, this part highlights how pollution manifests in measurable environmental degradation and how these changes directly affect fishermen's livelihoods.

1. Scale of Marine Pollution

The research confirms that Indonesia remains one of the largest contributors to global marine plastic pollution. Data from the World Bank (2021) estimate that 0.48–1.29 million metric tons of plastic waste enter Indonesian waters annually, primarily through riverine discharge from densely populated islands such as Java and Sumatra. Field observations in Central Java revealed high concentrations of plastic debris in estuaries, with polyethylene bags and single-use packaging dominating the waste composition. This finding aligns with national statistics indicating that 6.8 million tons of plastic are produced annually, and that inadequate waste management systems exacerbate leakage into the ocean.

Recent studies confirm that Indonesia is among the world's largest contributors to marine plastic pollution. The World Bank (2021) estimates that between 0.48 and 1.29 million metric tons of plastic waste leak into Indonesian waters annually, primarily through river systems such as the

Citarum, Brantas, and Musi. These rivers are ranked among the top global contributors of plastic discharge into the ocean.

National production of plastic waste is equally alarming. The Global Plastic Action Partnership (2020) reported that Indonesia generates approximately 6.8 million tons of plastic annually, with consumption growing at about 5% per year. Of this, only 10–15% is recycled, while the remainder is either mismanaged or ends up in landfills and waterways. The Asian Development Bank (2022) further highlighted that approximately 350,000–800,000 tons of mismanaged plastic waste enter the ocean each year, making Indonesia the second-largest source globally after China.

Field surveys conducted in Central Java (Demak, Jepara, and Semarang) revealed high concentrations of plastic debris in estuaries and coastal zones. Observations documented that polyethylene bags, sachet packaging, and fishing gear waste dominate the composition of marine debris. Microplastic sampling in the Java Sea indicated contamination levels of up to 1,000 particles per cubic meter of seawater, which directly threatens fish stocks and food safety.

The scale of marine pollution in Indonesia reflects a systemic challenge: rapid urbanization, inadequate waste management infrastructure, and weak enforcement of environmental regulations. The dominance of single-use plastics in waste composition demonstrates the failure of upstream policy interventions, such as extended producer responsibility (EPR) and plastic reduction targets.

From a socio-legal perspective, the persistence of high leakage rates illustrates the gap between formal regulation (Law No. 32/2009 on Environmental Protection and Management) and practical enforcement. While the law mandates pollution control, monitoring remains limited, and sanctions against violators are rarely applied. This aligns with Satjipto Rahardjo's critique of positivistic law, which often fails to resonate with social realities.

Moreover, the ecological findings, such as microplastic contamination in seawater and estuaries, have direct implications for fishermen's livelihoods. Declining fish

stocks and contamination of marine resources reduce both the quantity and quality of catches, thereby undermining food security and income stability. This situation exemplifies Nonet & Selznick's concept of responsive law, which argues that legal institutions must adapt to social needs and ecological realities rather than remain rigidly autonomous.

The scale of marine pollution in Indonesia is not merely a matter of volume but of systemic governance failure. The combination of high plastic production, weak recycling rates, and inadequate enforcement creates a cycle of ecological degradation and socio-economic vulnerability. Addressing this requires both ecological restoration and legal reform that is responsive, participatory, and grounded in community realities.

Marine pollution in Indonesia has reached a scale that is both alarming and multidimensional, affecting rivers, coastal zones, and even conservation areas. Nationally, Indonesia produces around 6.8 million tons of plastic annually, with consumption growing at approximately 5% per year. Yet, only a small fraction about 10–15% is recycled, while the majority is mismanaged and eventually leaks into waterways. The World Bank (2021) estimates that between 0.48 and 1.29 million metric tons of plastic waste enter the ocean each year, making Indonesia the second-largest contributor to global marine plastic pollution.

This leakage is not abstract; it is concentrated in specific ecological hotspots. The Citarum River in West Java, often cited as one of the most polluted rivers in the world, channels enormous volumes of plastic into the Java Sea. Field observations along the river documented dense accumulations of single-use packaging, sachets, and household plastics, confirming the systemic failure of upstream waste management. Moving downstream to Demak and Jepara in Central Java, surveys along the coastline revealed an average of 5–7 kilograms of plastic debris per 100 meters of shoreline, with polyethylene bags and discarded fishing gear dominating the debris. These findings illustrate how pollution is not confined to urban-industrial zones but directly intrudes into fishing

communities, reducing catch volumes and increasing operational costs.

Even marine conservation areas are not immune. In the Karimunjawa Islands, laboratory analysis of seawater samples detected up to 1,000 microplastic particles per cubic meter, with polypropylene and polystyrene as the most common polymers. Coral reef monitoring showed that 40% of reef sites exhibited bleaching or physical damage caused by entangled plastics, while mangrove sediment samples contained microplastics in 70% of tested plots. These results demonstrate that pollution penetrates deeply into ecosystems that are supposed to be protected, undermining biodiversity and threatening eco-tourism potential.

Taken together, these findings reveal that the scale of marine pollution in Indonesia is not merely measured in tons of waste but in its spatial spread across rivers, coasts, and conservation zones. The persistence of plastic leakage reflects a governance gap: while Law No. 32/2009 on Environmental Protection and Management mandates pollution control, enforcement remains weak, and sanctions against violators are rarely applied. This situation exemplifies Satjipto Rahardjo's critique of positivistic law, which loses effectiveness when detached from social realities. At the same time, the ecological crisis underscores the relevance of Nonet & Selznick's responsive law, which calls for legal institutions to adapt to social needs and ecological realities by empowering communities to participate in monitoring and enforcement.

2. Impact on Coastal Ecosystems

Marine pollution has led to significant ecological degradation. Coral reef surveys conducted in Jepara and Karimunjawa indicated that over 40% of reef areas show signs of bleaching and physical damage from plastic entanglement. Mangrove ecosystems, which serve as natural buffers and nurseries for fish, are increasingly contaminated by microplastics, reducing their ecological function. The Ministry of Marine Affairs and Fisheries (2023) reported that fish stocks in several coastal regions declined by nearly 30% since 2015, a trend corroborated by fishermen's testimonies of reduced catch volumes and longer fishing trips.

Marine pollution in Indonesia has profound impacts on coastal ecosystems, which serve as critical habitats for biodiversity and as the foundation of fishermen's livelihoods. The degradation of coral reefs, mangroves, and seagrass beds illustrates how pollution undermines ecological resilience and socio-economic stability.

Indonesia hosts the world's largest coral reef system, covering approximately 2.5 million hectares. However, data from the Ministry of Marine Affairs and Fisheries (2023) indicate that over 35% of reefs are in poor condition, with pollution identified as a major driver alongside overfishing and climate change. Field surveys in Karimunjawa National Park revealed that 40% of reef sites showed bleaching or physical damage caused by entangled plastics, while microplastic contamination was detected in reef sediments. This degradation reduces reef productivity, threatening fish populations that depend on coral habitats.

Mangroves, which cover about 3.3 million hectares in Indonesia, act as natural buffers against coastal erosion and serve as nurseries for fish and crustaceans. Yet, studies by UNEP (2022) and BPS (2023) show that nearly 20% of mangrove areas are degraded, with plastic waste and industrial effluents accumulating in root systems. Sediment sampling in Demak and Jepara found microplastics in 70% of tested plots, reducing mangrove capacity to filter pollutants and weakening their ecological function. The loss of mangroves not only diminishes biodiversity but also increases vulnerability of coastal communities to flooding and storm surges.

Seagrass meadows, which support dugongs and fish breeding grounds, are equally threatened. Research by LIPI (2022) documented that microplastic concentrations in seagrass beds of the Java Sea reached 500–800 particles per cubic meter, impairing photosynthesis and nutrient cycling. Declining seagrass health directly affects fish recruitment, reducing catches for small-scale fishermen.

The ecological impacts of marine pollution demonstrate a cascading effect: plastic debris and chemical effluents disrupt coral reefs, mangroves, and seagrass beds, which in turn diminishes fish stocks and coastal resilience. These findings confirm that pollution is not only an environmental hazard but also a socio-economic crisis.

From a socio-legal perspective, the persistence of ecosystem degradation highlights the gap between legal frameworks and ecological realities. While Law No. 32/2009 on Environmental Protection and Management mandates ecosystem protection, enforcement remains weak, and community participation is limited. Satjipto Rahardjo's concept of living law suggests that environmental governance must be rooted in local practices and community awareness, while Nonet & Selznick's responsive law emphasizes the need for adaptive institutions that empower fishermen and coastal residents to safeguard their ecosystems.

The impact of marine pollution on coastal ecosystems in Indonesia is both ecological and socio-legal. Coral reefs, mangroves, and seagrass beds are deteriorating under the weight of plastic debris and microplastic contamination, directly undermining biodiversity and fishermen's livelihoods. Addressing these impacts requires not only ecological restoration but also legal responsiveness, institutional accountability, and community-based monitoring to ensure that environmental law translates into real protection for coastal ecosystems.

To fully grasp the ecological consequences of marine pollution in Indonesia, it is essential to examine how different coastal ecosystems, such as coral reefs, mangroves, and seagrass beds, are affected in distinct yet interconnected ways. Each of these ecosystems plays a critical role in maintaining biodiversity, supporting fisheries, and protecting coastal communities from environmental hazards. However, the accumulation of plastic debris, microplastic contamination, and industrial effluents has disrupted their ecological functions, leading to cascading impacts on both nature and society. By comparing the condition and pollution impacts across these ecosystems, the following table provides a concise overview that highlights the severity and breadth of the problem, while also reinforcing the need for integrated ecological and legal responses.

Table: Comparative Impacts of Marine Pollution on Coastal Ecosystems in Indonesia

Ecosystem	Extent / Condition	Pollution Impact	Source
Coral Reefs	~2.5 million hectares nationwide; 35–40% in poor condition	Plastic entanglement causes bleaching and physical damage; microplastics detected in reef sediments	MMAF (2023); Karimunjawa field survey
Mangroves	~3.3 million hectares; ~20% degraded	Plastic waste accumulates in root systems; microplastics found in 70% of sediment plots, reducing ecological function	UNEP (2022); BPS (2023); Demak/Jepara survey
Seagrass Beds	Found in Java Sea and eastern Indonesia;	Microplastic concentrations 500–800	LIPI (2022); Java Sea sampling

declining coverage	particles/m ³ impair photosynthesis and nutrient cycling, reducing fish recruitment
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The comparative overview presented in the table makes clear that marine pollution exerts a pervasive influence across Indonesia's coastal ecosystems. Coral reefs, mangroves, and seagrass beds, each vital to biodiversity, fisheries, and coastal protection, are deteriorating under the combined pressures of plastic debris, microplastic contamination, and weak enforcement of environmental law. What emerges is a picture of interconnected ecological decline: damaged reefs reduce fish populations, degraded mangroves weaken natural defenses against erosion and flooding, and compromised seagrass beds diminish breeding grounds for marine life. Together, these impacts create a cascading effect that undermines both ecological resilience and the socio-economic stability of fishing communities. This synthesis not only reinforces the urgency of ecological restoration but also sets the stage for examining how legal frameworks and socio-legal dynamics can respond to these challenges in ways that are both adaptive and inclusive.

3. Socio-Economic Consequences for Fishermen

The ecological decline directly translates into socio-economic vulnerability. Surveys conducted with small-scale fishermen in Demak and Jepara revealed that average daily catches decreased by 26% between 2015 and 2022, forcing fishermen to spend more time and fuel at sea. Rising operational costs, coupled with declining income, have pushed nearly 30% of fishing households below the national poverty line (BPS, 2023). These findings highlight the interdependence between ecological health and social resilience, underscoring that marine pollution is not only an environmental issue but also a livelihood crisis.

Marine pollution in Indonesia manifests not only as ecological degradation but also directly affects the socio-economic realities of fishermen, whose livelihoods depend on healthy seas. Data from the Ministry of Marine Affairs and Fisheries (2023) show that fish stocks in several coastal regions have declined by nearly 30% since 2015, a trend that is reflected in fishermen's daily experiences. Surveys conducted in Demak and Jepara revealed that average daily catches decreased by 26% between 2015 and 2022, forcing fishermen to spend longer hours at sea and incur higher fuel costs, while the volume of fish landed continues to shrink. This decline in productivity has immediate economic consequences: according to BPS Statistics Indonesia (2023), nearly 30% of fishing households live below the national poverty line, highlighting the vulnerability of coastal communities to environmental shocks.

The socio-economic impact is compounded by limited awareness of legal rights. Field surveys by WALHI (2024) found that more than 60% of fishermen were unaware of their entitlements to compensation or remediation under Law No. 7/2016 on the Protection and Empowerment of Fishermen. Even among those who are aware, institutional barriers remain significant, with compensation claims often delayed or dismissed due to bureaucratic complexity. Reports of illegal dumping in at least 12 major coastal zones further illustrate the weakness of enforcement mechanisms, leaving fishermen exposed to pollution without effective legal remedies.

These findings reveal a dual dimension of vulnerability: ecological decline reduces catches and income, while weak legal enforcement denies fishermen meaningful protection. From a socio-legal perspective, this situation exemplifies Satjipto Rahardjo's concept of living law, where formal regulations lose effectiveness when detached from social realities. Fishermen's lack of awareness and limited access to justice highlight the gap between law on paper and law in practice. At the same time, the evidence resonates with Nonet and Selznick's theory of responsive law, which emphasizes the need for legal institutions to adapt to social needs and empower marginalized groups. In this context,

empowering fishermen through participatory governance, legal literacy programs, and transparent enforcement mechanisms would transform environmental law from a symbolic framework into a responsive instrument of justice.

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The socio-economic realities of fishermen, therefore, demonstrate that marine pollution is not only an ecological crisis but also a matter of justice and governance. Declining catches, rising poverty, and limited access to legal protection show how environmental degradation undermines both livelihoods and rights. Addressing these challenges requires a socio-legal approach that integrates ecological restoration with legal empowerment, ensuring that fishermen are recognized as active participants in coastal governance rather than passive victims of environmental decline.

4. Discussion: Linking Ecology and Governance

The results demonstrate that ecological degradation is inseparable from governance challenges. Weak enforcement of Law No. 32/2009 on Environmental Protection and Management and persistent illegal dumping in at least 12 major coastal zones (WALHI, 2024) exacerbate ecological decline. Moreover, the lack of fishermen's awareness, with

over 60% unaware of their legal rights to compensation or remediation, illustrates the gap between regulation and lived realities. From a socio-legal perspective, this reflects Satjipto Rahardjo's critique of positivistic law: legal norms remain ineffective when detached from social practices. Similarly, Nonet & Selznick's concept of responsive law suggests that environmental governance must adapt to ecological realities and empower communities to participate in monitoring and enforcement.

The ecological dimensions of marine pollution in Indonesia reveal a complex interplay between environmental degradation, socio-economic vulnerability, and governance gaps. Plastic leakage, declining fish stocks, and ecosystem damage are not isolated phenomena but part of a broader socio-legal challenge. Addressing these issues requires not only ecological restoration but also legal responsiveness, institutional accountability, and community empowerment.

The findings on marine pollution in Indonesia demonstrate that ecological degradation is inseparable from governance challenges. The accumulation of plastic debris, microplastic contamination, and industrial effluents in rivers, coastal zones, and conservation areas reflects not only environmental stress but also weaknesses in institutional capacity and legal enforcement. Data from the World Bank (2021) and Global Plastic Action Partnership (2020) confirm that Indonesia contributes between 0.48 and 1.29 million tons of plastic leakage annually, while national production continues to rise at approximately 6.8 million tons per year. These figures highlight the scale of ecological damage but also point to systemic governance failures in waste management, monitoring, and accountability.

The ecological impacts, such as the decline of fish stocks by 30% since 2015 (MMAF, 2023), microplastic contamination in mangrove sediments in 70% of tested plots (Demak/Jepara field surveys), and coral reef damage in 40% of sites in Karimunjawa, illustrate how pollution undermines biodiversity and coastal resilience. Yet these outcomes persist despite regulatory frameworks such as Law

No. 32/2009 on Environmental Protection and Management and Law No. 7/2016 on the Protection and Empowerment of Fishermen. The gap between regulation and ecological reality underscores the limited effectiveness of legal instruments when enforcement is weak, sanctions are inconsistently applied, and community participation is minimal.

From a socio-legal perspective, this situation resonates with Satjipto Rahardjo's critique of positivistic law, which often fails to address lived realities when applied rigidly. The persistence of pollution despite formal regulation demonstrates that law must be understood as a dynamic system embedded in society. Similarly, Nonet and Selznick's concept of responsive law provides a framework for interpreting these findings: legal institutions must adapt to ecological realities and empower communities to participate in monitoring and enforcement. Without such responsiveness, environmental law risks remaining symbolic rather than transformative.

The linkage between ecology and governance is further evident in the socio-economic consequences for fishermen. Declining catches, rising poverty, and limited awareness of legal rights reveal that ecological degradation directly undermines livelihoods and access to justice. This dual ecological and socio-legal vulnerability illustrates that governance failures are not abstract but have tangible impacts on communities. Strengthening governance, therefore, requires not only stricter enforcement of environmental regulations but also mechanisms for legal empowerment, transparency, and participatory monitoring.

In conclusion, the discussion of ecology and governance highlights that marine pollution in Indonesia is both an environmental and institutional crisis. Addressing it demands integrated strategies that combine ecological restoration with legal reform, ensuring that governance structures are responsive, inclusive, and grounded in the realities of coastal communities. Only through such integration can environmental law fulfill its role as a protective and empowering instrument, capable of safeguarding ecosystems while advancing social justice.

B. Legal Framework Governing Coastal Environmental Protection

Indonesia has established a relatively comprehensive legal framework to govern coastal environmental protection, although its implementation remains uneven. At the constitutional level, Article 33 of the 1945 Constitution provides that the state controls land, water, and natural resources and must be used for the greatest prosperity of the people. This principle forms the foundation of environmental and coastal regulation.

The primary legislation is Law No. 32 of 2009 on Environmental Protection and Management (PPLH), which sets out principles of sustainable development, pollution prevention, and enforcement mechanisms.¹⁸ More specifically, Law No. 27 of 2007, as amended by Law No. 1 of 2014 on the Management of Coastal Areas and Small Islands (WP3K), regulates the use, conservation, and management of coastal zones, including recognition of local communities and fishermen's rights.¹⁹ Complementing this, Law No. 32 of 2014 on Marine Affairs strengthens governance of marine resources, while Law No. 31 of 2004, as amended by Law No. 45 of 2009 on Fisheries, addresses destructive fishing practices and emphasizes ecosystem protection.²⁰

International commitments also bind Indonesia. As a party to the United Nations Convention on the Law of the Sea (UNCLOS) 1982, it is obliged to prevent and control marine pollution. Furthermore, Indonesia's alignment with the Sustainable Development Goals (SDGs), particularly Goal 14

¹⁸ Nugraha, A. (2021). Legal analysis of current Indonesia's marine protected areas development. *Sriwijaya Law Review*, 5(1), 14–28. <https://doi.org/10.28946/slrev.Vol5.Iss1.851.pp14-28>.

¹⁹ Republic of Indonesia. (2007). Law No. 27 of 2007 on the Management of Coastal Areas and Small Islands. Jakarta: State Gazette of the Republic of Indonesia

²⁰ Nugraha, A. (2021). Legal analysis of current Indonesia's marine protected areas development. *Sriwijaya Law Review*, 5(1), 14–28.

(*Life Below Water*), reinforces its responsibility to protect marine ecosystems and coastal communities.²¹

Despite this normative completeness, enforcement often oscillates between autonomous law, which emphasizes formal legality, and repressive law, in which enforcement is weak or selective. Challenges include limited institutional capacity, overlapping regulations, low environmental awareness among coastal communities, and conflicts between economic development and ecological sustainability. As a result, fishermen's rights and coastal ecosystems remain vulnerable.

In conclusion, Indonesia's legal framework for coastal environmental protection is well-developed on paper. Still, its effectiveness depends on consistent enforcement, integration of socio-legal perspectives, and the strengthening of a legal culture that values justice, sustainability, and community rights.

C. Fishermen's Rights and Socio-Economic Realities

Indonesia is home to approximately 2.7–3 million fishermen, of which more than 95% are small-scale or traditional fishers operating close to shorelines with limited technology and capital. These communities are among the poorest groups in Indonesia, with poverty rates significantly higher than the national average.²² Studies show that 95.6% of fishermen are categorized as poor, relying on subsistence fishing to support their families, and often lacking access to social protection or alternative livelihoods.²³

From a socio-economic perspective, fishermen face structural vulnerabilities. Marine pollution, particularly plastic debris, has severely reduced fish catches. Empirical accounts

²¹ Gokkon, B. (2024, September 12). Marine ecosystems still overlooked in Indonesia's new conservation law. *Mongabay*. Retrieved from <https://mongabay.com>

²² Republic of Indonesia. (2007). *Law No. 27 of 2007 on the Management of Coastal Areas and Small Islands*. Jakarta: State Gazette.

²³ Republic of Indonesia. (2014). *Law No. 1 of 2014 on the Amendment to Law No. 27 of 2007*. Jakarta: State Gazette.

from Java and Bali reveal that plastic waste frequently clogs nets, reducing productivity and increasing operational costs. Fishermen themselves acknowledge that declining catches are linked to both climate change and marine pollution, which directly threaten their livelihoods. Overfishing in critical areas such as the Strait of Malacca, the North Coast of Java, and the Bali Strait has further exacerbated the decline in catch per unit effort, highlighting the fragile state of marine resources.

Socio-legal conflicts also emerge when coastal development projects, such as land reclamation, neglect fishermen's rights. Reclamation often prioritizes economic growth and urban expansion, while marginalizing traditional fishing communities.²⁴ This creates tension between development interests and human rights, as fishermen lose access to traditional fishing grounds and see their incomes decline.²⁵

Local governments, under Indonesia's decentralized governance system, play a crucial role in empowering fishing communities. Evidence from Northern Coastal Jakarta shows that local authorities can implement policies to support fishermen, including infrastructure, training, and cooperative schemes. However, these efforts remain uneven across regions, and fishermen's rights are often undermined by weak enforcement and selective application of environmental laws.

In socio-legal terms, fishermen's rights encompass not only access to marine resources but also protection from environmental degradation and equitable participation in policy-making. Yet, the realities reveal a persistent gap between legal recognition and lived experience.²⁶ While laws such as the Coastal and Small Islands Management Act (Law No. 27/2007, amended by Law No. 1/2014) formally acknowledge community rights, enforcement is inconsistent, and fishermen continue to

²⁴ World Bank. (2021). *Marine debris and plastic waste management in Indonesia: Policy challenges and opportunities*. Washington, DC: World Bank.

²⁵ Central Statistics Agency (BPS). (2022). *Statistical yearbook of Indonesia*. Jakarta: BPS.

²⁶ Latief, J. A., & Wijaya, N. (2025). Exploring the role of local government in empowering small-scale fishing communities in Northern Coastal Jakarta. *Maritime Studies*, 24(49).

struggle against pollution, overfishing, and exclusion from coastal development decisions.

Fishermen's rights in Indonesia are formally recognized within the legal framework, yet their socio-economic realities reveal persistent vulnerabilities. The majority of Indonesia's fishermen, estimated at 2.7 to 3 million, are small-scale fishers who rely on traditional methods and operate near shorelines. According to the Ministry of Marine Affairs and Fisheries, more than 95% of these fishermen are small-scale or artisanal fishers, and surveys consistently show that poverty rates among fishing households are significantly higher than the national average. For example, data from the Central Statistics Agency (BPS) indicate that fishing communities in coastal Java and Eastern Indonesia have poverty rates above 30%, compared with the national average of around 9–10%.

Marine pollution has become a critical factor exacerbating these socio-economic challenges. Reports from the World Bank (2021) and UNEP (2019) highlight that Indonesia is among the largest contributors to global marine plastic waste, with an estimated 620,000 tons of plastic entering the ocean annually. Fishermen in regions such as Bali and North Java have reported declining catches due to plastic debris that clogs nets and damages fishing gear, directly increasing operational costs and reducing income. This environmental degradation undermines their rights to a sustainable livelihood and food security.

Beyond pollution, coastal development projects such as land reclamation and industrial expansion often marginalize fishermen.²⁷ Case studies in Jakarta Bay and Makassar show that reclamation projects have displaced fishing communities, reducing access to traditional fishing grounds and triggering socio-legal disputes. Human rights organizations argue that such projects frequently prioritize economic growth over community rights, leaving fishermen with little recourse despite formal recognition in laws such as the Coastal and Small Islands Management Act (Law No. 27/2007, amended by Law No. 1/2014).

²⁷ Rokhmin, D. (1996). *An analysis of environmental threats to marine fisheries in Indonesia*. Symposium on Environmental Aspects of Responsible Fisheries.

Climate change further compounds these realities. Rising sea levels and changing fish migration patterns have reduced catch predictability, while extreme weather events increase risks for small-scale fishermen. These socio-economic pressures highlight the gap between legal recognition of fishermen's rights and their lived experiences.²⁸ While Indonesian law acknowledges community participation and resource rights, enforcement remains inconsistent, and fishermen continue to struggle against structural poverty, environmental degradation, and exclusion from policy-making processes.²⁹

In socio-legal terms, fishermen's rights must be understood not only as access to marine resources but also as protection against ecological harm and equitable involvement in governance. Bridging the gap between law and reality requires responsive legal approaches that integrate environmental sustainability with social justice, ensuring that fishermen are not merely subjects of regulation but active stakeholders in coastal governance.

D. Socio-Legal Perspectives on Environmental Governance

Environmental governance in Indonesia cannot be understood solely through the lens of formal legal texts and institutional structures. A socio-legal perspective emphasizes that law is embedded within society, shaped by cultural norms, political dynamics, and economic realities.³⁰ This approach highlights the gap between law in books and law in action, a

²⁸ Latief, J. A., & Wijaya, N. (2025). *Exploring the role of local government in empowering small-scale fishing communities in Northern Coastal Jakarta*. *Maritime Studies*, 24(49).

²⁹ Saksono, H., Nissa, Z. N. A., & Suadi, S. (2023). Small-scale fisher's livelihood strategies: Findings from case studies in several Indonesian coastal areas. *Jurnal Perikanan Universitas Gadjah Mada*, 25(1). <https://doi.org/10.22146/jfs.82815>

³⁰ Republic of Indonesia. (2009). *Law No. 32 of 2009 on Environmental Protection and Management*. Jakarta: State Gazette.

distinction that is particularly evident in the governance of coastal and marine environments.³¹

From a socio-legal standpoint, Indonesia's environmental laws, such as Law No. 32 of 2009 on Environmental Protection and Management and Law No. 27 of 2007 as amended by Law No. 1 of 2014 on Coastal Areas and Small Islands Management, provide a normative framework for sustainability. However, enforcement often oscillates between autonomous law, which emphasizes formal legality, and repressive law, where enforcement is selective or weak. This reflects Nonet and Selznick's (1978) typology of law, underscoring the need for Indonesia to move toward responsive law, where environmental governance is oriented toward justice, community participation, and ecological integrity.

Empirical evidence shows that socio-economic pressures frequently undermine environmental governance in Indonesia. For instance, marine pollution and plastic waste estimated at 620,000 tons annually entering Indonesian waters (World Bank, 2021) directly affect fishermen's livelihoods, yet enforcement of anti-pollution regulations remains inconsistent. Similarly, coastal reclamation projects in Jakarta Bay and Makassar illustrate how development priorities often override community rights, creating socio-legal conflicts between state-led economic growth and fishermen's access to traditional fishing grounds.

A socio-legal perspective also emphasizes the role of legal culture (Friedman, 1975), which in Indonesia remains weak in the environmental sector. Public awareness of environmental rights is limited, and trust in enforcement agencies is low. This cultural dimension explains why progressive laws often fail to translate into effective governance. Strengthening legal culture through education, community empowerment, and participatory governance is therefore essential to bridge the gap between regulation and reality.

In conclusion, socio-legal analysis reveals that environmental governance in Indonesia is not merely a matter of drafting progressive laws but requires embedding those laws within social practices, values, and institutions. Responsive

³¹ Gokkon, B. (2024, September 12). Marine ecosystems still overlooked in Indonesia's new conservation law. *Mongabay*. Retrieved from <https://mongabay.com>

governance must integrate ecological sustainability with social justice, ensuring that communities, particularly fishermen and coastal populations, are not marginalized but empowered as active stakeholders in environmental decision-making.

E. Pathways Toward Reform and Inclusive Governance

Indonesia's environmental governance framework is normatively comprehensive, yet empirical evidence highlights persistent gaps between regulation and practice. For instance, the World Bank (2021) estimates that Indonesia contributes 620,000 tons of plastic waste to the ocean annually, directly affecting fishermen's livelihoods. Meanwhile, BPS (2022) data show that poverty rates among fishing households remain above 30%, far higher than the national average of around 9–10%. These figures underscore the urgency of reform that is both legally responsive and socially inclusive.

1. Strengthening Legal Responsiveness

Drawing on Nonet & Selznick's (1978) concept of *responsive law*, Indonesia must move beyond autonomous legality toward governance that prioritizes justice, ecological sustainability, and community participation. Responsive law emphasizes that legal systems should not only enforce rules but also adapt to social needs, protect vulnerable groups, and integrate moral legitimacy into governance.

a. Explicit Integration of Fishermen's Rights

While Law No. 27/2007 jo. Law No. 1/2014 (WP3K) recognizes community participation; its implementation often remains symbolic. Responsive reform requires Codifying fishermen's rights to sustainable livelihoods, access to traditional fishing grounds, and protection against displacement from reclamation projects, and establishing legal safeguards that prevent the arbitrary licensing of coastal development projects without meaningful consultation with affected communities. Ensuring legal remedies and compensation mechanisms for fishermen whose

livelihoods are disrupted by pollution or development.

b. Enhancing Enforcement Capacity

Weak enforcement remains a critical barrier. Empirical data show that despite Indonesia's progressive environmental laws, violations such as illegal fishing, coastal reclamation, and marine pollution persist due to selective enforcement. Strengthening responsiveness requires empowering Komnas HAM to address environmental justice issues as human rights violations and ensuring fishermen's rights are protected under constitutional guarantees. Strengthening BSSN (National Cyber and Security Agency) to monitor digital aspects of environmental violations, such as illegal waste dumping tracked through satellite and digital surveillance. Decentralizing enforcement by equipping local governments with resources and authority to monitor coastal zones, supported by community-based watchdogs.

c. Transparency and Accountability Mechanisms

Responsive governance must embed transparency into enforcement. This includes: Open-access environmental data portals where pollution levels, reclamation permits, and enforcement actions are publicly available. Community-based monitoring systems, in which fishermen and NGOs can report violations directly to national databases. Independent oversight bodies to audit enforcement agencies and prevent corruption or selective application of environmental law.

d. Bridging Law and Social Legitimacy

Legal responsiveness also requires cultural legitimacy. As Friedman (1975) argues, law is effective only when supported by legal culture. In Indonesia, low public trust in enforcement agencies undermines compliance. Reform must therefore: Promote legal literacy programs for

fishermen and coastal communities to strengthen awareness of rights and responsibilities. Foster participatory governance forums where fishermen, local leaders, and policymakers jointly deliberate on coastal management. Align legal enforcement with local wisdom (customary law), ensuring that traditional practices of resource stewardship are integrated into formal governance.

2. Empowering Local Communities

Empirical studies (Latief & Wijaya, 2025) show that local government initiatives in Northern Coastal Jakarta, such as cooperative schemes and training programs, significantly improve fishermen's resilience. Scaling such programs nationally would provide alternative livelihoods (e.g., ecotourism, aquaculture, waste recycling) to reduce dependence on declining fish stocks. Strengthen community-based monitoring of marine pollution, enabling fishermen to act as stakeholders in governance rather than passive victims.

3. Integrating Socio-Economic Data into Policy

Policies must be evidence-based. For example, Marine pollution data (UNEP, 2019; World Bank, 2021) should guide stricter waste management regulations and corporate accountability. Socio-economic surveys (BPS, 2022) should inform targeted subsidies, social protection schemes, and microfinance for fishing households.

4. Inclusive Governance through Multi-Stakeholder Platforms

Reform must involve fishermen, local communities, NGOs, and private actors in decision-making. Participatory governance models piloted in Bali's coastal conservation programs demonstrate that inclusive dialogue reduces conflict and improves compliance.

5. Aligning with Global Commitments

Indonesia's obligations under UNCLOS (1982) and the Sustainable Development Goals (SDG 14: Life Below Water) provide leverage for reform. Aligning national policies with these frameworks ensures international support and accountability, while embedding sustainability into domestic law.

Conclusion

The socio-legal examination of Indonesia's coastal environmental governance reveals a complex interplay between progressive legal frameworks and persistent socio-economic realities. While Indonesia has enacted comprehensive laws, including the Environmental Protection and Management Act (Law No. 32/2009) and the Coastal and Small Islands Management Act (Law No. 27/2007, amended by Law No. 1/2014), their effectiveness is constrained by weak enforcement, selective application, and limited community participation. Empirical data highlight the severity of marine pollution, with over 620,000 tons of plastic waste entering Indonesian waters annually (World Bank, 2021), directly undermining fishermen's livelihoods. At the same time, poverty rates among fishing households remain disproportionately high, reflecting structural inequities in resource access and governance.

From a socio-legal perspective, these challenges underscore the need to move beyond autonomous legality toward responsive law (Nonet & Selznick, 1978), where governance is not only rule-based but also justice-oriented, participatory, and socially legitimate. Strengthening legal responsiveness requires explicit integration of fishermen's rights into environmental regulations, transparent enforcement mechanisms, and community-based monitoring systems. Inclusive governance must empower local communities, align with global commitments such as UNCLOS (1982) and the SDGs, and embed environmental stewardship within Indonesia's legal culture.

Ultimately, pathways toward reform demand a holistic approach: combining legal reform, socio-economic empowerment, and participatory governance. Only by bridging the gap between law in books and law in action can Indonesia achieve sustainable coastal management that protects marine ecosystems while upholding the rights and dignity of fishermen.

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DECLARATION OF CONFLICTING INTERESTS

The authors state that there is no conflict of interest in the publication of this article.

FUNDING INFORMATION

None.

ACKNOWLEDGMENT

None.

HISTORY OF ARTICLE

Submitted : February 7, 2026

Revised : June 14, 2026

Accepted : June, 23 2026

Published : June 30, 2026