

Reinforcing Legal Enforcement Mechanisms in Environmental Pollution Control: An Analysis of Regulatory Effectiveness in River Basin Areas

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Abstract

Environmental pollution in river basin areas is a systemic ecological problem caused by industrial, domestic, and agricultural waste that contaminates water bodies and disrupts ecosystem functions. This study aims to analyze the effectiveness of legal enforcement in addressing environmental pollution in river basins and to formulate strategies for strengthening legal mechanisms. The research employs a normative juridical method with statutory and conceptual approaches, utilizing primary, secondary, and tertiary legal materials analyzed through descriptive-analytical techniques. The findings indicate that administrative sanctions are more frequently applied yet lack deterrent effect, while criminal and civil sanctions are rarely used due to evidentiary and procedural constraints. Weak institutional coordination, legal ambiguity, and limited public participation are identified as the main obstacles to effective enforcement. The study recommends reinforcing the principle of strict liability, harmonizing national and regional regulations, enhancing institutional capacity, and integrating legal enforcement with ecosystem-based management. Effective legal enforcement must be responsive to pollution complexity, ecologically just, and socially participatory.

Keywords: environmental law; environmental pollution; law enforcement; regulatory effectiveness; river basin

Abstrak

Pencemaran lingkungan di wilayah Daerah Aliran Sungai (DAS) merupakan permasalahan ekologis yang bersifat sistemik, disebabkan oleh limbah industri, domestik, dan pertanian yang mencemari badan air dan mengganggu fungsi ekosistem. Penelitian ini bertujuan untuk menganalisis efektivitas penegakan hukum terhadap pencemaran lingkungan di wilayah DAS serta merumuskan strategi penguatan mekanisme hukumnya. Metode yang digunakan adalah penelitian hukum normatif dengan pendekatan perundang-undangan dan konseptual, menggunakan bahan hukum primer, sekunder, dan tersier yang dianalisis secara deskriptif-analitis. Hasil penelitian menunjukkan bahwa mekanisme sanksi administratif lebih sering diterapkan namun kurang memberikan efek jera, sementara sanksi pidana dan perdata jarang digunakan karena kendala pembuktian dan teknis prosedural. Lemahnya koordinasi kelembagaan, ketidakjelasan norma hukum, serta minimnya partisipasi masyarakat menjadi faktor penghambat utama dalam penegakan hukum lingkungan. Penelitian ini merekomendasikan penguatan prinsip strict

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liability, harmonisasi regulasi pusat dan daerah, peningkatan kapasitas lembaga, serta integrasi pendekatan hukum dengan pengelolaan berbasis ekosistem. Penegakan hukum yang efektif harus responsif terhadap kompleksitas pencemaran, adil secara ekologis, dan partisipatif secara sosial.

Kata kunci: daerah aliran sungai; efektivitas regulasi; hukum lingkungan; pencemaran lingkungan; penegakan hukum

1. INTRODUCTION

Environmental pollution within river basin areas represents a multifaceted ecological crisis that continues to escalate in complexity. River basins serve as critical hydrological planning units, linking upstream, midstream, and downstream ecosystems. In this context, pollution not only degrades environmental quality but also generates far-reaching socio-economic and health consequences. A polluted river basin loses its function as a life-supporting system, resulting in declining water quality, the collapse of aquatic ecosystems, and increased environmental inequality, especially for vulnerable communities that rely directly on river resources. This phenomenon is prevalent across various regions in Indonesia, where environmental governance struggles to keep pace with the exploitation of natural resources.

The urgency of environmental law enforcement has become increasingly apparent amidst the growing degradation of river ecosystems. Legal instruments are central pillars in building a sustainable environmental governance framework. Effective law enforcement is not only a punitive tool but also a preventive mechanism that promotes compliance, corrects behavior, and ensures the continuity of natural resources. Indonesia's legal system, particularly Law No. 32 of 2009 on Environmental Protection and Management, regulates the imposition of administrative, civil, and criminal sanctions. These sanctions are intended to work complementarily and to form a responsive legal mechanism capable of addressing various forms of environmental violations.

In practice, however, the implementation of environmental regulations continues to encounter numerous structural and cultural barriers. Law enforcement often operates inconsistently, slowly, or is not carried out at all. This indicates a significant gap between legal norms and actual implementation. One of the primary obstacles is the limited

institutional capacity, which includes insufficient human resources, inadequate funding, and lack of coordination among enforcement bodies. In addition, overlapping authority between central and regional governments often results in jurisdictional confusion, particularly in river basins that span multiple administrative areas. Weak monitoring and enforcement systems further exacerbate the situation, leaving many violations undetected or unaddressed.

Substantive legal issues also contribute to the ineffectiveness of enforcement. Although the legal framework is relatively comprehensive, there remains a lack of clarity regarding the prioritization of sanctions. Law No. 32 of 2009 does not explicitly establish a hierarchy between administrative, civil, and criminal sanctions. This ambiguity often leads to uncertainty in their application. In the context of environmental pollution, the speed and precision of legal responses are crucial to preventing broader ecological harm. This underscores the urgent need for reformulating law enforcement strategies that are contextually grounded and responsive to on-the-ground conditions.

Previous studies have explored the issue of environmental law enforcement from various angles. I Made Arya Utama¹ in 2018, in *The Challenges of Water Pollution: Enforcement of Water Pollution Control*, contends that administrative sanctions are more efficient and practical than criminal and civil penalties because they can be applied swiftly without requiring judicial proceedings. Dyah Mustika Prasetyaningsih² in 2022, through *Effectiveness of Environmental Law Implementation: Compliance and Enforcement*, highlights the critical role of compliance and oversight, asserting that regulatory frameworks become ineffective in the absence of consistent monitoring and enforcement. A broader perspective is presented by Denicia Kassie³ in 2024 in *Unravelling the Legal Labyrinth: Investigating Barriers to Effective Adoption and Enforcement of International*

¹ I Made Arya Utama and I Nengah Suharta, "The Challenges of Water Pollution: Enforcement of Water Pollution Control," *Hasanuddin Law Review* 4, no. 1 (April 14, 2018): 81, <https://doi.org/10.20956/halrev.v4i1.1414>.

² Dyah Mustika Prasetyaningsih et al., "Effectiveness of Environmental Law Implementation: Compliance and Enforcement," *Volksgeist: Jurnal Ilmu Hukum Dan Konstitusi*, December 19, 2022, 215–25, <https://doi.org/10.24090/volksgeist.v5i2.6826>.

³ Denicia Kassie, "Unravelling the Legal Labyrinth: Investigating Barriers to Effective Adoption and Enforcement of International Environmental Law in Domestic Jurisdictions," *Journal of Environmental Management* 352 (February 2024): 119944, <https://doi.org/10.1016/j.jenvman.2023.119944>.

Environmental Law in Domestic Jurisdictions, which identifies structural and institutional barriers that impede the implementation of international environmental law within national legal systems. While all three studies share a common concern about the ineffectiveness of environmental enforcement, they differ in focus: Utama emphasizes the type of sanction, Prasetyaningsih focuses on compliance mechanisms, and Kassie addresses the challenge of legal-institutional integration across jurisdictions.

The findings of these studies suggest that environmental law enforcement, particularly in river basin areas, cannot rely solely on normative legal approaches. There is a pressing need for integrative strategies that go beyond the formal legal framework and incorporate institutional strengthening, community participation, and the use of technology to support real-time environmental monitoring. Legal reforms should also integrate the principle of ecological justice to ensure that the most affected communities have access to effective legal remedies. Such approaches align with the broader goals of sustainable development and the constitutional right to a healthy environment.

Moreover, river basins possess unique characteristics that demand context-specific legal responses. As regions that encompass multiple ecosystems and administrative jurisdictions, river basin management requires inter-sectoral and inter-regional coordination. Legally, this calls for harmonized regulations between central and local governments, as well as synergy among enforcement agencies. A collaborative and integrated approach to river basin governance is essential in ensuring that environmental violations are addressed comprehensively and sustainably. This study seeks to analyze how existing legal structures and enforcement mechanisms can be strengthened to accommodate the complex realities of river basin management.

Considering these complexities, this research aims to fill a gap in the discourse on environmental law enforcement by offering a focused analysis of regulatory effectiveness within river basin contexts. The primary objective is to assess the extent to which existing environmental regulations have facilitated effective enforcement against pollution, while identifying the key enabling and inhibiting factors in the implementation of sanctions as stipulated by law. This analysis will contribute to a more comprehensive understanding of how legal mechanisms function within complex and dynamic environmental settings.

The academic contribution of this study lies in its reinforcement of the theoretical framework of environmental enforcement through an analysis of regulatory effectiveness. By adopting a normative-juridical approach and incorporating critical perspectives on field practices, the study proposes a strategic framework for policymakers, legal practitioners, and environmental agencies to design more responsive, efficient, and equitable enforcement systems. Additionally, the research provides an argumentative basis for reformulating environmental policies, particularly in the context of river basin management. The goal is to support sustainable development initiatives and uphold environmental rights for all communities.

2. RESEARCH METHODS

This research is a normative legal study, focusing on the analysis of statutory regulations and legal doctrines related to law enforcement in the control of environmental pollution, particularly within river basin areas. This method is used to assess the effectiveness of legal enforcement mechanisms as regulated in environmental laws, and to identify normative gaps, regulatory disharmony, and structural weaknesses in their implementation. The main legal framework referred to in this study is Law Number 32 of 2009 on Environmental Protection and Management, which outlines three types of sanctions: administrative, civil, and criminal, particularly within Articles 76 to 120.

The study adopts both a statutory approach and a conceptual approach. The statutory approach is applied to systematically examine the substance of applicable legal norms, both at the national level (laws and government regulations) and at the local level (regional regulations relevant to environmental and river basin governance).⁴ The conceptual approach is used to explore foundational principles of environmental law enforcement, including the precautionary principle, ecological justice, and sustainable development.⁵ These principles serve as analytical tools to evaluate the extent to which

⁴ Irwansyah, *Penelitian Hukum, Pilihan Metode & Praktik Penulisan Artikel*, Cetakan Ke 3 (Yogyakarta: Mirra Buana Media, 2020).

⁵ Muhammad Siddiq Armia, *Penentuan Metode Dan Pendekatan Penelitian Hukum* (Banda Aceh: Lembaga Kajian Konstitusi Indonesia (LKKI), 2022).

the existing legal instruments reflect a commitment to environmental protection and uphold justice for affected communities.

Sources of legal materials in this research include primary legal materials, such as laws, government regulations, and regional regulations; secondary legal materials, which consist of academic journals, legal textbooks, and previous scholarly works; and tertiary legal materials, including legal dictionaries and supporting documentation that help interpret environmental legal concepts. The materials were gathered through library research, organized, and analyzed using a descriptive-analytical technique. This method allows for a detailed explanation of the normative content of environmental laws while also providing a critical assessment of their practical implementation in addressing pollution within river basin areas. The analysis is expected to result in normative conclusions and prescriptive recommendations that contribute to the development of a more effective and responsive environmental enforcement system.

3. RESULTS AND DISCUSSION

3.1. Characteristics of Environmental Pollution in River Basin Areas

Environmental pollution in river basin areas is a multifaceted issue that arises from various human activities. These activities generally include industrial operations, domestic waste generation, and agricultural practices. The river basin, as an integrated ecological unit, is highly sensitive to anthropogenic interventions. Industrial facilities located near rivers often discharge untreated wastewater containing heavy metals, dyes, and chemical compounds directly into the water bodies. Such pollutants cause irreversible damage to aquatic ecosystems and degrade water quality.⁶ Meanwhile, domestic waste contributes organic pollutants, detergents, and pathogens, exacerbating eutrophication and oxygen depletion in the water system.

The agriculture sector significantly contributes to non-point source pollution through the use of chemical fertilizers and pesticides. These substances are carried into

⁶ Chengqing Liu et al., "The Impact of Environmental Regulations on Pollution and Carbon Reduction in the Yellow River Basin, China," *International Journal of Environmental Research and Public Health* 20, no. 3 (January 17, 2023): 1709, <https://doi.org/10.3390/ijerph20031709>.

rivers through surface runoff, particularly during rainfall events, leading to nutrient overloading. This results in algal blooms that disrupt aquatic food chains.⁷ Agricultural runoff also transports sediment that can alter the physical characteristics of the river, affecting both flow dynamics and habitat structures. The combined effect of these sources intensifies the environmental burden on river basins, making pollution management a complex and urgent task for policymakers.

The impact of pollution in river basins is not only ecological but also social and economic. Water pollution threatens public health, particularly in communities relying on rivers for drinking, bathing, and irrigation. Cases of waterborne diseases, such as diarrhea, skin infections, and parasitic outbreaks, are often reported in areas with poor sanitation and polluted rivers. Economically, river pollution affects fisheries and agricultural productivity. Farmers and fishers suffer income losses due to reduced yields, while local governments bear the financial burden of environmental restoration and public health interventions. Environmentally, pollution leads to the loss of biodiversity, particularly the extinction or migration of sensitive aquatic species. Rivers that once supported diverse ecosystems become biologically impoverished. Polluted rivers also produce unpleasant odors and discoloration, reducing their aesthetic and recreational value. The degradation of riverine environments ultimately compromises ecosystem services such as flood control, water filtration, and habitat provision, which are essential for both human well-being and environmental sustainability.

In the legal context, river basins constitute strategic ecological zones necessitating integrated protection and management. Law No. 32 of 2009 on Environmental Protection and Management defines the environment as a unified space comprising natural and artificial elements, including biotic components and human activities. Within this framework, river basins are identified as essential environmental components. Government Regulation No. 37 of 2012 mandates integrated watershed management, underscoring the interconnectedness between upstream and downstream regions. Legal

7 Wenjie Yao, “Effect of the River Chief System on River Pollution Control under ‘Responsibility Contracting’: Lessons and Experiences from China,” *Water Policy* 25, no. 7 (July 1, 2023): 731–41, <https://doi.org/10.2166/wp.2023.059>.

recognition, however, has not translated into effective enforcement. An ambiguous division of authority between central and local governments contributes to jurisdictional overlap and enforcement delays.⁸ Poor inter-agency coordination further weakens regulatory effectiveness. Administrative fragmentation continues to obstruct the consistent application of environmental safeguards in river basin areas.

Another issue is the absence of a clear legal mandate for rapid response to pollution incidents. While the law provides for administrative, civil, and criminal sanctions, it does not explicitly prioritize which type of sanction should be applied in specific scenarios. This ambiguity often results in enforcement delays or selective application of penalties. Moreover, some enforcement agencies may lack the legal competence or technical capacity to carry out investigations, collect evidence, and prosecute environmental offenses effectively. These institutional weaknesses compromise the legal protection of river basins.⁹ In addition to legal and institutional challenges, cultural and societal factors also affect the management of river pollution. Public awareness of environmental law is generally low, and environmental crimes are often perceived as minor offenses. In some regions, traditional practices such as disposing of household waste directly into rivers are still prevalent. This behavior persists due to inadequate education and the lack of accessible waste management infrastructure. Without a strong culture of environmental compliance, legal measures alone are insufficient to deter polluting behavior.¹⁰

Furthermore, data availability and environmental monitoring systems remain limited in many parts of Indonesia. Reliable water quality data are crucial for assessing the extent of pollution and identifying its sources. However, monitoring equipment is often lacking, and data collection is sporadic and uncoordinated. This impedes timely and evidence-based decision-making. It also reduces the effectiveness of early warning

⁸ Trias Hernanda and Urip Giyono, "Environmental Legal Protection of Rivers in the Perspective of Sustainable Development," *Jurnal Jurisprudence* 11, no. 1 (January 14, 2022): 100–113, <https://doi.org/10.23917/jurisprudence.v11i1.14744>.

⁹ Philipp Wesche, "Rights of Nature in Practice: A Case Study on the Impacts of the Colombian Atrato River Decision," *Journal of Environmental Law* 33, no. 3 (November 17, 2021): 531–55, <https://doi.org/10.1093/jel/eqab021>.

¹⁰ Susanne Wuijts et al., "An Ecological Perspective on a River's Rights: A Recipe for More Effective Water Quality Governance?," *Water International* 44, no. 6–7 (October 3, 2019): 647–66, <https://doi.org/10.1080/02508060.2019.1615773>.

systems and risk assessments, which are essential for preventing large-scale pollution events in river basins. Addressing these issues requires a multi-layered approach involving legal reform, institutional strengthening, public engagement, and technological innovation. Legal reforms must clarify enforcement procedures and enhance the accountability of polluters. Institutions must be equipped with the necessary tools and training to enforce environmental laws consistently. Public participation must be institutionalized through community-based monitoring and legal standing for citizen lawsuits. Finally, environmental data systems should be modernized to support real-time monitoring and rapid response to pollution incidents.

3.2. Evaluation of the Existing Legal Enforcement Framework

The enforcement of environmental law in Indonesia is structured around three core types of sanctions: administrative, civil, and criminal. These are stipulated in Law No. 32 of 2009 on Environmental Protection and Management, particularly in Articles 76 to 120. Each type of sanction is designed to address different forms and severities of environmental violations. In theory, this multi-layered enforcement framework is intended to offer flexibility and comprehensiveness. In practice, however, the application of these sanctions is far from optimal. The mechanisms often operate in silos, are inconsistently applied, or remain dormant due to institutional constraints and legal ambiguity. Administrative sanctions are the most frequently applied, primarily because they allow environmental authorities, such as the Ministry of Environment and Forestry (KLHK) and regional Environmental Agencies (DLH), to act without going through the courts.¹¹ These sanctions include written warnings, temporary suspension of business licenses, administrative fines, and even closure of operations. They are intended to be preventive and corrective rather than punitive. However, in many cases, the effectiveness of administrative sanctions is undermined by a lack of follow-up, insufficient monitoring, and limited institutional authority, particularly at the regional level.

¹¹ Valencia Prasetyo Ningrum, "Environmental Law Enforcement In Law Number 32 of 2009 Concerning Environmental Protection and Management," *Asian Journal of Social and Humanities* 1, no. 08 (May 25, 2023): 351–56, <https://doi.org/10.59888/ajosh.v1i08.38>.

Criminal sanctions, although more severe in nature, are rarely applied in environmental cases. This is due to several reasons. First, environmental crimes are difficult to prove beyond a reasonable doubt, as required under criminal law. Gathering scientific evidence of pollution and establishing a direct causal link between the offender's actions and environmental harm requires both technical expertise and time, which law enforcement officers often lack. Second, environmental crimes are still considered low-priority offenses by many police departments and prosecutors. As a result, very few environmental cases proceed to prosecution, and even fewer result in convictions. Civil sanctions, which include compensation claims for environmental damage, are theoretically available to both the state and affected individuals or communities. These are outlined in Articles 87-92 of the law.¹² However, civil litigation in environmental matters is not common in Indonesia. The process is costly, time-consuming, and often inaccessible to marginalized communities that are most affected by pollution. Furthermore, the judiciary may lack sufficient environmental law expertise to adjudicate such cases effectively, resulting in low success rates for plaintiffs.

Institutional roles in environmental enforcement are clearly delineated in the law, but in practice, the coordination among them is weak. The KLHK is responsible for national policy and supervision, while DLH agencies at the provincial and district levels are tasked with implementation. In enforcement, collaboration is required with the police, prosecutors, and sometimes the military. However, turf wars, overlapping mandates, and unclear standard operating procedures often create confusion. These inter-agency gaps allow violators to exploit legal loopholes and regulatory ambiguity, weakening the entire enforcement system. Beyond structural inefficiencies, there are also problems of legal uncertainty and regulatory fragmentation. Multiple overlapping laws and sectoral regulations ranging from forestry, mining, to spatial planning often create conflicting obligations or unclear jurisdictional boundaries.¹³ As a result, enforcement officials may

¹² *Ibid.*

¹³ Prasasti Dyah Nugraheni and Andrianantenaina Fanirintsoa Aime, "Environmental Law Enforcement in Indonesia Through Civil Law: Between Justice and Legal Certainty," *The Indonesian Journal of International Clinical Legal Education* 4, no. 2 (June 30, 2022), <https://doi.org/10.15294/ijicle.v4i1.55763>.

hesitate to act, fearing legal challenges or accusations of overstepping their authority. Moreover, the absence of implementing regulations and detailed guidelines for environmental law adds further ambiguity in practice.

Another challenge is the lack of deterrent effect in current enforcement practices. The penalties imposed, particularly administrative fines, are often too low to deter repeat offenders, especially large corporations. When violations do occur, companies sometimes opt to pay the fine as a cost of doing business rather than adjusting their operations to comply with environmental standards. This undermines the purpose of the law and perpetuates a culture of non-compliance. Environmental enforcement also suffers from capacity deficits, both in terms of human resources and infrastructure. Many local environmental offices are understaffed and underfunded. Inspectors may lack training in environmental investigation techniques, environmental forensics, or GIS mapping.¹⁴ This limits their ability to collect robust evidence and enforce sanctions effectively. Additionally, institutional performance is rarely evaluated using environmental outcomes, which means agencies are not held accountable for the state of the ecosystems they oversee.

There is also a cultural dimension to the weak enforcement framework. In some cases, local communities, officials, and even judges may not perceive environmental harm as a serious issue. The prevailing perception is that economic development should take precedence, even at the cost of environmental degradation. This growth-at-all-costs mentality results in leniency toward polluters, especially when they are major employers or investors in the region. The failure to internalize environmental values across institutions and society at large is a major barrier to enforcement. Public participation in enforcement is legally acknowledged but rarely facilitated. While Law No. 32 of 2009 permits citizens to file lawsuits and engage in environmental monitoring, in practice, civil society involvement is limited.¹⁵ There is little institutional support for citizen lawsuits, and community complaints are often ignored or inadequately followed up. Without a

¹⁴ *Ibid.*

¹⁵ Imam Mulyana, "Public Participation in Environmental Matters: Indonesia's Brief Reflection," *Jurnal Bina Mulia Hukum* 9, no. 1 (2024): 61–95, <https://doi.org/https://doi.org/10.23920/jbmh.v9i1.1508>.

robust public oversight mechanism, environmental law enforcement risks becoming an insular process with minimal accountability.

3.3. Strategies for Strengthening Legal Enforcement Mechanisms

Strengthening legal enforcement mechanisms in the context of environmental pollution control, especially in river basin areas, requires a multidimensional and systemic approach. Existing regulations must be refined to reduce ambiguity and enhance their enforceability. While Law No. 32 of 2009 already provides a framework for sanctions, it does not clearly outline the hierarchy, priority, or procedural pathways for each type of sanction. Developing a more coherent regulatory system would ensure that enforcement agencies apply administrative, civil, or criminal sanctions appropriately based on the severity and nature of the violation. Detailed implementing regulations and technical guidelines are needed to support consistent and predictable enforcement.¹⁶ The harmonization of central and regional environmental policies is essential to close existing regulatory gaps. Many river basins span multiple administrative jurisdictions, making them particularly vulnerable to fragmented governance. The central government should work in partnership with provincial and district governments to align environmental regulations, permitting processes, and enforcement protocols. This coordination can be achieved through joint ministerial decrees or intergovernmental frameworks that define roles, responsibilities, and reporting obligations across administrative levels. Regulatory coherence will ensure that local actions reinforce national objectives rather than contradict them.¹⁷

The principle of strict liability, as outlined in Article 88 of Law No. 32 of 2009, holds polluters accountable for environmental damage regardless of intent or negligence. This legal tool is especially crucial for addressing industrial pollution in river basins,

¹⁶ Utama and Suharta, "The Challenges of Water Pollution: Enforcement of Water Pollution Control."

¹⁷ Wildan Siregar, Ida Nurlinda, and Maret Priyanta, "Kebijakan Penegakan Hukum Lingkungan Atas Pelanggaran Administrasi Tata Ruang Dan Alih Fungsi Lahan Sempadan Sungai Dalam Rangka Terwujudnya Tata Ruang Yang Berkelanjutan," *Jurnal Poros Hukum Padjadjaran* 3, no. 1 (December 10, 2021): 130–49, <https://doi.org/10.23920/jphp.v3i1.710>.

where proving causation is often challenging.¹⁸ Its broader application can enhance enforcement efficiency and deterrence. To strengthen this framework, strict liability should be integrated with command-and-control measures such as emission limits, permit conditions, and mandatory reporting.¹⁹ Effective implementation depends on institutional capacity, including trained personnel, adequate funding, and technologies like GIS-based monitoring.²⁰ Performance indicators must also reflect ecological outcomes such as water quality and biodiversity improvements to ensure that enforcement contributes to sustainability goals.

Community involvement should be institutionalized within the enforcement system. Local residents, who are often the first to experience the effects of pollution, should be empowered to report violations and participate in environmental monitoring. Legal mechanisms such as citizen lawsuits (*actio popularis*) and community reporting platforms can increase transparency and accountability. Public complaint mechanisms must be responsive and linked to official enforcement workflows. When citizens are confident that their concerns will result in action, they are more likely to act as stewards of local ecosystems, including rivers and wetlands.²¹ Independent environmental oversight is another critical element of a robust enforcement system. Establishing or strengthening Environmental Ombudsman Offices, independent commissions, or multi-stakeholder monitoring boards can provide checks and balances on government enforcement actions. These entities can investigate complaints, audit agency performance, and ensure that enforcement is not influenced by political or economic

¹⁸ Zahranissa Putri Faizal, "Strict Liability in Environmental Dispute Responsibility Before and After the Enabling of Omnibus Law," *Administrative and Environmental Law Review* 2, no. 1 (May 21, 2021): 53–60, <https://doi.org/10.25041/aelr.v2i1.2318>.

¹⁹ Jinyang Li, Chao Xiong, and Yunrong Huang, "How the River Chief System Achieved River Pollution Control: Analysis Based on AGIL Paradigm," *Sustainability* 16, no. 5 (February 21, 2024): 1775, <https://doi.org/10.3390/su16051775>.

²⁰ Utama and Suharta, "The Challenges of Water Pollution: Enforcement of Water Pollution Control."

²¹ Prasetyaningsih et al., "Effectiveness of Environmental Law Implementation: Compliance and Enforcement."

pressures. Their independence is vital to protect the integrity of environmental governance and public trust.²²

Judicial capacity should also be enhanced. Judges and prosecutors require specialized training in environmental law, science, and procedural mechanisms related to pollution cases. The establishment of environmental courts or special chambers can improve the handling of complex environmental litigation. These courts can also set legal precedents that clarify the application of sanctions and expand the interpretation of environmental rights. Access to justice should be facilitated through pro bono legal services, legal aid for marginalized communities, and simplified procedures for filing environmental claims.²³ Cross-sectoral integration between environmental law enforcement and ecosystem-based management approaches is essential. Pollution control must be aligned with watershed conservation, land use planning, and climate adaptation strategies. Legal instruments should reflect ecological realities such as hydrological boundaries and ecosystem interdependencies rather than being confined by administrative lines. For example, integrating enforcement protocols with river basin management plans can create a synergistic relationship between legal compliance and ecosystem health.²⁴

Technology and data systems must play a larger role in supporting environmental enforcement. The deployment of real-time monitoring systems, satellite imagery, mobile reporting apps, and public dashboards can increase transparency and improve enforcement efficiency. Digital evidence collected through sensors or drones can strengthen prosecution cases and reduce reliance on subjective testimonies. Furthermore, open access to environmental data can enhance civic engagement and scientific research, creating a feedback loop that continuously improves enforcement practices. Lastly, cultural transformation is needed to embed environmental protection into the core values

²² Muhammad Arslan and Ahmad Alqatan, "Role of Institutions in Shaping Corporate Governance System: Evidence from Emerging Economy," *Heliyon* 6, no. 3 (March 2020): e03520, <https://doi.org/10.1016/j.heliyon.2020.e03520>.

²³ Wayne B. Gray and Jay P. Shimshack, "The Effectiveness of Environmental Monitoring and Enforcement: A Review of the Empirical Evidence," *Review of Environmental Economics and Policy* 5, no. 1 (January 1, 2011): 3–24, <https://doi.org/10.1093/req/req017>.

²⁴ David A Keiser and Joseph S Shapiro, "Consequences of the Clean Water Act and the Demand for Water Quality*," *The Quarterly Journal of Economics* 134, no. 1 (February 1, 2019): 349–96, <https://doi.org/10.1093/qje/qjy019>.

of institutions and society.²⁵ Legal enforcement cannot succeed without public support and institutional commitment to ecological sustainability. Environmental education, awareness campaigns, and public dialogues should accompany legal reforms. A strong environmental ethic must be cultivated at all levels from policymakers to industrial actors to individual citizens. Only through a comprehensive, participatory, and integrated strategy can legal enforcement mechanisms truly contribute to the long-term protection of river basins and the environment.

CONCLUSION AND SUGGESTION

Environmental pollution in river basin areas is characterized by various sources, including industrial effluents, household waste, and agricultural runoff, all of which contribute to the degradation of water quality and ecosystem functions. These pollutants cause ecological damage, public health risks, and socioeconomic disruption in communities that rely on river systems. Legal recognition of river basins as ecological units exists in national regulations, yet enforcement remains fragmented and weak. The effectiveness of environmental law enforcement is limited by unclear legal procedures, lack of prioritization among types of sanctions, and insufficient institutional coordination. Administrative sanctions are more frequently applied but often lack follow-through and deterrent effect. Civil and criminal sanctions are rarely enforced due to evidentiary and procedural challenges. Environmental agencies at both national and local levels face structural limitations, while public participation remains minimal and underutilized. Enforcement efforts are not yet aligned with the ecological urgency nor the practical needs of affected communities. Legal mechanisms currently in place have not achieved optimal deterrence or restorative impact in addressing pollution in river basins.

Strengthening the enforcement of environmental law requires refining sanction procedures and providing clear legal pathways for action. Coordinated regulation between central and regional governments is necessary to avoid overlapping mandates. Applying the strict liability principle consistently, especially in pollution cases involving

²⁵ Taufiqur Rahaman, "Smart Environmental Monitoring Systems For Air And Water Quality Management," *American Journal of Advanced Technology and Engineering Solutions* 1, no. 01 (February 3, 2025): 1–19, <https://doi.org/10.63125/a08zay47>.

hazardous materials, will reduce the burden of proof and enhance legal responsiveness. Institutional capacity must be supported through training, adequate funding, and access to environmental monitoring technologies. Public involvement should be encouraged through accessible complaint systems and recognition of citizen legal standing. Independent oversight bodies such as environmental ombudsmen or monitoring commissions should be established to ensure transparency and accountability. Judicial systems require specialization in environmental law to handle complex cases effectively. Enforcement must be integrated with ecosystem-based management approaches that reflect the interdependence of land, water, and communities. Technological tools such as real-time monitoring, open data, and digital reporting systems should be leveraged to improve enforcement outcomes. Cultural transformation toward environmental responsibility is essential to embed enforcement within societal values, institutional norms, and policy priorities.

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