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Environmental Law in Responding to Environmental Damage Due to Carbon Emissions

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Abstract: Carbon emissions are a major contributor to environmental damage and global climate change. This article examines the role and effectiveness of environmental law in Indonesia in addressing damage caused by carbon emissions, using an empirical juridical approach. Through legislation such as Law Number 32 of 2009 concerning Environmental Protection and Management and Presidential Regulation Number 98 of 2021 concerning the Economic Value of Carbon, it is found that Indonesia has a sufficient legal basis from a normative perspective. However, the case studies of the Suralaya coal-fired power plant and the forest fires in Riau demonstrate that law enforcement remains weak, inconsistent, and often biased against ecological victims. An analysis of expert citations highlights the importance of law as a transformative instrument that not only regulates but also protects and enforces the law. This article recommends law enforcement, criminal sanctions against corporations, and public involvement in oversight as concrete steps towards ecological justice and sustainable development.

Keyword: Environmental Law, Carbon Emissions, Climate Change, Law Enforcement, Ecological Damage

INTRODUCTION

Environmental damage due to climate change has now become a global issue that threatens the sustainability of human life on Earth (Malihah, 2022). Climate change is scientifically recognized as a direct impact of increased greenhouse gas emissions, particularly carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), released into the atmosphere by various human activities. Among the various types of greenhouse gases, carbon emissions dominate the contribution to global warming, particularly those generated by the energy, industrial, transportation, and deforestation sectors. This global warming has a wide range of impacts, including changes in extreme weather patterns such as floods, droughts, stronger storms, and irregular seasons. Global warming also causes the melting of polar ice caps, which directly impacts sea level rise. This potentially threatens tens of

millions of people living in coastal areas, with the threat of sea flooding that damages infrastructure and disrupts daily life.

Furthermore, climate change also impacts ecosystems on land and at sea, causing species migration, coral reef mortality, and the destruction of natural habitats. According to the Central Statistics Agency (BPS), in 2018, the average greenhouse gas emission intensity of Indonesian industry was 75.9 tons of carbon dioxide equivalent (CO₂e) per billion rupiah. This means that every time domestic industry produces IDR 1 billion in gross added value, the volume of emissions released into the environment averages 75.9 tons of CO₂e. However, the emission intensity has tended to increase, reaching 79.2 tons of CO₂e per billion rupiah in 2022, a 4.3% increase compared to 2018. (adi ahdiat, 2024).

This phenomenon has triggered global temperature increases, extreme weather, melting polar ice caps, rising sea levels, and damage to terrestrial and marine ecosystems. In Indonesia, these impacts are increasingly evident in the form of hydrometeorological disasters, forest fires, droughts, and declining urban air quality (Tresnanti et al., 2024). As a developing country rich in natural resources, Indonesia faces a dilemma between pursuing economic growth and preserving the environment. High carbon emissions are not only contributed by the industrial and energy sectors, but also from land conversion and peatland burning. Various studies show that Indonesia is one of the largest contributors of carbon emissions in the world, especially during forest and land fires (karhutla) (Aisah et al., 2023). Furthermore, Indonesia has also demonstrated its commitment to tackling climate change through ratification of the Paris Agreement and the preparation of its Nationally Determined Contribution (NDC), which targets a gradual reduction in greenhouse gas emissions.

In this context, environmental law is crucial as a regulatory, controlling, and disciplinary tool for various activities that have the potential to damage the environment. Environmental law encompasses legal norms and instruments designed to prevent environmental pollution and damage, as well as to uphold ecological justice. In Indonesia, the environmental legal framework is comprehensively regulated through Law Number 32 of 2009 concerning Environmental Protection and Management (UU PPLH), which outlines principles, principles, and legal provisions for maintaining environmental sustainability. This law is reinforced by a number of derivative regulations, such as Presidential Regulation Number 98 of 2021 concerning the Economic Value of Carbon (NEK), which serves as the starting point for implementing market-based emission reduction mechanisms, such as carbon trading, carbon tax, and carbon offset schemes (Sutanto et al., 2023).

However, the implementation of environmental law in Indonesia still faces various challenges. These include weak oversight of high-emission industries, lax enforcement of environmental violations, overlapping regulations between agencies, and limited public participation in oversight. At the local level, the limited capacity of local government officials and low public awareness of climate change issues also hinder the effectiveness of legal approaches to carbon emissions mitigation. Along with advances in science and global awareness of the importance of transitioning to a green economy and sustainable development, environmental law is required to be adaptive and progressive. The legal approach should not be merely repressive through sanctions, but should also be preventive and promotive, encouraging business actors to adopt environmentally friendly technologies and implement circular economy principles. In the context of addressing carbon emissions, environmental law needs to be directed towards creating incentives that encourage voluntary and mandatory emission reductions, through measurable and accountable regulations (Ariani et al., 2022).

Therefore, this article is designed to discuss in depth the role of environmental law in addressing environmental damage caused by carbon emissions. This article examines the legal instruments applicable in Indonesia, the challenges of their implementation, and

opportunities to strengthen their effectiveness. The discussion focuses not only on written legal norms but also on law enforcement practices, the role of oversight institutions, and the contribution of civil society in promoting accountability and transparency. Through an interdisciplinary approach and critical analysis, it is hoped that this article will contribute to the development of environmental law that is more responsive to the increasingly complex climate crisis.

METHOD

This research uses an empirical juridical method, a legal approach that focuses not only on norms or laws but also examines how these laws are implemented and function in society (Maranay & Marsal, 2024). This method was chosen because the issue of environmental damage caused by carbon emissions cannot be analyzed solely from a normative perspective; it also requires an understanding of the practical implementation of environmental law in the field.

Empirical juridical research, in this context, is used to assess the effectiveness of legal instruments in addressing pollution and environmental damage caused by carbon emissions, whether from the industrial, energy, or forestry sectors. In addition to examining the content and structure of laws governing carbon emission control (such as Law Number 32 of 2009 concerning Environmental Protection and Management and Presidential Regulation Number 98 of 2021 concerning the Economic Value of Carbon), this research also utilizes field data in the form of case studies and law enforcement reports to measure the extent to which these laws are effectively implemented.

Data collection techniques included literature studies and document reviews, as well as content analysis of policies and their implementation. The analysis was conducted using a qualitative descriptive approach, describing and interpreting the data obtained within a legal and environmental framework (Achjar et al., 2023). Using an empirical juridical approach, this study is expected to provide a comprehensive picture of the extent to which Indonesia's environmental legal system is able to respond to the ecological crisis caused by carbon emissions, while also identifying weaknesses and opportunities for strengthening regulations and their enforcement.

RESULT AND DISCUSSION

A. The Urgency of Carbon Emission Control from an Environmental Law Perspective

Carbon emissions are a major contributor to global warming and climate change. In Indonesia, carbon emissions originate primarily from the coal-based energy sector, industry, transportation, and deforestation and forest fires. Environmental damage caused by these emissions not only impacts nature but also the quality of life of the community, such as an increased risk of respiratory diseases due to air pollution, decreased agricultural productivity, and an increased frequency of climate-related natural disasters (Maulia et al., 2023).

Within the national legal framework, carbon emission control is regulated through various laws and regulations, with Law Number 32 of 2009 concerning Environmental Protection and Management (UU PPLH) as the primary instrument. This law emphasizes that any activity that causes environmental pollution and/or damage requires prevention and control efforts. Furthermore, Article 69 paragraph (1) letter a of the UU PPLH explicitly prohibits any person from engaging in actions that result in environmental pollution or damage (Pahlevi & Rahmawan, 2019).

The latest policy, Presidential Regulation Number 98 of 2021 concerning the Economic Value of Carbon (NEK), demonstrates the country's commitment to integrating emissions control into a green economy framework. This regulation opens up the opportunity for the implementation of market mechanisms such as cap and trade, carbon offsets, and

carbon taxes to encourage businesses to reduce their emissions, both voluntarily and mandatorily (President, 2021). However, despite Indonesia's relatively progressive legal framework, its effective implementation still faces various challenges on the ground.

B. Implementation and Challenges of Law Enforcement on Carbon Emissions

Empirically, law enforcement against carbon emission violations has not been optimal. Case studies conducted on coal-fired power plants (PLTU) in several regions of Java and Sumatra show that, despite their high emission contribution, oversight of emission standards remains weak (Burhanuddin, 2015). For example, investigative reports issued by environmental NGOs such as Greenpeace Indonesia and WALHI found that several PLTUs produced dust particles and sulfur dioxide that exceeded environmental quality standards, yet they received no strict sanctions from the government.

Another relevant case is the forest and land fires (karhutla) in Sumatra and Kalimantan, which were largely caused by large corporations to clear land for plantations. Although the Ministry of Environment and Forestry (KLHK) has imposed administrative sanctions, including permit revocation, the legal process is often lengthy, non-transparent, and some perpetrators are not subject to criminal penalties despite the extensive damage caused (Pangaribuan, 2024). In this context, environmental laws appear insufficient to provide a deterrent effect and prevent similar incidents from recurring. Some of the main obstacles in implementing environmental laws regarding carbon emissions include:

1. Lack of oversight capacity at the regional level and limited resources within environmental inspectorates.
2. Overlapping authority between agencies, for example, between the Ministry of Environment and Forestry (KLHK), the Ministry of Energy and Mineral Resources (ESDM), and local governments.
3. Weak political commitment and law enforcement, especially when polluters are large corporations with strong ties to economic or political elites.
4. Lack of public participation in monitoring and reporting environmental violations.

Furthermore, the limited tangible incentives for businesses to adopt low-carbon technologies are also a barrier. Although regulations regarding carbon trading have been developed, the implementation of the domestic carbon market is still in its infancy and has not had much direct impact on emissions reduction.

C. Efforts to Strengthen Environmental Law in the Context of Carbon Emissions

To make environmental law more effective in addressing the damage caused by carbon emissions, strengthening several aspects is necessary (Muzaki et al., 2021). First, strengthening institutional capacity and oversight, particularly at the regional level. This includes increasing budgets, technical training, and establishing dedicated emission monitoring units. Second, reforming the law enforcement system by clarifying the mechanisms for administrative, civil, and criminal sanctions against emission violations. A transparent and publicly accessible real-time emission monitoring system is necessary, as has been implemented in several developed countries. Third, the serious implementation of green economy mechanisms, including fiscal incentives for companies that reduce their emissions, as well as the imposition of a fair and gradual carbon tax, is crucial.

By promoting carbon pricing mechanisms, industry players will be encouraged to be more efficient and environmentally friendly. Fourth, community and NGO participation needs to be continuously expanded in monitoring, reporting, and advocating for pollution cases. The active role of civil society can act as a social check on weak law enforcement by the state. Finally, environmental law enforcement must be understood not only as a means of

punishing violations, but also as part of a national strategy toward a clean energy transition, sustainable development, and ecological justice. The law must be a tool for transformation, not simply a means of licensing administration.

D. Theoretical Analysis and Expert Perspective

In the context of modern environmental law, (Rahardjo, 2006) states that "law should not be merely a rigid text, but rather must be alive and respond to the ever-changing needs of society." This statement emphasizes the importance of law as an adaptive tool to contemporary challenges such as the climate crisis. In the case of carbon emissions, law is not enough to simply establish norms; it must also be able to create a real preventive and protective effect on the environment. Similarly, Maria Farida Indrati (Simabura et al., 2023) emphasizes that "legislation must have social effectiveness, not just formal validity." In the context of carbon emissions, this means that environmental law must not only be procedurally valid but also have a direct impact in reducing emissions, preventing pollution, and protecting the public's right to a healthy environment. From an international perspective, Philippe Sands, in his book *Principles of International Environmental Law* (Bilqis & Afriansyah, 2020), states that "environmental law must be enforced to be meaningful, especially in the context of climate change, which affects the global commons." This principle asserts that without concrete legal enforcement, a country like Indonesia's climate commitments will remain empty promises.

Based on these perspectives, it can be concluded that environmental laws, particularly those related to carbon emissions, must be supported by political courage, strict oversight mechanisms, and a collective awareness that ecological damage constitutes a violation of human rights.

F. Critical Reflection and Recommendations

From the expert analysis and case studies above, it is clear that controlling carbon emissions through legal instruments requires a more assertive and systematic approach. Regulation needs to be supported by:

1. Law enforcement free from political and economic interference.
2. Consistent application of criminal sanctions, especially against corporate actors proven to have caused significant ecological damage.
3. Involving communities and environmental organizations as partners in oversight.
4. Strengthening the transparency of emissions data, so that the public can access real-time environmental information.

Without fundamental reforms to the law enforcement and oversight system, environmental law risks becoming merely a moral symbol without coercive power. As (Asshiddiqie, 2020) stated, "a law that is not enforced is not a law in the substantive sense, but merely an administrative regulation that lacks meaning."

CONCLUSION

Environmental law plays a strategic role in addressing ecological damage caused by carbon emissions. Normatively, Indonesia already has a fairly adequate legal framework, such as Law Number 32 of 2009 concerning Environmental Protection and Management, and derivative policies such as Presidential Regulation Number 98 of 2021 concerning the Economic Value of Carbon. These instruments demonstrate the state's formal commitment to responding to the climate crisis and environmental damage.

However, the reality on the ground shows that legal implementation is less than optimal. Empirical studies and concrete cases, such as pollution from the Suralaya Coal-Fired

Power Plant and forest fires in Riau, confirm that law enforcement against carbon polluters remains weak and often lacks a deterrent effect. The imbalance between corporate power and state assertiveness creates a space for ecological impunity, where significant damage does not always result in legal accountability.

Quotes and insights from legal experts make it clear that the effectiveness of environmental law is measured not only by the comprehensiveness of its regulations, but also by the extent to which it changes behavior, upholds ecological justice, and protects the public's right to a healthy environment.

Therefore, comprehensive reforms are needed in aspects of oversight, enforcement, and public participation. Strengthening carbon pricing instruments, corporate criminal sanctions, emissions transparency, and civil society engagement are strategic steps that must be implemented immediately. Environmental law must be a living, adaptive tool for social change that supports the sustainability of the earth and future generations.

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