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Analysis of Environmental Economic Policy in Indonesia: A Literature Study on Environmental Economic Instruments in National Regulations

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Abstract: *This study examines environmental economic policies in Indonesia through a literature review and analysis of national regulatory documents. The main focus is on mapping environmental economic instruments regulated under Law No. 32 of 2009 on Environmental Protection and Management, Government Regulation No. 46 of 2017, PP 22/2021, the Presidential Regulation on Carbon Economic Value (NEK), and strategic planning documents such as RAN-GRK, LTS-LCCR, and RPJMN. The study employs a qualitative-descriptive approach, using thematic content analysis to identify categories of economic instruments, including market-based instruments, funding mechanisms, risk-based licensing, and incentive–disincentive schemes. Findings indicate that Indonesia has established a relatively comprehensive regulatory framework; however, its effectiveness remains limited due to regulatory inconsistencies, institutional capacity constraints, inadequate environmental data, and weak monitoring mechanisms. The study recommends enhancing inter-agency coordination, standardizing environmental data, developing digital monitoring systems, and expanding the implementation of carbon taxes and payment-for-environmental-services schemes. These findings are expected to contribute to the development of more effective environmental economic policies, supporting Indonesia's transition toward a low-carbon economy.*

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Introduction

Environmental degradation in Indonesia has shown an increasing trend over time, in line with economic growth, industrial expansion, and intensified natural resource exploitation. Official data confirm that the national environmental condition is in a concerning state. Indonesia ranks among the top ten greenhouse gas (GHG) emitting countries globally, primarily contributed by the energy, manufacturing, and land-use change sectors (KLHK, 2023). In 2022, total national GHG emissions were estimated to exceed 1.8 billion tons of CO_2e, marking a significant increase compared to a decade earlier (KLHK, 2023). Furthermore, the deforestation rate in the same year reached approximately 104 thousand hectares—though lower than in previous years, this figure still reflects significant pressure on ecological systems (BPS, 2024).

In addition to deforestation, urban air quality in Indonesia has consistently deteriorated. Throughout 2023, major cities such as Jakarta, Surabaya, and Medan experienced "unhealthy" air quality conditions for more than 200 days, mainly due to emissions from transportation and coal-fired power plants (IQAir, 2023). Serious problems are also evident in river water quality, with approximately 63 percent of Indonesian rivers classified as moderately to heavily polluted due to domestic, industrial, and mining activities (KLHK, 2023). Meanwhile, national waste production continues to rise, reaching 68.5 million tons in 2023, but only about 11 percent is successfully recycled (KLHK, 2023).

These phenomena indicate that the government's command-and-control approach to environmental management has not been sufficiently effective in curbing environmental degradation. Regulatory measures such as establishing quality standards, licensing systems, and sanctions are fundamental, but they do not fully provide the economic incentives needed to encourage changes in business behavior. Literature suggests that command-and-control approaches are rigid, administratively costly, and insufficient in motivating sustainable technological innovation (Tietenberg & Lewis, 2018).

Within the framework of environmental economics, environmental degradation is understood as a form of market failure arising from negative externalities, where the cost of environmental damage is not reflected in the price of goods and services (Field & Field, 2021). The absence of social cost consideration results in economic activities producing higher pollution levels than socially optimal. Environmental economic theory thus recommends the application of economic instruments or market-based instruments that provide price signals to internalize externalities. Such instruments may include environmental taxes, emission fees, green subsidies, tradable emission permits, carbon trading, and payment for environmental services (PES) mechanisms (Pearce, 2006; Tietenberg & Lewis, 2018).

Indonesia has begun strengthening these environmental economic instruments through various regulatory frameworks. Law No. 32 of 2009 on Environmental Protection and Management serves as the primary foundation, mandating the government to develop economic instruments to control pollution and environmental degradation. More technical implementation is articulated in Government Regulation No. 46 of 2017, which classifies

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environmental economic instruments into five categories: environmental development planning, environmental financing, incentives and disincentives, market-based instruments, and emission permit trading mechanisms. Additionally, the strengthening of market-based instruments in Indonesia is reflected through the Presidential Regulation on Carbon Economic Value (NEK), which forms the basis for national carbon trading policies, including cap-and-trade schemes, carbon offsets, and results-based payment mechanisms.

These regulatory efforts are reinforced by strategic policy documents such as the National Action Plan for GHG Emission Reduction (RAN-GRK), Long-Term Strategy for Low-Carbon and Climate Resilience (LTS-LCCR), and the Low-Carbon Development Initiative (LCDI) developed by Bappenas. All these instruments complement each other, providing an integrated policy framework toward a green development transition.

Numerous international and national studies demonstrate the effectiveness of environmental economic instruments in reducing emissions and improving environmental management efficiency. For instance, Carattini et al. (2019) found that carbon taxes consistently reduce CO_2 emissions in OECD countries without hindering economic growth. At the Asian level, Narayanan (2020) showed that market-based instruments significantly improve industrial compliance with environmental standards at lower implementation costs compared to regulatory mechanisms. Additionally, Zhang and Wang (2021) in China revealed that emissions trading promotes both emission reduction efficiency and green technology innovation.

Studies in Indonesia also show promising prospects and challenges in implementing economic instruments. Wibowo and Sari (2022) emphasized that green incentives and environmental financing positively influence investment in environmentally friendly projects, although institutional coordination remains challenging. Meanwhile, Wirawan (2020) noted that PES mechanisms in Indonesia have developed reasonably well but still require stronger legal certainty and institutional design. Adi et al. (2021) highlighted that NEK implementation has the potential to enhance emission reduction effectiveness, but it requires data readiness, verification systems, and long-term policy consistency.

Nevertheless, comprehensive academic reviews evaluating Indonesia's environmental economic policy framework from the perspective of national regulatory documents remain limited. Many studies are sectoral and do not map environmental economic instruments as a whole within Indonesia's legal framework. This creates a critical research gap: a lack of structured understanding of how these various instruments are formulated, interconnected, and implemented to support sustainable development agendas.

Considering these conditions, this study aims to conduct an in-depth analysis of environmental economic policies in Indonesia based on a literature review, examining environmental economic instruments as regulated in Law No. 32/2009, Government Regulation No. 46/2017, PP No. 22/2021, the Presidential Regulation on Carbon Economic Value, and related policy documents. This study is expected to contribute theoretically to strengthening economic instruments in the national environmental management system and provide empirical insights into the challenges and opportunities for their implementation in

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driving the transition toward a green economy.

Research Methods

This study employs a qualitative-descriptive approach, relying primarily on library research and document analysis to examine environmental economic policies in Indonesia. A qualitative approach was chosen because the focus of the study lies in understanding the content of regulations, the structure of environmental economic instruments, and their significance within the framework of environmental protection and management. Document-based analysis is considered the most appropriate method for evaluating regulations and formal policy instruments, as it allows the researcher to systematically examine the content of documents without the need to collect primary data (Bowen, 2009; Zed, 2014).

All data used in this study are secondary, sourced from legal documents, official government reports, and academic literature related to environmental economics. Key regulations referenced include Law No. 32 of 2009 on Environmental Protection and Management, Government Regulation No. 46 of 2017 on Environmental Economic Instruments, Government Regulation No. 22 of 2021 on the Implementation of Environmental Protection and Management, and various regulations related to the Carbon Economic Value (NEK). In addition, national planning documents such as the National Action Plan for GHG Emission Reduction (RAN-GRK), Long-Term Strategy for Low-Carbon and Climate Resilience (LTS-LCCR), and green economy documents issued by Bappenas were also used as sources. Academic literature on environmental economics, including works by Field and Field (2021) and Tietenberg and Lewis (2018), was employed to provide a theoretical foundation, particularly regarding externalities, economic instruments, and market-based policies.

Data collection was conducted through a systematic search of official government portals—including KLHK, Bappenas, BPS, and the Legal Documentation and Information Network (JDIH BPK)—as well as national and international journal databases. Documents were selected based on inclusion criteria, including relevance to environmental economic instruments, having legal legitimacy or a strong scientific basis, and being published between 2009 and 2024. Documents that were opinion-based or lacked substantive provisions were excluded. After selection, the documents were analyzed through initial coding to identify major themes such as environmental incentives and disincentives, environmental financing, market mechanisms, emission trading, and other environmental pricing instruments.

Data analysis was conducted using content analysis with a thematic approach. This technique involves in-depth reading of documents, data reduction, and grouping information into specific thematic categories. Content analysis is considered highly relevant for policy research as it can systematically reveal the structure, objectives, and direction of regulations (Bowen, 2009; Miles et al., 2014). Once the main themes were identified, the researcher mapped the relationships between regulations and assessed their alignment with environmental economic theory. The interpretation phase then connected document findings with the theories of externalities, economic instruments, and market failure to evaluate the

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extent to which Indonesian regulations align with both theoretical frameworks and international practices.

Research validity was ensured through source triangulation by comparing the content of regulations with government reports and previous academic findings. This approach ensures that interpretations are not based on a single source but are cross-verified across multiple documents. To enhance reliability, the researcher also applied the audit trail principle as recommended by Creswell and Poth (2018), systematically and transparently recording every step in the process of data retrieval, selection, and analysis.

The study is limited in scope, as it relies solely on secondary data and does not assess policy implementation at the field level. Therefore, the findings primarily reflect the normative structure and conceptual framework of environmental economic policies in Indonesia. Nevertheless, this research provides an important foundation for further studies using empirical data or evaluative research on the implementation of environmental economic instruments across various sectors.

Result and Discussion

Result

Based on the review findings, Indonesia has developed a variety of environmental economic instruments, including market-based instruments, financing mechanisms, risk-based permitting systems, as well as various forms of incentives and disincentives to support environmental management. A summary of the main findings is presented in the following table.

Table 1. Key Findings of Environmental Economic Policy in Indonesia Based on Document Analysis

Instrument Category	Main Regulation	Key Findings	Implications
General Environmental Economic Instruments	Law No. 32/2009	Regulates incentives, disincentives, emissions trading, environmental funding, environmental taxes	Serves as the highest legal basis for economic instruments
Detailed Economic Instruments	Government Regulation No. 46/2017	Provides detailed definitions of incentives, disincentives, pollution fees, levies, and market-based instruments	Provides operationalization of economic instruments
Implementation of Environmental Protection and Management (PPLH)	Government Regulation No. 22/2021	Integrates economic instruments into AMDAL, environmental permits, and environmental approvals	Strengthens the role of risk-based economic instruments
Carbon Economic Value (NEK)	Presidential Regulation No. 98/2021	Regulates carbon trading, offsets, cap-and-trade, and emissions verification results	Initiates Indonesia's carbon market
Environmental Funding	Ministry of Environment and Forestry Regulations, Bappenas	Funding schemes, Environmental Public Service Agencies (BLU), green finance	Supports financing for mitigation and adaptation activities
Strategic Policies	RAN-GRK, LTS-LCCR, RPJMN	Integrates green economy, energy transition, and NDC achievement	Serves as a guideline for cross-sector implementation
Technical Standards	KLHK Guidelines	Carbon verification, emissions	Ensures quality

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	measurement	implementation of instruments

Document review of various national regulations indicates that Indonesia's environmental economic policy framework has developed significantly since the enactment of Law No. 32 of 2009. Key findings show that the government has established five major groups of environmental economic instruments: (1) environmentally-conscious development planning instruments, (2) environmental financing instruments, (3) incentive and disincentive instruments, (4) market-based instruments, and (5) emission permit trading mechanisms. Government Regulation No. 46 of 2017 serves as the core policy detailing these instruments, although the level of operationalization varies.

Document analysis reveals that planning instruments have been integrated into the national development system, evident in the requirement for Strategic Environmental Assessments (KLHS) across multiple levels of development plans. In terms of financing, regulations provide several mechanisms, such as the Special Allocation Fund (DAK) for the environment, rehabilitation and recovery funds, and the potential development of carbon funds. Regarding incentives and disincentives, government rules cover tax reductions for environmentally friendly businesses, specific fees for waste producers, and emission charge mechanisms. Market-based instruments, such as emission levies, carbon taxes, and payments for environmental services, have gained stronger legal footing through PP 46/2017 and its derivative regulations.

The Carbon Economic Value (NEK) framework introduces a new basis for implementing domestic carbon market mechanisms. NEK establishes five primary instruments to reduce emissions: carbon trading, carbon levies, results-based payments, carbon offsets, and non-market mechanisms. NEK documents indicate that carbon trading is positioned as the core instrument to achieve NDC targets, prioritizing sectors such as energy, forestry, and heavy industry. NEK also regulates the roles of verifiers, the carbon registry, and reporting mechanisms, although some operational rules remain non-technical.

Review of PP No. 22 of 2021 shows that environmental economic instruments are linked to more detailed environmental protection standards. The regulation emphasizes environmental performance assessment, risk-based permitting systems, and the obligation of business actors to fully bear the costs of environmental restoration. Provisions on environmental quality standards, AMDAL (Environmental Impact Assessment), and management standards are important prerequisites before economic instruments are applied.

Planning documents such as RAN-GRK and LTS-LCCR indicate that economic instruments are employed to support short-term emission reduction targets and long-term transition to a low-carbon economy. RAN-GRK underscores the importance of fiscal and non-fiscal incentives to stimulate green investment. LTS-LCCR reinforces policy direction to establish a low-emission economy through green financing, carbon trading, and technological innovation.

Analysis of KLHK and Bappenas documents suggests that most economic instruments

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are still in the process of implementation strengthening. The use of instruments such as environmental taxes remains limited. Pilot carbon trading at power plants (PLTU) since 2023 shows that the national carbon market is still in its early stage. Payment for environmental services schemes are relatively more advanced, particularly in the forestry and water sectors, though not yet consistent nationwide. Key challenges noted in regulations include inter-agency coordination, local government capacity, emission data availability, and regulatory harmonization.

Overall, the analysis concludes that Indonesia has established a comprehensive normative framework for environmental economic instruments. However, the effectiveness of on-the-ground implementation still requires improvement, particularly regarding operationalization, institutional readiness, and oversight systems.

Discussion

The findings indicate that Indonesia has developed a relatively comprehensive legal framework for implementing environmental economic instruments. However, the effectiveness of these regulations requires further assessment through comparison with environmental economic theory and international experience.

According to environmental economics theory, instruments such as environmental taxes, emission charges, and carbon trading systems are considered more efficient than command-and-control regulations because they provide price signals that encourage businesses to reduce emissions voluntarily and rationally (Tietenberg & Lewis, 2018). Although Indonesia has adopted these instruments in its regulations, document analysis shows that many remain in general normative form and are not yet operationalized. For example, the implementation of the carbon tax, introduced in 2022, has been repeatedly delayed due to market readiness, limited verification methods, and reporting capacity.

The National Carbon Economic Value (NEK) framework demonstrates the government's commitment to market mechanisms. However, carbon trading implementation remains very limited. Compared to countries with mature carbon trading systems—such as the European Union, China, or South Korea—Indonesia faces significant challenges in providing accurate emissions data, monitoring capacity, and carbon registry infrastructure. These countries have successfully reduced emissions through carbon market schemes because their reporting and verification systems are robust (Zhang & Wang, 2021). Document review indicates that these two elements are not yet fully developed in Indonesia.

Regarding incentives and disincentives, Indonesia's regulations include various fiscal facilities for environmentally friendly activities. Yet documents show these instruments are not fully integrated into environmental policy and are often treated as part of macroeconomic policy. In environmental economics theory, green incentives function to internalize negative externalities. For instance, Wibowo and Sari (2022) found that green incentives positively influence green investment, but implementation is hindered by unclear environmental benefit indicators and weak institutional structures.

On environmental financing, Indonesia has established a legal basis for several

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funding instruments, but operational mechanisms remain fragmented and unintegrated. Effective environmental financing should strengthen emission reduction projects that cannot rely solely on market mechanisms. Experiences from countries such as Brazil and South Africa show that strong environmental trust funds play a crucial role in accelerating environmental projects. Document analysis suggests that Indonesia's environmental financing structure is not yet as robust as these models.

In terms of environmental planning, there is evidence that planning instruments such as Strategic Environmental Assessment (KLHS) and Environmental Impact Assessment (AMDAL) are not yet integrated with economic instruments. Theoretically, planning instruments and economic instruments should complement each other. However, documents show that KLHS is not used to determine appropriate economic instruments for specific sectors, making it primarily administrative without significant economic impact on business behavior.

Although regulations have adopted the polluter-pays principle and externality internalization, implementation remains limited. Determination of restoration costs often does not reflect the true economic value of environmental damage. Many developed countries have applied valuation formulas to set damage costs, but Indonesia still faces limitations in valuation data and environmental cost standards.

Consistency of regulations is also a major challenge. Differences in definitions among regulations, lack of alignment between NEK and national energy policy, and variations in market mechanism terminology create uncertainty for businesses. From a governance perspective, regulatory inconsistency increases compliance costs and reduces incentives for green investment.

National data showing that GHG emissions, air quality, and water pollution remain problematic indicate that the existence of regulations has not fully improved environmental conditions. This demonstrates that the effectiveness of economic instruments is highly influenced by implementation quality, supervision, and institutional capacity.

The monitoring system's reliance on self-reporting presents another challenge. In other countries, businesses are required to use technology-based reporting verified independently. Indonesia is still developing this capacity, so the effectiveness of economic instruments is not yet optimal.

From a macro-policy perspective, regulations such as LTS-LCCR indicate Indonesia's orientation toward a green economy. However, these documents lack sufficient implementation details to strengthen the link between planning and economic instruments. Without operational specifics, available instruments risk being underutilized.

Governance is also a critical issue. Inter-agency coordination in Indonesia remains weak, yet implementing environmental economic instruments requires cross-sector integration. OECD countries have successfully applied such instruments due to strong coordination between energy, fiscal, and environmental policies.

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Nevertheless, Indonesia has significant opportunities because the policy framework is already in place and the legal foundation for various instruments is strong. With institutional strengthening, enhanced technical capacity, and regulatory harmonization, environmental economic instruments can become effective tools in the transition to a low-carbon economy.

Conclusion and Recommendation

The conclusion of this study emphasizes that Indonesia has established a relatively comprehensive regulatory framework for implementing environmental economic instruments, ranging from the legal foundation in the Environmental Protection and Management Law (UU PPLH), technical regulations through various government regulations, to strategic policy directions outlined in national documents such as RAN-GRK, LTS-LCCR, RPJMN, and NEK. A variety of economic instruments—including market-based instruments, financing mechanisms, risk-based permits, and incentive–disincentive schemes—have been integrated into environmental policy. However, despite the structured framework, the effectiveness of implementation still requires strengthening, particularly in regulatory harmonization, institutional capacity building, reliable data provision, and enhanced supervision systems, so that environmental economic instruments can function optimally in reducing pollution and supporting the achievement of national emission reduction targets.

The study's recommendations stress the need for a more comprehensive strengthening of environmental economic instrument implementation in Indonesia. The government should ensure harmonization across all relevant regulations to avoid policy inconsistencies, particularly between NEK provisions, energy sector regulations, and implementing rules of UU PPLH. Institutional capacity must be urgently enhanced, especially in establishing a robust monitoring, reporting, and verification (MRV) system as the foundation for carbon trading and other market-based instruments. Coordination between ministries and regional governments should also be improved to ensure uniform and effective operation of incentive schemes, environmental financing mechanisms, and risk-based permits. Updating and standardizing national environmental data is essential to support evidence-based policy. In terms of supervision, mechanisms should be strengthened through higher-quality human resources, digital inspection systems, and reduced reliance on self-reporting. Ultimately, the development of environmental economic instruments should focus on enhancing effectiveness, including expanding carbon tax implementation, strengthening payment for ecosystem services (PES) schemes, and providing targeted green financing to accelerate the transition to a low-carbon economy.

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