

# The Role of Carbon Trading in Climate Change Mitigation: A Juridical Analysis of Policies and Regulations in Environmental Law in Indonesia

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## ABSTRACT

This paper examines the role of carbon trading in climate change mitigation through a juridical analysis of Indonesia's environmental law and regulatory frameworks. Carbon trading has emerged as a critical tool for reducing greenhouse gas emissions, but its success depends on the strength of the legal and regulatory systems supporting it. By analyzing Indonesia's Carbon Economic Value policy, environmental laws, and international commitments such as the Paris Agreement, this study identifies key regulatory gaps, overlapping jurisdictional issues, and enforcement challenges. The findings highlight the need for stronger monitoring, reporting, and verification mechanisms, as well as clearer regulatory frameworks to ensure the effectiveness of carbon trading in Indonesia. Recommendations are made to enhance institutional capacity, align national policies with international standards, and promote private sector participation. These improvements are crucial for achieving Indonesia's emissions reduction targets and contributing to global climate change efforts.

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## 1. INTRODUCTION

### 1.1 Background

Carbon trading is a key market-based tool to combat climate change by offering economic incentives for reducing greenhouse gas emissions. It enables countries and companies to trade carbon credits, encouraging cost-effective emission reductions. The success of carbon trading depends on the

system's design, international cooperation, and integration of complementary policies. Emission Trading Systems (ETS) set emission caps, allowing companies to trade permits within those limits [1], [2]. Carbon trading promotes innovation and clean technology investment, especially in developing nations through mechanisms like the Clean Development Mechanism (CDM) and Verified Carbon Standard (VCS) [3].

However, global cooperation is essential to avoid emissions shifting across borders and to manage equity concerns for vulnerable populations and industries [1]. Successful implementation requires stakeholder collaboration and alignment with emission reduction targets [2].

Indonesia plays a pivotal role in climate change mitigation due to its vast natural resources and significant carbon sinks. Establishing a robust carbon trading framework is essential for Indonesia to meet its Nationally Determined Contributions (NDCs) under the Paris Agreement, balancing its dual role as a major carbon emitter and a key factor in global carbon sequestration. Carbon trading is a crucial mechanism for Indonesia to achieve its carbon reduction targets by allocating permits to emit greenhouse gases, which can be traded among firms, incentivizing emission reductions [4]. This system can enhance carbon and energy performance through technical improvements and stakeholder engagement [4]. Indonesia has made strides with the REDD+ scheme, aimed at reducing emissions from deforestation, which is integral to its climate strategy [5]. However, effective carbon trading requires cooperation from stakeholders and the development of a comprehensive legal framework [2]. Carbon markets must also consider biodiversity and ecosystems, incorporating nature-based solutions to mitigate negative impacts [6]. A national carbon budget is vital for guiding Indonesia's efforts in limiting global temperature rise [7].

The legal landscape of carbon trading in Indonesia is shaped by a complex mix of regulatory frameworks, economic factors, and environmental goals. Despite Indonesia's commitment to reducing greenhouse gas emissions, the implementation of carbon trading

schemes faces challenges such as bureaucratic complexity, lack of transparency, and limited trading volumes, all of which hinder business participation in the Indonesia Carbon Exchange (IDXCarbon) [8]. The introduction of a carbon tax under Law No. 7 of 2021 aims to combat climate change but poses economic risks, particularly for low-income groups, by potentially raising production costs and affecting competitiveness [9]. Bureaucratic hurdles, overlapping jurisdictions, and a lack of transparency further complicate participation in carbon trading [4], [8]. The carbon tax may increase production costs, impacting the global competitiveness of domestic products [9]. Aligning carbon trading with economic development while ensuring sustainable growth remains a key challenge [9], [10]. Limited institutional capacity to enforce regulations and manage the carbon market also hinders effectiveness, emphasizing the need for broader stakeholder engagement [4], [10]. The regulatory framework must evolve to ensure carbon trading schemes reduce emissions while supporting sustainable economic growth.

## 1.2 *Objective Research*

This paper seeks to provide a juridical analysis of the policies and regulations governing carbon trading in Indonesia, examining their effectiveness in supporting climate change mitigation efforts. Through an in-depth review of environmental laws and regulations, this study will identify key legal challenges and propose recommendations to strengthen the regulatory framework for carbon trading. By doing so, it aims to contribute to the broader discourse on the role of market-based mechanisms in addressing climate change, while considering the specific

legal, economic, and environmental context of Indonesia.

## 2. LITERATURE REVIEW

### 2.1 *The Concept of Carbon Trading*

Carbon trading, a market-based mechanism, plays a crucial role in reducing greenhouse gas emissions by allowing entities to trade carbon credits. Based on the cap-and-trade principle, it incentivizes emission reductions where they are most cost-effective. The system promotes flexibility, efficiency, and innovation in emission reduction strategies, but its success relies on robust regulatory frameworks to prevent pitfalls such as overallocation of credits and financial exploitation. Carbon trading schemes offer flexibility by enabling cross-sectoral trading, which has been shown to be more cost-effective, as evidenced by India's proposed ETS, where cross-sectoral trading is 30-50% more efficient than within-sector trading [11]. Adaptive mechanism design frameworks, like multi-agent reinforcement learning, can further enhance carbon markets by balancing productivity, equality, and emissions ([12]. Carbon trading also promotes green innovation efficiency (GIE) in manufacturing, increasing subsidies and R&D investments, although the impact of carbon prices on GIE diminishes beyond a certain threshold [13]. However, challenges persist, including overallocation of credits and weak regulatory oversight, which can undermine effectiveness and lead to exploitation for financial gains, highlighting the need for strong legal frameworks [3].

### 2.2 *Legal and Regulatory Frameworks for Carbon Trading*

The success of carbon trading systems is closely tied to legal and regulatory frameworks, which are essential for setting emission caps, allocating credits, monitoring emissions, and enforcing compliance.

Transparent, enforceable regulations are crucial for maintaining market integrity, as noted by Wemaere et al. (2009). International agreements like the Kyoto Protocol and Paris Agreement have been instrumental in shaping carbon trading by providing legal bases for cross-border trading and setting reduction targets. In countries like Indonesia, aligning domestic policies with these frameworks is vital for successful implementation, considering local legal, economic, and environmental conditions. Emission caps create a market for allowances, with credit allocation through auctions or free distribution affecting market dynamics [14], [15]. Effective monitoring, verification [16], and enforcement mechanisms ensure compliance through penalties and incentives [15], [16]. Developing countries face challenges such as limited institutional capacity and the need to align carbon trading with broader development goals, requiring strong legal frameworks and stakeholder engagement [17], [18].

### 2.3 *Carbon Trading in Indonesia: Policy and Regulatory Context*

Indonesia's commitment to reducing greenhouse gas emissions is formalized through its Nationally Determined Contributions (NDCs) under the Paris Agreement, with ambitious targets set for 2030. Carbon trading is a key component of Indonesia's strategy to meet these targets, supported by the Carbon Economic Value policy introduced in 2021, which aims to regulate emissions across sectors like energy, industry, forestry, and transportation [4]. The legal framework for this is backed by Law No. 32/2009 on Environmental Protection and Management, which controls pollution and manages natural resources, including GHG emissions

[19]. However, challenges include regulatory clarity, inconsistent enforcement, and governance issues like overlapping agency responsibilities and corruption, which hinder the effectiveness of the carbon market [4], [20]. Balancing emissions reduction with economic growth and poverty alleviation, particularly in forestry and agriculture, remains a concern [20]. Despite these challenges, Indonesia's tropical forests present significant potential for carbon trading with developed nations, and integrating Maqashid Sharia principles into a green economy framework can promote sustainability and address inequality [20].

#### **2.4 International Lessons for Indonesia**

Indonesia's carbon trading development can benefit from international experiences, especially the European Union Emissions Trading System (EU ETS), which offers a robust framework for strict emission caps, credit allocation adjustments, and strong monitoring to prevent market manipulation and ensure transparency. Integrating carbon trading with other environmental policies, as seen in New Zealand and California, underscores the importance of regulatory oversight and policy adaptation for cost-effective and equitable emission reductions. The EU ETS highlights the need for stringent caps and regular credit adjustments for market stability [18], [21], along with strong transparency mechanisms [18]. Policy integration and oversight are essential for effective emission reductions [22], but challenges like stakeholder coordination and potential design flaws, such as over-allocation, must be addressed [21], [23].

#### **2.5 Legal Gaps and Recommendations**

Several studies have identified legal gaps in Indonesia's

carbon trading framework that must be addressed to ensure its success. Indonesia's carbon trading framework faces significant legal and regulatory challenges, including a lack of comprehensive regulations on carbon credit ownership, verification, and trading platforms, creating uncertainties for businesses and investors. Overlapping sectoral regulations complicate enforcement, underscoring the need for a coherent legal framework [16], [24]. Businesses are also deterred by bureaucratic complexity, low transparency, and limited trading volumes, raising concerns over revenue loss [8]. Technological innovations like blockchain could enhance transparency and reduce costs, improving market integrity [25]. Carbon markets, supported by international stakeholders like the EU, can significantly boost carbon and energy performance, contributing to Indonesia's climate goals [4]. These issues highlight the need for a more coherent legal framework that provides clear guidelines on carbon trading and ensures the participation of both public and private actors.

### **3. METHODS**

#### **3.1 Research Design**

This study adopts a qualitative legal research approach to explore the regulatory and legal frameworks surrounding carbon trading in Indonesia. Qualitative legal research is suitable for understanding the nature and functioning of laws, policies, and regulations, and for identifying gaps in their implementation. By focusing on Indonesia's environmental laws, this research provides an in-depth analysis of the legal provisions, policy objectives, and regulatory structures that underpin carbon trading in the country.

### 3.2 Data Collection

The data used in this research is primarily qualitative, consisting of legal texts, government policies, regulations, and reports from both national and international sources. Primary legal sources include key Indonesian environmental laws and regulations relevant to carbon trading, such as Law No. 32/2009 on Environmental Protection and Management, the Carbon Economic Value (CEV) policy of 2021, Presidential Regulation No. 98/2021 on Carbon Economic Value and Climate Change Control, and related ministerial regulations and decrees. Secondary sources include legal commentaries, government reports, academic studies, and international agreements like the Paris Agreement and the Kyoto Protocol, providing broader context on carbon trading regulations. Additionally, comparative case studies of carbon trading systems from the European Union, New Zealand, and California were analyzed to identify legal and regulatory structures that have contributed to the success of these systems.

### 3.3 Data Analysis

The analysis of the data employed a juridical approach, focusing on interpreting legal texts, examining policy objectives, and identifying challenges in implementing carbon trading regulations. Key analytical methods included doctrinal legal analysis to interpret statutes and assess the legal framework governing carbon trading in Indonesia, identifying provisions supporting climate change mitigation. A gap analysis was conducted to highlight shortcomings in Indonesia's regulations by comparing them with international standards and best practices. Comparative analysis benchmarked Indonesia's carbon trading policies

against countries with well-established carbon markets, identifying regulatory features that could improve Indonesia's system. Additionally, policy analysis evaluated the objectives and outcomes of Indonesia's carbon trading regulations, reviewing government reports and environmental strategies to assess their alignment with national climate goals.

## 4. RESULTS AND DISCUSSION

### 4.1 Results

#### 1. Key Findings from the Analysis of Indonesia's Carbon Trading Framework

The Carbon Economic Value (CEV) policy introduced in Indonesia in 2021 is a major regulatory initiative that aims to create a legal framework for carbon trading in sectors such as energy, forestry, and waste management. In line with international climate strategies such as the Paris Agreement, the policy recognizes the economic value of greenhouse gas reductions and sets the stage for emissions trading. However, as it is still in its early stages, various challenges in implementation have emerged. Based on Presidential Regulation No. 98/2021, the CEV policy requires further regulations to clarify the roles and participation of stakeholders (Yanti & Buana, 2023), which supports Indonesia's goal to reduce emissions by 31.89% through national efforts and 43.20% with international assistance [8]. Companies face various barriers such as revenue issues, bureaucratic complexity, and limited trade volumes, underscoring the need for increased regulatory compliance and engagement [8]. The CEV policy is integrated into Indonesia's Green Growth Programme, which promotes environmental sustainability and

economic recovery, with a carbon tax expected to drive the energy transition and support the Sustainable Development Goals (SDGs) [26], [27].

Analyses of this policy show that it is a significant step forward for Indonesia in aligning with international climate mitigation strategies, such as the Paris Agreement. It provides a legal basis for emissions trading while recognising the economic value of greenhouse gas reductions. However, the CEV policy is still at an early stage of implementation, and several gaps and challenges have been identified.

## 2. *Overlapping Regulations and Jurisdictions*

One of the key challenges in Indonesia's carbon trading framework is the existence of overlapping regulations and unclear jurisdictional boundaries among various government agencies. Indonesia's carbon trading framework faces considerable challenges due to overlapping regulations and unclear jurisdictional boundaries among government agencies, leading to inconsistencies in policy enforcement and confusion for market participants. The Ministry of Environment and Forestry and the Ministry of Energy and Mineral Resources have separate oversight responsibilities, resulting in sectoral regulations that complicate the carbon trading landscape [4], [8]. This fragmentation is further compounded by bureaucratic complexity and low transparency, making it difficult for businesses to effectively engage in carbon trading [8]. In addition, carbon tax implementation faces administrative challenges, including the need for better inter-agency coordination and resistance from the industry sector, compounded by a lack of accurate emissions data [28]. These barriers

highlight the need for regulatory simplification and increased transparency to boost participation in Indonesia's carbon market.

Indonesia's Environmental Protection and Management Law (Law No. 32/2009) provides a broad framework for pollution control and environmental management, but lacks specific provisions for carbon trading, creating legal uncertainty around carbon credits. This gap in the law causes challenges in the allocation and validation of carbon credits across different industries, as the law focuses on environmental protection and criminal liability for pollution without addressing market-based mechanisms such as carbon trading. The absence of regulations for carbon trading under Law No. 32/2009 results in uncertainty regarding the allocation of carbon credits and their recognition as a legitimate compliance tool, hindering the development of a robust carbon market and leaving industries without clear guidelines for integrating carbon credits into environmental practices. These gaps also reflect broader issues of regulatory overlap and inconsistency, potentially limiting opportunities for industry to engage in sustainable practices through carbon trading.

## 3. *Enforcement and Monitoring Mechanisms*

The effectiveness of carbon trading schemes relies heavily on the existence of robust monitoring, reporting and verification (MRV) systems. Indonesia's legal framework outlines the need for emissions reporting and verification through authorised agencies. However, the current MRV system is underdeveloped, and there is a lack of independent oversight bodies to ensure compliance.

Research shows that enforcement of carbon trading

regulations is also hampered by limited institutional capacity. Enforcement of carbon trading regulations in Indonesia is significantly hampered by limited institutional capacity, which affects the ability of government agencies to effectively monitor and verify carbon emissions. This challenge is compounded by a lack of resources, expertise and technology, making it difficult to ensure compliance and prevent corporate exploitation of regulations. Bureaucratic complexity and the need for strong interagency coordination create inefficiencies in monitoring and enforcement [8], [28], while immature monitoring systems lack the sophistication needed to accurately track emissions [28]. Data falsification by companies and unreliable emissions data further undermine the credibility of the carbon market [28], [29]. In addition, technical constraints and limited stakeholder participation are significant barriers to effective implementation of carbon trading systems, requiring stronger collaboration between companies and government agencies to achieve emissions reduction targets [2], [4]. Government agencies responsible for monitoring carbon emissions lack the resources, expertise and technology needed to effectively track and verify emissions across the sectors covered. This makes it difficult to ensure that companies are actually reducing their carbon footprint and not exploiting loopholes in the system.

#### **4. Alignment with International Standards**

Indonesia's transition from the Kyoto Protocol's Clean Development Mechanism (CDM) to the Paris Agreement's Article 6 framework for carbon trading presents several challenges, including the need to harmonise national laws with international standards,

particularly in the forestry sector. Gaps in regulatory clarity and integration into national law create uncertainty for investors, making it critical for Indonesia to address these issues to meet ambitious emissions reduction targets and attract investment. Key challenges include the absence of detailed regulations for carbon credit trading (Wibowo, 2024), administrative complexities in implementing a carbon tax and ensuring effective inter-agency coordination (Ardhimansyah & Khaddafi, 2024), and barriers to business participation, such as bureaucratic hurdles and limited trading volumes on the Indonesian Carbon Exchange (Wibowo, 2024). Balancing economic growth with environmental goals remains difficult, as evidenced by the mixed results of carbon tax implementation in other countries (Aulia & Pasha, 2024).

#### **4.2 Discussion**

##### **1. Strength of Indonesia's Carbon Trading Framework**

Indonesia's recognition of carbon as an economic asset is a significant step toward establishing a national carbon market, driving emissions reductions across key sectors and aligning with global climate change mitigation efforts, as seen in its participation in international carbon markets like the Clean Development Mechanism (CDM). With its vast forest cover and potential for reforestation projects, Indonesia plays a crucial role in global carbon sequestration efforts. The integration of carbon trading with principles such as Maqashid Sharia and Good Environmental Governance (GEG) further supports sustainable development. Indonesia's tropical forests have the potential to absorb around 25.18 billion tons of carbon emissions, positioning the country as a key player in carbon

trading with developed nations [20]. The carbon tax policy aims to harmonize economic growth with environmental quality, reflecting Pancasila economic principles [30]. Presidential Regulation No. 98 of 2021 supports carbon economic values through mitigation, adaptation, and carbon trading efforts, with the principles of GEG—such as participation, accountability, and transparency—being critical for effective implementation [31]. Technologically, Indonesia is advancing carbon capture, utilization, and storage (CCUS) technologies, targeting a 29% emissions reduction by 2030 and net zero by 2050, supported by regulatory developments like MEMR February 2023 and Presidential Order No. 14/2024, which facilitate local and international collaboration in CCUS projects [32].

## 2. *Weaknesses and Challenges*

Despite the progress made, several weaknesses in Indonesia's carbon trading framework still need to be addressed. First, overlapping regulations and unclear jurisdictional boundaries between government agencies create regulatory inefficiencies and confusion among market participants. This can lead to uneven enforcement and hamper the effectiveness of the carbon market.

Second, the lack of a robust monitoring, reporting and verification system is a significant challenge. Without a reliable MRV mechanism, it is difficult to ensure that emission reductions are real, permanent and verifiable. This will reduce the credibility of the carbon trading system and deter potential investors who want transparency and accountability.

Third, limited institutional capacity to enforce carbon trading regulations is a barrier to achieving the full potential of carbon markets.

Government agencies need more resources, training and technological tools to effectively monitor emissions and ensure compliance.

## 3. *Lessons from International Best Practices*

International experience in carbon trading provides valuable lessons for Indonesia. The European Union Emissions Trading System (EU ETS) and the New Zealand Emissions Trading Scheme (NZ ETS) provide valuable insights into designing and implementing effective carbon trading systems. Both emphasize the importance of strict emission limits, periodic adjustments to credit allocations, and robust oversight to maintain market integrity. The EU ETS, managed by a centralized regulatory body, ensures consistent enforcement and prevents insider trading, demonstrating how strong governance can enhance carbon market transparency [33]. The NZ ETS integrates carbon trading with broader environmental and economic policies, including provisions for the forestry sector, highlighting the role of carbon sequestration and establishing clear rules for carbon credit ownership [3]. Both systems also stress the significance of transparent Monitoring, Reporting, and Verification (MRV) systems for accountability [3]. However, challenges such as maintaining environmental integrity and navigating differing legal frameworks, as seen in the US and EU, must be addressed to ensure the long-term effectiveness of carbon markets [16], [33].

## 4. *Recommendations for Improving Indonesia's Carbon Trading Framework*

Based on the findings of this study, several recommendations can be made to strengthen Indonesia's carbon trading framework:



1. Clarify Regulatory Jurisdiction: The government should streamline regulatory responsibilities by clearly defining the roles of different agencies in managing carbon trading across sectors. This will reduce confusion and ensure consistent policy enforcement.
2. Strengthen MRV System: Indonesia needs to develop a more robust MRV mechanism to ensure accurate reporting and verification of emissions. An independent oversight body should be established to monitor compliance and ensure transparency in carbon trading transactions.
3. Build Institutional Capacity: Government agencies involved in carbon trading should receive additional resources, training and technology to improve their capacity for enforcement and monitoring. This includes investing in data collection and emissions tracking systems.
4. Align with International Standards: Indonesia should revise its carbon trading regulations to align them with the new Article 6 mechanism under the Paris Agreement. This will facilitate the integration of Indonesia's carbon market into the international carbon trading system and attract foreign investment.
5. Incentivise Private Sector Participation: To increase the effectiveness of carbon trading, the government should provide incentives for private companies to participate in the carbon

market, such as tax breaks or subsidies for low-carbon technologies and practices.

#### ***4.3 Implications for Policy and Future Research***

The findings of this study have significant implications for policymakers and researchers. For policymakers, it is clear that Indonesia's carbon trading framework, while promising, still requires further refinement to ensure its success in mitigating climate change. Addressing regulatory gaps and challenges will be critical to creating a functional carbon market that can deliver real emissions reductions.

For researchers, this study highlights the need for ongoing analyses of Indonesia's evolving carbon trading system. Future research should focus on the implementation of Carbon Economic Value policies, the development of MRV systems, and the integration of carbon trading with other environmental policies. In addition, comparative studies between Indonesia and other developing countries can provide valuable insights into the unique challenges faced by countries with similar economic and environmental contexts.

## **5. CONCLUSION**

The analysis of Indonesia's carbon trading framework reveals both significant progress and key challenges that must be addressed to ensure the system's success in mitigating climate change. The Carbon Economic Value policy lays a solid foundation for establishing a national carbon market, yet regulatory overlaps, weak monitoring and enforcement mechanisms, and insufficient institutional capacity hinder its full potential. Drawing from international best practices, Indonesia can strengthen its carbon trading framework by clarifying regulatory jurisdictions, enhancing MRV systems, and

building institutional capacity. Furthermore, aligning national policies with the international carbon market under the Paris Agreement is critical for facilitating cross-border trading and attracting investments.

With these improvements, carbon trading can become a powerful tool in achieving Indonesia's climate goals and supporting sustainable economic development.

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