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Legal Reform of Carbon Trading Mechanisms in Indonesia's Environmental Law Policy

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Abstract

This study examines the structural weaknesses of Indonesia's carbon trading governance within environmental law, investment regulation, and international climate obligations. The research applies normative juridical, doctrinal, and comparative legal approaches through statutory interpretation and conceptual analysis of Indonesian environmental regulations, carbon market regulations, and international climate instruments. The analysis demonstrates that Indonesia's carbon trading framework remains fragmented because institutional coordination, emissions verification, market supervision, and liability mechanisms are regulated through disconnected legal regimes lacking integrated enforcement structures. The study further identifies serious deficiencies concerning administrative accountability, judicial enforcement, ecological supervision, and climate related financial governance, particularly regarding carbon fraud, greenwashing, and anti money laundering safeguards. Comparative examination of China, Finland, Sweden, and New Zealand illustrates that integrated climate governance requires centralized supervision, transparent carbon registries, enforceable liability systems, and judicially supported environmental accountability. This study proposes an integrated legal reform model emphasizing institutional synchronization, sustainable finance governance, ecological justice, and conformity with the Paris Agreement and United Nations climate regime. The proposed framework strengthens regulatory coherence and climate legitimacy globally.

Keywords : *Carbon Trading, Environmental Governance, Climate Accountability, Legal Reform, Sustainable Finance.*

INTRODUCTION

The intensification of global climate governance has transformed carbon trading from a merely economic instrument into a complex legal architecture that mediates the relationship between environmental protection, sustainable investment, and transnational regulatory compliance, particularly after the consolidation of market based mitigation frameworks under the Paris Agreement regime and the expansion of emission trading systems across both developed and developing economies. Comparative experiences in jurisdictions such as China demonstrate that carbon emissions trading has evolved not only as a fiscal mechanism for reducing greenhouse gas emissions, but also as a legal institution requiring harmonized governance structures, integrated compliance procedures, and enforceable accountability standards capable of balancing market efficiency with environmental justice objectives (Tianbao & Meng, 2023).

Within this global trajectory, Indonesia has increasingly positioned itself as an emerging carbon market actor through the incorporation of climate mitigation commitments into domestic environmental governance, including the enactment of Law Number 32 of 2009 concerning Environmental Protection and Management and the more recent issuance of Financial Services Authority Regulation Number 14 of 2023 concerning Carbon Trading through Carbon Exchange, both of which signify a gradual transition from conventional command and control environmental regulation toward market oriented ecological governance models (Government of Indonesia, 2009; Financial Services Authority of Indonesia, 2023). The acceleration of green finance discourse, coupled with the growing pressure to align national development agendas with international decarbonization commitments, has consequently

elevated carbon trading into a strategic legal issue whose institutional coherence directly affects Indonesia's credibility within the global climate governance regime.

Existing scholarship has substantially contributed to understanding the legal and policy dimensions of carbon trading in Indonesia, although the analytical emphasis has frequently remained fragmented across environmental regulation, fiscal incentives, and investment governance without constructing a sufficiently integrated legal framework. Rahmawati et al. (2024) argue that carbon trading possesses significant potential as a juridical mechanism for climate change mitigation because it operationalizes environmental responsibility through market based incentives while simultaneously expanding state capacity to regulate corporate emissions behavior. Their analysis illustrates that Indonesian environmental law has gradually incorporated climate oriented principles, yet the operationalization of those principles remains dependent upon institutional coordination that is still evolving (Rahmawati et al., 2024).

Sedera (2023) further demonstrates that carbon pricing instruments, particularly carbon taxation and carbon trading, are increasingly perceived as strategic mechanisms capable of attracting environmentally responsible investment by improving Indonesia's sustainability profile within international markets, suggesting that ecological compliance has become economically valuable in contemporary investment governance (Sedera, 2023). Complementing these arguments, Tektona et al. (2024) emphasize that legal certainty constitutes the central prerequisite for an effective carbon market because investors, regulators, and market participants require predictable compliance standards and transparent transactional procedures in order to minimize regulatory risk and prevent market distortion (Tektona et al., 2024). Collectively, these studies reveal that carbon trading is no longer interpreted solely as an environmental instrument, but rather as an interdisciplinary governance mechanism located at the intersection of environmental law, financial regulation, and investment policy.

Despite these contributions, the current literature remains characterized by significant conceptual and regulatory fragmentation that limits its capacity to explain the structural weaknesses embedded within Indonesia's emerging carbon trading regime. Much of the existing scholarship tends to evaluate carbon trading through sectoral legal perspectives without critically interrogating the interaction between environmental obligations, investment liberalization frameworks, and international climate commitments as mutually constitutive legal domains. Rahmawati et al. (2024), for instance, focus primarily on the juridical legitimacy of carbon trading within environmental law without examining how overlapping institutional mandates generate enforcement ambiguity in practice, while Tektona et al. (2024) prioritize legal certainty concerns yet provide limited analysis regarding the normative conflict between economic deregulation and ecological accountability. Similar limitations appear in Sedera's (2023) discussion, where the investment dimension of carbon governance is explored predominantly through economic incentives rather than through the lens of regulatory synchronization and institutional accountability.

The literature consequently underestimates how inconsistent legal standards between environmental governance institutions and financial market authorities may create loopholes for speculative transactions, weak emissions verification, and ineffective compliance supervision. Comparative scholarship on carbon emissions trading in China has already demonstrated that successful carbon market governance requires integrated monitoring systems, centralized reporting mechanisms, and enforceable sanctions supported by coherent institutional coordination (Tianbao & Meng, 2023), yet such dimensions remain insufficiently theorized within Indonesian legal scholarship. The absence of an integrated analytical framework has therefore produced a substantial gap in understanding how legal incoherence undermines both environmental effectiveness and market legitimacy within Indonesia's carbon trading architecture.

The unresolved nature of this regulatory fragmentation carries urgent scientific and practical implications because ineffective carbon trading governance not only threatens the credibility of Indonesia's climate commitments but also increases the risk of regulatory capture, greenwashing practices, and environmentally harmful investment behavior. Contemporary legal debates concerning environmental accountability increasingly recognize that ecological degradation cannot be addressed through symbolic regulation alone, particularly when market based environmental instruments operate without robust monitoring and enforcement structures. Thani et al. (2025) highlight that the expansion of green finance mechanisms in Indonesia has simultaneously created new forms of financial vulnerability and potential environmental crime, especially in situations where regulatory institutions

lack integrated supervisory authority capable of detecting manipulative carbon transactions and fraudulent sustainability claims (Thani et al., 2025).

Parallel concerns are articulated by Widiartana et al. (2025), who argue that Indonesian environmental governance continues to experience systemic enforcement weaknesses that permit large scale ecological harm to persist despite the formal existence of environmental protection norms, illustrating the broader structural limitations of current environmental legal reform initiatives (Widiartana et al., 2025). In the context of carbon trading, such weaknesses become particularly problematic because market credibility depends fundamentally upon accurate emissions accounting, transparent verification systems, and enforceable sanctions against noncompliance. The inadequacy of institutional synchronization between environmental authorities, financial regulators, and investment governance agencies therefore risks transforming carbon trading into a symbolic compliance mechanism rather than an effective instrument for ecological transition.

Within this intellectual landscape, the present study positions itself as a critical legal inquiry into the structural reform of Indonesia's carbon trading governance by advancing an integrative analysis that connects environmental law, investment regulation, and international climate obligations into a unified framework of regulatory synchronization. Existing studies have generally treated these domains as analytically separate fields, whereas this research conceptualizes carbon trading as a multidimensional legal regime whose effectiveness depends upon the interaction between normative coherence, institutional accountability, and enforcement capacity. The study critically examines how Indonesia's environmental law framework under Law Number 32 of 2009 interacts with financial regulatory mechanisms established through Financial Services Authority Regulation Number 14 of 2023, while simultaneously evaluating whether these instruments adequately reflect the compliance standards expected within contemporary international climate governance structures (Government of Indonesia, 2009; Financial Services Authority of Indonesia, 2023). By situating Indonesia's carbon trading policy within broader comparative and transnational legal developments, the research seeks to move beyond descriptive legal analysis toward a more systemic examination of regulatory design, institutional fragmentation, and governance effectiveness. This positioning enables the study to address not merely whether carbon trading exists as a formal legal mechanism, but whether the current regulatory architecture possesses sufficient coherence and enforceability to achieve substantive environmental objectives.

This research aims to formulate a comprehensive model of legal reform for Indonesia's carbon trading mechanism through an integrated analysis of regulatory synchronization, institutional accountability, and enforcement effectiveness within environmental law policy. The study contributes theoretically by developing an interdisciplinary legal governance framework that reconceptualizes carbon trading as an interconnected regulatory ecosystem rather than a fragmented collection of sectoral policies. Methodologically, the research contributes by employing a normative juridical approach combined with comparative legal analysis in order to evaluate the interaction between domestic regulation and transnational climate governance standards. The findings are expected to provide a substantive foundation for strengthening Indonesia's environmental legal reform agenda while also enriching broader scholarly debates concerning the governance of market based climate mitigation instruments in developing legal systems.

RESEARCH METHODS

This research constitutes non empirical legal research employing a normative juridical approach combined with doctrinal and comparative legal analysis in order to examine the structural coherence of Indonesia's carbon trading regulatory framework within the broader context of environmental governance and international climate obligations. The study relies primarily on secondary legal materials consisting of international legal instruments, including the United Nations Framework Convention on Climate Change (1992) and the Paris Agreement (2015), together with Indonesian statutory and regulatory frameworks governing environmental protection, carbon economic value, and carbon exchange mechanisms, namely Law Number 32 of 2009 concerning Environmental Protection and Management, Presidential Regulation Number 98 of 2021 concerning the Implementation of Carbon Economic Value, Minister of Environment and Forestry Regulation Number 21 of 2022 concerning Procedures for the Implementation of Carbon Economic Value, and Financial Services Authority Regulation Number 14 of 2023 concerning Carbon Trading through Carbon Exchange

(Government of Indonesia, 2009; Government of Indonesia, 2021; Ministry of Environment and Forestry of the Republic of Indonesia, 2022; Financial Services Authority of Indonesia, 2023). The research further incorporates authoritative doctrinal literature and comparative scholarly works concerning climate governance and carbon market regulation, including Yamin and Depledge's analysis of emissions reduction mechanisms and international carbon markets, in order to contextualize Indonesia's regulatory development within evolving global climate governance paradigms (Yamin & Depledge, 2004).

The analytical framework of this study is grounded in statutory interpretation, conceptual analysis, and systematic legal interpretation directed toward identifying normative inconsistencies, institutional fragmentation, and regulatory gaps within Indonesia's carbon trading governance structure. The research applies comparative legal reasoning to evaluate the extent to which domestic regulatory mechanisms conform to international climate commitments established under the United Nations climate regime while simultaneously assessing the synchronization between environmental law, investment governance, and financial market regulation (United Nations, 1992; United Nations, 2015). Analytical examination is conducted through prescriptive legal reasoning that emphasizes coherence, legal certainty, institutional accountability, and enforcement effectiveness as core principles of environmental governance. The interpretative process focuses on evaluating whether existing carbon trading regulations provide an integrated legal framework capable of ensuring transparent monitoring mechanisms, enforceable compliance procedures, and effective supervision of carbon market activities within Indonesia's emerging green economic transition.

RESULTS AND DISCUSSION

Regulatory Fragmentation and Normative Inconsistency in Indonesia's Carbon Trading Governance

The juridical construction of carbon trading governance in Indonesia demonstrates a persistent fragmentation between environmental regulation, investment governance, and financial supervision that weakens the normative coherence required within a functional climate governance regime. Law Number 32 of 2009 concerning Environmental Protection and Management establishes ecological sustainability as a constitutional obligation through Article 2 letter e and Article 3 letter h, yet the statute does not explicitly formulate carbon market governance as an integrated environmental compliance instrument within administrative and investment law structures (Government of Indonesia, 2009). Presidential Regulation Number 98 of 2021 subsequently introduced the concept of Carbon Economic Value through Article 1 paragraph 2 and Article 47, although the regulation prioritizes economic instruments without constructing a comprehensive enforcement architecture capable of synchronizing ministerial and financial supervisory institutions (Government of Indonesia, 2021). Financial Services Authority Regulation Number 14 of 2023 institutionalizes carbon exchange mechanisms through capital market supervision principles, although the regulation adopts a transactional orientation that remains insufficiently integrated with environmental licensing obligations and emissions accountability standards under environmental law (Financial Services Authority of Indonesia, 2023). The resulting regulatory structure reveals a systematic disconnection between ecological obligations and financial market governance that complicates the implementation of legal certainty principles emphasized by Tektona, Harefa, and Yasa (2024).

The interpretative inconsistency between environmental protection norms and market based carbon governance becomes increasingly visible through the divergent legal objectives embedded within sectoral regulations governing carbon economic value. Article 4 of Law Number 32 of 2009 conceptualizes environmental protection as a mechanism for preserving ecological sustainability and human welfare, whereas Presidential Regulation Number 98 of 2021 introduces carbon valuation primarily as an economic instrument intended to support nationally determined contributions under the Paris Agreement framework (United Nations, 2015). Systematic interpretation demonstrates that these regulatory approaches operate within distinct normative paradigms because environmental legislation prioritizes ecological preservation while carbon trading regulations prioritize market functionality and investment attractiveness. Rahmawati et al. (2024) observe that Indonesian climate governance frequently experiences institutional overlap because environmental agencies and financial authorities interpret climate obligations through different regulatory logics that generate administrative ambiguity. Similar concerns appear in Sedera's (2023) analysis regarding carbon taxation and investment

incentives, where fiscal mechanisms are frequently designed without adequate integration into environmental compliance frameworks, thereby increasing the possibility of normative conflict between economic growth objectives and ecological accountability.

Comparative legal analysis further illustrates that Indonesia's carbon governance regime remains underdeveloped when contrasted with jurisdictions that have institutionalized integrated carbon market supervision through unified climate legislation and centralized monitoring systems. Tianbao and Meng (2023) explain that China's carbon emissions trading framework evolved through the consolidation of emissions reporting obligations, administrative sanctions, and centralized verification mechanisms into a coordinated national climate governance system. Indonesian regulations, by contrast, distribute supervisory functions across multiple ministries and agencies without establishing a singular authority capable of resolving institutional disputes or ensuring consistent compliance standards. The absence of harmonized regulatory interpretation creates uncertainty regarding verification authority, licensing obligations, emissions accountability, and dispute settlement mechanisms within carbon trading transactions. Yamin and Depledge (2004) argue that carbon market legitimacy depends fundamentally upon coherent institutional design because fragmented governance structures frequently generate inconsistent compliance standards and weak enforcement capacity within emerging carbon economies.

Doctrinal examination of environmental law principles reveals that the precautionary principle and polluter pays principle embedded within Article 2 letters e and j of Law Number 32 of 2009 have not been adequately operationalized within Indonesia's carbon exchange governance framework. The Financial Services Authority Regulation Number 14 of 2023 primarily regulates transactional procedures and market participation requirements without imposing sufficiently detailed environmental accountability obligations upon carbon credit issuers and exchange participants. This imbalance creates a juridical situation in which carbon trading mechanisms function more prominently as financial commodities than as enforceable environmental compliance instruments. Andhella (2024) contends that Indonesian environmental regulation historically developed through administrative control models influenced by state centered resource governance rather than integrated climate market supervision, explaining why ecological accountability remains institutionally separated from financial governance mechanisms. The interpretative consequence of this separation is the emergence of legal ambiguity regarding whether carbon trading constitutes a mechanism for environmental restoration, economic liberalization, or merely symbolic climate compliance.

The constitutional dimension of environmental governance further complicates the legal structure of Indonesia's carbon market because Article 28H paragraph 1 of the Constitution recognizes the right to a healthy environment as a fundamental constitutional right requiring active state protection. Constitutional interpretation suggests that environmental rights impose positive obligations upon the state to establish enforceable regulatory systems capable of preventing ecological harm and ensuring public accountability. Carbon trading mechanisms that prioritize transactional efficiency without effective monitoring and sanctions potentially undermine constitutional environmental guarantees because environmental protection becomes dependent upon market incentives rather than enforceable legal obligations. Widiartana, Setyawan, and Anditya (2025) argue that Indonesian environmental governance continues to experience substantial enforcement deficiencies that permit environmentally destructive practices to persist despite formal legal recognition of ecological rights. Hanafi et al. (2025) similarly emphasize that environmental legal policy must integrate ecological justice principles into climate governance structures because market based environmental instruments often marginalize vulnerable communities when accountability standards remain weak.

Table 1. Normative Inconsistencies within Indonesia's Carbon Trading Regulatory Framework

Regulatory Instrument	Core Normative Objective	Institutional Limitation	Juridical Implication
Law Number 32 of 2009	Environmental protection and sustainability	Absence of explicit carbon market governance provisions	Weak integration between ecological obligations and carbon transactions

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Presidential Regulation Number 98 of 2021	Carbon economic value implementation	Fragmented institutional coordination	Regulatory overlap between ministries and financial authorities
Ministerial Regulation Number 21 of 2022	Technical procedures for carbon economic value	Limited enforcement supervision	Administrative uncertainty in emissions verification
Financial Services Authority Regulation Number 14 of 2023	Carbon exchange governance	Financial orientation dominates ecological accountability	Carbon trading reduced to transactional market mechanism

Source: Constructed from Government of Indonesia (2009), Government of Indonesia (2021), Ministry of Environment and Forestry of the Republic of Indonesia (2022), and Financial Services Authority of Indonesia (2023).

The normative inconsistencies reflected in Table 1 indicate that Indonesia's carbon governance framework operates through sectoral compartmentalization rather than integrated climate governance. Ministerial Regulation Number 21 of 2022 establishes technical procedures concerning carbon economic value implementation, although the regulation does not provide comprehensive enforcement standards concerning emissions fraud, market manipulation, or environmental reporting obligations (Ministry of Environment and Forestry of the Republic of Indonesia, 2022). Financial market supervision consequently develops independently from environmental compliance supervision despite the fact that carbon credits derive legitimacy from ecological performance and emissions reduction verification. Lisanawati and Kristina (2025) warn that weak synchronization between financial governance and environmental compliance potentially increases the risk of money laundering and fraudulent transactions within carbon taxation and carbon exchange systems. Thani et al. (2025) similarly identify the emergence of green financial crime risks within Indonesia's climate governance structure because fragmented supervision mechanisms enable regulatory arbitrage and accountability avoidance across overlapping institutional jurisdictions.

The weakness of enforcement mechanisms within Indonesia's carbon governance system reflects broader structural deficiencies within administrative environmental law and climate accountability regulation. Article 76 of Law Number 32 of 2009 authorizes administrative sanctions for environmental violations, although the provision does not explicitly regulate carbon market misconduct or emissions reporting fraud within emerging climate governance structures (Government of Indonesia, 2009). Presidential Regulation Number 98 of 2021 likewise prioritizes implementation procedures concerning carbon economic value without constructing detailed sanctioning mechanisms against market participants who manipulate emissions data or violate verification obligations (Government of Indonesia, 2021). Firmandayu and Abdalrhman (2025) argue that environmental justice principles require climate governance mechanisms capable of ensuring transparent accountability and equitable enforcement because carbon markets frequently reproduce existing sociolegal inequalities when supervision remains weak. The absence of explicit sanctions within carbon exchange regulations consequently generates uncertainty regarding liability allocation, institutional authority, and judicial review procedures in environmental disputes arising from carbon trading activities.

Comparative doctrinal interpretation demonstrates that Indonesia's climate governance structure remains excessively dependent upon ministerial discretion rather than legislatively entrenched accountability standards. Nurhayati et al. (2024) explain that jurisdictions such as Finland and Sweden institutionalize carbon pricing governance through integrated statutory mechanisms linking taxation, emissions supervision, and environmental accountability into coherent national climate strategies. Indonesian carbon governance, however, remains distributed across environmental ministries, financial regulators, and sectoral authorities whose mandates frequently overlap without clear hierarchical coordination. Hartono et al. (2023) observe that climate policy instruments in Indonesia continue to experience institutional inconsistency because economic development objectives frequently dominate environmental accountability considerations within regulatory formulation processes. Jaelani et al. (2024) further contend that carbon policy effectiveness depends upon the existence of integrated governance systems capable of balancing sustainable development objectives with enforceable compliance standards and legal certainty principles.

The absence of explicit judicial guidance regarding carbon market disputes also contributes to legal uncertainty within Indonesia's climate governance architecture. Indonesian environmental adjudication has historically concentrated upon pollution disputes, administrative licensing conflicts, and environmental impact assessment litigation rather than carbon market accountability and emissions verification controversies. Kurniawan et al. (2025) demonstrate that environmental procedural law in Indonesia still encounters substantial limitations concerning collective legal standing, evidentiary standards, and procedural access within environmental litigation frameworks. The absence of judicial precedents concerning carbon trading disputes consequently creates uncertainty regarding the applicability of strict liability principles, administrative sanctions, and civil compensation mechanisms in climate related litigation. Nahwan, Sukmana, and Fikri (2025) explain that regulatory reform within environmental governance requires not only legislative amendment but also doctrinal adaptation capable of integrating emerging ecological risks into judicial and administrative accountability structures.

The doctrinal and comparative analysis undertaken within this section confirms that Indonesia's carbon trading governance framework remains constrained by fragmented institutional coordination, inconsistent normative orientation, and insufficient enforcement mechanisms that undermine both legal certainty and ecological accountability. Existing regulations recognize carbon trading as an instrument supporting climate mitigation and sustainable investment, although the absence of integrated statutory harmonization weakens the operational effectiveness of environmental supervision and market compliance structures. Comparative experiences from China and European jurisdictions indicate that carbon market legitimacy depends upon centralized monitoring authority, enforceable sanctions, and coherent legal integration between environmental regulation and financial governance systems (Tianbao & Meng, 2023; Li & Liu, 2024). Indonesian climate governance presently lacks a comprehensive legislative architecture capable of resolving the institutional conflicts generated by overlapping regulatory mandates and sectoral legal fragmentation. These deficiencies necessitate structural legal reform directed toward harmonizing environmental law, investment regulation, and financial supervision into a unified climate governance framework capable of ensuring accountability, transparency, and constitutional environmental protection.

Institutional Accountability and Enforcement Deficiencies in Indonesia's Carbon Market Supervision

The institutional architecture governing carbon trading supervision in Indonesia reflects a fragmented enforcement structure in which administrative authority is dispersed across environmental regulators, financial supervisory institutions, and sectoral ministries without the establishment of an integrated accountability mechanism capable of ensuring effective monitoring and sanctioning procedures. Presidential Regulation Number 98 of 2021 grants authority concerning Carbon Economic Value implementation to multiple institutions through Articles 58 and 59, although the regulation does not formulate a centralized supervisory structure capable of coordinating emissions verification, carbon registry administration, and dispute resolution procedures within a unified institutional framework (Government of Indonesia, 2021). Minister of Environment and Forestry Regulation Number 21 of 2022 further delegates technical responsibilities regarding carbon recording and verification to environmental authorities, yet the regulation lacks comprehensive provisions concerning institutional liability and interagency enforcement coordination in cases involving reporting manipulation or carbon market misconduct (Ministry of Environment and Forestry of the Republic of Indonesia, 2022). Financial Services Authority Regulation Number 14 of 2023 simultaneously constructs a market oriented supervisory model through financial compliance principles, although environmental verification standards remain largely dependent upon administrative discretion rather than integrated statutory obligations enforceable across institutions (Financial Services Authority of Indonesia, 2023). Adriansyah and Wardhani (2025) argue that comparative experiences in New Zealand demonstrate that carbon market supervision requires centralized institutional coordination supported by unified reporting mechanisms and transparent emissions accountability standards capable of preventing regulatory overlap and fragmented compliance structures.

The weakness of Indonesia's administrative supervision system becomes increasingly visible through the absence of integrated monitoring obligations capable of connecting emissions verification procedures with financial transaction oversight and environmental licensing compliance. Article 55 of

Ministerial Regulation Number 21 of 2022 regulates monitoring procedures concerning Carbon Economic Value implementation, although the provision remains procedurally limited because it does not establish enforceable cross institutional verification obligations involving environmental agencies, financial supervisors, and investment authorities (Ministry of Environment and Forestry of the Republic of Indonesia, 2022). Systematic interpretation of the regulation reveals that emissions reporting remains dependent upon self reporting mechanisms and sectoral administrative verification without adequate independent auditing safeguards capable of preventing manipulation of carbon reduction data. Rahmatullah (2025) contends that Indonesia's carbon credit system currently operates within a regulatory environment vulnerable to speculative transactions and environmental liability risks because institutional monitoring mechanisms remain underdeveloped and administratively fragmented. Tektona, Harefa, and Yasa (2024) similarly emphasize that effective carbon market governance requires enforceable institutional accountability capable of ensuring transparency, data integrity, and legal responsibility among carbon market participants.

Doctrinal analysis of enforcement principles within Indonesian environmental law indicates that the polluter pays principle and precautionary principle recognized under Article 2 letters e and j of Law Number 32 of 2009 have not been adequately translated into carbon market sanctioning mechanisms. Administrative sanctions regulated under Article 76 of Law Number 32 of 2009 primarily address conventional environmental violations such as pollution and ecological destruction, while carbon trading regulations fail to establish explicit liability standards concerning fraudulent emissions reporting, double counting practices, and unlawful carbon credit transactions (Government of Indonesia, 2009). The absence of precise statutory sanctions creates substantial legal uncertainty concerning the allocation of responsibility among corporations, verification institutions, financial intermediaries, and regulatory authorities involved within carbon exchange transactions. Widiartana, Setyawan, and Anditya (2025) argue that environmental law reform in Indonesia remains constrained by weak enforcement traditions in which administrative compliance frequently substitutes substantive ecological accountability, thereby limiting the deterrent effect of environmental sanctions. Thani et al. (2025) further observe that green financial governance mechanisms lacking integrated enforcement structures may facilitate the emergence of ecological financial crimes because fragmented institutional authority creates opportunities for regulatory arbitrage and supervision avoidance.

Comparative legal interpretation demonstrates that China's emissions trading framework institutionalizes significantly stronger compliance mechanisms through centralized registry supervision, mandatory reporting standards, and integrated administrative sanctions linking climate obligations with state enforcement authority. Tianbao and Meng (2023) explain that China's carbon governance model combines emissions verification, state supervision, and environmental accountability into a singular climate governance architecture capable of imposing direct sanctions against entities violating reporting obligations or emissions quotas. Indonesia's regulatory structure, by contrast, separates environmental supervision from financial oversight because emissions verification remains institutionally detached from carbon exchange administration and investment compliance monitoring. Li and Liu (2024) note that integrated climate rule of law frameworks require synchronized environmental and economic governance mechanisms capable of ensuring that ecological obligations maintain juridical priority over speculative market interests within carbon transactions. The absence of such synchronization within Indonesia's carbon governance regime weakens enforcement effectiveness because regulatory institutions operate through compartmentalized administrative mandates lacking coherent supervisory integration.

The institutional weakness of Indonesia's carbon market supervision also creates significant vulnerability concerning greenwashing practices and carbon fraud because current regulations do not establish sufficiently rigorous disclosure obligations and auditing mechanisms for carbon market participants. Financial Services Authority Regulation Number 14 of 2023 regulates carbon exchange transactions through financial market governance principles, although the regulation does not comprehensively integrate environmental due diligence standards or mandatory ecological performance disclosure obligations capable of preventing misleading sustainability claims (Financial Services Authority of Indonesia, 2023). Lisanawati and Kristina (2025) argue that anti money laundering frameworks within carbon taxation and carbon trading systems remain institutionally weak because financial compliance regulations have not yet developed specialized mechanisms for detecting fraudulent carbon transactions and illicit environmental financial flows. Similar concerns are articulated

by Dewi and Dewi (2022), who explain that ineffective carbon pricing implementation may generate regulatory inefficiency and economic distortion when monitoring systems fail to ensure accurate emissions accountability and transparent reporting standards. Yamin and Depledge (2004) historically emphasized that the legitimacy of international carbon markets depends upon robust verification procedures and transparent compliance systems because carbon trading mechanisms lacking credible enforcement safeguards risk becoming symbolic economic instruments disconnected from actual emissions reduction objectives.

Table 2. Institutional Supervision and Enforcement Gaps in Indonesia's Carbon Trading Governance

Institution or Regulation	Supervisory Authority	Enforcement Mechanism	Regulatory Weakness	Comparative Observation
Ministry of Environment and Forestry Regulation Number 21 of 2022	Environmental supervision and emissions verification	Administrative monitoring and reporting procedures	Limited independent verification authority	China ETS applies centralized emissions auditing
Financial Services Authority Regulation Number 14 of 2023	Carbon exchange and financial supervision	Market compliance supervision	Ecological accountability weakly integrated into financial oversight	New Zealand ETS integrates environmental and financial monitoring
Presidential Regulation Number 98 of 2021	Coordination of Carbon Economic Value implementation	Interministerial coordination framework	Absence of centralized enforcement institution	Finland applies integrated climate governance mechanisms
Indonesia Carbon Exchange System	Carbon trading administration	Transaction recording and market procedures	Lack of comprehensive fraud prevention mechanism	Sweden emphasizes transparent registry supervision
Law Number 32 of 2009	Environmental protection enforcement	Administrative and civil sanctions	Carbon specific liability norms remain absent	China combines environmental liability with climate enforcement

Source: Constructed from Adriansyah and Wardhani (2025), Tianbao and Meng (2023), Li and Liu (2024), Government of Indonesia (2021), Ministry of Environment and Forestry of the Republic of Indonesia (2022), and Financial Services Authority of Indonesia (2023).

The institutional deficiencies identified in Table 2 indicate that Indonesia's carbon governance system lacks the integrated supervisory mechanisms necessary to ensure enforceable environmental accountability and transparent compliance administration. Comparative analysis with New Zealand and China demonstrates that effective carbon market governance depends upon centralized registry management, mandatory independent auditing procedures, and enforceable sanctions capable of deterring fraudulent emissions reporting and speculative carbon transactions (Adriansyah & Wardhani, 2025; Tianbao & Meng, 2023). Indonesian regulations currently distribute supervisory authority across environmental agencies and financial institutions without establishing a unified legal mechanism capable of coordinating monitoring, verification, and dispute resolution functions. Nurhayati et al. (2024) explain that jurisdictions implementing effective carbon pricing systems typically institutionalize integrated climate governance through coherent statutory structures linking environmental accountability with economic regulation and administrative supervision. Indonesia's

fragmented supervisory structure consequently weakens the enforceability of climate obligations because regulatory institutions remain unable to exercise coordinated oversight over carbon market participants and emissions verification procedures.

Judicial enforcement mechanisms concerning carbon market violations remain substantially underdeveloped because Indonesian environmental procedural law has not yet formulated specialized adjudicative standards governing carbon trading disputes and climate related financial misconduct. Law Number 32 of 2009 recognizes environmental dispute resolution and administrative litigation procedures through Articles 84 and 87, although the statutory framework does not specifically regulate evidentiary standards concerning carbon accounting fraud, emissions misrepresentation, or unlawful carbon credit certification (Government of Indonesia, 2009). Kurniawan et al. (2025) observe that environmental litigation in Indonesia continues to experience procedural limitations involving class action requirements, evidentiary burdens, and institutional access barriers that weaken judicial effectiveness in resolving complex environmental disputes. The absence of specialized judicial doctrine concerning carbon market liability creates substantial uncertainty regarding the applicability of strict liability principles, administrative compensation mechanisms, and public interest litigation procedures within climate related disputes. Rahmawati et al. (2024) note that environmental law enforcement in Indonesia frequently prioritizes administrative settlement mechanisms rather than substantive judicial accountability, thereby limiting the deterrent capacity of environmental adjudication within emerging carbon governance disputes.

The limited integration between environmental governance and investment regulation further weakens institutional accountability because sustainable finance mechanisms frequently operate without sufficiently rigorous ecological supervision standards. Ayuningtias (2025) argues that Indonesia's investment legal system continues to prioritize economic growth and green investment attraction despite the absence of integrated environmental accountability structures capable of ensuring compliance with sustainability obligations. Article 3 of Financial Services Authority Regulation Number 14 of 2023 permits carbon exchange participation by market actors and institutional entities, although the regulation does not comprehensively impose environmental liability standards concerning investment activities linked to emissions reduction projects (Financial Services Authority of Indonesia, 2023). Hartono et al. (2023) explain that climate related fiscal instruments and energy policies in Indonesia often encounter implementation difficulties because regulatory institutions prioritize economic competitiveness over integrated ecological supervision mechanisms. Jaelani et al. (2024) similarly emphasize that sustainable development governance requires institutional synchronization between climate policy, fiscal supervision, and environmental accountability in order to ensure that market based environmental mechanisms produce substantive ecological benefits rather than merely symbolic compliance outcomes.

The absence of participatory and community centered supervision mechanisms also undermines the legitimacy of Indonesia's carbon governance framework because current regulations insufficiently recognize indigenous ecological knowledge and environmental justice considerations within carbon market administration. Akbar et al. (2025) explain that indigenous communities possess substantial ecological knowledge capable of supporting sustainable carbon governance and food security protection, although Indonesian carbon policies rarely integrate community participation into supervisory and accountability mechanisms. Hanafi et al. (2025) further argue that environmental legal policy must recognize ecological rights and community based environmental protection principles because climate governance mechanisms excluding vulnerable communities frequently reproduce environmental injustice and distributive inequality. Firmandayu and Abdalrhman (2025) emphasize that spatial governance and climate mitigation policies require environmentally just supervision systems capable of balancing economic objectives with ecological sustainability and community protection. Falah (2025) additionally demonstrates that sustainable regional development and environmentally conscious governance require integrated planning mechanisms connecting climate accountability, energy transformation, and ecological supervision within coherent environmental governance frameworks.

The comparative and doctrinal analysis undertaken within this section confirms that Indonesia's carbon trading supervision system remains institutionally fragmented, procedurally weak, and insufficiently integrated to ensure effective environmental accountability and enforceable climate governance. Existing regulations formally establish supervisory structures concerning carbon exchange

administration and emissions monitoring, although enforcement mechanisms remain constrained by fragmented institutional authority, weak sanctioning provisions, and limited judicial accountability frameworks. Comparative experiences from China, Finland, Sweden, and New Zealand demonstrate that effective carbon governance depends upon centralized supervision, transparent registry systems, mandatory independent verification, and enforceable liability mechanisms capable of integrating environmental accountability with financial regulation and climate policy obligations (Nurhayati et al., 2024; Li & Liu, 2024). Indonesia's current framework consequently risks transforming carbon trading into a procedurally compliant market instrument lacking substantive ecological effectiveness because monitoring structures remain incapable of ensuring credible emissions accountability and institutional transparency. These institutional deficiencies necessitate comprehensive legal reform directed toward strengthening supervisory integration, judicial enforcement, ecological accountability, and climate governance coherence within Indonesia's emerging carbon market regime.

Reconstructing an Integrated Legal Framework for Carbon Trading Governance within Indonesia's Climate and Environmental Policy

The future development of Indonesia's carbon trading governance requires a comprehensive legal reform model capable of integrating environmental regulation, investment governance, and international climate obligations within a unified institutional and normative framework oriented toward ecological accountability and sustainable development. Article 2 of Law Number 32 of 2009 establishes sustainability, precautionary principles, and environmental justice as foundational legal principles within Indonesian environmental governance, although these principles have not yet been systematically incorporated into the operational architecture of carbon market regulation (Government of Indonesia, 2009). A reform oriented interpretation of Presidential Regulation Number 98 of 2021 indicates the necessity of constructing an integrated carbon governance authority possessing supervisory jurisdiction over emissions verification, registry administration, compliance monitoring, and dispute resolution in order to eliminate institutional fragmentation and regulatory inconsistency (Government of Indonesia, 2021). Li and Liu (2024) argue that responsive climate rule of law systems require integrated governance structures capable of synchronizing environmental protection with economic administration through centralized institutional accountability mechanisms. Comparative experiences analyzed by Tianbao and Meng (2023) further demonstrate that successful climate governance frameworks depend upon legally coordinated supervisory systems capable of harmonizing environmental obligations with market based regulatory instruments and enforceable compliance procedures.

The reformulation of Indonesia's carbon trading governance should prioritize the establishment of an integrated supervisory authority operating through statutory coordination between environmental regulators, financial supervisory agencies, and investment institutions in order to ensure coherent implementation of climate governance obligations. Financial Services Authority Regulation Number 14 of 2023 currently regulates carbon exchange administration through financial governance principles, although environmental accountability remains institutionally peripheral because ecological supervision is not structurally integrated into financial compliance mechanisms (Financial Services Authority of Indonesia, 2023). Systematic legal interpretation demonstrates that effective climate governance requires the transformation of carbon supervision from fragmented sectoral administration into a unified legal regime connecting environmental licensing, emissions reporting, and financial transparency obligations within a centralized governance structure. Nurhayati et al. (2024) explain that Finland and Sweden successfully institutionalize carbon pricing governance through integrated legal systems combining environmental accountability with fiscal and administrative supervision under coordinated state institutions. Rahmatullah (2025) similarly emphasizes that Indonesia's carbon trading framework risks prioritizing speculative market interests over environmental sustainability unless legal reform establishes enforceable ecological accountability standards applicable to all carbon market actors and institutions.

The reconstruction of Indonesia's liability system concerning carbon trading activities also requires significant doctrinal reform because current environmental sanctions remain insufficiently adapted to address carbon related violations involving emissions manipulation, registry fraud, and ecological misrepresentation. Article 76 of Law Number 32 of 2009 regulates administrative sanctions concerning environmental violations, although the statutory framework does not explicitly establish

carbon specific liability standards applicable to carbon exchanges, verification institutions, or corporate entities engaged in emissions trading activities (Government of Indonesia, 2009). A teleological interpretation of environmental accountability principles suggests that liability reform should incorporate strict liability mechanisms and mandatory ecological compensation obligations capable of ensuring substantive accountability for environmental harm generated through fraudulent carbon transactions. Widiartana, Setyawan, and Anditya (2025) contend that Indonesian environmental law reform requires stronger ecological accountability doctrines capable of preventing environmental degradation resulting from weak enforcement traditions and market oriented regulatory approaches. Thani et al. (2025) further explain that climate related financial governance must incorporate anti corruption safeguards, anti money laundering supervision, and ecological compliance obligations in order to prevent environmental financial crimes emerging within rapidly expanding carbon markets.

The harmonization of environmental governance and investment regulation constitutes another essential component of Indonesia's future carbon governance reform because green investment mechanisms currently operate within fragmented regulatory structures lacking coherent ecological accountability standards. Ayuningtias (2025) explains that Indonesia's investment law framework frequently emphasizes economic competitiveness and investment facilitation despite limited integration between investment governance and environmental sustainability obligations. Article 3 of Presidential Regulation Number 98 of 2021 formally recognizes Carbon Economic Value implementation as part of Indonesia's climate commitment strategy, although investment related environmental accountability mechanisms remain weakly institutionalized within operational carbon market governance structures (Government of Indonesia, 2021). Hartono et al. (2023) argue that sustainable energy transition and climate fiscal policy require integrated legal frameworks capable of synchronizing investment regulation with environmental protection principles and emissions reduction obligations. Jaelani et al. (2024) similarly emphasize that climate related fiscal reform and carbon pricing systems can only contribute effectively toward sustainable development objectives when environmental governance mechanisms possess sufficient legal authority to ensure transparent compliance and ecological accountability among corporate actors and financial institutions.

The reform of carbon governance within Indonesia also requires the institutional incorporation of environmental justice principles and indigenous ecological participation into climate governance mechanisms because current regulatory structures remain predominantly technocratic and market oriented. Akbar et al. (2025) explain that indigenous knowledge systems contribute substantially toward sustainable climate governance and ecological preservation because local communities possess historically embedded environmental management practices capable of supporting long term ecological resilience. Hanafi et al. (2025) further argue that national environmental policy should recognize ecological rights and community participation as integral components of climate governance because environmental regulation detached from social justice principles frequently reproduces ecological inequality and marginalization. Firmandayu and Abdalrhman (2025) similarly demonstrate that spatial governance and climate mitigation policy require participatory environmental supervision capable of protecting vulnerable communities from ecological exploitation associated with market based climate instruments. Falah (2025) additionally notes that sustainable urban and regional transformation depends upon legally integrated ecological planning systems combining climate governance, energy transition, and participatory environmental accountability within coherent environmental regulatory structures.

Table 3. Proposed Legal Reform Framework for Integrated Carbon Trading Governance in Indonesia

Reform Sector	Existing Weakness	Proposed Legal Reform	Comparative Reference	Expected Juridical Impact
Supervisory Integration	Fragmented institutional authority	Establishment of integrated carbon governance authority	China ETS and New Zealand ETS	Coordinated climate supervision and legal accountability
Emissions Verification	Weak independent	Mandatory third party verification	Sweden carbon registry model	Increased transparency and

	auditing mechanism	and centralized registry system		emissions reliability
Judicial Remedies	Limited climate dispute adjudication	Specialized environmental and climate adjudication chamber	Finland climate governance system	Stronger judicial enforcement capacity
Sanctions and Liability	Absence of carbon specific liability norms	Strict liability and ecological compensation mechanisms	China environmental enforcement model	Enhanced deterrence against carbon fraud
Indigenous Participation	Minimal community involvement	Statutory recognition of ecological participation rights	Community based governance approach	Strengthened environmental justice
Anti Money Laundering Safeguards	Weak financial monitoring	Integration of climate finance and anti money laundering supervision	International ESG compliance system	Reduced ecological financial crime
ESG Compliance	Fragmented sustainability obligations	Mandatory ESG disclosure and carbon accountability reporting	European sustainable finance governance	Increased corporate environmental responsibility
Registry Transparency	Decentralized reporting structure	Unified national carbon registry platform	New Zealand monitoring framework	Improved data accountability and market integrity
Climate Accountability	Weak integration with Paris Agreement obligations	Binding alignment mechanism with international climate commitments	UNFCCC and Paris Agreement framework	Stronger conformity with global climate governance

Source: Constructed from Li and Liu (2024), Tianbao and Meng (2023), Nurhayati et al. (2024), United Nations (1992), United Nations (2015), Government of Indonesia (2021), and Financial Services Authority of Indonesia (2023).

The reform sectors identified in Table 3 demonstrate that Indonesia's future carbon governance architecture requires multidimensional legal transformation involving institutional integration, strengthened liability systems, participatory governance mechanisms, and synchronized environmental accountability standards. Comparative legal analysis reveals that climate governance systems operating effectively within Finland, Sweden, China, and New Zealand institutionalize transparent registry mechanisms, centralized supervision, and enforceable ecological obligations capable of maintaining the legitimacy of market based climate instruments (Nurhayati et al., 2024; Tianbao & Meng, 2023). Indonesia's reform trajectory consequently requires legislative reconstruction extending beyond procedural compliance reforms toward the creation of a comprehensive climate governance framework integrating environmental law, financial regulation, and international climate obligations within a coherent legal structure. Li and Liu (2024) emphasize that climate rule of law systems become effective only when environmental governance institutions possess sufficient authority to ensure ecological accountability across administrative, economic, and judicial dimensions of climate regulation. The proposed reform framework therefore reflects a transition from fragmented regulatory administration

toward responsive environmental governance capable of ensuring substantive climate accountability and sustainable ecological protection.

The institutionalization of transparent carbon registry governance constitutes another central component of Indonesia's proposed legal reform because emissions data integrity represents the foundation of credible carbon trading systems and enforceable climate accountability. Ministerial Regulation Number 21 of 2022 currently regulates procedures concerning Carbon Economic Value implementation and carbon recording systems, although registry administration remains institutionally decentralized and insufficiently integrated with financial supervision mechanisms and independent verification procedures (Ministry of Environment and Forestry of the Republic of Indonesia, 2022). Comparative legal interpretation demonstrates that Sweden and New Zealand maintain effective carbon registry governance through centralized digital reporting systems supported by transparent verification procedures and publicly accessible emissions accountability standards (Adriansyah & Wardhani, 2025). Yamin and Depledge (2004) explain that carbon market legitimacy fundamentally depends upon transparent registry administration because emissions reduction mechanisms lacking credible reporting systems risk undermining international climate cooperation and environmental accountability. Nahwan, Sukmana, and Fikri (2025) further observe that sustainable environmental reform requires legislative revitalization capable of integrating technological transparency with responsive governance principles in order to ensure long term environmental sustainability and institutional legitimacy.

The strengthening of judicial mechanisms concerning carbon related disputes also constitutes an indispensable dimension of Indonesia's future climate governance reform because environmental adjudication remains insufficiently equipped to address complex climate accountability disputes involving financial transactions, emissions verification, and ecological liability. Kurniawan et al. (2025) explain that environmental litigation in Indonesia continues to face procedural limitations involving evidentiary burdens, collective action requirements, and institutional barriers limiting access to effective environmental remedies. A comparative doctrinal approach suggests that Indonesia should establish specialized climate adjudication mechanisms within environmental courts capable of integrating environmental science, financial governance, and climate accountability principles into judicial reasoning and dispute resolution procedures. Tektona, Harefa, and Yasa (2024) argue that legal certainty within carbon governance can only emerge when judicial institutions possess sufficient doctrinal clarity and procedural competence to adjudicate carbon market disputes consistently and transparently. Rahmawati et al. (2024) similarly emphasize that environmental governance effectiveness depends upon the capacity of legal institutions to transform environmental principles into enforceable obligations supported by credible judicial accountability mechanisms.

The integration of international climate commitments into domestic carbon governance reform remains essential because Indonesia's obligations under the United Nations Framework Convention on Climate Change and the Paris Agreement require the establishment of effective domestic mechanisms capable of ensuring measurable emissions reduction and accountable climate governance. The United Nations Framework Convention on Climate Change establishes principles concerning common but differentiated responsibilities and sustainable environmental cooperation, while the Paris Agreement requires participating states to formulate transparent and enforceable national climate governance mechanisms aligned with global emissions reduction objectives (United Nations, 1992; United Nations, 2015). Indonesia's future legal reform should consequently institutionalize binding statutory alignment between domestic carbon governance mechanisms and international climate obligations through mandatory legislative harmonization procedures and enforceable emissions accountability standards. Andhella (2024) argues that Indonesian environmental regulation historically developed through interactions between legal modernization, ecological values, and environmental governance traditions, thereby indicating the importance of constructing climate governance reform compatible with domestic legal culture and environmental priorities. Sedera (2023) additionally explains that climate fiscal instruments and carbon economic policies require integrated regulatory support capable of balancing investment incentives with sustainable environmental governance and ecological accountability obligations.

The proposed reform model ultimately reflects the necessity of transforming Indonesia's carbon trading governance from fragmented sectoral administration into a responsive climate governance system grounded in integrated legal accountability, ecological sustainability, and institutional coherence. Existing environmental regulations already recognize sustainability principles and climate

related policy objectives, although effective implementation requires comprehensive legislative reconstruction capable of integrating supervision, liability, judicial enforcement, community participation, and financial accountability into a unified carbon governance framework. Comparative legal experiences from China, Finland, Sweden, and New Zealand demonstrate that effective climate governance depends upon centralized supervision, transparent emissions reporting, enforceable liability standards, and coherent synchronization between environmental law and economic governance mechanisms (Li & Liu, 2024; Nurhayati et al., 2024; Tianbao & Meng, 2023). Indonesia's future carbon governance trajectory should therefore prioritize responsive environmental governance and climate rule of law principles capable of ensuring that carbon trading mechanisms operate as substantive instruments of ecological protection rather than merely procedural market instruments. Such legal reconstruction would strengthen Indonesia's capacity to fulfill international climate commitments while simultaneously advancing environmental justice, sustainable investment governance, and long term ecological resilience within the national legal system.

CONCLUSION

Indonesia's carbon trading governance continues to experience structural fragmentation because environmental regulation, financial supervision, investment governance, and international climate obligations remain institutionally and normatively disconnected within the existing regulatory framework. The analysis demonstrates that Law Number 32 of 2009, Presidential Regulation Number 98 of 2021, Minister of Environment and Forestry Regulation Number 21 of 2022, and Financial Services Authority Regulation Number 14 of 2023 have not yet produced an integrated legal structure capable of ensuring coherent supervision, enforceable liability mechanisms, transparent emissions verification, and effective climate accountability. Comparative legal examination of China, Finland, Sweden, and New Zealand further confirms that successful carbon market governance depends upon centralized institutional coordination, independent monitoring systems, judicially enforceable environmental obligations, and transparent registry mechanisms aligned with international climate commitments under the United Nations Framework Convention on Climate Change and the Paris Agreement. The study also establishes that weak administrative supervision, fragmented enforcement authority, limited judicial remedies, and insufficient anti money laundering safeguards create substantial risks of carbon fraud, greenwashing, and ecological injustice within Indonesia's emerging carbon economy. The proposed legal reform model therefore emphasizes integrated carbon governance authority, harmonization between environmental law and investment regulation, strengthened judicial enforcement, mandatory ESG accountability, ecological participation rights, and binding conformity with international climate governance standards in order to construct a responsive and sustainable climate rule of law framework in Indonesia.

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