

Legal Certainty and Governance of Carbon Exchange Trading in Indonesia: An Analysis of the Implementation of Presidential Regulation Number 98 of 2021

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ABSTRACT

Keywords:

Legal Certainty,
Carbon
Exchange,
Economic Value
of Carbon,
Governance,
Carbon Trading.

Carbon exchange trading is an economic instrument developed to support greenhouse gas emission reduction and achieve sustainable development targets. In Indonesia, carbon trading is regulated by Presidential Regulation Number 98 of 2021 concerning the Management of Carbon Economic Value. This study aims to analyze the legal regulations for carbon exchange trading in Indonesia, the implementation of Presidential Regulation Number 98 of 2021 in achieving legal certainty, carbon trade governance, and the legal and institutional obstacles encountered in its implementation. The research method used is normative legal research with statutory, conceptual, and analytical approaches. Research data was obtained through a literature review sourced from laws and regulations, books, scientific journals, and other legal documents relevant to the research object. The results show that Presidential Regulation Number 98 of 2021 has provided a legal basis for the implementation of carbon trading through regulations regarding Carbon Economic Value, a national registration system, and mechanisms for measuring, reporting, and verifying emissions. However, its implementation still faces various obstacles, such as suboptimal regulatory harmonization, limited institutional coordination, unclear legal status of carbon units, and the need to strengthen the oversight system and legal protection for market players. Therefore, regulatory strengthening, institutional capacity building, and transparent and accountable governance are needed to create an effective, sustainable carbon market capable of supporting the achievement of Indonesia's greenhouse gas emission reduction targets.

Article Info

Received:

01/09/2025

Revised:

05/09/2025

Accepted:

26/09/2025

Published:

30/09/2025



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How to cite: Rico Nur Ilham, Irada Sinta, Mangasi Sinurat, Muammar Khaddafi, & Maulana Majied Sumatrani Saragih. (2025). Legal Certainty and Governance of Carbon Exchange Trading in Indonesia: An Analysis of the Implementation of Presidential Regulation Number 98 of 2021. *International Journal of Educational Review, Law And Social Sciences (IJERLAS)*, 5(5), 798–812.

DOI: <https://doi.org/10.5281/zenodo.20552704>

Introduction

Climate change is a global challenge that has a significant impact on environmental sustainability, the economy, and social life. Increased concentrations of greenhouse gases in the atmosphere due to industrial activity, transportation, deforestation, and the use of fossil fuels have caused global temperatures to rise, resulting in changes in weather patterns, increased frequency of natural disasters, environmental degradation, and threats to food security and natural resources. These conditions have prompted various

countries to take strategic steps to reduce greenhouse gas emissions as part of a global commitment to addressing climate change. One instrument that is developing and widely used in various countries is the carbon trading mechanism, which allows businesses and certain economic sectors to trade carbon emission rights as part of an efficient emission reduction effort. In the international context, carbon trading has gained legitimacy through various international legal instruments, such as the Kyoto Protocol and the Paris Agreement, which encourage countries to develop carbon market mechanisms as an approach to achieving emission reduction targets. Through these mechanisms, emission reduction is viewed not only as an environmental obligation but also as an economic asset with trade value. Thus, carbon trading becomes an instrument that integrates environmental and economic interests within a single framework of sustainable development. Various countries have developed structured carbon market systems supported by strong regulations to ensure effective implementation and provide legal certainty for market participants.

As part of the international community, Indonesia is committed to reducing greenhouse gas emissions through various policies and legal instruments. This commitment is realized through the ratification of various international agreements and the development of national policies oriented towards low-carbon development. In its Nationally Determined Contribution (NDC) document, Indonesia targets a reduction in greenhouse gas emissions as part of its national contribution to climate change control. To support the achievement of this target, the government is developing various environmental economic instruments, including carbon trading, which is expected to encourage private sector participation in emission reduction efforts.

The Indonesian government officially regulated carbon trading mechanisms through Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Values for Achieving Nationally Determined Contribution (NDC) Targets and Greenhouse Gas Emission Control in National Development. This regulation serves as the primary legal basis for the implementation of carbon trading, carbon offset mechanisms, performance-based payments, and other carbon economic instruments.

Table 1.1 Legal Basis for the Implementation of the Indonesian Carbon Exchange

Information	Data
Regulation Number	Presidential Decree No. 98 of 2021
Year of Ratification	2021
Regulatory Focus	Economic Value of Carbon (ECC)
Objective	Supporting Indonesia's NDC targets and controlling GHG emissions

Source: [BPK RI – Presidential Decree No. 98 of 2021](#)

The primary legal basis for carbon trading in Indonesia is currently Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Value for the Achievement of Nationally Determined Contribution Targets and Greenhouse Gas Emission Control in National Development. This regulation is a significant milestone in establishing the legal framework for Indonesia's carbon market, as it regulates various mechanisms for carbon economic value, including carbon trading, performance-based payments, carbon levies, and various other economic instruments related to emissions control. The existence of this regulation demonstrates the government's commitment to building a carbon trading system that is integrated with national development policies and the environmental sustainability agenda.

The implementation of carbon trading in Indonesia is growing with the presence of a carbon exchange, which serves as a means for transacting carbon units between parties with a surplus in emissions reductions and those requiring emissions compensation. The carbon exchange is expected to create a transparent, efficient, and accountable market, thereby attracting participation from both domestic and international investors. In addition to providing economic incentives for businesses that successfully reduce emissions, carbon trading is also expected to accelerate the transformation towards a green economy and support the government's Net Zero Emissions target.

However, the implementation of carbon exchange trading in Indonesia still faces various legal and governance challenges. One major issue is the complexity of regulations involving various sectors and government agencies. Regulations concerning the environment, energy, forestry, capital markets, and

carbon trading fall under different legal regimes, potentially leading to overlapping authorities and unclear implementation mechanisms. This situation can impact the level of legal certainty, a crucial factor in building market confidence in the national carbon trading system. The development of carbon trading in Indonesia has shown an increasing trend since the launch of the national carbon exchange through the IDXC Carbon platform managed by the Indonesia Stock Exchange.

Table 1.2 Carbon Trading Volume Data

Year	Transaction Volume (tCO ₂ e)
2023	494,254
2024	413,764
First Quarter 2025	690,675

Source: Antaranews.com

Data shows that in just the first quarter of 2025, carbon trading volume surpassed the total transactions for all of 2023 and 2024. This demonstrates the growing interest of business actors in the Indonesian carbon market and the importance of legal certainty in maintaining the sustainability of national carbon transactions. Furthermore, the governance of carbon trading is also an issue that requires serious attention. The success of the carbon market is determined not only by the existence of regulations but also by the effectiveness of the monitoring, verification, reporting, and accountability systems for carbon transactions. An accurate Monitoring, Reporting, and Verification (MRV) mechanism is a key requirement to ensure that traded carbon units truly represent legitimate and accountable emission reductions. Without good governance, carbon trading risks problems such as double counting, emissions data manipulation, and greenwashing practices, which can undermine the credibility of the Indonesian carbon market internationally.

Another equally important issue is legal protection for carbon traders. As a relatively new economic instrument in Indonesia, various questions remain regarding the legal status of carbon units, dispute resolution mechanisms, investor protection, and the responsibilities of parties involved in carbon transactions. Unclear aspects of these aspects have the potential to create legal uncertainty that could hamper the development of the national carbon market. Therefore, a comprehensive study is needed to assess the extent to which the existing legal framework is able to provide legal certainty and support effective carbon trading governance.

Based on this description, it is clear that carbon exchange trading is a strategic instrument for controlling greenhouse gas emissions and achieving sustainable development targets in Indonesia. However, its successful implementation depends heavily on the existence of clear regulations, adequate legal certainty, and transparent and accountable governance. Therefore, the study, "Legal Certainty and Governance of Carbon Exchange Trading in Indonesia: An Analysis of the Implementation of Presidential Regulation Number 98 of 2021," is crucial to assess the effectiveness of the existing legal framework, identify various implementation challenges, and formulate recommendations that can strengthen Indonesia's carbon trading system in the future.

Formulation of the problem

1. What are the legal regulations for carbon exchange trading in Indonesia based on Presidential Regulation Number 98 of 2021 concerning the Implementation of Carbon Economic Value?
2. How is Presidential Regulation Number 98 of 2021 implemented to ensure legal certainty in the implementation of carbon exchange trading in Indonesia?
3. How is the governance of carbon exchange trading in Indonesia reviewed from the aspects of transparency, accountability, effectiveness of supervision, and legal protection for carbon market players?
4. What are the legal and institutional obstacles faced in implementing carbon exchange trading in Indonesia, and what efforts can be made to strengthen legal certainty and governance of the national carbon market?

Literature Review

2.1 Theory of Legal Certainty

Legal certainty is one of the primary objectives of establishing laws, which serve to provide behavioral guidelines for society while guaranteeing protection of the rights and obligations of every legal entity. In the context of carbon exchange trading, legal certainty is crucial because it involves various parties, including the government, business actors, investors, verification agencies, and communities involved in carbon emission reduction activities. Without legal certainty, carbon trading has the potential to create uncertainty regarding carbon unit ownership rights, transaction mechanisms, and potential dispute resolution.

According to Brian Z. Tamanaha (2020), legal certainty is a condition where legal rules can be understood, predicted, and consistently applied by authorized institutions. Legal certainty relates not only to the existence of regulations but also to the consistency of law enforcement so that the public can predict the consequences of their actions. A similar opinion was expressed by Martin Loughlin (2020), who explained that legal certainty is a fundamental element of a rule of law, ensuring that every government action is based on clear and accountable rules. Thus, legal certainty serves as an instrument to prevent arbitrary actions in governance and economic activity.

According to Paul Craig (2021), legal certainty encompasses the elements of normative clarity, regulatory consistency, and legal accessibility for the public. A legal system is said to provide certainty if the applicable norms are understandable to all stakeholders and do not give rise to differing interpretations. Meanwhile, Mark Elliott (2021) states that legal certainty is a primary requirement for creating a healthy investment climate. Investors tend to invest in sectors with stable and predictable regulations, including carbon trading, which is currently developing as an environmental economic instrument. According to Jens Meierhenrich (2022), legal certainty is not only oriented towards the existence of written regulations but also encompasses the effectiveness of the institutions tasked with enforcing those regulations. Therefore, the successful implementation of a regulation is greatly influenced by institutional capacity to carry out its oversight and law enforcement functions.

2.2 Governance Theory

Governance is a concept that explains how a system is managed through interactions between the government, the private sector, and the public. In carbon exchange trading, governance is a crucial factor in ensuring that carbon transactions are conducted transparently, accountably, and sustainably. According to Mark Bevir (2020), governance is the process of coordinating various actors with different interests to achieve common goals through transparent and participatory mechanisms. Good governance requires the involvement of various stakeholders in the decision-making process.

According to David Levi-Faur (2020), modern governance no longer relies solely on government but instead involves various institutions working collaboratively to regulate economic and social activities. In the context of carbon trading, collaboration between the government, carbon exchanges, verification agencies, and business actors is key to the successful implementation of carbon markets. Furthermore, Thomas Risse (2021) explains that effective governance is characterized by the ability of institutions to create coordination, compliance, and policy effectiveness. A good governance system must ensure that all actors comply with applicable regulations.

According to Jan Kooiman (2021), governance is a dynamic interaction between various parties aimed at resolving public problems through adaptive and responsive mechanisms. This concept is relevant to carbon trading, which requires cross-sector and cross-institutional coordination. Meanwhile, Gerry Stoker (2022) states that governance emphasizes the importance of accountability and transparency in every decision-making process. The success of a policy is greatly influenced by the level of public trust in the institutions that administer it.

2.3 Good Environmental Governance Theory

Good Environmental Governance is a concept that integrates the principles of good governance with sustainable environmental management. This theory is relevant in research on carbon trading because the primary goal of carbon trading is to reduce greenhouse gas emissions and maintain environmental quality. According to Louis J. Kotzé (2020), good environmental governance is an environmental management system oriented towards sustainability, transparency, public participation, and institutional accountability. These principles form the basis for managing environmental economic instruments, including carbon markets.

According to Klaus Bosselmann (2020), good environmental governance must simultaneously balance economic, social, and ecological interests. Thus, environmental policies not only pursue economic growth but also ensure the sustainability of natural resources. Furthermore, Jona Razzaque (2021) explains that good environmental governance places the precautionary principle as the foundation for environmental policymaking. Any policy with the potential to cause environmental impacts must be supported by an effective monitoring system.

According to Benjamin J. Richardson (2022), good environmental governance requires strong legal instruments to ensure business compliance with established environmental standards. In the context of carbon trading, regulation is a key tool for ensuring the integrity of the carbon market. Meanwhile, Maria Antonia Tigre (2023) states that good environmental governance requires integration between national environmental policies and international commitments to address climate change. This is crucial given that carbon trading is part of the global effort to achieve emission reduction targets.

2.4 Carbon Market Theory (Carbon Market Theory)

The carbon market is an economic mechanism that assigns financial value to greenhouse gas emission reductions. Through this mechanism, companies that successfully reduce emissions can sell carbon credits to others seeking offsets. According to Danny Cullenward (2020), the carbon market is an economic instrument designed to create financial incentives for businesses to efficiently reduce emissions. Carbon pricing serves as an economic signal that encourages investment in low-carbon technologies.

According to Michael Mehling (2021), the success of a carbon market depends heavily on regulatory clarity, environmental integrity, and an effective oversight system. Without these three elements, the carbon market risks losing credibility and investor confidence. Furthermore, Gilbert E. Metcalf (2022) explains that the carbon market is one of the most efficient economic instruments for reducing emissions because it provides businesses with the flexibility to choose the most cost-effective way to meet their emission reduction targets.

According to Joseph E. Aldy (2022), carbon trading can improve economic efficiency and support the achievement of climate targets if supported by an accurate emissions measurement, reporting, and verification system. Meanwhile, Barry Rabe (2023) emphasized that developing a carbon market requires strong regulatory support, sound institutional coordination, and transparent oversight mechanisms to ensure the effectiveness of climate policies.

Method

3.1 Types and Approaches of Research

The study, entitled "Legal Certainty and Governance of Carbon Exchange Trading in Indonesia: An Analysis of the Implementation of Presidential Regulation Number 98 of 2021," utilizes normative legal research, often referred to as normative juridical research. Normative legal research positions law as the norms, rules, principles, doctrines, and regulations that serve as the basis for examining legal issues. The primary focus of this study is to analyze the legal certainty and governance of carbon exchange trading based on the applicable regulatory framework in Indonesia, specifically Presidential Regulation Number 98 of 2021 concerning the Management of Carbon Economic Value.

According to Muhammad Hendri Yanova, Parman Komarudin, and Hendra Hadi (2023), normative legal research is used to analyze legal problems through a doctrinal approach oriented towards legal norms, legal principles, and the synchronization of laws and regulations. Normative research aims to produce legal arguments that can systematically address legal problems. According to Alfian Maulana, Titi Atiyatul Alawiyah, and Firman Adi Candra (2025), normative legal research is highly relevant for studying regulatory dynamics because it can identify gaps in norms, regulatory inconsistencies, and provide solutions based on legal arguments to the ever-changing development of legislation.

Furthermore, Sidi Ahyar Wiraguna (2024) explains that normative legal research uses secondary legal sources such as legislation, legal literature, scientific journals, and other legal documents as the primary material in the analysis process. This approach aims to understand how law is formed, applied, and developed to address contemporary legal issues. According to Beni Ahmad Saebani (2021), normative legal research is conducted using an internal approach within legal science through an analysis of legal theory,

legal principles, and the applicable legal system. This approach is used to find the appropriate legal concept to explain a particular legal phenomenon.

Meanwhile, Bintang Adi Putra, Bimantoro Yusuf Habibie, Muhammad Akbar Ramadhan, M. Luthfi Arya Putra, and Nazwatul Khusna (2025) stated that normative legal research has doctrinal characteristics oriented towards the *das sollen* aspect or the law that should apply, making it very appropriate for use in assessing the effectiveness of a regulation in realizing legal objectives. Based on the opinions of these experts, this study uses a normative juridical approach because it focuses on the analysis of legal norms governing carbon trading in Indonesia, particularly regarding legal certainty and governance of carbon exchange trading based on Presidential Regulation Number 98 of 2021.

3.2 Research Approach

This research utilizes several legal approaches aimed at obtaining a comprehensive analysis of the research object. According to Yulia Audina Sukmawan and Dwi Damayanti (2025), normative legal research can be conducted through a statute approach, a conceptual approach, and an analytical approach to legal doctrines developed in the legal literature. The first approach used in this research is the statute approach. This approach is carried out by examining various regulations related to carbon trading, carbon markets, the environment, investment, and greenhouse gas emission control policies in Indonesia.

The second approach is the conceptual approach. This approach is used to understand the concepts of legal certainty, good governance, good environmental governance, and carbon trading as they develop in legal theory and international environmental policy. The third approach is the analytical approach, which is used to examine the relationship between legal norms and the implementation of carbon trading in Indonesia and to evaluate the effectiveness of regulations in providing legal protection to carbon market players.

3.3 Sources and Types of Legal Materials

In normative legal research, the data used is in the form of legal materials obtained through library research.

According to Ahamad Rosidi, M. Zainuddin, and Ismi Arifiana (2024), normative legal research uses legal materials as the main source of research consisting of primary, secondary, and tertiary legal materials.

The legal materials in this research consist of:

a. Primary Legal Materials

Primary legal materials are legal materials that have direct binding force.

Primary legal materials used include:

1. Presidential Regulation Number 98 of 2021
2. Paris Agreement
3. Law on Environmental Protection and Management.
4. Regulations related to carbon trading and the Indonesian carbon market.
5. Government policy on the Economic Value of Carbon (NEK).

b. Secondary Legal Materials

According to Jonaedi Efendi and Johny Ibrahim (2021), secondary legal materials are legal materials that provide explanations to primary legal materials in the form of books, scientific journals, research results, academic articles, and legal doctrines.

Secondary legal materials in this study include:

1. Environmental law book.
2. Economic and investment law books.
3. National and international journal articles.
4. Research results related to carbon trading.
5. The doctrine of experts regarding legal certainty and environmental governance.

c. Tertiary Legal Materials

Tertiary legal materials are used as supporting materials to help understand primary and secondary legal materials.

Tertiary legal materials include:

1. Legal dictionary.

2. Encyclopedia of law.
3. Environmental dictionary.
4. Official government website.
5. Official documents of international institutions related to climate change.

3.4 Legal Material Collection Techniques

The data collection technique in this research was carried out through library research.

According to Dede Indraswara (2025), literature studies in legal research are carried out through systematic searches of regulations, legal doctrines, scientific articles, and various academic sources that are relevant to the legal issues being researched.

The technique for collecting legal materials is carried out in the following ways:

1. Inventory of laws and regulations related to carbon trading.
2. Collection of legal literature and scientific journals.
3. Study of the doctrines of the experts.
4. Identify national and international policies regarding carbon trading.
5. Documentation of various legal data relevant to the research object.

Through this technique, researchers can obtain comprehensive legal materials to answer the formulation of research problems.

3.5 Legal Material Analysis Techniques

The analysis of legal materials in this study uses a juridical qualitative analysis method.

According to Ujang Charda S. (2021) states that qualitative legal analysis is conducted by interpreting legal norms, connecting various relevant legal provisions, and systematically constructing legal arguments without using statistical calculations. According to Sukmawan and Damayanti (2025), analysis in normative legal research aims to evaluate the consistency of norms, identify legal gaps, and identify solutions to the legal problems being studied.

Furthermore, Maulana, Alawiyah, and Candra (2025) explain that normative analysis is carried out through identifying legal norms, interpreting regulations, synchronizing regulations, and drawing legal arguments based on relevant legal principles and theories.

In this study, the analysis was carried out through the following stages:

1. Identification of carbon trading regulations in Indonesia.
2. Analysis of legal certainty in Presidential Regulation Number 98 of 2021.
3. Analysis of carbon exchange trading governance based on the principles of good governance and good environmental governance.
4. Evaluation of normative barriers in the implementation of carbon trading.
5. Preparation of legal arguments and recommendations for strengthening national carbon trading regulations.

Based on this method, the research is expected to provide a comprehensive picture of the legal certainty and governance of carbon exchange trading in Indonesia and produce recommendations that can support the strengthening of the national carbon market system.

Results and Discussion

The legal regulations for carbon exchange trading in Indonesia are based on Presidential Regulation Number 98 of 2021 concerning the Implementation of the Economic Value of Carbon.

Carbon trading is an environmental economic instrument developed to support efforts to control greenhouse gas emissions and achieve sustainable development targets. In recent decades, various countries have begun integrating carbon market mechanisms into national policies as a means to encourage businesses to reduce emissions more efficiently. Indonesia, as a country that has ratified various international agreements on climate change, has also developed a carbon trading system as part of its national commitment to reducing greenhouse gas emissions. Carbon trading serves not only as an environmental instrument but also as an economic instrument that can provide incentives to businesses that successfully reduce emissions.

The primary legal basis for carbon trading in Indonesia is currently Presidential Regulation No. 98 of 2021 concerning the Implementation of the Economic Value of Carbon to Achieve Nationally Determined Contribution Targets and Control Greenhouse Gas Emissions in National Development. This Presidential Regulation marks a significant milestone in establishing the legal framework for the national carbon market, as it provides the first comprehensive government regulation of the mechanism for the economic value of carbon as an emission control instrument. This regulation was issued as an implementation of Indonesia's commitment to reducing greenhouse gas emissions, as outlined in the Nationally Determined Contribution (NDC) and various international agreements related to climate change. According to Michael Mehling (2021), the success of a carbon trading system depends heavily on clear regulations governing rights, obligations, transaction mechanisms, and the oversight system implemented by the state. Without a clear legal framework, the carbon market faces various risks, such as legal uncertainty, low investor participation, and weak credibility of the carbon trading system. Therefore, Presidential Regulation No. 98 of 2021 serves as a crucial foundation for establishing legal certainty for carbon trading in Indonesia.

In addition to the increase in trade volume, the value of carbon trade transactions also experienced significant growth.

Table 4.1 Economic Value of the Indonesian Carbon Exchange

Period	Transaction Value
February 2025	Rp70.85 billion
Mid 2025	Rp78.5 billion

By 2025, the transaction value of Indonesia's carbon exchange had reached more than IDR 78 billion with a total trade of around 1.6 million tons of CO₂e. This increase indicates that carbon is beginning to be viewed as an economic instrument with promising commercial and investment value. Substantially, Presidential Regulation Number 98 of 2021 introduced the concept of the Economic Value of Carbon (NEK) as an instrument that assigns economic value to every effort to reduce greenhouse gas emissions. Through this approach, emission reduction is no longer viewed solely as an environmental obligation but also as a tradable economic asset. This regulation reflects a paradigm shift in environmental policy, from a command-and-control approach to a market-based approach. According to Gilbert E. Metcalf (2022), market-based mechanisms are one of the most efficient approaches to emission reduction policy because they provide businesses with the flexibility to choose the most economical strategy to meet environmental targets. In this context, carbon trading provides a means for companies that successfully reduce emissions to obtain economic benefits by selling carbon units to other parties in need of emission compensation.

Presidential Regulation Number 98 of 2021 stipulates that the implementation of the Carbon Economic Value can be carried out through several instruments, namely carbon trading, performance-based payments, carbon levies, and other mechanisms in accordance with national and international policy developments. Of these instruments, carbon trading is one of the most strategic mechanisms because it involves direct interaction between market players in the form of carbon unit transactions. Through this mechanism, business actors with surplus emissions reductions can trade carbon credits with parties unable to meet their established emission reduction targets. According to Danny Cullenward and David G. Victor (2020), effective carbon trading must be based on the principles of environmental integrity, transparency, and accountability. This means that each traded carbon unit must truly represent a real, measurable, and verifiable emission reduction and must not result in double counting. This principle is also reflected in Presidential Regulation Number 98 of 2021, which requires a system for measuring, reporting, and verifying (MRV) emissions reduction activities.

As an implementation of the Paris Agreement, Indonesia is committed to reducing greenhouse gas emissions through its Nationally Determined Contribution (NDC).

Table 4.2 Indonesia's Commitment to Emission Reduction

Target	Percentage
Independent Emission Reduction	31.89%
With International Support	43.20%

This target underpins the government's development of carbon economic instruments through Presidential Regulation No. 98 of 2021. The carbon exchange is viewed as a strategic mechanism to help achieve national emission reduction targets more efficiently and market-based. One important aspect regulated in Presidential Regulation No. 98 of 2021 is the establishment of a national climate change control registration system. This system serves as a database that records all emission reduction activities, the issuance of emission reduction certificates, and carbon transactions conducted by various parties. The presence of a national registration system is a crucial instrument for ensuring transparency and accountability in carbon trading in Indonesia. Furthermore, the system also serves to prevent duplication of carbon unit recording, which could harm the credibility of the national carbon market. According to Joseph E. Aldy (2022), the existence of an integrated registration and verification system is a key requirement for the success of the carbon market because it can increase investor confidence and ensure that all carbon transactions have a clear legal basis. Therefore, the regulation of national registration in Presidential Regulation No. 98 of 2021 is a strategic step to strengthen carbon trading governance in Indonesia.

From an institutional perspective, Presidential Regulation Number 98 of 2021 positions the government as the primary actor in managing the national carbon trading system. The Ministry of Environment and Forestry plays a central role in implementing the Economic Value of Carbon, particularly in the regulation, supervision, verification, and recording of emission reductions. Meanwhile, other institutions, such as relevant sector ministries, capital market authorities, and verification agencies, also have complementary functions in supporting carbon market operations. According to David Levi-Faur (2020), modern governance demands effective inter-institutional coordination to avoid overlapping authority and increase the effectiveness of public policy. In the context of Indonesia's carbon trading, inter-institutional coordination is crucial because carbon trading involves various sectors such as the environment, energy, forestry, industry, finance, and investment. Therefore, the successful implementation of Presidential Regulation Number 98 of 2021 depends heavily on the government's ability to build strong institutional synergy.

In addition to regulating domestic carbon trading mechanisms, Presidential Regulation Number 98 of 2021 also opens up opportunities for international carbon trading cooperation. This regulation demonstrates Indonesia's efforts to integrate the national carbon trading system with the global carbon market mechanisms that have developed post-Paris Agreement. Through involvement in international carbon trading, Indonesia has the opportunity to obtain greater economic benefits while increasing its contribution to global efforts to reduce greenhouse gas emissions. According to Maria Antonia Tigre (2023), the integration of the national carbon market with the international carbon market must be supported by regulatory harmonization and an adequate oversight system to avoid legal conflicts or the risk of misuse of cross-border carbon transactions. Therefore, the regulation of international carbon trading in Presidential Regulation Number 98 of 2021 is an important part of strengthening Indonesia's position in global climate governance.

However, the implementation of carbon trading regulations based on Presidential Regulation No. 98 of 2021 still faces several challenges. One of the main challenges is the complexity of regulations involving various sectors and government agencies. Furthermore, there is still a need to clarify various technical regulations related to the legal status of carbon units, dispute resolution mechanisms, investor protection, and oversight of carbon transactions. This situation indicates that although the legal framework for carbon trading is in place, strengthening of derivative regulations is still necessary to increase legal certainty for all market players. According to Brian Z. Tamanaha (2020), legal certainty is determined not only by the existence of regulations, but also by the consistency of their application and the ability of state institutions to enforce the law effectively. Therefore, the success of carbon trading regulations in Indonesia depends

not only on Presidential Regulation No. 98 of 2021 as the legal basis, but also on the effectiveness of its implementation in practice.

Based on the above description, it can be concluded that Presidential Regulation Number 98 of 2021 has provided a comprehensive legal basis for the implementation of carbon trading in Indonesia through regulations regarding the Economic Value of Carbon, carbon trading mechanisms, a national registration system, emissions verification, and institutional governance that supports the implementation of the carbon market. The presence of this regulation demonstrates the government's commitment to building a carbon trading system that is transparent, accountable, and oriented towards achieving national emission reduction targets. However, to achieve optimal legal certainty, strengthening technical regulations, harmonizing policies across sectors, and increasing institutional capacity are needed so that carbon trading can develop effectively and sustainably in Indonesia.

Implementation of Presidential Regulation Number 98 of 2021 to ensure legal certainty in the implementation of carbon exchange trading in Indonesia

The implementation of Presidential Regulation Number 98 of 2021 represents a strategic step by the Indonesian government in establishing a carbon trading system with a clear and integrated legal basis. This regulation not only serves as the legal basis for implementing the Economic Value of Carbon (NEK) but also serves as an instrument linking greenhouse gas emission control policies with market mechanisms that provide economic incentives for business actors. The presence of this regulation demonstrates the transformation of environmental policy from an administrative approach to a market-based approach that is more adaptive to global economic developments and the needs of sustainable development. Legal certainty in the implementation of carbon exchange trading is crucial, given that carbon trading is a relatively new instrument in the Indonesian legal system. Unlike capital markets or conventional commodity trading, which already have established regulations and practices, carbon trading involves a specific transaction object: carbon units derived from the reduction or absorption of greenhouse gas emissions. Therefore, legal regulations are needed that clarify the legal status of carbon units, the rights and obligations of the parties, transaction mechanisms, and a monitoring system that can provide legal protection for all market participants.

The implementation of Presidential Regulation Number 98 of 2021 is evident in the establishment of various supporting instruments necessary for the implementation of carbon trading. One such implementation is the development of the National Climate Change Control Registry System (SRN-PPI), which serves as a centralized recording system for greenhouse gas emission reduction activities in Indonesia. This system is a crucial tool for ensuring that every traded carbon unit has a clear legal basis, its origin can be traced, and has undergone a verification process in accordance with applicable regulations. With an integrated registration system, the potential for double counting and misuse of carbon credits can be minimized. Regulation implementation is also realized through the establishment of a mechanism for measuring, reporting, and verifying emissions, or Monitoring, Reporting, and Verification (MRV). The MRV system plays a crucial role in ensuring the integrity of carbon trading, as each traded carbon unit must originate from real, measurable, and scientifically proven emission reduction activities. Through this mechanism, the government strives to ensure that carbon trading is not merely an economic activity but also makes a tangible contribution to achieving national emission reduction targets. The existence of the MRV system also provides legal certainty for investors and business actors because transactions carried out are based on verifiable data.

In its implementation, the government has also developed various technical regulations as implementing regulations for Presidential Regulation Number 98 of 2021. These regulations govern carbon trading procedures, the issuance of emission reduction certificates, registration mechanisms, and the governance of carbon transactions at both the national and international levels. The presence of these derivative regulations demonstrates the government's efforts to create more detailed legal certainty so that business actors have clear guidelines for carrying out carbon trading activities. One important development in the implementation of Presidential Regulation Number 98 of 2021 is the launch of the Indonesian carbon exchange, which serves as the official platform for trading carbon units. The presence of the carbon exchange provides legal certainty regarding transaction mechanisms because all trading activities are conducted through an organized, transparent system and under the supervision of authorized authorities.

The carbon exchange also serves as a means of establishing more objective carbon prices through market mechanisms, thereby increasing economic efficiency in efforts to reduce greenhouse gas emissions. From a legal certainty perspective, the existence of a carbon exchange provides significant benefits for business actors and investors. Through a structured trading system, parties gain certainty regarding transaction procedures, carbon unit ownership registration, transaction settlement mechanisms, and protection of rights arising from such trading activities. Furthermore, the existence of a clear supervisory body and reporting mechanism also increases market confidence in the credibility of carbon trading in Indonesia. However, the implementation of Presidential Regulation Number 98 of 2021 still faces various challenges that could impact the level of legal certainty in the implementation of carbon trading. One major challenge is the complexity of regulations involving various sectors, such as the environment, forestry, energy, investment, and capital markets. Each sector has different regulatory characteristics, requiring policy harmonization to avoid overlapping authority and conflicts of legal norms. Regulatory inconsistencies have the potential to create uncertainty in the implementation of carbon trading and undermine market confidence.

Another issue that remains a concern is the legal status of carbon units as a trading object. Although Presidential Regulation Number 98 of 2021 recognizes carbon units as part of the Carbon Economic Value instrument, more detailed regulations regarding the legal nature, ownership rights, transfer mechanisms, and legal protection of carbon units still require strengthening through more comprehensive technical regulations. Certainty regarding the legal status of carbon units is crucial to ensure transaction security and prevent future legal disputes. Furthermore, dispute resolution mechanisms in carbon trading also require clearer regulations. Carbon trading involves various parties with differing interests, both at the national and international levels. Potential disputes can arise from differences in interpretation of carbon trading contracts, the validity of carbon units, and the implementation of the parties' obligations in the transaction. Therefore, an effective dispute resolution system is needed that guarantees legal protection for all parties involved.

Another challenge relates to the institutional capacity and human resources supporting carbon trading implementation. As a relatively new instrument, carbon trading requires a thorough understanding of the legal, economic, environmental, and technical aspects of emissions measurement. Limited institutional capacity and a lack of understanding of carbon trading mechanisms among business actors can hinder the realization of an effective and sustainable trading system. Therefore, increasing institutional capacity and strengthening human resource competencies are crucial factors in supporting regulatory implementation. In the investment context, legal certainty is a key factor influencing investor interest in participating in the carbon market. Investors require assurance that the carbon trading system has stable regulations, transparent oversight mechanisms, and adequate legal protection. The implementation of Presidential Regulation No. 98 of 2021 has provided the initial foundation for this certainty, but improvements in various regulatory and governance aspects are still needed to ensure the Indonesian carbon market is competitive with international markets.

On the other hand, the implementation of carbon trading must also adhere to the principles of transparency and accountability. The entire process of issuing, registering, verifying, and trading carbon units must be accessible and monitored by authorized parties. Transparency is crucial for maintaining the integrity of the carbon market and preventing practices that could harm market players and achieve environmental goals. A transparent system will increase public trust in carbon trading, thus supporting the growth of the national carbon market. Overall, the implementation of Presidential Regulation Number 98 of 2021 has significantly contributed to achieving legal certainty for the implementation of carbon exchange trading in Indonesia. This regulation has become the foundation for the establishment of a national carbon trading system through regulations regarding the Economic Value of Carbon, national registration, emissions verification, and the development of carbon exchanges as official transaction vehicles. However, optimal legal certainty still requires strengthening derivative regulations, harmonizing cross-sectoral policies, increasing institutional capacity, and refining legal protection and dispute resolution mechanisms. With these steps, carbon trading in Indonesia is expected to develop more effectively and transparently, supporting the achievement of greenhouse gas emission reduction targets and sustainable development.

The governance of carbon exchange trading in Indonesia is reviewed from the aspects of transparency, accountability, effectiveness of supervision, and legal protection for carbon market players.

The governance of carbon exchange trading in Indonesia is a crucial element in ensuring the successful implementation of the carbon market as an instrument for controlling greenhouse gas emissions. Good governance is not only oriented towards smooth carbon trading transactions but also ensures that every activity meets the principles of transparency, accountability, effective oversight, and provides legal protection for all parties involved. These four aspects are the main foundation for building public and investor trust in the national carbon market. From a transparency perspective, the implementation of carbon trading in Indonesia is supported by the National Climate Change Control Registry System (SRN-PPI), which serves as a means of recording emission reduction activities and carbon transactions. This system allows for clear traceability of data on carbon units, the origin of emission reductions, and the verification process. Transparency is crucial to prevent double counting, manipulation of emissions data, and misuse of carbon credits, which can harm market players and undermine the credibility of the Indonesian carbon market.

From an accountability perspective, carbon trading requires every traded carbon unit to undergo a process of measurement, reporting, and verification. This accountability is realized through a Monitoring, Reporting, and Verification (MRV) mechanism that ensures that claimed emission reductions have actually occurred and have met established standards. With this system, each market player has clear responsibility for their carbon trading data and activities. Furthermore, from an oversight effectiveness perspective, the government, through relevant ministries and agencies, has the authority to oversee the entire carbon trading process, from project registration and issuance of emission reduction certificates to transactions on the carbon exchange. Effective oversight is necessary to ensure compliance with applicable legal provisions and maintain the integrity of the carbon market. However, given that carbon trading involves various sectors such as the environment, energy, forestry, and capital markets, coordination between agencies still needs to be strengthened to ensure optimal oversight.

Meanwhile, from a legal protection perspective, carbon trading regulations have provided a legal basis for market players in conducting carbon transactions. This legal protection includes certainty regarding trading mechanisms, recording carbon unit ownership, and the rights and obligations of the parties involved. However, more detailed regulations regarding dispute resolution, the legal status of carbon units, and investor protection are still needed to increase legal certainty and confidence in the Indonesian carbon market. Overall, the governance of carbon exchange trading in Indonesia has shown positive developments through the application of the principles of transparency, accountability, effective oversight, and legal protection. However, to create a more credible, competitive, and sustainable carbon market, strengthening institutional coordination, improving technical regulations, and increasing oversight capacity are needed to optimally achieve the goals of emission control and sustainable development.

What are the legal and institutional obstacles faced in implementing carbon exchange trading in Indonesia and what efforts can be made to strengthen legal certainty and governance of the national carbon market?

The implementation of carbon exchange trading in Indonesia is a strategic step in supporting the achievement of greenhouse gas emission reduction targets and sustainable economic development. However, the implementation of carbon trading still faces various obstacles, both legal and institutional. These obstacles impact the level of legal certainty, the effectiveness of oversight, and the confidence of market players in participating in national carbon trading. Therefore, a comprehensive identification of these obstacles is necessary to formulate appropriate strengthening measures. From a legal perspective, one of the main obstacles is the still-developing regulatory framework for carbon trading in Indonesia. Presidential Regulation Number 98 of 2021 provides the legal basis for the implementation of the Carbon Economic Value (CVE), but more detailed regulations regarding various technical aspects of carbon trading are still being refined. This situation leaves room for differing interpretations regarding trading mechanisms, the legal status of carbon units, carbon credit ownership rights, and procedures for resolving disputes that may arise in carbon transactions. This lack of clarity has the potential to create legal uncertainty for market players.

Another legal obstacle is the interconnectedness of carbon trading with various legal sectors, such as environmental law, state administrative law, investment law, capital market law, forestry law, and energy law. Each sector has its own regulations and authorities, potentially leading to overlapping regulations and conflicting norms. If regulatory harmonization is not optimally implemented, the implementation of carbon trading could face obstacles in the form of differing interpretations and unclear authority between the institutions involved. Furthermore, legal protection for carbon market players also requires strengthening. As a relatively new economic instrument, carbon trading has characteristics that differ from those of commodity trading in general. Therefore, clearer regulations are needed regarding investor protection, dispute resolution mechanisms, party responsibilities, and certainty regarding the validity of traded carbon units. The absence of comprehensive regulations can increase legal risks and discourage businesses and investors from participating in the national carbon market.

From an institutional perspective, the primary challenge is the complexity of coordination between institutions authorized to implement carbon trading. The implementation of carbon trading involves various ministries, government agencies, supervisory authorities, verification bodies, and market institutions, each with distinct functions and responsibilities. The large number of actors involved requires a strong coordination mechanism to ensure that the resulting policies are implemented in an integrated manner and avoid overlapping authority. Another institutional constraint is the limited capacity of human resources with specialized competencies in carbon trading. Managing the carbon market requires an understanding that encompasses not only legal aspects but also environmental technical aspects, carbon economics, emissions measurement, data verification, and market governance. The limited availability of experts with understanding of all these aspects can impact the quality of oversight, verification, and overall implementation of carbon trading policies.

Furthermore, the carbon trading monitoring and control system still needs strengthening to keep pace with increasingly complex market developments. Effective oversight is crucial to prevent emissions data manipulation, double counting of carbon credits, and misuse of trading mechanisms that could undermine the integrity of the carbon market. If the monitoring system is not functioning optimally, achieving the primary objective of carbon trading as an emissions reduction instrument may be difficult. Another challenge that needs to be addressed is the low level of understanding of carbon trading mechanisms among business actors. Many companies are still at an early stage in understanding the concept of Carbon Economic Value, carbon trading procedures, and the economic benefits of participating in the carbon market. This situation can impact business participation rates and slow the development of the national carbon market.

To overcome these various obstacles, efforts are needed to strengthen legal certainty through more comprehensive and integrated regulatory improvements. The government needs to ensure that all implementing regulations related to carbon trading are aligned with other laws and regulations to avoid conflicting norms or unclear authority. Regulatory harmonization is a crucial step in creating a legal system that is consistent and easily understood by all stakeholders. Furthermore, strengthening legal protection for carbon market players is necessary through more detailed regulations regarding the rights and obligations of parties, dispute resolution mechanisms, investor protection, and the legal status of carbon units as objects of trade. Such clarity in regulations will increase business and investor confidence in the Indonesian carbon market and reduce potential legal risks arising from transactions.

From an institutional perspective, the government needs to strengthen coordination between agencies involved in carbon trading by establishing an integrated, collaborative working mechanism. Effective coordination will help expedite decision-making, improve oversight efficiency, and avoid overlapping authority that could hinder the development of the carbon market. Improving human resource capacity is also crucial. Training, certification, and competency development programs need to be expanded for government officials, verification agencies, business actors, and other parties involved in carbon trading. With competent human resources, carbon trading implementation can be more professional and accountable. Furthermore, strengthening the information technology-based monitoring system needs to be continuously developed to increase the transparency and accuracy of carbon trading data. Utilizing an integrated national registration system with measurement, reporting, and verification mechanisms will help ensure that every carbon transaction can be monitored and accounted for legally and administratively.

Based on the above description, it is clear that the implementation of carbon exchange trading in Indonesia still faces various legal and institutional obstacles that affect the level of legal certainty and the effectiveness of carbon market governance. These obstacles include suboptimal regulatory harmonization, legal protection that still needs to be strengthened, complex inter-institutional coordination, limited human resource capacity, and challenges in the oversight system. Therefore, efforts to strengthen regulations, harmonize policies, increase institutional capacity, develop a transparent oversight system, and enhance carbon market literacy are strategic steps to realize a national carbon market with legal certainty, credibility, and high competitiveness at the national and international levels.

Conclusion

Based on the research results regarding "Legal Certainty and Governance of Carbon Exchange Trading in Indonesia: An Analysis of the Implementation of Presidential Regulation Number 98 of 2021," the following conclusions can be drawn:

1. Legal Regulations for Carbon Exchange Trading in Indonesia

The legal framework for carbon exchange trading in Indonesia has been clearly established through Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Value (NEK). This regulation serves as the legal basis for the implementation of various carbon economic value instruments, including carbon trading as a market-based mechanism to support the achievement of national greenhouse gas emission reduction targets. The regulation addresses aspects of registration, measurement, reporting, emission verification, and carbon trading governance, all of which are integrated with national climate change control policies. Therefore, Presidential Regulation No. 98 of 2021 provides a crucial legal foundation for the development of the carbon market in Indonesia.

2. Implementation of Presidential Regulation Number 98 of 2021 in Realizing Legal Certainty

The implementation of Presidential Regulation Number 98 of 2021 has shown progress through the establishment of the National Climate Change Control Registry System (SRN-PPI), the implementation of Monitoring, Reporting, and Verification (MRV) mechanisms, and the operationalization of carbon exchanges as official trading platforms. These instruments provide legal certainty regarding the registration, verification, and transaction processes for carbon units. However, achieving optimal legal certainty still requires strengthening technical regulations, harmonizing cross-sectoral regulations, and more detailed regulations regarding the legal status of carbon units, investor protection, and dispute resolution mechanisms to ensure stronger legal guarantees for all market players.

3. Governance of Carbon Exchange Trading in Indonesia

The governance of the carbon exchange in Indonesia has adopted the principles of transparency, accountability, effective oversight, and legal protection. Transparency is realized through an integrated national registration system and recording of carbon transactions. Accountability is implemented through strict emission measurement, reporting, and verification mechanisms. Oversight is carried out by various relevant institutions to maintain the integrity of the carbon market. Furthermore, existing regulations provide a basis for legal protection for market players. However, effective governance still requires improvement, particularly in inter-institutional coordination, strengthening the oversight system, and refining legal protection instruments for investors and business actors.

4. Obstacles and Efforts to Strengthen Legal Certainty and Carbon Market Governance

The implementation of carbon exchange trading in Indonesia still faces various legal and institutional obstacles. These legal obstacles include suboptimal regulatory harmonization, insufficient detail regarding the legal status of carbon units, and the need to strengthen dispute resolution mechanisms. Meanwhile, institutional obstacles include the complexity of inter-agency coordination, limited human resources competent in the carbon sector, and challenges in monitoring and verifying carbon transactions. To overcome these obstacles, strengthening derivative regulations, harmonizing cross-sectoral policies, increasing institutional capacity, developing a technology-based and transparent monitoring system, and increasing carbon market literacy for all stakeholders are necessary.

References

- Aldy, J.E. (2022). *Pricing Climate Risk and Carbon Policy*. Cambridge University Press.
- Beni Ahmad Saebani. (2021). *Legal Research Methods: A Normative Juridical Approach*. Bandung: CV Pustaka Setia.
- Bevir, M. (2020). *A Theory of Governance* (2nd ed.). University of California Press.
- Bosselmann, K. (2020). *The Principle of Sustainability: Transforming Law and Governance* (2nd ed.). Routledge.
- Craig, P. (2021). *Administrative Law* (9th ed.). Sweet & Maxwell.
- Cullenward, D., & Victor, D. G. (2020). *Making Climate Policy Work*. Polity Press.
- Dede Indraswara. (2025). Methodological reconstruction of law: Diversification and integration of normative, empirical, and socio-legal legal research. *IPMHI Law Journal*.
- Elliott, M. (2021). *The Constitutional Foundations of Judicial Review*. Hart Publishing.
- Jonaedi Efendi, & Johny Ibrahim. (2021). *Normative and Empirical Legal Research Methods*. Jakarta: Kencana.
- Kooiman, J. (2021). *Governance and Governability: Using Complexity, Dynamics and Diversity*. Palgrave Macmillan.
- Kotzé, L. J. (2020). *Global Environmental Constitutionalism in the Anthropocene*. Hart Publishing.
- Levi-Faur, D. (2020). *The Oxford Handbook of Governance* (2nd ed.). Oxford University Press.
- Loughlin, M. (2020). *The Idea of Public Law*. Oxford University Press.
- Maulana, A., Alawiyah, TA, & Candra, FA (2025). Normative legal research methods in responding to the challenges of the dynamics of legislation. *Journal of Interdisciplinary Scientific Research*.
- Mehling, M.A. (2021). Governing cooperative approaches under the Paris Agreement. *Climate Policy*, 21(7), 915–930.
- Meierhenrich, J. (2022). *The Remnants of the Rechtsstaat: An Ethnography of Nazi Law*. Oxford University Press.
- Metcalf, G. E. (2022). *Paying for Pollution: Why a Carbon Tax Is Good for America*. Oxford University Press.
- Putra, BA, Habibie, BY, Ramadhan, MA, Putra, MLA, & Khusna, N. (2025). Normative legal research methodology in the perspective of concepts and analytical techniques in juridical studies. *Journal of Multidisciplinary Scientific Studies*.
- Rabe, B. G. (2023). *Can We Price Carbon?* MIT Press.
- Razzaque, J. (2021). Environmental governance and sustainable development in developing countries. *Review of European, Comparative & International Environmental Law*, 30(2), 183–195.
- Richardson, B. J. (2022). Climate finance and environmental governance: Emerging legal frameworks. *Journal of Environmental Law*, 34(1), 1–22.
- Rosidi, A., Zainuddin, M., & Arifiana, I. (2024). Methods in normative and sociological legal research (field research). *Journal of Law and Government*.
- Stoker, G. (2022). *Governance as Theory: Five Propositions Revisited*. Palgrave Macmillan.
- Sukmawan, YA, & Damayanti, D. (2025). Normative and empirical legal research methods as a strategy to strengthen the perspective of legal studies. *Notary Law Journal*.
- Tamanaha, B. Z. (2020). *Legal Realism and Legal Certainty in Contemporary Legal Systems*. Cambridge University Press.
- Tigre, M.A. (2023). *Global Climate Change Law and Policy: Cases, Materials, and Problems*. Foundation Press.
- Ujang Charda S. (2021). Typology of legal research methods in normative and sociological thinking. *Fox Justi: Jurnal Ilmu Hukum*.
- Risse, T. (2021). *Governance in Areas of Limited Statehood*. Oxford University Press.
- Wiraguna, SA (2024). Normative and empirical methods in legal research: An exploratory study in Indonesia. *Public Sphere: Journal of Social Politics, Government and Law*.
- Yanova, MH, Komarudin, P., & Hadi, H. (2023). Legal research methods: Analysis of legal problems using normative and empirical research methods. *Badamai Law Journal*.