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Carbon Exchange Trading and Monitoring Scheme In Indonesia and New Zealand

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Abstract. Climate change caused by greenhouse gas emissions has led countries like Indonesia and New Zealand to develop carbon trading systems as mechanisms to reduce emissions. This study aims to analyze the differences in the structure and oversight of carbon market regulation between Indonesia and New Zealand, as well as to assess the effectiveness of their implementation. The research uses normative legal methods, combining comparative and statutory approaches. The findings indicate that Indonesia officially launched its carbon exchange in 2023, regulated by the Financial Services Authority (OJK) and implemented through a market-based mechanism. In contrast, New Zealand has operated its Emissions Trading Scheme (NZ ETS) since 2008 using a closed-bid auction system with robust compliance monitoring by the Environmental Protection Authority (EPA). The study compares three key aspects: legal regulation, trading mechanisms, and supervision systems. The results reveal that New Zealand has more advanced obligations for sectors, price setting, and risk-based auditing, while Indonesia faces challenges in regulatory clarity and market participation. The study recommends strengthening Indonesia's legal framework and reporting mechanisms to enhance the carbon market's effectiveness and contribute meaningfully to emission reduction targets.

Keywords: Carbon Exchange, Emissions Trading, Climate Change

Abstrak. *Perubahan iklim yang disebabkan oleh emisi gas rumah kaca telah mendorong negara-negara seperti Indonesia dan Selandia Baru untuk mengembangkan sistem perdagangan karbon sebagai mekanisme pengurangan emisi. Studi ini bertujuan untuk menganalisis perbedaan struktur dan pengawasan regulasi pasar karbon antara Indonesia dan Selandia Baru, serta menilai efektivitas implementasinya. Penelitian ini menggunakan metode hukum normatif, yang menggabungkan pendekatan komparatif dan perundang-undangan. Temuan menunjukkan bahwa Indonesia secara resmi meluncurkan pertukaran karbon pada tahun 2023, yang diatur oleh Otoritas Jasa Keuangan (OJK) dan diimplementasikan melalui mekanisme berbasis pasar. Sebaliknya, Selandia Baru telah mengoperasikan Skema Perdagangan Emisi (NZ ETS) sejak tahun 2008 menggunakan sistem lelang tertutup dengan pemantauan kepatuhan yang ketat oleh Otoritas Perlindungan Lingkungan (EPA). Studi ini membandingkan tiga aspek utama: regulasi hukum, mekanisme perdagangan, dan sistem pengawasan. Hasilnya menunjukkan bahwa Selandia Baru memiliki kewajiban yang lebih maju untuk sektor, penetapan harga, dan audit berbasis risiko, sementara Indonesia menghadapi tantangan dalam kejelasan regulasi dan partisipasi pasar. Studi ini merekomendasikan penguatan kerangka hukum dan mekanisme pelaporan Indonesia untuk meningkatkan efektivitas pasar karbon dan berkontribusi secara signifikan terhadap target pengurangan emisi.*

Kata Kunci: *Pertukaran Karbon, Perdagangan Emisi, Perubahan Iklim*

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INTRODUCTION

The phenomenon of climate change, commonly referred to as global warming, is inextricably linked to the greenhouse gas (GHG) effect. Mitigating the GHG effect primarily through the reduction of carbon emissions constitutes a critical component in efforts to curb and prevent the adverse consequences of climate change. In recognition of the risks posed by global warming, Indonesia, alongside 196 other nations, has committed to the United Nations Framework Convention on Climate Change (UNFCCC) through its ratification of the Paris Agreement. This international commitment is codified in Law No. 16 of 2016 on the Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change (hereinafter referred to as the Paris Agreement Ratification Law), which mandates the Indonesian government to contribute actively to the reduction of GHG emissions. Furthermore, Law No. 17 of 2004 on the Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (hereinafter referred to as the Kyoto Protocol Ratification Law) obliges member parties to undertake emission reductions in accordance with the quantitative targets outlined in the Annex to the Kyoto Protocol.[1] These targets are consistent with the national agenda to promote economic growth through the principles of sustainable development, as articulated in Law No. 32 of 2009 concerning Environmental Protection and Management.[2]

The carbon exchange serves as an institutional framework that governs carbon trading activities and/or the recording of carbon unit ownership.[3] In Indonesia, the carbon exchange was officially launched on September 26, 2023, in accordance with Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Value for Achieving Nationally Determined Contribution (NDC) Targets and the Control of Greenhouse Gas Emissions within the context of national

[1] Biro Komunikasi Kementrian Koordinator Bidang Kemaritiman dan Investasi RI. 2023. *"Pemerintah Indonesia Tegaskan Komitmen Mewujudkan Nol Emisi Karbon di Tahun 2060"*. https://maritim.go.id/detail/pemerintah-indonesia-tegaskan-komitmen-wujudkan-nol-emisi-karbon-di-tahun-2060. Accesed 11 Juli 2024.

[2] Leonarda, T dkk. 2023. "Pengaruh Peraturan Pajak Ramah Lingkungan Terhadap Energi Baru Terbarukan Pendanaan Energi di Indonesia." *Bestuur Jurnal of Administrasi Law* Vol 11. No 2. page 397.

[3] Article 24 section (2) of law Number 4 of 2023 concerning the Development and Strengthening of the Financial Sector.

development. This regulatory foundation is further reinforced by Regulation of the Minister of Environment and Forestry No. 21 of 2022 on Procedures for Implementing Carbon Economic Value. The operational aspects of carbon trading through the carbon exchange are regulated by Circular Letter of the Financial Services Authority (OJK) No. 12/SEOJK.04/2023 on Procedures for Carbon Trading Implementation via the Carbon Exchange, and OJK Regulation No. 14 of 2023 on Carbon Trading Through the Carbon Exchange. These regulatory developments reflect Indonesia's firm commitment to addressing global climate change, in alignment with its obligations under the Paris Agreement and the Kyoto Protocol.

Developed countries, including New Zealand, have adopted multidisciplinary scientific approaches in formulating policies aimed at reducing carbon emissions. In this context, New Zealand has implemented a comprehensive carbon trading system governed by the Climate Change Response Act 2002, specifically Section 4, which outlines the provisions for the Greenhouse Gas Emissions Trading Scheme (NZ ETS). The legislation mandates independent reviews to assess the operation and effectiveness of the NZ ETS, ensuring its continual refinement. This framework was further strengthened through the Climate Change Response (Emissions Trading Reform) Amendment Act 2020, which consolidated New Zealand's principal climate-related statutes into a single, cohesive legislative instrument. As a result, the NZ ETS encompasses a wide range of sectors, including forestry, stationary energy, industrial processes, liquid fossil fuels, waste, and synthetic greenhouse gases, thereby enhancing the scope and impact of its carbon trading mechanism. Indonesia may draw valuable lessons from such models, particularly from industrialized nations like New Zealand that have successfully institutionalized carbon trading mechanisms through legal frameworks. Differences in territorial scope, legal jurisdiction, and the timing of carbon exchange implementation have led to significant distinctions between the carbon trading systems of Indonesia and New Zealand. New Zealand has made substantial progress in the development of its carbon exchange, particularly within the forestry and agricultural sectors. Indonesia's carbon exchange system continues to encounter several structural and institutional challenges. In contrast,

New Zealand has successfully implemented a stable and credible Emissions Trading Scheme (ETS), underpinned by a well-defined legal framework, internationally recognized MRV standards, and coherent institutional coordination. New Zealand's experience underscores the critical importance of regulatory clarity, robust market infrastructure, and well-designed economic incentives in ensuring the success of carbon trading mechanisms.

Apart from that, given that both Indonesia and New Zealand are rich in natural resources, there are valuable insights that each country can offer the other in the design and implementation of carbon trading mechanisms. New Zealand, recognized as an agricultural nation since the 19th century, is widely regarded for its expertise in agricultural management and sustainability practices. Furthermore, the existing bilateral cooperation between the two countries exemplified by the sister city partnership between New Zealand and North Toraja provides a strategic foundation for knowledge exchange and collaborative efforts in environmental governance and sustainable resource management. Adopting a similar approach tailored to Indonesia's specific economic, environmental, and institutional contexts could support the country's efforts to effectively regulate and reduce greenhouse gas emissions.[4]

Amid escalating climate challenges, effective carbon trading systems are vital for achieving emission reduction targets. Indonesia and New Zealand offer contrasting models Indonesia's emerging carbon market is still developing its regulatory structure, while New Zealand operates a mature Emissions Trading Scheme (ETS). A comparative analysis is urgently needed to assess differences in market design, regulatory oversight, and enforcement mechanisms. Such research is critical to inform Indonesia's policy development, enhance market integrity, and draw lessons from New Zealand's regulatory experience, especially as both nations strive to meet their climate commitments under the Paris Agreement.

[4] Irama Ade. 2020. "*Perdagangan Karbon di Indonesia: Kajian Kelembagaan dan Keuangan Negara*". Info Arthaa Vol 4 No 1. Tanggerang Selatan: Direktorat Sistem Manajemen Investasi Ditjen Perbendaharaan, Kementrian Keuangan, Politeknik Keuangan Negara STAN.

Based on the aforementioned discussion, this study undertakes a comparative analysis of the differences in carbon exchange trading and regulatory oversight schemes between Indonesia and New Zealand.

METHODOLOGY

This research employs a normative legal research method that integrates a comparative study approach with a statutory and regulatory framework analysis. The key legal instruments referenced include Law No. 16 of 2016 on the Ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change; Law No. 17 of 2004 on the Ratification of the Kyoto Protocol; Law No. 32 of 2009 concerning Environmental Protection and Management; Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Value; Regulation of the Minister of Environment and Forestry No. 21 of 2022 on Procedures for Implementing Carbon Economic Value; OJK Regulation No. 14 of 2023 on Carbon Trading Through the Carbon Exchange; and Circular Letter of the Financial Services Authority (OJK) No. 12/SEOJK.04/2023 on Procedures for Carbon Trading Implementation via the Carbon Exchange. Meanwhile, the New Zealand regulations include the Climate Change Response Act 2002 and the Climate Change Response (Emissions Trading Reform) Amendment Act 2020, which collectively form the foundation of the country's Emissions Trading Scheme (ETS). The research materials are drawn from a wide range of sources, including academic books, peer-reviewed journals, scientific articles, statutory laws, and their derivative regulations. To formulate the discussion and arrive at well-founded conclusions, each source is systematically analyzed and evaluated, then synthesized with supplementary materials to ensure a comprehensive and coherent examination of the subject matter.

RESULTS AND DISCUSSION

Legal Regulation Scheme of Carbon Exchange in Indonesia and New Zealand

Carbon trading is a market-based policy instrument designed to reduce greenhouse gas emissions by facilitating the buying and selling of carbon units or emission allowances.[5] The carbon units traded on the carbon exchange consist of the following categories :[6]

a. Technical Approval of Upper Emission Limits for Business Actors (PTBAE-PU). As PTBAE-PU is an effect[7], determined by the Minister who is the coordinator in the sector or the person responsible for the sub-sector in the implementation of carbon economic values.
b. Greenhouse Gas Emission Reduction Certificate (Sertifikat Pengurangan Emisi Gas Rumah Kaca/SPE-GRK). The SPE-GRK is a tradable instrument that represents verified reductions in greenhouse gas emissions. It is issued based on the results of a measurement, reporting, and verification (MRV) process and is officially recognized by the Minister responsible for environmental and forestry affairs.

The carbon trading framework developed by the Indonesia Stock Exchange through the IDX Carbon platform encompasses four distinct trading schemes: the regular trading scheme, the auction trading scheme, the negotiated trading scheme, and the marketplace-based trading scheme.[8] Regular trading scheme is the same as stock trading where the service users can submit offers and requests. Auction scheme is a one-way carbon trading scheme from the project owner, such as an Initial Public Offering (IPO). Negotiation scheme is a trade that first has an external agreement and can then be transacted with a confirmed party through a carbon exchange. Marketplace scheme is a trading scheme like a marketplace in general where the

[5] Article 1 point 8 Financial Services Authority Regulation Number 14 of 2023 concerning Carbon Trading Through the Carbon Exchange.

[6] See Financial Services Authority Circular Letter Number 12/SEOJK.04/2023 concerning Procedures for Conducting Carbon Trading Through the Carbon Exchange.

[7] Efek adalah surat berharga atau kontrak investasi baik dalam bentuk konvensional dan digital atau bentuk lain sesuai dengan perkembangan teknologi yang memberikan hak kepada pemiliknya untuk secara langsung maupun tidak langsung memperoleh manfaat ekonomis dari penerbit atau dari pihak tertentu berdasarkan perjanjian dan setiap Derivatif atas Efek, yang dapat dialihkan dan/atau diperdagangkan di Pasar Modal (Lihat Undang Undang Nomor 4 Tahun 2023 tentang Pengembangan dan Penguatan Sektor Keuangan).

[8] Wuryasti, F. 2023. *"Ini Empat Skema Perdagangan Karbon yang Disiapkan BEI"*. https://maritim.go.id/. Accesed 13 Juli 2024.

project's carbon is displayed and buyers can submit their requests. Currently, the carbon exchange trading scheme running in Indonesia is carried out in two ways, namely: First, through the Indonesian Carbon Exchange or IDX Carbon Trading. Second, through direct trading between companies or related agencies.

Carbon trading in Indonesia operates as a market-based mechanism aimed at reducing greenhouse gas emissions through the purchase and sale of carbon units. This approach is codified in Article 1, Number 17 of Presidential Regulation No. 98 of 2021 concerning the Implementation of Carbon Economic Value for Achieving Nationally Determined Contribution (NDC) Targets and the Control of Greenhouse Gas Emissions within the Framework of National Development.[9]

The designated carbon exchange operator in Indonesia is PT Bursa Efek Indonesia (Indonesia Stock Exchange/BEI), as authorized by OJK through Decree No. KEP-77/D.04/2023, which grants BEI an official business license to operate as a Carbon Exchange Organizer. Within the BEI, a specialized division known as IDXCarbon has been established to facilitate carbon market operations in Indonesia. IDXCarbon serves as the platform for carbon trading, offering a system that is transparent, orderly, fair, and efficient. In addition to ensuring price transparency, the platform also provides a streamlined and user-friendly transaction mechanism.

IDXCarbon is integrated with the National Climate Change Control Registry System (Sistem Registri Nasional Pengendalian Perubahan Iklim/SRN-PPI), managed by the Ministry of Environment and Forestry (KLHK), thereby facilitating the administration of carbon unit transfers and minimizing the risk of double counting. Companies that are subject to emission reduction obligations, or those that voluntarily commit to reducing greenhouse gas emissions, are eligible to become IDXCarbon Service Users and may purchase carbon units available on the platform. To participate, companies must first register by completing the IDXCarbon Service User Registration Form, accessible via the official website (www.idxcarbon.co.id). Additionally, project

[9] Article 1 Point 17 of Presidential Regulation Number 98 of 2021.

developers who hold verified carbon units recorded in the SRN-PPI system may sell their carbon units through the IDXCarbon marketplace.

Prior to being traded on the Indonesian carbon market, carbon units are classified as tradable securities that must be registered with both the Ministry of Environment and Forestry (Kementerian Lingkungan Hidup dan Kehutanan/KLHK) and the designated carbon exchange operator through the National Registry System for Climate Change Control (SRN-PPI). Prospective carbon exchange issuers are required to undergo a verification process to determine the total volume of carbon units eligible for trade. Based on the outcome of this verification, the KLHK, through an accredited Validation and Verification Institution (Lembaga Validasi dan Verifikasi/LVLV), issues a formal carbon certification known as a Green Certificate, which authorizes the carbon units for trading on the carbon exchange. In the transaction process, both the selling company and the purchasing entity must register directly with IDXCarbon. This requirement underscores the prohibition of intermediary involvement, such as brokers, distinguishing the carbon market mechanism from conventional securities trading. The direct registration process aims to enhance transparency, accountability, and regulatory oversight within the carbon trading system.

Carbon trading in Indonesia involves the coordination of multiple institutions, each with distinct regulatory and operational roles. The Ministry of Environment and Forestry (KLHK) serves as the principal regulator responsible for overseeing the implementation of carbon economic valuation and the procedural framework for carbon trading. The Indonesia Stock Exchange (BEI) acts as the official operator of the carbon trading platform, while the OJK is the competent authority responsible for issuing business licenses for carbon trading operations. The legal and regulatory framework governing the Carbon Exchange in Indonesia is outlined in the following key regulations:

a. Law No. 4 of 2023 on the Development and Strengthening of the Financial Sector (Pengembangan dan Penguatan Sektor Keuangan/PPSK) Article 5 letter a, point 8 affirms the authority of the Financial Services Authority (Otoritas Jasa

Keuangan/OJK) to regulate secondary trading of instruments related to the economic value of carbon on the carbon exchange.

b. Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value to Achieve Nationally Determined Contribution Targets and the Control of Greenhouse Gas Emissions in National Development Article 1 point 17 defines carbon trading as a market-based mechanism to reduce greenhouse gas emissions through the buying and selling of carbon units. Article 1 point 23 further defines the carbon exchange as a system that governs the registration of carbon reserves, carbon trading transactions, and the ownership status of carbon units.
c. Regulation of the Minister of Energy and Mineral Resources No. 16 of 2022 on the Procedures for Implementing the Carbon Economic Value in the Power Plant Subsector.
d. Regulation of the Minister of Environment and Forestry No. 21 of 2022 on Procedures for the Implementation of Carbon Economic Value.
e. Regulation of the Minister of Environment and Forestry No. 7 of 2023 on Procedures for Carbon Trading in the Forestry Sector
f. Regulation of the Financial Services Authority No. 14 of 2023 on Carbon Trading Through the Carbon Exchange This regulation sets out the technical and ope

Financial Services Authority Regulation No. 14 of 2023 on Carbon Trading Through Carbon Exchanges serves as a key technical regulation that outlines the procedures for conducting carbon trading within Indonesia's carbon exchange system. This regulation forms the legal foundation for the implementation of carbon trading in the country. It comprehensively regulates the operational mechanisms of carbon trading, including procedural requirements, licensing frameworks, supervisory authority, and the ongoing development and governance of carbon trading activities conducted through officially recognized carbon exchanges.

On September 26, 2023, the Government of Indonesia officially launched the Indonesian Carbon Exchange, marking a significant milestone in the country's carbon

market development. In its initial phase, participation in the exchange was limited to coal-fired power plants (Pembangkit Listrik Tenaga Uap/PLTU) operated by PT Perusahaan Listrik Negara (PLN), in accordance with Regulation of the Minister of Energy and Mineral Resources No. 16 of 2022 concerning the implementation of carbon economic value in the power generation subsector. A total of 99 PLN-operated coal-fired power plants took part in this initial trading phase, representing approximately 86 percent of all coal-fired PLTUs in Indonesia. Building on these early initiatives within the energy sector, the Ministry of Environment and Forestry (KLHK) has expanded the carbon trading framework to include the forestry sector. To facilitate this, the Ministry issued Regulation of the Minister of Environment and Forestry No. 7 of 2023 on Procedures for Carbon Trading in the Forestry Sector, which provides the legal and procedural foundation for implementing carbon trading mechanisms within forest-based emissions reduction projects.

Supervision of Carbon Exchange trading in Indonesia is carried out by the Financial Services Authority. The Financial Services Authority (OJK) acts as the vanguard in supervising the smoothness and accountability of carbon trading on IDX Carbon. This is in accordance with the Decree of the Board of Directors of PT Bursa Efek Indonesia Number: Kep-00298/BEI/09-2023 concerning the Regulation of Supervision of Trading Through the Carbon Exchange. The Financial Services Authority (OJK) in this case supervises the operations of the carbon exchange. In this context, the task of OJK is to carry out supervision which includes, among others:

a. Carbon Exchange Organizer
b. Supporting market infrastructure for Carbon Trading
c. Carbon Exchange Service Users
d. Carbon Unit Transactions and Transaction Settlement
e. Carbon Trading Governance
f. Risk Management
g. Consumer Protection
h. Parties, products, and/or activities related to Carbon Trading through the Carbon Exchange.

In addition, OJK also has a role as:[10]

a. Comprehensive supervision. OJK supervises all important aspects of carbon trading, from carbon exchange organizers, market infrastructure, service users, to transactions and settlement of carbon unit transactions. This is done to ensure fair, transparent trading and avoid fraudulent practices.
b. Solid governance. OJK ensures that carbon trading governance runs well and in accordance with established standards. This is important to maintain public trust in the carbon trading system.
c. Measurable risk management. OJK supervises the implementation of adequate risk management by carbon exchange organizers to minimize potential risks associated with carbon trading.
d. Consumer protection. OJK protects consumer rights and ensures that they are protected from unfair and misleading trading practices.
e. However, in terms of the institution that supervises the carbon exchange, namely the Financial Services Authority

The Financial Services Authority (OJK) for the carbon securities exchange (IDX Carbon) still need various mitigations to face the challenges of the development of carbon trading in the future. This is related to the status of carbon units as securities mandated by POJK 14/2023. The concept of carbon units as securities, not commodities, can create specialization in the organization of carbon exchanges, where securities trading in Indonesia is carried out by the Indonesia Stock Exchange (IDX) which is currently a securities trading institution. Meanwhile, other institutions that can technically become organizers such as ICDX are not accommodated as organizers because of the nature of carbon units that have been regulated in laws and regulations in Indonesia regarding carbon exchanges.

New Zealand Carbon Exchange Regulatory and Trading Scheme

[10] Diana Afifah. 2024. "*Mengenal Bursa Karbon Indonesia (Indonesia Carbon Exchange) dan Tntangannya di Masa Depan."* https://www.djkn.kemenkeu.go.id/kpknl-lampung/baca-artikel/17264/Mengenal-Bursa-Karbon-Indonesia-Indonesia-Carbon-Exchange-dan-Tantangannya-di-Masa-Depan.html. Accesed 21 November 2024.

Among developed countries, New Zealand has a unique greenhouse gas (GHG) emissions profile due to its heavy reliance on the agricultural sector. Agriculture not only plays a major role in contributing to the country's gross domestic product (GDP), but it is also one of the primary sources of GHG emissions. This distinctive emissions profile has directly influenced the design and implementation of New Zealand's Emissions Trading Scheme (ETS)—a national carbon trading system that was one of the first in the world to include the forestry sector and to consider the future inclusion of agricultural emissions. The NZ ETS serves as the country's key policy instrument for reducing national emissions by setting a price on carbon, thereby encouraging industries including agriculture to adopt more sustainable practices.[11]

Among developed countries, New Zealand possesses a distinctive greenhouse gas (GHG) emissions profile due to the central role of agriculture in its national economy. The agricultural sector not only contributes significantly to the country's gross domestic product (GDP), but it is also one of the primary sources of GHG emissions. This sectoral characteristic has had a direct impact on the formulation and implementation of the New Zealand Emissions Trading Scheme (NZ ETS) a national carbon trading system notable for being one of the first in the world to incorporate the forestry sector and to consider the future inclusion of agricultural emissions. The NZ ETS serves as a central policy instrument for achieving emissions reductions through a carbon pricing mechanism, thereby incentivizing industrial sectors, including agriculture, to transition toward more sustainable and low-emission practices.[12]

Carbon trading in New Zealand involves the coordination of multiple government agencies, each with specific roles in the administration and oversight of the NZ ETS. The Ministry for the Environment is responsible for establishing and maintaining the overall regulatory framework governing the NZ ETS. The Environmental Protection Authority (EPA) serves as the central administrative body, tasked with maintaining records, managing registrations, and ensuring compliance with applicable

[11] Ivan Diaz-Rainey, "Carbon Pricing and System Linking: Lessons from The New Zealand Emissions Trading Scheme", *Energy Economics,* Vol. 73, 2018, page. 70-71.

[12] *ibid.*

regulations. The Ministry for Primary Industries (MPI) oversees the implementation of the NZ ETS within the forestry sector, which plays a crucial role in New Zealand's carbon offset strategy. [13] Additionally, the Climate Change Commission, an independent statutory body, provides annual advice and recommendations to the government regarding the operation, effectiveness, and potential reforms of the NZ ETS.[14]

In the trading scheme, New Zealand implements an auction system conducted by the government together with the NZE and the European Energy Exchange (EEX) and held four times a year. Every account holder, both individuals and organizations, can own and trade New Zealand Units (NZU) or domestic emission units. The government also has a policy to determine prices. So that entities are required to follow the scheme and regulations made by the New Zealand government.[15] The auction mechanism in New Zealand was introduced in 2021. Then in 2022, 19.3 million carbon credits were sold through the auction mechanism, plus 7 million carbon credit units issued by CCR.[16]

The auction system implemented by the New Zealand government for carbon trading employs a single-round, closed bidding format. Under this mechanism, all participants submit their bids simultaneously, specifying both the price and the quantity of New Zealand Units (NZUs) they intend to purchase. Once submitted, the bids are ranked in descending order based on the offered price.[17] If the auction fails and the auction activity carried out is the last auction in that year's period, then the unsold carbon credits will be auctioned in the following year.

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[13] Ministry for the Environtment, *The New Zealand Emissions Trading Scheme Evaluation 2016,* Wellington: Ministry for the Environtment, 2016, https://environment.govt.nz/assets/publications/ets-evaluation-report.pdf, page 12.

[14] https://www.climatecommission.govt.nz/our-work/advice-to-government-topic/nz-ets/about-the-nz-emissions-trading-scheme/our-role-in-the-nz-ets.

[15] International Carbon Action Partnership (ICAP). 2023. *"New Zealand Emissions Trading Scheme"*. https://icapcarbonaction.com/. Accesed 11 Juli 2024.

[16] Baskara Wahyu, A.P. 2023. "*Kerangka Hukum Bursa Karbon di Indonesia: Perkembangan Terkini dan Tantangn Ke depan"*. Jurnal: Mimbar Hukum Universitas Gajah Mada. page. 53.

[17] The Treasury of New Zealand, "*Coversheet: Rules for auctioning in the New Zealand Emissions Trading Scheme,"* environment,govt.nz. https://environment.govt.nz/assets/Publications/ Impact-statement.-Rules-for-auctioning-in-the-NZ-ETS.pdf

With the commencement of the auction process, the New Zealand government establishes a floor price through a public reserve price, which represents the minimum acceptable bid in the auction. In addition to this publicly disclosed reserve price, the government also employs a confidential reserve price, determined using a proprietary methodology that incorporates reference prices from the secondary market. This confidential reserve price sets a threshold below which New Zealand Units (NZUs) cannot be sold. In cases where the confidential reserve price exceeds the public auction reserve price, the higher of the two becomes the effective floor price for that auction round. This dual-pricing mechanism is designed to ensure market stability and prevent the undervaluation of carbon units in the auction process.

The Carbon Exchange arrangements in New Zealand are regulated as follows:

a. Climate Change Response Act 2002. Section 4 New Zealand greenhouse gas emissions trading scheme
b. In order to keep New Zealand's main climate change legislation in one piece of legislation, the Climate Change Response Act combines the "Climate Change Response (Emissions Trading Reform) Amendment Act 2020" and the "Climate Change Response (Zero Carbon) Amendment Act 2019". The "Zero Carbon Act" details domestic targets to 2050, establishes the Climate Change Commission, and mandates a process for setting and meeting a five-year national emissions budget.

New Zealand's carbon trading scheme, the NZ ETS, was launched in 2008 and has become a central policy for mitigating climate change in the country. It covers around half of New Zealand's greenhouse gas emissions. The scheme is based on the New Zealand Greenhouse Gas Emissions Trading Scheme Act 2002 section 4. This includes provisions for special reviews of the operation and effectiveness of the NZ ETS. These reviews were initially required every five years, but are now subject to policy. The first review was conducted in 2011-12, and the second review was conducted in 2015-17. Public consultation on proposed amendments to the Climate Change Response Act 2002 was conducted in 2018 following the second review. The Climate Change Response Act was subsequently amended in 2020. The amendments to the Climate

Change Response Act set out a framework for the NZ ETS and brought all of New Zealand's major climate laws into one Act.[18] The NZ ETS encompasses a broad sectoral scope, regulating emissions across multiple sectors, including forestry, stationary energy, industrial processes, liquid fossil fuels, waste, and synthetic greenhouse gases. This comprehensive coverage reflects New Zealand's commitment to an inclusive and economy-wide carbon pricing mechanism. Following significant structural reforms in preceding years, the New Zealand government continued to implement incremental improvements to the operation and effectiveness of the NZ ETS throughout 2022, aimed at enhancing its transparency, efficiency, and alignment with long-term emissions reduction targets.

In 2023, the NZ ETS rules were again updated. The supply of carbon units entering the NZ ETS was tightened so that it is hoped that it will meet New Zealand's Net-Zero target. The auction price rules were updated for 2024 to 2028, while also setting annual limits for 2024-2028. These limits limit the number of New Zealand Units (NZUs) that can be released into the market through auctions, industry allocations and CCRs, as well as from any international units (currently not allowed). In addition, these rules tighten the supply of carbon units while increasing the auction floor price for 2024.

Emissions in the NZ ETS are categorized into seven sectors which will be covered in stages, namely:[19]

a. Forestry (starting from 1 January 2008)
b. Non-moving energy sources (starting from 1 July 2010)
c. Liquid fossil fuels (starting from 1 July 2010)
d. Industrial processes (starting from 1 July 2010)
e. Waste (starting from 1 January 2013)
f. Synthetic greenhouse gases (starting from 2013)
g. Agriculture (starting from 2015).

[18] Benjamin Rontard dan Harnandez, H. 2022. "Konstruksi Politik Penetapan Harga Karbon: Pengalaman dari Skema Perdagangan Emisi Selandia Baru". *Environmental Development* 43. page. 8.

[19] Dewan Nasional. 2013. "Mari Berdagang Karbon (pengantar pasar karbon untuk pengendalian perubahan iklmim)". page. 40.

Any installation in the sector that has passed a certain threshold is required to participate in the ETS.

New Zealand requires most sectors to submit annual emissions reports by the end of March, which are verified through the government's Monitoring, Reporting, and Verification (MRV). Entities that fail to report their annual emissions on time must pay a fine of the number of carbon units involved multiplied by the current unit price, and entities that fail to submit or pay carbon emission units by the specified time must submit the units and pay a cash fine of three times the current market price for each unit not submitted by the due date.

Under the NZ ETS, entities may be subject to financial penalties of up to NZD 24,000 (approximately USD 14,640) if found in violation of specific compliance obligations. These violations include failure to collect required emissions data, calculate emissions or discharges accurately, maintain adequate records, register as a participant, submit an Annual Emissions Return when mandated, or notify the administering authority and provide relevant information as required. More severe infractions, such as the alteration, falsification, or submission of incomplete or misleading information in relation to any obligation under the NZ ETS including within the annual emissions report may result in penalties of up to NZD 50,000 (approximately USD 30,500).

In cases where an entity is found to have knowingly misrepresented its obligations under the NZ ETS for the purpose of gaining an unfair advantage, the penalties may extend beyond fines to include imprisonment for up to five years. These enforcement provisions serve to maintain the integrity and credibility of the emissions trading system and deter non-compliance among regulated entities. Regarding compliance, for some sectors the NZ ETS has an annual reporting requirement. For the forestry sector, after 1989, the annual reporting mechanism for emissions and discharges was optional with a mandatory reporting period of five years. Over time these weaknesses have been changed. Currently, the Monitoring, Reporting, and Verification (MRV) system is implemented following a self-reporting system that is complemented by an official government audit program. Moreover, New Zealand has defined carbon

rights as property rights recognized in their national laws.[20] So every year a sample of NZ ETS participants are selected for compliance review. Even in the rules, there is a penalty for entities that do not fulfill their obligations, namely 5 years in prison.[21] Third-party verification is not usually required to perform an emissions report, but participants must obtain third-party verification if they apply to use their own emission factors rather than those provided by the government.

In general, the NZ ETS has proven to be an effective policy instrument in reducing carbon emissions. This conclusion is supported by an empirical study entitled "Enhancing New Zealand's Emissions Trading Scheme: A Comprehensive Sector-Level Assessment For A Stronger Regulatory Framework". In this study, the researchers used the Double Machine Learning (DDML) approach, a modern and powerful method for causal analysis in the context of complex and high dimensional data. Using detailed sectoral data this study was able to specifically measure the impact of the ETS on carbon intensity in various economic sectors. The results show that the implementation of the NZ ETS has a significant impact on reducing sectoral carbon intensity, meaning that emissions per unit of output have been successfully reduced in most regulated sectors. This finding suggests that the ETS is not only a compliance tool, but also drives market incentives for emission reductions. The ability of companies to trade emission units in a limited system appears to drive behavioral and operational changes towards better environmental efficiency.[22]

In general, the NZ ETS has proven to be an effective policy instrument in reducing carbon emissions. This conclusion is supported by empirical research titled *"Enhancing New Zealand's emissions trading scheme: A comprehensive sector-level assessment for a stronger regulatory framework."* In this study, researchers used a Double Machine Learning (DML) approach—a modern and robust method for causal analysis in the context of complex, high-dimensional data. By utilizing detailed sectoral data

[20] Catera, K. 2022. "Pengakuan Hak Karbon Hutan di Indonesia: Pendekatan Konsitusional." *Jurnal Lentera Hukum*, Vol 9, Edisi 1. page. 170.

[21] *Ibid.*

[22] Miaomiao Tao, et all, "Enhancing New Zealand's emissions trading scheme A comprehensive sector-level assessment for a stronger regulatory framework", *Journal or Environtmental Management,* Vol. 352, 2024, page. 13.

from 2006 to 2020, the study was able to specifically measure the impact of the ETS on carbon intensity across different economic sectors. The results show that the implementation of the NZ ETS significantly reduced sectoral carbon intensity, meaning that emissions per unit of output were successfully lowered in most regulated sectors. These findings suggest that the ETS functions not only as a compliance tool but also as a market-based incentive for emission reductions. The ability of firms to trade emission units within a capped system appears to drive behavioral and operational changes toward greater environmental efficiency.[23]

Comparative Analysis of Indonesia and New Zealand Carbon Exchange

The inauguration of the carbon exchange in Indonesia represents a significant milestone in the country's efforts to establish a formal carbon trading system aimed at reducing greenhouse gas emissions. The Indonesia Stock Exchange (IDX) has been officially appointed by the OJK as the operator of the national carbon exchange. While the implementation of the carbon exchange marks important progress, it remains in an early developmental stage. Indonesia has taken initial steps toward fulfilling the foundational regulatory requirements necessary for operating a carbon market. However, a review of the existing legal framework and the early stages of implementation indicates that considerable challenges remain. Further regulatory refinement, institutional capacity building, and cross-sectoral coordination will be essential for ensuring the effectiveness, transparency, and sustainability of Indonesia's carbon trading system.

First, Legal Regulation. Indonesia does not yet have a firm regulation that regulates companies to contribute to reducing carbon emissions. What currently exists is only a form of commitment based on the awareness of the Company itself and domestic business entities. The current sector-based regulation tends to result in its implementation being highly dependent on the progress of the relevant sector ministry. This has an impact on carbon trading in Indonesia being relatively low. Environmental observer Forest Digest stated that the existing regulations are still very

[23] Miaomiao Tao, et all, "Enhancing New Zealand's emissions trading scheme A comprehensive sector-level assessment for a stronger regulatory framework", *Journal or Environtmental Management,* Vol. 352, 2024, page. 13.

bureaucratic and inefficient. It takes almost four years for a business entity to enter carbon trading, both in the domestic and foreign markets.

Another important factor is the issue of limited supply and limited demand. Citing statistics showing a lack of interest in carbon exchange that has been tracked routinely for the past eight months, it is evident that only a few businesses are aware of the importance of carbon exchange in Indonesia.[24] Judging from the participation of carbon trading in Indonesia through the current carbon exchange, most of it comes from the banking sector, even though the emissions released by banking are not large enough. The absence of strict regulations makes companies reluctant to participate in the carbon exchange in Indonesia. Regarding carbon quality standards, trading procedures, transaction guarantees, and derivative regulations, sharpening is still needed to create a safer carbon exchange for the parties. The current Indonesian carbon exchange should be able to function as a useful trigger for the development of an environmentally friendly technology ecosystem centered on carbon trading.

New Zealand has strict rules that require several sectors to trade carbon, including the forestry sector and the agricultural sector. Every entity that has passed a certain limit is "required" to participate in the carbon exchange. This makes New Zealand active in carbon exchange transactions. New Zealand is said to be the only country that requires its forestry sector to participate in the carbon exchange and then becomes one of the largest entities. This also shows great benefits in forest management in New Zealand. NZ ETS also contributes greatly to increasing renewable energy in the country.

Second, Trading Scheme. The trading scheme regulations in New Zealand state that every individual or organization can own and trade carbon in NZU if they have a registered account with NZ ETS. The main market in the carbon exchange is the auction. Every NZ ETS registered account holder can participate in the auction. New Zealand implements an auction system carried out by the government together with the New Zealand Exchange and the European Energy Exchange (EEX) and the auction is held four times a year. The New Zealand government also has a policy for

[24] Kamalina, A. R. 2024. *Ibid.*

determining prices, so entities are required to follow the schemes and regulations made by the New Zealand government.

The auction follows a sealed bid format and one round. In this format, bidders in the auction will submit bids simultaneously. Then the bidders will state the price and the amount of NZU to be purchased. The stated price will then be sorted from highest to lowest price. If the auction is declared failed and the auction activity carried out is the last auction of the year, then the unsold carbon credits will be auctioned in the following year. In its implementation, most of it is generated from the forestry sector, this allows carbon sequestration from the forestry sector in New Zealand in line with the original objectives of the NZ ETS.

The auction trading scheme makes the carbon exchange in New Zealand very active. The government is directly involved in determining the carbon credit threshold price and auction participants are required to comply with the rules issued by the government. Although there have been several unsold carbon credit auctions that have been declared failed, they have a policy to be auctioned in the next period. Then if the next period still fails, there is a policy for the removal of carbon credits with strict provisions.

Indonesia, the trading scheme adopts a stock trading scheme where there is no obligation for entities to follow. The carbon trading scheme that adopts a stock trading scheme feels less effective because the carbon exchange should be more mandatory, especially for companies that cause large-scale carbon effects. This cap and trade mechanism should not be voluntary. Companies should be required to comply with the carbon threshold value that has been set. However, with the absence of strict regulations regarding sanctions for companies that do not fulfill their obligations regarding the carbon emission threshold value, many companies are reluctant to get involved in the carbon exchange, they prefer to pay fines or pay additional taxes to fulfill their company's obligations.

Third, Supervision aspect. The New Zealand Carbon Exchange involves the environmental protection authority, which is the authority that is authorized and

responsible for recording and complying with existing regulations. New Zealand requires most sectors to report annually with a deadline of the end of March to submit annual emission reports. Verification is carried out through authorities that follow a self-reporting system equipped with an official government audit program. Each year a sample of NZ ETS participants is selected for review and evaluation. Even in its regulations, there are penalties for entities that do not fulfill their obligations ranging from fines to imprisonment.

Indonesia involves the Financial Services Authority in terms of comprehensive supervision. The OJK was formed by the government so that all activities in the financial services sector are organized regularly, fairly, transparently, and accountably. In addition, the OJK was formed to be able to realize a financial system that grows sustainably and stably and is able to protect the interests of consumers and the community. The OJK oversees all important aspects of carbon trading, from carbon exchange organizers, market infrastructure, service users, to transactions and settlement of carbon unit transactions. This is done to ensure fair, transparent trade and avoid fraudulent practices.

Transparency is considered necessary to fulfill the sustainability aspect of the carbon exchange in Indonesia. There needs to be transparency as to whether companies in Indonesia have been serious about reducing carbon emissions and whether companies in Indonesia have implemented green investment or have only campaigned as if they have participated in reducing carbon emissions but are actually still contributing carbon on a large scale. This is a future challenge for the government on how to provide counseling and strict regulations in order to create an effective carbon exchange in Indonesia. In this case, the government should be able to involve other institutions such as the Ministry of Environment and Forestry and other institutions in creating a good carbon emission reduction scheme.

Supervision of Indonesia's Carbon Exchange Compared with New Zealand

As part of a participatory oversight mechanism, the Environmental Protection Authority (EPA) provides various forms of support to help participants of the

Emissions Trading Scheme (ETS) understand and comply with applicable regulations. One of the key efforts is through consistent communication and education. The EPA regularly disseminates information through official channels such as e-newsletters, website updates, emails, letters, and phone calls. Additionally, a Contact Centre service is available to handle inquiries or direct clarifications from participants.

Oversight of the carbon market in New Zealand, particularly in relation to the NZ ETS, is based on a robust and systemic regulatory framework. Although the system employs a self-assessment model by participants, the government still carries out a strategic oversight function to ensure compliance. In this model, participants are responsible for calculating, reporting, and verifying their own emissions in accordance with existing regulations. While third-party verification is not generally required, oversight is still enforced through selective audits conducted by government authorities.[25]

The government, through the EPA, holds the authority to audit emissions reports and compliance of NZ ETS participants. Each year, the EPA randomly selects a number of participants from both forestry and non-forestry sectors, as well as those receiving free emissions unit allocations for comprehensive reviews conducted by internal teams or designated third parties. This is a form of indirect oversight aimed at creating a deterrent effect and enhancing accountability, even though the system fundamentally relies on trust and self-declaration by carbon market actors.[26]

In terms of emissions measurement, the NZ ETS provides standardized technical mechanisms to ensure reporting accuracy. For example, when participants submit emissions returns, the system automatically generates an online form to assist them in surrendering the appropriate number of units. This form auto-populates based on reported data, making the accuracy of the initial input critically important. If a

[25] Catherine Leining, "A Guide To The New Zealand Emissions Trading Scheme: 2022 Updatr", https://www.motu.nz/assets/Documents/our-research/environment/climate-change-mitigation/emissions-trading/A-Guide-to-the-New-Zealand-Emissions-Trading-System-2022-Update-Motu-Research.pdf. accesed 28 Juni 2025.

[26] *Ibid.*

participant does not promptly approve the surrender, the system sends reminders prior to the legally mandated deadline.

The government also provides default emission factors for all sectors as the basis for emissions calculations via a standardized and user-friendly system. The online platform, known as the Register, allows participants to directly input the data required for reporting. Within the system, there is also an industrial allocation application equipped with an activity-based calculator to help participants accurately calculate the number of emission units. Additional features such as assigning preparer and approver roles in the reporting process add another layer of confidence and control over the accuracy of reported data.[27] For non-forestry participants with specific conditions, there is an option to request the use of custom emission factors. This reflects the system's flexibility but also requires additional responsibility from participants. This is part of the technical oversight to ensure the validity of reported emissions data.

Oversight of the forestry sector under the NZ ETS follows its own standards. For post-1989 forest owners, reporting mechanisms vary depending on the size of the landholding. Landowners with less than 100 hectares are required to use government reference tables, while those with 100 hectares or more must use the more complex, field-based Field Measurement Approach (FMA). FMA requires data collection from sample plots, making it more accurate but also increasing the reporting burden.[28] This is where the government's oversight function is tested, as the EPA must ensure the methodologies used are correct and consistent with national guidelines.

For pre-1990 forests, the oversight mechanism is simpler, with deforestation emissions required to be calculated using government reference tables. This reduces the risk of data manipulation by participants and simplifies the audit process. However, despite this more straightforward approach, oversight mechanisms are still necessary to ensure no misclassification or misreporting of deforested areas occurs. Therefore,

[27] New Zealand Government, *Emissions Trading Scheme Compliance And Enforcement Programme*, https://www.epa.govt.nz/assets/Uploads/Documents/Emissions-Trading-Scheme/Policies/ETS-Compliance-Programme-Feb-2019.pdf, accesed 26 Juni 2025.

[28] Catherine leining, *op.cit.*

while a full independent verification system is not in place, regulation-based supervision and standardized reporting continue to play a vital role.

Moreover, the EPA applies proactive monitoring of reporting and submission activities. Its internal system automatically highlights significant variations from previous reports to detect potential issues early. Initial checks are conducted by considering reporting history, industry sector dynamics, and other relevant information. If discrepancies are found, the EPA contacts the participant for clarification. Although the EPA assists with verification, the ultimate responsibility for accuracy remains with the participant.[29]

As part of more targeted oversight, the EPA conducts periodic reviews using a combination of desk-based document reviews and audits by approved third parties. A panel of independent ETS review service providers is authorized to conduct field visits, inspect source data, and assess participants' administrative records. Findings from third-party auditors are reported back to the EPA, which then collaborates with the relevant organizations to resolve any identified issues. Additionally, the EPA conducts phone-based interviews to explore participants internal processes and agree on necessary improvements.[30]

This indicates that while oversight is based on self-assessment, the NZ ETS is still actively and professionally supervised by the government. Thus, carbon market oversight in New Zealand is decentralized yet structured, maintaining trust in market actors through random audits and the provision of well-defined technical guidelines.

CONCLUSION

The implementation of carbon exchanges, which is an effort to reduce carbon emissions in Indonesia, is still very new, and still needs some evaluation to increase the effectiveness of this program. It can be said that Indonesia has met the initial requirements in creating regulations regarding carbon exchanges, but referring to

[29] New Zealand Government, *op.cit.*
[30] *Ibid*

several regulations that have been issued and the implementation process of carbon exchanges to date, there is still a lot of homework for the Indonesian government so that carbon exchanges in Indonesia can run optimally. The absence of regulations that require companies in Indonesia to conduct carbon exchanges makes the goal of achieving the target of reducing carbon emissions using the carbon exchange method difficult to achieve.

The comparative study conducted by the author on carbon trading regulations in New Zealand found several points that can inspire Indonesia in improving regulations regarding carbon exchanges, including: First, the implementation aspect, Indonesia can follow New Zealand's policy which requires several sectors to conduct carbon trading. Second, the aspect of the trading scheme, New Zealand implements an auction system carried out by the government and the New Zealand government also has a policy to set prices, so that entities are required to follow the schemes and regulations made by the New Zealand government. Third, the supervision aspect, New Zealand requires most sectors to report annually, even in its regulations, there are penalties for entities that do not fulfill their obligations, namely imprisonment for 5 years.

COMPETING INTEREST

The author declares that this research was conducted independently, no potential conflicts of interest with respect to the research, authorship, and/or publication of this study.

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