International Journal of Educational Review, Law & Social Sciences (IJERLAS)
International Journal of Educational Review, Law And Social Sciences (IJERLAS Journal) | ISSN(e): 2808-487X
Volumes 5 No. 6 (2025)

CARBON CAPTURE AND STORAGE REGULATION UNDER INDONESIAN ADMINISTRATIVE LAWJURIDICAL ANALYSIS OF PRESIDENTIAL REGULATION NO. 14 OF 2024 AND ITS IMPLEMENTATION

Audrey Kartika Putri, Indah Dwi Qurbani, Mardian Wibowo
Universitas Brawijaya
Email: audrey_tika@student.ub.ac.id, indah.qurbani80@ub.ac.id, mwibowo@ub.ac.id

Received : 15 October 2025
Revised : 01 November 2025
Accepted : 25 November 2025
Published : 24 December 2025
DOI : https://doi.org/10.54443/ijerlas.v6i1.4275
Link Publish : https://radjapublika.com/index.php/IJERLAS

Abstract

This study examines the legal framework of Carbon Capture and Storage (CCS) in Indonesia, focusing on the enactment and implementation of Presidential Regulation No. 14 of 2024 concerning the Organization of Carbon Capture and Storage Activities. The objective of this research is to assess how the regulation provides legal certainty, administrative accountability, and clarity of state control in CCS governance as a strategic instrument to achieve Indonesia's Net Zero Emission (NZE) target by 2060. The study employs a normative juridical approach, relying on primary legal materials including laws, presidential regulations, and ministerial decrees, as well as secondary sources such as academic literature, legal doctrines, and previous studies. Data collection was conducted through library research and analyzed using grammatical and systematic interpretation to examine the relationship between CCS regulations within the broader Indonesian legal system. The results indicate that the regulation establishes an initial legal basis for CCS governance, particularly in terms of site characterization, licensing, monitoring, and post-operational responsibilities. However, challenges remain, including overlapping institutional mandates, the absence of comprehensive technical guidelines for Monitoring, Measurement, and Verification (MMV), and legal uncertainties for enterprises participating in CCS projects. These findings highlight the necessity of harmonizing CCS regulations with existing environmental and energy laws, as well as strengthening administrative law mechanisms to ensure compliance, transparency, and public accountability. In conclusion, Presidential Regulation No. 14 of 2024 represents a progressive step in integrating CCS into Indonesia's climate policy framework, but its effectiveness will depend on consistent implementation, the formulation of detailed technical rules, and institutional coordination. Reinforcing the principles of administrative law, particularly legal certainty, the rule of law, and state responsibility, is crucial to ensure that CCS not only contributes to emission reduction but also aligns with the principles of good governance.

Keywords: Carbon Capture and Storage, Legal Framework, Administrative Law

1. INTRODUCTION

Climate change is currently regarded as the most urgent global challenge due to its multidimensional implications for the sustainability of human life. The increase in greenhouse gas (GHG) concentrations, particularly carbon dioxide (CO_2), is the primary factor accelerating the pace of global warming. Its impacts are extensive, ranging from ecosystem degradation and the intensification of hydrometeorological disasters such as floods and droughts, to threats against global economic stability and the quality of human life (IPCC 2022). This condition affirms that climate change is not merely an environmental issue but also a matter of development, law, and humanity. Stern emphasizes that failure to address climate change could precipitate a global economic crisis equivalent to the consequences of a world war[1]. As a form of global awareness, the international community established the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 as the principal international legal framework. This convention subsequently gave rise to more specific instruments, namely the Kyoto Protocol of 1997 and the Paris Agreement of 2015. The Kyoto Protocol adopted a top-down approach by imposing quantitative obligations on developed states (Annex I countries), while the Paris Agreement employed a bottom-up mechanism through Nationally Determined Contributions (NDCs), granting both developed and developing states discretion in

[1] Stern, Nicholas. ***The Economics of Climate Change: The Stern Review***. Cambridge: Cambridge University Press, 2007.

setting emission-reduction targets in accordance with their national capacities[2]. This paradigm shift reflects the necessity for flexibility in international law to accommodate the diverse social, economic, and political circumstances of state parties. Indonesia responded to these dynamics by ratifying the Paris Agreement through Law No. 16 of 2016. Its national commitment is reflected in the target of reducing emissions by 29% unilaterally and up to 41% with international support by 2030. This commitment was further reinforced at COP26 in Glasgow in 2021, when President Joko Widodo announced Indonesia's target of achieving Net Zero Emission (NZE) by 2060, or earlier if adequate international support in terms of technology, financing, and capacity building is secured[3]. This target became the basis for the formulation of the Long-Term Strategy for Low Carbon and Climate Resilience (LTS-LCCR) 2050 and the enhancement of ambition in the 2022 Enhanced NDC. Within the domestic policy framework, the government has not only focused on developing renewable energy such as solar, geothermal, wind, and bioenergy, but has also advanced the adoption of Carbon Capture and Storage (CCS) technology. CCS is regarded as a strategic instrument to reduce emissions from carbon-intensive sectors, particularly extractive industries, oil and gas, and cement. According to the International Energy Agency (IEA), CCS holds significant potential in facilitating energy transition by enabling substantial emission reductions while maintaining fossil fuel supply in the medium term[4].

The regulatory framework for CCS in Indonesia has been formally initiated through Ministry of Energy and Mineral Resources Regulation No. 2 of 2023, which governs CCS in the oil and gas sector, and subsequently expanded by Presidential Regulation No. 14 of 2024 as a national legal framework covering non-oil and gas sectors. This regulation addresses technical aspects, licensing, operational governance, and legal certainty concerning the ownership of captured and stored carbon. Its enactment demonstrates the integration of environmental law and administrative law, oriented not only toward environmental protection but also toward the creation of new economic value through carbon trading schemes (Nugroho 2023). This aligns with the concept of a green economy, which emphasizes energy efficiency, social equity, and environmental sustainability.

Concrete implementation of CCS policy is exemplified by the Tangguh LNG CCS Project in West Papua, managed by BP Berau Ltd. The project is projected to capture and store approximately 25 million tons of CO_2 over its operational lifetime, making it one of the largest CCS projects in Southeast Asia[5]. This initiative demonstrates Indonesia's tangible efforts to integrate CCS technology with upstream oil and gas activities. Moreover, the project is regarded as a replicable model for other regions while simultaneously strengthening Indonesia's position in global climate diplomacy. Nevertheless, fundamental challenges hinder the optimization of CCS in Indonesia. First, the investment cost for developing facilities for CO_2 capture, transportation, and storage remains prohibitively high, thereby limiting private sector participation without fiscal support or governmental incentives[6]. Second, supporting infrastructure, such as pipeline networks and verified geological storage sites, remains insufficient. Third, a long-term monitoring mechanism is required to ensure the security of carbon storage, particularly to prevent potential leakage that could pose environmental and social risks[7].

From the perspective of administrative law, the regulatory scheme for CCS must adhere to the principles of legality, prudence (zorgvuldigheid), and transparency as instruments of public accountability[8]. Presidential Regulation No. 14 of 2024, through its mandatory Monitoring, Measurement, and Verification (MMV) provisions, underscores the importance of these principles. However, the legal status of ownership of stored carbon has not yet been explicitly regulated, thereby creating potential legal uncertainty. Article 33 of the 1945 Constitution of Indonesia stipulates that natural resources are controlled by the state for the greatest prosperity of the people, thereby limiting private entities to derivative economic rights through mechanisms such as carbon credits[9]. Consequently, more detailed implementing regulations are necessary to govern ownership and carbon trading to achieve legal certainty.
In conclusion, while Indonesia has established a progressive legal framework regulating CCS, the effectiveness of its implementation remains contingent upon three key factors:

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[2] Bodansky, Daniel. ***The Art and Craft of International Environmental Law***. Cambridge, MA: Harvard University Press, 2016.
[3] Jong, Hans Nicholas. ***Indonesia Pledges Net-Zero Emissions by 2060***. Mongabay, November 2021.
[4] International Energy Agency (IEA). ***Carbon Capture, Utilisation and Storage: A Global Analysis***. Paris: IEA Publications, 2020.
[5] BP. Tangguh LNG, ***CCS Project Overview***. London: BP Global Report, 2023.
[6] Zhang, X., and Y. Wang. ***Financing CCS in Developing Countries: Challenges and Opportunities***. Climate Policy 22, no. 3 (2022): 321–338.
[7] Hasan, M. ***Carbon Capture and Storage as Climate Mitigation Strategy in Indonesia***. Energy Policy Journal 15, no. 2 (2022): 45–63.
[8] Ridwan HR. ***Hukum Administrasi Negara***. Jakarta: Rajawali Pers, 2014.
[9] Butt, Simon, and Tim Lindsey. ***Indonesian Law***. Oxford: Oxford University Press, 2018.

(i) transformation of the energy mix to avoid entrenchment in coal dependency;
(ii) financial certainty and fiscal incentives to encourage private investment and secure international support; and
(iii) institutional capacity building, particularly at the regional level, to ensure effective oversight.

If these factors are adequately addressed, CCS has the potential to become a principal instrument in Indonesia's climate change mitigation strategy while simultaneously strengthening its position in realizing Net Zero Emission by 2060.

2. METHOD

This research employs a normative juridical method (doctrinal legal research), emphasizing the study of positive law and relevant legal doctrines. The selection of this method is grounded in the research object, which focuses on the regulation of Carbon Capture and Storage (CCS) in Indonesia, particularly the implementation of Presidential Regulation No. 14 of 2024 in supporting the achievement of the Net Zero Emission (NZE) target by 2060. Since the primary issues under examination pertain to legal certainty, normative coherence, and the position of CCS regulation within the national legal system, the normative juridical approach is deemed the most appropriate to address the formulated research questions[10]. Data collection is conducted through library research by examining various legal materials. Primary legal materials consist of Law No. 16 of 2016 on the Ratification of the Paris Agreement, Law No. 32 of 2009 on Environmental Protection and Management, Presidential Regulation No. 14 of 2024, as well as Ministry of Energy and Mineral Resources Regulations No. 2 of 2023 and No. 2 of 2024. Secondary legal materials include scholarly works on environmental law and energy law, academic journal articles both national and international, and prior research findings on CCS and energy transition[11]. Tertiary legal materials serve as supporting references, such as legal dictionaries, legal encyclopedias, and other academic sources to clarify terminology and concepts applied.

Data analysis is carried out through an interpretive approach. First, grammatical interpretation is used to ascertain the literal meaning of provisions, for instance, Articles 6, 12, and 14 of Presidential Regulation No. 14 of 2024, which regulate the stages of capture, transport, and storage. Second, systematic interpretation is applied to examine the interrelation between Presidential Regulation No. 14 of 2024 and other relevant regulations, thereby assessing consistency and harmonization of legal norms within the unified legal system. This analysis enables the researcher to evaluate the legal position of CCS, the scope of obligations of business entities, and the challenges of regulatory implementation in the context of Indonesia's energy transition. To enrich the analysis, this study also employs a conceptual approach by examining international environmental law principles, such as the precautionary principle, the polluter pays principle, and the sustainable development principle. This approach ensures that the research does not merely describe normative provisions textually, but also connects them with foundational legal concepts underpinning environmental law development in Indonesia[12]. By combining these approaches, the normative juridical method is expected to yield a comprehensive analysis of CCS regulation in Indonesia while evaluating its contribution to the realization of the NZE 2060 target. Furthermore, this method allows the researcher to examine legal certainty, business entities' obligations, and regulatory challenges, while also providing policy recommendations for more effective legal reform.

3. RESULT AND DISCUSSION

RESULT

The findings of this research indicate that Indonesia has undertaken various regulatory measures to achieve Net Zero Emission (NZE) by 2060 or earlier. The initial commitment was demonstrated through the ratification of the Paris Agreement under Law No. 16 of 2016. Subsequently, the government established a national legal framework by enacting Presidential Regulation No. 14 of 2024 concerning the Implementation of Carbon Capture and Storage (CCS) Activities as the principal legal basis for CCS. Further technical regulations were issued under Ministry of Energy and Mineral Resources (MoEMR) Regulation No. 2 of 2023 (for the upstream oil and gas sector) and MoEMR Regulation No. 2 of 2024 (for the non-oil and gas sector), which govern technical standards, licensing procedures,

[10] Soekanto, Soerjono. ***Pengantar Penelitian Hukum***. Jakarta: UI Press, 1986. Halaman 17.
[11] Bodansky, Daniel. ***The Legal Character of the Paris Agreement***. Review of European, Comparative & International Environmental Law 25, no. 2 (2016): 142–150.
[12] Birnie, Patricia, Alan Boyle, and Catherine Redgwell. ***International Law and the Environment***. Oxford: Oxford University Press, 2009.

safety requirements, and the obligations of business entities in implementing CCS. Concrete implementation has commenced through the Tangguh LNG CCS Project in Bintuni Bay, West Papua, managed by BP Berau Ltd. This project is designed to capture approximately 25 million tons of CO_2 over its operational cycle[13]. The regulatory framework divides the CCS process into three principal stages: capture, transport, and storage.

a. Capture Article 6(1) of Presidential Regulation 14/2024 stipulates that carbon capture shall be carried out by business entities using specific technologies in accordance with applicable standards. Such technologies include pre-combustion capture, post-combustion capture, and oxy-fuel combustion.
b. Transport Article 12(1) prescribes that carbon transport must utilize means that meet technical and safety requirements, while paragraph (2) permits the use of pipelines, vessels, or other facilities consistent with statutory regulations.
c. Storage Article 14(1) establishes that carbon storage shall be conducted through the injection of CO_2 into designated geological formations, subject to safety and environmental requirements. Furthermore, Article 14(3) requires that storage sites be determined on the basis of site characterization studies.

Ministerial regulations elaborate further on these stages. MoEMR Regulation No. 2 of 2023 (Articles 5–15) regulates capture, transport, and storage in the upstream oil and gas sector, whereas MoEMR Regulation No. 2 of 2024 (Articles 6–16) imposes similar obligations on non-oil and gas business entities. In addition, CCS regulation in Indonesia mandates the establishment of a Monitoring, Measurement, and Verification (MMV) system to ensure the safety of carbon storage. Article 25 of Presidential Regulation 14/2024 requires long-term auditing and supervision, including site characterization, monitoring, and independent verification. These MMV obligations are reaffirmed in Article 21 of MoEMR Regulation No. 2/2023 (for upstream oil and gas) and Article 18 of MoEMR Regulation No. 2/2024 (for non-oil and gas). The study also identifies legal uncertainty regarding the ownership of captured and stored carbon. Neither Presidential Regulation 14/2024 nor the MoEMR Regulations explicitly regulate ownership status. In practice, captured CO_2 remains the responsibility of business entities, while stored CO_2 may be converted into carbon units (carbon credits) owned by the entities but subject to state oversight. Pursuant to Article 33 of the 1945 Constitution, the State retains sovereignty and ultimate authority over natural resources, while business entities hold only limited economic rights.

DISCUSSION

The discussion of findings demonstrates that Indonesia's regulatory efforts toward achieving NZE 2060 have produced a relatively comprehensive legal framework. From the perspective of administrative law, Presidential Regulation No. 14 of 2024 embodies the principle of legality, whereby every governmental act must be based on clear legal authority[14]. The President exercises attributed authority pursuant to Article 4 (1) of the 1945 Constitution to establish national regulations, which are subsequently delegated to the Ministry of Energy and Mineral Resources through ministerial regulations[15]. This finding is consistent with the analysis of Indah Dwi Qurbani (2022), who emphasizes that sustainable energy regulation requires not only a normative legal framework but also instruments that ensure the integration of green constitutional principles into the practice of state administration[16]. In her article "Prospective Green Constitution in New and Renewable Energy Regulation", she asserts that energy regulation in Indonesia must incorporate the principles of sustainability, intergenerational justice, and environmental protection in order to align with Article 28H and Article 33 of the 1945 Constitution.

Furthermore, the technical stages of CCS, consisting of capture, transport, and storage, demonstrate the application of the principle of zorgvuldigheid (due care). The mandatory geological studies, safety requirements, and MMV mechanisms stipulated in the Presidential Regulation and the Ministerial Regulations of Energy and Mineral Resources indicate that the regulatory framework is not merely normative, but also attentive to scientific and technical standards[17]. These provisions affirm that the implementation of CCS in Indonesia is designed not only to comply with legal obligations but also to internalize the principle of prudence in both technical and administrative aspects. This is consistent with the analysis of Indah Dwi Qurbani, who emphasizes the importance of prudence in

[13] Yusgiantoro, Luky, Tri Bagus Prabowo, and Dedi Kristanto. 2024. ***The Structural Factors in Advancing CCS/CCUS Technology in Indonesia: A Comprehensive Analysis***. Scientific Contributions Oil and Gas 47 (2): 33–48.
[14] Muhtar Said, ***Asas-asas Hukum Administrasi Negara*** (Yogyakarta: Thafa Media, 2019), halaman 87.
[15] Wiratno. 2025. ***Hukum Administrasi Negara***. Jakarta: Penerbit Universitas Trisakti, halaman 112.
[16] Indah Dwi Qurbani, ***Prospective Green Constitution in New and Renewable Energy Regulation***," Legality: Jurnal Ilmiah Hukum 30, no. 2 (2022): 183–198, https://ejournal.umm.ac.id/index.php/legality/article/view/18289.
[17] Yusgiantoro, Luky, Tri Bagus Prabowo, and Dedi Kristanto. 2024. ***The Structural Factors in Advancing CCS/CCUS Technology in Indonesia: A Comprehensive Analysis***. Scientific Contributions Oil and Gas 47 (2): 33–48.

harmonizing energy sector regulations to prevent institutional conflicts[18]. Accordingly, the technical stages of CCS in Indonesia may be regarded as a concrete reflection of the application of zorgvuldigheid, while at the same time supporting the realization of sustainable energy governance. The principle of Zorgvuldigheid or due care is one of the essential doctrines in administrative law, requiring that every governmental decision be made carefully, thoroughly, and based on adequate data and proper procedures. Utrecht highlights that this principle is intended to prevent arbitrary governmental actions, whereas Philipus M. Hadjon views it as a form of legal protection for citizens, ensuring that decisions are grounded on comprehensive facts and in-depth analysis[19]. In the context of CCS regulation, the principle of zorgvuldigheid is embodied in the legal requirements for geological characterization, environmental risk assessment, and the establishment of Monitoring, Measurement, and Verification (MMV) mechanisms, as set out in Presidential Regulation No. 14 of 2024 and Ministerial Regulations No. 2 of 2023 and 2024. These requirements confirm that CCS regulation is not solely normative but also integrates scientific and technical standards. This finding resonates with the analysis of Indah Dwi Qurbani, who underscores the necessity of prudence in the harmonization of energy and natural resources regulation to avoid inter-institutional conflicts and to ensure sustainable governance in Indonesia[20].

The technical stages of CCS are capture, transport, and storage was illustrate the principle of due care (zorgvuldigheid). The mandatory requirements of geological studies, safety standards, and MMV mechanisms, as stipulated under the Presidential Regulation and Ministerial Regulations, indicate that the regulatory framework not only sets normative obligations but also incorporates scientific and technical standards[21].

Transparency is also institutionalized through reporting, monitoring, and verification obligations, ensuring accountability of corporate entities to both the public and the government. This corresponds with the view of Muhtar Said et al. that transparency constitutes a crucial instrument in fostering public trust in governance[22]. Nevertheless, several structural challenges remain. First, heavy reliance on fossil fuels, particularly coal, continues to hinder renewable energy penetration[23]. Second, the high cost of CCS implementation has not been matched by adequate fiscal incentives or financial support[24]. Third, regional governments face limitations in technical expertise and institutional capacity to effectively perform supervisory functions.

The findings further reveal unresolved issues regarding ownership of captured and stored carbon. Neither the Presidential Regulation nor the Ministerial Regulations provide explicit provisions on ownership status. For legal certainty, a regulatory clarification is required affirming that the State retains ownership of stored carbon, while corporate entities may exercise limited economic rights through carbon trading mechanisms. This approach aligns with Article 33 of the 1945 Constitution, which affirms State sovereignty over natural resources. Accordingly, Indonesia's CCS regulatory framework serves not only as a formal legal foundation but also integrates administrative, technical, and environmental dimensions. It operates simultaneously as an instrument of energy transition, a mechanism for green economic development, and an expression of State accountability in pursuing the NZE 2060 target.

4. CONCLUSION

The findings indicate that climate change constitutes a multidimensional issue that affects environmental, economic, legal, and humanitarian aspects on a global scale. For Indonesia, its commitment to addressing these challenges is reflected in the ratification of the Paris Agreement through Law No. 16 of 2016, the establishment of the 2030 emission reduction targets, and the declaration of achieving Net Zero Emission (NZE) by 2060 or earlier. One of the strategic instruments adopted is the implementation of Carbon Capture and Storage (CCS) technology,

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[18] Indah Dwi Qurbani, ***Analysis of the Energy and Mineral Source Regulation in the Formulation of Job Creation Law (Omnibus Law)***, Airlangga Environmental Law Review 2, no. 2 (2020): 145–160, https://jurnal.fh.unila.ac.id/index.php/aelr/article/download/2117/1889.

[19] Philipus M. Hadjon. ***Perlindungan Hukum bagi Rakyat di Indonesia***. Surabaya: Bina Ilmu, 1987.

[20] Indah Dwi Qurbani. ***Analysis of the Energy and Mineral Source Regulation in the Formulation of Job Creation Law***." Advances in Social Science, Education and Humanities Research, vol. 570 (2021): 117–123.

[21] Yusgiantoro, Luky, Tri Bagus Prabowo, and Dedi Kristanto. 2024. ***The Structural Factors in Advancing CCS/CCUS Technology in Indonesia: A Comprehensive Analysis***. Scientific Contributions Oil and Gas 47 (2): 33–48.

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particularly within carbon-intensive sectors. The analysis demonstrates that CCS regulation under Minister of Energy and Mineral Resources Regulation No. 2 of 2023 and Presidential Regulation No. 14 of 2024 provides the essential legal foundation governing technical requirements, licensing, operational governance, and long-term monitoring mechanisms. These regulations simultaneously situate CCS not merely as a climate change mitigation instrument, but also as part of a green economy framework through carbon trading schemes. The Tangguh LNG CCS project represents the initial evidence of implementation, although its application remains limited in scale. Nevertheless, the effectiveness of CCS in Indonesia encounters three principal challenges. First, the high capital investment requirements and the lack of transportation and storage infrastructure. Second, legal uncertainty concerning the ownership status of captured and stored carbon, which must be harmonized with the principle of state control over natural resources as enshrined in Article 33 of the 1945 Constitution. Third, institutional weaknesses in supervision and in the Monitoring, Measurement, and Verification (MMV) process, which may create risks of leakage and environmental contamination in the future.

From the perspective of administrative law, the implementation of Carbon Capture and Storage (CCS) in Indonesia reflects the internalization of fundamental principles, particularly the principle of legality, the principle of due care (zorgvuldigheid), and the principle of transparency. The principle of legality ensures that all governmental policies and actions are grounded in a clear legal basis. The principle of due care (zorgvuldigheid) requires that every administrative decision related to the operation of CCS be made with precision, supported by scientific data, and attentive to potential environmental risks as well as public safety. Meanwhile, the principle of transparency constitutes an essential foundation to guarantee public accountability and to prevent potential inter-institutional conflicts in the implementation of CCS. Accordingly, the main conclusion of this research is that the success of CCS implementation in Indonesia depends not only on the availability of a legal framework but also on the consistency of policy, fiscal support and investment incentives, and the strengthening of institutional governance. If these three aspects are fulfilled, CCS could become a vital instrument in climate change mitigation strategies and contribute significantly to achieving the NZE 2060 target. Conversely, without strengthening these aspects, CCS risks becoming merely a symbolic project with limited impact on emission reduction.

Accordingly, Carbon Capture and Storage (CCS) must be positioned within the framework of environmental law development that is oriented toward intergenerational equity, legal certainty, and integration with the national energy transition agenda. This aligns with the notion that modern environmental law functions not only as an instrument of ecological protection but also as a means to realize sustainable development in a broader sense. The academic contribution of this research lies in providing an in-depth juridical analysis of the legal framework governing CCS in Indonesia, while simultaneously offering comprehensive regulatory reform recommendations to ensure legal certainty, environmental protection, and the sustainability of energy governance in support of achieving the Net Zero Emission (NZE) 2060 target.

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