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CLEAN COAL ENERGY: THE PERSPECTIVE OF ENVIRONMENTAL LAW ON STEAM POWER PLANTS IN INDONESIA

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ABSTRACT

The use of coal as a primary energy source in Indonesia has made a significant contribution to meeting the nation's electricity demand. However, coal utilization also leads to serious environmental impacts, such as greenhouse gas emissions and air pollution. Clean Coal Energy has emerged as a solution that is expected to reduce environmental impacts through the application of technologies, such as carbon capture and storage (CCS), which aim to capture and store CO2 produced during coal combustion. Nevertheless, the implementation of this technology must align with environmental regulations, both those outlined in international legal instruments and those applicable in Indonesia. This study aims to examine the concept and implementation of clean coal energy in Steam Power Plants (PLTU) in Indonesia, as well as to review environmental law perspectives related to this matter. The writing employs a juridical-normative method, with a legislative approach and a conceptual approach. The research is conducted by qualitatively examining secondary data, which includes primary legal materials and secondary legal materials. These data are then presented in a narrative text. The research findings indicate that although clean coal energy can be a temporary alternative in the energy transition, its implementation still faces significant challenges. These challenges include issues related to regulations, high investment costs, and the effectiveness of the technology in reducing environmental impacts. Therefore, more integrated policies between environmental protection and national energy policies are needed, so that this technology not only reduces carbon emissions but also supports long-term environmental sustainability.
Keyword: Clean Coal Energy, Environmental Law, Steam Power Plants

ABSTRAK

Penggunaan batu bara sebagai sumber energi utama di Indonesia telah memberikan kontribusi besar dalam pemenuhan kebutuhan listrik nasional. Namun, pemanfaatan batu bara juga menimbulkan dampak lingkungan yang serius, seperti emisi gas rumah kaca dan polusi udara. Clean Coal Energy hadir sebagai solusi yang diharapkan dapat mengurangi dampak lingkungan hidup melalui penerapan teknologi, seperti carbon capture and storage (CCS), yang bertujuan menangkap dan menyimpan CO2 yang dihasilkan selama pembakaran batu bara. Meski demikian, penerapan teknologi ini harus sejalan dengan regulasi lingkungan, baik yang dimuat dalam instrument Hukum Internasional, maupun regulasi yang berlaku di Indonesia. Penelitian ini bertujuan untuk mengkaji konsep dan penerapan clean coal energy dalam Pembangkit Listrik Tenaga Uap (PLTU) di Indonesia, serta menelaah perspektif Hukum Lingkungan terkait hal tersebut. Penulisan ini menggunakan metode yuridis-normatif, dengan pendekatan perundang-undangan dan pendekatan konseptual. Penelitian ini dilakukan dengan menelaah secara kualitatif data sekunder, yang terdiri dari bahan hukum primer dan bahan hukum sekunder. Data-data tersebut kemudian disajikan ke dalam teks yang bersifat naratif. Hasil penelitian menunjukkan bahwa meskipun clean coal energy dapat menjadi alternatif sementara dalam transisi energi, penerapannya masih menghadapi tantangan besar. Tantangan tersebut antara lain berkaitan

dengan aspek regulasi, biaya investasi yang tinggi, serta efektivitas teknologi dalam mengurangi dampak lingkungan. Oleh karena itu, diperlukan kebijakan yang lebih terintegrasi antara perlindungan lingkungan dan kebijakan energi nasional, sehingga teknologi ini tidak hanya mengurangi emisi karbon, tetapi juga mendukung keberlanjutan lingkungan dalam jangka panjang.
Kata Kunci: *Clean Coal Energy*, Hukum Lingkungan, PLTU.

1. Introduction

The state has the responsibility to provide a guarantee of a safe, peaceful, and prosperous life for all its people.[1] Indonesia as a sovereign country, is committed to ensuring a good life for its people, especially by providing a healthy and sustainable living environment. This This **commitment is** guaranteed in Article 28H Paragraph (1) of the 1945 Constitution of the Republic of Indonesia, which affirms that: "Everyone has the right to live a prosperous life **physically and mentally**, to have a good and healthy living environment, and to receive health services." Article 28H paragraph (1) of the 1945 Constitution of the Republic of Indonesia **serves as** a guarantee **from** the state **to provide** a good and healthy living environment **for** the Indonesian people.

Concrete efforts to achieve this goal can be seen in the state's initiatives to establish environmental regulations. Historically, this effort began with the issuance of Law Number 4 of 1982 concerning the Main Provisions of Environmental Management. This law highlights two key points: *First*, it provides general guidelines rather than detailed regulations; *Second*, it focuses solely on environmental management without regulating all aspects comprehensively.[2] However, this law was the first national environmental law in Indonesia. As understanding of environmental issues evolved, improvements were made through Law Number 23 of 1997 concerning Environmental Management. This law complemented the previous one by addressing previously unregulated aspects, such as environmental audits and the public's right to access information. Additionally, this law introduced legal enforcement measures, covering both material and corporate offenses.[3]

Furthermore, to strengthen legal certainty and ensure everyone's right to a healthy environment, as well as to protect the ecosystem holistically, a revision of Law Number 23 of 1997 was deemed necessary. As a result, on October 3, 2009, the government enacted Law Number 32 of 2009 concerning Environmental Protection and Management.passed Law Number 32 of 2009 concerning Environmental Protection and Management.[4] This law emphasizes preventive efforts in mitigating environmental impacts by strengthening supervisory and licensing mechanisms. If environmental pollution or damage occurs, repressive measures through consistent and effective law enforcement must be taken. This is reinforced by several legal provisions, including Administrative Law, Criminal Law, and Civil Law.[5]

Additionally, in terms of environmental dispute resolution, Civil Law provides mechanisms for both out-of-court and in-court settlements, including class action lawsuits, lawsuits by environmental organizations, and government-initiated legal actions. These provisions aim not only to deter violations but also to raise public and stakeholder awareness of the importance of environmental protection for sustainable development.

Based on the above discussion, it can be concluded that Law Number 32 of 2009 prioritizes the *ultimum remedium* principle, meaning criminal sanctions are applied as a last resort when administrative measures fail. This principle applies to specific environmental violations, such as breaches of wastewater quality standards, emissions, and other environmental disturbances. Over time, environmental regulations in Indonesia have continued to develop, including through Law Number 11 of 2020 concerning Cipta Kerja.

[1] Devi Yulida and Rina Talisa, "The Executory Authority of Constitutional Court Decisions in the 2024 Local Head Election," *Acta Law Journal* 3, no. 1 (December 2024): 25–36.

[2] Ketut Meta, "Perspektif Historis Dan Perandingan Pengaturan Masalah Lingkungan Hidup Di Indonesia," *Jurnal Cakrawala Hukum* 6, no. 1 (2015): 67–76.

[3] Takdir Rahmadi, *Hukum Lingkungan Di Indonesia* (Jakarta: Rajawali Pers, 2012).

[4] Rispalman, "Sejarah Perkembangan Hukum Lingkungan Di Indonesia," *Jurnal Dusturiah* 8, no. 2 (July 2018): 185–96.

[5] Muhammad Alrizky Ekiawan, "Pengelolaan Lingkungan Hidup Dalam Norma Hukum Indonesia," *Jurnal Rechten: Riset Hukum Dan Hak Asasi Manusia* 5, no. 2 (January 30, 2023): 34–42, https://doi.org/10.29123/jy.v13i3.345.

Alongside efforts to manage and protect the environment under Law Number 32 of 2009, Indonesia faces a significant dilemma: balancing energy demands with ecosystem sustainability. Rapid economic growth and increasing electricity demand have positioned the energy sector as a crucial element of national development. However, relying on coal as a primary energy source, while effective in electricity generation, has severe environmental consequences, including greenhouse gas emissions and air pollution.

The consumption of coal in Indonesia has been steadily increasing, from 177 million tons in 2022 to 213 million tons in 2023.[6] This growing demand for coal underscores the challenge of balancing energy security with environmental sustainability, particularly as coal combustion contributes to both air pollution and climate change. Thus, this trend highlights the urgent need for solutions that mitigate environmental impacts while meeting energy needs. [7]

To address these challenges, Indonesia must accelerate its transition toward cleaner and more sustainable energy sources. However, this transition is complex, requiring substantial investments, infrastructure readiness, and a shift in both industrial and societal mindsets. The Indonesian government has begun implementing policies to support energy diversification, as outlined in Presidential Regulation Number 22 of 2017 concerning the National Energy General Plan, which sets targets for increasing renewable energy in the national energy mix.[8] However, achieving these targets requires better integration between energy, environmental, and investment policies.

Therefore, the adoption of environmentally friendly technologies and energy efficiency measures will play a critical role in mitigating negative environmental impacts while ensuring sufficient energy supply. Furthermore, the increasing affordability and efficiency of renewable energy technologies can accelerate this transition. However, successfully shifting to sustainable energy depends heavily on strong collaboration among the government, industry stakeholders, and the community.

Additionally, this transition is crucial to meeting global commitments for carbon emission reduction, including through clean coal technology.[9] This technology aims to reduce pollution from coal-fired power plants and includes processes such as Carbon Capture and Storage (CCS), which captures and stores CO_2 emissions from coal combustion. Therefore, clean coal technology represents an important step in reducing the carbon footprint of Indonesia's energy sector.

Steam Power Plants play a vital role in meeting national energy demands. Therefore, implementing clean coal technology should be seriously considered to balance energy needs and environmental sustainability. Indonesia’s energy policies, as outlined in the Nationally Determined Contribution (NDC), focus on reducing carbon emissions and promoting renewable energy development.[10]

However, finding a balance between economic growth and environmental preservation remains a major challenge for clean coal implementation in Indonesia. While coal provides substantial economic benefits, its environmental impact—particularly on air quality and climate change—cannot be overlooked. The negative effects of coal usage include significant air pollution, the emission of harmful substances such as sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter, which contribute to respiratory issues, heart disease, and other health problems. Furthermore, coal combustion is one of the largest sources of CO_2 emissions, a key driver of global warming and climate change. Thus, policies must consider not only economic factors but also long-term environmental sustainability for future generations.

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[6] Firda Dwi Muliawati, “Pecah Rekor! Produksi Batu Bara RI Di 2023 Tembus 775 Juta Ton,” CNBC Indonesia, January 15, 2024.

[7] Andre Sapthu, "Electricity and Its Influence on Economic Growth in Maluku Province," Jurnal Cita Ekonomika 17, no. 2 (November 22, 2023): 199–207, https://doi.org/10.51125/citaekonomika.v17i2.11315.

[8] Grita Anindarini Widyaningsih, “Ulasan Peraturan Peraturan Presiden Nomor 22 Tahun 2017 Tentang Rencana Umum Energi Nasional” 4, no. 1 (2017), http://setkab.go.id/.

[9] Rinaldi Pahlevi et al., “Masa Depan Pemanfaatan Batubara Sebagai Sumber Energi Di Indonesia,” *Jurnal Energi Baru Dan Terbarukan* 5, no. 2 (July 31, 2024): 50–60, https://doi.org/10.14710/jebt.2024.22973.

[10] Sri Nurhayati Qodriyatun, "Green Energy and Emission Reduction Targets," Brief Info: A Brief Study of Actual and Strategic Issues 13, no. 6 (March 2021): 13–18.

Based on this context, the author finds it necessary to explore two key questions: *First*, what constitutes clean coal energy in Steam Power Plants? *Second*, how does Environmental Law perceive the implementation of clean coal energy?

Referring to these research questions, the author intends to explore two primary objectives. *First*, to define and explain clean coal energy in Steam Power Plants in Indonesia, providing a clear understanding of its concepts and technologies. *Second*, to analyze Environmental Law's perspective on clean coal energy implementation, focusing on its compliance with existing regulations and its impact on environmental sustainability in Indonesia. This study aims to contribute to a better understanding of the intersection between environmental law and sustainable energy technologies.

To ensure the novelty of this article, similar research works and their distinctions will be discussed. *First*, Endang Suarna's article, "*Perkembangan Batu Bara Bersih Berwawasan Lingkungan"*, examines clean coal technology to reduce emissions from coal utilization. While this article discusses general pollution-reducing technologies, the present study focuses specifically on the application of clean coal energy in Steam Power Plants in Indonesia and the legal perspective surrounding it.[11] *Second*, an article by Rinaldi Pahlevi et al., "*Masa Depan Pemanfaatan Batu Bara Sebagai Sumber Energi di Indonesia*", analyzes the projected role of coal in Indonesia's energy mix and potential shifts toward sustainable scenarios. While that study focuses on long-term policy and projections, this article prioritizes the legal perspective governing clean coal energy implementation in Steam Power Plants in Indonesia.[12]

Referring to the novelty that has already been described, this article will focus on two main points. *First*, it will thoroughly explain clean coal energy in Steam Power Plants, including its associated technologies. *Second*, it will examine the legal framework governing clean coal energy, assessing its alignment with environmental regulations and its impact on sustainability in Indonesia. Ultimately, this study seeks to enhance understanding of how clean coal energy aligns with environmental legal policies and contributes to national energy sustainability.

2. Method

Research is a scientific activity aimed at systematically and consistently analyzing and constructing information to answer a specific problem. The research method used in this study is the normative juridical method, which focuses on analyzing laws and regulations as well as employing a conceptual approach. Legal research through this approach examines all laws and regulations relevant to the legal issues under discussion, The conceptual approach involves analyzing and critically evaluating the implementation of laws while striving to balance legal practice with the formulation of ideal legal provisions. This research employs a descriptive-analytical specification. Meanwhile, the data collection method used is library research, which involves gathering legal materials and data relevant to the topic under study. To obtain comprehensive and accurate data, this research utilizes primary sources such as laws and court decisions. Additionally, secondary sources include literature, comprehensive analyses, and regulations related to clean coal energy in Steam Power Plants in Indonesia. The collected data is then analyzed descriptively and qualitatively and presented in narrative text.

3. Result and Discussion

a. Clean Coal Energy in Steam Power Plants

By 2030, the world's population is projected to grow by 1.3 billion people, reaching a total of 8.3 billion. Along with this, the global gross domestic product (GDP) is expected to double compared to 2011.[13] This

[11] Endang Suarna, " *Perkembangan Batu Bara Bersih Berwawasan Lingkungan*," Journal of Environmental Engineering 12, no. 1 (January 2011): 25–34.

[12] Pahlevi et al., "*Masa Depan Pemanfaatan Batu Bara Sebagai Sumber Energi di Indonesia*."

[13] Fadjar Djoko Santoso, "Clean Coal Technology: Inovasi Baru Kurangi Emisi Karbon," Pertamina, November 29, 2018.

growth will also lead to an increase in global energy consumption, which is estimated to rise by approximately 36% by 2030, with an average annual growth of 1.6%. Therefore, ensuring a sufficient and affordable energy supply is crucial to support sustainable economic growth.

Over the past few decades, the global energy sector has been predominantly reliant on fossil fuels, particularly coal. However, the environmental consequences, such as air pollution and greenhouse gas emissions, have driven efforts to explore alternative, more environmentally friendly energy sources.[14] In response to these challenges, clean coal technology has emerged as a solution to reduce the negative impacts of coal combustion. This technology enhances combustion efficiency and reduces pollutant emissions.

From the perspective of International Law instruments, clean coal aligns with the objectives set forth in the Paris Agreement and the Kyoto Protocol, which aim to reduce greenhouse gas emissions and limit global temperature rise to below 2°C above pre-industrial levels. The Paris Agreement encourages countries to gradually reduce their emissions, and clean coal, coupled with CCS (Carbon Capture and Storage) technology, can assist coal-dependent nations in meeting these targets. The Kyoto Protocol also introduced flexible mechanisms, such as the Clean Development Mechanism (CDM), which enables developing countries to adopt low-emission technologies with support from developed nations. While there is increasing pressure to reduce reliance on fossil fuels and transition to renewable energy, clean coal remains a viable transitional solution for countries still heavily dependent on coal.

Furthermore, when applied to Steam Power Plants, clean coal offers various benefits in terms of both environmental sustainability and energy efficiency. *First,* by utilizing carbon capture and storage (CCS), CO_2 emissions that would typically be released into the atmosphere can instead be captured and securely stored in underground geological formations, significantly reducing coal plants' contributions to global warming. Additionally, clean coal helps mitigate air pollution by decreasing emissions of sulfur dioxide (SO_2) and nitrogen oxides (NO_x), two pollutants that contribute to acid rain and health issues. *Second,* from an efficiency standpoint, clean coal technology enables power plants to generate more energy while consuming less fuel. This not only reduces coal consumption and waste but also lowers operating costs and extends the lifespan of coal reserves. This is particularly crucial for countries like Indonesia, which possess abundant coal reserves. With improved efficiency, clean coal can also enhance national energy security and reduce reliance on fuel imports.[15]

However, the implementation of clean coal technology is not without challenges. One of the primary obstacles is the high cost, especially for CCS technology, which requires substantial investments and entails significant operational expenses. Additionally, many countries still lack the necessary infrastructure for carbon storage and transportation, necessitating further investment to establish adequate facilities.

Overall, clean coal serves as an important transitional solution in the global effort to reduce emissions while still meeting energy demands, particularly in coal-dependent nations. Through technologies such as CCS, desulfurization, and denitrification, clean coal enables power plants to minimize their environmental footprint.[16] However, significant challenges persist, particularly in terms of cost and infrastructure limitations. A holistic approach is therefore essential, involving collaboration among governments, industry sectors, and research institutions to advance more cost-effective and efficient technological innovations. Additionally, integrating clean coal with renewable energy sources, such as biomass co-firing, could serve as a stepping stone toward a more sustainable energy transition. With technological advancements and well-supported policies, clean coal has the potential to help mitigate climate change impacts while still fulfilling the energy needs of coal-producing countries.

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[14] Kiki Apriliyanti and Darlin Rizki, "Kebijakan Energi Terbarukan: Studi Kasus Indonesia Dan Norwegia Dalam Pengelolaan Sumber Energi Berkelanjutan," *Jurnal Ilmu Pemerintahan Widya Praja* 49, no. 2 (2023): 186–209, https://doi.org/10.33701/jipwp.v49i2.36843246.

[15] Kementerian Energi dan Sumber Daya Mineral, "Clean Coal Technology Untuk PLTU Yang Ramah Lingkungan ," Kementerian Energi dan Sumber Daya Mineral, September 8, 2016.

[16] Arananda Dwi Putri, Nugroho Adi Sasongko, and Donny Yoesgiantoro, "Carbon Capture Storage Dan Carbon Capture Utilization Storage (CCS/CCUS) Sebagai Solusi Transisi Energi Fosil Di Indonesia," *PENDIPA Journal of Science Education* 8, no. 2 (June 21, 2024): 191–203, https://doi.org/10.33369/pendipa.8.2.191-203.

b. Legal Perspective on Environmental Law and Clean Coal Energy

The environment can simply be interpreted as a place for living things exist, grow, and develop. Therefore, its sustainability must be considered and maintained to prevent damage, as such damage could impact future generations**.** Furthermore, when discussing environmental damage, Takdir Rahmadi explains, the factors that cause environmental problems, namely:[17] *First,* the technological factor refers to progress that cannot be separated from the development of science. Technology helps humans manage natural resources to meet their needs and improve living standards. However, technology can also be a solution to mitigating its negative impacts, for example by applying circular economy principles that prioritize the reuse and recycling of natural resources, as well as the developing renewable energy source that is more environmentally friendly. *Second*, the increasing population growth leads to a greater demand for space and resources. While developed countries can address this challenge through technology and science, many developing countries still struggle with environmental management.

As a result, environmental damage worsens because the long-term impact is often neglected. *Third,* economic factors are among the main causes of natural resource exploitation. In pursuit of profit, many parties overuse natural resources without considering their future impact. This uncontrolled exploitation results in a decline in both the quality and quantity of natural resources, ultimately damaging the environment. Therefore, the concept of sustainable development serves as a solution to ensure that resource exploitation is conducted while maintaining ecological balance and the well-being of future generations. *Fourth,* political factors also play a role in environmental sustainability. Currently, the world's natural resources are depleting, while humans continue to depend on them for survival. If the demand for natural resources continues to rise without proper management, this could threaten human security, health, equality, and well-being. International policies such as carbon taxes and carbon trading mechanisms have been implemented in several countries to control resource exploitation and reduce greenhouse gas emissions. However, the effectiveness of these policies still faces various challenges, especially in their implementation in developing countries that still rely on fossil fuels.

Referring to the definitions and issues of environmental problems, legal regulations are needed to ensure environmental sustainability. Environmental Law, as a branch of law, governs the relationship between humans and their environment, aiming to protect and maintain natural resource sustainability and environmental quality.[18] Thus, Environmental Law encompasses a wide range of regulations focusing on pollution control, waste management, biodiversity conservation, and the regulation of natural resource usage.

In recent decades, Environmental Law has gained increasing global attention. This trend aligns with the growing concerns of the international community regarding worsening environmental damage, primarily caused by human activities such as deforestation, air pollution, and climate change resulting from fossil fuel combustion, including coal. These concerns underscore the urgent need to regulate and mitigate the negative impacts of human activities that pose environmental risks**.**[19]

One of the major consequences of these activities is the rise in greenhouse gas emissions, which contribute to global climate change. In response, countries worldwide are undertaking various efforts to address these issues. Through the Kyoto Protocol and the Paris Agreement, nations have committed to reducing carbon emissions and tackling the climate crisis. These two agreements serve as the global foundation for

[17] Arvin Asta Nugraha et al., "Hukum Untuk Mengatur Dan Melindungi Masyarakat" 7, no. 2 (2021): 283–98, https://doi.org/10.33541/tora.v12i3.1295.

[18] A'an Efendi, "Instrumen Hukum Lingkungan Sebagai Sarana Pencegahan Pencemaran Lingkungan," *Jurnal Supremasi* 6, no. 1 (March 10, 2016): 3, https://doi.org/10.35457/supremasi.v6i1.395.

[19] Amalia Diamantina and Devi Yulida, "Reinforcement of Green Constitution: Efforts for Manifesting Ecocracy in Indonesia," in *IOP Conference Series: Earth and Environmental Science*, vol. 1270 (Institute of Physics, 2023), 1–6, https://doi.org/10.1088/1755-1315/1270/1/012005.

mitigating climate change, emphasizing the necessity of transitioning to cleaner and more sustainable energy sources.[20]

The Paris Agreement aims to limit global temperature increases to below 2 degrees Celsius compared to pre-industrial levels, with an ideal target of no more than 1.5 degrees Celsius. Achieving this goal is crucial to reducing the risks associated with more severe climate change. To this end, each country must contribute through Nationally Determined Contributions (NDCs), which outline specific targets and strategies for reducing greenhouse gas emissions according to their respective capabilities. These NDCs must be updated regularly with increasingly ambitious targets. If implemented effectively through international cooperation, the Paris Agreement could significantly help mitigate climate change risks.[21]

However, in its implementation, various challenges arise, not only technical but also economic and social. Some countries struggle to meet their emission reduction targets due to technological and financial constraints. Therefore, international cooperation-including technology transfer and financial assistance from developed nation-is essential to ensuring a fair and equitable energy transition.

The above discussion highlights the responsibility of countries to reduce greenhouse gas emissions. One such effort involves the adoption of clean coal technology, which aims to minimize environmental pollution from coal use—a known major source of carbon emissions. The application of this technology is expected to make coal usage more environmentally friendly, reduce air pollution, and help combat global warming. However, in addition to high investment costs, another challenge lies in the lack of supportive regulations and insufficient infrastructure in many countries.

The application of clean coal technology is one of the important steps taken by Indonesia, as a country with abundant natural resources, especially coal. As a developing country with increasing energy needs, Indonesia faces a major challenge in balancing energy needs and efforts to reduce environmental impact. In recent years, Indonesia has begun to implement this technology, one of which is through a steam power plant project that integrates carbon capture and storage (CCS) systems.[22] The goal is to capture CO2 produced from coal-fired power plants and store it underground, thus preventing it from entering the atmosphere.

Furthermore, in the 2021-2030 General Plan for the Provision of Electricity, the government will continue to encourage the development of the electricity system with a focus on the use of new and renewable energy (NRE) and the application of environmentally friendly technology. This step is in line with the government's target to achieve Net Zero Emission (NZE) by 2060. The2021-2030 General Plan for the Provision of Electricity also affirms the government's commitment to reduce greenhouse gas emissions by 29% by 2030, which is part of the national strategy to reduce emissions, considering the electricity sector.

Some of the steps planned to reduce greenhouse gas emissions from the coal sector include: *First*, fuel switching, which is replacing coal with biomass as an energy source. *Second*, the use of biomass in power plants that still use coal (co-firing), where some of the coal is replaced with biomass in several existing and upcoming coal-fired power plants. *Third*, the application of low-carbon technology to improve the efficiency of power plants.

The various efforts made are actually in line with the ideals and mandates given by the 1945 NRI Constitution as the written constitution of Indonesia. This is contained in Article 28H of the 1945 Constitution of the Republic of Indonesia, in essence, stating that: a good and healthy environment is a human right of every Indonesian citizen. It is further affirmed in Article 33 Paragraph (3) of the 1945 Constitution of the Republic of Indonesia: The earth and water and the natural resources contained in it are quasi-controlled by the state and used for the greatest possible prosperity of the people". Thus, every exploration and exploitation.

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[20] Tadashi Matsumoto et al., "An Integrated Approach to the Paris Climate Agreement: The Role of Regions and Cities," 2019.

[21] Bagaskara, "Mengenal Apa Itu Paris Agreement Dan Implementasinya Di Indonesia," Mutu International, June 21, 2024.

[22] Ellen May, "Ada Clean Coal Technology, Apa Efeknya Ke Industri Batu Bara?," Detik Finance, February 1, 2017.

If examined more deeply, the 1945 NRI Constitution as Indonesia's written constitution has emphasized that **environmental management must be carried out with the principles of sustainability and intergenerational justice. This shows that economic development and the use of natural resources should not sacrifice the rights of future generations to enjoy a healthy and sustainable environment.** In addition, **the constitution also mandates a balance between economic, social, and ecological interests in every policy related to the environment. Thus, all forms of exploitation of natural resources must consider their long-term impact on ecosystems and communities.**

In Indonesia, for example, Law No. 32 of 2009 concerning Environmental Protection and Management is the legal basis that regulates environmental protection. This law requires any activity that has the potential to damage the environment to meet an environmental impact analysis (EIA). With this regulation, every project involving the use of coal, including those that apply Clean Coal technology, must meet strict environmental standards so as not to cause greater damage.

Furthermore, in the Indonesian constitution, the 1945 Constitution of the Republic of Indonesia also affirms the state's commitment to protecting the environment. Article 33 of the 1945 Constitution of the Republic of Indonesia, for example, stipulates that the earth, water, and natural resources contained in it are controlled by the state and used for the greatest possible prosperity of the people. This provides a foundation for the country to manage natural resources in a sustainable way, including through environmentally friendly energy policies. Therefore, although Clean Coal Energy technology can be considered a step to reduce the negative impact of coal burning, its application in Indonesia must be in line with the sustainability principles enshrined in the constitution and laws, as well as meet strict environmental standards.

Furthermore, in the Indonesian constitution, the 1945 Constitution of the Republic of Indonesia also affirms the state's commitment to protecting the environment. Article 33 of the 1945 Constitution of the Republic of Indonesia, for example, stipulates that the earth, water, and natural resources contained in it are controlled by the state and used for the greatest possible prosperity of the people. This provides a foundation for the country to manage natural resources in a sustainable way, including through environmentally friendly energy policies. Therefore, although Clean Coal Energy technology can be considered a step to reduce the negative impact of coal burning, its application in Indonesia must be in line with the sustainability principles enshrined in the constitution and laws, as well as meet strict environmental standards.

4. Conclusion

Environmental sustainability is a shared responsibility that must be preserved to ensure that future generations can continue to benefit from it. In response to the challenges of climate change and the growing demand for energy, clean coal technology can serve as a transitional solution for countries still dependent on coal. However, its implementation must be supported by clear regulations, such as Law No. 32 of 2009 on Environmental Protection and Management, as well as global commitments under the Paris Agreement. Finding a balance between utilizing natural resources and protecting the environment is essential to ensure that economic development can proceed sustainably without harming ecosystems.

To ensure a successful transition to cleaner energy, the government must strengthen environmental management policies and enforce strict oversight of clean coal technology implementation. This should include regular monitoring and accountability measures to ensure compliance with environmental standards. Additionally, investment in renewable energy technologies and innovation should be actively promoted to offer a more environmentally friendly alternative in the long term. Collaboration between the government and the industrial sector will be key to adopting cleaner energy solutions while maintaining economic growth and social well-being. By working together, a sustainable energy transition can be achieved without compromising the environment.

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