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ASSESSING THE LEGAL IMPLICATIONS OF ALLEGED FUEL BLENDING ON INDONESIA'S COMPLIANCE WITH THE PARIS AGREEMENT

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Abstract

This study examines the impact of PT Pertamina Niaga's alleged fuel mixing case on Indonesia's commitment to the Paris Agreement. The research analyzes how mixing higher octane fuels (RON 92) with lower octane fuels affects carbon emissions and contributes to environmental degradation. Through case study methodology comparing Indonesia's policies with successful implementations in Canada and the Philippines, the research reveals significant challenges in Indonesia's emission reduction efforts. The findings demonstrate that Indonesia faces obstacles in meeting its Nationally Determined Contribution targets due to heavy reliance on fossil fuels, inadequate investment in renewable energy infrastructure, and weak regulatory enforcement. The study highlights the ineffectiveness of the Paris Agreement's enforcement mechanisms and proposes solutions including expanding green finance policies, transitioning to clean energy, strengthening compliance mechanisms, and implementing carbon pricing strategies similar to the Carbon Border Adjustment Mechanism. This research contributes to understanding the intersection between corporate practices, environmental regulations, and international climate commitments in developing nations.

I. Introduction

In modern times, the world faces various environmental problems, ranging from pollution, greenhouse gas effects, damage to the ozone layer, and many more. This global climate change poses a significant environmental threat prompting the creation of the Paris Agreement. This agreement was adopted at the 21st Conference of Parties (COP) in Paris on December 12, 2015, under the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels and to make efforts to limit the increase to 1.5 degrees Celsius so that countries that ratify this agreement are expected to participate in reducing greenhouse gas emissions. (Huang & Zhai, 2021). Until today, the Paris Agreement has been ratified by 195 countries including Indonesia.

Indonesia ratified the Paris Agreement through *Undang-Undang Nomor 16 Tahun 2016*. This step was taken as a form of commitment to reduce greenhouse gas emissions and contribute to climate change mitigation and adaptation. Indonesia is committed to reducing greenhouse gas emissions following the First Nationally Prepared Contribution (NDC) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) in November 2016. The NDC serves as a guideline in implementing climate change mitigation efforts, with a target of reducing emissions by 2030 by 29 percent through its efforts and can increase to 41 percent with international efforts. (Suwatno, 2022). Greenhouse gases, especially carbon dioxide (CO_2), contribute significantly to the climate crisis, with the transportation sector being one of the main sources of emissions. One of the main aspects of the transportation sector itself is fuel. The combustion of gasoline in vehicles can produce various pollutants including CO_2 and CO. Recently, allegations of fuel distribution misconduct have been made against PT. Pertamina Niaga.

The alleged fuel mixture case by PT Pertamina Patra Niaga involved mixing RON 92 (Pertamax) fuel with lower octane fuel, such as RON 90 (Pertalite) and RON 88 (Premium). This practice took place during the period 2018-2023 and was carried out to reduce production costs, but the mixed product was still sold at a price equivalent to Pertamax (RON 92), which was more expensive. This method caused state losses estimated at IDR 193.7 trillion per year. This mixed fuel case has attracted public attention due to the potential violation of fuel quality standards. RON (Research Octane Number) is an indicator of the fuel's ability to withstand pressure before burning, with higher numbers

indicating better quality and friendlier to vehicle engines. (Iswanto, Sumarmi, W., Jakaria, R. B., & Tjahjanti, P. H., 2020). In this case, mixing fuels with different RONs can reduce product quality, and affect vehicle efficiency. Most importantly, this article will discuss the effect of this mixing on carbon emissions.

Fuels with higher octane ratings, such as RON 92, have a more complete combustion capability than fuels with lower octane ratings (Prakash, Wang, Janssen, Aradi, & Cracknell, 2017). When high-octane fuels are mixed with low-octane, the combustion quality decreases, thereby increasing emissions of incompletely burned exhaust gases, such as carbon monoxide (CO), hydrocarbons (HC), and particulates (Prasetiyo, Muhammad, Baihaqi, Abdillah, & Supraptiningsih, 2022). In addition, this fuel mixture can also produce higher pollutant emissions due to the instability of the combustion process in the engine. Pollutants such as nitrogen oxides (NOx) and carbon dioxide (CO2) tend to increase due to less efficient combustion (Winoko & Firmansyah, 2021). These impacts contribute to air pollution, increased greenhouse effects, and decreased air quality in urban environments. Incompletely burned hydrocarbon emissions can also form tropospheric ozone, which is harmful to human health and ecosystems.

The aim of writing this journal article is to discuss the impact of the mixed fuel case on pollutant emissions and its influence on Indonesia's commitment to complying with the Paris Agreement. Previously, there have been many studies related to the effect of gasoline on vehicle emission output. An example is a study conducted by Prasetiyo et al. which discussed the effect of RON value on gasoline fuel exhaust emissions (Prasetiyo, Muhammad, Baihaqi, Abdillah, & Supraptiningsih, 2022). In addition, there is a study conducted by Wiyoko and Firmansyah which added variations in the mixture of octane fuel values and gasoline engine speeds on exhaust emissions (Winoko & Firmansyah, 2021). From the various existing studies, no research has been found that discusses the case of illegally mixed oils and its impact on Indonesia's commitment to comply with the Paris Agreement. This is where this study emerged to discuss this matter.

II. Indonesia's Commitment to Paris Agreement

Indonesia has demonstrated its commitment to the Paris Agreement by establishing regulations governing the implementation of the agreement. One of the regulations that is the basis for Indonesia's commitment to the Paris Agreement is the *Undang-Undang Nomor 16 Tahun 2016 tentang Pengesahan Paris Agreement.* This law is a legal instrument that

officially ratifies the Paris Agreement to the United Nations Framework Convention on Climate Change or what is known as the Paris Agreement. This legislation was ratified on October 24, 2016, and came into effect the following day, October 25, 2016, under the authority of President Joko Widodo. This agreement commits Indonesia to engage in international initiatives aimed at restricting the rise in the global average temperature to below 2°C relative to pre-industrial levels, with the aspiration of limiting the increase to below 1.5°C. The main purpose of this ratification is to protect the environment, ensure sustainable development, and increase the country's resilience to the impacts of climate change.

Indonesia's engagement in the Paris Agreement is consistent with Article 28H(1) of the 1945 Constitution of the Republic of Indonesia. This article articulates that "Everyone has the right to live in physical and spiritual prosperity, to have a place to live, and to enjoy a good and healthy environment, as well as the right to access health services." This provision underscores the relationship between the Paris Agreement and the Indonesian Constitution, whereby Indonesia's commitment to reducing greenhouse gas emissions supports the promotion of a healthier environment for its citizens (Baroleh, Massie, & Lengkong, 2023). In alignment with the obligations established under the Paris Agreement, Indonesia has pledged to achieve a reduction in greenhouse gas emissions of 29% by 2030 through domestic efforts, and up to 41% with international assistance. This commitment is articulated in Indonesia's Nationally Determined Contribution (NDC), which encompasses the forestry, energy, transportation, industrial, agricultural, and waste management sectors. The proposed mitigation strategies aim to decrease emissions via various policies, including the advancement of renewable energy, enhancements in energy efficiency, sustainable forest management practices, and the integration of green technology within industrial processes. Moreover, Indonesia is equally dedicated to adapting to climate change, with particular emphasis on bolstering the resilience of coastal communities, establishing early warning systems for disasters, and safeguarding ecosystems that are susceptible to the adverse effects of climate change.

With regard to transparency and monitoring, Indonesia is obligated to provide periodic reports detailing its progress in the implementation of the Paris Agreement, particularly in the areas of greenhouse gas emission reductions and the efficacy of adaptation strategies. To ensure accountability, Indonesia has established a Monitoring, Reporting, and

Verification (MRV) mechanism that aligns with international standards. Furthermore, the government has enacted supporting policies, such as *Peraturan Presiden Nomor 98 Tahun 2021 tentang Penyelenggaraan Nilai Ekonomi Karbon untuk Pencapaian Target Kontribusi yang Ditetapkan Secara Nasional dan Pengendalian Emisi Gas Rumah Kaca dalam Pembangunan Nasional*, which promotes carbon trading mechanisms and offers incentives to industries that foster emission reductions. However, despite Indonesia's efforts to incorporate the Paris Agreement into its existing legal framework, various challenges remain that impede the country's commitment to this accord. The subsequent sections will examine these challenges and provide a comparative analysis of case studies from other countries concerning Indonesia's commitments.

A. Challenges of Meeting the Commitments in the Paris Agreement

The Paris Agreement is a legally binding international treaty addressing climate change, adopted by 196 Parties at the UN Climate Change Conference (COP21) held in Paris, France, in December 2015, and subsequently entered into force on November 4, 2016. This agreement represents a collective effort by nations to combat climate change on a global scale. The contemporary issues of climate change and global warming warrant significant attention, as they pose threats not only to the environment but also to human existence. If global warming persists, resulting in rising temperatures, it may lead to the melting of polar ice caps, consequently elevating sea levels and potentially submerge low-lying regions. This concern prompted the convening of the Paris Agreement, where participating nations committed to transitioning from fossil fuels to more environmentally sustainable energy sources (Aprilianto & Arifianto, 2021).

As a signatory to the 2015 Paris Agreement, Indonesia is obligated to uphold the commitments articulated within the treaty, particularly regarding carbon emission reductions. The reduction of carbon emissions is one of the important targets regulated in the Paris Agreement, which aims to limit the increase in global temperatures by regulating greenhouse gas emissions, including carbon dioxide, methane, and nitrogen oxides. However, Indonesia confronts significant challenges in achieving its commitments under the Paris Agreement, especially in terms of emission reductions. Indonesia remains heavily reliant on fossil fuels for its energy and transportation needs, presenting a significant obstacle to the reduction of greenhouse gas emissions. This

dependence is deeply embedded in the nation's energy infrastructure and economic framework. Historically, fossil fuels such as oil, coal, and natural gas—have dominated Indonesia's energy consumption, resulting in considerable carbon dioxide emissions. In Indonesia, fossil fuels have typically been more affordable and dependable than renewable energy sources (Wong & Dewayanti, 2024). Given the long-standing integration of fossil fuels into the nation's energy landscape, envisioning change is challenging, particularly as this reliance has developed over decades, influenced by political interests. This dependence is particularly pronounced in electricity generation, transportation, and industrial processes, all of which contribute to substantial greenhouse gas emissions (Rahman, Richards, Paul, & David, 2023). The economic advantages associated with fossil fuel production further reinforce their dominance in the energy sector. Consequently, the decarbonization of Indonesia's energy system is a complex undertaking, complicated by established industries and socio-political challenges that impede the transition to a more sustainable energy framework.

Between 2016 and 2022, Indonesia’s energy sector generated annual revenues ranging from 45 to 143 trillion Rupiah, with coal exports positioning the country as one of the world’s largest thermal coal exporters (Government, 2023). In 2021, coal production not only satisfied domestic demand but also accounted for 71% of exported commodities. This economic reliance creates a challenging environment for reducing fossil fuel consumption. Coal’s significant earnings and export volume make it a pillar of Indonesia’s economy, which complicates attempts toward a switch to renewable energy sources. Implementation of regulations meant to lower greenhouse gas emissions and support sustainable energy sources is seriously hampered by this economic reliance.

Given these challenges, the shift toward a low-carbon economy in Indonesia necessitates significant advancements in infrastructure and technology. However, inadequate investment remains a considerable obstacle. This transition requires substantial improvements in both areas, emphasizing the need for investment and innovation. A critical focus is the development of renewable energy infrastructure. Despite Indonesia's ambitious objectives, investments in renewable energy amounted to only USD 3 billion from 2015 to 2021, which is insufficient to achieve the nation's net-zero emissions target by 2060. Additionally, the establishment of biofuel

infrastructure offers both opportunities and challenges in fulfilling the commitments outlined in the Paris Agreement. Indonesia's B30 program, which mandates a 30% biodiesel content in diesel fuel, positions the country as a potential leader in biodiesel production; however, its success relies on the availability of adequate infrastructure and technology to facilitate large-scale biofuel production and distribution. Addressing these infrastructure and technology gaps requires coordinated efforts among the government, private sector, and international partners. Implementing policies that offer incentives for investment in renewable energy and biofuels is essential.

Moreover, achieving Indonesia's net-zero emissions targets under the Paris Agreement requires coordination and governance across multiple levels of government and sectors. This requirement adds another layer of complexity to an already intricate transition process. Several limitations hinder the practical achievement of these goals, including incompatible regulations, a decentralized political framework that impedes local government implementation of central policies, a lack of synergy, and overlapping policies among relevant institutions and ministries (Hastuti, 2024). These regulatory discrepancies may lead to fragmented efforts and diminished policy effectiveness. Consequently, tailored approaches that take local contexts into account are essential for developing effective mitigation and adaptation strategies.

B. Case Study

Indonesia is not alone in its commitment to mitigating climate change. Numerous countries around the world are actively working to reduce their greenhouse gas emissions under the Paris Agreement. Canada, a signatory to the accord, has also confronted the challenge of significant carbon dioxide emissions.

According to the Emissions Database for Global Atmospheric Research, maintained by the European Commission, Canada consistently ranks among the world's top emitters of carbon dioxide. In 2022, Canada contributed 563.54 million metric tons of CO2, placing it 11th globally and second in North America..

Table 1. Carbon dioxide emissions of the most polluting countries worldwide in 2021

Number	Country	Carbon Dioxide Emissions Contribution (in million metric tons)
1	China	12466.32

2	United States	4752.08
3	India	2648.78
4	Russia	1942.54
5	Japan	1084.69
6	Iran	710.83
7	Germany	665.88
8	South Korea	626.80
9	Indonesia	602.59
10	Saudi Arabia	586.40
11	Canada	563.54

Source: https://edgar.jrc.ec.europa.eu/report_2022

In response to these emissions levels, the Canadian government has implemented measures to align with its Nationally Determined Contribution (NDC) target of reducing emissions by 40-45% below 2005 levels by 2030 (Government, Greenhouse Gas Emissions Canadian Environmental Sustainability Indicators, 2024). One of the key strategies in Canada's emissions reduction plan involves the mandated use of biofuels. The Renewable Fuel Regulation (RFR), implemented in 2010, requires a 5% blend of renewable fuel in gasoline.

Image 1. Gasoline biofuel blending policies in Canada

Region	2010	2011 to 2019	2020	2021	2022	2023
British Columbia	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Alberta	-	5.0%	5.0%	5.0%	5.0%	5.0%
Saskatchewan	7.5%	7.5%	7.5%	7.5%	7.5%	7.5%
Manitoba	8.5%	8.5%	8.5%	9.25%	10%	10%
Ontario	5.0%	5.0%	10%	10%	10%	10%
Québec	-	-	-	-	-	10%
Canada	-	5.0%	5.0%	5.0%	5.0%	5%

Source: Navius Research

Since Canada operates as a federation, individual provinces have different levels of renewable fuel adoption. Provinces like Quebec have begun complying with the

RFR in recent years. Overall, there is a steady increase in the percentage of ethanol blended into gasoline across the country.

The Canadian government demonstrates a strong commitment to its regulations, ensuring an equitable distribution of renewable fuel usage across all provinces. These policies have proven effective in reducing greenhouse gas (GHG) emissions. From 2005 to 2022, Canada's GHG emissions have declined by 7.1%, equivalent to a reduction of 54 million tons of carbon dioxide (Government, Greenhouse Gas Emissions Canadian Environmental Sustainability Indicators, 2024). These reductions underscore the impact of renewable fuel adoption on Canada's progress toward its NDC goals and the Paris Agreement. The consumption of renewable fuels in Canada is consistently rising. Between 2021 and 2022, renewable fuel consumption increased by 20%, followed by a further 25% increase in 2022-2023. This trend signifies the effectiveness of the Renewable Fuel Regulation. By promoting the use of renewable fuels over conventional fuels, the Canadian government is gradually reducing emissions from one of the largest contributing sectors. The success of Canada's renewable fuel program serves as a valuable model for other nations seeking to address climate change through sustainable energy solutions.

In Canada, the transportation sector is the second largest source of greenhouse gas emissions, following only the oil and gas industry. The most prevalent vehicle types are multi-purpose vehicles and cars, accounting for 91.6% of registered vehicles. These vehicles predominantly rely on gasoline and diesel fuels. The Canadian government's Renewable Fuel Regulation (RFR), implemented in 2010, mandates a 5% blend of renewable fuel, primarily ethanol, in gasoline. This regulation, similar to the Pertamax Green 95 program in Indonesia, promotes the use of cleaner-burning fuels. Data collected by Navius Research reveals the significant environmental benefits of this policy. In 2022 and 2023, the use of ethanol-blended gasoline resulted in a 55% reduction in greenhouse gas emissions compared to standard gasoline, while ethanol-blended diesel fuel achieved an 87% reduction compared to conventional diesel. These reductions translated into an estimated avoidance of 8.4 MtCO2e/yr in 2022 and 11.4 MtCO2e/yr in 2023 (Wolinetz & Harrison, 2024).

The Philippines provides another example of a country actively reducing transportation sector emissions. In 2009, the Philippine government mandated a 5%

blend of ethanol in gasoline, making it the first Southeast Asian country to implement such a policy (Government, Biofuel Annual Report, 2023). Since then, the ethanol blend has been increased to 10% and further plans are underway to introduce E15 (15% ethanol) and E20 (20%) blends. The Philippines has shown significant progress in decreasing greenhouse gas emissions through its ethanol blending program. The Department of Energy and the Energy Policy and Planning Bureau actively monitor the program's impact, reporting a reduction of over 810,600 tons of CO2 equivalent in 2023.

Table 2. Green House Gas Avoidance Data

Year	Bioethanol (KTCO2e)	Biodiesel (KTCO2e)
2016	499.59	551.98
2017	516.61	516.05
2018	668.81	520.39
2019	782.92	551.53
2020	609.38	406.75
2021	788.81	484.74
2022	810.60	512.53
2023 Quarter 1	206.85	140.04

However, the Philippines has also encountered challenges, particularly in securing a sufficient supply of domestically produced ethanol. The country relies heavily on ethanol imports, mainly from the United States, due to limitations in local production availability (Government, Biofuel Annual Report, 2023).

While Canada and the Philippines have demonstrated success in implementing renewable fuel mandates, Indonesia faces significant hurdles in promoting ethanol blending. Currently, Pertamina, the state-owned oil and gas company, does not have a mandatory blending requirement for gasoline and biodiesel products. While Pertamax Green 95, a gasoline blend with ethanol, is available, its distribution remains limited to specific areas.

Furthermore, the continued subsidization of Pertalite, a lower-grade gasoline with a lower RON (Research Octane Number) and a greater environmental impact, presents

a significant barrier to the widespread adoption of ethanol-blended fuels. Pertalite is the most consumed gasoline in Indonesia, representing nearly 80% of total gasoline consumption (Government, Pertalite, BBM yang Paling Banyak Dikonsumsi Masyarakat, 2022). These factors highlight the challenges Indonesia faces in achieving its NDC targets, which include a 31.89% reduction in emissions through domestic efforts and a 43.20% reduction with international support (Government, Enhanced NDC: Komitmen Indonesia untuk Makin Berkontribusi dalam Menjaga Suhu Global, 2022).

1 **The Legal Implications of the Paris Agreement**

Indonesia's commitment to addressing climate change is evident in its ratification of the Paris Agreement in April 2016, signed by Dr. Siti Nurbaya, Minister of Environment and Forestry. However, the case of Pertamina, Indonesia's state-owned oil and gas company, highlights the complexities and challenges inherent in enforcing global climate agreements like the Paris Agreement. The Paris Agreement aims to foster international cooperation to reduce greenhouse gas emissions and mitigate the effects of climate change. It outlines commitments, targets, and financial support mechanisms to achieve these goals. However, the agreement's lack of a robust enforcement mechanism has proven a significant hurdle in achieving its objectives.

Article 4, point 2 of the Paris Agreement mandates that each signatory country "prepare, communicate and maintain successive nationally determined contributions that it intends to achieve." Furthermore, Article 4, point 9 requires countries to submit their Nationally Determined Contributions (NDCs) and report on their progress every five years.

While the Paris Agreement emphasizes the importance of these commitments, it lacks clear consequences for non-compliance. If a country fails to submit its NDC or meet its targets, the existing enforcement mechanisms are limited. The committee responsible for overseeing the agreement can only set new deadlines for submission. This lack of enforcement creates a potential for non-compliance among signatory states, as the absence of significant penalties can incentivize inaction (Adriansyah, Siswandi, & Mulyana, 2023). The reliance on voluntary commitments, as outlined in Article 4, point 2, without accompanying penalties,

can weaken the agreement's overall effectiveness.

The absence of legally binding emissions reduction targets is partly due to political realities; as veteran climate analyst Alden Meyer noted, the Obama administration recognized the difficulty of securing Senate approval for a legally binding agreement given the political polarization surrounding climate change (Borenstein, 2025). The Agreement's non-punitive structure reflects a belief that norms and expectations can be more effective than legally binding requirements, which can paradoxically lead to weaker action as countries may understate their targets to avoid legal liability. This is exemplified by China, whose climate targets and policies are rated "Highly Insufficient" by the Climate Action Tracker (CAT), indicating inconsistency with the 1.5°C temperature limit and a projected plateau of high emissions. China's NDC and policies are deemed "insufficient" compared to its fair share, yet international criticism remains limited (Climate Action Tracker, 2024). Nations are hesitant to publicly criticize China, fearing reciprocal attacks and potential repercussions in areas such as trade or diplomatic relations. Furthermore, poorer nations may be reluctant to challenge a major economic power on whom they depend for significant financial and military assistance. Many climate experts worry that the lack of penalties for non-compliance will hinder swift action and that developed countries will continue to shirk their responsibility to fund climate action in developing nations (Maclellan, 2022).

Indonesia, as a developing nation, relies on financial support from developed countries, as stipulated in Article 9, point 1 of the Paris Agreement. However, the only potential consequence Indonesia faces for non-compliance is a reduction in financial aid from developed countries. This consequence lacks the necessary weight to incentivize significant action, particularly since there are no financial penalties associated with failing to meet NDC targets. The lack of a legally binding enforcement mechanism has created an opportunity for irresponsible actors to prioritize economic interests over environmental sustainability. This has hindered government efforts to reduce greenhouse gas emissions and prevent the worsening effects of climate change.

2 **Solutions**

According to *Peraturan Presiden Nomor 98 Tahun 2021,* which corresponds

to Article 6 of the Paris Agreement, Indonesia is committed to implementing Carbon Economic Value (NEK) to achieve its Nationally Determined Contribution (NDC) targets and control greenhouse gas (GHG) emissions in national development. Indonesia aims for a 31.89% reduction in emissions by 2030, demonstrating high ambition in achieving NDC goals and supporting a sustainable energy transition.

Indonesia's commitment to addressing climate change is evident through its signing of the Paris Agreement on April 22, 2016, and its ratification on October 31, 2016. In addition to ratifying this international agreement, Indonesia has also issued various policies in the form of legislation, such as Peraturan *Presiden Nomor 61 Tahun 2011*, which sets a target for reducing greenhouse gas emissions by 26% independently and 41% with international support by 2020. Through *Peraturan Presiden Nomor 71 Tahun 2011*, Indonesia committed to conducting a greenhouse gas inventory, while Presidential Regulation No. 98 of 2021 emphasizes the government's responsibility to reduce greenhouse gas emissions to limit global temperature rise (Iqbal & Ruhaeni, 2022).

Before exploring potential solutions, it is crucial to acknowledge the significantly lower cost of fossil fuels, especially coal, compared to renewable energy sources. The sustained affordability of fossil energy in this region, facilitated by government subsidies, has created a strong dependency on fossil fuels. This economic advantage underscores the preference for fossil fuels, particularly in low- and middle-income countries, where high energy costs pose a substantial financial burden and impede social welfare (Zaky, 2024).

One of the steps that Indonesia could take is to expand green finance policies by developing solid green finance regulations, such as the Paris Agreement, the Kyoto Protocol, and the United Nations Sustainable Development Goals (SDGs), to strengthen its commitment to climate action. By establishing a Green Finance Roadmap in line with Article 2.1(c) of the Paris Agreement, which mandates financial flows to support low-carbon development, Indonesia could provide clear policies regarding green bonds, carbon pricing, and ESG (Environmental, Social, and Governance) investment standards. To ensure compliance with global climate finance mechanisms, it requires climate risk disclosures for financial institutions,

in accordance with the guidelines of the Task Force on Climate-related Financial Disclosures (TCFD) and the International Sustainability Standards Board (ISSB). Expanding carbon market regulations by adopting best practices from the European Union Emissions Trading System (EU ETS) and strengthening its carbon tax policies under the Carbon Pricing Leadership Coalition (CPLC) of the World Bank will also help regulate emissions effectively (Sundarrajan & Vivek, 2016).

Additionally, the standards for issuing green bonds should align with the Green Bond Principles from the International Capital Market Association (ICMA) to attract international investors and prevent greenwashing practices. Strengthening bilateral and multilateral cooperation through climate finance agreements with the Green Climate Fund (GCF), the Asian Development Bank (ADB), and the World Bank Climate Investment Funds (CIF) will also provide funding for Indonesia's renewable energy and climate resilience projects. By integrating these international legal standards into its financial system, Indonesia can build a globally recognized green finance framework, ensuring compliance, attracting investment, and accelerating its transition to a low-carbon economy (Sundarrajan & Vivek, 2016).

Another solution is for Indonesia to transition to clean energy by increasing the capacity of renewable energy sources such as solar, wind, and hydro, and encouraging investment in green energy through tax incentives and subsidies. Additionally, decarbonizing the industrial and transportation sectors is crucial through the implementation of low-carbon technologies, accelerating vehicle electrification, and enhancing environmentally friendly public transportation. Energy efficiency should also be improved through incentives for energy-saving technologies and energy demand management to reduce excessive consumption. The implementation of an effective carbon trading system under *Peraturan Presiden Nomor 98 Tahun 2021* also needs to be optimized with a more transparent and competitive carbon pricing mechanism. Stricter regulations and policies, including higher emission standards and better coordination between central and regional governments, are also key to emission reduction. Furthermore, financial support and technology transfer from developed countries should be

maximized to accelerate the adoption of low-carbon solutions across various sectors. With these measures, Indonesia can accelerate its transition to a low-carbon economy and achieve its emission reduction targets in line with international commitments (Lamb, Grubb, Diluiso, & Minx, 2022).

The principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) is one of the main normative foundations in the Paris Agreement, which emphasizes that all countries have a collective responsibility in addressing climate change, but with obligations adjusted according to their respective capacities and levels of development. This principle provides space for developing countries, such as Indonesia, to set emission reduction targets flexibly through Nationally Determined Contributions (NDCs). Therefore, the measures that have been discussed previously need to be supported by an approach that is not only normative but also operational to ensure the successful implementation of this principle within the framework of the Paris Agreement. In this case, there are three crucial pillars of solutions to encourage the compliance of party countries, including Indonesia, with global climate commitments. First, it is necessary to strengthen the compliance mechanism as regulated in Article 15 of the Paris Agreement.

Although it is facilitative and non-punitive, this mechanism needs to have its mandate expanded so that it can provide more concrete recommendations to countries experiencing non-compliance, as well as bridge the need for technical support and capacity building for developing countries. The compliance committee must have stronger authority to monitor the implementation of national policies and provide systemic encouragement for countries to stay on track to achieve emission targets. Second, the aspects of transparency and reporting play an important role in building accountability and legitimacy of climate policies. In accordance with Articles 4 and 13 of the Paris Agreement, party countries are required to periodically submit informatioregarding mitigation steps, adaptation, as well as financial and technical support. In the context of Indonesia, enhancing a more standardized and integrated emission reporting system will strengthen international trust and open access to foreign funding and low-carbon technologies. Consistent transparency also allows evaluation of the effectiveness

of *Peraturan Presiden Nomor 98 Tahun 2021*, particularly in the development of the carbon market and clean energy regulations. Third, the dimension of reputation and social sanctions is a strategic instrument in encouraging state compliance. In contemporary global governance, a country's reputation becomes an important diplomatic asset, and non-compliance with international agreements such as the Paris Agreement can weaken Indonesia's bargaining position and affect its credibility in global climate forums. On the other hand, consistent and measurable commitments will strengthen Indonesia's position as a leader among developing countries in climate action. Therefore, maintaining openness, policy consistency, and real implementation on the ground becomes key to preserving a positive track record and strengthening compliance with international climate commitments (Adriansyah, Siswandi, & Mulyana, 2023).

CBAM stands for Carbon Border Adjustment Mechanism, which is a trade policy instrument that has been implemented by the European Union to support the target of carbon neutrality by 2050. This mechanism is designed to reduce the risk of carbon leakage, and the main objective of this principle is to create fairness in global climate change mitigation efforts, as well as to maintain the competitiveness of domestic industries in the European Union that have been subject to emission costs through the EU Emissions Trading System (EU ETS), which is the European Union's internal carbon trading system that serves as the foundation for the implementation of CBAM. This system sets domestic carbon prices by selling carbon allowances to domestic producers. Indonesia, especially in addressing environmental issues involving large companies such as Pertamina. CBAM emphasizes the importance of transparency in reporting the carbon emissions of each exported product, which can serve as an example for Indonesia to build a standardized and digital-based carbon reporting system.

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subject to emission costs through the EU Emissions Trading System (EU ETS), which is the European Union's internal carbon trading system that serves as the foundation for the implementation of CBAM. This system sets domestic carbon prices by selling carbon allowances to domestic producers. Indonesia, especially in addressing environmental issues involving large companies such as Pertamina. CBAM emphasizes the importance of transparency in reporting the carbon emissions of each exported product, which can serve as an example for Indonesia to build a standardized and digital-based carbon reporting system. With this system, companies such as Pertamina can be encouraged to take greater responsibility for the emissions they produce, while also increasing public and international investor confidence in Indonesia's climate commitments. In addition, the CBAM concept of directing revenue from carbon tariffs to support the energy transition in developing countries can also be applied in Indonesia through the establishment of a National Energy Transition Fund. This fund can come from state-owned enterprise dividends, environmental fines, or carbon taxes, and be used to support the development of renewable energy and energy efficiency in communities. Furthermore, the application of shadow pricing or the valuation of the social cost of carbon emissions can serve as a basis in investment decision-making by large companies, so that environmental impact becomes a main consideration in business policy. Through these measures, Indonesia can strengthen its tangible emission control efforts, while also adapting to developments in global climate policy. (Perdana & Vielle, 2022).

Having examined potential solutions for Indonesia, a broader consideration of international approaches to climate action is warranted. On a collective level, the Paris Agreement could more effectively leverage the polluter-pays principle. This principle, which dictates that higher-emitting nations should bear a greater share of climate policy costs, functions not only as a liability and compensation mechanism but also as an incentive for emissions reduction. The 1992 Rio Declaration, for example, explicitly advocated for the application of this principle in waste management, stating that waste generators should bear the full cost of environmentally sound disposal. Similarly, within the context of the Paris Agreement, financial penalties could be imposed against nations failing to meet

their Nationally Determined Contributions (NDCs), thereby discouraging non-compliance.

Further strengthening international accountability, mechanisms such as targeted embargos could be implemented. The European Union's planned withdrawal of preferential trade access for developing countries that do not meet climate action standards, effective in 2024, exemplifies this approach. The growing recognition of the Paris Agreement's obligations by international courts further underscores the potential for legal recourse. The implementation of such clear and substantial penalties would significantly deter non-compliance, fostering greater adherence to the agreement's goals among all participating nations.

III. Conclusion

The case of Pertamina underscores the complex interplay between economic development and environmental sustainability, highlighting the critical need for enhanced transparency and accountability in emissions reporting. As global climate commitments intensify, the consistent and accurate disclosure of emission data is essential to fostering trust, both domestically and internationally, and ensuring the legitimacy of climate policies. To this end, Indonesia must implement standardized and integrated reporting systems that align with international best practices. Such measures would not only bolster credibility but also enhance the country's ability to attract foreign investment, secure climate financing, and gain access to cutting-edge low-carbon technologies.

In shaping its climate policies, Indonesia can draw valuable lessons from global examples. Canada’s renewable fuel program illustrates how well-structured policies can drive the transition toward cleaner energy sources, while the Philippines' ethanol blending initiative, despite its challenges in securing a stable domestic ethanol supply, offers insights into the practical hurdles and opportunities in promoting biofuels. By analyzing and adapting these strategies to its national context, Indonesia can accelerate its progress toward a low-carbon future while mitigating potential economic and logistical constraints.

Beyond national efforts, the broader challenge of global climate governance remains a significant concern. The Paris Agreement, while a landmark accord in international climate diplomacy, lacks enforcement mechanisms, relying primarily on voluntary commitments. This absence of binding consequences allows certain actors to prioritize short-term economic gains over long-term environmental responsibilities. The agreement’s non-

punitive nature was a strategic decision, designed to ensure broad participation in a politically fragmented global landscape. However, with the escalating severity of climate change, this approach is no longer sufficient.

Given the urgency of the climate crisis, the international community must consider evolving the Paris Agreement to incorporate stronger compliance mechanisms. One potential step forward is the implementation of a structured system of consequences for non-compliance, such as the application of the polluter-pays principle. By holding nations and corporations accountable for their environmental impact, this framework would reinforce the credibility of climate commitments and create tangible incentives for emission reductions. Strengthening enforcement provisions within the Paris Agreement would mark a critical shift from voluntary pledges to a more effective, action-driven framework, ensuring that global climate goals are met and that future generations inherit a more sustainable planet.

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