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Optimizing Carbon Taxation from the Perspective of Tax Law in Indonesia

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Abstract. *Indonesia, as one of the world's largest coal producers, faces significant challenges related to the increase of greenhouse gas emissions, particularly methane (CH_4), which has a greater global warming potential than carbon dioxide (CO_2). This study aims to analyze the legal framework for the implementation of a carbon tax in Indonesia as well as the potential imposition of a carbon tax on methane emissions from the coal mining sector. The method used is normative juridical research, employing a statutory approach and literature review. The results indicate that although the carbon tax has been regulated under Law Number 7 of 2021 concerning the Harmonization of Tax Regulations, its implementation still faces obstacles, including the absence of technical regulations, limited emission measurement systems, and unclear mechanisms for allocating carbon tax revenue. Therefore, there is a need to strengthen regulations and emission measurement systems so that the carbon tax can function effectively as a fiscal instrument to control greenhouse gas emissions in Indonesia.*
Keywords: *Carbon taxation, Greenhouse gas, Revenue, Regulation, Emission*

1. BACKGROUND

Indonesia plays a crucial role in the global energy market as one of the world's largest coal producers. In 2023, Indonesia solidified its position as the third-largest coal producer globally, following China and India. According to data from Minerba One Data Indonesia (MODI), the industry recorded its highest output in the past eight years, with production reaching 770.80 million tons—exceeding the national target by 110.99%. However, this surge in production has brought about serious environmental consequences, particularly with regard to the increase in greenhouse gas (GHG) emissions in the form of methane (CH_4).

Methane is the second most potent greenhouse gas after carbon dioxide (CO_2), contributing to 30% of global warming since the pre-industrial era. Although its atmospheric lifetime is relatively short (about 12 years), methane's global warming potential (GWP) is significantly more damaging than CO_2. According to the latest report from the Intergovernmental Panel on Climate Change (IPCC), methane can trap heat 82.5 times more effectively than CO_2 over a 20-year period. The energy sector accounts for nearly 40% of anthropogenic methane emissions, with one-third originating from coal mining activities, known as Coal Mine Methane (CMM).

Although Indonesia has committed—along with more than 150 countries—to reducing methane emissions, there remains a significant discrepancy between official government data and findings from independent studies. The Ministry of Environment and Forestry's (KLHK) report to the Third Biennial Report-UNFCCC (2021) only records emissions from surface

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mining, while data from underground mining are still absent from the national emission inventory.

In fact, technically, underground mines produce much higher emissions because methane content rises with increasing pressure and coal seam depth. Findings from the Global Energy Monitor (GEM) indicate that 85% of global coal mine methane emissions come from underground mines. Due to this data omission, EMBER (2024) estimates that actual methane emissions from Indonesia's coal mines could be eight times higher than official government figures. This disparity has placed Indonesia as the third-largest coal sector methane emitter in the world in 2024, according to the International Energy Agency (IEA).

The main issue hindering climate crisis mitigation in Indonesia is the low transparency of emissions data at the company level. Currently, emission reporting is still voluntary and limited to companies that are publicly listed. Only seven major companies, such as Bukit Asam, Adaro, and Indika Energy, have reported emissions through sustainability reports, and even then, their calculation methodologies have not been publicly disclosed, making them prone to under-reporting.

On the other hand, regulatory instruments through Law No. 7 of 2021 on Harmonization of Tax Regulations have begun to introduce a carbon tax. Although it currently focuses on the coal-fired power plant sector, there is significant potential to implement a broader carbon tax in 2025. Adopting the approach of the United States, which has already imposed methane emission charges, could serve as an important precedent for Indonesia to include methane in its carbon tax mechanism to enhance corporate accountability.

The implementation of a carbon tax mandated by Law No. 7 of 2021 on Harmonization of Tax Regulations should not be viewed merely as a source of state revenue, but as a mechanism for internalizing negative externalities. By setting a price for every ton of methane released (given its warming potential is 82.5 times higher than carbon dioxide over 20 years), the government can compel industry players to accurately account for their emissions and shift to cleaner methane capture technologies. Without the imposition of such a tax, companies are likely to continue ignoring fugitive emissions from their mines. Conversely, a carbon tax would provide an economic incentive: the lower the emissions produced, the lower the tax burden borne.

2. THEORETICAL FRAMEWORK

Ilyas (2023) explains that evidence refers to anything related to an act which can be used as proof to establish a judge's conviction regarding the truth of a criminal offense committed by the defendant.

Electronic evidence is recognized as one type of evidence under Law No. 20 of 2025. In the Explanation of Article 235 paragraph (1) letter f of Law No. 20 of 2025, electronic evidence is defined as information that is spoken, transmitted, received, or stored electronically using optical devices or similar technologies. This includes any record of data or information that can be seen, read, and/or heard, which can be produced with or without the assistance of tools, whether contained on paper, on any physical object other than paper, or recorded electronically in the form of writings, images, maps, designs, photographs, letters, symbols, numbers, or perforations that convey meaning.

3. METHOD

This article employs a juridical-normative approach, a legal research method that emphasizes the examination of laws and regulations, legal doctrines, legal principles, and expert opinions. This method was chosen based on the study's focus on analyzing the positive legal provisions regarding carbon tax within Indonesia's legal system. Data collection was conducted through a literature review method. The legal materials used in this research consist of primary and secondary legal sources. Primary legal materials include regulations and laws relevant to this study. Secondary legal materials comprise scientific journals, legal textbooks, and other scholarly works related to carbon tax.

4. RESULTS AND DISCUSSION

Implementation of Regulations to Address Greenhouse Gas Emissions

Due to extreme climate change, the Earth Summit was held in Brazil in 1992, resulting in the United Nations Framework Convention on Climate Change (UNFCCC). This convention aims to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system.

In an effort to implement the contents of the Climate Change Convention, the third session of the Conference of the Parties (COP-3), held in Kyoto in 1997, produced the Kyoto Protocol. The Kyoto Protocol has been ratified within Indonesia's legal system through Law Number 17 of 2004, and Indonesia now participates in the Clean Development Mechanism (CDM).

The Climate Change Convention was further discussed at the UNFCCC Conference of the Parties (COP-21) in Paris in 2015, which resulted in the implementation of the Paris Agreement. The Paris Agreement aims to keep the increase in global average temperature below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. Through the Paris Agreement, Indonesia has committed in

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its Nationally Determined Contribution (NDC) to reduce greenhouse gas emissions by 29% independently and by 41% with international assistance by 2030.

Through these global agreements, Indonesia has begun to strengthen its climate change control policies by planning the implementation of Carbon Pricing. Carbon pricing consists of the Emission Trading System (ETS), Crediting Mechanism, Result-Based Climate Finance (RBCF), internal carbon pricing, and carbon tax. Carbon pricing is considered an effective step to reduce emissions (Economic Cooperation and Development). The most commonly applied form of carbon pricing globally is the calculation and imposition of a carbon tax. In Indonesia, the carbon tax was introduced through the Law on Harmonization of Tax Regulations, which sets a fixed price for one ton of certain greenhouse gases measured in CO_2 equivalent.

The imposition of the carbon tax is specifically regulated in Article 13 of the Law on Harmonization of Tax Regulations. The carbon tax rate is set at a level equal to or higher than the carbon price on the carbon market per kilogram of CO_2 equivalent (COze) or its equivalent unit. If the carbon price in the carbon market is lower than IDR 30 (thirty rupiah) per kilogram CO_2 equivalent (COze) or its equivalent, the carbon tax rate is set at a minimum of IDR 30.00 per kilogram CO_2 equivalent (COze) or its equivalent.

According to the Tax Foundation (2020), the carbon tax is imposed on every product that generates carbon emissions. Carbon emissions here are not limited only to carbon dioxide (CO_2) but also include methane (CH_4), nitrous oxide (N_2O), and other fluorinated gases (F-gases). Article 13 of the Law on Harmonization of Tax Regulations defines the carbon tax as a Pigovian tax used to address the negative impacts of carbon emissions. The explanation of Article 13 also broadens the definition of carbon emissions beyond carbon dioxide (CO_2) compounds alone.

Article 13 paragraph 5 of the Law on Harmonization of Tax Regulations also clarifies that the carbon tax is imposed on individuals and entities that purchase goods containing carbon and/or carry out activities that generate carbon. Thus, there are two objects subject to the carbon tax: "the purchase of goods containing carbon" and activities that generate carbon emissions. Activities generating carbon emissions include those in the energy sector, agriculture, forestry and land use change, industry, and waste sectors (Barus & Wijaya, 2022). Methane is one of the compounds produced from coal mining.

Indonesia is the third-largest coal producer in the world. Based on Article 13 paragraphs 14 and 15 of the Law on Harmonization of Tax Regulations, the imposition of the carbon tax in Indonesia is regulated by Government Regulation. Meanwhile, Government Regulation Number 40 of 2025 regulates in Article 83 that the carbon tax is to be implemented gradually,

taking into account social, economic, and environmental impacts, and must be in accordance with the provisions of the law on harmonization of tax regulations. However, Article 13 of the Law on Harmonization of Tax Regulations stipulates that the imposition of the carbon tax must refer to the carbon roadmap policy determined by the Government with the approval of the House of Representatives. From 2022 to 2024, the imposition of the carbon tax is limited to coal-fired power plants. Starting in 2025, the scope of the carbon tax will be expanded.

To date, the carbon tax roadmap is still being drafted by the Ministry of Finance. This has resulted in a regulatory vacuum regarding the implementation of the carbon tax. If this continues for too long, the potential for carbon tax revenues and also the risk of environmental damage from carbon emissions will persist.

Current Challenges in Carbon Tax Implementation

There are several challenges currently facing the implementation of the carbon tax in Indonesia. According to the Director General of Economic and Fiscal Strategy at the Ministry of Finance, four main considerations are as follows:

1. Indonesia's actual emissions are still on track to meet the targets of the Enhanced NDC.
2. The government needs to synchronize cross-sectoral policies in accordance with Presidential Regulation No. 110 of 2025 and the carbon trading policy roadmap, including both national and global carbon markets.
3. The government wants to ensure that the burden of reducing carbon emissions in Indonesia is not borne solely by the government. Therefore, there will be a priority to strengthen carbon trading instruments, as these are considered more flexible and able to provide a clear and credible carbon price.
4. The carbon tax could potentially have several negative impacts on the macroeconomy, as well as pose risks of increased energy costs, such as for electricity and fuel.

Indonesia's SNDC calculation no longer uses a percentage projection of emissions reduction below the business-as-usual (BAU) scenario, but instead refers to an absolute amount of greenhouse gas (GHG) emissions in 2035, using 2019 as the reference year (across five sector categories: Energy, IPPU, Waste, Agriculture, and FOLU). The Indonesian SNDC document presents three scenarios for GHG emissions calculations. However, in the two conditional target scenarios, Indonesia's total emissions are actually projected to increase by 2030 compared to 2019.

Figure 1. Greenhouse Gas Emissions by Sector under Different Scenarios (Gg CO_2eq)

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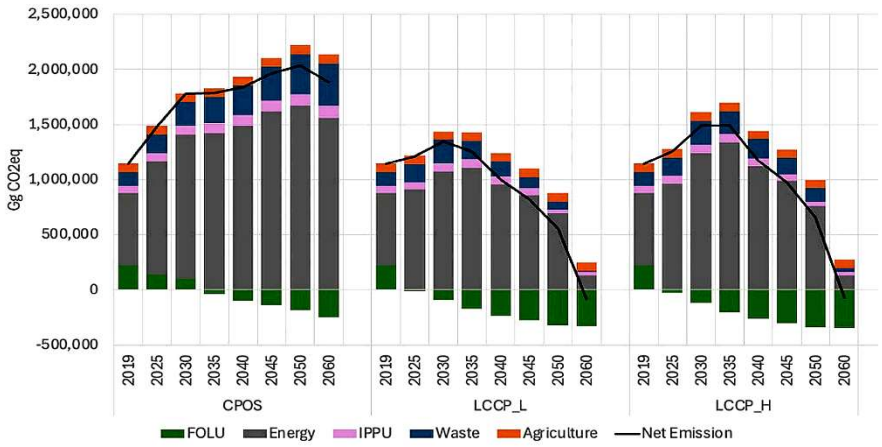

Source: Indonesia Second NDC 2025

Projected Greenhouse Gas Emissions by Sector under CPOS, LCCP_L, and LCCP_H Scenarios (Gg CO_2eq)

1. Scenario: CPOS

Sector	2019	2025	2030	2035	2060
Energy	655.568	1.032.127	1.310.969	1.419.126	1.561.764
IPPU	63.729	74.658	79.465	93.580	109.397
Waste	124.360	164.933	215.924	238.017	379.674
Agriculture	79.996	79.572	79.457	79.634	83.504
FOLU	221.384	133.675	94.635	-43.354	-247.434
Net Emission	**1,145,037**	**1,484,966**	**1,780,450**	**1,787,004**	**1,886,905**

2. Scenario: LCCP_L

Sector	2019	2025	2030	2035	2060
Energy	655.568	909.629	1.071.841	1.109.800	129.000
IPPU	63.729	68.042	74.147	73.115	34.243
Waste	124.360	164.905	215.750	168.477	9.069
Agriculture	79.996	77.843	76.193	74.738	76.503
FOLU	221.384	-12.886	-92.224	-168.412	-329.703
Net Emission	**1.145.037**	**1.207.533**	**1.345.707**	**1.257.717**	**-80.889**

3. Scenario: LCCP_H

Sector	2019	2025	2030	2035	2060
Energy	655,568	964,610	1,239,463	1,336,312	129,000
IPPU	63,729	70,656	78,960	78,304	34,375
Waste	124,360	164,540	215,928	205,695	34,705
Agriculture	79,996	77,570	75,708	75,452	78,307
FOLU	221,384	-25,729	-118,585	-206,897	-347,540
Net Emission	**1,145,037**	**1,251,648**	**1,491,474**	**1,488,866**	**-71,154**

Source: Indonesia Second NDC 2025

Several observers in Indonesia view the country's SNDC as merely an update to emission measurement methods, without any significant breakthrough in mitigation actions. The SNDC still maintains old patterns, such as relying on the absorption capacity of the FOLU sector as the main mitigation strategy, delaying the peak of emissions in the energy sector, and setting relatively easy targets that are already within reach of current policy capabilities.

Potential Calculation of Carbon Tax from Methane and Greenhouse Gas Emissions

Based on data from the Third Biennial Update Report under the United Nations Framework Convention on Climate Change (UNFCCC), in 2019, national GHG emissions reached 1,845,113 Gg CO_2e for five gases (CO_2, CH_4, N_2O, CF_4, and C_2F_6) or 1,845,067 Gg CO_2e for three gases (CO_2, CH_4, N_2O). Assuming the calculation uses three greenhouse gases, the total weight would be 1,845,067,000,000 kg (1 Gg = 1,000 tons = 1,000,000 kg). The calculation is based on GHG emissions produced from five main sectors (Energy, IPPU, Waste, Agriculture, and FOLU), and the emission reduction factor is not applied since the calculation is based on activities that generate carbon. It should be noted that this calculation does not account for emission reductions or removals.

Thus: Total carbon tax in 2019 = 1,845,067,000,000 kg × IDR 30 = IDR 55,352,010,000,000

Therefore, the estimated carbon tax revenue in 2019 would reach IDR 55.3 trillion.

Furthermore, by specifically calculating methane emissions using the same data source, the total weight amounts to 185,191 Gg or equivalent to 185,191,000,000 kg.

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Thus: Total carbon tax (methane) in 2019 = 185,191,000,000 kg × IDR 30 = IDR 5,555,730,000,000

Accordingly, the estimated carbon tax revenue specifically from methane emissions in 2019 would reach IDR 5.5 trillion.

Referring to the EMBER report, it is noted that the total methane emissions from coal mines reported by the government to the UNFCCC have not yet included methane emissions from several underground coal mines. If combined with the official figure reported in 2019, coal mine methane emissions could potentially triple. Methane emissions from coal mines reported to the UNFCCC in 2019 amounted to 128,000 tons or equivalent to 128,000,000 kg. Thus, the carbon tax on methane emissions from coal mines is estimated at IDR 3,840,000,000.

Juridical Review of Carbon Tax Implementation

The Law on Harmonization of Tax Regulations (UU HPP) does not explicitly stipulate administrative sanctions. Nevertheless, Article 13 paragraph 16 states that the exercise of rights and the fulfillment of tax obligations related to the carbon tax shall comply with the provisions of laws and regulations in the field of general provisions and tax procedures. This means that the sanctions, as a consequence of obligations, are implicitly included. This differs from the perception of Evangelista & Fanggi (2025), who argue that there is an absence of administrative or criminal sanctions for businesses that fail to comply with carbon tax emission reporting.

To control emissions, Law Number 32 of 2009 on Environmental Protection and Management already exists and regulates both administrative and criminal sanctions for violations of emission quality standards. The carbon tax is implemented to fill legal gaps by introducing the polluter pays principle (Nugroho & Aziz, 2024). The polluter pays principle was first introduced by the OECD (Organization for Economic Cooperation and Development) in 1972 through its "Guiding Principles Concerning the International Economic Aspects of Environmental Policies." This principle was later reaffirmed in the Rio Declaration on Environment and Development in 1992. The polluter pays principle means that every party responsible for activities causing pollution and/or environmental damage must bear the costs of environmental restoration. Referring to Article 13 paragraph 12 of the Law on Harmonization of Tax Regulations, it is clearly stated that carbon tax revenue is expected to be used for climate change mitigation.

The existence of a carbon tax under the Law No. 7 of 2021 on the Harmonization of Tax Regulations also complements the provisions contained in Law No. 32 of 2009 on Environmental Protection and Management. The Environmental Protection and Management Law regulates, among other principles, the *polluter pays principle* (Nurulhuda, 2025). This demonstrates that the carbon tax possesses dual legitimacy within the Indonesian legal system, both from the perspective of tax law and environmental law. Article 2 letter j of the Environmental Protection and Management Law emphasizes the responsibility of polluters to bear the costs arising from environmental pollution. In essence, a healthy environment constitutes a fundamental right of citizens that is also guaranteed by the constitution, as stipulated in Article 28H paragraph (1) of the The 1945 Constitution of the Republic of Indonesia, which states that every person has the right to a good and healthy environment. Therefore, the carbon tax can also be interpreted as an effort by the state to guarantee the rights of its citizens (Nugroho & Najicha, 2023). In this context, the carbon tax is no longer merely an implementation of the ratification of the Paris Agreement 2015.

The carbon trading mechanism is implemented through government policy that establishes a maximum allowable emission limit (*cap*) as an instrument for controlling and reducing greenhouse gas emissions (Editiana, 2023). This upper limit represents the highest level of emissions permitted within a given period, as determined by the relevant governmental authority. Within this scheme, industries that succeed in reducing their emissions below the prescribed threshold—for example, by cutting each ton of CO_2, will obtain surplus emission allowances. These excess allowances may then be traded or sold to other industries that are unable or unwilling to reduce their emission levels in accordance with the established limit. Law No. 7 of 2021 on the Harmonization of Tax Regulations has addressed these concerns by stipulating that a carbon tax will be imposed on individuals or corporations that use fossil fuels as taxable subjects. Meanwhile, the object of the tax encompasses all activities that utilize such fuels to generate carbon emissions. This provision reflects a clear limitation: if the level of carbon usage does not exceed the threshold established under the *cap-and-tax* mechanism, no tax will be imposed. In this context, taxation is understood as a fiscal obligation rather than a punitive sanction (Santoso & Lie, 2025). One can imagine that, in the absence of such taxation, environmental polluters would compete to maximize economic gains from their business activities without due regard for the environmental damage they cause.

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However, analysis shows that the implementation of this principle in Indonesia's carbon tax policy still faces limitations (Widyanti, et al., 2026).. The structure of the energy market and existing production chains allow businesses to pass on the tax burden to end consumers through higher energy and product prices. This situation can undermine the effectiveness of internalizing externalities and raise equity issues, as the cost burden is shifted to society at large, including low-income groups who do not directly contribute to emissions. In effect, the carbon tax leaves loopholes for polluters to transfer their responsibilities. One root cause is the limited and inadequate implementation regulations, which do not provide sufficient certainty for both taxpayers and tax authorities (Ministry of Finance, 2022).

The legal vacuum due to the absence of technical regulations makes the norms in tax law ambiguous. As part of the national legal system, the carbon tax falls under material tax law, which regulates the tax object, subject, rate, and tax base. However, the HPP Law does not specify these four elements in detail for the carbon tax, resulting in operational normative gaps (Saputra, 2021). Administratively, carbon tax implementation also faces technical challenges, such as the lack of a nationally standardized mechanism for calculating carbon emissions. The absence of standardized emission measurement methods as a basis for taxation weakens the administrative foundation for tax officers (Directorate General of Taxes, 2023). There are also unresolved questions regarding how to measure emissions and which authorities are entitled to verify them. According to the lex certa principle, the law should be clear, unambiguous, and easily understood by its subjects.

The carbon tax also has the potential to become a disproportionate burden for certain groups or sectors. This relates to the fairness aspect of this legal instrument in balancing the imposition of tax burdens based on emission quantities with the polluter's ability to pay. Currently, there is no tiered rate scheme or sectoral rate adjustment. This could make the tax burden particularly heavy for carbon-intensive industries, especially for small and medium-sized enterprises that lack sufficient capital for energy transition. The final products of each industry naturally have different market values, so the ratio of industry income to carbon tax burden may also vary, even if the quantity of emissions is the same.

Although the carbon tax is intended to reduce carbon emissions, its implementation creates an economic dilemma. Energy-intensive industries such as cement and steel face increased production costs of 7–9%, contributing to 0.35% inflation in the first quarter. The impact is

most felt by low-income groups, who allocate a larger share of their income to energy and basic needs (Iskandar & Aqbar, 2019). The Monitoring, Reporting, and Verification (MRV) system, which is crucial for measuring emissions, is still under development, resulting in data gaps and potential inequities (Hartono & Suhariyanto, 2025).

From the perspective of earmarking regulations, we can compare this to regional taxes and retributions as previously regulated in the Regional Tax and Retribution Law, although this regulation is no longer in effect following the enactment of the Law on Fiscal Relations between the Central and Regional Governments. Earmarking tax demonstrates the rationality of tax collection compared to the general allocation model, where taxpayers do not directly know how their taxes are used. The justification for implementing the carbon tax is its existence as a Pigovian tax.

From the Pigovian tax perspective, the carbon tax is imposed to address negative environmental impacts, while the Ramsey perspective emphasizes the role of taxes as a tool for generating state revenue. Both perspectives share the view that taxes are levied to reduce the consumption of certain goods (Pertiwi & Wisaksono, 2024). According to Pertiwi and Wisaksono (2024), the Government Regulation on Procedures for Exercising Rights and Fulfilling Tax Obligations only regulates the procedures for the implementation of carbon tax rights and obligations, without addressing the allocation (earmarking) of carbon tax revenue, thus a special regulation is still needed as a mandatory mandate to address earmarking. The HPP Law does explicitly state that carbon tax revenue may be allocated for climate change mitigation. However, the allocation is not absolute; there remains room for negotiation between the Government and the House of Representatives regarding its use. If the carbon tax is not directed towards environmental interests, it loses its role as a tool to address carbon emission issues.

Although the Government Regulation on Procedures for Exercising Rights and Fulfilling Tax Obligations contains a specific article on carbon tax (Article 69), its provisions only regulate the implementation of carbon tax rights and obligations, without addressing the allocation (earmarking) of carbon tax revenue. Therefore, a specific regulation is still needed as mandated by Article 13 paragraph (12) in conjunction with Article 13 paragraph (15) letter b, which specifically regulates the earmarking of carbon tax revenue.

5. CONCLUSION AND RECOMMENDATIONS

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This study shows that the implementation of a carbon tax in Indonesia already has a legal foundation through Law Number 7 of 2021 on the Harmonization of Tax Regulations, which introduces the carbon tax as a fiscal instrument to control greenhouse gas emissions. Conceptually, the carbon tax is a form of Pigovian tax aimed at internalizing the negative externalities of economic activities that generate emissions. However, its implementation still faces several normative and administrative challenges, including the absence of a comprehensive carbon tax roadmap, limited national standards for emission measurement, and the lack of clear mechanisms for verification and reporting of emissions by businesses. These conditions create legal uncertainty and may hinder the effectiveness of the carbon tax as an instrument for climate change mitigation.

In addition, this study also shows that the coal mining sector—particularly methane emissions from mining activities—has significant potential to be included in the carbon tax scheme. Based on estimates of national greenhouse gas emissions, the potential revenue from the carbon tax could reach tens of trillions of rupiah per year. Nevertheless, the effectiveness of this policy is also influenced by aspects of fiscal equity and the risk of tax burden shifting to end consumers. On the other hand, regulations regarding the allocation (earmarking) of carbon tax revenues have not yet been clearly defined, which may reduce the function of the carbon tax as an environmental policy instrument. Therefore, strengthening the regulatory framework and tax administration system is a crucial factor to ensure that the carbon tax can function optimally in supporting climate change mitigation in Indonesia.

The government should strengthen the regulatory framework and governance of carbon tax implementation in Indonesia by developing a comprehensive roadmap, including expanding the tax base to cover methane emissions from the coal mining sector. Additionally, it is necessary to establish a nationally standardized Monitoring, Reporting, and Verification (MRV) system to ensure that emission measurement and reporting are conducted accurately and transparently. Carbon tax rates should also be designed in a more adaptive manner, taking into account fiscal equity and the capacity of industrial sectors to transition to clean energy. Furthermore, the government needs to regulate the allocation (earmarking) mechanism for carbon tax revenues more strictly, so that the funds are consistently used to support climate change mitigation programs and the development of low-carbon technologies. With strengthened regulations and administrative systems, the carbon tax is expected to function effectively as both a fiscal instrument and environmental policy to control greenhouse gas emissions in Indonesia.

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