International Journal of Environmental Impacts
https://www.acadlore.com/journals/IJEI

Carbon Tax Implementation Urgency in Indonesia's Oil and Gas Sector: Fiscal Policy Agency and Industry Perspectives

Elvani*, Vinnie Gabriella Puteri Wagiri, Ka Tiong

Accounting Department, School of Accounting, Bina Nusantara University, 11480 Jakarta, Indonesia

* Correspondence: Elvani (elvani@binus.ac.id)

Received: 04-29-2025 **Revised:** 07-03-2025 **Accepted:** 08-12-2025

Citation: Elvani, V. G. P. Wagiri, and K. Tiong, "Carbon tax implementation urgency in Indonesia's oil and gas sector: Fiscal Policy Agency and industry perspectives," *Int. J. Environ. Impacts.*, vol. 8, no. 6, pp. 1179–1196, 2025. https://doi.org/10.56578/ijei080606.

Abstract: The carbon tax, one of Indonesia's climate change mitigation instruments for achieving the Nationally Determined Contribution (NDC) target, has been continuously delayed since 2022. A carbon tax is applied to carbon-based products, particularly those derived from the oil and gas sector. The oil and gas sector aims to achieve a targeted production increase of 1 million barrels of oil and 12 Billion Cubic Feet (BCF) of gas by 2030, as mandated by the Indonesian government. However, the rise of the production target may lead to a rise in carbon emissions, contradicting the country's emission reduction commitments. This study aims to explore the perspectives of the government and the oil and gas industry regarding the urgency and readiness of carbon tax implementation in Indonesia's oil and gas sector, as well as assessing alternative policies for emission reduction. Using a qualitative methodology, semi-structured interviews were conducted to obtain primary data. The result indicates the urgency of implementing a carbon tax in Indonesia's oil and gas sector to reduce carbon emissions, support energy transition, and achieve Net Zero Emission (NZE), but it is outweighed by both government and industry unreadiness. The Regulatory Framework aspect primarily influences the government's unreadiness, as the absence of a carbon tax roadmap as a technical implementation guideline, combined with ongoing fuel subsidies, contributes to policy incoherence. On the other hand, the Production Sharing Contract (PSC), as the Regulatory Framework of the oil and gas sector, has the potential to be amended once the carbon tax is implemented. The findings provide an overview of the government's considerations contributing to the years-long delay in implementation and enrich the government's viewpoint on developing a carbon tax policy, considering the industry's perspective and readiness factors.

Keywords: Carbon tax; Climate change; Fiscal Policy Agency; Greenhouse gases; Oil and gas industry; Tax policy

1 Introduction

Indonesia is particularly vulnerable to climate change. Climate change arises from environmental damage caused by global warming, driven by greenhouse gas (GHG) emissions [1]. Carbon dioxide (CO_2), as one of the main components of GHG emissions, is produced through industrial production activities that rely on fossil fuels and energy as the driving force for their operations.

To address climate change as a global issue, various countries, including Indonesia, have been involved in the Paris Agreement. It has a primary objective of keeping the global average temperature increase well below 2℃ above pre-industrial levels, and to endeavour to limit the temperature increase to 1.5℃ above pre-industrial levels [2]. However, there is an 80% likelihood of a temporary increase in the annual global average temperature exceeding 1.5℃ [3]. Furthermore, in 2024, Indonesia's average temperature increased, peaking at 38.4℃ [4].

The increase in average temperature reflected the accumulation of GHG emissions, one of the main causes of which is the usage of fossil fuels. Oil and gas, as one of the fossil fuel sources, are one of the crucial sectors for a clean and renewable energy transition in Indonesia [5]. According to CO_2 emission sources data in 2022 from the International Energy Agency (IEA), fuel oil combustion contributes the second-highest CO_2 emissions (following coal), with a percentage of 32.9% (214.7 megatonnes [Mt] CO_2). Natural gas ranks third, contributing 9.5% (62.1 Mt CO_2) [6]. Indonesia's transportation sector is the largest consumer of oil products, accounting for 72.3% (2,057,895 terajoules (TJ)) of total consumption in 2022, as oil is one of the most widely used fuels [7].

On the other hand, the Indonesian government continues to increase domestic oil and natural gas production to reduce its reliance on imports. These efforts aim to achieve a production target of 1 million barrels of oil and 12 Billion Cubic Feet (BCF) of gas by 2030 [8]. However, they may potentially lead to an increase in GHG emissions and contrary to Indonesia's Nationally Determined Contribution (NDC), which contains efforts and targets for reducing GHG emissions to achieve the Paris Agreement goals [9]. Indonesia's NDC reflects the country's commitment to reducing GHG emissions in the energy sector by targeting a decrease of 11%–15.5% from the total Business as Usual (BaU) scenario by 2030, which was later revised to 12.5%–15.5% through Indonesia's Enhanced Nationally Determined Contribution (ENDC) in 2022 [10]. Indonesia is also committed to achieving Net Zero Emissions (NZE) by 2060 at the latest [11].

Various policy alternatives have been developed to realize Indonesia's mission to reduce carbon emissions, including the carbon tax. A carbon tax is a tax imposed on carbon emissions that negatively impact the environment. Indonesia's carbon tax was initially intended to be implemented starting April 1, 2022, specifically targeting industries operating in coal-fired power plants, with a minimum rate of IDR 30.00 per kg carbon dioxide equivalent (CO_2e) emissions [12]. The formulation of the carbon tax policy falls under the responsibility of the Center for State Revenue Policy, one of seven units within the Fiscal Policy Agency. The Fiscal Policy Agency is a first-echelon unit under the Ministry of Finance of the Republic of Indonesia, playing a strategic role in fiscal and financial sector policy formulation [13].

The G20 Presidency, held in Indonesia from December 1, 2021, to November 30, 2022, has addressed the importance of carbon tax implementation in Indonesia. The G20 Presidency has sustainable energy transition as one of the main topics, which also discussed directing the potential contribution of the carbon tax or environmental tax scheme [14, 15]. A carbon tax is designed to reduce carbon emissions and encourage industries to switch to renewable energy. However, Indonesia's carbon tax implementation has been postponed for years and is now planned for 2025 [16].

Several previous studies have emphasized the carbon tax rate Indonesia must set to achieve its emission reduction targets and the projected potential carbon tax revenues [17, 18]. However, these studies are general in scope and have not specifically addressed the energy sector, particularly the oil and gas subsector. Considering the differences in emission profiles and the economic role of the oil and gas sector compared to others, this study aims to analyze the urgency and readiness of the two involved parties (regulator and industry) in implementing a carbon tax in Indonesia's oil and gas sector.

The continuous postponement of Indonesia's carbon tax implementation has sparked societal debate about the country's commitment to the Paris Agreement and its contribution to tackling climate change. This issue raises several key questions: What prevents the government from being ready to implement the carbon tax? Is the government deemed ready to enforce the carbon tax in Indonesia? Are the current carbon tax regulations considered sufficient to achieve the ENDC?

The research on the Carbon Tax Implementation Urgency in Indonesia's Oil and Gas Sector: Fiscal Policy Agency and Industry Perspectives aims to:

(a) Compare the perspectives of the Fiscal Policy Agency and the oil and gas industry regarding the urgency of implementing the carbon tax in Indonesia's oil and gas sector.

(b) Assess the readiness of the government and the oil and gas industry towards the carbon tax implementation in Indonesia.

(c) Assess the alternative carbon emission reduction policies besides the carbon tax.

2 Literature Review

2.1 Pigouvian Tax Theory

Pigouvian tax theory was developed by Arthur Cecil Pigou in 1920 through his book The Economics of Welfare. In this book, externalities were described by the terms Marginal Private Net Product (the impact gained by economic actors) and Marginal Social Net Product (the effect on society, including economic actors and uninvolved third parties). Economic activity can indirectly affect society through benefits or losses that are not reflected in market transactions. When the Marginal Private Net Product exceeds the Marginal Social Net Product, a negative externality arises, indicating the need for taxation to correct the imbalance [19].

According to Pigouvian tax theory, imposing a tax equivalent to the marginal social cost of negative externalities is required to correct the market inefficiency caused by social costs not borne entirely by producers and consumers. Imposing a tax on producers and consumers reflects the additional costs (social and environmental costs) from negative externalities. Therefore, the tax can internalize negative externalities and trigger behavioral changes in producers and consumers to transition to cleaner energy [20]. One of the derivatives of the Pigouvian tax imposed on carbon emissions is the carbon tax [21]. Through a carbon tax, the social cost of negative externalities (carbon emissions) is imposed on carbon emissions that have a negative impact on the environment. Tax is law-based coercive, as a mandatory contribution that must be paid to the state aimed at maximizing society's welfare [22]. As industry players

and citizens, there is no choice but to pay tax, thus expecting them to seek environmentally friendly alternatives to reduce their tax burden.

Although Pigouvian tax theory suggests that negative externalities can be internalized, it also has limitations, including the complexity of optimally and accurately estimating the value and social cost of negative externalities [23]. This limitation can be overcome by adopting or adjusting the same policy from other countries. This is related to the policy diffusion theory, which states that external influences, including competitive pressures, adoption patterns of peer countries, and international norms often shape a policy.

2.2 Policy Diffusion Theory

Policy diffusion theory explains how a policy of one country can be influenced by policy in a different jurisdiction [24]. This theory emphasizes that the diffusion of a policy can occur through four mechanisms: learning, emulation, competition, and coercion. Learning is a mechanism by which the government assesses the policies of other countries that are considered successful, efficient, and innovative in solving public problems within their own countries, based on considerations of the costs and benefits of the policy. Emulation is a mechanism where countries imitate the policies of other countries due to social pressure and global standards. Competition is a mechanism where a policy is adjusted to compete with other countries in attracting and retaining investment and resources in strategic sectors. Coercion is a mechanism in which threats are made to a jurisdiction to adopt policies or implement policy changes by powerful countries and international organizations [24, 25].

In relation to the carbon tax, carbon pricing policy is found to be able to spread mainly through a learning mechanism, and there is a slight tendency through imitation (emulation). The learning mechanism is carried out by studying carbon tax policies from neighboring countries of those located close to the country concerned (Regional Diffusion Model). In addition, at a certain point, the spread of this policy can also be through imitation, for example, if both countries have similar colonial experiences. In some countries, especially EU countries, in addition to the learning mechanism, carbon pricing policy (cap and trade) can also spread through coercive mechanisms due to normative pressure as members of the EU [26].

2.3 Carbon Tax Implementation

The carbon tax was first formulated through Law No. 7 of 2021 on the Harmonization of Tax Regulations (HPP Law), which was enacted at the end of 2021. Carbon tax is included in the Economic Value of Carbon non-trading instrument, which aims to achieve the NDC target. The carbon tax and carbon market roadmap are used as considerations in the imposition of a carbon tax [12]. With a minimum carbon tax rate of IDR 30.00 per kg CO_2e, Indonesia is among the countries with the lowest carbon tax rates compared to other countries. Sweden, which successfully implemented the carbon tax starting in 1991, proved effective in reducing carbon emissions while maintaining economic growth. In 2019, Sweden had the highest carbon tax rate among countries worldwide [27, 28].

The implementation of a carbon tax can bring several positive impacts, such as reducing carbon emissions to achieve NDC targets, encouraging companies to innovate and transition to environmentally friendly technologies, promoting sustainable green economic growth, creating new job opportunities, improving public welfare, fostering the development of the carbon market, and increasing state revenues [29, 30]. However, alongside these advantages, there are also several drawbacks to imposing a carbon tax, such as the complexity of policy design, the risk of carbon leakage, the potential increase in industrial production costs, and a decline in public purchasing power due to carbon tax burdens on products with high carbon emissions. Additionally, it may affect the welfare of low-income households as electricity tariffs rise [30, 31].

Studies on carbon tax policies in various countries have demonstrated that the implementation of carbon taxes can effectively reduce carbon emissions. For instance, research involving 22 countries in the Americas and Europe demonstrated that carbon taxes significantly reduce carbon emissions without negatively impacting GDP or the overall economic conditions of these nations [32]. A similar study emphasized the success of carbon tax implementation in Finland and Sweden in reducing CO_2 emissions without negatively impacting the economy. Their success can be attributed to prioritizing the implementation of the carbon tax in the transportation sector while avoiding strategic sectors such as manufacturing [33]. Additionally, a qualitative comparative study on the implementation of carbon tax policies in several European, North American, and Asian countries confirmed the effectiveness of carbon taxes in addressing the negative externalities of CO_2 emissions. It highlighted the potential additional benefits (double dividend) from well-designed revenue recycling strategies of the carbon tax [34].

Although the carbon tax policy was planned to be effectively implemented in April 2022, the Indonesian government has yet to implement it. This delay is primarily due to the absence of a carbon tax roadmap to identify the sectors subject to the carbon tax and determine the carbon emission thresholds [35]. According to Indonesia's Minister of Finance, Sri Mulyani Indrawati, the postponement is due to the preparation of comprehensive carbon tax regulations and ensuring readiness regarding the country's economy and industrial sectors [36]. This reason is also supported by a statement from the Financial Services Authority (OJK), which states that the government

must consider the effects of carbon tax implementation on inflation and national economic stability [16]. These considerations highlight many factors the government is addressing to prevent negative economic impacts before implementing the carbon tax policy. Public and industry acceptance and support will significantly influence the successful implementation of the policy [37].

2.4 Research Key Concepts: Urgency and Readiness

This research utilizes two key concepts to examine the factors that can significantly affect the implementation of carbon tax policy, play a crucial role in determining the feasibility of policy implementation, and impact the success of achieving the policy's target. First, the urgency of carbon tax implementation in Indonesia's oil and gas sector. Urgency can be defined as something that is critical and requires immediate action or attention [38]. Urgency is a pressing necessity that influences decision-making or action within a short timeframe. In the context of this research, the researchers aim to assess the urgency of implementing a carbon tax in Indonesia from the perspectives of the regulator as a policymaker and the oil and gas industry that will be affected by the policy's implementation. Urgency plays a crucial role in determining whether a policy is worthwhile to implement. The measurable criteria of the urgency of carbon tax implementation consist of: (a) environmental risk, (b) potential policy impact and contribution to state revenue, and (c) international commitment and pressure.

Second, the readiness of carbon tax implementation in Indonesia's oil and gas sector. Readiness is a condition that indicates a party is ready for something [39]. In the context of this study, the researchers aim to examine the readiness of the government and industry towards the implementation of a carbon tax in Indonesia from each party's perspective. Thus, two perspectives will be obtained from one party: the government's readiness to implement the carbon tax policy and the industry's readiness to face and comply with this policy. The measurable criteria of carbon tax implementation readiness consist of: (a) policy design and operational challenges, (b) sectoral characteristics, and (c) sector resources.

3 Methodology

The research was conducted using qualitative methods to analyze the data. According to Creswell and Creswell [40], a qualitative research method is a research method approach used to explore and gain an understanding or meaning from several individuals or groups regarding a social or humanitarian problem. This research method provides the opportunity for researchers to gain deep insight into the phenomenon being studied [41]. Aspects that are often overlooked or invisible on a topic can be discovered and studied further through qualitative research methods. Meanwhile, the quantitative research method is frequently used to confirm something that can be measured (such as numerical data) systematically [42].

This study used a constructivism approach, meaning researchers utilize subjective meanings about certain issues based on each individual's unique experiences. Researchers can obtain and explore a wide range of individual or group views on the issue under research [40]. This research was conducted using primary data obtained through semi-structured online interviews (Zoom Meeting), with a total of approximately 12–14 open-ended questions, with five informants: one representative from the Fiscal Policy Agency, two representatives from the Oil and Gas Industry, and two representatives from external perspectives, consisting of a tax consultant and an environmental Non-Governmental Organization (NGO) activist. An interview with the tax consultant provided additional perspectives from the tax professional practitioner regarding the technical aspects of carbon tax implementation in Indonesia. These insights were complemented by the perspectives of the environmental NGO activist, representing civil society, who emphasized environmental impacts, climate change mitigation, and the accountability and transparency of government environmental policies. Information obtained from external perspectives enriched the perspectives of the regulator and industry. Table 1 summarizes the background of the informants who participated in this study. Through semi-structured interviews, researchers can explore respondents' unique perspectives based on their experiences rather than gaining a general understanding of the phenomenon being studied [43]. By asking pre-prepared questions, researchers can explore relevant aspects that emerge from respondents' answers during the interview process [44].

Table 1. Informants' identities

No.	Initial	Entity	Division / Position	Years of Service
1	Mr. A	Fiscal Policy Agency	Center for State Revenue Policy	3 years
2	Mr. B	Oil and Gas Company	Accounting Team Lead	18 years
3	Ms. C	Oil and Gas Company	Financial Reporting Manager	21 years
4	Mr. D	Tax Consulting Firm	Corporate Tax Team Leader	9 years
5	Ms. E	Environmental NGO	Director of Climate Education	5 years

The open-ended questions focused on their perspective regarding climate change issues, the importance and

readiness of carbon tax implementation in the oil and gas sector, and other alternative policy suggestions. The results of the interviews with informants were manually transcribed into written data and analyzed using NVivo 15 Software. Manually transcribing interview responses enables researchers to engage deeply with the data, thereby aiding the coding process and thematic analysis [45]. The researchers first conducted a thorough review and transcribed the interview data. The transcribed data were then processed by identifying and marking relevant recurring words or phrases that indicate urgency and readiness related to the implementation of a carbon tax, as well as alternative policy options. In this research, three stages of coding were carried out:

• Open coding: Open coding is the initial stage in qualitative data analysis, where raw data is carefully read and organized into small units. These units are given a "code" based on their meaning. Open coding identifies essential concepts from the data. At this stage, two events are compared. Then conceptually similar events are labelled (categories and subcategories) [46]. Sentence example: "In terms of regulations, the legal framework is already in place, but the derivative regulations have yet to be issued". (Informant Mr. B, 2024). This sentence was classified under the coding Absence of derivative regulations.

• Axial coding: At this stage, the relationship between categories and subcategories and the data is tested. Further category development is conducted to identify indications of the category. Data was organized using codes that were similar and related to the larger category [46]. For example, the Absence of derivative regulations was classified under the Regulatory Framework aspect.

• Selective coding: the process of unifying all categories into a main category or core category. The central phenomenon of the research is represented by the core category [46]. The Regulatory Framework was included in the Government Readiness core category because it describes the unreadiness of the government in terms of regulation and policy formulation.

The resulting themes were then validated by data triangulation based on secondary data, including trusted and credible publications, to confirm and deepen the understanding of the resulting themes. Data visualizations were created using mind maps that contain the main findings. Secondary data, including literature and scientific publications, were also used in this research to gain further context and support the results of the data analysis.

4 Result and Discussion

One of the factors indicating the urgency of implementing a carbon tax is Indonesia's binding global commitment, particularly through the Paris Agreement. As reflected in its NDC, under the Paris Agreement, all participating countries, including Indonesia, are obligated to commit to emissions reduction targets within their respective national frameworks and contribute to global climate change mitigation. Figure 1 illustrates how this commitment, alongside other key aspects, shapes the level of Indonesia's carbon tax urgency. The Paris Agreement aims to achieve NZE and the Sustainable Development Goals (SDGs) [9]. Such international commitments serve as a driving force for the formulation of carbon tax policy as a regulatory instrument to control emissions. In Indonesia, the HPP Law stipulates that the carbon tax will be implemented gradually. The policy was initially scheduled to start in 2022 with the coal sector, identified as the largest emitter, and to expand to other emission-intensive sectors by 2025. However, in practice, no carbon tax has been implemented since 2022, including in the coal sector. In addition to coal, the oil and gas sector, a major source of emissions and widely utilized in Indonesia, is also expected to contribute to emission reduction, aligning with government commitments. This expectation is reinforced by user statements that emphasized that carbon emission reduction is regarded as an international requirement. The user also noted that the implementation of zero-emission programs can enhance business value. Moreover, in Indonesia, to become a green company, a company's carbon emissions reduction is a key requirement that must be met [47].

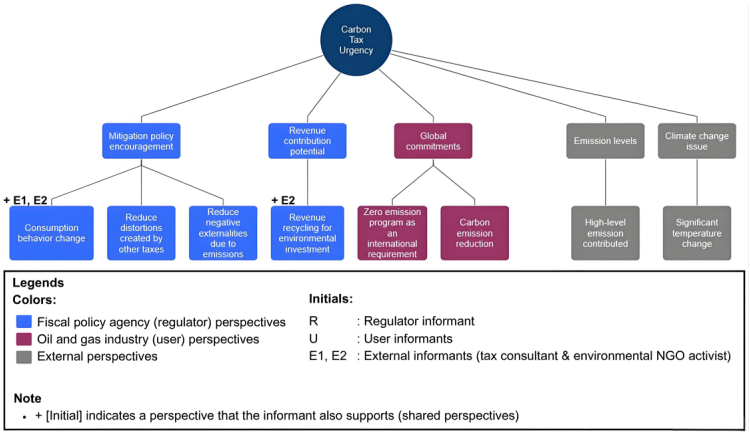

Figure 1. The urgency of the carbon tax implementation

Under the Paris Agreement, each country is required to develop a national-level climate change mitigation plan through its NDC. The NDC serves as a formal communication of a country's mitigation plans and must be updated every five years and submitted to the United Nations Framework Convention on Climate Change (UNFCCC) [9]. Indonesia's first NDC, submitted in 2021, prioritized the sectors of Energy, Waste, Industrial Processes and Product Use (IPPU), Agriculture, and Forestry and Other Land Uses (FOLU), targeting a 29%–41% reduction in carbon emissions from the BaU scenario by 2030. Specifically, the energy sector was expected to reduce emissions by 11%–15.5% from BaU levels. This target was later increased through the submission of Indonesia's ENDC in 2022, which set an overall emissions reduction target of 31.89%–43.20% from the BaU total by 2030 (energy sector specifically at 12.5%–15.5%) [10]. The upper end of the range reflects reductions achieved through the country's efforts (CM1), while the bottom end of the range represents reductions targeted with international support (CM2). The increase in the energy sector's emission reduction target from 11% (NDC) to 12.5% (ENDC) reflects the Indonesian government's more substantial commitment to reducing carbon emissions through national efforts. The Indonesian government is expected to update its NDC by submitting its Second Nationally Determined Contribution (SNDC), which was initially scheduled for submission in February 2025. However, as of now, Indonesia has yet to submit the SNDC and instead plans to introduce it ahead of COP30 in November 2025 [48].

Alongside other commitments, Indonesia has pledged to achieve NZE by no later than 2060, as announced during COP26. To support the realization of this target, Indonesia officially launched the Energy Transition Mechanism (ETM) Country Platform during the G20 Summit in 2022. The Minister of Finance, Sri Mulyani, stated that this initiative was designed to foster ambitious commitments, ensure policy consistency, and facilitate a structured transition from fossil fuels to cleaner energy sources. The platform aims to reduce carbon emissions while simultaneously supporting the rising demand for oil and gas driven by economic development [49]. Figure 2 illustrates the increasing demand for global energy, which indicates that dependence on fossil fuels is expected to remain high through 2040. Fossil fuels, including oil and gas, are projected to continue dominating global energy demand during this period [50]. This trend is supported by projections from Indonesia's National Energy Plan (RUEN). The plan estimates a 139% increase in oil consumption, from 1.66 million to 3.97 million barrels of oil per day, and a 298% increase in natural gas consumption, from 6,557 to 26,112 Million Standard Cubic Feet per Day (MMSCFD), between 2020 and 2050 [51]. Given these projected consumption increases, the Indonesian government has set a production target of 1 million barrels of oil and 12 BCF of gas per day by 2030 [8]. Projected increases in oil and gas consumption and production targets could potentially lead to a substantial rise in carbon emissions within the oil and gas sector.

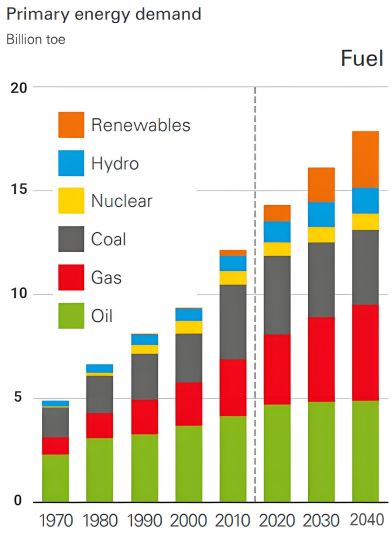

Figure 2. Global energy demand [50]

The level of carbon emissions in the energy sector plays a crucial role in reinforcing the urgency of implementing a carbon tax in Indonesia. In 2022, Indonesia contributed significantly to global emissions, recording a total of 1.3 gigatonnes (Gt) of CO_2, with 50.6% of these emissions originating from the energy sector [52]. Within the energy sector, oil and gas ranked as the second and the third most significant sources of emissions, contributing 214.7 Mt CO_2 and 62.1 Mt CO_2, respectively. Coal remained the highest emitting subsector [6]. The total final consumption of the energy sector was topped by oil products, with the highest ranked consumption of 2,845,717 TJ in 2022 [53]. This substantial emission level and product consumption reflect Indonesia's heavy dependence on energy consumption, particularly in the transportation sector, which was the dominant source of energy-related emissions that year.

On the other hand, data on the targets and actual achievements of GHG emission reductions in the energy sector

from 2019 to 2024 indicate that Indonesia has consistently surpassed its annual reduction targets. Table 2 summarizes the comparison of emission reduction targets and realizations, which indicates the effectiveness of the implemented policy in the energy sector. As illustrated in Table 2, in 2024, Indonesia set a target of reducing 142 Mt CO_2 emissions and achieved a reduction of 147.61 Mt CO_2 [54]. This demonstrates that the implementation of a carbon tax has the potential to support the transition toward renewable energy and sustain the downward trend in emissions over the long term. Such a gradual approach could enable Indonesia to achieve its NDC and NZE targets.

Table 2. Indonesia's energy sector GHG emissions reduction [54]

		Year				
		2020	**2021**	**2022**	**2023**	**2024**
Energy sector GHG emissions reduction (million t)	Target	58.00	67.00	91.00	116.00	142.00
	Realization	64.35	70.02	91.51	123.22	147.61
	Achievement	110.95%	104.51%	100.56%	106.22%	103.95%

Despite the energy sector's emissions reductions exceeding targets, Indonesia is currently rated as critically insufficient by Climate Action Tracker in terms of its GHG emissions reduction targets and actions. The country's current climate policies and mitigation efforts are also classified as critically insufficient. According to the environmental NGO activist, this indicates that Indonesia's existing environmental policies remain inadequate to meet the Paris Agreement's goal of limiting the global temperature rise to below 2°C. For example, through the Just Energy Transition Partnership, Indonesia secured international funding to support and strengthen the energy transition. On the other hand, Indonesia also lowered its 2025 renewable energy target from 23% to 17%–19%. The discrepancy demonstrates the challenges faced by the Indonesian government in making a just and effective energy transition [55].

The carbon tax, as an instrument for realizing emission reduction commitments and supporting the energy transition, is reinforced by its function in internalizing negative externalities, one of the primary justifications for adopting this policy. From the regulator's perspective, a carbon tax is one of the emission reduction instruments that can reduce the impact of negative externalities resulting from carbon emissions. It is in line with the Pigouvian tax theory, wherein the imposition of a carbon tax on parties that generate negative externalities (producers and consumers) enables them to consider the social costs resulting from their production and consumption activities. Thus, this tax can reduce or eliminate negative externalities [56]. In Indonesia, the implementation of a carbon tax represents a practical application of Pigouvian tax principles within environmental policy. It functions not only as a fiscal regulation but also as a mechanism to reduce the negative externalities of carbon emissions, leveraging fiscal instruments to achieve ecological objectives while simultaneously reshaping economic incentive structures.

By imposing social costs on producers to internalize negative externalities, a carbon tax is designed to influence consumer behavior. It encourages a shift from carbon-containing products to renewable energy products. It may also prompt industries to adopt renewable technologies and invest in green initiatives. A carbon tax may encourage companies to reduce carbon emissions through other low-carbon alternatives and investment in sustainable technologies and projects [57]. The tax consultant and environmental NGO activist also agreed that a carbon tax can drive behavioral change among both the public and industry actors. This effect occurs by fostering competition among companies to reduce their carbon output through various measures, such as adopting environmentally friendly machinery and using more sustainable raw materials. Carbon tax policy can be complemented with fiscal incentives for green investment or renewable energy subsidies. These measures can enhance the effectiveness of the carbon tax in supporting industrial energy transition and encouraging changes in production behavior. However, the environmental NGO activist has also raised concerns regarding the potential for greenwashing associated with industry behavioral changes prompted by carbon tax implementation. Greenwashing refers to the practice of entities investing heavily in branding themselves as environmentally responsible, while the actual environmental impact of their actions remains minimal or superficial [58]. There is a risk that companies may view the carbon tax not as a form of accountability for their emissions, but rather as a means to obtain a "license to pollute". In such cases, the carbon tax could fail to produce genuine behavioral change.

In the context of behavior change, a carbon tax can also reduce distortions caused by other types of taxes. Usually, taxes can result in distortion (a change in people's behavior). An increase in the tax rate leads to a decrease in motivation to work and earn income. As a result, high taxes can potentially reduce economic activity [59]. The regulator revealed that the potential revenue generated from the carbon tax could help reduce this distortion through a mechanism known as revenue recycling. If other tax rates increase, carbon tax revenue can serve as a policy cushion. It can provide cash transfers to affected citizens, mitigating the impact of higher taxes.

One of the positive implications of implementing a carbon tax is its potential revenue contribution, which can increase state revenue. Table 3 summarizes Indonesia's projected potential revenue from carbon tax in the energy

sector, which indicates that the government could earn IDR 23,651 trillion from carbon tax revenue by 2025 [18]. This projection was calculated using the exponential smoothing method, assuming a 3.57% annual increase in carbon emissions multiplied by Indonesia's lowest carbon tax rate of IDR 30.00 per kg CO_2e. These figures suggest that, from a fiscal perspective, the adoption of a carbon tax could be economically advantageous for Indonesia. The revenue generated from carbon taxation can be recycled through well-structured strategies to provide a "double dividend" for the government [34]. Revenue recycling can serve as a policy cushion to mitigate the economic burden of other policies, such as rising tariffs. It can also be directed toward green investments, particularly to support the development and adoption of renewable energy technologies. This approach is supported by the environmental NGO activist, who argued that the revenue should be redistributed back to society and industry in the form of clean energy access and social protection for communities directly affected by the energy transition.

Table 3. Carbon tax potential revenue projection in Indonesia's energy sector [18]

Year	Carbon Emission (Gg CO_2e)	Tariff (IDR/kg CO_2e)	Minimum Carbon Tax Revenue (IDR Million)
2019	638,808	30.00	19,164,240
2020	661,603*	30.00	19,848,088
2021	685,211*	30.00	20,556,338
2022	709,622*	30.00	21,289,861
2023	734,985*	30.00	22,049,559
2024	761,212*	30.00	22,836,366
2025	788,375*	30.00	23,651,249

This projection also highlights the missed revenue opportunity if Indonesia had implemented a carbon tax earlier, with a broader sector scope. Indonesia could earn a cumulative potential revenue of IDR 125,744 trillion from 2019 to 2024 if it were to apply a carbon tax across the entire energy sector. The missed revenue opportunity caused by the delayed implementation and limited sector scope could be allocated to support other energy transition acceleration programs and policies. However, the previously discussed trend of emission reductions in the energy sector may influence the actual revenue potential projected in this estimate. In addition, the calculation is limited by the unavailability of publicly released actual emission data from 2020 onward, which poses a constraint to the accuracy of the projection.

Several findings collectively indicate the urgency of implementing a carbon tax in Indonesia's oil and gas sector. These include global commitments, worsening climate change issues, encouragement of mitigation policies, potential state revenue contributions, and high emission levels. However, this indication of urgency stands in contrast to the government's ongoing provision of fuel subsidies, highlighting a lack of policy coherence. Figure 3 illustrates how policy incoherence, alongside other key aspects, influences the government's level of readiness in implementing the carbon tax. The Indonesian government continues to subsidize certain fuel types, namely Biosolar and Pertalite, with funding sourced from the National Budget (APBN) to maintain fuel affordability for lower-income groups. Nevertheless, in practice, the distribution of these fuel subsidies remains inefficient, as they are still accessed mainly by individuals with elevated income [60]. This misalignment leads to increased fuel consumption, thereby contradicting the primary objective of carbon taxation, which is to discourage the use of fossil fuels and reduce carbon emissions.

Under Pigouvian tax theory, taxation is imposed to eliminate negative externalities, such as those resulting from carbon emissions. However, the provision of fuel subsidies may diminish the intended effect of the carbon tax. The carbon tax is levied by the government on emissions generated from economic activities, based on the principle that producers and consumers do not internalize the full social costs of their emissions. However, the current provision of subsidized fuel at lower prices undermines this mechanism. As a result, fuel subsidies may hinder the emission reduction goals of carbon tax implementation. Furthermore, this contradiction is misaligned with Indonesia's commitments to energy transition and emission reduction under the Paris Agreement. Fuel subsidies may disincentivize households and industries from transitioning toward cleaner energy alternatives. This runs counter to the carbon tax's purpose of encouraging behavioral shifts in both consumption and production patterns.

The provision of fuel subsidies serves as a concrete instance of counteracting policy interaction. The spectrum of policy interaction consists of complementary, overlapping, and counteracting. Policy interactions should not be counteracting in nature. If the government provides fuel subsidies while simultaneously implementing a carbon tax, this may lead to public confusion. It can also affect public perceptions of the government's commitment to enforcing the carbon tax. This policy inconsistency arises because the government imposes a tax on emissions. At the same time, it continues to subsidize the consumption of goods that produce those emissions. Therefore, the interaction between multiple policies should ideally be aligned or complementary.

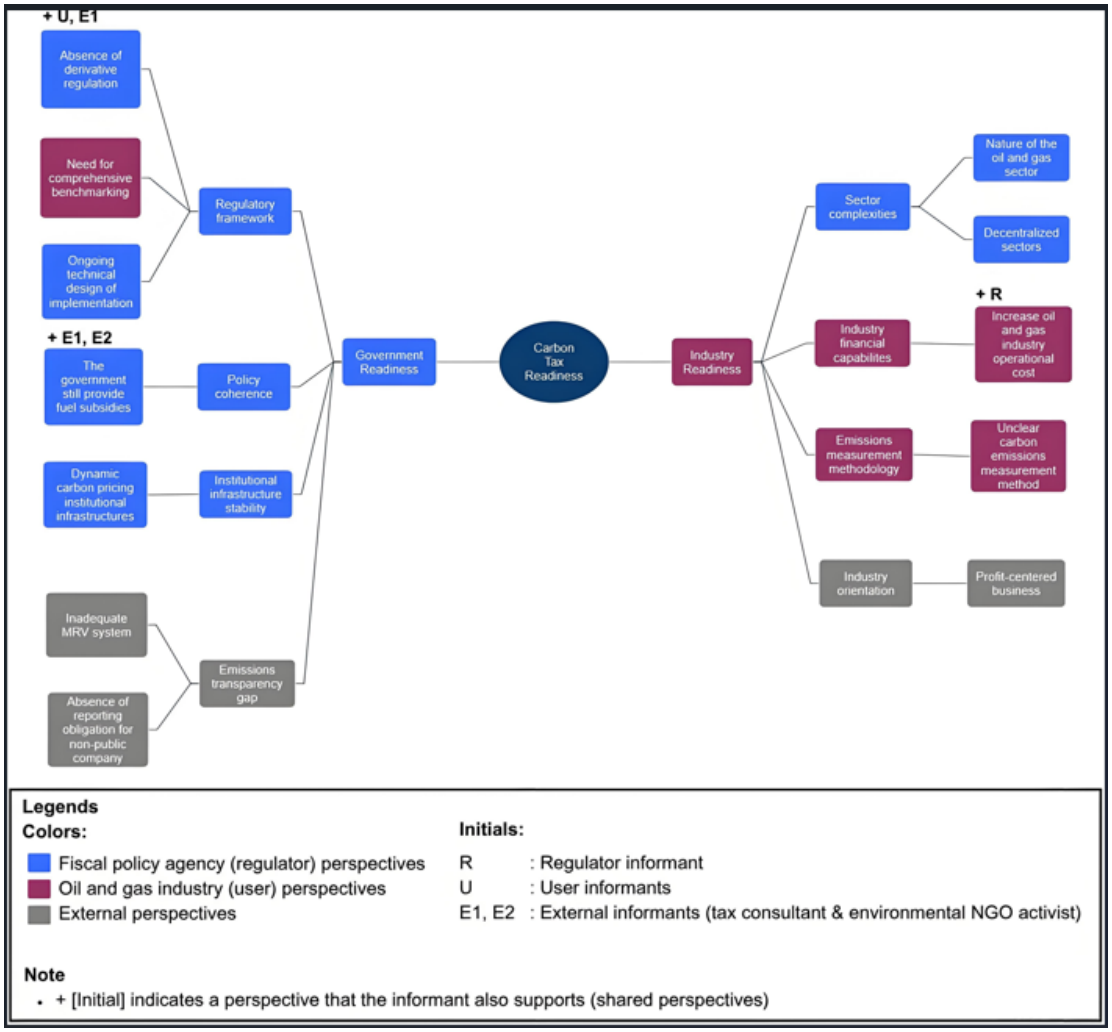

Figure 3. The readiness of the carbon tax implementation

Ideally, the government should phase out fuel subsidies if it intends to implement a carbon tax effectively. In 2021, during the initial introduction of the carbon tax policy in Indonesia, the Ministry of National Development Planning of the Republic of Indonesia (BAPPENAS) recommended that, alongside the introduction of the tax, the government should gradually eliminate all fuel subsidies, aiming for a complete removal by 2030 [61]. In 2025, Indonesia's fuel subsidy budget is targeted at IDR 26.7 trillion—an increase of 23.6% from 2024 [62]. Eliminating fuel subsidies can have a significant impact by reducing carbon emissions and encouraging the public to adopt energy efficiency measures and shift to cleaner fuels. Both the tax consultant and the environmental NGO activist agreed that fuel subsidies contradict the core purpose of a carbon tax. While the removal of subsidies cannot be abrupt or absolute, it should be carried out progressively, with strengthened monitoring to ensure the subsidies reach the intended recipients. Furthermore, fuel subsidy allocations could be reallocated to address other urgent national priorities requiring government intervention.

These policies' misalignment reflects the government's limitation in formulating a carbon tax policy, particularly in terms of its Regulatory Framework. Both the user and the regulator shared the view that the absence of derivative regulations for the carbon tax is one of the main factors contributing to the government's unreadiness. In the law regulation, provisions regarding the carbon tax in Indonesia have not been explicitly detailed. The law typically only outlines the general framework, while the detailed and technical implementation is supposed to be regulated under the Ministry of Finance or a Government Regulation. Article 13 of the HPP Law governs the carbon tax in general terms. It applies to individuals or entities that purchase or produce goods containing carbon, with a minimum tariff of IDR 30.00 per kg CO_2e [12]. However, this law fails to establish essential technical mechanisms such as emission calculation methods, reporting procedures, and administrative sanctions for late payments or non-compliance. These derivative regulations are crucial for providing systematic and technical guidance to facilitate the effective implementation of policies. The lack of these operational guidelines has significantly hampered the rollout of the carbon tax. Taxpayers do not have access to well-defined procedures or systems for compliance, leading to legal

uncertainty and confusion among industries as carbon tax subjects. The tax consultant also emphasized that industry readiness is mainly dependent on the clarity of regulations. If the regulations are well-defined, companies will know what to expect and prepare accordingly. The environmental NGO activist also expressed the need for well-defined regulation, stating that Indonesia's carbon tax remains technically insufficient due to the absence of derivative regulations, which ideally should be formulated with the involvement of academics and civil society organizations. Additionally, policies should be crafted with consideration for transparency, accountability, and the protection of vulnerable groups.

In the context of technical readiness for implementing a tax policy, the application of Micro, Small, and Medium Enterprises (MSMEs) tax serves as a real-world example of why derivative regulations are crucial in policy implementation. The application of tax policies for MSMEs is implicitly regulated in the HPP Law. However, the law primarily governs the gross income threshold for the taxation of corporate taxpayers and does not explicitly specify which businesses are eligible for MSME tax incentives or the applicable tax rates. However, in Government Regulation No. 55 of 2022, it is explicitly regulated that the imposition of a 0.5% MSME tax is final on the gross income. There is a specific division for the validity period of incentives for each type of taxpayer, as well as the tax payment mechanism. A policy implementation requires derivative regulations to ensure its effective implementation by taxpayers.

To date, the Fiscal Policy Agency is still preparing derivative regulations that govern the technical implementation of the carbon tax. These derivative regulations must consider certain norms, objectives, and generally accepted principles. The drafting of derivative regulations is carried out through a consultation process with the House of Representatives and will be enacted upon their approval. The derivative regulations for the carbon tax must be established through a Government Regulation or a Minister of Finance Regulation. Each type of derivative regulation has different content. The Government Regulation governs the carbon tax roadmap, while the Minister of Finance Regulation under it regulates the mechanism for determining tariffs, tax imposition methods, and the technicalities of tax collection, payment, and reporting. A carbon tax roadmap is necessary to achieve the NDC target. The absence of a carbon tax roadmap as a concrete step for long-term carbon tax implementation leads to uncertainty, ambiguity, and challenges in its enforcement. Therefore, to implement the carbon tax effectively, a well-defined roadmap is needed as a guide in implementing this tax [63].

Furthermore, the absence of derivative regulations also affects the technical aspect of emissions reporting. Currently, there is no mandatory requirement for all business actors to report the emissions they generate, resulting in a transparency gap in emissions data. Emissions reporting remains mostly voluntary, particularly for non-public companies and smaller enterprises. Generally, only publicly listed companies are required to submit Sustainability Reports, which typically include disclosures of emissions data and the company's efforts to reduce GHG emissions. According to the tax consultant, the voluntary nature of emissions reporting reflects the government's lack of strictness in establishing regulations to control and mitigate industrial GHG emissions. As a result, non-listed companies and similar entities that are not obligated to report emissions may pay less attention to managing their carbon output due to the absence of regulatory oversight. This regulatory gap undermines the government's readiness to implement a carbon tax. The limited availability of emissions data makes it difficult to determine the tax base and monitor taxpayer compliance. Moreover, it hampers the government's ability to monitor and ensure taxpayer compliance with carbon tax obligations.

The emission transparency gap is also related to the Monitoring, Reporting, and Verification (MRV) system. MRV is a system used to ensure that data related to actions to achieve climate change targets and commitments can be tracked, recorded, and validated [64]. In the context of a carbon tax, the data used is the emissions data produced by the entity. The MRV system must be run accurately and transparently, as it plays a crucial role in ensuring the accuracy of carbon tax calculations, payments, and reporting. The MRV system aims to track emissions produced, report emissions by entities for tax calculations, and ensure the accuracy of emissions data provided by third parties, so that the implementation of a carbon tax can be more well-directed. Currently, Indonesia is still preparing and developing the MRV system specifically for the carbon tax. Partially manual process of collecting emission data raises questions about the credibility of the data, and self-reporting of emissions creates difficulties in verifying and ensuring entity compliance [65]. These limitations affect government readiness due to an inadequate MRV system and limited regulations on MRV in the energy sector that should be formulated to support the digitalization of the MRV process. The reporting process may also experience obstacles due to the emission reporting obligation for entities that are not required to publish a Sustainability Report. According to the tax consultant, the inadequate MRV system hinders transparency, accuracy, and data verification, which are critical challenges for implementing a carbon tax. The environmental NGO activist also highlighted technical shortcomings in the carbon tax policy, particularly in terms of emission monitoring and reporting, which could affect the overall effectiveness of the policy's implementation.

The formulation process of Indonesia's carbon tax roadmap is also influenced by the depth and comprehensiveness of benchmarking activities, which fall under the broader Regulatory Framework. According to the tax consultant, the carbon tax is a relatively new concept in Indonesia; therefore, benchmarking it with other countries is essential. The

benchmarking process conducted by the government is closely related to policy diffusion theory, which posits that policies adopted by different countries can influence the policy formulation of one country. In the context of carbon taxation, this policy may diffuse from one country to another through mechanisms of learning from neighboring countries that have adopted similar policies. Diffusion may also occur through imitation of adopters that share similar historical or institutional experiences [26]. Consequently, Indonesia could learn from neighboring economic leaders such as Singapore and Japan, both of which have implemented carbon tax frameworks. Indonesia could also consider emulating the carbon tax policy of South Africa, a fellow developing country that shares a similar colonial legacy (having been colonized by the Dutch), making its approach potentially more relatable and adaptable.

The user also stated that Indonesia needs to conduct more comprehensive comparative studies on carbon tax implementation. These studies should focus on developing countries with conditions similar to Indonesia to serve as benchmarks. One of the developing countries that has implemented a carbon tax is South Africa, which became the first country on the African continent to implement a carbon tax in June 2019, following the "polluter pays" principle and procedures aligned with the Intergovernmental Panel on Climate Change (IPCC) standards. Except for the agriculture, forestry, land use, and waste sectors, the carbon tax is imposed on sectors that account for 90% of South Africa's total GHG emissions. During the transition period, South Africa also introduced temporary tax-free thresholds, allowances, and carbon offsets. As in other countries, the carbon tax was initially implemented at a low rate and gradually increased [66]. The development of this policy in Indonesia still needs to consider the country's conditions from various aspects, including the readiness of the government and business actors. The existing global commitments also encourage Indonesia to implement similar policies, as reflected in the government's efforts to create an environmental domestic policy that must be applied to businesses emitting GHG emissions. However, there has been no further execution.

In relation to the institutional infrastructure stability of the Regulatory Framework aspect, the regulator noted that the change in presidential leadership also impacted the preparation process for implementing the carbon tax. During Joko Widodo's presidency, the Ministry of Environment and Forestry served as the National Focal Point for the arrangement of the Economic Value of Carbon. Following the change to Prabowo Subianto's presidency, the Ministry of Environment and Forestry was divided into two separate ministries. Until now, there has been no information regarding which ministry or agency will become the National Focal Point. The regulator also revealed that the government has been preparing the technical design for implementing the carbon tax.

The government's unreadiness creates structural barriers that impact the industry's level of readiness. Figure 3 illustrates the industry's level of readiness, which indicates the limited readiness that may affect policy effectiveness. According to the regulator, the industry's readiness is significantly influenced by the sector's complexity. The nature of Indonesia's oil and gas sector, particularly its upstream segment, is regulated under the principle of lex specialis. The phrase 'lex specialis derogat legi generali' can be interpreted as more specific laws override the general laws [67]. Thus, regulations under the Oil and Gas Law must take precedence over general regulations. It sets the upstream oil and gas sector apart from other sectors, as it is subject to specific regulations.

Both sides, from the user and regulator, mentioned that, particularly in the upstream oil and gas sector, the operations are managed and regulated through a contract known as a Production Sharing Contract (PSC). PSC is a form of cooperation contract in upstream activities based on the principle of production sharing. It is designed to increase state revenue derived from natural resources and to attract investors to invest in Indonesia [68]. This contract governs cooperation between the government and the contractor (investor). It outlines the rights and financial obligations of the parties, including taxation related to the contractor's contribution to state revenue. Implementing the carbon tax would impact the content of the PSC agreement, as it would introduce a new policy that has not been previously regulated in the contract. The carbon tax could become an additional component in the financial obligation that must be paid. Therefore, imposing a carbon tax may require adjustments or amendments to the PSC agreement between the government and the Contractor of Cooperation Contract. It may require coordination with each contractor.

On the other hand, PSC is further complicated by the decentralized nature of Indonesia's NDC priority sectors. From the regulator's perspective, NDC priority sectors such as FOLU, Energy, IPPU, Waste, and Agriculture can utilize several Economic Value of Carbon instruments. In this context, a carbon tax can serve as an alternative when emission deficit obligations, defined as actual emissions exceeding the cap, cannot be sufficiently fulfilled through other mechanisms such as emissions trading and emission offsets. Each sector can also choose a suitable Economic Value of Carbon instrument based on its readiness. Therefore, the implementation of the carbon tax as one of the non-trade-based Economic Value of Carbon instruments should be aligned and synchronized with other policies in the sector. However, the decentralized nature of the sectors may result in uncertainty, as there are multiple options for each sector to choose from. The flexibility in instrument options and the continuous postponement of the carbon tax may also potentially cause the industry to under-prepare for the carbon tax.

The regulator and user also highlighted that the complexity and orientation of the sector may pose significant challenges for industries in responding to new policies, particularly in terms of operational aspects, which are

influenced by the financial capacity of the respective companies. The imposition of a carbon tax as an additional cost in the oil and gas sector may increase the company's operational costs, leading to increased prices for products and services. Therefore, it can impact people's purchasing power and reduce the industry's competitiveness in the global market. Increased operational costs experienced by the Contractor of Cooperation Contract may lead to reduced government revenues (the government's share of profits) from the upstream oil and gas sector under the PSC Cost Recovery scheme. Increased operational costs can also lead to potential workforce reductions within the company, as well as demand for greater profits or additional incentives requested by the contractor to maintain profitability. The increased operational cost aligns with the consultant's perspective, which states that companies are generally driven by profitability. Firms tend to prefer less environmentally friendly technologies due to their lower costs. This allows them to avoid higher expenses and maintain maximum profitability.

The user also stated that the taxation issues in the oil and gas industry are relatively intricate. Additionally, the cost of investing in emission reduction is high. A company already bears numerous tax burdens, including monthly taxes, annual taxes, land and building taxes, and other levies. Before receiving revenue, they are already burdened with various tax levies. The user perceived the carbon tax as part of a government project and expects the government not to impose it. They argued that the initiative should support the activities of the oil and gas industry, rather than create a burden through potential double taxation. They also hoped that the carbon tax would not be merely an opportunity for the government to generate revenue.

From a technical standpoint, the industry also demonstrates a lack of readiness for the carbon tax policy implementation, particularly due to the insufficiently defined methodology for measuring emissions. Industry representatives stated that they are still conducting studies to determine the appropriate method for measuring their emissions. On the other hand, the regulator explained that emission measurement and carbon tax calculation can be carried out using two approaches: the fuel approach and the direct approach. The fuel approach is typically used in the transportation sector, based on the emission factor value determined by the Research Octane Number (RON). In this approach, the carbon tax is calculated by multiplying the emission factor of 1 litre (L) of oil by the tax rate. Meanwhile, the direct approach is typically used for sectors that apply a cap system, with the basis of the calculation being the total emissions produced in a year multiplied by the tax rate. This gap indicates that, in the absence of derivative regulations governing the technical implementation of the carbon tax, the industry lacks a standardized method for measuring its emissions. Lack of standardization in emission measurement may affect the accuracy and precision of carbon tax imposition.

From the aspects of sectoral complexity and orientation, financial capacity of the industry, and emission measurement methodology, the findings indicate a lack of readiness in the sector to implement the carbon tax policy. All aspects reflecting the unreadiness of both the government and the oil and gas industry may contribute to potential barriers and challenges in the implementation of a carbon tax in Indonesia. Considering these challenges, exploring alternative carbon emission reduction policies may be a viable option to support the emission reduction targets. The user stated that some entities have already started independent efforts to reduce carbon emissions through internal programs. They developed a carbon emission reduction program through two key initiatives: forming a carbon emission reduction team and designing new business processes as part of their strategic vision for emission reduction until 2035. The development of a roadmap as a guideline for carbon emission reduction followed the team's formation.

Figure 4 illustrates the alternative policy options identified by the regulator and user, which provides an overview of which policies can still be developed. Both the regulator and the user argued that carbon trading can be used as an alternative policy to a carbon tax. The Economic Value of Carbon trade-based instrument consists of emission offsets and emission trading (ETS). Emission offset is a mechanism that allows entities capable of reducing emissions to sell carbon credits to entities that require them. Entities that successfully reduce emissions must obtain a GHG Emission Reduction Certificate (SPE-GRK) as proof of emission reduction, which has undergone MRV and is recorded in the National Registry System for Climate Change Control (SRN PPI) [69]. Entities with substantial emissions can purchase carbon credits or certificates [70]. With an emission offset, no quota (allowance) is assigned to entities at the beginning of the period. ETS is a mechanism for selling emission permits from entities that emit less than their cap to entities that exceed their cap, also known as the cap-and-trade mechanism. Through emission offset, at the beginning of the period, entities will be allocated a quota (allowance) as a form of obligation to limit their emissions. Entities are then required to report the emissions produced in that year. Entities whose actual emissions exceed the cap can purchase additional allowances from entities whose quotas are unused or whose actual emissions do not exceed the cap [71].

A carbon tax is a non-trade-based instrument within the Economic Value of Carbon. It can be used to cover the gap between actual emissions and the emissions cap. The implementation of a carbon tax must also align with other sectoral policies. For example, two coal-fired power plants have a cap in one period. One power plant's actual emission exceeds the cap (deficit). This deficit value must be met through other trade-based instruments, such as purchasing surplus emissions from coal-fired power plants whose emissions are below the cap. If the deficit value is still not met, the power plant can purchase SPE-GRK or emission offsets from other entities that do not produce or

have lower emissions. Suppose the power plant remains in deficit after utilizing these two mechanisms, a carbon tax payment can be used as an alternative to cover the remaining deficit gap (cap-and-tax mechanism). The regulator revealed that trade-based instruments offer more certainty in achieving emission reduction levels than a carbon tax. This is because cap and trade sets an upper limit on GHG emissions. Therefore, it ensures emission reductions up to the capped level. On the other hand, a carbon tax provides certainty regarding the price to be paid, rather than the exact emission reduction.

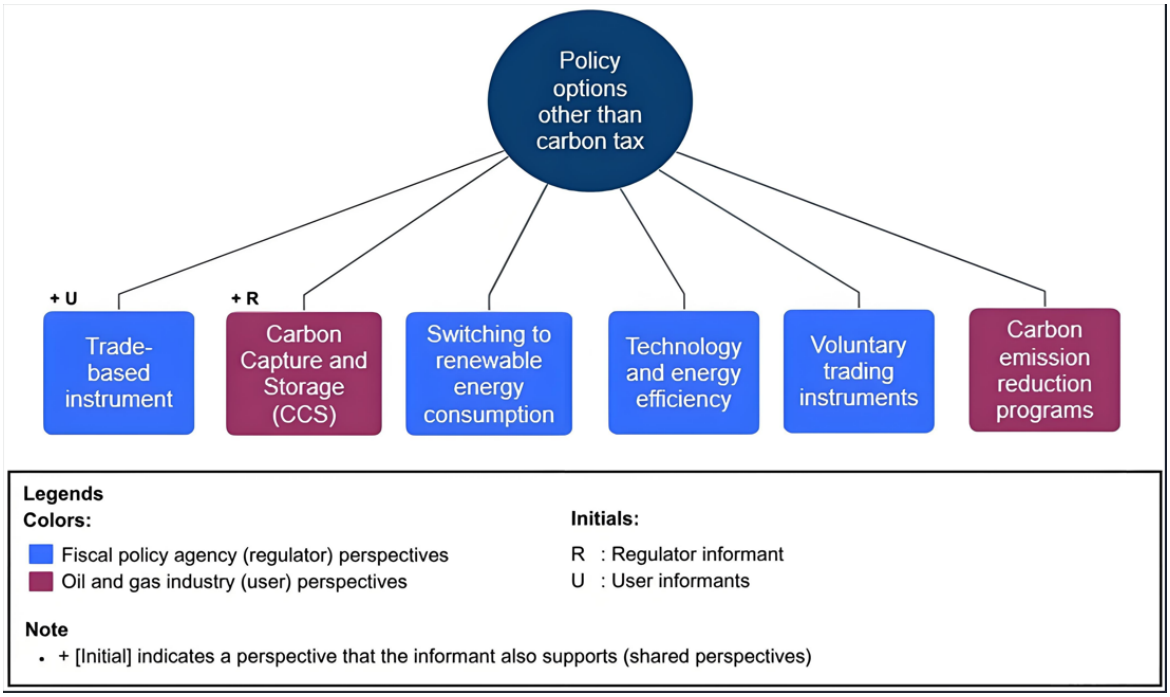

Figure 4. Policy options other than the carbon tax

Both the regulator and the user also mentioned the use of Carbon Capture and Storage (CCS) as an alternative policy, particularly for application in the oil and gas sector. CCS is a technology that reduces carbon emissions by separating and capturing CO_2 from the source of flue gas emissions, then transporting and storing it [72]. Carbon Capture Utilization and Storage (CCUS) is a further development of CCS. It utilizes the captured CO_2 for producing synthetic fuels, increasing oil and gas output, and supporting other industrial production needs [73]. Policies regarding the implementation of CCS/CCUS in Indonesia have been regulated in several regulations, such as Presidential Regulation No. 14 of 2024 and Minister of Energy and Mineral Resources Regulation No. 2 of 2023 [74]. It indicates that the Indonesian government is considering the application of CCS/CCUS technology in reducing carbon emissions while preparing to implement the carbon tax. This indication is supported by the fact that Indonesia is preparing 15 CCS/CCUS projects, covering refineries, petrochemicals, and fossil fuel power plants, with an investment of USD 28 billion. To support CCS capacity until 2050, an investment of approximately USD 2.4 trillion is required [75].

Although the application of CCS/CCUS technology is considered one of the technologies that can be utilized to reduce carbon emissions, the investment in this technology is costly, and there is a potential for carbon emission leakage [73]. However, the user preferred the development of CCS/CCUS projects over the implementation of a carbon tax to reduce carbon emissions because the user was still unsure about the impact of carbon emission reductions resulting from carbon tax implementation later.

The regulator also provided alternative policies that can be implemented by the oil and gas sector. These include reducing oil and gas use by transitioning to renewable energy technologies, improving technological and energy efficiency in operations and facilities, and utilizing voluntary carbon trading instruments. The user revealed some emission reduction initiatives and programs that can be done, including tree planting programs, zero flaring practices, and transitioning from fossil fuels to renewable energy sources. These alternatives have the potential to provide impacts equivalent to or even greater than if a carbon tax is implemented, especially in maintaining sustainability and environmental preservation.

5 Conclusions

This study provides an overview of how Indonesia has involved in various emission reduction commitments, but simultaneously increased its oil and gas production targets that may potentially increase carbon emissions.

Indonesia succeeded in achieving its emission reduction target in the energy sector, indicating that Indonesia can drive further reductions by implementing an effective carbon tax policy. This demonstrates the urgency of carbon tax implementation in Indonesia's oil and gas sector, considering the socio-economic effects and emission levels.

However, the indication of urgency alone is not sufficient to estimate the effectiveness of carbon tax implementation, which must also consider the readiness of both the government as the policy maker and the industry as the party that will be affected by the carbon tax policy. The study indicates that the absence of carbon tax derivative regulation as the primary and technical guideline for the implementation is a major aspect contributing to the government's unreadiness. This absence of a derivative regulation also creates legal uncertainty for the industry, compounded by the industry's complexity and the potential amendment of the PSC. While there is an urgent need to address the worsening impacts of climate change, the lack of readiness of both the government and the oil and gas industry significantly outweighs the urgency of immediate implementation.

The provision of fuel subsidies also acts as an obstacle to the carbon tax implementation planning. Fuel subsidies contradict the fundamental objectives of the carbon tax and reflect the government's lack of genuine commitment to effectively implementing such a policy. The government should reform fuel subsidy distribution to more accurately target and gradually phase them out while simultaneously preparing for carbon tax implementation. On the other hand, industry stakeholders should gradually adopt renewable materials and machinery within their production processes to support the transition to cleaner energy. Policy design must be conducted in a transparent and inclusive manner, involving public participation through open forums and outreach programs targeting both industry and society.

Indonesia can also consider implementing other alternative policies to reduce carbon emissions in the oil and gas sector, such as Economic Value of Carbon trade-based instruments (including emission offset and emission trading system), CCS/CCUS, technology and energy efficiency improvements, voluntary trading mechanism, and other emission reduction initiatives, such as tree planting, zero flaring, and transitioning from fossil fuels to renewable energy sources. The implementation of the carbon tax must align with other policies in the sector, while avoiding counteracting policies.

6 Limitation

This study identifies several key considerations in the government's carbon tax implementation in Indonesia's oil and gas sector, namely urgency, readiness, and policy alternatives. However, this study still carries limitations. One key limitation is the lack of prior literature, particularly studies that specifically address the carbon tax implications on Indonesia's oil and gas sector. Due to the regulations still being tentative and not fully implemented, there is a lack of comprehensive studies, particularly within the Indonesian context. The limited availability of data related to actual emissions from a credible source from 2020 to 2024 also contributes to these limitations, resulting in the inability to accurately and optimally estimate the potential revenue from carbon tax in Indonesia's oil and gas sector. Future research is recommended to further examine the implications of carbon tax implementation in Indonesia's oil and gas sector using a broader and more diverse sample of industry or user parties. Subsequent research should also explore the implications of the carbon tax once the policy is fully implemented in Indonesia.

Author Contributions

Conceptualization, E., V.G.P.W., and K.T.; methodology, E., V.G.P.W., and K.T.; software, E.; validation: V.G.P.W.; formal analysis, E. and V.G.P.W.; resources, E. and V.G.P.W.; data curation, E. and V.G.P.W.; writing-original draft, E. and V.G.P.W.; writing-review & editing: E., V.G.P.W., and K.T.; visualization: E. and V.G.P.W.; project administration: E., V.G.P.W., and K.T.; supervision: K.T.

Data Availability

According to the ethical consent agreed upon with interview respondents, raw data would remain confidential and would not be shared publicly.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] R. Nugraha and P. Balogun, "Climate change, carbon tax, and the Indonesian directorate general of taxes preparedness in implementing the new carbon tax," *Ilomata Int. J. Tax Account.*, vol. 3, no. 1, pp. 35–45, 2022. https://doi.org/10.52728/ijtc.v4i1.420

[2] United Nations Framework Convention on Climate Change (UNFCCC), "The Paris Agreement," 2024. https://unfccc.int/process-and-meetings/the-paris-agreement

[3] World Meteorological Organization, “Global temperature is likely to exceed 1.5℃ above pre-industrial level temporarily in next 5 years,” 2024. https://wmo.int/news/media-centre/global-temperature-likely-exceed-15degc-above-pre-industrial-level-temporarily-next-5-years

[4] Mae, “Indonesia masuki musim kemarau, awas "Neraka Bocor" di April,” CNBC Indonesia, 2025. https://www.cnbcindonesia.com/research/20250402065511-128-623234/indonesia-masuki-musim-kemarau-awas-neraka-bocor-di-april

[5] Kementerian Energi Dan Sumber Daya Mineral, “Menteri Arifin tegaskan sektor migas masih berperan penting di era transisi energi,” 2024. https://www.esdm.go.id/id/media-center/arsip-berita/menteri-arifin-tegaskan-sektor-migas-masih-berperan-penting-di-era-transisi-energi

[6] International Energy Agency (IEA), “Indonesia emissions,” 2022. https://www.iea.org/countries/indonesia/emissions

[7] International Energy Agency (IEA), “Indonesia oil,” 2022. https://www.iea.org/countries/indonesia/oil

[8] Kementerian Energi Dan Sumber Daya Mineral, “Genjot produksi migas, pemerintah berdayakan perusahaan nasional,” 2024. https://www.esdm.go.id/id/media-center/arsip-berita/genjot-produksi-migas-pemerintah-berdayakan-perusahaan-nasional-

[9] United Nations, “The Paris Agreement,” United Nations Climate Change, 2024. https://www.un.org/en/climatechange/paris-agreement

[10] Republic of Indonesia, “Enhanced nationally determined contribution Republic of Indonesia,” 2022. https://unfccc.int/documents/615082

[11] Kementerian Energi Dan Sumber Daya Mineral, “Speaking at COP26, Energy Minister gives Indonesia’s commitment to net zero emission,” 2021. https://www.esdm.go.id/en/media-center/news-archives/speaking-at-cop26-energy-minister-gives-indonesias-commitment-to-net-zero-emission

[12] Republic of Indonesia, “Undang-Undang Republik Indonesia nomor 7 tahun 2021 tentang harmonisasi peraturan perpajakan,” 2021. https://peraturan.bpk.go.id/details/185162/uu-no-7-tahun-2021

[13] Kementerian Keuangan Republik Indonesia, “Sejarah direktorat jenderal strategi ekonomi dan fiskal,” 2024. https://fiskal.kemenkeu.go.id/profil

[14] Kementerian Koordinator Bidang Perekonomian Republik Indonesia, “Government commits to reducing carbon emissions by developing green economy: Coordinating Minister Airlangga,” 2022. https://ekon.go.id/publikasi/detail/4043/government-commits-to-reducing-carbon-emissions-by-developing-green-economy-coordinating-minister-airlangga

[15] Rdaksi DDTCNews, “Presidensi G-20 Indonesia bakal bahas insentif pajak negara berkembang,” 2022. https://news.ddtc.co.id/berita/nasional/36995/presidensi-g-20-indonesia-bakal-bahas-insentif-pajak-negara-berkembang

[16] F. D. Muliawati, “Pajak karbon belum berlaku, sederet isu ini masih dikaji,” CNBC Indonesia, 2024. https://www.cnbcindonesia.com/news/20240326175050-4-525681/pajak-karbon-belum-berlaku-sederet-isu-ini-masih-dikaji

[17] D. Hartono, W. Indriyani, B. S. Iryani, A. Komarulzaman, A. Nugroho, and R. Kurniawan, “Carbon tax, energy policy, and sustainable development in Indonesia,” *Sustain. Dev.*, vol. 31, no. 4, pp. 2332–2346, 2023. https://doi.org/10.1002/sd.2511

[18] B. A. Pratama, M. A. Ramadhani, P. M. Lubis, and A. Firmansyah, “Implementasi pajak karbon di Indonesia: Potensi penerimaan negara dan penurunan jumlah emisi karbon,” *J. Pajak Indones. (Indones. Tax Rev.)*, vol. 6, no. 2, pp. 368–374, 2022.

[19] A. C. Pigou, *The Economics of Welfare (4th ed.)*. London: Macmillan and Co., 1932.

[20] I. P. Obani and T. O. Akroh, “Evaluating the effectiveness of environmental taxes: A case study of carbon pricing in the UK as a tool to reducing greenhouse gases emissions,” *Int. J. Sci. Res. Arch.*, vol. 13, no. 2, pp. 372–380, 2024. https://doi.org/10.30574/ijsra.2024.13.2.2126

[21] W. S. Saputra, “Pajak karbon dan Pigouvian Tax,” 2021. https://www.pajak.go.id/id/artikel/pajak-karbon-dan-pigouvian-tax

[22] Republic of Indonesia, “Undang-Undang Republik Indonesia Nomor 28 Tahun 2007 tentang Perubahan Ketiga atas Undang-Undang Nomor 6 Tahun 1983 tentang Ketentuan Umum dan Tata Cara Perpajakan,” 2007. https://peraturan.bpk.go.id/Details/39916/uu-no-28-tahun-2007

[23] D. R. Dewati and I. Inayati, “The urgency of implementing tax incentives through the exemption of renewable energy vehicles from PKB and BBNKB tax objects in the HKPD law,” *J. Syntax Literate*, vol. 10, no. 1, pp. 63–76, 2025. https://doi.org/10.36418/syntax-literate.v10i1.56045

[24] J. Blatter, L. Portmann, and F. Rausis, “Theorizing policy diffusion: From a patchy set of mechanisms to a paradigmatic typology,” *J. Eur. Public Policy*, vol. 29, no. 6, pp. 805–825, 2022. https://doi.org/10.1080/135017

63.2021.1892801

[25] H. Cheung, A. Song, M. Di Marco, and D. Biggs, "Policy diffusion in global biodiversity conservation: Learning, competition, coercion, and emulation amid US–China great-power politics," *Conserv. Lett.*, vol. 17, no. 4, p. e13026, 2024. https://doi.org/10.1111/conl.13026

[26] P. Raghoo and K. Shah, "A global empirical analysis on the diffusion & innovation of carbon pricing policies," *J. Clean. Prod.*, vol. 362, p. 132329, 2022. https://doi.org/10.1016/j.jclepro.2022.132329

[27] J. J. Andersson, "Carbon taxes and CO_2 emissions: Sweden as a case study," *Am. Econ. J. Econ. Policy*, vol. 11, no. 4, pp. 1–30, 2019. https://doi.org/10.1257/pol.20170144

[28] Y. Nurhayati, M. Said, and M. Yanova, "Carbon pricing policy to support net zero emission: A comparative study of Indonesia, Finland and Sweden," *Environ. Policy Law*, vol. 54, no. 1, pp. 53–63, 2024. https://doi.org/10.3233/EPL-230047

[29] Badan Kebijakan Fiskal Kementerian Keuangan Republik Indonesia, "Kenalkan pajak karbon untuk mengendalikan perubahan iklim, Indonesia ambil manfaat sebagai penggerak pertama di negara berkembang," 2021. https://fiskal.kemenkeu.go.id/publikasi/siaran-pers-detil/328

[30] M. Omolere, "Explainer: What is a carbon tax, pros and cons, and implementation around the world," 2024. https://earth.org/explainer-what-is-a-carbon-tax-pros-and-cons-and-implementation-around-the-world/

[31] V. D. Haptari and B. Widiastuti, "Implementation of carbon tax in Indonesia from a carbon tax design perspective," *J. Ekon.*, vol. 12, no. 04, pp. 2452–2460, 2023.

[32] A. Gurtu, V. Vyas, and A. Gurtu, "Emissions reduction policies and their effects on economy," *J. Risk Financ. Manag.*, vol. 15, no. 9, p. 404, 2022. https://doi.org/10.3390/jrfm15090404

[33] D. Ramdani, "Indonesia's economic impact of the carbon tax," *Wiga: J. Penelit. Ilmu Ekon.*, vol. 13, no. 1, pp. 62–73, 2023. https://doi.org/10.30741/wiga.v13i1.970

[34] R. L. Putri, D. N. S. Werastuti, N. W. Rustiarini, A. Sutoto, E. Wahyono, B. Wardono, A. Zulham, A. Lukas, R. D. Goenawan, S. Anita *et al.*, "Assessing the role of carbon taxes in driving low-carbon transformations: A comparative analysis of implementation policies," *Int. J. Sustain. Dev. Plan.*, vol. 19, no. 3, pp. 1171–1180, 2024. https://doi.org/10.18280/ijsdp.190335

[35] M. Wildan, "Kemenko perekonomian tetapkan 2 fase implementasi pajak karbon," DDTC News, 2024. https://news.ddtc.co.id/berita/nasional/1804235/kemenko-perekonomian-tetapkan-2-fase-implementasi-pajak-karbon

[36] N. L. Anggela, "Kapan pajak karbon diterapkan di RI? Sri Mulyani jawab begini," Bisnis.com, 2024. https://hiau.bisnis.com/read/20240824/651/1793713/kapan-pajak-karbon-diterapkan-di-ri-sri-mulyani-jawab-begini

[37] R. Azhar, L. Firdaus, N. Desriani, W. R. E. Putri, and F. S. D. Kesumah, "Environmental policy implications of carbon tax implementation using natural language processing," *Int. J. Environ. Impacts*, vol. 7, no. 4, pp. 705–712, 2024. https://doi.org/10.18280/ijei.070411

[38] Cambridge University Press & Assessment, "Urgency," 2025. https://dictionary.cambridge.org/dictionary/english/urgency

[39] Cambridge University Press & Assessment, "Readiness," 2025. https://dictionary.cambridge.org/dictionary/english/readiness

[40] J. W. Creswell and J. D. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches (5th ed.)*. Los Angeles: SAGE Publications, 2018.

[41] J. Bienkowska and C. Sikorski, "Integrating qualitative and quantitative methods: A balanced approach to management research," *East. J. Eur. Stud.*, vol. 15, pp. 345–360, 2024. https://doi.org/10.47743/ejes-2024-0115

[42] H. K. Mohajan, "Quantitative research: A successful investigation in natural and social sciences," *J. Econ. Dev. Environ. People*, vol. 9, no. 4, pp. 50–79, 2020. https://doi.org/10.26458/jedep.v9i4.679

[43] O. A. Adeoye-Olatunde and N. L. Olenik, "Research and scholarly methods: Semi-structured interviews," *J. Am. Coll. Clin. Pharm.*, vol. 4, no. 10, pp. 1358–1367, 2021. https://doi.org/10.1002/jac5.1441

[44] C. McGrath, P. J. Palmgren, and M. Liljedahl, "Twelve tips for conducting qualitative research interviews," *Med. Teach.*, vol. 41, no. 9, pp. 1002–1006, 2019. https://doi.org/10.1080/0142159X.2018.1497149

[45] T. H. Khan and E. MacEachen, "An alternative method of interviewing: Critical reflections on videoconference interviews for qualitative data collection," *Int. J. Qual. Methods*, vol. 21, pp. 1–12, 2022. https://doi.org/10.1177/16094069221090063

[46] J. M. Corbin and A. Strauss, "Grounded theory research: Procedures, canons, and evaluative criteria," *Qual. Sociol.*, vol. 13, no. 1, pp. 3–21, 1990. http://doi.org/10.1007/BF00988593

[47] S. A. Putri and L. K. Wedari, "Towards low-carbon economy: How does Indonesia's industry decarbonize its assets," *Int. J. Environ. Impacts*, vol. 7, no. 4, pp. 653–662, 2024. https://doi.org/10.18280/ijei.070406

[48] A. R. Pramusakti, "Monitoring Indonesia's second NDC: A closer look at Indonesia's climate ambitions and performance in 2024," 2024. https://iesr.or.id/en/monitoring-indonesias-second-ndc-a-closer-look-at-indonesi

as-climate-ambitions-and-performance-in-2024/
[49] Kementerian Keuangan Republik Indonesia, "Ini komitmen indonesia mencapai net zero emission," 2022. https://www.kemenkeu.go.id/informasi-publik/publikasi/berita-utama/Ini-Komitmen-Indonesia-Mencapai-Net-Zero-Emission
[50] British Petroleum, "BP energy outlook 2019 edition," 2019. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2019.pdf
[51] A. Umah, "Belum tenggelam, konsumsi minyak RI bisa 3,97 juta barel 2050," 2021. https://www.cnbcindonesia.com/news/20210819170056-4-269713/belum-tenggelam-konsumsi-minyak-ri-bisa-397-juta-barel-2050
[52] Kementerian Perhubungan Republik Indonesia, "Transportasi umum massal indonesia menuju zero emission," 2024. https://dephub.go.id/post/read/transportasi-umum-massal-indonesia-menuju-zero-emission
[53] International Energy Agency (IEA), "Indonesia energy mix," 2023. https://www.iea.org/countries/indonesia/energy-mix
[54] Kementerian Energi Dan Sumber Daya Mineral, "Laporan Kinerja," 2025. https://www.esdm.go.id/id/publikasi/laporan-kinerja
[55] Climate Action Tracker, "Indonesia policies and action," 2024. https://climateactiontracker.org/countries/indonesia/policies-action/
[56] M. Cahyani and D. Ardiyanti, "The influence of Sweden's carbon tax on global environmental diplomacy," *Proc. IROFONIC 2024*, vol. 1, no. 1, pp. 216–225, 2025.
[57] M. Bhatnagar, S. Taneja, and P. Kumar, "The effectiveness of carbon pricing mechanism in steering financial flows toward sustainable projects," *Int. J. Environ. Impacts*, vol. 6, no. 4, pp. 183–196, 2023. https://doi.org/10.18280/ijei.060403
[58] K. Becker-Olsen and S. Potucek, "Greenwashing," in *Encyclopedia of Corporate Social Responsibility*. Springer, Berlin, Heidelberg, 2013, pp. 1318–1323. https://doi.org/10.1007/978-3-642-28036-8_104
[59] R. Mcmanus, G. Ozkan, and D. Trzeciakiewicz, "Which taxes might help to restore sustainability of the public finances?" 2021. https://www.economicsobservatory.com/which-taxes-might-help-to-restore-sustainability-of-the-public-finances
[60] Kementerian Energi Dan Sumber Daya Mineral, "Masyarakat mampu lebih banyak nikmati BBM subsidi," 2024. https://www.esdm.go.id/id/media-center/arsip-berita/masyarakat-mampu-lebih-banyak-nikmati-bbm-subsidi
[61] Redaksi DDTCNews, "Penerapan pajak karbon di Indonesia, ini penjelasan kepala bappenas," 2021. https://news.ddtc.co.id/berita/nasional/29291/penerapan-pajak-karbon-di-indonesia-ini-penjelasan-kepala-bappenas
[62] A. Rachman, "Anggaran subsidi BBM-LPG sudah tersedot Rp10,6 t di awal 2025," 2025. https://www.cnbcindonesia.com/news/20250313194158-4-618478/anggaran-subsidi-bbm-lpg-sudah-tersedot-rp106-t-di-awal-2025
[63] R. A. Sofiyati and S. Hermawan, "Tantangan dan faktor yang mempengaruhi penundaan implementasi pajak karbon di Indonesia," *Bilancia: J. Stud. Ilmu Syariah dan Huk.*, vol. 17, no. 2, pp. 187–208, 2023. https://doi.org/10.24239/blc.v17i2.2150
[64] European Climate Pact, "What is MRV?" 2022. https://climate-pact.europa.eu/system/files/2022-11/MRV%20guidance.pdf
[65] A. Dohong, "Innovation in MRV technology for enhancing carbon trading governance," 2025. https://www.thejakartapost.com/opinion/2025/03/10/innovation-in-mrv-technology-for-enhancing-carbon-trading-governance.html
[66] International Monetary Fund, African Dept., "South Africa carbon pricing and climate mitigation policy," 2023. https://www.elibrary.imf.org/view/journals/002/2023/195/article-A003-en.xml
[67] Y. H. Nur and D. W. Prabowo, "Penerapan prinsip tanggung jawab mutlak (Strict Liability) dalam rangka perlindungan konsumen," *Bull. Ilm. Litbang Perdag.*, vol. 5, no. 2, pp. 177–195, 2011. https://doi.org/10.30908/bilp.v5i2.127
[68] JDIHBPK, "Perbandingan production sharing contract (PSC) cost recovery dengan PSC gross split," 2022. https://jdih.bpk.go.id/Info/Details/c529f09b-e6e6-47ac-b7bb-4fe0c8637e2f
[69] Republic of Indonesia, "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," 2021. https://peraturan.bpk.go.id/Details/187122/perpres-no-98-tahun-2021
[70] M. S. W. Muzakki, "Implementasi pajak karbon pasca-berlakunya bursa karbon," DJP, 2023. https://pajak.go.id/id/artikel/implementasi-pajak-karbon-pasca-berlakunya-bursa-karbon
[71] ICDX Group, "Apa yang Dimaksud dengan Perdagangan Karbon?" 2021. https://www.icdx.co.id/news-detail/publication/apa-yang-dimaksud-dengan-perdagangan-karbon
[72] Kementerian Energi Dan Sumber Daya Mineral, "Carbon capture and storage (3): Sistem penangkapan CO_2," 2009. https://www.esdm.go.id/id/media-center/arsip-berita/carbon-capture-and-storage-3-sistem-penangkapa

n-co2
[73] Indonesia Petroleum Association, “CCS/CCUS, jurus andalan industri migas mereduksi karbon,” 2024. https://www.ipa.or.id/id/news/ipa-news/ccsccus-the-oil-and-gas-industrys-key-to-reducing-carbon-emissions
[74] Ministry of Energy and Mineral Resources, “Regulasi penyimpanan karbon, Indonesia jadi pionir di Asia tenggara,” 2024. https://www.esdm.go.id/id/media-center/arsip-berita/regulasi-penyimpanan-karbon-indonesia-jadi-pionir-di-asia-tenggara-
[75] Z. Prihatini and Y. W. Utomo, “Proyek carbon capture storage, Indonesia butuh 2,4 triliun dollar AS,” 2025. https://lestari.kompas.com/read/2025/01/19/134107086/proyek-carbon-capture-storage-indonesia-butuh-24-triliun-dollar-as