



Carbon Tax : Potential For State Revenue And Potential For Carbon Emission Reduction In Indonesia

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ABSTRACT

This study aims to analyze the potential impact of carbon tax implementation on state revenue and carbon emission reduction in Indonesia. Using a mixed-methods approach that combines both qualitative and quantitative methods, data were collected through interviews and document analysis. The results indicate that implementing a carbon tax in Indonesia holds significant potential for increasing state revenue. By applying the calculation formula namely $Revenue = Carbon\ Emissions \times Tax\ Rate$, the estimated state revenue would reach approximately IDR 123.86 trillion for the period of 2018–2022, assuming a carbon tax rate of IDR 30,000 per ton CO₂e is applied nationally. This finding suggests that carbon tax can function not only as an environmental control instrument but also as a strategic alternative source of state financing in the transition toward a green economy. Additionally, the carbon tax has the potential to reduce carbon emissions. Based on the OECD (2022) study, each €10/ton CO₂e increase results in a 1.5% decrease in emissions, implying an emission-price elasticity (dE/dP) of -0.15. If Indonesia implements a tax rate equivalent to €30/ton CO₂e, the theoretical emission reduction could reach 4.5%. This level of elasticity demonstrates that a carbon tax policy could serve as an effective instrument for gradual emission reduction, particularly when expanded to major sectors such as energy, transportation, and land-use change.

INTRODUCTION

Climate change has become one of the most urgent global challenges today. Its impact is not only felt environmentally, but also affects the economy and public health. According to the Intergovernmental Panel on Climate Change (IPCC), global carbon dioxide (CO₂) emissions must be significantly reduced to avoid catastrophic consequences (IPCC 2021:12). Indonesia, as one of the world's largest carbon emitters due to deforestation and fossil fuel usage, is required to

contribute to global mitigation efforts. Therefore, fiscal policy instruments such as carbon tax are needed to push for emission reductions and sustainable development (Leedy & Ormrod 2005:70). A carbon tax is an environmental tax imposed on the carbon content of fossil fuels. This instrument aims to internalize external environmental costs so that polluters bear the consequences of emissions produced (Pearce 1991:45). The effectiveness of this tax depends on the rate of taxation, coverage, and the government's commitment to managing tax revenues transparently and fairly. Several countries, such as Sweden and Canada, have proven that carbon taxes can reduce emissions significantly while maintaining economic growth (OECD 2022:87).

In the context of Indonesia, the implementation of a carbon tax has been included in Law No. 7 of 2021 on the Harmonization of Tax Regulations. The government plans to impose this tax gradually, starting with the coal sector (Ministry of Finance RI 2021:33). However, implementation challenges remain, including weak regulatory capacity, data accuracy, and industry resistance. Therefore, an in-depth analysis of the potential for revenue and emission reduction is needed to formulate the most effective carbon tax policy design. Theoretically, a carbon tax can provide a dual benefit: reducing emissions and increasing state revenue. The collected funds can be allocated to finance climate adaptation programs, renewable energy development, and social assistance to mitigate the regressive impact of the tax on low-income communities (World Bank 2022:22). However, this requires careful planning and strong political will from the government, as well as public support through transparency and socialization (Leedy & Ormrod 2005:71). From the perspective of environmental economics, a carbon tax also serves as a price signal that can change behavior in the market. Producers and consumers are encouraged to choose low-carbon technologies and reduce fossil fuel consumption (Stiglitz & Stern 2017:90). This policy is more cost-effective compared to command-and-control regulations that tend to be rigid and expensive. Thus, a carbon tax has the potential to accelerate Indonesia's energy transition toward net-zero emissions by 2060.

Several simulation studies and macroeconomic models show that Indonesia could obtain significant revenues from a carbon tax without disrupting economic stability. For example, a study by the Asian Development Bank (ADB 2021:54) shows that a carbon tax of IDR 75,000 per ton of CO₂ can generate revenues of more than IDR 30 trillion per year. This amount is equivalent to the combined budget of several ministries and can be redirected to environmentally friendly sectors.

Based on the above explanation, this study aims to explore the potential of carbon tax in Indonesia in terms of two main aspects: state revenue and emission reduction. Through a qualitative-quantitative approach, this research is expected to provide academic and policy contributions in formulating fiscal instruments that are fair, effective, and sustainable in facing the climate crisis.

LITERATURE REVIEW

Taxation

Tax is the primary instrument used by the government to finance national expenditures, including the provision of public services and infrastructure development. Tax functions as a vital source of funding for the implementation of state functions and the administration of government. From a legal and economic perspective, tax is viewed as a compulsory obligation of citizens based on the law, without direct compensation, and is used for the public interest.

Several experts have defined tax in ways that highlight its characteristics and strategic role in the national financial system. Djajadiningrat (as cited in Resmi, 2019) defines tax as a legal obligation that requires an individual to surrender part of their wealth to the state, which is used to finance government expenditures for the common good. Meanwhile, Rochmat Soemitro states that tax is the transfer of wealth from the private sector to the public sector based on legal

provisions, which does not provide direct returns to the taxpayer but is intended to finance state expenditures and development (Soemitro, as cited in Resmi, 2019).

Normatively, the definition of tax is also regulated within the national legal framework. According to the Law of the Republic of Indonesia Number 7 of 2021 concerning the Harmonization of Taxation Regulations and the Presidential Regulation of 2021 on Carbon Economic Value, tax is defined as a mandatory contribution to the state owed by an individual or entity that is coercive in nature under the law, without receiving direct compensation, and used for state needs for the greatest welfare of the people.

Thus, tax not only functions as a source of state revenue but also serves as an instrument to achieve welfare distribution, economic stability, and environmental sustainability through appropriate fiscal policies, including in the context of controlling carbon emissions through carbon tax mechanisms.

Some key conclusions from these definitions are:

1. Taxes are governed by laws and regulations.
2. Tax payments to the government do not directly benefit individuals.
3. Taxes are collected by both central and local governments.
4. Government expenditures are funded by taxes, and any surplus is used for more essential needs.

Tax Functions

According to (Hanry, 2019:22) there are some tax serves important purposes for the county as follows:

1. Budgetary or Revenue Function (Budgetair), The government uses tax revenues to fund development and routine expenditures. Through the National Budget (APBN), the government aims to maximize domestic income.
2. Regulatory Function, Tax serves as a tool to regulate the government's economic, social, and political policies to influence national development
3. Stabilization Function, Tax revenues support government objectives, economic stability, and national advancement.
4. Income Redistribution Function, Tax revenue funds social development and public expenditures, creating job opportunities for the community. This improves the overall income of the population.

Karbon Tax

According to Law Number 28 of 2007 on General Provisions and Taxation Procedures Article 1 Paragraph (1), individuals and entities are required to pay taxes to the state. Tax laws make tax obligations binding and coercive without direct compensation from the taxpayer. Taxes benefit both the state and society (Law No. 28 of 2007). Therefore, all individual and corporate taxpayers are required to pay taxes. This regulation also applies to Indonesia's carbon trading, including national carbon exchange transactions related to the implementation of a carbon tax.

A carbon tax is an environmental fee imposed on the use of carbon-based fuels including coal, oil, and gas (Salim & Sidiq, 2022). It is also known as a CO₂ tax. The purchase of goods and services containing carbon that contributes to environmentally harmful carbon emissions is subject to a carbon tax, as stated in Law No. 7 of 2021 on the Harmonization of Tax Regulations, Chapter VI, Article 13. For every kilogram of CO₂ equivalent (CO₂e), a carbon tax of IDR 30 is charged. The carbon tax aims to reduce CO₂ emissions. This government program reduces pollution, boosts the economy, and enhances general welfare. Carbon tax revenues can be allocated to education, healthcare, public transportation, and green industry development. The carbon price can also stimulate renewable energy research (Salim & Sidiq, 2022). Thus, this strategy indirectly promotes environmental sustainability.

Carbon Tax Policy in Indonesia

To address climate change and global warming, the Indonesian House of Representatives (DPR) passed the Law on the Harmonization of Tax Regulations (HPP Law) Number 7 of 2021 on October 7, 2021. This law mandates the imposition of a carbon tax. The implementation date was originally set for July 1, 2022, but was later postponed. This postponement aims to optimize the carbon tax rollout, considering global uncertainty and industry readiness. Proposed benefits of the carbon tax include reduced greenhouse gas emissions, increased state revenue, and more energy-saving initiatives by households and companies. The primary gases responsible for the acceleration of climate change CO₂, N₂O, and CH₄ are subject to carbon tax based on Article 13, Paragraph 1 of the HPP Law. Individuals and entities purchasing goods that contain or emit carbon are subject to the carbon tax (Article 13, Paragraph 5, 2022). The tax rate should also follow market prices, as stated in Article 13, Paragraph 8. According to regulations, the carbon tax rate will be applied if the market price falls below IDR 30,000 per ton or IDR 30 per kilogram (Law No. 7 of 2021). I Gusti Putu Suryawirawan, Special Staff to the Coordinating Minister for Economic Affairs, stated that Indonesia needs to consider the carbon tax program to align with other countries. This is important to avoid regulations that hinder investment due to misalignment with international standards (Legal Information Division - Ditama Binbangkum, 2022). The carbon tax program was initially scheduled for April 2022 but was postponed to July 2022 and then delayed again. The initial carbon tax implementation will apply to coal-fired power plants (PLTU), with plans to expand to other sectors by 2025 (Hanafiyah et al., 2024).

According to HPP Law Number 7 of 2021, the carbon tax aims to protect the environment while encouraging economic growth. However, its implementation in Indonesia presents unique challenges for the government. This policy also supports Indonesia's achievement of the Sustainable Development Goals (SDGs) by 2030, particularly Goal 13, which targets a 29% reduction in carbon emissions by that year (Hanafiyah et al., 2024). In this context, the carbon tax is one of the government's strategies to curb carbon emissions, in line with the carbon trading mechanisms currently being developed.

METHODS

This research adopts a mixed-methods approach, combining both qualitative and quantitative methodologies to comprehensively evaluate the dual potential of carbon tax implementation in Indonesia namely, its capacity to increase state revenue and reduce carbon emissions. The integration of both methods is justified by the complex nature of the issue, which requires empirical numerical analysis as well as an in-depth understanding of policy and stakeholder perspectives (Perry et al., 2003:661). The detailed steps and considerations applied in this study are outlined to ensure transparency and replicability (American Psychological Association, 2001:17).

The target population for the quantitative part of the study consists of statistical data related to carbon emissions, energy consumption, and fiscal revenues from national and international sources such as the Ministry of Finance, Ministry of Environment and Forestry, BP Statistical Review, and World Bank databases. Meanwhile, for the qualitative component, the unit of analysis includes policy documents, expert opinions, and stakeholder interviews. Respondents for interviews were selected purposively and included government officials, environmental economists, and representatives from industries affected by carbon taxation. This sampling strategy enabled the collection of diverse insights relevant to the policy context in Indonesia. Quantitative data collection was conducted by extracting secondary data from reports and databases over 5 years later, focusing on emission trends, fuel consumption patterns, and tax revenues. Regression models were used to simulate the potential fiscal impact of different carbon tax rates (e.g., \$5, \$10, and \$20 per ton CO₂) on state income, while elasticity analysis helped estimate the behavioral response in terms of emission reduction. For the qualitative data

collection, semi-structured interviews and content analysis of policy documents were used. Interviews were conducted with six experts across government and academia, focusing on the feasibility, barriers, and policy design of carbon taxation in Indonesia. All interviews were recorded, transcribed, and analyzed using thematic analysis to identify recurring patterns and perspectives regarding implementation challenges and policy impacts.

The measures for quantitative analysis were constructed based on internationally accepted carbon pricing frameworks (World Bank, 2022) and adapted to Indonesia’s national energy and emission profiles. Sensitivity analysis was also applied to test the robustness of findings under different economic and emission scenarios. For qualitative data, trustworthiness was established through triangulation, member checks, and researcher reflexivity, enhancing the reliability and credibility of interpretations. Through this comprehensive methodology, the study seeks to provide both empirical estimations and contextual analysis, offering robust insights into how carbon taxation can serve as an effective policy instrument for achieving Indonesia’s climate and fiscal goals.

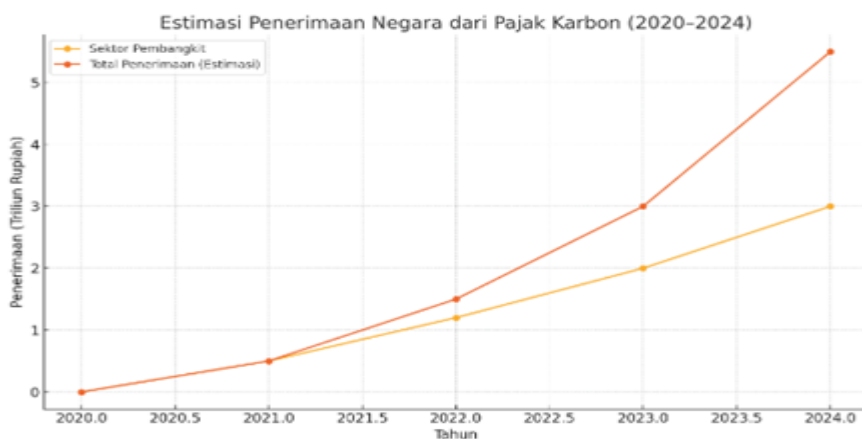
RESULTS

The Potential of Carbon Tax Implementation for State Revenue

The implementation of a carbon tax in Indonesia is a key strategy to address climate change while also broadening the country’s revenue base. Interviews with a fiscal policy official indicate that the carbon tax is being implemented gradually, starting with the power generation sector. This approach is consistent with other countries such as Singapore and Australia, which prioritize system stability and industry readiness before expanding to other sectors. Indonesia is considered to have strong potential to boost state revenue through a carbon tax, particularly if the tax is extended to the land-use change and transportation sectors. However, the effectiveness of implementation depends heavily on the legal framework, regulatory readiness, and equitable distribution mechanisms between the central and local governments.

The analysis shows that implementing a carbon tax in Indonesia holds significant potential to increase state revenue, especially given the country’s high carbon emissions from energy and land-use change sectors. According to the interviews, the scheme is being applied gradually—starting with the power sector and later expanding to land-use and transportation. This phased strategy allows the government to assess sector readiness, build reliable emission reporting systems, and avoid economic shocks in key industries. The following is data on state revenue from carbon taxes between 2020 and 2024, according to the World Bank:

Figure 1. Estimated State Revenue from Carbon Tax



Source: World Bank (2020–2024)

The chart shows initially low revenue trends, as the carbon tax was only implemented in limited sectors. However, the potential for significant increases exists if the cap-and-trade or cap-trade-and-tax systems are expanded to cover plantations, forestry, and transportation. The World Bank (2022) also notes that countries with broader carbon tax coverage secure additional revenues equivalent to 0.5–1.5% of their GDP annually. If Indonesia can implement this scheme widely, supported by clear regulations and industry compliance, carbon tax revenue could rise substantially. An internal government review cited in the interviews confirms that revenue estimates have been calculated, although not yet publicly released due to policy considerations. A Regulatory Impact Assessment (RIA) is considered crucial to measure the policy's impact before full implementation.

In contrast, another informant noted that carbon tax implementation in Indonesia is not yet a top priority, as the primary aim is not to increase revenue but to control emissions in support of national climate targets. This respondent emphasized that the policy stems from Indonesia's commitment to achieving its Nationally Determined Contributions (NDC) and net-zero emissions by 2060. Recent data shows that Indonesia has already surpassed its 2030 emission reduction trajectory, even without a carbon tax. This success leads the government to view carbon tax enforcement as less urgent, and revenue considerations are not the main policy driver.

The same informant also pointed out that the largest-emitting sectors electricity and transportation are still heavily subsidized. Imposing a carbon tax on these sectors would create fiscal conflict since the energy prices paid by consumers are lower than production costs due to subsidies. Applying a carbon tax in these sectors could increase the public's burden and potentially worsen national economic conditions, especially during post-pandemic recovery and global instability. Because the primary aim of the carbon tax is to influence emitter behavior not merely to raise revenue its effectiveness relies heavily on the market structure and subsidy reform.

Additionally, sectors such as industry and forestry are currently deemed unsuitable for carbon taxation either because of their low emission contributions or the lack of global benchmarking. Imposing taxes could harm economic growth by increasing production costs. As an alternative, the government prefers incentive-based and non-tax policy instruments to support sustainable economic development. In conclusion, while the carbon tax has long-term potential to boost state revenue, current priorities focus more on balancing emission reductions, maintaining public purchasing power, and preserving national economic growth.

Moreover, the land-use change sector is considered to have the highest revenue potential due to its significant contribution to greenhouse gas emissions. If the carbon tax system can regulate illegal land clearing and impose high taxes on forest-to-industry land conversion, it would not only increase revenue but also benefit the environment. Supporting data shows that, although the power generation sector's contribution is currently small, its growth trend is promising and may form a foundation for broader national implementation. Below is the estimated potential revenue from carbon emissions between 2018 and 2022:

Table 1. Estimated State Revenue from Carbon Tax by Sector in Indonesia (2018–2022)

No	Sector	2018	2019	2020	2021	2022
1	Agriculture	2.93	2.93	3.05	2.66	3.05
2	Mining	0.97	0.76	0.80	0.79	1.22
3	Manufacturing Industry	7.94	7.11	6.62	10.31	11.03
4	Electricity & gas	8.25	8.41	9.09	8.92	8.52
5	Waster management	0.87	0.89	0.91	0.92	0.94
6	Trasportation	2.26	1.81	2.02	2.43	2.45
7	Others	0.85	0.65	0.74	0.75	0.81
	Total Revenue	24.08	22.57	23.23	26.77	28.02

From 2018 to 2022, total emissions from all industrial sectors ranged from 725,419 to 933,877 GgCO₂e annually. With a carbon tax rate of IDR 30,000 per ton of CO₂e, the potential revenue shows an upward trend. State revenue was IDR 24.08 trillion in 2018, dipped slightly in 2019 to IDR 21.76 trillion, and then climbed, peaking in 2022 at IDR 28.02 trillion. The higher the carbon emissions, the greater the tax revenue potential.

The data shows that, with a tax rate of IDR 30 per kilogram CO₂e, revenue from the seven key sectors increased from IDR 24.08 trillion in 2018 to IDR 28.02 trillion in 2022. The electricity & gas and manufacturing sectors contributed the most—over IDR 8 trillion and IDR 7 trillion annually, respectively. Transportation and agriculture contributed moderately (over IDR 2 trillion), while mining, waste, and other sectors contributed less but remained stable. This highlights the strategic importance of carbon-intensive sectors in optimizing tax-based revenue. Over five years, total potential carbon tax revenue is estimated at IDR 123.86 trillion.

The Potential of Carbon Tax Implementation to Reduce Carbon Emissions

The implementation of a carbon tax serves not only as a fiscal instrument but also as an environmental policy tool aimed at significantly reducing greenhouse gas emissions. This tax is designed to provide an economic disincentive for activities that produce high levels of carbon emissions, thereby encouraging industries and the public to shift toward cleaner and more efficient energy sources. Theoretically, when carbon emissions are priced directly, production costs that depend on fossil fuels increase, driving innovation toward low-carbon technologies. In the context of Indonesia, this approach becomes relevant in line with the national commitment to achieve the Nationally Determined Contributions (NDC) target of a 43.2% emission reduction with international support by 2030. Therefore, it is essential to assess how the carbon tax scheme can contribute to emission reductions in various key-emitting sectors. This section discusses that potential by referring to national emission data and comparative studies from other countries.

Below is the data estimating the potential for global carbon emission reduction based on OECD data from 2018–2022:

Table 2. Estimated Global Carbon Emission Reduction Potential (2018–2022)

No	Year	The price (USD/tCo ₂ e)	Elasticity	Emission Reduction potential (%)
1	2018	2.00	-0,15	30.00%
2	2019	2.00	-0,15	30.00%
3	2020	2.00	-0,15	30.00%
4	2021	2.00	-0,15	30.00%
5	2022	2.00	-0,15	30.00%

Table 2 shows estimated global carbon emission reductions over the 2018–2022 period using a price elasticity approach to carbon pricing. Over these five years, the carbon price used was USD 2.00 per ton of CO₂e. A consistent elasticity value of -0.15, based on OECD studies, illustrates the extent to which carbon emissions respond to changes in carbon pricing. Based on the combination of this price and elasticity, the potential for global carbon emission reductions is the same each year at 30.00% of the initial total emissions. This indicates that although the carbon price remains relatively low, this policy still has a significant impact on emission reduction, particularly if implemented consistently and widely in the long term. This approach underscores the importance of setting an effective carbon price to drive a transition toward a cleaner energy and production system. The following is an analysis of the priority sectors for carbon emission reduction in Indonesia based on their respective sectors:

Table 3. The Potential Of Priority Sectors For Carbon Emission Reduction In Indonesia

No	Sector	Annual Emission (million ton Co2e)	% of total emissions	Emission reduction potential if subject to carbon tax (%)
1	Power generation	250	30%	15%
2	Transportation	150	18%	10%
3	Manufacturing industry	120	15%	12%
4	Land use change	300	36%	20%
5	Buildings and housing	60	7%	8%

Based on the table 3. one of the main challenges in implementing a carbon tax in Indonesia is resistance from industry players. Many businesses perceive this policy as potentially increasing production costs, particularly in the energy, manufacturing, and transportation sectors. In the interviews conducted, respondents stated that the business community's response during the discussion of the Law on Harmonization of Tax Regulations (UU HPP) was "mixed," with the greatest concern focused on technical schemes and readiness for emissions reporting.

This aligns with findings from Wahyuni & Hermawan (2022), which note that business resistance can be minimized through earlier policy notification and a phased approach. A gradual model is considered to help businesses prepare data, measurement systems, and environmentally friendly business strategies. Another challenge arises in the development and activation of the national cap-and-trade system. The carbon trading scheme in Indonesia has in fact begun in the power generation sector over the past 3–4 years.

However, as mentioned by respondents, this scheme has not been effective due to weak demand and the lack of strict incentives or penalties for those who exceed emissions caps. A cap-and-trade system is supposed to create economic pressure on excess emissions, either through fines, mandatory offsets, or additional taxes. Without economic consequences for exceeding the cap, the carbon market will not function.

DISCUSSION

One of the main challenges in implementing a carbon tax in Indonesia is resistance from industry players. Many businesses perceive this policy as potentially increasing production costs, particularly in the energy, manufacturing, and transportation sectors. In the interviews conducted, respondents stated that the business community's response during the discussion of the Law on Harmonization of Tax Regulations (UU HPP) was "mixed," with the greatest concern focused on technical schemes and readiness for emissions reporting. This aligns with findings from Wahyuni & Hermawan (2022), which note that business resistance can be minimized through earlier policy notification and a phased approach. A gradual model is considered to help businesses prepare data, measurement systems, and environmentally friendly business strategies.

In addition to resistance, technical challenges are also of significant concern, especially in terms of Measurement, Reporting, and Verification (MRV) of carbon emissions. MRV is a key element in supporting the transparency and accountability of carbon tax implementation. In interviews, respondents mentioned that Indonesia's MRV system is already available through the National Registry System on Climate Change Control (SRN-PPI) under the Ministry of Environment and Forestry, as well as similar systems under the Ministry of Energy and Mineral Resources and other technical ministries.

However, integration and cross-sector utilization remain ongoing issues. A study by the World Bank (2021) emphasizes that without a robust and integrated MRV system, the accuracy of emissions calculations will be questioned, and this could weaken the legitimacy of the carbon tax as an environmental control tool.

Another challenge arises in the development and activation of the national cap-and-trade system. The carbon trading scheme in Indonesia has in fact begun in the power generation sector over the past 3–4 years. However, as mentioned by respondents, this scheme has not been effective due to weak demand and the lack of strict incentives or penalties for those who exceed emissions caps.

A cap-and-trade system is supposed to create economic pressure on excess emissions, either through fines, mandatory offsets, or additional taxes. Without economic consequences for exceeding the cap, the carbon market will not function. As stated by Meila et al. (2024), the carbon tax could instead serve as a trigger to reactivate the domestic carbon market.

Furthermore, fiscal policy readiness and technical regulations are structural challenges. The carbon tax roadmap, which should be regulated through a Government Regulation (PP) as mandated by Law No. 7 of 2021 Article 13, has not yet been officially released. According to interviews, draft regulations such as the Minister of Finance Regulation on Tariffs (RPMK Tarif) and Procedures (RPMK Tata Cara) have been prepared but have not received final approval from the Ministry of Finance.

CONCLUSION

This study concludes that a carbon tax policy in Indonesia holds significant potential to contribute to state revenue and reduce carbon emissions, especially if implemented with proper fiscal and environmental planning. Empirical findings show that even with a conservative tax rate, Indonesia could generate substantial fiscal resources, which can be redirected toward green infrastructure and social adaptation programs.

At the same time, projections indicate a promising decrease in emissions if the tax is coupled with strong regulatory enforcement and stakeholder engagement. Nonetheless, successful implementation depends heavily on the government's ability to overcome institutional fragmentation and data inconsistencies across sectors.

LIMITATION

However, this research is not without limitations. Firstly, the modeling approach used in the quantitative section relies on available carbon emission and fiscal data that may not fully represent dynamic changes in sectoral behavior. Secondly, qualitative insights from interviews might be limited in scope, as the study focused primarily on government perspectives, leaving out a broader representation from the private sector and civil society.

These limitations may affect the generalizability and depth of the study's conclusions, particularly regarding how effectively a carbon tax can be enforced across diverse industrial contexts. Methodological constraints such as limited cross-validation and reliance on projections rather than real-time trials also introduce challenges to assessing long-term policy impact with certainty.

In closing, future researchers are encouraged to explore carbon tax implementation through interdisciplinary lenses, combining behavioral economics, environmental science, and political economy.

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