



Working Paper 2025.1.5.20

- Vol. 1, No. 5

**ĐÁNH GIÁ VIỆC ÁP DỤNG THUẾ CARBON TRONG NGÀNH NĂNG
LƯỢNG CỦA VIỆT NAM: CÁC KHUYẾN NGHỊ CHIẾN LƯỢC ĐỂ GIẢM
THiểu TÁC ĐỘNG KINH TẾ**

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Tóm tắt

Khi việc giảm thiểu biến đổi khí hậu trở nên cấp bách, thuế carbon là một công cụ quan trọng để giảm lượng khí thải bằng cách thúc đẩy các công nghệ sạch hơn. Đối với Việt Nam, một nền kinh tế đang phát triển nhanh chóng và phụ thuộc vào nhiên liệu hóa thạch, yếu tố này vừa mang lại cơ hội vừa đặt ra thách thức. Bài viết này xem xét việc thực hiện thuế carbon trong lĩnh vực năng lượng của Việt Nam, bao gồm khung thuế carbon, bối cảnh năng lượng của Việt Nam và tác động ngành của nó. Những thách thức chính bao gồm chi phí năng lượng ngày càng tăng, khả năng cạnh tranh công nghiệp và phân phối thuế công bằng. Bài viết cung cấp các khuyến nghị chiến lược để cân bằng các mục tiêu kinh tế và môi trường, định vị Việt Nam như một quốc gia hàng đầu trong quá trình chuyển đổi năng lượng bền vững ở Đông Nam Á.

Từ khóa: Thuế carbon, lĩnh vực năng lượng, kinh tế, phát triển bền vững

EVALUATING THE IMPLEMENTATION OF CARBON TAXATION WITHIN VIETNAM'S ENERGY SECTOR: STRATEGIC RECOMMENDATIONS FOR MITIGATING ECONOMIC IMPACT

Abstract

As climate change mitigation becomes urgent, carbon taxation is a key tool to reduce emissions by promoting cleaner technologies. For Vietnam, a fast-growing, fossil fuel-dependent economy, it presents both opportunities and challenges. This report examines carbon tax's implementation in Vietnam's energy sector, covering the carbon tax framework, Vietnam's energy landscape, and its sectoral impact. Key challenges include rising energy costs, industrial competitiveness, and fair tax distribution. The report provides strategic recommendations to balance economic and environmental goals, positioning Vietnam as a top-runner in sustainable energy transitions in Southeast Asia.

Keywords: Carbon tax, energy sector, economy, sustainable development

1. Introduction

As the global fight against climate change intensifies, carbon taxation has become a key policy tool to reduce greenhouse gas (GHG) emissions. By assigning a monetary value to emissions, it encourages industries to adopt cleaner technologies. For Vietnam, a rapidly growing economy reliant on fossil fuels, carbon taxation presents both opportunities and challenges. While it can drive a shift toward sustainable energy, concerns remain about its economic and social impacts.

This report explores the implementation of carbon taxation in Vietnam's energy sector, assessing its macroeconomic, social, and environmental implications. It examines the theoretical framework of carbon taxes and contextualizes their role within Vietnam's energy landscape, including the country's reliance on coal and climate policies. A literature review highlights research gaps and evaluates the tax's effectiveness.

Key challenges include rising energy costs, economic disruptions in key industries, and ensuring an equitable tax burden. The report offers strategic recommendations for the Vietnamese government and energy companies, aiming to mitigate economic impacts while maximizing environmental benefits. By adopting a balanced approach, Vietnam can align carbon taxation with sustainable development goals and position itself as a leader in green energy transitions in Southeast Asia.

2. Theoretical framework

2.1. Carbon tax

A carbon tax is a market-based tool that reduces greenhouse gas emissions by pricing carbon emissions directly. It imposes a fixed tax rate per unit of CO₂ or equivalent emissions, making carbon-intensive activities more expensive. This approach, based on Pigouvian taxes, addresses market failures caused by negative externalities by internalizing the social costs of emissions (Pigou, 1920). It encourages emission reductions, cleaner technologies, and shifts toward low-carbon goods and services. The tax also generates revenue that can be reinvested into sustainable practices (Baranzini et al., 2000).

In contrast, cap-and-trade systems set a limit on total emissions and allocate permits to companies, which can trade them (Nordhaus, 2007). This creates a market-driven price for emissions, incentivizing reductions. While carbon taxes offer price certainty, cap-and-trade ensures emissions stay within a set limit (Goulder, 2009). Both mechanisms aim to internalize the social costs of carbon but differ in their approach to pricing and emission control.

2.2. Carbon tax models

Carbon tax models vary significantly in their design and implementation, reflecting different approaches to pricing carbon emissions in different countries. A flat carbon tax imposes a fixed price per ton of CO₂ emitted, it has simplicity and investment certainty. However, it does not guarantee specific emission reductions. In contrast, a dynamic carbon tax adjusts the tax rate over time based on economic conditions, emission targets, or technological advancements, making it more effective in achieving specific emission targets and adapting to changing circumstances.

Another type is tiered carbon tax, which applies different tax rates to various sectors or emitters, allowing for targeted incentives and protection of trade-exposed industries. This approach encourages emission reductions in high-emission sectors while mitigating impacts on vulnerable industries. Additionally, carbon taxes can be levied either upstream on fossil fuel producers and importers, simplifying administration, or downstream on end-users, enabling more direct incentives for consumers and industries, as the Commonwealth stated.

Hybrid carbon tax models, according to the United Nations, combine elements of carbon taxes and emission trading systems (ETS), offering flexibility and price certainty. These models provide both price and quantity certainty, allowing for more effective emission reduction strategies. However, they are more complex to design and manage.

2.3. Factors affected by carbon tax

The implementation of a carbon tax significantly influences three primary domains: economic, environmental, and socio-political. Economically, it imposes additional costs on carbon-intensive industries, such as energy and manufacturing, which may lead to increased production expenses and, consequently, higher prices for consumers. Environmentally, the tax serves as a mechanism to mitigate greenhouse gas emissions by incentivizing the adoption of cleaner technologies and sustainable practices. From a socio-political perspective, the introduction of a carbon tax often generates discourse on equity, regulatory frameworks, and governmental accountability, necessitating careful design to ensure fair distribution of benefits and avoid disproportionate impacts on vulnerable groups.

3. Overview

3.1. Overview of carbon tax

The Intergovernmental Panel on Climate Change (IPCC), in its Second Assessment Report, states that “the balance of evidence suggests that there is a discernible human influence on global climate” (Houghton et al., 1996, p. 5), due to the emission of a number of 'greenhouse gases (GHG)' into the atmosphere. The most prominent GHG is carbon dioxide (CO₂), which accounts for three-quarters of global emissions. Methane, which positions in the second most emission,

accounting for a further 18% of global emissions. Nitrous oxides (N₂O) and other gases account for the remaining roughly 8% of GHG emissions.

Table 1: Greenhouse gas emission in 2016

Source	World	China	EU-28	India	United States
Carbon dioxide	74%	83%	80%	70%	83%
Methane	18%	11%	11%	21%	10%
Nitrous oxides	6%	5%	6%	8%	4%
Fluorinated gases	2%	2%	3%	1%	3%

Source: World Resources Institute CAIT (2016)

The table shows the global breakdown of GHG emissions for 2016 as well as the breakdown for different countries. In the US, EU, and China, CO₂ emissions make up a larger portion of overall emissions than the global average. Given the significant contribution of agriculture to the Indian economy, it is not surprising that methane makes up a higher percentage of emissions in India than the global average. Methane and CO₂ make for about 90% of emissions in every country (comparing the various GHGs using a 100-year global warming potential).

The increasing degradation of natural ecosystems, primarily attributed to human activities, has led to a gradual rise in operational costs for firms, largely as a result of the implementation of various environmental policies. Taxing greenhouse gas emissions is one way to reduce those harms, according to Goulder and Schein (2013). A total of 182 governments have signed the United Nations Framework Convention on Climate Change (UNFCCC) with the objective of “preventing dangerous anthropogenic interference with the climate system” (UNFCCC, 1992, Article 2). The Kyoto Protocol, devised by the UNFCCC has changed the context of global warming policies by prescribing legally binding greenhouse gas (GHG) emissions reduction. Many nations, despite not being mandated by the Kyoto Protocol, are developing or have already implemented climate change programs to meet sustainable goals. A key tool in many of these initiatives is energy taxation, which, in some cases, is based on the carbon content of fossil fuels, commonly referred to as a carbon tax.

Pollution is a problem arising from the failure of firms or individuals to account for the damages from pollution that are borne by others in their decision making. Historically, there were various economic theories to assess which taxation approach is the most effective for stakeholders. The economic foundation of a carbon tax lies in the concept of Pigouvian taxes, which are designed to correct market failures caused by negative externalities. In the case of greenhouse gas emissions, producers and consumers do not bear the full social cost of their actions, leading to excessive emissions and environmental harm. By levying a tax proportional to the social cost of carbon, Pigou (1920) declared that this taxation approach would guarantee an efficient market outcome and reconcile private and social marginal costs. This mechanism incentivizes firms and individuals to reduce emissions, adopt cleaner technologies, and shift consumption toward low-carbon goods and services.

3.2. Overview of energy sector in Vietnam

The Intergovernmental Panel on Climate Change (IPCC) stated that energy-related activities account for over 70% of global greenhouse gas emissions, primarily from the burning of fossil fuels for transportation, heat supply, and electricity generation in all sectors of the economy (IPCC, 2007). According to the International Energy Agency (IEA) 2022 report, the energy sector in Vietnam is responsible for over 65% of the country's GHG emissions, being characterized by a heavy reliance on fossil fuels, particularly coal, which accounts for a significant share of the country's electricity generation. Yet approximately 60% of Vietnam's primary energy supply comes from fossil fuels, mainly coal and oil (especially for transport), but increasingly also natural gas (IEA, 2022). The rapid expansion of coal-fired power plants has been driven by industrialization and increasing energy demand over the past two decades. While renewable energy sources, such as solar, wind, and hydropower, have seen considerable growth in recent years, they still represent a relatively small portion of the overall energy mix. This dependency on fossil fuels has raised concerns regarding the environmental sustainability of Vietnam's energy sector and its contribution to global carbon emissions.

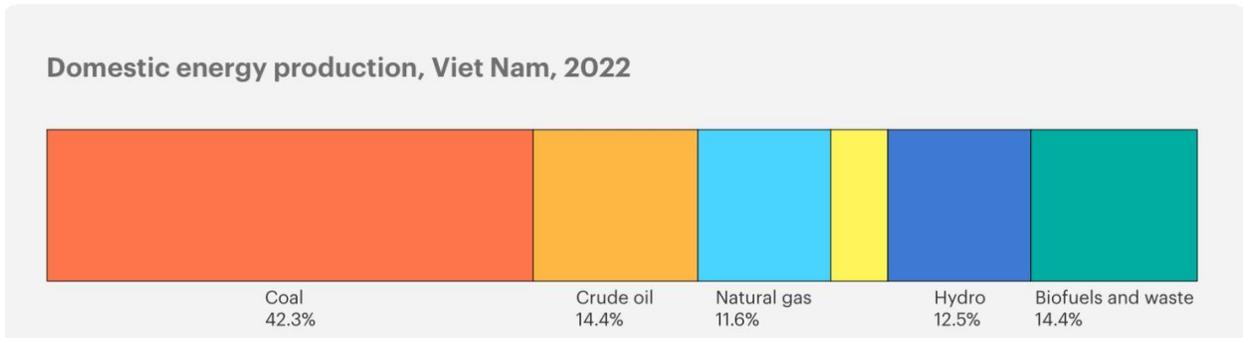


Figure 1: Domestic energy production of Vietnam in 2022

Source: International Energy Agency (2022)

As of the IEA’s latest report, Energy consumption in Vietnam has been growing at an average annual rate of over 8%, fueled by robust economic growth, rapid industrialization, and urbanization, underscoring the challenges of meeting future energy needs while transitioning to cleaner energy sources. This significant increase in energy demand highlights the urgency of addressing inefficiencies in energy production and consumption while balancing economic growth with environmental sustainability.

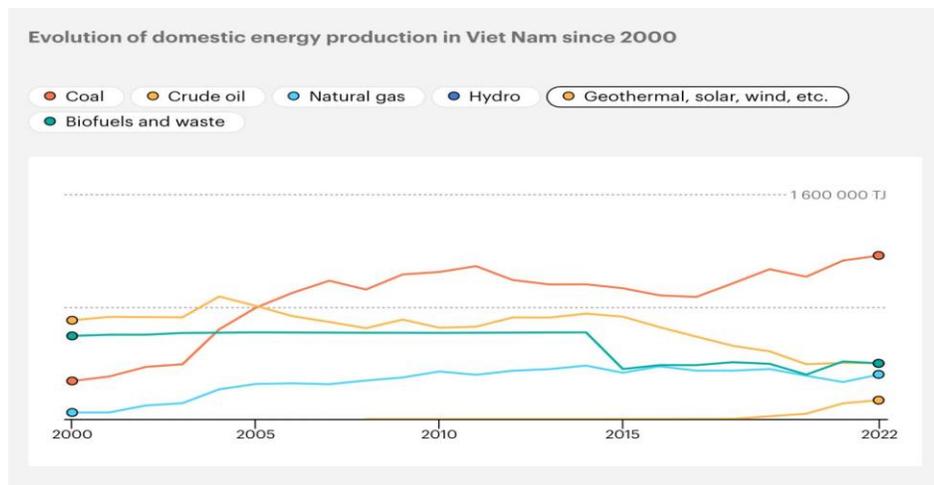


Figure 2: Evolution of domestic energy production in Vietnam since 2000

Source: International Energy Agency (2024)

In response to these challenges, Vietnam’s energy policy emphasizes energy security, affordability, and sustainability. The Power Development Plan VIII (PDP VIII) outlines the

government's strategy to diversify energy sources, reduce dependence on coal, and expand renewable energy capacity. Additionally, Vietnam has committed to achieving net-zero carbon emissions by 2050 under the Paris Agreement, a goal that necessitates transformative changes in its energy sector (Vietnam Ministry of Industry and Trade, 2023). However, achieving these objectives will require substantial investment in infrastructure, particularly in renewable energy integration, grid capacity, and energy storage systems.

Despite these efforts, Vietnam faces significant challenges in transitioning to a sustainable energy future. The continued reliance on coal presents environmental and health concerns, while underdeveloped infrastructure limits the integration of renewable energy into the national grid. Furthermore, the high initial costs associated with renewable energy projects and policy uncertainties create barriers to attracting long-term investments. Balancing economic growth with environmental goals remains a critical issue as Vietnam seeks to modernize its energy sector.

Nevertheless, Vietnam's renewable energy sector presents a promising opportunity for reducing carbon emissions and transitioning toward a low-carbon economy. Government incentives and international investments have already driven substantial growth in solar farms and wind energy projects, suggesting that renewable energy could play a pivotal role in Vietnam's energy transition. Implementing carbon taxation could further accelerate this shift by making renewable energy more competitive and encouraging innovation in clean technologies (UNDP, 2023).

4. Literature review

4.1. Previous research

The carbon tax environmental effectiveness in the energy industries has been proven across the world. Five EU member countries, namely Sweden, Finland, Denmark, Ireland, and Slovenia have been charged the tax for a long time and studies have shown that the carbon tax charged in the area of energy industries is environmentally effective, the rising tax rate resulting in the reduced production of greenhouse gases. The study indicated that increasing the carbon tax rate by one euro per tonne led to a decrease of 11.58 kg of annual per capita GHG emissions. The study also stated that if the tax has been collected for a longer time, it is more environmentally efficient than the system of emission allowance trading (Hájek et al., 2019).

Another study by Khastar et al. (2020) took a closer look at Finland's status, results indicating that the implementation of carbon taxes reduces welfare in the Finnish community: if the country applies the \$150 carbon tax rate, Finland will see a welfare decline of \$ 3.5 billion. But, on the other hand, Finland, as stated above, succeeded in reducing emissions: under the \$150 scenario, the percentage change in emissions is 30% lower than non-taxed.

A study focused on Saskatchewan, Canada, examined the energy sector and found that implementing a carbon tax effectively reduced GHG emissions but also led to economic contraction. The study suggested that further increases in the carbon tax rate would result in notable declines in GDP (Liu et al., 2018).

In South Africa, simulation results show that the carbon tax is an effective instrument to enable the country to considerably reduce the emissions levels, while still experiencing relatively small overall impacts on the country's economy (Nong, 2020). Real GDP only declines by 1.17%–1.59% with reduction rates of the emission levels by 12.25%–15.6%.

Japan is another country where researchers made some examinations about the impact of the carbon tax. They found out that carbon and energy taxes will decrease carbon dioxide emissions to a proposed target. The study also indicates that carbon taxes cause a shift in resources used from coal to gas (Nakata & Lamont, 2001). But as Japan is a country where maintaining a diverse base of resources is very important, this result is undesirable. However, from another perspective, this result clearly proves the effect of the carbon tax on the usage of resources in the energy industry. Another up-to-date study by Lee et al. (2012) found that the tax in Japan will only have a small impact on emission levels, the GDP, and employment. It should be noted, though, that the economic impacts vary across industries: the cost effect on high-emitting industries will be stronger than on others (Kawakatsu et al., 2017).

In another Asian country, China, the researcher, Lin and Jia (2018), has studied and suggested that the carbon tax mechanism, as a simple and easy-to-operate policy, has a very prominent contribution to emission reduction. The paper divided the mechanism into three scenarios: low, medium, and high. The higher the rate, the more effective the emission reduction. It is also stated that the focus of taxation should be on energy enterprises. Only in this way can the

sub-initiative of the market be fully implemented to save energy and reduce emissions while adjusting the energy factor market. Moreover, as the carbon tax rate increases, the negative impact of the carbon tax system on GDP will gradually increase. However, even in the situation with the most negative impact, it will not exceed 0.5%.

In Vietnam only, a paper also has the same suggestion as for China: the emission reduction policies should target the energy sector (Borges et al., 2024). However, the results of carbon tax scenarios indicated a reduction in GDP by 1.20- 2.70 percent - higher than that of China.

4.2. Research gap

Carbon tax in Vietnam actually has been studied for a long time by researchers, especially when in recent years, Vietnam is shifting to a greener, sustainable economy. However, the scenario of this kind of tax in the energy sector in Vietnam is still underrepresented. The impacts of the carbon tax on different aspects of Vietnam are ambiguous.

In this paper, we will investigate how carbon tax in the energy industry impacts the macroeconomic, social, and environmental aspects of Vietnam. Moreover, we will evaluate and provide some policies for the energy sector in Vietnam to fill the gap in this topic.

5. Evaluation of carbon taxation within Vietnam's energy sector

5.1. Current landscape of implementing carbon tax

The implementation of a carbon tax in Vietnam is situated within a broader context of the country's efforts to address climate change and its commitments to international climate agreements. As Vietnam grapples with significant increases in greenhouse gas (GHG) emissions due to rapid industrialization and foreign direct investment (FDI), the government is exploring carbon pricing mechanisms as a means to mitigate these emissions. The introduction of a carbon tax is being considered alongside the establishment of a national carbon market, as outlined in the Environmental Law of 2020 and subsequent decrees (Akkemik et al., 2024). This dual approach aims to create a comprehensive framework for emissions reduction while ensuring economic growth remains established.

Research utilizing dynamic computable general equilibrium (CGE) models indicates that the introduction of a carbon tax could lead to a reduction in emissions by approximately 1.3% to 2.8% below the 2030 target levels, albeit at the cost of a GDP decline ranging from 1.2% to 2.7% (Akkemik et al., 2024). Notably, foreign-invested enterprises are identified as substantial contributors to GHG emissions, raising concerns about the effectiveness of a carbon tax if it disproportionately impacts domestic firms while allowing foreign entities to continue increasing their emissions. This scenario aligns with the "pollution haven" hypothesis, which posits that the lack of environmental regulations in developing countries may attract foreign investment at the expense of environmental integrity (Dang & Akkemik, 2023).

Despite these challenges, the Vietnamese government remains committed to achieving net-zero emissions by 2050, as pledged during the COP26 Conference (European Commission, 2023). The National Climate Change Strategy outlines significant investments aimed at reducing emissions across various sectors, with an emphasis on improving energy efficiency and reducing reliance on fossil fuels. Although the carbon market is being prioritized for immediate implementation, policymakers are recognizing the potential necessity of a carbon tax in light of international trade dynamics, particularly with the European Union's forthcoming Carbon Border Adjustment Mechanism (CBAM) set to take effect in 2026 (Nguyen, 2023). This mechanism could incentivize Vietnam to adopt a carbon tax domestically to maintain its competitive edge in global markets while adhering to climate commitments.

The analysis of the impact of a carbon tax on Vietnam's energy sector reveals both challenges and opportunities for enhancing sustainability and reducing greenhouse gas emissions. The introduction of a carbon tax is projected to significantly influence the energy sector, primarily by incentivizing shifts toward cleaner energy sources and improving energy efficiency. According to Akkemik et al. (2024), the implementation of a carbon tax could lead to a reduction in emissions from the energy sector, which is essential for achieving Vietnam's climate targets. The authors highlight that substantial reductions in emissions are crucial for successful carbon abatement, emphasizing that the energy sector must transition away from its heavy reliance on coal and other fossil fuels.

The dynamic computable general equilibrium (CGE) model employed in the analysis indicates that while the carbon tax may result in a GDP contraction of 1.2% to 2.7%, it can also

facilitate significant improvements in energy efficiency (Akkemik et al., 2024). The model demonstrates that domestic firms are more responsive to the carbon tax compared to foreign-invested enterprises, which tend to maintain higher emission levels even with the tax in place. This suggests that a well-structured carbon tax could drive domestic firms to adopt cleaner technologies and practices, thereby contributing to overall emissions reductions in the energy sector.

Moreover, the revenue generated from the carbon tax could be strategically reinvested into renewable energy projects and infrastructure improvements, further accelerating the transition to a low-carbon economy (ADB, 2017). This reinvestment could help address the current challenges posed by foreign firms, which account for a significant portion of emissions while benefiting from more lenient environmental regulations. By promoting investments in renewable energy sources and enhancing energy efficiency measures, a carbon tax could ultimately support Vietnam's ambitious goal of achieving net-zero emissions by 2050.

5.2. Analysis of carbon tax effectiveness in energy sector

5.2.1. Macroeconomics impacts

- *Impact on GDP*

A carbon tax increases the cost of fossil fuels, which are integral to many sectors of the Vietnamese economy, particularly energy, manufacturing, and transportation. This leads to higher production costs, reduced competitiveness, and a contraction in economic output. An analysis of the effects of an emission trading scheme (ETS) in Vietnam found a GDP reduction rate of 3.7%, indicating that similar carbon pricing mechanisms could lead to comparable economic contractions (Nguyen, 2024). European evidence—where carbon taxes above US\$20/tCO₂ had no negative GDP impact (Metcalf & Stock, 2020)—suggests manageable effects if policies align with Vietnam's economic structure, where fossil fuel extraction isn't a dominant GDP driver.

Moreover, the IMF study on carbon taxes investigates their macroeconomic effects, particularly the interplay between taxation, emissions reductions, and GDP. The analysis emphasizes that while carbon taxes can cause a slight GDP contraction (e.g., approximately 0.7% by 2050 in some scenarios), the broader impact depends on revenue recycling strategies (Williams III, 2015). For instance, reinvesting tax revenues into green technologies or reducing distortionary taxes (like income taxes) can mitigate GDP losses.

These outcomes are highly dependent on the specific design and implementation of the tax, as well as the accompanying policies. For Vietnam, adopting a well-structured carbon pricing mechanism could not only mitigate greenhouse gas emissions but also drive innovation in cleaner technologies, potentially offsetting negative economic impacts.

- *Fiscal Revenue*

Implementing a carbon tax in Vietnam could dramatically enhance fiscal revenues, providing a critical financial boost to support the country's climate goals and sustainable development. According to Do and Burke (2021), a modest carbon tax starting at US\$1.85 per ton of CO₂ in 2022, with a real annual increase of 10%, could generate cumulative revenues of approximately US\$10.9 billion by 2030 (in 2022 prices). This revenue stream would align with Vietnam's unconditional Nationally Determined Contribution (NDC) target of reducing energy sector emissions by 5.5% relative to the business-as-usual (BAU) scenario. A higher initial rate of US\$3.86/tCO₂ could amplify this fiscal impact, yielding up to US\$21.9 billion over the same period, sufficient to meet the conditional NDC target of an 11.2% reduction. These figures underscore the carbon tax's potential as a powerful fiscal tool, capable of delivering billions of dollars to Vietnam's state budget over the next decade.

The fiscal windfall from a carbon tax could transform Vietnam's financial landscape, particularly in the post-COVID-19 recovery period. The study estimates that a tax of US\$1.85/tCO₂, rising to US\$3.97/tCO₂ by 2030, would provide an annual revenue injection averaging over US\$1.2 billion per year under the lower scenario, and more than US\$2.4 billion annually under the higher scenario. This substantial revenue could be strategically deployed to fund critical priorities: bolstering environmental protection through investments in renewable energy like solar and wind (Lu et al., 2021), supporting businesses in adopting greener technologies to reduce reliance on coal (which dominated 66% of CO₂ emissions from fuel combustion in 2018, per International Energy Agency, and mitigating social impacts via subsidies for low-income households or electrified public transport infrastructure. Such uses not only enhance fiscal capacity but also align with Vietnam's green growth ambitions.

However, the magnitude of fiscal revenue from a carbon tax hinges on several critical factors. The tax rate and its coverage are paramount—Do and Burke suggest initially targeting fossil fuels

due to Vietnam's robust data in the energy sector, though limited MRV capacity in areas like agriculture or land use constrains broader application (Wang et al., 2018).

- *Trading competitive*

Implementing a carbon tax in Vietnam presents a complex interplay between environmental objectives and trade competitiveness. On one hand, introducing such a tax could increase production costs for carbon-intensive industries, potentially diminishing the price competitiveness of Vietnamese exports in global markets. This is particularly pertinent as international mechanisms like the European Union's Carbon Border Adjustment Mechanism (CBAM) come into effect, imposing tariffs on imports from countries lacking equivalent carbon pricing measures. Without a domestic carbon pricing system, Vietnamese exporters might face additional costs under CBAM, thereby reducing their competitiveness in the EU market.

Conversely, adopting a carbon tax could enhance Vietnam's export competitiveness by aligning its environmental standards with international expectations. The World Bank suggests that implementing carbon pricing frameworks can bolster FDI attractiveness and export competitiveness, particularly to markets with stringent environmental regulations. Moreover, a well-structured carbon tax can incentivize industries to innovate and adopt cleaner technologies, potentially leading to increased efficiency and long-term cost savings. This proactive approach may not only mitigate the immediate financial impacts of carbon taxes but also position Vietnamese products as environmentally responsible choices in the global market.

5.2.2. Social and Environmental impacts

- *Social impacts*

A carbon tax in Vietnam significantly affects low-income households, who are vulnerable to rising energy and goods prices. Coxhead et al. (2013) liken its impact to a real exchange rate appreciation, raising costs in labor-intensive export sectors and cutting jobs, which many low-income families depend on. Energy, a major expense for these households, becomes costlier, straining budgets and forcing cuts to essentials like food and healthcare, potentially deepening poverty. Rural communities, with limited alternatives, face higher goods prices due to increased

production and transportation costs, while energy-intensive industries like agriculture suffer income losses.

The tax’s regressive nature hits poorer households harder, as non-tradable sectors pass costs forward and tradable sectors cut jobs due to fixed global prices. Wealthier households can adapt with cleaner energy options, but low-income families, lacking resources, remain tied to costly high-carbon sources, widening inequality and entrenching socio-economic divides.

- *Environmental impacts*

Implementing a carbon tax in Vietnam could have profound and multifaceted impacts on the environment, positioning it as a key tool in the country's climate action strategy. Vietnam has committed to achieving net-zero emissions by 2050 and reducing its greenhouse gas (GHG) emissions by 15.8% by 2030 under unconditional conditions, and up to 43.5% with international support, according to its updated Nationally Determined Contribution (NDC). A carbon tax directly supports these goals by incentivizing cleaner production and consumption behaviors, reducing reliance on fossil fuels, and promoting the adoption of renewable energy.

Table 2: Comparison of emission reduction targets in NDC 2020 and NDC 2022

Sector	Unconditional contribution				Conditional contribution			
	NDC 2020		NDC 2022		NDC 2020		NDC 2022	
	(%)	(Mt CO ₂ eq)	(%)	(Mt CO ₂ eq)	(%)	(Mt CO ₂ eq)	(%)	(Mt CO ₂ eq)
Energy	5.5	51.5	7.0	64.8	16.7	155.8	24.4	227.0
Agriculture	0.7	6.8	1.3	12.4	3.5	32.6	5.5	50.9
LULUCF	1.0	9.3	3.5	32.5	2.3	21.2	5.0	46.6
Waste	1.0	9.1	1.0	8.7	3.6	33.1	3.2	29.4
IP	0.8	7.2	3.0	27.9	0.9	8.0	5.4	49.8
Total	9.0	83.9	15.8	146.3	27.0	250.8	43.5	403.7

Source: United Nations Framework Convention on Climate Change (2022)

Moreover, a study by Choi et al. (2017) found that a carbon price of \$9.14 per ton of CO₂ could reduce Vietnam's carbon emissions by approximately 2.56%. This demonstrates the potential of even a modest carbon price to significantly curb emissions. As sectors like electricity generation, manufacturing, and transportation account for a large proportion of Vietnam's

emissions, a carbon tax would particularly impact these high-emission industries, pushing them toward energy efficiency and cleaner technologies.

Beyond reducing carbon emissions, a carbon tax can indirectly lead to improvements in air quality by discouraging the use of coal and other fossil fuels that produce harmful pollutants such as sulfur dioxide (SO₂) and nitrogen oxides (NO_x). The reduction of air pollutants would not only benefit public health but also reduce the environmental degradation caused by acid rain and smog, particularly in urban areas like Hanoi and Ho Chi Minh City, where pollution levels are often critically high.

Furthermore, the World Bank has highlighted that carbon pricing instruments, such as carbon taxes, can serve as pivotal tools in Vietnam's decarbonization efforts. By assigning a cost to carbon emissions, these instruments incentivize businesses and consumers to adopt cleaner technologies and energy sources, thereby contributing to the country's environmental objectives.

5.2.3. Challenges in the application of carbon tax

From an economic perspective, one of the major concerns is the potential impact on the competitiveness of domestic industries. Energy-intensive industries such as cement, steel, and textiles, which are integral to Vietnam's export-driven economy, may face higher production costs due to the tax. If these costs increase significantly, Vietnamese products could become less competitive in international markets. This scenario is particularly concerning when countries such as the European Union (EU) are implementing Carbon Border Adjustment Mechanisms (CBAMs), which penalize imports from nations without stringent carbon pricing. As of 2023, the EU's CBAM has begun affecting trade relations with countries like Vietnam, which lacks a national carbon pricing system. This highlights the risk of *carbon leakage*, where businesses might relocate to countries with less stringent environmental policies. Furthermore, inflationary pressures are another economic challenge. The tax could drive up the cost of energy and transportation, which would be passed down to consumers, particularly impacting low-income households that spend a higher share of their income on essential goods.

Socially, Vietnam faces challenges in ensuring public acceptance of a carbon tax, particularly among low-income groups. A regressive tax structure could disproportionately affect

these households, which are more vulnerable to price increases on essential goods. Without proper compensation, a carbon tax could increase poverty rates among vulnerable populations. Public resistance might intensify if the tax is seen as a burden on those already struggling financially.

Implementation of a carbon tax in Vietnam also involves logistical and administrative challenges. The country would need to set an optimal carbon price that incentivizes emission reductions without imposing excessive burdens on businesses and consumers. According to the World Bank, a reasonable carbon tax should be in the range of \$29 per ton of CO₂ equivalent by 2030, gradually increasing to \$90 per ton by 2040. However, determining the right balance between an effective tax rate and economic feasibility is complex.

6. Recommendations

6.1. For Vietnamese government

Given the difficulties associated with enacting a carbon tax, determining economic viability is an essential step in the policymaking process (Tang and Mizunoya, 2021). To reduce adverse effects on society and the economy, particularly on the energy sector, policymakers must carry out in-depth investigation and evaluation of the existing state of affairs. To provide a thorough legal framework and regulatory guidelines for the application of carbon taxes, tax administration must coordinate with relevant governmental institutions (UN Tax Committee, 2021). Restructuring the budgetary and financial systems to promote stability and boost output through lower personal and corporate income tax rates should be the top priorities (Vu, 2024).

The foundation for a carbon tax must be properly crafted to encourage the decrease of greenhouse gas emissions. Reducing emissions with a limited tax base will not work, but expanding the carbon tax base too much to increase possible emission reductions beyond sustainable balancing capability could have detrimental effects on the economy. In order to prevent double taxation, which can place an additional financial burden on society and incite opposition from both citizens and businesses, it is also crucial to precisely define the entities that are subject to carbon taxation. The carbon tax rate needs to balance preventing detrimental effects on economic development, including unnecessarily high energy prices, with establishing a high enough carbon price to discourage the use of fossil fuels and encourage investment in low-carbon alternatives.

The lack of efficiency and openness in tax collecting and spending is one of Vietnam's major public finance management flaws. Inadequate accountability, transparency, and public disclosure can violate citizens' rights, especially those that are taxed. Therefore, it is essential to improve openness and accountability regarding the tax base before extending the carbon tax base. Other procedures, such as revenue audits, tax collection techniques, resource distribution from this tax, and the creation of communal monitoring organizations, must also be clearly established in compliance with legislative frameworks (Mizunoya and Tang, 2021).

Therefore, finding revenue uses that increase support for a carbon tax over time should be a top priority for policymakers (Marron and Morris, 2016). Carbon taxes help reduce greenhouse gas emissions, but they also help support the sustainable energy transition by increasing budgetary revenue that can be used to support the use of renewable energy and to compensate impacted groups for losses incurred as a result of the implementation of the carbon tax (Lu et al., 2020). For instance, transmission lines to link to renewable energy zones are examples of much-needed infrastructure that might be funded with public funds (Do and Burke, 2021). In addition to providing incentives for reducing emissions, a well-crafted carbon tax program brings in money for the government (Wu et al., 2023). The adoption of sustainable development in the energy sector can then be strategically supported by these extra earnings, which will incentivize businesses to switch to technology that lowers carbon emissions during production.

6.2. For companies within energy industry

Retraining employees must be a top priority for businesses in order to support the shift to low-carbon industries. In order to fulfill the growing demands of many sectors and accomplish environmental sustainability goals, it is imperative that this project fill the significant knowledge and skill gap regarding low-carbon technology. Vietnamese businesses may guarantee that their workforce is prepared to handle new technologies and developments in the energy sector by investing in skill development and educational initiatives. In addition to strengthening Vietnam's competitive advantage in the global low-carbon economy, this strategic strategy will promote economic resilience (Kemala et al., 2024). Additionally, the successful implementation of carbon markets and the promotion of a sustainable economic framework depend on workforce transformation.

Investments in sustainable energy sources like solar, wind, and hydrogen should be a top priority for businesses. This change not only supports carbon reduction objectives but also puts them in a competitive position in a market that is becoming more and more concerned with sustainability (Dushime, 2021). Putting money into research and development for cutting-edge carbon-footprint-reducing solutions can provide businesses a competitive edge and open up new markets. Investigating carbon capture, utilization, and storage (CCUS) options is part of this.

7. Conclusion

Implementing carbon taxation in Vietnam's energy sector is a crucial step toward reducing emissions and meeting global climate commitments. A well-structured carbon tax can drive investment in renewable energy while encouraging businesses to adopt cleaner technologies. However, its success depends on careful planning to balance environmental objectives with economic stability and social equity.

This report has explored the macroeconomic, social, and environmental impacts of carbon taxation in Vietnam. While it can accelerate the transition away from fossil fuels, challenges such as rising energy costs, economic disruptions, and ensuring fairness in tax distribution must be addressed. A coordinated approach that includes fiscal incentives, reinvestment in green infrastructure, and support for affected industries is essential.

To facilitate a smooth transition, the government should develop a clear policy framework that phases in the tax gradually while reinvesting revenues into renewable energy projects. Energy companies must embrace cleaner technologies with government incentives to reduce compliance costs. Collaboration among policymakers, businesses, and civil society will be key to ensuring the policy's success.

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