Carbon Pricing Policy and Emissions Trading: Policy Implications for Greenhouse Gas Mitigation in Vietnam's Industrial Sector

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ABSTRACT

Industry is one of Vietnam' largest sources of greenhouse gas emissions, and it is also the sector most directly exposed to the domestic carbon pricing mechanisms now under development and to international carbon-related trade barriers such as the EU's CBAM. This paper synthesizes and analyzes the academic literature on carbon taxes, emissions trading systems, and the impact of CBAM on Vietnamese industry and situates these findings against the current legal framework and international experience with heavy industry decarbonization. The review shows that computable general equilibrium models consistently identify a trade-off between emission reduction targets and GDP growth, with estimated GDP losses ranging from 0.35% to 4.57% depending on the instrument and its coverage. The paper puts forward six policy implications for designing a carbon pricing mechanism suited to Vietnam's 2025 - 2028 carbon market pilot phase.

Keywords: carbon pricing, carbon tax, CBAM, emissions trading system, greenhouse gas emissions, industry, Vietnam

INTRODUCTION

At Conference of the Parties 26 (COP26), Vietnam committed to reaching net-zero emissions by 2050, and its 2022 updated Nationally Determined Contribution (NDC) commits to cutting greenhouse gas (GHG) emissions by 15.8% under an unconditional scenario, rising to as much as 43.5% with international support, relative to a business-as-usual (BAU) baseline by 2030 (Vietnam, 2022). Against this backdrop, industry - given its close ties to fossil fuel consumption and to steel, cement, and chemical production - has become a central focus of emission reduction policy.

The legal foundation for carbon pricing in Vietnam dates to the Law on Environmental Protection (National Assembly of the Socialist Republic of Vietnam, 2020) and was elaborated through Decree 06/2022/ND-CP on the mitigation of greenhouse gas emissions and protection of the ozone layer (Government of Vietnam, 2022), later amended by Decree 119/2025/ND-CP (Government of Vietnam, 2025). Notably, Vietnam has formally approved the Scheme for the Establishment and Development of the Carbon Market under Decision 232/QD-TTg (Prime Minister of Vietnam, 2025) and began piloting an emissions trading scheme (ETS) in mid-2025, covering roughly 110 facilities in the three largest emitting sectors - power, steel, and cement - which together account for about 50% of national emissions. In early 2026, Decision 263/QD-TTg formally allocated pilot emission quotas for 2025 - 2026 to 34 thermal power plants, 25 iron and steel facilities, and 51 cement facilities, with a total quota of 243,082,392 tons of CO_2-equivalent (CO_{2eq}) for 2025 alone (Prime Minister of Vietnam, 2026), and Decree 29/2026/ND-CP brought the country's first carbon exchange into operation (Government of Vietnam, 2026). At the same time, Vietnam's export-oriented industries - particularly steel, aluminum, cement, and fertilizer - face substantial financial pressure from the European Union (EU)'s Carbon Border Adjustment Mechanism (CBAM), with direct financial exposure estimated at around EUR 580 million per year starting in 2026 (Hayes et al., 2026).

Alongside the pressure from CBAM, Vietnamese industry also benefits from international financing mechanisms designed to support the energy transition, most notably the Just Energy Transition Partnership (JETP), announced in 2022 with a pledge to mobilize USD 15.5 billion from the International Partners Group. Although JETP's initial focus is the shift of the power sector away from coal toward renewables, the mechanism also indirectly creates financial and technical space for industrial decarbonization - particularly for the grid infrastructure and renewable energy supply that the steel and cement sectors need to convert their technology. In practice, JETP disbursement has lagged initial commitments, and concerns over transparency and access to funding remain a challenge for industrial firms seeking to make use of the mechanism.

This paper addresses four research questions: (i) Which carbon pricing instruments have been studied for Vietnam, and what economic impacts do quantitative models show over time? (ii) How has the legal framework for Vietnam's carbon market evolved, and what stage has it now reached? (iii) How does CBAM affect export-oriented industries, particularly steel? (iv) What does international experience with the cost of heavy industry decarbonization suggest for designing an appropriate carbon pricing policy in Vietnam?

CONTEXT AND INTERNATIONAL PRESSURES

Before turning to the research literature and the current state of domestic policy, it is worth situating Vietnamese industry within two external contexts that are creating pressure to act: (i) the financial obligations imposed by the EU's CBAM on carbon intensive exports, and (ii) the decarbonization technology options already proven abroad that Vietnam can draw on in designing its own pathway.

CBAM and its impact on Vietnam's export-oriented industries

The EU's CBAM imposes an additional financial obligation on carbon-intensive imports, including steel, aluminum, cement, and fertilizer - all significant Vietnamese exports to the European market. Chu et al. (2023) builds a partial equilibrium model combining CBAM with domestic carbon pricing to examine within sector market share shifts in Vietnam's steel industry, finding that CBAM can reshape the production structure in favor of firms with lower emission intensity. A follow up study by Chu et al. (2024) extends the analysis to the macro level, concluding that CBAM in its current form is unlikely to have a significant effect on the economy, since the share of affected goods is relatively small, but that at the sectoral level - particularly steel, aluminum, and cement - it could substantially reduce export volumes and value.

Data updated to 2026 show that the problem has grown more severe: the total direct financial exposure of the four carbon intensive export sectors (steel, aluminum, cement, fertilizer) to the EU market is estimated at around EUR 580 million per year from 2026 onward (Hayes et al., 2026), while facilities without verified emissions data will be subject to country level default values plus an escalating surcharge - 10% in 2026, 20% in 2027, and 30% from 2028. This reinforces the implication drawn by Chu et al. (2023, 2024): building a credible firm level monitoring, reporting, and verification (MRV) system is not only essential for operating the domestic ETS but is also a precondition for exporters to avoid CBAM penalties and to have a basis for negotiating mutual recognition of carbon pricing with the EU.

International experience with the cost and pathways of heavy industry decarbonization

Setting an appropriate carbon price - low enough to avoid stifling competitiveness, yet high enough to drive transformation - requires a clear understanding of the marginal cost of available abatement technologies. This is an especially pressing need for Vietnam, since two of the three sectors included in the pilot ETS - steel and cement - both belong to the 'hard-to-abate' category because of their underlying technology: Vietnam's steel industry still relies mainly on the carbon intensive blast furnace basic oxygen furnace (BF-BOF) route, while cement emissions come mainly from clinker calcination - a chemical process emission rather than simply a fuel combustion one - so the sector cannot be decarbonized just by switching to clean electricity.

In Germany, Graupner et al. (2024) assess how adjustments to the free allocation product benchmark under the EU ETS affect the transformation of integrated steel plants, while Weckenborg et al. (2024) find that natural gas may remain more economical than hydrogen in the short term, but that direct emissions could fall by as much as 96% by 2050 if the industry switches fully to hydrogen. In Austria, Mobarakeh and Kienberger (2022), and Nagovnak et al. (2024) identify direct electrification and green hydrogen as the two dominant technology levers, both of which require a carbon price signal strong and stable enough over the long run. A common thread running through this body of work is that the cost of transforming steelmaking technology lies not only in production equipment but in the entire surrounding energy infrastructure chain - an important implication for Vietnam, where most of the renewable power and green hydrogen infrastructure is still at the planning stage.

For hydrogen-based direct reduced iron (DRI), a range of studies agree that the technology can cut CO_2 emissions by 85 - 90% relative to conventional BF-BOF, though costs depend heavily on the price of renewable electricity and green hydrogen (Rechberger et al., 2020; Rippy et al., 2024; Trinca et al., 2023; Zang et al., 2023). Xue et al. (2024) and Wan et al. (2024) study in China - a country whose steel industry shares Vietnam's heavy reliance on BF-BOF - show that combining hydrogen metallurgy with clean electricity and biomass can meaningfully cut emissions, though it requires financial support given the large upfront investment cost.

For cement, Volaity et al. (2025) conduct a critical review of electrification technologies for cement production and show that roughly 60% of the sector's emissions come from the chemical reaction of clinker calcination rather than from energy use, so heat electrification - the central solution for steel - addresses only part of the cement industry's problem. The authors note that electrolysis-based routes to cement precursors, along with large scale electrified kiln technology, remain at the pilot stage, require substantial grid infrastructure investment, and are not yet ready for wide commercial deployment. The implication for Vietnam is that the 56 cement facilities currently within the pilot ETS face far less room for near term emission reductions than the steel sector does, and that the quota allocation mechanism needs to account for this process-related emission profile rather than applying a single emission intensity benchmark to both sectors.

Adapting these findings to Vietnam nonetheless requires care, since most of this technical literature is calibrated to European and Chinese conditions that differ from Vietnam's in three respects. First, industrial electricity prices in Vietnam remain state-regulated and comparatively low relative to the EU, which weakens the near-term economic case for direct electrification relative to the German and Austrian studies discussed above, so a shift toward market-based industrial power pricing would need to happen gradually to avoid an abrupt cost shock to steel and cement producers. Second, Vietnam's green hydrogen supply chain - electrolyser capacity, the renewable generation needed to feed it, and storage and transport infrastructure - is still at the planning stage, so the 85 - 96% emission reduction potential reported for hydrogen-based DRI routes (Rechberger et al., 2020; Weckenborg et al., 2024) should be read as a technical ceiling rather than a near-term deployment target for the 2025 - 2028 pilot phase. Third, ownership structure matters: Dang and Akkemik (2022) show that FDI firms account for the fastest-growing share of Vietnam's industrial emissions, and these firms' technology adoption decisions are shaped as much by parent-company investment strategy and international clients' carbon requirements as by the domestic carbon price - a dynamic largely absent from the German, Austrian, and Chinese case studies reviewed above. Quantitative studies calibrated to these Vietnam specific conditions, rather than a direct transposition of European or Chinese cost curves, are needed before setting sector specific technology targets.

Turning to the institutional design of the ETS instrument itself - not just the underlying decarbonization technology - Joo et al. (2023) compare the EU ETS with South Korea's ETS (K-ETS) through an institutional complementarity lens, finding that the EU ETS is bound up with a stakeholder ownership model set within a decentralized political system and a liberalized energy market, whereas K-ETS is more regulatory and state-led, consistent with a majoritarian political system and a still tightly managed electricity market. The two models have therefore not converged over time despite sharing the same goal, and the authors recommend that late-adopting countries focus on adapting the ETS to their existing institutions rather than copying a model that succeeded elsewhere wholesale. This is a lesson with direct relevance for Vietnam: the current pilot ETS - with quotas allocated for free based on sector specific emission intensity benchmarks set by the state, rather than through market auctioning - is, in essence, closer to Korea's regulatory model than to the EU's market-based one, suggesting that lessons drawn from K-ETS's operational experience and early teething problems (such as low liquidity in its initial phase) may be more directly applicable than experience drawn straight from the EU ETS.

REVIEW OF VIETNAM FOCUSED RESEARCH

Before turning to specific quantitative studies, it is worth noting that carbon pricing in Vietnam can be pursued through two main instruments: a carbon tax or an ETS. Do and Burke (2021) provide one of the first systematic analyses of carbon pricing options for Vietnam, weighing the two instruments' relative advantages and disadvantages against criteria such as price certainty (carbon tax) versus emissions quantity certainty (ETS), the institutional capacity needed to operate each, the readiness of firm level emissions data, and distributional impact. The study recommends that Vietnam consider starting with a low-rate carbon tax, which is institutionally easier to administer in the early stages, before gradually moving to an ETS once MRV capacity has been strengthened - a recommendation that, in practice, Vietnam later departed from, moving directly to a pilot ETS starting in 2025, reflecting a shift in how institutional readiness was assessed over 2021 - 2025.

Pioneering computable general equilibrium studies on carbon pricing in Vietnam

The earliest quantitative studies of carbon pricing in Vietnam used computable general equilibrium (CGE) models to simulate macroeconomic impacts. Coxhead et al. (2013) were among the first, combining a CGE model with household level data to assess how an environmental/carbon tax would affect poverty and the labor market; they find that the tax burden falls disproportionately on labor intensive export sectors, reducing employment and potentially worsening poverty in the absence of accompanying redistribution policy, with real gross domestic product (GDP) estimated to fall by 0.35% to 0.63% depending on assumptions about labor market elasticity. Nong (2018) extends the analysis to a broader increase in energy taxes using a GTAP-E model, showing an effect on fossil fuel prices - coal in particular - though a milder one than under the ETS scenario examined in the same research group's follow up study.

Nong et al. (2020) produced a highly influential quantitative study simulating the impact of an ETS in Vietnam using a global energy CGE model (an extension of GTAP-E). Their key finding, with direct relevance for policy design, is that confining ETS coverage to just a few sectors (power, coal) cause a far larger economic hit (a 4.57% GDP loss) than extending the ETS across all industrial sectors (only a 1.78% GDP loss), while cutting coal combustion emissions by as much as 31.5%. The explanation is that a narrow scope creates larger relative price distortions across sectors, whereas a broad scope spreads the adjustment cost more evenly across the economy. This is key quantitative evidence supporting the decision to extend the 2025 - 2028 pilot ETS across power, steel, and cement rather than confining it to the power sector alone.

Nguyen (2023) goes on to simulate the impact of a carbon tax at different price levels (USD 1, 5, and 10 per ton of CO_2) using a static CGE model, finding that a higher carbon price brings greater GDP and welfare losses but also greater emission reduction effectiveness; the study also shows that recycling carbon tax revenue can substantially reduce economic damage, and in some scenarios even improve GDP and welfare, though at the cost of somewhat weaker emission reductions.

Recent research on carbon taxes and emissions trading

Akkemik et al. (2024) use a dynamic CGE model that distinguishes between domestic and foreign invested (FDI) firms to assess the impact of a carbon tax, finding that GDP could fall by 1.2% to 2.7% depending on the tax rate, and that FDI firms continue to account for a substantial share of emissions even under a carbon tax policy - raising questions about how effectively such a policy would be enforced in this segment. This finding is consistent with earlier work by Dang and Akkemik (2022), which uses a social accounting matrix disaggregated by firm ownership type and shows that rising FDI exports and investment are the fastest-growing source of GHG emissions, outpacing state-owned and domestic private firms - suggesting that carbon pricing policy should be designed with an eye to these ownership-related differences in emission behavior.

Nguyen (2024) examines the impact of an ETS from a revenue redistribution perspective, showing that reaching the NDC's 15.8% emission reduction target would require a carbon price that reduces GDP by 3.7% and welfare by 2.89% of GDP in the absence of any redistribution policy; however, channeling the revenue into income tax cuts can improve welfare, while directing it to government spending mainly reduces the GDP loss without improving household welfare. Tang and Mizunoya (2024) conduct a systematic review of quantitative approaches for assessing the potential effectiveness of Vietnam's ETS, recommending that CGE be combined with input output analysis to reduce the number of assumptions required, while also identifying an important research gap: most existing work focuses on the macro level, with sector- and firm-level impact assessments still largely missing.

Domestic legal and policy framework

Pham and Phung (2023) survey Vietnam's policy and legal framework for GHG emission reduction, noting that although the country had already issued a substantial body of relevant legislation, coordinated implementation at the industry level remained limited at the time of writing. Ngoc et al. (2024) highlights the role of the national GHG inventory system - citing a figure of 2,261 reporting facilities at the time of their study - as an essential data foundation for operating carbon pricing mechanisms. This figure differs slightly from the official count of 2,166 facilities under Decision 13/2024/QD-TTg (Prime Minister of Vietnam, 2024); the discrepancy most likely reflects differences in survey timing or statistical scope between academic research and official administrative documents - we were unable to locate the primary source needed to determine which figure is more accurate. Minh (2024) analyzes the legal framework for the carbon emissions trading market from a legal studies perspective, pointing to several institutional gaps that still need to be addressed in MRV and in dispute resolution.

Phan (2025) examines the development of a legal framework for a carbon tax in Vietnam in the context of the EU-Vietnam Free Trade Agreement (EVFTA), recommending that Vietnam draw on international experience (Singapore, for instance) to design a transparent, sufficiently long-term schedule of tax/price increases that meets its environmental commitments while preserving its trade competitiveness under the EVFTA.

Comparative summary of quantitative economic impacts

Table 1 summarizes the results of six CGE-based studies on Vietnam in order of publication, revealing a consistent pattern: the negative impact on real GDP rises with the stringency of the policy instrument and falls when coverage is broadened, or an appropriate revenue-recycling mechanism is in place.

Table 1. Comparison of carbon pricing instruments

Policy instrument	Method	Main scenario	Real GDP impact	Source
Environmental /energy tax	Static CGE + household micro-simulation	Taxing fossil fuels, petroleum, and coal	-0.35% to -0.63%	Coxhead et al. (2013)
Increased energy tax	Dynamic CGE (extended GTAP-E)	Higher environmental protection tax on petroleum and coal	Modest decline, smaller than the corresponding ETS scenario	Nong (2018)
ETS	Dynamic CGE (extended GTAP-E)	Narrow scope (coal, power) versus economy wide scope	-4.57% (narrow scope); -1.78% (economy wide)	Nong et al. (2020)
Carbon tax	Static CGE	Carbon price of USD 1, 5, 10/tCO_2, with revenue recycling	GDP loss increases with the carbon price; can be mitigated with appropriate revenue recycling	Nguyen (2023)
Carbon tax	Dynamic CGE distinguishing domestic and FDI firms	Different carbon tax levels	-1.2% to -2.7%	Akkemik et al. (2024)
ETS	CGE with revenue redistribution analysis	15.8% emission reduction target	-3.7% (welfare loss of 2.89% of GDP)	Nguyen (2024)

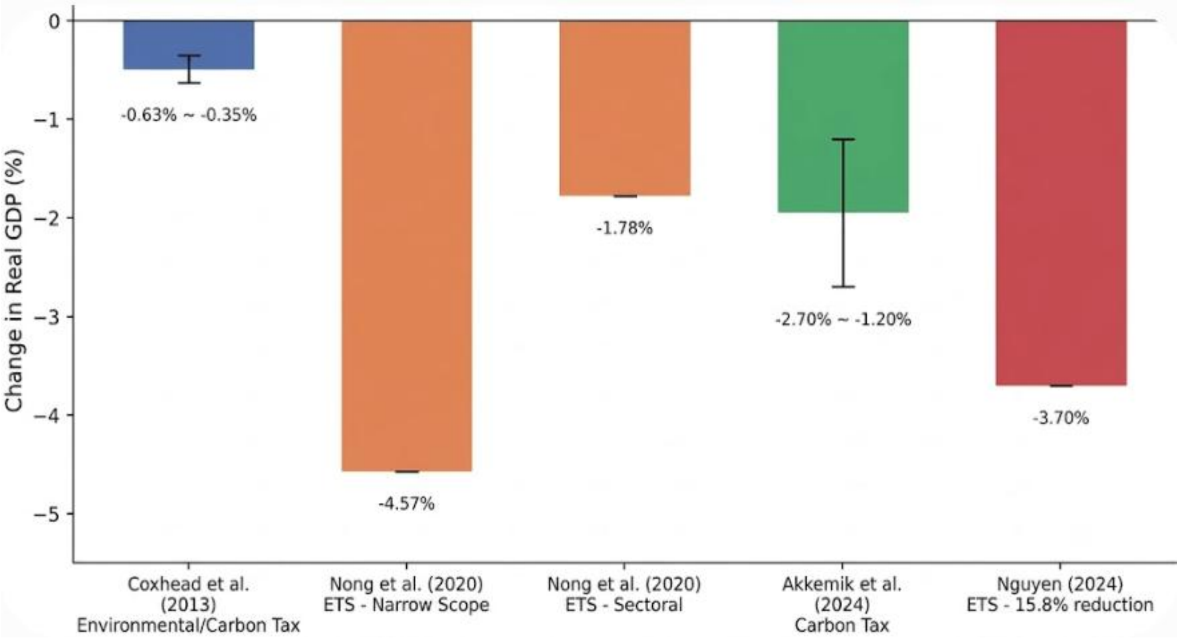

Figure 1. Estimated impact of carbon pricing instruments on Vietnam's GDP

Three main conclusions emerge from Table 1 and Figure 1: (i) the magnitude of GDP loss varies considerably, from under 1% to over 4%, depending largely on the sectoral scope and the carbon price applied; (ii) extending ETS coverage economy wide (Nong et al., 2020) reduces the GDP loss by as much as 2.79 percentage points relative to a narrow scope - strong quantitative evidence in favor of Vietnam's choice to pilot the ETS across power, steel, and cement rather than a single sector; and (iii) revenue recycling mechanisms (Nguyen, 2023) may be an important tool for softening the economy environment trade-off, but one that has not yet been given concrete design in Vietnam's current legislation.

Limitations of the reviewed CGE studies

It is also worth noting the methodological limitations shared by the six studies summarized in Table 1. Four rely on a static or single period CGE framework (Coxhead et al., 2013; Nguyen, 2023; Nguyen, 2024), which captures the economy's adjustment to a policy shock at one point in time but cannot trace the year-by-year investment and technology adoption path firms would actually follow over the 2025 - 2028 pilot and beyond; only Nong (2018), Nong et al. (2020), and Akkemik et al. (2024) use a genuinely dynamic, multi-period specification. All six studies also depend on Vietnam's input - output and social accounting matrix data, which are updated only periodically and pre-date the 2025 pilot ETS, so none of them could calibrate directly to the actual sectoral coverage, quota levels, or facility count now in place under Decision 263/QD-TTg. These are not weaknesses specific to any one study but a structural limitation of ex-ante CGE modelling in a data environment that is still catching up with a fast moving policy rollout, reinforcing Tang and Mizunoya's (2024) call for firm- and sector-level empirical assessment once real pilot-phase data become available.

STATUS OF CARBON MARKET IMPLEMENTATION IN VIETNAM 2020 -2029

The legal framework for Vietnam's carbon market has undergone continuous refinement over 2020 - 2026 (Table 2, Figure 2). Starting from the 2020 Law on Environmental Protection, the Government elaborated this framework through Decree 06/2022/ND-CP and Decision 01/2022/QD-TTg, which identified 1,912 facilities required to conduct GHG inventories. This list was updated to 2,166 facilities under Decision 13/2024/QD-TTg, reflecting the gradual expansion of emissions monitoring coverage over time.

Table 2. Summary of legal instruments governing Vietnam's carbon market

Date	Legal instrument	Main content
2020	Law on Environmental	Article 91 (GHG emission mitigation), Article 92 (ozone layer protection), Article 139 (organization and development of the carbon market) - the first

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	Protection 2020	legal foundation at the law level.
01/2022	Decree 06/2022/ND-CP	Detailed regulations on GHG emission mitigation, ozone layer protection, and carbon market organization; establishes a two-phase roadmap (pilot and official operation).
01/2022	Decision 01/2022/QD-TTg	Promulgates the list of sectors and facilities required to conduct GHG inventories - 1,912 facilities across industry and trade, transport, construction, and natural resources and environment.
2022	Updated NDC	Commits to a 15.8% reduction in GHG emissions (unconditional) and up to 43.5% (with international support) by 2030 relative to the BAU scenario.
8/2024	Decision 13/2024/QD-TTg	Updates the GHG inventory list to 2,166 facilities (1,805 industry and trade, 75 transport, 229 construction, 57 natural resources and environment).
01/2025	Decision 232/QD-TTg	Approves the Scheme for the Establishment and Development of Vietnam's Carbon Market; sets out a pilot roadmap for 2025 - 2028, with official operation from 2029.
6/2025	Decree 119/2025/ND-CP	Amends and supplements Decree 06/2022/ND-CP; refines regulations on quota allocation and carbon credit management, and transposes Article 6 of the Paris Agreement into domestic law.
6 - 8/2025	Pilot ETS launch	Officially launches the pilot ETS, covering roughly 110 facilities in the power, steel, and cement sectors - about 50% of national emissions.
02/2026	Decision 263/QD-TTg	Allocates pilot GHG emission quotas for 2025 - 2026 to 34 thermal power plants, 25 iron and steel facilities, and 51 cement facilities; total quota of 243,082,392 tons of CO_{2eq} for 2025.
2026	Decree 29/2026/ND-CP	Formally launches Vietnam first carbon exchange, integrating emission quotas into the domestic stock market infrastructure.
2028	End of the pilot phase	Finalizes the MRV mechanism and national registry system in preparation for the transition to official operation.
2029	Official operation	Vietnam's carbon market becomes fully operational nationwide, with plans to link to international carbon markets after 2030.

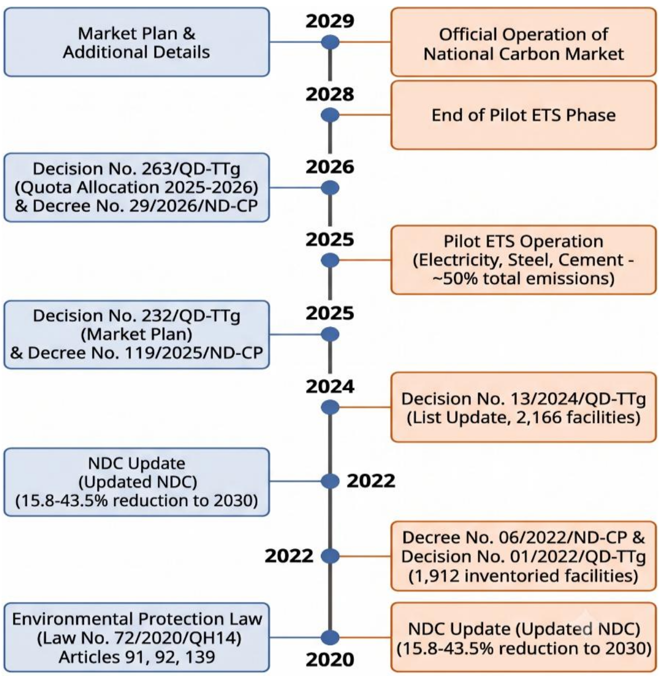

Figure 2. Timeline of Vietnam's national carbon market development

A major turning point came in 2025: Decision 232/QD-TTg approved the Scheme for the Establishment and Development of the Carbon Market, setting out a two-phase roadmap - a 2025 - 2028 pilot followed by official operation from 2029. Decree 119/2025/ND-CP amended Decree 06/2022/ND-CP to refine quota allocation rules and carbon credit management, while also transposing into domestic law the guidance for implementing Article 6 of the Paris Agreement agreed at COP29. At the time Decree 119/2025/ND-CP was signed (June 2025), the announced ETS design was set to cover about 110 facilities across the power, steel, and cement sectors - roughly 50% of national GHG emissions - with only 27 of more than 300 steel facilities expected to fall within ETS scope (though still accounting for over 80% of the sector's emissions), alongside 56 selected cement plants (about 90% of cement sector emissions). By the time Decision 263/QD-TTg (February 2026) formally allocated quotas for 2025 - 2026, the confirmed number of iron and steel facilities had settled at 25, two fewer than the 27 initially announced under Decree 119/2025/ND-CP. This reduction reflects the finalization process between the two documents: as the National Registry System verified facility level emissions data, a small number of the originally listed steel facilities fell below the coverage threshold or were consolidated with other reporting entities, rather than reflecting any inconsistency between the two legal instruments. This approach of narrowing coverage to the largest emitters is consistent with Nong et al. (2020) finding that a broader ETS scope spreads out the economic cost, while keeping implementation feasible by concentrating on the biggest emitting facilities.

In early 2026, Decision 263/QD-TTg (9 February 2026) formally allocated pilot emission quotas for 2025-2026 to 34 thermal power plants, 25 iron and steel facilities, and 51 cement facilities, with a total quota of 243,082,392 tons of CO_{2eq} for 2025 alone. Decree 29/2026/ND-CP then brought Vietnam first carbon exchange into operation, integrating quota-trading infrastructure into the domestic stock market system. Practical challenges nonetheless remain substantial: MRV capacity is uneven across firms, with large corporations and state-owned enterprises already having relatively well-developed carbon accounting systems, while many small and medium sized enterprises continue to struggle - an observation consistent with the institutional gap Minh (2024) had earlier warned about.

POLICY IMPLICATIONS FOR VIETNAM

First, on the roadmap and carbon price level: the consistent evidence in Table 1 shows that broad coverage substantially reduces economic cost (Nong et al., 2020); Vietnam's choice to pilot the ETS simultaneously across power, steel, and cement under Decree 119/2025/ND-CP is therefore a sound direction, and coverage should continue to expand gradually to other industrial sectors over 2026 - 2028.

Second, on quota allocation and revenue use: the free allocation mechanism under Decision 263/QD-TTg should be phased toward partial auctioning over time, paired with a revenue recycling mechanism along the lines recommended by Nguyen (2023) and Nguyen (2024) - prioritizing reinvestment in green technology for the very sectors affected, rather than channeling the funds solely into the general budget.

Third, for the steel sector and other CBAM-exposed exporters: firm level MRV systems need to be built out quickly and made credible, drawing on the National Registry System now being developed under Decree 119/2025/ND-CP, so as to provide a basis for negotiating mutual recognition of carbon pricing with the EU and thereby avoid a double financial burden - following the implication drawn by Chu et al. (2023, 2024) and reflecting the reality of a penalty that escalates from 10% to 30% over 2026 - 2028 for unverified emissions data.

Fourth, carbon pricing policy needs to be paired with industrial policy that supports technology transformation - particularly the development of renewable energy and green hydrogen infrastructure - drawing on the lesson from Germany and Austria that a price signal alone is not enough to drive large capital-intensive technology investment without accompanying clean energy infrastructure. The USD 15.5 billion JETP financing package, though initially targeted at the power sector's coal transition, is directly relevant here: channeling part of its concessional finance toward the grid upgrades and renewable generation capacity that steel and cement decarbonization depend on would give Vietnam's carbon pricing mechanism a financing partner for capital investment that a price signal alone cannot deliver, while addressing industrial firms' concern that JETP offers them little direct benefit - though this requires resolving the transparency and disbursement access barriers that have so far slowed JETP funding.

Fifth, institutional capacity needs to be strengthened, particularly through technical and financial support for small and medium-sized enterprises in building emissions inventory capability, addressing the institutional gap identified by Minh (2024) and the disparity in MRV capacity between large and small firms observed during the 2025 - 2026 pilot phase.

Sixth, on the ETS's overall institutional model: the lesson from Joo et al. (2023) is that Vietnam need not replicate the EU ETS model wholesale and should instead continue developing along a state-led regulatory path - closer to the Korean model - while proactively studying and drawing lessons from K-ETS's early operational problems (low liquidity, excessive free allocation dampening trading incentives) to avoid repeating them during the 2025 - 2028 pilot phase. For the cement sector specifically, given the large share of emissions coming from the chemical process itself (Volaity et al., 2025), the quota allocation mechanism should establish a separate emission intensity benchmark for this sector rather than applying the same assessment framework used for steel.

CONCLUSION

This paper has drawn together the academic literature and the current body of legislation to examine carbon pricing policy and the emissions market in Vietnamese industry. In doing so, it contributes to the literature in two ways: to our knowledge, it is the first synthesis to bring the quantitative CGE literature, the CBAM exposure and MRV literature, and the international heavy industry decarbonization literature together within a single, up-to-date account of Vietnam's 2025 - 2028 ETS pilot, and it translates that synthesis into six specific, actionable design recommendations rather than general policy principles. Consistent quantitative evidence from CGE studies published between 2013 and 2024 shows that a trade-off between emission reduction and economic growth does exist, but that it can be substantially eased through broad sectoral coverage and a well-designed revenue recycling mechanism. Vietnam's decision to formally launch a pilot ETS in 2025 across the power, steel, and cement sectors is consistent with the academic recommendations, though firm level MRV capacity and a revenue recycling mechanism still need to be developed further before the transition to official operation in 2029. International experience shows that no single ETS model suits every country: institutional design needs to fit the domestic political economic context rather than replicate wholesale a model that succeeded elsewhere. Future research should incorporate firm level empirical data to more accurately assess the impact of the 2025 - 2028 pilot phase once sufficient real-world data becomes available.

This paper has two limitations worth noting. First, most of the technical literature on decarbonization technology focuses on the European and Chinese contexts; how well these findings transfer to Vietnam's specific conditions - electricity prices, the availability of green hydrogen, and the ownership structure of steel and cement firms - still needs to be verified through quantitative studies conducted specifically for Vietnam. Second, the data on ETS implementation over 2025 - 2026 draw mainly on industry news sources and international organization reports, owing to the lag in academic publication, and may therefore change once Vietnam releases more complete official data.

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