

The Carbon Border Adjustment Mechanism and the Adaptive Capacity of Vietnamese Export Enterprises: Empirical Overview and Policy Recommendations

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KEYWORDS

Carbon Border Adjustment Mechanism (CBAM), carbon trade, sustainable development, non-tariff barriers, sustainable exports.

ABSTRACT

The European Union's Carbon Border Adjustment Mechanism (CBAM) is emerging as a major environmental policy instrument with significant implications for global trade, particularly for exporting countries such as Vietnam. By internalizing carbon costs into cross-border trade, CBAM imposes stringent technical requirements and may create new trade barriers for enterprises lacking adequate preparation. Based on a preliminary survey of 120 Vietnamese exporting enterprises across key sectors, this study finds that most firms have limited awareness of CBAM, weak emissions accounting capacity, and considerable difficulties in ensuring supply chain transparency. These challenges are especially pronounced among small and medium-sized enterprises. Major obstacles include high transition costs, shortages of specialized technical personnel, and limited access to policy support and green finance, which may undermine firms' competitiveness in the EU market. In response, the article proposes a set of policy recommendations and short- and long-term adaptation strategies to support enterprises in maintaining competitiveness while aligning with sustainable development goals in a trade environment increasingly shaped by low-emission standards.

1. Introduction

Amid the escalating impacts of climate change and the growing stringency of global commitments to greenhouse gas (GHG) mitigation, leading nations and major economic blocs have been consistently strengthening and refining their environmental policy frameworks to advance sustainable development objectives (Adanma & Ogunbiyi, 2024). A growing body of research has examined how climate policies, carbon pricing instruments, and trade-related environmental measures affect global production

and trade patterns. Within this global movement, the European Union (EU) has introduced the CBAM as a key component of the European Green Deal (EGD). The CBAM represents a crucial advancement in the EU's efforts to curb carbon leakage, whereby firms shift production to jurisdictions with laxer emission regulations to circumvent the environmental compliance costs imposed in the EU (Wang et al., 2023).

The CBAM applies a carbon charge to selected imports based on their embedded GHG emissions. It therefore functions not only as an internal

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environmental policy tool but also as a non-tariff trade measure with global implications (Corvino, 2023). Existing studies have mainly focused on the legal compatibility of CBAM with WTO rules and its macroeconomic and distributional effects across countries. In contrast, firm-level responses and adaptive capacity in developing economies remain insufficiently explored. Although the CBAM initially targets sectors such as iron and steel, cement, fertilizers, aluminum, and electricity, its scope is expected to expand to other industries, including textiles, footwear, electronics, and agricultural products (Chu et al., 2023). This expansion poses growing challenges for the competitiveness and adaptability of Vietnamese export-oriented enterprises.

The necessity of a comprehensive investigation into the CBAM and its potential implications has become increasingly evident. For Vietnamese enterprises, the CBAM represents not only a technical trade barrier but also a critical test of their capacity to adapt to the global trajectory toward sustainable development (Thao et al., 2024). Limited understanding of the mechanism and insufficient preparation may lead to higher production costs, increased export prices, and reduced access to the EU market. In the long run, these risks could weaken firms' competitiveness. At the same time, early and proactive adaptation may create opportunities for technological upgrading and sustainable branding.

In the current context, as Vietnam has pledged to achieve net-zero GHG emissions by 2050 in its commitment at COP26, the study of the CBAM is both academically relevant and practically significant as a crucial instrument for informed policy formulation and strategic development. However, domestic research on CBAM remains limited and largely descriptive. Few studies provide empirical evidence on enterprises' awareness, readiness, and technical capacity to comply with CBAM requirements. To address this gap, this paper offers a firm-level empirical assessment of Vietnamese exporters' adaptive capacity based on survey data. The outcomes of this research are expected to generate not only firm-level insights but also valuable references for policymakers, industry associations, and enterprise-supporting organizations in shaping effective and sustainable transition strategies.

In addition to its empirical contribution, this research develops an analytical framework that links international environmental trade policies with corporate behavior in developing economies. As carbon transparency and emissions traceability become standard requirements in global supply chains, adapting to CBAM is no longer optional. It is a necessary condition for Vietnamese enterprises to participate responsibly and competitively in international markets.

In conclusion, examining the CBAM and its impacts on Vietnam's export sector is timely and essential amid the global shift toward green globalization. By combining empirical evidence with

policy-oriented analysis, this study contributes to the literature on carbon border measures and sustainable trade. Ultimately, it aims to support Vietnamese exporters in enhancing their competitiveness in the EU market, where environmental standards are becoming increasingly strict and transparent.

The remainder of this article is organized as follows. It first presents the research method and an overview of the CBAM, followed by an analysis of Vietnam's export performance and the adaptive capacity of Vietnamese enterprises. The final sections discuss potential financial impacts, policy recommendations, research limitations, and directions for future research.

2. Research Methodology

This study employs a qualitative research approach. Primary data were collected through in-depth semi-structured interviews with representatives of Vietnamese exporting firms operating in key sectors exposed to the EU market, including steel, cement, textiles and garments, electronics, and agro-based products. In addition, the study draws on document analysis of policy reports, legal texts, and industry publications related to CBAM and climate-related trade measures. The qualitative data were analyzed using thematic analysis to identify common patterns, key challenges, and emerging adaptation strategies among enterprises. This approach allows for a nuanced understanding of firms' perceptions, constraints, and strategic responses to CBAM within the broader context of green trade and sustainable development.

3. Literature Background and CBAM Framework

3.1. The Context of the CBAM's Emergence

With the launch of the EGD in 2019, the EU articulated its ambitious vision for climate protection. The initiative comprises a comprehensive set of policy measures designed to cut GHG emissions by at least 55% by 2030, relative to 1990 levels, and to attain carbon neutrality by 2050 (Corvino, 2023). However, this ambition also increases the risk of carbon leakage and weakens the competitiveness of EU producers facing rising compliance costs (Wang et al., 2023). One of the EU's key instruments to achieve these objectives is the Emissions Trading System (ETS).

The EU ETS, introduced in 2005, represents the world's first compulsory carbon market (De Perthuis & Trotignon, 2014). Encompassing emissions from the electricity generation, industrial, and aviation sectors, the system currently covers around 40% of the EU's total GHG output, with ongoing discussions on extending its sectoral scope to align with the Union's enhanced 2030 climate objectives (Bleuel, 2023). To address carbon leakage, the ETS relies on two main

measures: the free allocation of emission allowances for industrial installations under the ETS Directive (EC 2003/87/EC), and compensation for indirect electricity-related emission costs at the national level. These measures are based on benchmarks and are subject to quantitative limits and annual reductions (Meadows et al., 2024).

The EU ETS entered its fourth phase in 2021, introducing steeper annual cap reductions and stricter benchmarks for free allocation (Agreement et al., 2020). At the same time, the Market Stability Reserve (MSR) began to reduce the surplus of allowances in the carbon market, contributing to rising carbon prices (Fischer et al., 2019). As a result, allowance prices exceeded EUR 50 in May 2021.

Rising carbon prices and declining free allocations have increased EU firms' exposure to carbon leakage risks. These risks arise when production shifts to countries with weaker climate regulations or when EU producers lose market share to less regulated competitors. To address this challenge, the EU introduced the Carbon Border Adjustment Mechanism (CBAM) under the EGD. The CBAM applies financial adjustments to imports based on their embedded GHG emissions and may include rebate or exemption schemes for EU exporters (Corvino, 2023).

By reducing carbon price differentials between domestic and foreign producers, the CBAM aims to support more ambitious EU climate policies and encourage stronger mitigation efforts by trading partners. It also enables a gradual phase-out of free allocation under the ETS while limiting carbon leakage (Acworth et al., 2020). The CBAM is the first international mechanism specifically targeting

emissions embedded in cross-border trade. It entered into force on January 10, 2023, with financial obligations for importers scheduled to begin in 2026. Table 1. summarizes the key milestones in the CBAM legislative process.

3.2. Objectives of the CBAM

The CBAM aims to address multiple issues; however, its primary objective is to prevent carbon leakage, driven by two major concerns: the potential increase in global GHG emissions (an environmental concern) and the weakening of the EU economy's international competitiveness (a competitiveness concern) (Wang et al., 2023). In the Inception Impact Assessment released in March 2020 and the CBAM Draft Leak published on 3 June 2021, the EC emphasized that the CBAM should be effective in addressing the risk of carbon leakage (Wang et al., 2023). To achieve this objective, the CBAM must ensure that the price of imported goods more accurately reflects their carbon content, thereby complementing the EU ETS and conveying a clear carbon price signal to consumers. Beyond protecting against carbon leakage, other goals of the CBAM include phasing out existing measures currently used to mitigate carbon leakage, providing incentives for third countries to adopt similarly "ambitious" climate policies to reduce both global GHG emissions and the EU's carbon footprint, and ultimately generating "own resources" to help finance the EU budget.

Setting a price on GHG emissions, or a carbon price, is intended to provide companies with an incentive to reduce carbon emissions. However, for EU

Table 1. Key Timeline in the Legislative Process of the CBAM (Lin & Zhao, 2023)

Date	Legislative Event
11 December 2019	The EU has officially endorsed the EGD, which includes the proposal for the CBAM targeting energy-intensive sectors as a key component of its future climate action plans.
19 October 2020	The 2021 European Commission Work Programme proposed and planned the introduction of the CBAM. This programme aims to encourage both EU producers and foreign importers to reduce carbon emissions while maintaining a fairtrading environment in accordance with the regulations of the World Trade Organization (WTO).
10 March 2021	The introduction of the CBAM has been supported by the European Parliament, ensuring its compatibility with WTO rules and the EU's Free Trade Agreements (FTAs)
14 July 2021	Commission presented a detailed plan for the establishment of the CBAM. This mechanism is intended to mitigate the risk of carbon leakage resulting from the misalignment of climate policies between EU and non-EU countries.
15 March 2022	The Council of the EU reached an agreement on the CBAM and published its compromise text. The European Parliament, the Council, and the European Commission (EC) then engaged in trilogue negotiations.
22 June 2022	The European Parliament adopted its position on the regulation establishing the CBAM with 450 votes in favor, 115 votes against, and 55 abstentions.
13 December 2022	The Council of the EU and the European Parliament subsequently reached a provisional agreement on the final text of the CBAM regulation. The compromise text was made public in January 2023.
10 January 2023	The CBAM entered into its transitional phase on 1 October 2023, and the obligation for importers to make financial payments will begin in 2026

companies competing internationally, the additional costs resulting from the EU's climate policies pose a competitive disadvantage, as their counterparts in third countries are not subject to equivalent costs (Lin & Zhao, 2023). The resulting distortion of competition and the weakening of the international competitiveness of EU industries may lead to carbon leakage.

3.3. CBAM and Its Implications for Export Activities

Current EU legislation seeks to maintain export competitiveness by reducing carbon costs for EU exporters through the free allocation of EU ETS allowances and compensation for indirect electricity costs (Meadows et al., 2024). However, the European Commission is gradually phasing out these anti-carbon leakage measures as the CBAM is introduced, while paying limited attention to the implications for EU exporters in third-country markets. This raises concerns about whether additional export-related CBAM instruments are needed to prevent carbon leakage and ensure fair competition in international trade.

Several policy options have been discussed as alternatives to free allocation under the EU ETS. These include partial reimbursement of ETS allowance costs for exported goods, annual export rebates based on verified emissions data, and export tax refunds linked to benchmark efficiency or environmental performance (Leonelli, 2022). Another option is to temporarily maintain free allocation for exporters during the CBAM transition period. While these measures could help preserve competitiveness, they also raise concerns regarding administrative complexity, potential conflicts with WTO rules, and the risk of weakening the carbon price signal (De Perthuis & Trotignon, 2014). As a result, their implementation requires careful design to balance climate ambition and trade competitiveness.

Beyond the EU, the CBAM is expected to have significant impacts on export activities in non-EU countries. One of its stated objectives is to stimulate global decarbonization by shifting part of the carbon pricing burden to imported goods (Kendrick, 2024). In practice, however, border carbon adjustments implemented by developed economies may disproportionately affect developing and emerging countries by increasing export costs and reducing market access (Chu et al., 2023). Potential impacts include declines in export revenues, employment, income, and fiscal resources. Böhringer et al. (2022) note that such outcomes may conflict with the principle of "common but differentiated responsibilities" under international climate agreements.

Empirical studies further highlight these concerns. Eicke et al. (2021) show that countries' exposure to CBAM depends on their export structure, emission intensity, climate policy ambition, and institutional capacity for emissions monitoring and reporting. Their

analysis identifies several developing countries as highly vulnerable due to weak measurement, reporting and verification (MRV) systems and limited adaptive capacity. While CBAM may be compatible with WTO rules, it has been widely perceived by major non-OECD economies, including China, India, Indonesia, and Thailand, as a protectionist and discriminatory measure. These findings suggest that the CBAM's global effectiveness will depend not only on its legal design but also on the availability of technical support and transitional arrangements for exporting countries.

4. Empirical Results: Vietnam's Export Performance and Enterprise Adaptation

4.1. Vietnam's Export Performance and Enterprise Adaptation to the CBAM

Figure 1 illustrates the growth trajectory of Vietnam's exports to the EU during the period 2015–2023, revealing an overall volatile pattern characterized by alternating phases of strong expansion and sharp contraction. This fluctuation reflects the inherent instability of global markets and the dependence of Vietnam's export performance on both domestic and external factors. During the period 2015–2018, exports to the EU maintained a relatively stable growth rate, ranging between 9.66% and 12.60%, indicating a positive trend in Vietnam–EU trade relations. Particularly, in 2017, export growth peaked at 12.60%, which can likely be attributed to government initiatives that facilitated business integration and effectively leveraged favorable trade conditions.

However, in 2019, exports experienced a significant contraction of -14.70%, marking a concerning turning point. This sharp decline likely reflected adverse impacts from global economic fluctuations, trade tensions, and increasingly stringent technical barriers imposed by the EU. It also underscored the vulnerability of Vietnam's export sector when confronted with external shocks. Although exports still recorded a negative growth rate of -2.77% in 2020, the decline had narrowed considerably, signaling the onset of recovery. Subsequently, exports rebounded strongly in the following two years, achieving 14.16% growth in 2021 and peaking at 16.7% in 2022, largely benefiting from tariff reductions under the EU–Vietnam Free Trade Agreement (EVFTA). Nevertheless, in 2023, exports again declined by -6.68%, suggesting that the EU market continues to pose potential risks. One plausible explanation for this downturn is the EU's increasingly stringent environmental regulations and sustainability standards, particularly the implementation of the CBAM during its transitional phase.

From the above analysis, it can be inferred that although the EU remains a critical export destination for Vietnam, the country's export sector is under growing

pressure from the EU's green policy framework, supply chain transparency requirements, and rigorous technical standards. Consequently, enhancing green competitiveness and aligning with sustainable trade requirements have become essential for Vietnam to sustain its export growth and ensure long-term resilience in the EU market.

Figure 2 illustrates the export growth rates of Vietnam's key commodity groups to the EU market in 2023, revealing a highly divergent picture: while many product categories experienced sharp declines, a few sectors recorded positive growth. Notably, the

rice sector stood out with an impressive increase of nearly 50%, highlighting the significant potential of this agricultural product in the European market. This surge can be attributed to the EU's growing demand for sustainable food sources, as well as global supply shortages driven by climate change and geopolitical conflicts in major rice-exporting countries. This positive trend underscores the increasingly important role of Vietnam's agricultural products within the global food supply chain.

However, most of Vietnam's major export commodity groups experienced significant negative

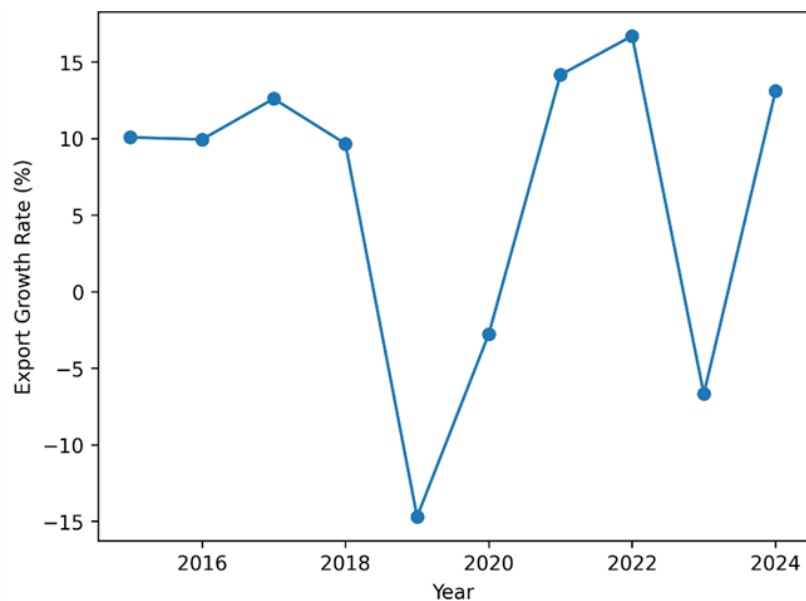


Figure 1. Export Growth of Vietnam to EU Countries
(General Statistics Office of Vietnam, 2023)

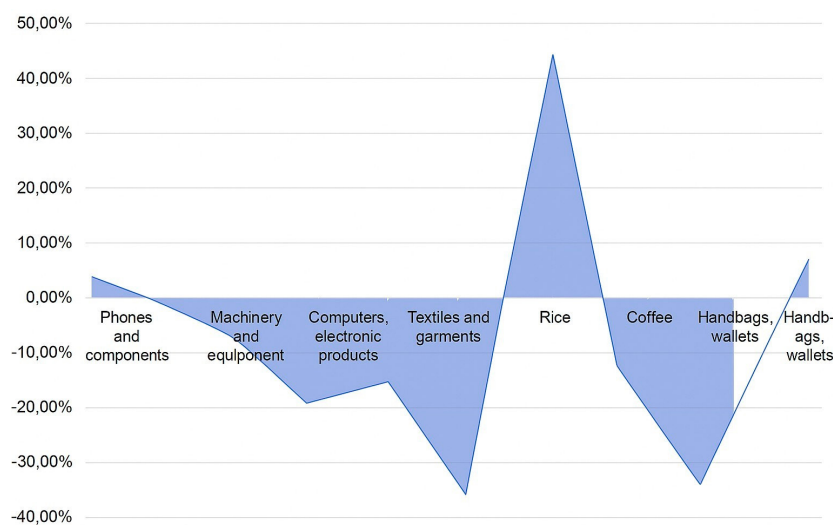


Figure 2. Export Growth Rates of Vietnam's Key Commodity Groups

growth. In particular, wood and wood products recorded the sharpest decline of nearly –35%, followed by seafood and textiles and garments, which dropped by approximately –30% and –20%, respectively. These sectors have been heavily affected by the EU’s increasingly stringent environmental regulations, traceability requirements, and labor standards. In addition, declining consumer demand in the EU, caused by inflation and economic instability, has further reduced import demand for external goods.

Technology-related products such as computers, electronics, phones and components, as well as machinery and equipment, also saw moderate declines ranging from –5% to –15%, reflecting both intense competition from regional rivals and the EU’s strict technical standards. On a more positive note, aside from rice, the handbags and wallets segment experienced modest growth (around +5%), indicating that niche markets still exist for businesses capable of transforming their design models toward sustainable fashion and environmentally friendly materials.

Overall, the implementation of the EU’s CBAM has introduced fundamental changes to international trade, particularly for countries exporting to the EU market. With its goal of minimizing carbon leakage and promoting global emission reductions, CBAM has become a regulatory tool that is binding not only in technical terms but also in shaping the strategic development of enterprises. In this context, assessing the readiness and adaptive capacity of Vietnamese enterprises is crucial to identify existing barriers, capability gaps, and opportunities for adjustment. This study presents preliminary survey results collected from 120 exporting enterprises, focusing on four key dimensions: (1) the level of awareness about CBAM; (2) preparedness and responsive actions; (3) technical capacity in emission inventory and supply chain transparency; and (4) internal challenges during the transition process. Table 2. presents information on the surveyed sample.

The analysis results in Table 2 indicate a relatively diverse industry structure, with the textile and garment sector accounting for the largest proportion (23.3%). This reflects its role as a key export industry but also highlights its vulnerability to CBAM impacts due to limited resource capacity. The electronics and components group (15.0%) mainly consists of FDI enterprises integrated into global supply chains, whereas the steel/metal (11.7%) and cement/construction materials (6.7%) sectors are high-emission industries, facing the most direct and significant effects from CBAM. Other major export sectors such as wood and wood products (10.0%), agro-aquatic products (10.0%), and leather and footwear (6.7%) also have strong exposure to the EU market. The “other industries” group (16.6%) represents a variety of manufacturing sectors beyond the main focus areas. Overall, this industrial composition provides a relatively clear picture of Vietnam’s export landscape and serves as a foundation for analyzing cross-sectoral differences in readiness and adaptive capacity.

Survey results indicate that among the 120 participating enterprises, 63.3% reported having heard of CBAM, while 36.7% had not encountered the concept. However, among those with initial awareness, only 17.5% correctly understood CBAM as a mechanism for calculating and levying carbon costs on imports to the EU based on GHG emissions during the production process. Notably, the proportion of accurate awareness was higher among large enterprises and foreign-invested (FDI) firms, whereas small and medium-sized enterprises (SMEs) primarily accessed CBAM information through informal channels, resulting in misperceptions or outdated knowledge.

Incomplete awareness of CBAM contributes to a lack proactive assessment of policy impacts. This information gap can be attributed to three factors: the technical complexity of the CBAM mechanism, the absence of formal knowledge dissemination systems from government authorities, and a wait-and-see

Table 2. Descriptive Statistics

Industry Group	Number of Enterprises	% of Total Sample	Type of Enterprises
Steel and Metals	14	11.7%	Some FDI firms exporting to the EU
Cement and Construction Materials	8	6.7%	Major exporters of clinker to the EU
Textiles and Garments	28	23.3%	Key export sector, many SMEs
Leather and Footwear	8	6.7%	Major export sector with EU orders
Wood and Wood Products	12	10.0%	Export to the U.S. and EU
Electronics and Components	18	15.0%	Mainly FDI firms participating in global supply chains
Agro-aquatic Products	12	10.0%	Major exports to the EU
Others	20	16.6%	Other manufacturing sectors
Total	120	100%	

attitude among enterprises, particularly given that the transitional phase of CBAM imposes no direct financial obligations.

4.2. Preparedness and Response Actions: The Gap Between Awareness and Practice

Although awareness of CBAM exists in some enterprises, concrete response actions remain limited. When asked about proactive measures taken to prepare for CBAM compliance, only 12.5% of enterprises reported conducting life-cycle assessments (LCA) or testing CO₂ emission measurements in certain production stages. Meanwhile, 26.7% indicated that they were gathering information about CBAM through industry workshops or international publications. However, nearly 61% had not undertaken any concrete steps, highlighting passivity and a lack of strategic orientation.

A noteworthy observation is that preparedness actions are primarily undertaken by firms under direct pressure from European partners. This suggests that responses are largely driven by market pressure to environmental policy rather than initiatives originating from internal capacity or national legal frameworks. Consequently, autonomy and scalability of compliance models remain highly limited.

One key requirement of CBAM is transparency and verifiability of GHG emissions associated with exported products. Survey results show that only 15.8% of enterprises have a relatively complete emissions measurement system, mainly among those that have obtained international environmental certifications. For the majority of remaining firms, emissions accounting is rudimentary, primarily estimated based on input material and energy consumption.

Additionally, 66.7% of enterprises reported difficulties in collecting data from suppliers and lack of input supply chain control, while 78.3% admitted they do not know how to prepare MRV-compliant emissions reports. This is particularly concerning for major export sectors such as textiles, leather and footwear, and wood, which rely heavily on domestic second- or third-tier suppliers that are not yet ready to share data or measure emissions.

Regarding clean energy use, only 10% of enterprises reported using some form of renewable

energy, mainly rooftop solar or biomass, and these efforts remain pilot-scale or insufficient to generate significant reductions in product emissions.

Qualitative interviews identified three major barriers to CBAM compliance: initial investment costs for green technologies and emissions measurement systems (72.5%), shortage of personnel specialized in carbon emissions and environmental management (61.7%), and lack of detailed guidance from regulatory authorities (45.8%).

Most enterprises reported that hiring consultants for LCA implementation or building emissions measurement systems costs several hundred million VND per production line, exceeding their current financial capacity. Investment in new technologies also requires long-term capital, while green financing mechanisms remain limited or inaccessible for SMEs.

Moreover, human resource constraints constitute a critical bottleneck. Many enterprises lack dedicated environmental officers, and most technical staff have not been trained on CBAM or internationally recognized emissions management tools. Internal training is limited due to the scarcity of Vietnamese-language materials and challenges in localizing high EU technical standards.

To quantify the specific impacts of the CBAM, this study develops preliminary quantitative scenarios for three major export sectors with significant emissions: steel, cement, and textiles. Scenario analysis clarifies the potential cost burden that Vietnamese enterprises may face, thereby highlighting the urgency of green transition processes.

The development of financial impact scenarios is based on three main pillars. First, export volumes to the EU are referenced from customs data (WITS). Second, emission intensities are selected based on average values from the IEA and LCA studies, representing the prevalent technological characteristics of production in Vietnam. Third, carbon prices are assumed at three levels to illustrate the sensitivity of CBAM costs under fluctuating EU Allowance (EUA) market conditions. This combination provides a relatively realistic picture of potential impacts while emphasizing the urgent need to improve production technologies and emissions measurement systems (MRV).

Table 3. Potential CBAM Cost Scenarios for Selected Vietnamese Export Sectors

Export Sector	Export Volume to EU (assumed)	Emission Intensity (tCO ₂ /t)	CBAM Cost (€50/tCO ₂)	CBAM Cost (€78/tCO ₂)	CBAM Cost (€120/tCO ₂)	Data Source
Steel & Metals	2,500,000t	2.0	€250,000,000	€390,000,000	€600,000,000	IEA, international BF-BOF reports (2.0–2.3 tCO ₂ /t)
Cement, Clinker	10,628,200t	0.6	€318,846,000	€497,399,760	€765,230,400	IEA, global cement industry data (0.55–0.65 tCO ₂ /t)
Textiles & Apparel	500,000t	20.0	€500,000,000	€780,000,000	€1,200,000,000	International LCA studies (range: 10–30 tCO ₂ /t)

The results illustrated in Table 3. indicate that the potential CBAM costs for Vietnam's key export sectors could reach hundreds of millions to several billion euros per year. The steel and cement sectors face direct risks due to their inherently high emission intensities, while the textile and apparel sector is exposed to indirect impacts through supply chains with significant carbon footprints. Although these figures are hypothetical, they are sufficient to demonstrate a highly concerning level of exposure that could erode competitive advantages and profit margins for enterprises. Therefore, establishing robust MRV systems, investing in emission-reduction technologies, increasing the use of renewable energy, and proactively negotiating with EU import partners are urgent requirements for Vietnamese businesses. Simultaneously, these scenarios serve as a strong alert for policymakers in designing support mechanisms that enhance enterprises' adaptive capacity and help maintain their market position in the EU.

5. Policy Directions, Strategic Recommendations, Limitations and Future Research

5.1. Policy Directions and Proposals to Support Enterprises in Adapting to CBAM

The implementation of CBAM creates new regulatory pressures for exporting countries, particularly developing economies such as Vietnam. To respond effectively, policy directions must be clearly differentiated according to key stakeholder groups, including state authorities, industry associations, and international partners, in order to enhance enterprises' adaptive capacity and ensure sustainable export growth.

For government authorities, the state should play a central coordinating role in responding to CBAM. First, ministries such as the Ministry of Industry and Trade and the Ministry of Natural Resources and Environment should jointly develop sector-specific technical guidelines on carbon accounting, emissions factors, and life-cycle assessment (LCA). This is necessary because most Vietnamese exporters currently lack the technical capacity and standardized tools to independently measure and report emissions. Clear guidance would reduce compliance costs and improve data consistency across sectors.

Second, the establishment of a national MRV system aligned with international standards should be prioritized. Competent authorities should be responsible for setting reporting templates, verification procedures, and accreditation mechanisms for third-party auditors. A standardized MRV framework would help enterprises provide reliable and verifiable emissions data, thereby meeting EU CBAM requirements and reducing the risk of disputes or default emission values.

Third, in the diplomatic and trade policy domain,

the government should actively engage with the EU through bilateral and multilateral channels. Vietnam should clearly communicate its implementation challenges and request technical assistance, technology transfer, and capacity-building support under frameworks such as the EVFTA. This approach would help ensure that CBAM implementation does not result in discriminatory barriers against Vietnamese exports.

For industry associations and intermediary organizations, entities such as VCCI, VASEP, VINATEX, LEFASO, and HAWA should act as operational bridges between policy and enterprises. Their role should focus on organizing targeted training programs on CBAM compliance, disseminating updated regulatory information, and facilitating access to technical consultants. In addition, cooperation with international organizations such as GIZ, UNIDO, IFC, and USAID can help mobilize financial and technical resources for sector-wide transition programs, particularly benefiting small and medium-sized enterprises (SMEs).

For financial and innovation policy stakeholders, the state should design preferential green finance instruments tailored to CBAM-related investments. These include concessional loans for clean technology upgrades, renewable energy installations, and emissions measurement systems. Tax incentives and import duty reductions for low-emission equipment, as well as corporate income tax incentives for certified green enterprises, would further encourage technological upgrading. A dedicated green transition fund, combining public resources, ODA, and private capital, should prioritize SMEs, which face the highest financial constraints.

Finally, for education and human resource development institutions, targeted training programs on carbon management, environmental engineering, and sustainable supply chain governance should be integrated into higher education and vocational training. Developing a pool of domestic experts capable of supporting enterprises in emissions accounting, MRV reporting, and international certification is essential for long-term adaptation.

5.2. Strategic Recommendations for Export Enterprises under CBAM

For export enterprises, adaptation strategies should be clearly structured according to implementation phases.

In the short term (before 2026), enterprises should prioritize low-cost and feasible actions. These include classifying export products by emission intensity, prioritizing cleaner product lines for the EU market, and optimizing existing production processes to reduce energy use and material waste. Enterprises should also proactively engage with suppliers to collect

emissions data and improve traceability, which is a core requirement under CBAM.

In the medium to long term, enterprises need to adopt a transformation-oriented strategy. Strategic investments in clean technologies and modern equipment can significantly reduce emissions while improving productivity and product quality. Transitioning to renewable energy sources, such as rooftop solar, biomass, or green power purchase agreements (PPAs), is particularly important to reduce Scope 2 emissions and align with international initiatives such as RE100 and SBTi.

In addition, enterprises should integrate sustainability into their business and marketing strategies. Building a green brand, disclosing emissions information, obtaining international environmental certifications, and embedding ESG principles into corporate governance can help firms access high-value EU market segments and strengthen long-term competitiveness. Under CBAM, sustainability is no longer only a compliance requirement but a strategic asset for export-oriented enterprises.

5.3 Limitations and directions for future research

This study is limited by its reliance on qualitative and self-reported data from a relatively small sample of Vietnamese exporting enterprises, which may affect the generalizability of the findings. In addition, the analysis focuses on the early phase of CBAM implementation and does not capture long-term impacts. Future research should employ larger datasets, quantitative methods, and post-2024 analyses to better assess the long-term effects of CBAM.

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