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Interim report

Export Carbon Leakage: Assessment of different policy options in the context of CBAM

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Abstract

The EU Carbon Border Adjustment Mechanism (CBAM) applies the same carbon price to the embedded emissions of selected products imported into the EU market as charged in the EU Emissions Trading System 1 (EU ETS 1). It thereby creates a level playing field in that respect between domestic EU production and imports from third countries. However, CBAM does not address the competitive disadvantage faced by EU producers when exporting to markets with lower or no carbon pricing. As CBAM progressively replaces the free allocation of allowances under the EU ETS 1, EU producers will increasingly bear carbon costs on their entire output, including the share destined for export. This creates a risk of export carbon leakage: EU products may lose market share in third-country markets to competitors operating under less ambitious climate policies, potentially leading to net increase in global emissions.

This paper develops an assessment framework and applies it to four distinct policy options designed to address export carbon leakage in the context of CBAM. It comprises five key criteria: the degree of protection against carbon leakage it provides, the extent to which it preserves decarbonisation incentives, the precision with which it targets the relevant actors, its financing requirements, and its administrative complexity.

The four options assessed are: direct export rebates linked to verified carbon costs (Option 1); additional free allocations granted to EU ETS 1 operators based on their export share (Option 2); a sector-specific adjustment to the CBAM phase-out trajectory for free allocations (Option 3); and direct financing of decarbonisation investments in export-oriented sectors, for instance through Carbon Contracts for Difference (Option 4).

This paper does not derive policy recommendations but rather aims to identify pros and cons of each Option. It finds that no single option is clearly superior across all criteria. Options 1 to 3 offer more immediate carbon leakage protection but tend to weaken decarbonisation incentives unless robust conditionality criteria are imposed. Option 4 most effectively preserves the carbon price signal and supports structural industrial transformation, but entails higher financing needs and provides only delayed leakage protection. A sequenced combination of options may offer a path forward, securing effective short-term protection while preserving long term decarbonisation incentives.

Zusammenfassung

Das EU CO_2-Grenzausgleichssystem (Carbon Border Adjustment Mechanism, CBAM) belegt die grauen Emissionen ausgewählter Importprodukte mit einem CO_2-Preis in der Höhe, wie er auch im EU-Emissionshandelssystems 1 (EU-ETS 1) anfällt. Dadurch sollen in Bezug auf CO_2-Preise gleiche Wettbewerbsbedingungen zwischen der EU-internen Produktion und Importen aus Drittländern geschaffen werden. Allerdings adressiert der CBAM nicht den Wettbewerbsnachteil, dem EU-Produzenten beim Export in Märkte mit niedrigeren oder gar keinen CO_2-Preisen ausgesetzt sind. Da der CBAM schrittweise die kostenlose Zuteilung von Emissionszertifikaten im Rahmen des EU-ETS 1 ersetzt, werden EU-Produzenten zunehmend die CO_2-Kosten für ihre gesamte Produktion tragen müssen, einschließlich des für den Export bestimmten Produktionsanteils. Dadurch entsteht das Risiko eines exportbedingten Carbon Leakage: EU-Produkte könnten auf Drittlandsmärkten Marktanteile an Wettbewerber verlieren, die unter weniger ambitionierten Klimapolitiken operieren, was potenziell zu einem Nettoanstieg der globalen Emissionen führen könnte.

Diese Studie entwickelt einen Bewertungsrahmen und wendet ihn auf vier unterschiedliche politische Handlungsoptionen an, die darauf abzielen, exportbedingtes Carbon Leakage im Kontext des CBAM zu adressieren. Der Bewertungsrahmen umfasst fünf zentralen Kriterien: den Grad des Schutzes vor Carbon Leakage, das Ausmaß, in dem Dekarbonisierungsanreize erhalten bleiben, die Zielgenauigkeit bei der Ansprache der relevanten Akteure, der Finanzierungsbedarf sowie die administrative Komplexität.

Die vier untersuchten Optionen sind: direkte Exporterstattungen auf Grundlage nachgewiesener CO_2-Kosten (Option 1); zusätzliche kostenlose Zuteilungen für EU-ETS-Anlagenbetreiber auf Basis ihres Exportanteils (Option 2); eine sektorspezifische Anpassung des CBAM-Ausstiegspfads für kostenlose Zuteilungen (Option 3); sowie die direkte Finanzierung von Dekarbonisierungsinvestitionen in exportorientierten Sektoren, beispielsweise durch Klimaschutzverträge (Option 4).

Die Studie kommt zu dem Ergebnis, dass keine einzelne Option über alle Kriterien hinweg eindeutig überlegen ist. Die Optionen 1 bis 3 bieten einen unmittelbareren Schutz vor Carbon Leakage, schwächen jedoch tendenziell die Dekarbonisierungsanreize, sofern keine robusten Konditionalitätskriterien eingeführt werden. Option 4 erhält das CO_2-Preissignal am wirksamsten und unterstützt den strukturellen industriellen Wandel, geht jedoch mit einem höheren Finanzierungsbedarf einher und bietet nur verzögerten Schutz vor Carbon Leakage. Eine sequentielle Kombination verschiedener Optionen könnte einen gangbaren Weg nach vorn darstellen, welche sowohl einen wirksamen kurzfristigen Schutz vor Carbon Leakage gewährleistet und gleichzeitig langfristige Dekarbonisierungsanreize aufrechterhält.

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List of abbreviations

Abbreviation	Explanation
BF-BOF	Blast Furnace - Basic Oxygen Furnace
CAPEX	Capital Expenditure
CBAM	Carbon Border Adjustment Mechanism
CCfDs	Carbon Contracts for Difference
CN	Combined Nomenclature
CO_2	Carbon Dioxide
CSCF	Cross-Sectoral Correction Factor
DRI-EAF	Direct Reduced Iron – Electric Arc Furnace
DRI-H_2	Direct Reduced Iron with hydrogen
EMAS	Eco-Management and Audit Scheme
EU	European Union
EU ETS	European Union Emissions Trading System
EUR	Euro
IF	Innovation Fund
ISO	International Organization for Standardization
NACE	Nomenclature of Economic Activities
OPEX	Operational Expenditure
PRODCOM	Production Communautaire (Community Production Statistics)
SME	Small and Medium-sized Enterprise
WTO	World Trade Organisation

1 Problem definition and context

The European Union Emissions Trading System 1 (EU ETS 1) imposes a carbon price on the production of certain goods as well as on electricity generation within EU borders – based on the territorial principle. Its primary objective is to meet the EU's commitment to reduce greenhouse gas emissions by means of a market for emission allowances,[1] where a cap induces scarcity and a positive price for emissions is generated, incentivising abatement in the regulated sectors. The Carbon Border Adjustment Mechanism (CBAM) complements the EU ETS 1 by applying a carbon price to emissions embedded in goods produced outside the EU but consumed within it. The fundamental objective is to avoid the risk of carbon leakage. The CBAM thus complements the EU's carbon pricing framework with a system for carbon-intensive goods imported and sold within its territory.

CBAM is designed to gradually replace the free allocation of allowances in the EU ETS 1. It is therefore intended to help prevent carbon leakage and maintain the effectiveness of the EU ETS 1 by shielding EU producers from competitive disadvantages arising from comparatively higher carbon costs. However, even a fully operational CBAM would only cover products sold within the EU, but does not address different carbon costs for EU exporters in third-country markets[2].

Goods produced in the EU remain subject to EU ETS 1 costs regardless of their destination. Due to the pricing effect, EU products may lose market share in export markets, potentially being replaced by more emissions-intensive alternatives from competitors that produce in jurisdictions with lower climate mitigation ambitions. Such displacement would not only result in carbon leakage, thereby compromising the effectiveness of the EU ETS 1 and undermining global emission reduction efforts; it would also reduce revenue streams of EU firms, thereby constraining their financial capacity to invest in decarbonisation technologies the EU ETS 1 aims to promote.

In December 2025, the European Commission put forward a proposal for a temporary measure to mitigate the remaining carbon leakage risk – the temporary decarbonisation fund.[3] It is meant to provide support to producers, conditional on their output being included in a predefined list of products, and consists of financial compensation for the reduction of free allocation resulting from the introduction of CBAM.

The proposed temporary decarbonisation fund is intended to provide support for operations in 2026 and 2027 and does not constitute a medium- to long-term solution, which is to be identified in the context of the EU ETS 1 review in 2026. The aim of this paper is to discuss potential long-term options for addressing the current lack of carbon leakage protection for EU exporters. All options discussed here are grounded in the current policy architecture of the EU ETS 1 and CBAM and discuss ways in which an instrument could enhance this policy architecture to take export leakage into account.

The paper is structured as follows: First, it describes the main aspects or criteria that need to be taken into account when designing a solution to ensure that EU exports are not disadvantaged on global markets in the context of EU ETS 1 and CBAM. These are: the protection against carbon leakage that is provided (section 2.1), the decarbonisation incentives that remain in place or are introduced (2.2), the targeting precision with respect to different stakeholders, in particular operators of EU ETS 1 installations and exporters downstream of the value chain (2.3), the

[1] See Recital 5 of the EU ETS Directive (2003/87/EC) (European Union 2003)

[2] A limited exception concerns cases under the EU customs inward processing procedure, where inputs are re-exported rather than released for free circulation in the EU (European Commission 2023a, pp. 24–25).

[3] European Commission 2025a

financing needs and funding sources required to implement the compensation (2.4), and the administrative burden placed on regulated entities and the public authorities responsible for implementation and enforcement (2.5).

Second, four ideal-typical options are outlined and discussed in light of these aspects. These are: directly addressing exports with rebates (3.1), directly addressing exports with ex-post free allocations (3.2), indirectly addressing exports with a different phase-out path for free allocations in export-exposed sectors (3.3), and directly financing decarbonisation investments in export-oriented sectors (3.4). Each option is discussed regarding its application in the three main CBAM sectors of steel, aluminium and fertilisers.

The paper aims at discussing the different options, identifying their respective advantages and disadvantages, yet does not deliver a definitive policy recommendation. Furthermore, it explicitly focuses on the economic incentives created by different options. A discussion of their full compliance with WTO regulations is outside the scope of this analysis. Moreover, this paper assesses the different options from the perspective of EU-based supply chains producing in part for external markets leaving the case of European supply chains sourcing from third countries - and not being covered by inward-processing - for further research.

2 Assessment framework for solutions to address export carbon leakage in the context of CBAM

Approaches to addressing export carbon leakage within the CBAM vary in design. To facilitate an informed discussion, this paper identifies the following aspects of implementation to be considered: How effectively is protection against carbon leakage ensured? How effectively are decarbonisation incentives upheld? Which stakeholders would benefit the most? What is the basis, including constraints, for financing such mechanisms, and what broader effects arise on the financing side, for instance with respect to public budgets and the use of EU ETS 1 auction revenues? How appropriate is the administrative burden from the implementation of the respective options?

2.1 Protection against carbon leakage

According to the CBAM Regulation (EU) 2023/956, "carbon leakage occurs if, for reasons of costs related to climate policies, businesses in certain industry sectors or subsectors transfer production to other countries or imports from those countries replace equivalent products that are less intensive in terms of greenhouse gas emissions."

Similarly, recital 5 of the guidelines on state aid measures to address carbon leakage in the context of the EU ETS 1 post-2021 states that: "As long as many international partners do not share the same ambition as the Union, there is a risk of carbon leakage, either because production is transferred from the Union to other countries with lower ambition for emission reduction, or because Union products are replaced by more carbon-intensive imports" (OJ C 317, 25.9.2020, p. 5)

These definitions have been operationalised through the eligibility criteria laid down in Articles 10b(2) and 10b(3) of Directive 2003/87/EC (EU ETS 1 Directive). On this basis, Commission Delegated Decision (EU) 2019/708 applies these criteria to establish the carbon leakage list and the associated compensation schemes. Under this framework, industrial sectors are classified as being at significant risk of carbon leakage when they meet a specific quantitative threshold: the product of their trade intensity and emissions intensity must exceed 0.2. In other words, sectors face carbon leakage risk when they are both highly trade-exposed (competing in international markets) and emissions-intensive in their production processes, with the combined metric exceeding this threshold. This evaluation is supplemented by a further qualitative assessment for sectors which are close to the defined carbon leakage threshold but do not exceed it.

A similar definition and operationalisation could be applied to exports. When EU companies compete in global markets, their products may face a competitive disadvantage if trading partners impose less stringent climate regulations. In such a scenario, EU-produced goods could be driven out of the market by products manufactured under weaker environmental standards and higher emissions intensity. As a result, EU companies would lose market share not due to inferior product quality or innovation, but rather due to the asymmetric ambition levels of climate policies and carbon costs across different jurisdictions.

Another relevant distinction between import- and export-related carbon leakage lies in the difference between the sectors producing specific goods and the actors exporting such goods. The regulatory frameworks discussed identified carbon leakage risk at the sectoral level, classifying entire industries based on aggregate trade and emissions intensity metrics. Whilst this may be appropriate for imports, given that imports and all domestic production compete in the same market, the situation is different for exports. The actual economic agents exposed to this risk are individual exporters: the specific companies and facilities that compete in

international markets. Within any sector classified as at risk, there is significant heterogeneity in export orientation across the sector. Some firms may direct most of their production towards international markets, facing direct competition from foreign producers, whilst others serve exclusively domestic demand and face no competitive pressure from asymmetric climate policies. Moreover, downstream manufacturers of complex goods, such as automotive or machinery producers, may be highly export-oriented despite falling outside traditional carbon leakage sectors and outside the scope of the EU ETS 1, yet they incorporate emissions-intensive inputs into their production chains. The actual export-oriented actors could fall outside the scope of specific options, creating a potential risk of leakage. The appropriate targeting of the instrument is therefore important and is discussed in section 2.3.

2.2 Preservation of decarbonisation incentives

Whilst carbon leakage protection addresses the competitive dimension of climate policy, the preservation of decarbonisation incentives concerns the environmental effectiveness of carbon pricing mechanisms. The fundamental premise of the EU ETS 1 is that imposing a cost on carbon emissions will incentivise operators to reduce their greenhouse gas emissions through technological innovation, process optimisation, and investment in cleaner production methods.

However, protective measures designed to address the risk of carbon leakage can weaken or undermine these decarbonisation incentives. When industrial installations receive significant financial support for carbon costs – whether through the free allocation of emission allowances or, for example, export rebates – they may face reduced financial pressure to invest in emission reductions. The European Commission has recognised this tension in its approach to free allocation under the EU ETS 1. As stated in recital 19 of Directive 2003/87/EC (as amended), free allocation should be "harmonised and based on objective criteria that take particular account of the possibilities for reductions in emissions and energy efficiency gains". This is implemented through product-specific benchmarks set at the level of the most efficient installations, ensuring that only operators who match best-in-class performance receive full free allocation, whilst less efficient installations must either improve their processes or purchase additional allowances.

In addition to the use of benchmarks, conditionality criteria are also important to ensure that beneficiaries of carbon cost compensation actively contribute to decarbonisation efforts. These conditionality criteria require companies receiving free allowances or other forms of support to demonstrate concrete actions to reduce emissions, rather than simply continuing with business-as-usual operations under the protective umbrella of compensation measures. In the context of the EU ETS 1, such conditionality has been integrated, primarily into the rules for free allocation. In addition, state aid schemes for indirect carbon costs provide a further example: under the German scheme for the compensation of indirect emission costs, beneficiaries must fulfil specific environmental requirements, such as implementing energy or environmental management systems (e.g. ISO 50001 or EMAS), conducting energy audits, or investing in energy efficiency measures. These obligations ensure that financial support is tied to tangible efforts to reduce emissions intensity and improve resource efficiency. Section 3 discusses how each of the options allows for maintaining both a high level of effectiveness in terms of preventing carbon leakage and incentivising decarbonisation outcomes.

2.3 Appropriate targeting of the instrument

An important criterion to evaluate an export leakage solution should be how well such a solution manages to target the different actors involved, and their direct and indirect carbon costs. Those actors can be broadly clustered in two groups: operators of installations regulated under the EU

ETS 1 (hereafter referred to as EU ETS operators) and downstream exporters, a term that in this paper is used to cluster together producers or traders of goods that contain materials produced in EU ETS 1 regulated installations.

This distinction is important because EU ETS 1 operators are not the only group facing export leakage risk. First, even within the same corporate group the EU ETS 1 operators might not be the same legal entity as the exporters of that product. Second, once EU ETS 1 operators begin paying for allowances on their domestic production, they can be expected to pass on these carbon costs to their downstream customers. They can do so as CBAM establishes a level-playing field on the domestic EU market. Consequently, manufacturers or traders of further processed goods containing materials produced in EU ETS 1 installations will indirectly bear these carbon costs despite not being directly regulated under the EU ETS 1. When these downstream actors now export their products, they too may face competitive disadvantages in markets with lower climate ambition, rendering them potentially eligible for support.

Another dimension concerns the carbon price paid in the destination of exports (or importing country). For any instrument designed to address export carbon leakage under CBAM, the compensation for carbon costs should be granted only for those products that face genuine competitive disadvantages due to asymmetric carbon pricing across jurisdictions. As CBAM progressively replaces free allocation, EU ETS operators will begin paying for allowances for both their domestic sales and exports. Whilst CBAM applies equivalent carbon costs to imports, it provides no such protection for exports competing in third-country markets, where climate mitigation ambitions – and consequently climate policy-induced costs – are often lower.

The appropriate level of compensation should ideally correspond to the difference in carbon pricing between the EU and the destination jurisdiction, mirroring the CBAM's logic of accounting for carbon prices paid in third countries. A product exported to a market with comparable carbon pricing should receive no compensation, whilst exports to jurisdictions with lower or no carbon pricing would be eligible for support proportional to this differential. This principle ensures that support to prevent export carbon leakage targets only competitive disadvantages arising from climate policy asymmetries, rather than subsidising all exports indiscriminately. This aspect will become less relevant once countries with carbon pricing schemes also introduce a CBAM at their borders.

Section 3 evaluates how different policy options can appropriately target support across EU ETS 1 operators, downstream producers, and traders, and whether they can account for variations in carbon pricing across export destinations.

2.4 Financing needs

Any instrument designed to address export carbon leakage in the context of CBAM must be financially sustainable over both the short and long term. The financing requirements depend critically on the instrument's design, including its scope of coverage, the level of compensation provided, and the number of beneficiaries. These financial resources must come from identifiable sources, whether through public budgets, the redirection of auction or CBAM revenues, or alternative mechanisms.

A key consideration is the opportunity cost of financing. Under the current EU ETS 1 framework, revenues from the auctioning of allowances flow primarily to Member States and to EU-level programmes. These latter funds are the Innovation Fund, which supports low-carbon technologies, and the Modernisation Fund, which assists lower-income Member States in transitioning their energy systems. In the future, additional instruments such as the proposed Industrial Decarbonisation Bank could also channel ETS-related revenues towards industrial

decarbonisation investments.[4] Although the phase-out of free allocation following the CBAM factor increases the total volume of allowances to be auctioned, mechanisms that prolong free allocation or earmark a share of auction proceeds for export support may still reduce the auction revenues available for these other purposes.

The financing challenge is further complicated by the declining emissions cap under the EU ETS 1. As the cap tightens over time towards climate neutrality, the total volume of allowances available for auctioning decreases, and even rising allowance prices may not compensate that. This creates a structural tension: as export support mechanisms are financed through auction revenues, the available funding pool declines unless alternative financing sources are identified. Conversely, if support levels are maintained through alternative financing, this places an increasing burden on public budgets or other revenue streams.

Section 3 evaluates how different policy options address these financing considerations and their long-term fiscal sustainability.

2.5 Administrative complexity

The administrative burden associated with any export carbon leakage mechanism affects both regulatory authorities and regulated entities. Administrative complexity encompasses several dimensions: the data collection and verification requirements, the frequency and timing of compliance activities, the sophistication of systems needed to implement the mechanism, and the capacity requirements for both public and private actors.

For regulatory authorities, administrative complexity includes the resources needed to design and maintain the system, verify compliance, prevent fraud or abuse, coordinate with other agencies (such as customs authorities or statistical offices), and resolve disputes. While synergies with existing mechanisms, for instance by relying on existing conditionality frameworks, are in principle conceivable and could reduce administrative burdens, whether such effects materialise in practice depends on the detailed design of the instrument.

For regulated entities, administrative translate into direct compliance costs: staff time devoted to reporting and documentation, external consultancy fees, IT systems for tracking and reporting, and the opportunity cost of management attention diverted from core business activities. These burdens can be particularly onerous for small and medium-sized enterprises (SMEs), which typically lack dedicated compliance departments and may struggle to navigate complex regulatory requirements. This is particularly relevant for export support mechanisms, where exporters and ETS 1 installations are often not identical entities, so that information on embedded emissions and compliance status has to be exchanged along the value chain, adding further administrative steps. Disproportionate administrative burdens on SMEs can inadvertently create barriers to accessing support mechanisms, potentially leaving smaller exporters unprotected despite them facing genuine competitive challenges.

The administrative complexity of an instrument also affects its transparency and verifiability. Simpler mechanisms are easier for stakeholders to understand, for civil society to monitor, and for policymakers to evaluate and adjust over time. Complex systems with multiple moving parts and extensive data requirements may be more prone to implementation errors or unintended

[4] In the Clean Industrial Deal communication, the European Commission announces its intention to strengthen the Innovation Fund and to propose an Industrial Decarbonisation Bank of around EUR 100 billion, financed inter alia by Innovation Fund resources, additional ETS revenues and a revision of InvestEU. However, as of May 2026, the Bank remains at the proposal and design stage: no dedicated legislative act establishing the Bank has yet been adopted, and the detailed governance and scope are still under preparation (European Commission 2025b, p. 13)

side effects. They may increase uncertainty for businesses planning long-term investments, and generate higher transaction costs that reduce the net benefit of the support provided.

Section 3 assesses how the different policy options for addressing export carbon leakage balance these administrative considerations against their effectiveness in achieving carbon leakage protection and maintaining decarbonisation incentives.

3 Design and discussion of different options to address export carbon leakage in the context of CBAM

This section discusses four options for addressing the carbon leakage risks associated with exports in the context of the CBAM: directly addressing exports through rebates (section 3.1), directly addressing exports through additional free allocations (section 3.2), indirectly addressing exports through a different phase-out path for free allocations in sectors exposed to exports (section 3.3), and directly financing decarbonisation investments in export-oriented sectors (section 3.4). Each of these options is discussed in terms of how they address the issues described in section 2.

3.1 Directly addressing export carbon leakage risks with rebates (Option 1)

3.1.1 Description

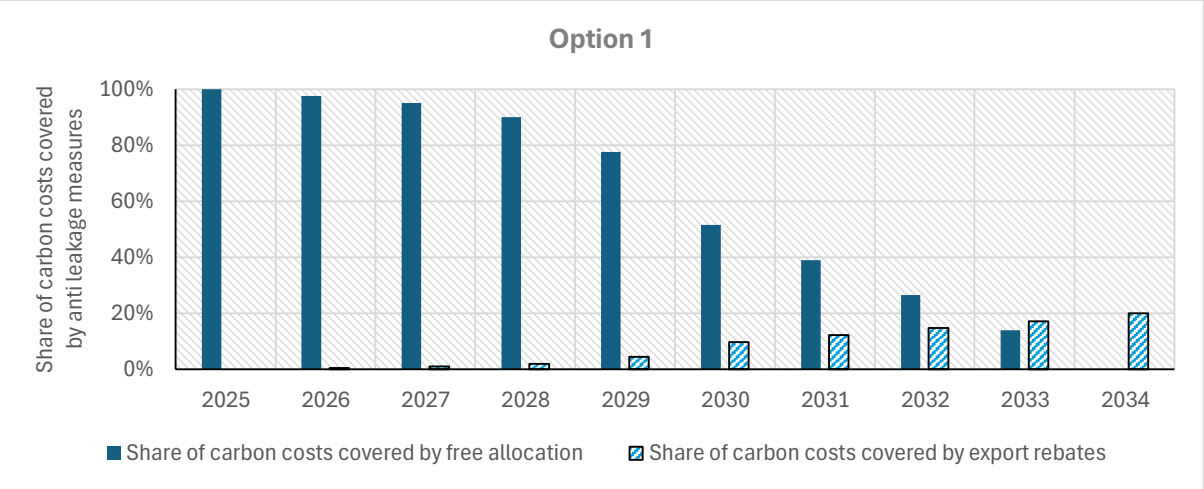
This option directly addresses the challenge of carbon leakage faced by EU exporters through the EU ETS 1 by offering financial compensation in the form of rebates. Under this mechanism, exporters could claim rebates based on the actual quantity of goods exported and the carbon price paid under the EU ETS 1, regardless of whether this price has been paid directly (because the exporter is an installation operator within the scope of the EU ETS 1) or indirectly (because the exporter is a downstream producer or trader that pays EU ETS 1 costs indirectly via cost pass-through)[5]. An exporter's eligibility for rebates could nevertheless be limited by specific criteria such as the relevance of carbon costs in the final price and exposure to trade. The financial compensation under option 1 would be designed to cover carbon costs on production volumes destined for third-country markets, ensuring that EU products are not disadvantaged when competing in jurisdictions with lower or no carbon costs. Effectively, this system mirrors the CBAM system for imported goods.

To preserve the decarbonisation incentives inherent in the EU ETS 1, the rebate system would follow a benchmarking logic similar to that used for free allocation. Since the exported product can be the result of various manufacturing steps, potentially including multiple products into one, the methodology for calculating the CBAM product level benchmarks could be adapted to create an EU product benchmark. In this way, rebates would be partial and linked to the efficiency of the production facility or of production along the supply chain, depending on the case. This means that only exporters of the least emission-intensive goods would receive a full compensation for their export volumes. To further strengthen decarbonisation incentives, rebates could be subject to conditionality criteria that link eligibility for support to specific climate performance requirements or investment commitments. However, the feasibility and administrative burden of such conditionality would differ across exporter types: while EU ETS operators can often implement measures and provide evidence in-house, downstream exporters may depend on supply-chain traceability of embedded emissions, which is significantly more complex.

Figure 1 illustrates how this system would function for a benchmark-efficient EU ETS 1 operator that exports 20% of its production. As free allocation phases out until 2034, such a facility would see its domestic carbon costs increase. However, for the exported portion of production, these costs would be fully compensated. This keeps the full price signal for the domestically consumed share, while maintaining competitiveness in international markets.

[5] Here we assume that the instrument can in principle cover EU ETS operators, downstream producers and trader, Section 3. 1. 2. 3 and 3.1.2.5 respectively on targeting and administrative complexity discuss the challenges related to this scope.

Figure 1 : Free allowances and export rebates for a benchmark-level plant with a 20% export share[6]



Notes: Share of carbon costs covered by free allocation and export rebates under option 1 for an EU ETS 1 operator producing at the benchmark level efficiency. Assuming constant production and constant export share (20% of production), carbon costs covered by free allocation decline following the CBAM factor, while the export rebates increase following the same factor but scaled by the share of exports. Source: Own illustration, The Climate Desk

For downstream exporters the example would be similar: they would also receive a rebate equal to the whole carbon costs indirectly passed over to them. Just like EU ETS 1 operators, that would receive rebates up to the benchmark value, downstream exporters would still have to bear part of the carbon costs if the material procured was produced at an emission intensity above the product benchmark.

3.1.2 Assessment against key design elements

3.1.2.1 Carbon leakage protection

Export rebates structured around a benchmarking system could provide substantial protection against carbon leakage. At the same time, this protection could be differentiated according to product's emission intensities. Products that are produced at or above benchmark efficiency levels would have their direct and indirect carbon costs on exported volumes fully rebated, effectively neutralising the competitive disadvantage for EU exporters in third-country markets. By contrast, less efficient producers would remain partially exposed to carbon costs, maintaining pressure for operational improvements. However, all connections to real emission intensities would lead to more complex administrative necessities. On the other hand, if standard values were used, the resulting rebate would be less targeted.

However, an important distinction must be made between EU ETS 1 operators and downstream exporters. In principle, export rebates could be offered to any product that leaves the EU, thus allowing for a full leakage protection from both direct and indirect carbon costs. However, the further down the value chain is the exported product the longer will be the chain of carbon costs to trace. Section 3.1.2.3 and section 3.1.2.5 will discuss how this could create greater burdens for downstream producers which might create a barrier, especially for smaller actors, to report indirect emissions. This in turn would lead to a lower carbon leakage protection for those actors.

Another important operational consideration is the timing of payments and rebates. Producers would need to purchase allowances upfront and only receive rebates retroactively, creating

[6] For demonstration purposes, we simplify and abstract from ETS-wide changes such as future adjustments to benchmarks.

liquidity pressures that could disproportionately affect smaller firms or those with tighter cash flow constraints.

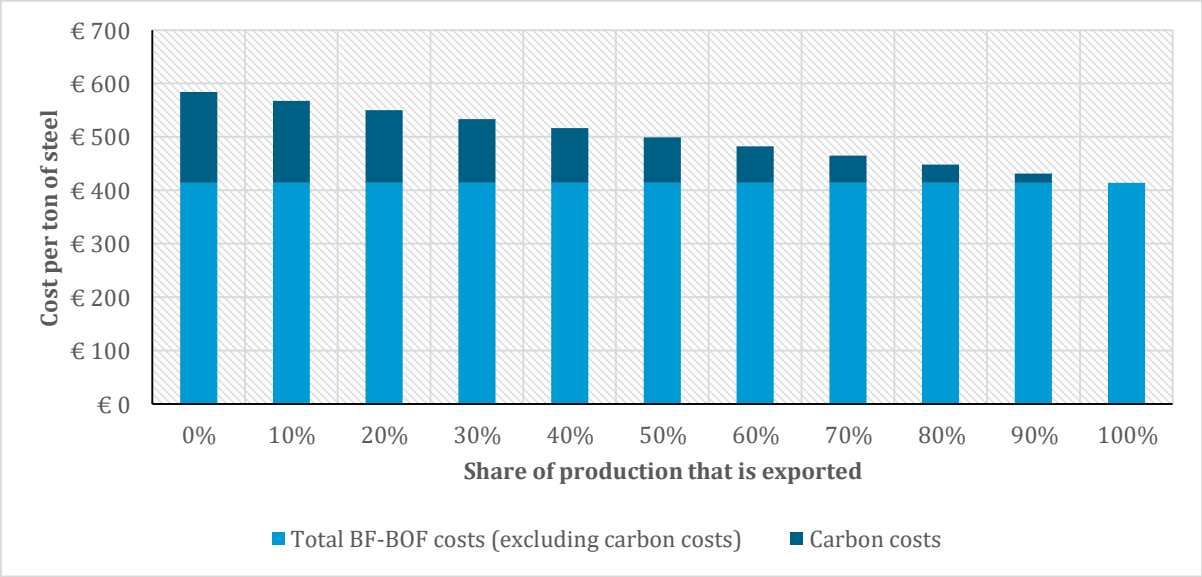
Assessment: *High protection against carbon leakage, particularly for efficient producers.*

3.1.2.2 Preservation of decarbonisation incentives

The granting of export rebates inherently weakens the carbon price signal by reducing the effective carbon cost faced by exporters. This weakening affects the economic calculus underlying decarbonisation investments. EU ETS operators evaluate such investments by comparing the prospective cost savings from reduced carbon payments under the EU ETS 1 against the upfront capital expenditure required, whilst also considering alternative investment opportunities. When export rebates are available, companies will factor this policy option into their investment evaluations, as rebates alter the effective carbon price and thus the payback period for decarbonisation technologies.

Figure 2 illustrates this dynamic through a cost calculation for a conventional BF-BOF steel plant. The light blue bars show total BF-BOF production costs excluding carbon costs, which remain constant regardless of export share. The dark blue segments represent the carbon costs effectively borne under the EU ETS 1, that is, the portion of the carbon price applying only to the share of production sold on the EU market and therefore not offset by an export rebate. Rarely will all the production of an installation be geared towards exports, for example, only 14% of total European finished steel products is exported (EUROFER 2025). However, this average might not show the full heterogeneity of the sector.

Figure 2 : Example calculation for production cost of conventional steel route with export rebates



Notes: Exemplary calculation based on costs from Agora (2022). The carbon price is assumed to be €100 per tonne of CO_2, and the emission intensity of one tonne of steel produced via the BF-BOF route is assumed to be 1.7 tonnes of CO_2. Source: Own illustration, The Climate Desk

The benchmarking system would still provide a partial decarbonisation incentive for both EU ETS 1 operators and downstream exporters. Such decarbonisation incentive could be strengthened through carefully designed conditionality criteria linked to eligibility for rebates. The nature of these conditionality criteria would need to differentiate between EU ETS 1 operators and downstream producers. For EU ETS 1 operators, these may include requirements to, for example, meet specific emissions reduction targets, invest a certain percentage of rebate

income in decarbonisation technologies, or demonstrate progress towards climate neutrality milestones. For downstream exporters who are usually not the actors to undertake deep decarbonisation investments, conditionality criteria could include a more stringent monitoring systems for their upstream emission, specific low-emission procurement quotas or a traceability system that proves that the material procured meets the conditionality criteria that are applied to EU ETS 1 operators for the same export rebates.

Additionally, an indirect effect on decarbonisation incentives arises from the financing structure. For example, if revenues from auctioned allowances are to be used to financing rebates rather than flowing to the Innovation Fund, they would reduce the financial resources available for supporting industrial transformation. However, such indirect effect depends strictly on the source of financing for the instrument.

Assessment: *Low preservation of decarbonisation incentives unless robust conditionality criteria are imposed*.

3.1.2.3 Appropriate targeting of the instrument

Export rebates offer considerable flexibility in targeting, allowing the mechanism to address both direct and indirect carbon costs across the value chain. The system could be designed to enable downstream producers to receive compensation for indirect carbon costs embedded in their products, thus addressing carbon leakage risks throughout complex supply chains. This could be implemented similarly to the approach used for complex goods in the CBAM regulation, whereby operators submit detailed accounts of emissions embedded in their products or input materials in the case of downstream producers, akin to the "Communication template for operators outside the EU."

Furthermore, rebates could be differentiated based on the destination market's climate policy landscape. By taking into account the prevailing carbon price in the country of destination, the rebate system could provide greater compensation for exports to jurisdictions with minimal or no carbon pricing, whilst reducing or eliminating rebates for exports to markets with comparable carbon costs. This differentiation would improve the efficiency of the mechanism by concentrating support where competitive disadvantages are most acute. However, in practice this might be difficult to achieve as the final country of destination might be hard to identify and verify.

Assessment: *Potentially high targeting capability with appropriate design features which would, on the other hand,* require detailed reporting obligations for the applicants.

3.1.2.4 Financing requirements

The phase-out of free allocation under CBAM will generate increasing revenues from auctioning allowances in the short to medium term, providing a potential funding source for export rebates. However, the declining emissions cap means that auction revenues are also projected to decrease over time. This creates a long-term financing challenge: either compensation to exporters is limited to the in the medium term, auction revenues, which are set to decline or additional financial resources are devoted to the rebate system.

A practical approach to managing these financing needs would be to link rebate levels to the carbon price prevailing in the destination country. This option might be challenging to implement because it might require to distinguish between a simple transit through a country and final destinations of the export (opening the door some extent of abuse). However, under such a design for targeted support, the financial burden of the instrument would likely decrease over time as carbon pricing schemes become more widespread and robust internationally.

Nevertheless, with a view to the long term, the financing of rebates depends on the existence a positive cap in the EU ETS 1. Once the cap reaches zero, the instrument would require financing from external sources beyond auction revenues.

It is important to note that financial resources allocated to export rebates represent an opportunity cost, as these revenues would otherwise be channelled towards other purposes, most notably the Innovation Fund, which supports breakthrough decarbonisation technologies.

Assessment: *High financing needs, but potentially manageable through increased auction revenues in the short and medium term.*

3.1.2.5 Administrative complexity

Accurate implementation of export rebates entails substantial administrative efforts from both, regulators and regulated entities. The system would require robust reporting and verification processes to ensure that rebates are claimed appropriately: this would require the export declaration to custom authorities to include verified carbon costs alongside the currently reported export quantities.

The administrative burden further increases if the mechanism is designed to target downstream products too. Complex and extended value chains complicate the traceability of embedded emissions and carbon costs, requiring systems for tracking products through multiple stages of processing and manufacturing. However, the administrative burden would be in principle similar to the burden placed on importers into the EU through the application of CBAM, and potentially, similar instruments could be applied. For example, practical implementation could be simplified by offering to use standard values and only account for emission stemming from specific emission intensive precursor material rather than all production processes involved. For smaller firms, the administrative requirements for claiming rebates could be particularly burdensome, potentially necessitating simplified procedures or administrative support mechanisms to ensure equitable access to the instrument.

Assessment: *High administrative complexity when applied to downstream products and to verified direct and indirect carbon costs.*

3.2 Addressing export carbon leakage risks with additional free allocations (Option 2)

3.2.1 Description

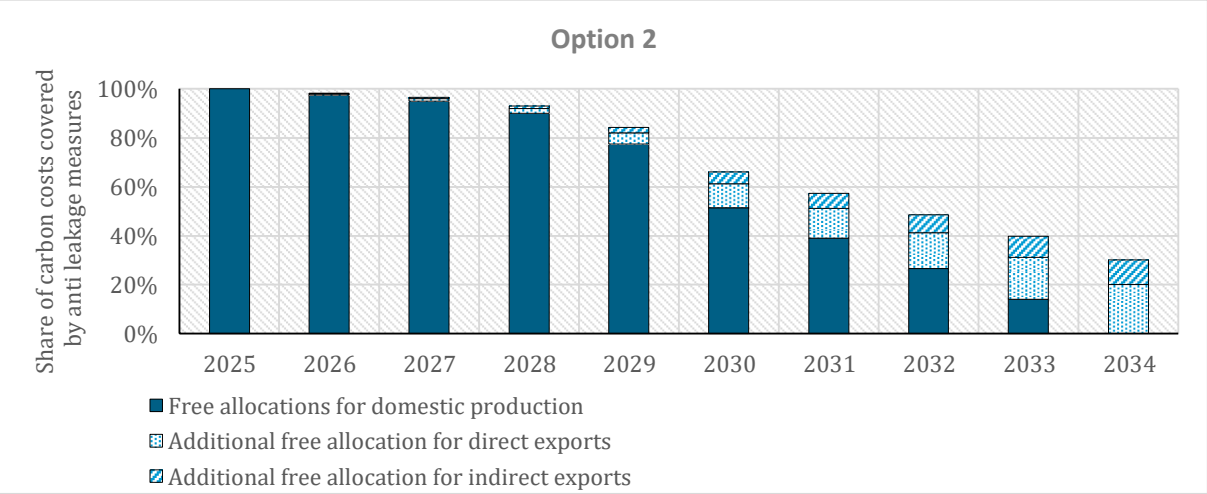
This option offers a structurally different approach to supporting EU exporters whilst maintaining a closer connection to the fundamental architecture of the EU ETS 1 which is based on installations and their operators as the main regulated entity. Rather than providing monetary rebates to any exporter, this mechanism grants additional free allowances to EU ETS 1 operators based on the share of their production that is exported, allocated either retrospectively after the production year or based on historical export data.

The main distinction with option 1, concerns the targeted entities. While in option 1 any exporter could be eligible for a rebate, in option 2 only operators of EU ETS 1 installation would be eligible to receive additional free allocations. They would receive a compensation for both the products directly exported (like in option 1), but also for the part of their output that is embedded in downstream products that are exported.

The second distinction with option 1 is that production geared towards exports and production geared towards the internal market compete for the same pool of allowances within the constraints of the EU ETS 1 cap. The volume of support available through additional allocations is therefore physically limited by the cap itself. If aggregate demand for ex-post free allocations exceed the available supply under the cap, a mechanism similar to the current cross-sectoral correction factor (CSCF) would apply, proportionally reducing all allocation claims. This places an implicit upper bound on the maximum support available and forces the support to decline over time in line with the EU ETS 1 cap.

Figure 3 shows the additional free allocations that an EU ETS 1 operator would receive assuming that they export 20% of their production directly, and 10% of their production indirectly (by being embedded in exported downstream products). Instead of receiving monetary refunds, the EU ETS 1 operator receives additional free allowances for its export volumes on top of the standard declining allocation trajectory linked to the CBAM phase-in. By 2034, the compensation covers carbon costs proportional to the 20% (direct) export share or the 30% of composite export share.

Figure 3 : Additional free allocations for a benchmark-level plant



Notes: Share of carbon costs covered by free allocation and additional free allocation for exports under option 2 for an installation operating at the benchmark level. Assuming constant production and constant export share (20% of production directly exported and 10% exported as material embedded in exported downstream products), carbon costs covered by free allocation decline following the CBAM factor, whilst additional free allocation are added proportionally to the share of exports[7]. Source: Own illustration, The Climate Desk

3.2.2 Assessment against key design elements

3.2.2.1 Carbon leakage protection

The main difference between option 1 and option 2 in terms of carbon leakage protection concerns the actors that they target.

Option 2 discussed here gives additional free allowances directly to EU ETS 1 operators, so that carbon costs are never incurred in the first place for the portion of production destined for export. If implemented correctly, no carbon costs would be passed on to downstream producers or exporters, removing the need for indirect cost rebates further down the value chain.

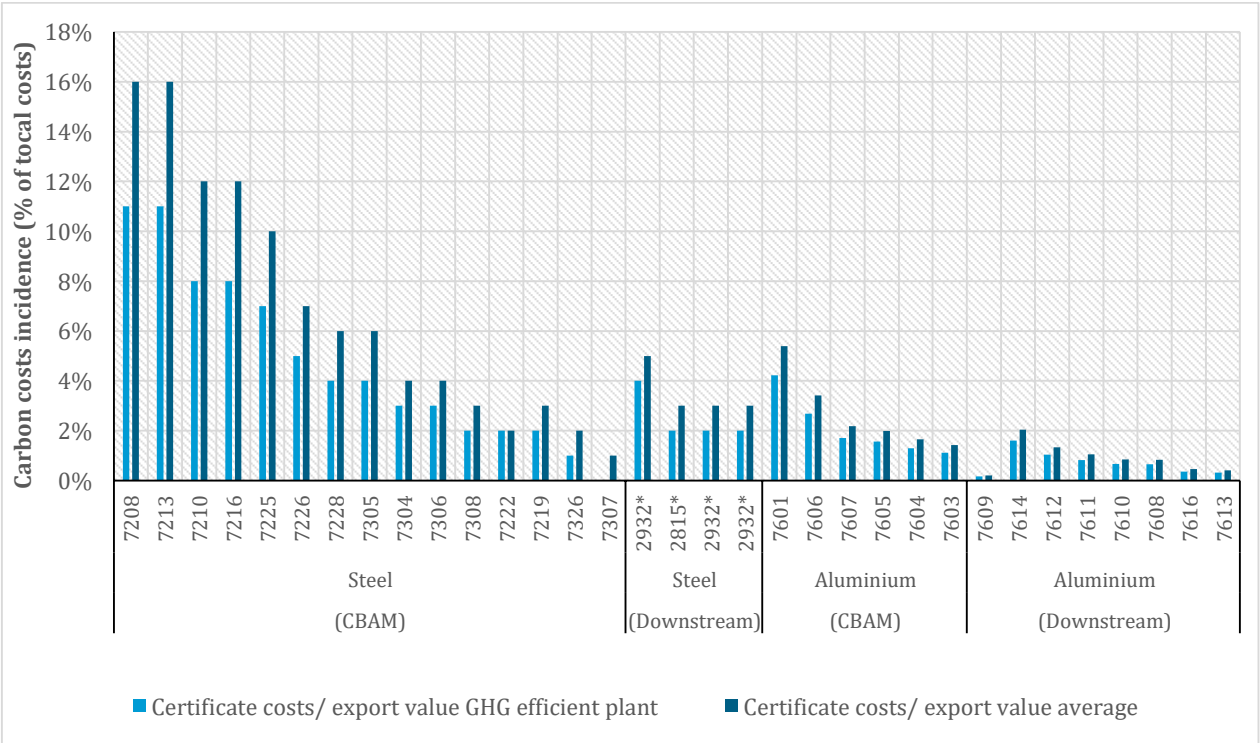
[7] For demonstration purposes, we simplify and abstract from ETS-wide changes such as future adjustments to benchmarks. Furthermore, the numbers provided here are refer to benchmark efficient installations; installation operating above the benchmark will have to pay the corresponding amounts.

For EU ETS 1 operators, adequate protection requires an accurate estimate of the share of production directly exported. This can be done either ex-ante using historical data, or ex-post based on actual reporting.

For downstream producers, the picture is more complex. Their protection depends on how well the exported share can be identified through the value chain. This could be done either based on precise tracking or based on a flat-rate factor to cover the average share indirectly exported via the downstream sector by sector (section 3.2.2.3 discusses these options). However, this is an extra effort that EU ETS 1 operators may choose not to make, particularly if a well-functioning CBAM already allows them to pass carbon costs through to their customers. In that scenario, the incentive to claim compensation for indirect exports weakens, and coverage of indirect export carbon leakage would depend entirely on whether EU ETS 1 operators find it commercially worthwhile to pursue it.

It should be noted that downstream producers typically face lower indirect carbon costs relative to their total production costs and therefore the carbon leakage risk in those sectors might be lower. Figure 4 compares the expected cost impacts from the complete pass-through of carbon costs for CN codes included in the initial scope of CBAM with selected downstream products[8]. These impacts, whilst indicative, are substantially lower than the carbon cost impacts on CN codes included in the initial scope of CBAM[9].

Figure 4 : Carbon cost impacts for primary and downstream products



[8] Estimated based on calculations by Graichen, V., & Healy, S. (2022), and Cludius, J., Graichen, V., Healy, S., & Skribbe, R. (2025), who calculated these costs for various products covered by CBAM, including cement, steel, and aluminium. Their methodology estimates the costs of purchasing emission allowances per tonne of product by comparing emissions from both greenhouse gas-efficient plants (those meeting EU ETS 1 benchmarks) and average plants, assuming a CO_2 price of €100 per tonne and a 50% reduction in free allocation by 2030. These certificate costs are then expressed as a percentage of the average export value per tonne of product, representing the maximum potential price increase due to carbon costs. For downstream goods, 100% cost pass-through is assumed.

[9] Even within the initial scope of CBAM there are products that are less likely to be produced in EU ETS installations such as for example fabricated articles, fittings, structures (7307, 7308, 7326), and they also show lower cost incidences.

Notes: Estimates based on calculations by Graichen, V., & Healy, S. (2022) and Cludius, J., Graichen, V., Healy, S., & Skribbe, R. (2025). The X-axis shows the CN code for all sectors except steel downstream, which uses PRODCOM codes (marked with *); the related estimates are taken from Cludius, J., Graichen, V., Healy, S., & Skribbe, R. (2025). Source: Own illustration, The Climate Desk

Another key difference in carbon leakage protection between options 1 and 2 relates to how the EU ETS 1 cap constrains the available support. Whilst option 1's financing is, may be indirectly linked to the cap through auction revenues, option 2 creates a direct physical constraint on the volume of allowances available for export support. This introduces uncertainty regarding whether a CSCF-type mechanism might be triggered if emissions associated with exports exceed available allowances under the cap.

In the short and medium term, the carbon leakage protection provided by option 2 is comparable to option 1, as both instruments cover similar percentages of carbon costs. However, the long-term trajectories diverge significantly. Option 1 could theoretically provide continued support for exporters even as the cap approaches zero through alternative financing mechanisms[10]. In contrast, option 2's support is inherently tied to cap availability and would necessarily phase out as the cap declines. If substantial disparities in climate mitigation ambition persist between the EU and third countries when allowances become scarce, EU exporters could face renewed competitive disadvantages. The timing and severity of this challenge would depend on both the pace of cap reduction and the evolution of climate policies in major trading partner countries.

Assessment: *High protection against carbon leakage for EU ETS 1 operators, protection against leakage for downstream actors is contingent on design and price pass through towards downstream producers.*

3.2.2.2 Preservation of decarbonisation incentives

In the short and medium term and not considering the application of conditionalities for export support, the decarbonisation incentive effects under option 2 are similar to those under option 1, given the functional equivalence in carbon cost coverage. However, the long-term dynamics differ fundamentally. Under option 2, producers understand that support will diminish in tandem with the declining cap, pointing to a certain trajectory towards much higher carbon costs. This temporal certainty may send stronger signals for investment in decarbonisation compared to option 1, where the possibility of continued support through alternative financing may reduce such urgency.

As with option 1, the introduction of conditionality criteria, which link eligibility for the free allocation to decarbonisation performance, could potentially enhance the incentivising effects. On the other hand, conditionality criteria increase the administrative burden.

An additional indirect effect arises from competition for scarce allowances. Ex-post allocations to exporters reduce the availability of allowances for other market participants: if additional allowances are to be taken from the existing pool of allowances available for free allocation, this might increase the risk that the Cross Sectoral Correction Factor (CSCF) is triggered, while, if taken from the pool of allowances planned to be auctioned, may increase scarcity and prices in the EUA market.

[10] Assuming that the need for compensation remains. For example, because residual gross emissions are still subject to a carbon price.

Assessment: *Low preservation of decarbonisation incentives in the short term, unless robust conditionality criteria are imposed, but `medium' in the long term due to cap-driven phase-out certainty and indirect scarcity effects.*

3.2.2.3 Appropriate targeting of the instrument

As discussed in section 3.2.2.1 carbon leakage protection for downstream exporters depends strongly on the accuracy of tracing exports products down complex value chains.

One option is to mandate precise tracking: EU ETS 1 operators would have to demonstrate that their products were physically embedded in exported goods. This solution ensures a high accuracy and it also creates a direct reporting link between installations and exporters, improving accountability around carbon cost pass-through. However, it adds administrative complexity and reporting burdens on EU ETS operators and downstream exporters.

Another option is to tie the additional free allocation needed to cover indirect costs on a flat-rate factor estimated using exported quantities and material shares for downstream products linked with the output of the EU ETS installations. This approximation will be less precise but administratively lighter and would overlap significantly with option 3 that will be discussed below.

Assessment: *High targeting effectiveness for* EU ETS 1 operators *but for downstream exporters there is a trade-off between accurate targeting and administrative burden.*

3.2.2.4 Financing needs

Option 2 does not require direct financial transfers from public budgets. However, by allocating free allowances that would otherwise be auctioned, auction revenues from these allowances would then be missing. The magnitude of this revenue impact depends on the volume of exports, the emissions intensity of exported products, and the prevailing allowance price.

Assessment: *No direct financing requirement, but redistribution of resources from innovation support and other auction revenue-funded programmes to export support.*

3.2.2.5 Administrative complexity

Option 2 places a lighter administrative burden on the overall system compared to option 1. Under option 1, any exporter seeking a rebate must verify embedded emissions across their inputs, while under option 2, the verification requirement falls almost exclusively on EU ETS 1 operators, and it is only limited to their export share.

For EU ETS operators' directly exported products, proving the export share is relatively straightforward. The more demanding step arises when EU ETS operators seek additional free allocations to cover the share of their output embedded in downstream exported products. In this case, they would need to collect export data from their customers, creating a voluntary reporting chain that runs from downstream producers back to the supplier of the primary material.

Assessment: *Medium administrative burden since this option is limited to, EU ETS 1 operators; accounting for indirect exports is administratively feasible but may be incomplete in practice.*

3.3 Addressing exports with a different phase-out path for free allocations for sectors at risk of export carbon leakage (Option 3)

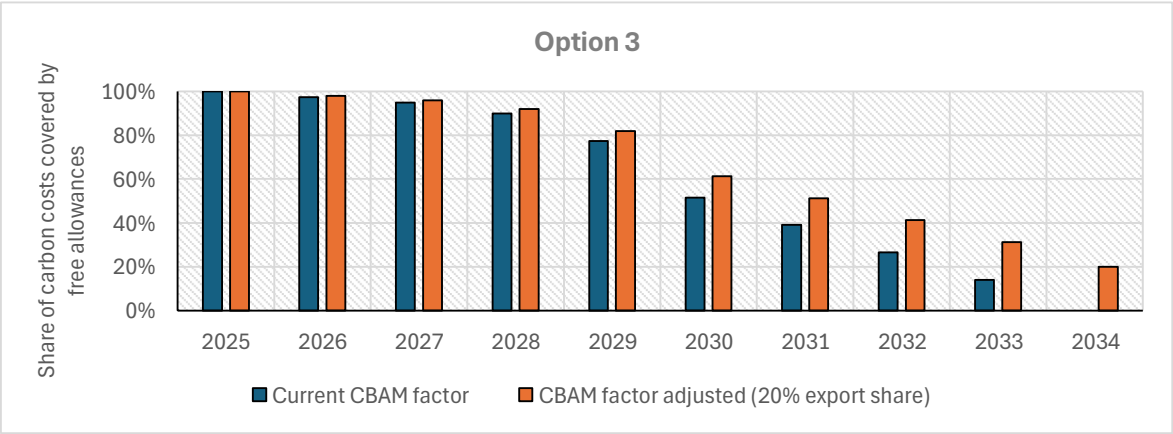
3.3.1 Description

This option is similar to option 2 but it simplifies its implementation by changing the methodology for the calculation of free allocation for each export-exposed sector rather than relying on installation reporting their actual export shares. For example, the CBAM factor could be adjusted proportionally to a sector export share (like option 2 including not only direct exports but also indirect exports). An alternative approach could be to maintain the current CBAM factor trajectory but prevent it from falling below the sector's export share threshold. These two approaches are similar but would yield different results in terms of the cumulative free allocation over time for the sector[11].

Figure 5 illustrates the application of this option to a sector with 20% of production devoted to exports. The CBAM factor—which determines the rate at which free allowances are phased out—is adjusted proportionally to this export share, resulting in a slower decline in free allowances over time and reaching a floor of 20% in 2034. Here the difference between the two aforementioned approaches becomes clear: Figure 5 shows how with the proportional adjustment approach the share of carbon costs covered would be higher every year, while by taking the alternative approach of maintaining the CBAM factor trajectory and setting a floor at the target export share the first year where a difference would materialize would be 2033 in this example.

A critical design parameter is the definition of a sector: level of sectoral aggregation at which export exposure is measured. This could range from the relatively broad 4-digit NACE level, consistent with the current carbon leakage list methodology, to more granular 6- or 8-digit Combined Nomenclature (CN) or PRODCOM codes that provide greater product specificity. This option would be identical to option 2 if the level of aggregation was the EU ETS 1 sub installation (i.e. no aggregation).

Figure 5 : Current CBAM factor and adjusted CBAM factor for a sector with 20% export intensity



Notes: Current CBAM factor and adjusted CBAM factor for a sector with an export intensity of 20%. Assuming constant production, a constant sectoral export share of 20%, and production at the benchmark level, the adjusted CBAM factor

[11] In practice, both approaches could be implemented also by maintaining the CBAM factor unchanged but modifying the formula for the calculation of the preliminary free allocation by a sector specific factor.

declines more slowly than the current CBAM factor (in proportion to the export share) and eventually stabilises at a level equal to the export share[12]. Source: Own illustration, The Climate Desk.

3.3.2 Assessment against key design elements

3.3.2.1 Carbon leakage protection

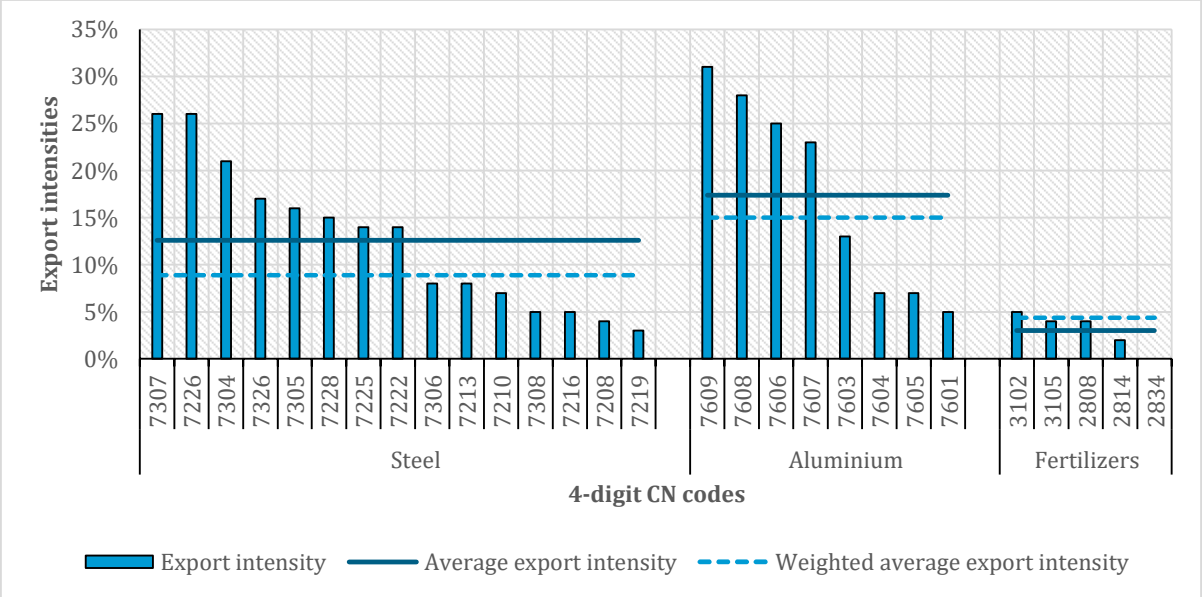
In principle, adjusting the CBAM factor based on sectoral export shares could provide comprehensive protection against carbon leakage for export-oriented sectors. If a sector's export intensity is 20%, retaining free allocations at 20% would theoretically cover the corresponding volume of production. These retained allocations could contain the carbon costs faced by exporters when competing in international markets, thereby neutralising competitive disadvantages arising from asymmetric climate policies. If the adjustment factor also includes the production of that sector that is embedded in downstream products that are themselves exported this protection could be indirectly expanded also to downstream exporters, similarly to option 2.

While working with aggregate exports metrics reduces complexity significantly, this comes at the cost of precision. Carbon leakage risk varies across individual firms and installations within the same sector. A sectoral export share represents an average that may poorly reflect the actual exposure of specific economic agents. Export-intensive firms operating within predominantly domestic-oriented sectors would receive insufficient protection under this approach, whilst domestically focused firms within generally export-intensive sectors would benefit from continued free allocations, even in the absence of real competitiveness threats for them in third-party international markets.

Figure 6 illustrates this heterogeneity by showing the distribution of export intensities within the steel, aluminium and fertiliser sectors, calculated at the 4-digit product group level, plotted against both simple average and production-weighted average export intensities. The dispersion reveals substantial variation around the sectoral mean.

[12] For demonstration purposes, we simplify and abstract from ETS-wide changes such as future adjustments to benchmarks. Furthermore, the numbers provided here are refer to benchmark efficient installations; installation operating above the benchmark will have to pay the corresponding amounts.

Figure 6 : Distribution of export intensities by product group against average and weighted average



Notes: Estimate based on Graichen, V., & Healy, S. (2022); weighted averages calculated based on the total export volume of specific products. Source: Own illustration, The Climate Desk

A production-weighted average calculated at the 4-digit PRODCOM/CN code level would provide improved targeting accuracy by giving greater weight to high-volume producers, better reflecting the actual carbon leakage risk in sectors such as steel. Nevertheless, significant mistargeting and overcompensation could still occur if substantial variation exists within individual 4-digit product categories. The highest level of detail possible would be the 8-digit PRODCOM code. Information at this level is already collected, and this granularity is already part of the existing free allocation framework. For all allocation elements, the PRODCOM codes of products and their CN codes are collected alongside the corresponding production volumes[13]. At the 8-digit PRODCOM level there the heterogeneity will likely be reduced, but with a trade-off with respect to administrative complexity (see section 3.3.2.5 below).

A second concern relates to the potential expansion of free allocation claims. Adjusting CBAM factors upwards for sectors exposed to exports would substantially increase aggregate demand for free allowances across the EU ETS 1. As total claims would then soon exceed available allowances under the cap, the CSCF would be triggered, reducing all allocations proportionally and creating competition for scarce allowances between export-oriented and domestic market-focused producers. This dynamic would generate indirect effects similar to those discussed in option 2, potentially disadvantaging sectors not benefiting from adjusted CBAM factors.

Assessment: *Theoretically high protection against carbon leakage, but heterogeneous in practice and highly dependent on the granularity of sector definitions, with significant cost distribution effects, including risks of under-protection for outlier cases.*

3.3.2.2 Preservation of decarbonisation incentives

The impacts on decarbonisation incentives under option 3 are structurally similar to those under options 1 and 2. The carbon price signal is effectively weakened for the share of

[13] For fallback products, such as those used for rolling mills in the steel industry, energy inputs have also been allocated to PRODCOM codes since 2021. From 2026 onwards, the annual allocation adjustment for fallback products will additionally be based on this consumption data, by accounting for product-level efficiencies for each PRODCOM code relative to the reference period.

production corresponding to the sector's export intensity, based on the existing benchmarking system. For installations operating at or above benchmark efficiency, the retention of free allowances reduces the financial incentive to invest in further emissions reductions, as the marginal benefit from avoided carbon costs diminishes. For installations operating less efficiently than the benchmark, the decarbonisation incentive would remain mostly intact. The extent to which the price signal is weakened depends on the amount of free allocation made available (like in option 2) rather than on the availability of finance of the instrument (like in option 1 or option 4).

In addition, firms with minimal or no export activity will continue to receive free allocations if they happen to operate in sectors classified as export-exposed, thereby eliminating part of the carbon price signal without any corresponding justification in terms of competitiveness. Conversely, highly export-intensive firms in sectors with low average export shares would face full carbon costs despite genuine competitive pressures.

As with previous options, the imposition of conditionality criteria linking allocation eligibility to demonstrated decarbonisation performance could substantially strengthen the incentive structures.

In this option, just like in option 2, a different CBAM factor for some sectors might significantly reduce the allowances available for other sectors. Furthermore, increasing the risk and uncertainty associated with the operation of the CSCF.

Assessment: *Low preservation of decarbonisation incentives unless robust conditionality criteria are imposed, with particular concerns about weakened incentives for non-exporting firms in sectors exposed to exports.*

3.3.2.3 Appropriate targeting of the instrument

Three aspects are worth considering with respect to the targeting of this instrument.

First, as mentioned above, the sectoral averaging approach inevitably creates both over-compensation and under-compensation. Figure 6 illustrates this challenge: firms with export intensities substantially above the sectoral average receive insufficient protection, whilst those below the average benefit from allocations that exceed their competitive needs. The magnitude of this mistargeting depends on the within-sector variance of export intensities, and the granularity of the sector definition.

The second aspect concerns downstream exporters. Just like option 2, the carbon leakage protection for this group depends on whether indirect exports are included in the calculation of used to adjust the free allocation quantities. However, while option 2 relied on a chain of reporting between downstream exporters and EU ETS 1 operators, this option relies on a metric that could be calculated, albeit imperfectly, from statistical data. This reduces the administrative costs and increases the likelihood that additional free allocation are allocated to EU ETS 1 operators in a quantity sufficient to potentially avoid cost pass through to downstream exporters as well. However, there is the risk of windfall profits if carbon costs are nonetheless passed on to downstream producers. This risk is higher than in option 2 high because there is no monitoring and required exchange of information between EU ETS operators and downstream exporters.

Third, option 3 cannot readily account for differences in carbon pricing levels across destination markets. Since the mechanism addresses entire sectors rather than individual export transactions, it lacks the granularity to differentiate support based on specific countries of destination. Whilst an average global carbon price could theoretically be incorporated into the

adjustment calculation, this would introduce additional layers of approximation and create further risks of systematic over- and under-compensation relative to actual competitive conditions in specific markets.

Assessment: *targeting effectiveness highly dependent on design choices.*

3.3.2.4 Financing needs

The financing implications of option 3 are similar to those of option 2, as both reduce auction revenues by handing over free allowances to market participants. By retaining free allocations that would otherwise be auctioned as CBAM is phased in, this option reduces revenue streams available for other purposes, particularly from the Innovation Fund and other climate-related programmes financed through proceeds from the EU ETS 1. The magnitude of foregone revenues depends on the number and size of sectors qualifying as export-exposed, specifically the thresholds used to define export exposure, and the level of aggregation at which sectors are defined as exposed or not.

Also, similarly to option 2, this option has an implicit upper bund of the available support determined by the EU ETS 1 cap and its share devoted to free allocation.

Assessment: *Capped financial requirement due to the EU ETS 1 cap, but trade-offs with other revenue uses.*

3.3.2.5 Administrative complexity

Option 3, in principle, offers a substantial advantage in terms of administrative simplicity compared to the previous options. However, it would require a considerable adjustment of the free allocation system. This is reflected in the type of sub-installation to be chosen (e.g. SI Fuel, CL, CBAM or Fuel, non-CL, CBAM or Fuel, non-CL, non-CBAM). If the CBAM factor depended on the e.g. 8-digit CN (or PRODCOM)-Code, this would constitute a major structural change. The current approach of sub-installations, which has been used for allocation since 2013, would no longer be usable and an alternative system would have to be established together with a new data collection approach.

Therefore, the administrative complexity for the change is considerable and even bigger, if the change was done within one trading period, i.e. additionally to “normal” changes of the allocation rules between trading periods. For the regulator, it would require defining sectoral export intensities and establishing a methodology for calculating adjusted CBAM factors, but would not necessitate the extensive export tracking, verification, and retrospective adjustment processes required by options 1 and 2.

An additional administrative requirement would be the periodic review and updating of sectoral export intensity metrics, conceptually similar to the existing process for maintaining the carbon leakage list. This could be carried out on a multi-year cycle using trade statistics and production data that are generally available from existing sources.

If strong conditionalities are to be applied in order to increase the decarbonisation incentive, this would further increase administrative complexity, just like previous options.

Assessment: *High administrative complexity upfront. Then low administrative complexity.*

3.4 Financing decarbonisation investments in export-oriented sectors (Option 4)

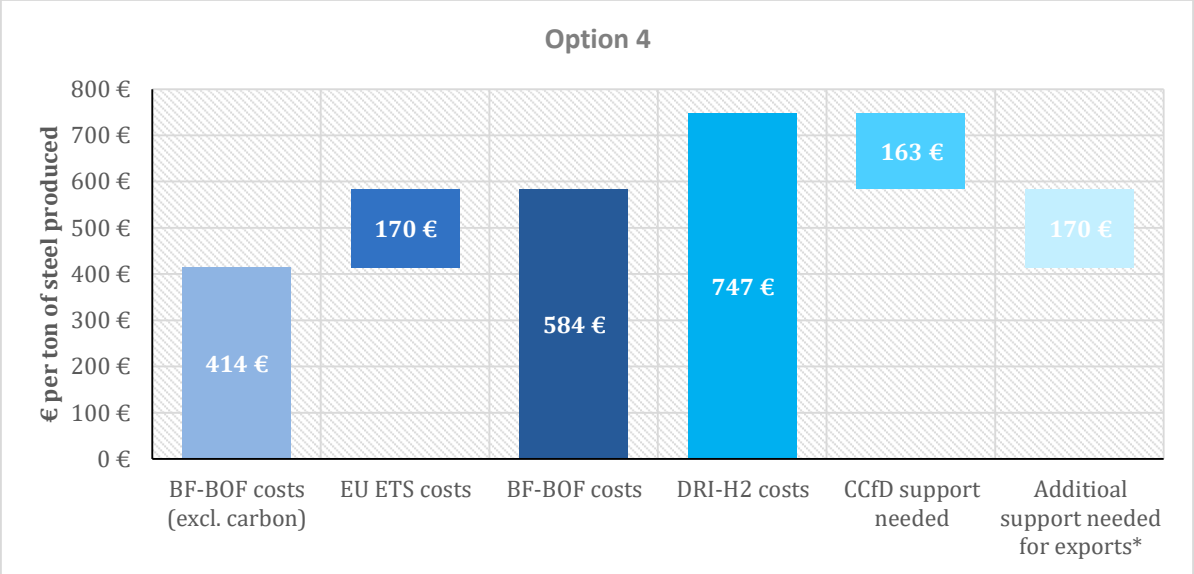
3.4.1 Description

This option proposes a different approach to addressing export carbon leakage: Instead of attempting to neutralise the carbon cost disadvantage faced by EU exporters through compensation, this approach aims to eliminate the underlying structural source of that disadvantage by accelerating the transition to carbon-neutral production methods.

This approach could build on different sources for this financing and use different policy instruments. For example, sources of funding could be the increased auction revenues for the phase-out of free allocation or the revenues raised by selling CBAM certificates. The policy instruments through which this financing could take place could include the Innovation Fund, the Decarbonisation Bank or Carbon Contracts for Difference (CCfDs). A specific implementation could involve creating funding calls explicitly tailored to sectors exposed to export competition, ensuring that resources are directed towards industries facing the most acute carbon-cost-induced competitive pressures in global markets. Another implementation could utilise CCfDs, in which effective CO_2 prices are already used to determine actual disbursements. For the export share of production under a CCfD, the effective price would be the CO_2 price paid in third countries instead of the EUA price.

Figure 7 shows how an instrument like CCfDs could be enhanced to account for exports leakage for a simplified example of steel production. The conventional route for producing steel (BF-BOF) produces 1 ton of steel at 414€ costs, including CAPEX and OPEX (Agora 2022). Based on an assumed emission intensity of 1.7 tCO_2/t steel and a carbon price of 100€ per tCO_2 the conventional route faces 170€ of carbon costs through the EU ETS 1 per tonne of steel, assuming there no free allocation (as will be the case in 2034). These additional costs are not sufficient to make the decarbonised production route (DRI-H2) competitive with the conventional route. The difference, in this example 163€ per tonne, is the gap that an instrument such as CCfD is meant to fill. However, if the steel produced is exported to a country with no carbon price in place, an additional 170€ would need to be offered through the CCfD or similar instruments to make the steel competitive. This matches the current value of free allocation that are allocated. The total gap for exports would be 333€ per tonne to be financed. The calculation here is only illustrative since estimation of DRI-H2 costs and carbon price estimate vary significantly depending on the assumptions.

Figure 7 Additional support needed to make DRI-H2 steel competitive with conventional route



Notes: BF-BOF and DRI-H2 include both CAPEX and OPEX costs based on Agora (2022). *The additional support needed for exports assumes no carbon price paid in the destination country. Source: Own illustration, The Climate Desk

3.4.2 Assessment against key design elements

3.4.2.1 Carbon leakage protection

Rather than compensating for carbon costs or maintaining free allocations, option 4 aims to eliminate the need to pay for allowances by supporting the transition to near-zero emission production processes.

Utilising an established instrument such as CCfDs, but adapted to the export case, would have clear advantages. As shown in Figure 7, existing or new CCfD contracts could be adapted to include the clause that for production geared towards exports, the reference price used to determine the payment under the contract would not be the EU ETS 1 carbon price but the carbon price of the destination country (or an average global or regional carbon price, if the destination country cannot be clearly identified). In this way the competitiveness gap could be filled.

In the following, we discuss three main limitations of this option with respect to carbon leakage protection, and ways how they can be overcome.

First, this option provides a structural long-term solution, but its leakage protection is inherently delayed. Investment decisions for large-scale industrial decarbonisation projects, such as green steel production or cement plants retrofitted with carbon capture and storage (CCS), must be made several years—sometimes more than a decade—before such low-carbon production capacities become operational. During this gap, EU ETS 1 operators remain exposed to carbon costs under the EU ETS 1 even if they have committed to invest in new decarbonised installations. A temporary bridging measure is therefore necessary. An instrument like the Temporary Decarbonisation Fund, currently under discussion, could serve this role and may need to be slowly phased-out while new low-carbon capacity is scaled up.

Second, downstream exporters, are only protected against export leakage under this option to the extent that they can source all or most of their inputs from decarbonised primary materials at prices competitive with those available to their foreign competitors. Until enough supply of green steel is secured to cover also the need for downstream products geared toward exports,

support might have to remain in place for downstream exporters. In addition to that, there is the possibility, similarly to option 3 and option 2, that costs could be passed through to downstream exporters even when EU ETS 1 operators receive full support.

Third, the success of this option is tied to its financial capacity. The option relies on innovation support covering a sufficient share of decarbonisation costs to make the transition financially viable for companies. If not enough financial resources are mobilised, the risk of leakage might in part remain.

Overall, option 4 represents a structurally sound and forward-looking approach to carbon leakage protection, but its effectiveness depends critically on the timely mobilisation of sufficient financial resources and the implementation of adequate bridging measures during the transition period.

Assessment: *Protection against carbon leakage is low in the short term (unless temporary measures are established), high in the medium and long term, but contingent on the volume of financial resources mobilised*.

3.4.2.2 Preservation of decarbonisation incentives

This option uniquely preserves—indeed strengthens—decarbonisation incentives. While the other options tend to mute the carbon price signal for the share of production that is geared towards exports (both in the short and in the long term) this option keeps the carbon price signal intact. While in the short-term additional support will be needed under this option to ensure that the carbon price signal is at a level that encourages companies to invest without placing an excessive burden on companies, in the medium to long term, this option ensures that decarbonised products are available in the EU. Rather than supporting European exports in foreign markets independently of the underlying technology, it aims as supporting exporters employing clean technologies, possibly even leading to a form of carbon leakage protection, where global emissions are reduced as a result.

Furthermore, this option avoids creating lock-in effects that can arise from compensation mechanisms. When firms receive rebates or extended free allowances, they may rationally choose to maintain existing production methods and claim compensation rather than undertake risky and capital-intensive transformation projects. Innovation support, by contrast, rewards transformation itself and creates pathways out of carbon cost exposure rather than merely managing it.

Assessment: *Full preservation and enhancement of decarbonisation incentives through maintained price signals combined with investment support.*

3.4.2.3 Appropriate targeting of the instrument

Two aspects of the targeting characteristics of this instrument warrant closer examination.

First, support under this option is strictly limited to EU ETS 1 operators both willing and able to invest in large-scale decarbonisation projects. However, even for firms with genuine decarbonisation ambitions, the application process can entail considerable administrative effort and uncertainties due to the fact that applicants bid for the resources of a tender and not all will be beneficiaries in the end. Complex and capital-intensive projects might be more sensitive to those uncertainties and as a result be less likely to apply. This introduces a selection bias: smaller and less ambitious projects are more likely to materialise than the larger ones that carry the highest emission reduction potential. Finally, a further complication arises for firms that have already secured transition funding from existing programs and might therefore not be eligible for additional support.

Second, downstream exporters are not directly covered by this instrument. The share of production the EU ETS 1 operators produce for exports would be exempted from carbon costs. However, the share of production that is sold in the EU market would still carry those costs (especially with the strengthening and CBAM). As a result, producers of downstream goods will pay those costs even if their products will be exported. One option to address this targeting miss-match would be to include a temporary mechanism similar to option 1, where downstream exporters can claim their indirect carbon costs back. Given that the purpose of option 4 is to focus on supporting mainly decarbonised production methods, the temporary mechanism could be phased-out over time for steel produced from conventional route and retained for the steel produced with a decarbonised route. This modification (similarly applicable to option 1) necessitates supply chain tracking, which, however, might become more prevalent with the adoption of standardised low emissions labeling systems

Assessment: *Medium-low targeting effectiveness unless additional compensation mechanisms are established for downstream exporters.*

3.4.2.4 Financing needs

Similarly to option 1, this option has no intrinsic upper bound of finance available to it and its financing needs will have to be met by designated financing sources. However, the financing needs of this option are generally higher than the previous options, because it not only has to compensate carbon costs (for exports), but also the residual gap between the carbon cost and the marginal costs of the abatement technology. In the example from Figure 7, up to 170€ per ton of steel would be needed in addition to the 163€ per ton from an assumed carbon price of 100€ per ton of CO_2.

To put these numbers into context, the EU exported 16.6 Mt of finished steel products in 2024 (EUROFER 2025). Financing the whole competitiveness gap would thus cost 5.5 billion € per year[14]. This approximate figure could be compared with two possible sources of finance: revenues from auctioning of allowances that are placed in the Innovation Fund as a consequence of the introduction of CBAM, as well as proper CBAM revenues. The former amount to about 95.5 million EUAs that can be expected to be transferred to the Innovation Fund and at an assumed EUA price of €90/tCO_2, this corresponds to approximately €8.6 billion per year[15].

A similar order of magnitude emerges when considering CBAM revenues. An S&P Global Energy forecast (2023) expects revenues to exceed €10 billion in 2030[16]. From steel imports alone, Hasanbeigi et al. (2025) estimate CBAM revenues in 2030 of around €2.5 billion. While this figure is lower than the green premium estimated above, it nonetheless represents a meaningful and dedicated revenue stream that could contribute to financing the transition.

While the financial resources needed for this options are much higher than previous options, it must be noted that the return on those funds is also different: instead of merely offsetting carbon costs through rebates, this option uses those resources to reduce emissions and drive structural transformation, creating permanent rather than temporary solutions to competitiveness challenges, potentially also creating knowledge spillovers and reducing costs through learning-by-doing.

[14] This number is strictly an approximation to provide the order of magnitudes. Actual numbers vary based on technology costs assumptions and hydrogen costs.

[15] Calculation based on The Climate Desk Emissary Model V5.1

[16] The analysis uses USD, for 2030 the expected revenues is estimated at $12.4 billion. This is generally in line with a European Commission estimate of around €1.5 billion in 2028 when free allocation is still at 90% (European Commission 2023b). This share is reduced to 48.5% in 2030 and reaches 0% in 2034, suggesting a significant increase of revenues.

Assessment: *High financing needs, but with substantial co-benefits and positive externalities.*

3.4.2.5 Administrative complexity

Direct financing of decarbonisation investments through innovation support schemes entails substantial administrative burdens for both applicants and regulatory authorities. Complex application procedures with demanding documentation requirements and technical specifications require firms to dedicate extensive internal resources and often necessitate external consultancy support, creating barriers particularly for smaller enterprises that lack specialised staff or experience with large-scale funding programmes.

Beyond the application phase, permitting processes for novel low-carbon technologies introduce significant delays due to regulatory uncertainty and the absence of harmonised EU-wide frameworks for emerging technologies such as CCS or hydrogen production—issues cited as critical obstacles by 68% of surveyed projects (European Commission 2025c). However, instruments such as CCfDs and Innovation Fund calls already exists and are well established despite their complexity.

Assessment: *Medium administrative complexity as it could build on existing instruments.*

4 Summary and conclusions

The table below summarises the assessment for each option and each element under scrutiny.

Table 1 Summary

Options	(1) Export rebates	(2) Additional free allocation	(3) Adjusted CBAM phase-out	(4) Decarbonisation support
Calculation basis	*Direct and indirect CO_2 costs of exports*	*Production volumes and direct and indirect export share of production*	*Production volumes and average direct and indirect export intensity*	*Depending on the instrument, e.g. additional compensation on top of existing CCfD depending on the CO2 price paid in destination.*
Targeting and protection against carbon leakage	**High, if design ensures high accuracy**, leakage protection high particularly for efficient producers.	**High for EU ETS 1 operators in the short and medium term**; declining in the long term due to falling caps; protection for downstream exporters contingent on design	**Theoretically high, but heterogeneous in practice:** risk of under-protection for some installations. Dependent on granularity of sector definitions	**High in the medium-long term** (time lag due to investment); In the short run it could be bridged by temporary solutions.
Incentive compatibility regarding decarbonisation	**Low** without benchmarks and unless strong conditionalities are imposed	**Low in the short term**, but increased in the long term due to falling caps. Might be improved by imposition of conditionalities	**Low in the short term**, but increased in the long term due to falling caps. Can be improved by imposition of conditionalities	**Very high**, as the price signal is maintained and support for investment is provided
Funding requirements	**High in the short and medium term**, which could be covered by higher auction proceeds, but requires alternative financing solutions in the long term	**Low, no direct funding requirement**, but reallocation of funds from innovation funding and other programmes financed from auction proceeds (opportunity costs)	**Low, no direct funding requirement**, Similar to option 2 but could be higher because of imprecise targeting.	**Potentially high but with large co-benefits**: emission reduction rather that cost compensation. Existing Innovation Fund and CBAM revenues could cover those costs
Administrative burden	**High**, since accurate reporting needed and rebates require processes apart from existing schemes in EU ETS 1.	**Medium,** since obligations are limited to EU ETS 1 operators	**Medium-high**, due to needed changes in the allocation system upfront, but simpler implementation	**Medium,** as it could build on existing policy instruments

The analysis presented in this paper does not point to a single clearly superior option. Each of the four approaches carries distinct advantages and disadvantages, and their relative merits depend heavily on specific design choices as well as on the overarching policy goal: whether the priority is to maximise protection against carbon leakage in export markets, or to preserve and strengthen decarbonisation incentives for EU industry. These objectives are not mutually exclusive, but they do pull in different directions, and no single option resolves that tension perfectly. It is also worth noting that the four options are less clearly delineated in practice than this paper's typology may suggest. Options 2 and 3, for instance, share a common underlying logic of adjusting free allocation and can overlap considerably or even converge depending on specific design choices. Option 1, similarly, need not stand alone: it could be integrated into either all other options, especially if specifically targeted at downstream exporters to compensate the shortfalls of other options in terms of targeting. Finally, rather than choosing between options in isolation, a sequenced combination may offer the most pragmatic path forward.

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