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The EU Carbon Border Adjustment Mechanism

A review of the EU CBAM's economic principles, expected impacts and outstanding issues

Fabien Roques
Florian Bourcier
Simon Malleret

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Executive summary

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1.
Executive summary

On 17 May 2023, the European Union's (EU) Carbon Border Adjustment Mechanism (CBAM) was formally adopted through Regulation (EU) 2023/956 (hereafter, the 'CBAM Regulation')[1], which provides for a staged implementation until 2034. Part of the wider EU climate policy, its primary objective is to provide an enhanced framework to address carbon leakage - that is the risk of relocation of industrial activities in countries where there is no carbon price.

The objective of this report is threefold: (i) explaining the economic rationale for introducing a CBAM, in connection with the issue of carbon leakage, (ii) providing an overview of the principles and rules being discussed for the implementation of the mechanism, and (iii) analysing the economic issues that remain to be addressed in implementing the CBAM.

Since the beginning of the EU ETS, the risk of carbon leakage had been tackled using the allocation of free allowances for industries in some sectors identified as at risk of carbon leakage, but these are being phased out. Through CBAM, certain goods imported in Europe will be subject to a border tax, based on estimated of their carbon content and the ETS carbon price. The CBAM scheme aims at levelling the playing field regarding carbon costs between domestic production and imports, while ensuring that the 'polluter pays' principle is implemented for industries at risk of carbon leakage, and thus also providing an incentive to producers outside of the EU willing to sell in Europe to decarbonise. The CBAM also aims at contributing to *"a stable and secure policy framework for investments in low or zero carbon technologies"*, while minimising the risk of the measure being circumvented.[2]

Whilst the conceptual principles of CBAM make economic sense reflecting the 'polluter pays' principle, the implementation of such a mechanism raises a number of complex issues and challenges. The staged approach provides for a transitory period until 31 December 2025, during which obligations for EU importers are limited to monitoring and reporting, and a number of

[1] Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism (CBAM Regulation).

[2] EC (2021) Commission Staff Working document – Impact assessment report accompanying the document "Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism", p. 15.

fine tunings can be made to the scheme. In particular, a review of the CBAM mechanism by the European Commission (EC) is underway, which will report to the Parliament and the Council on issues such as the possible expansion of the CBAM scope, a review of the criteria used to identify goods at risk of carbon leakage, technical rules for calculating actual embedded emissions, and the international impact of the CBAM.

The success of the CBAM will critically depend on some of the implementation rules which are yet to be decided. The paper identifies some of the key issues that remain to be addressed, including:

- **Carbon costs affecting exports.** While the CBAM is designed to address carbon leakage risks related to domestic consumption and imports, it does not provide a mechanism to address the differential in production costs for exports. Goods produced in Europe, exposed to EU ETS costs and destined to global exports may indeed pay a higher carbon cost than their foreign competitors. This creates a risk of carbon leakage as the decrease in export competitiveness could undermine the economic viability of local production for industries for which exports represent an essential market, for instance to reach economies of scale.

- **Reshuffling of trade flows.** The introduction of the CBAM may trigger a reshuffling of trade flows with foreign commercial partners, which could undermine the effectiveness of the mechanism in preventing carbon leakage. For instance, less carbon-intensive products from one country could be redirected towards the EU which has higher carbon costs, i.e. the EU. This would undermine the efficiency of the CBAM scheme as no additional emissions abatement activity would take place, since higher carbon-intensive products would just be redirected towards non-EU countries. Moreover, EU producers of complex manufactured goods[3] that are not covered by the CBAM, but that rely wholly or partly on CBAM-covered materials could face higher input costs due to the ETS applied domestically and CBAM charges at the border, compared to their foreign competitors. Hence, EU companies might be incentivised to directly import complex manufactured goods, instead of importing input products subject to CBAM and then manufacturing complex goods on EU soil.

- **Indirect carbon cost compensation.** The envisaged rules for calculating indirect emissions associated with the electricity consumed towards the manufacturing of CBAM create a risk of an unlevel-playing field for EU and foreign goods. Indeed, the calculation of embedded indirect emissions in foreign goods could use an average GHG content for electricity in

[3] CBAM goods can either be characterised as simple or complex goods.
- Simple goods refer to goods produced from input materials that are considered to have zero embedded emissions under the CBAM reporting methodology. The embedded emissions of simple CBAM goods are considered to be entirely derived from their production.
- Complex goods refer to goods which require CBAM-covered goods for their production. The embedded emissions of complex goods therefore need to include the emissions of these CBAM-covered precursors.

The **success of the CBAM** will critically depend on some of the implementation rules which are yet to be decided

each country.[4] However, the carbon content that is typically reflected in electricity prices in Europe is the GHG content of the marginal production unit, often a thermal plant. There is therefore a risk that foreign goods might be favoured compared to domestic products, as the average GHG content is often lower than the GHG content of the marginal production unit.

Finally, the significant uncertainty remaining on the precise CBAM rules may itself deter investment and contribute to carbon leakage issue. We for instance note that questions have also been raised regarding the CBAM's compatibility with World Trade Organization (WTO) rules, depending on some of the specific implementation rules. The implementation of the CBAM also casts a new light on some of the well know distributional issues affecting climate policies. For instance, CBAM might impact less developed countries whose exports are largely sold to the EU compared to other developed countries.

[4] The precise methodology for calculating indirect emissions will be reviewed by the EC before the end of the transitional period in its 2025 assessment report, as explained in section 4.1.

While the CBAM is designed **to address carbon leakage risks** related to domestic consumption and imports, it does not provide a mechanism to address the differential in production costs for exports

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2. Introduction

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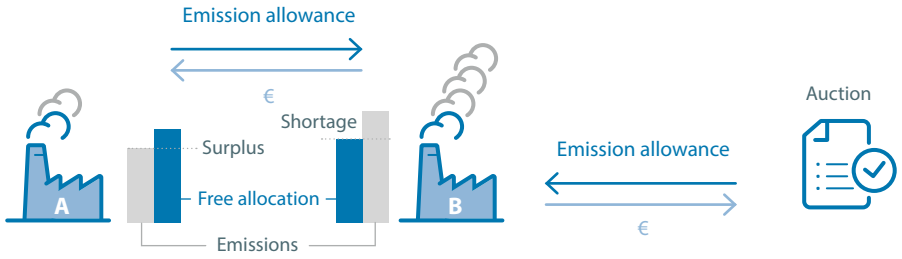
2. Introduction

The EU ETS is a 'cap and trade' system that was implemented in 2005. It covers emissions from electricity and heat generation, energy-intensive industry and aviation in the 27 EU Member States, as well as in European Free Trade Association countries – Iceland, Liechtenstein and Norway.[5, 6]

The maximum annual number of allowances available (the 'cap') is set in Directive 2003/87/EC (hereafter, the 'EU ETS directive')[7] and decreases every year. The EU ETS cap has been set so far to bring emissions down by 62% by 2030 compared to 2005 levels.[8] Each operator is required to surrender a EU allowance for each tonne of CO_2eq emitted, and a market is created for parties to buy and sell such allowances. Emission allowances can either be distributed through free allocation, or auctioned, as highlighted in **Figure 1** below.

Figure 1. Principles of the EU ETS.



Source: ECA (2020). The EU's Emissions Trading System: free allocation of allowances needed better targeting, p. 8.

[5] As well as power plants in Northern Ireland.
[6] EC (2023) Report from the Commission to the European Parliament and the Council on the functioning of the European carbon market in 2022
[7] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for GHG emission allowance trading with the Union and amending Council Directive 96/61/EC (EU ETS Directive).
[8] FSR (2024) The EU Emissions Trading System: two decades of scope evolution

Implementing a carbon price scheme increases the cost for domestic activities and may incentivise European companies to displace production in jurisdictions not covered by carbon prices. As a result, emissions reductions in Europe would be met by an increase in other jurisdictions' greenhouse gas (GHG) emissions. This issue is referred to as carbon leakage risk.

So far, carbon leakage risks have been mitigated through free allocation of allowances and indirect GHG cost compensations. The primary goal of the CBAM, introduced in 2023, is to replace these two schemes while encouraging producers in third countries who export to the EU to adopt low carbon technologies, by extending the coverage of carbon pricing to goods produced in other jurisdictions and destined to imports in the EU.

The objective of this report is threefold: (i) to explain the economic rationale for introducing a CBAM, in connection with the issue of carbon leakage, (ii) to provide an overview of the principles and rules being discussed for the implementation of the mechanism, and (iii) to analyse the economic issues that remain to be addressed ahead of the CBAM's implementation.

The report is structured as follows. We first analyse the EU CBAM's raison-d'être, its economic principles, and its expected impacts. We then present the implementation rules currently foreseen by the European Commission (EC), and highlight some of the issues that stakeholders have argued would require attention from the regulator for the CBAM's implementation phase, notably in terms of potential impact on trade flows between the EU and its commercial partners and third countries' climate and economic policies.

The primary goal of the CBAM, introduced in 2023, is **to replace free allocation of allowances and indirect GHG cost** compensation, while encouraging producers in third countries who export to the EU to adopt low carbon technologie

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3.
The EU's historical approach to carbon leakage and the economic rationale for a CBAM

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3.

The EU's historical approach to carbon leakage and the economic rationale for a CBAM

In this section, we present the *raison d'être* and economic principles of the EU CBAM. We explain the risk of carbon leakage arising from asymmetric carbon pricing policies, and present the historical approach to mitigate this risk in the EU ETS, together with its shortcomings. We then present the rationale and principles for the introduction of the CBAM. Finally, we provide an overview of the main challenges in designing practical CBAM implementation rules.

3.1.

Introduction: asymmetric carbon pricing policies create a risk of carbon leakage

Asymmetric climate policies implementing a carbon price create a risk related to the so-called issue of carbon leakage. When one country sets up carbon pricing schemes or stringent environmental regulations, this increases costs for domestic economic activities. As a result, industrials may be incentivised to displace production from this country's facilities with production located in countries not affected by carbon prices, or even permanently relocate production in jurisdictions with less stringent climate policies.[9] As the EC puts it, *"carbon leakage refers to the situation that occurs if, for reasons of costs related to climate policies, businesses in certain industry sectors or subsectors were to transfer production to other countries with less stringent emission constraints".*[10]

[9] The former case is referred as static leakage, and the latter as dynamic leakage.
[10] EC (2018) Commission Notice – Preliminary Carbon Leakage List 2021-2030

In practice, **the risk of carbon leakage may significantly differ** between individual industrial sectors

In practice the risk of carbon leakage in Europe has been considered since the implementation of the EU ETS, and stems both from the lack of carbon pricing in many other trade partners from Europe, and/or the carbon price differential with countries in which a pricing scheme is implemented.

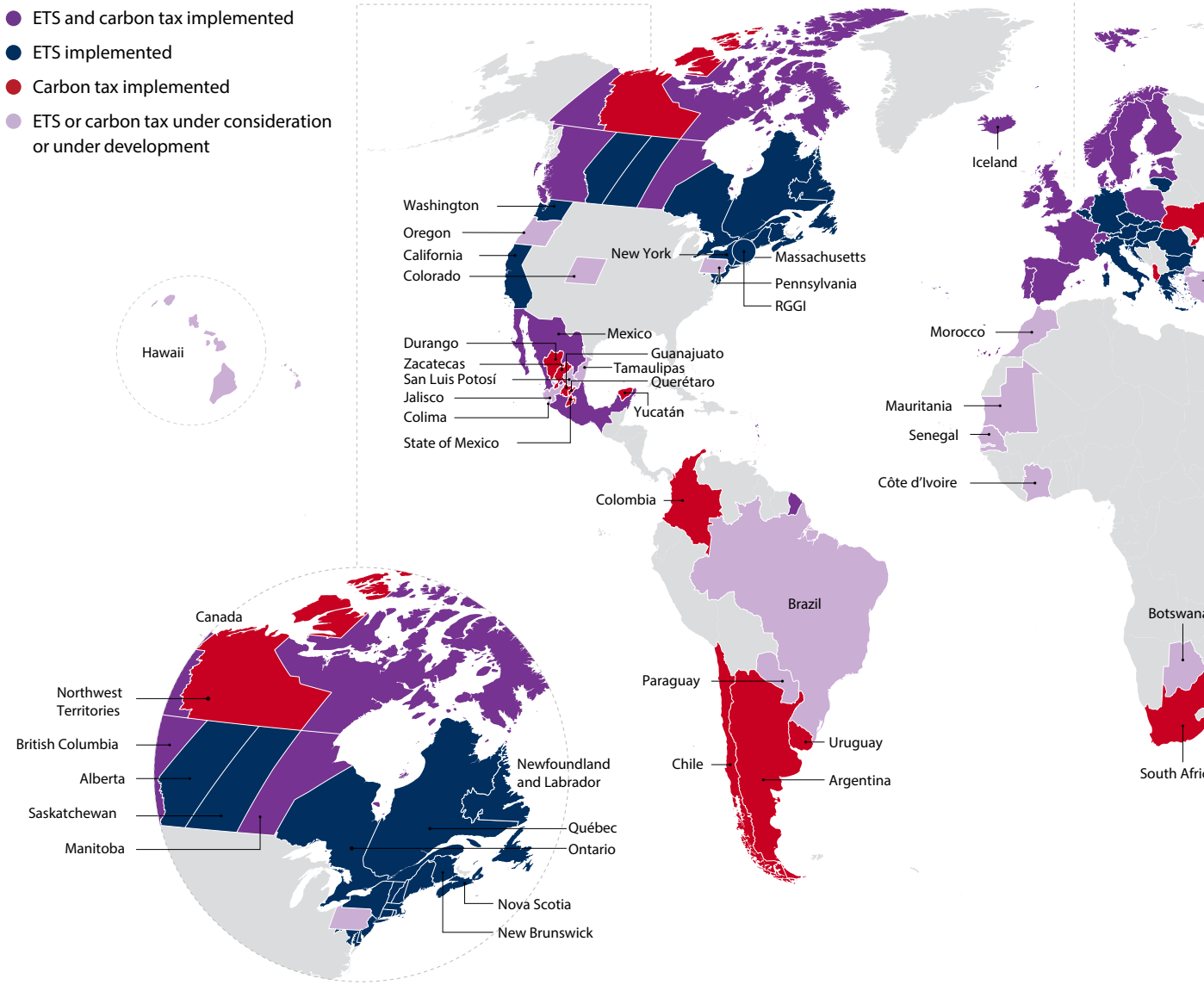
As of April 2024, 75 carbon pricing schemes were implemented globally as shown on **Figure 2** below, covering 24% of global GHG emissions. Where implemented, the level of carbon price is heterogeneous between the various jurisdictions. In many countries, the World Bank points out that carbon prices remain insufficient to drive the level of change required to meet the Paris Agreement's climate goals.[11] The carbon price is below the 2030 estimated price range required to drive investments needed to limit temperature rise to *"well below 2°C"* in at least 56 carbon pricing schemes.[12] In comparison to other carbon pricing schemes implemented around the world, the EU ETS typically exposes companies to higher carbon prices.[13]

In practice, the risk of carbon leakage may significantly differ between individual industrial sectors. Several criteria have typically been used to assess the risk of carbon leakage in the literature. Key issues when assessing the risk of carbon leakage include:[14, 15]

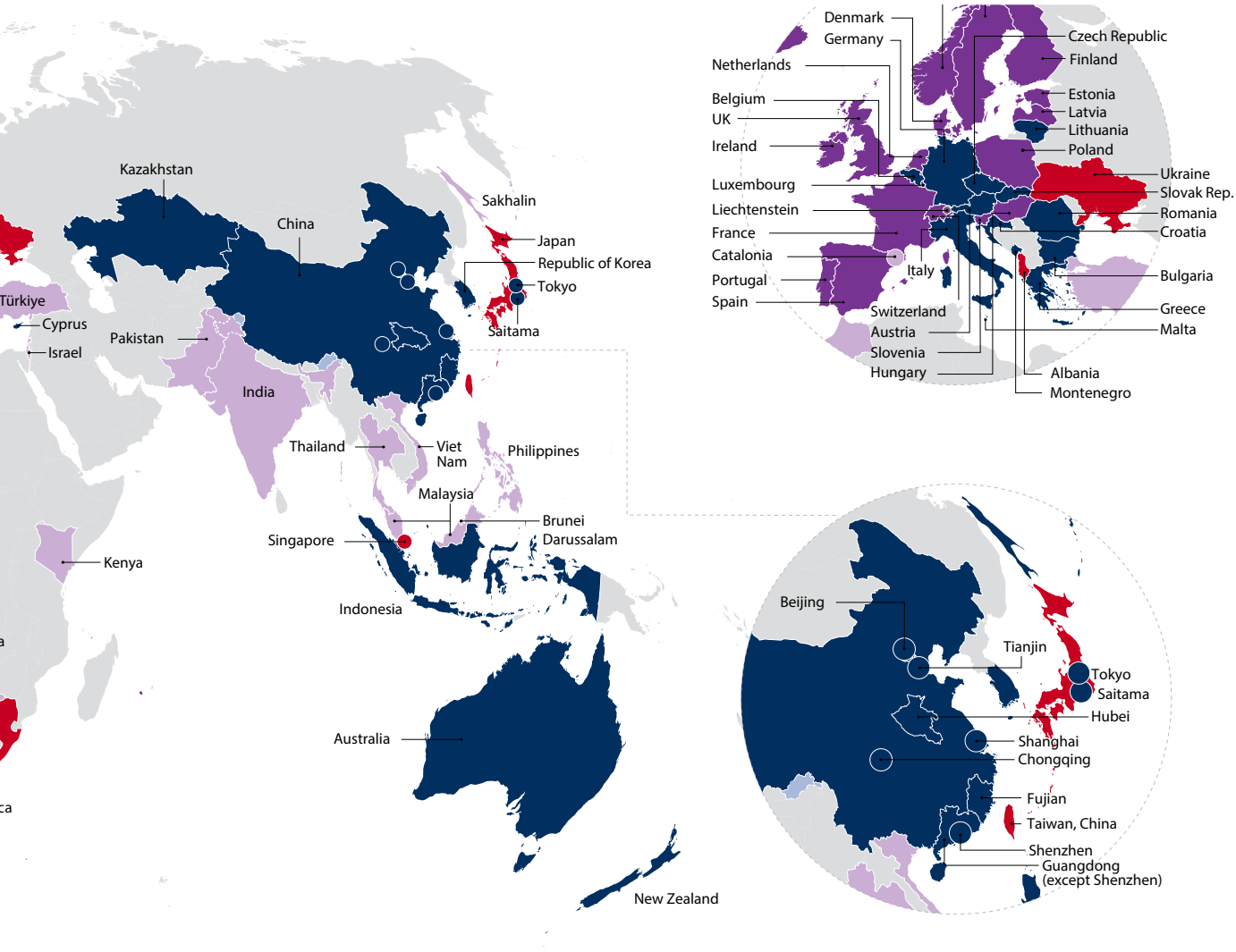
- **Carbon intensity[16]:** How much does the sector emit per unit of economic output, and in turn how much do carbon costs represent compared to total production costs? The higher the cost share, the higher the risk of carbon leakage.

[11] World Bank (2024) State and trends of carbon pricing, p. 9.
[12] Price range recommended by the High-Level Commission on Carbon Prices; USD 63-127 per tCO_2eq.
[13] World Bank (2024) State and trends of carbon pricing, p. 25, Figure 7.
[14] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC, Article 10b.
[15] Adapted from EC, ADE & Compass Lexecon (2020) Combined retrospective evaluation and prospective impact assessment support study on Emission Trading System (ETS) State Aid Guidelines
[16] Carbon intensity refers to the amount of GHG emissions emitted per unit of activity or output.

Figure 2. Map of carbon taxes and ETSs.



Source: World Bank (2024) State and trends of carbon pricing, p. 21.



The **carbon price is below the 2030 estimated price range** required to drive investments needed to limit temperature rise to *"well below 2°C"* in at least 56 carbon pricing schemes, according to the World Bank

- **Abatement potential:** To what extent is it technically and economically possible for individual installations in a given sector to reduce emissions? The risk of carbon leakage may be higher for sectors with little scope for further reduction in GHG emissions, compared with those in which lower-emission technologies are technically and economically mature. This can be assessed, for instance, by analysing the emission reduction potential using the most carbon-efficient available technology, its current degree of penetration, and the associated switching cost (for instance by considering the impact of its adoption on profit margins, or the opportunity cost of closing existing installations earlier than expected).

- **Ability to pass higher costs to consumers:** To what extent are companies already passing or able to pass higher costs on to their customers? The risk of carbon leakage may be limited in practice if European manufacturers can pass on carbon cost surpluses to customers, by increasing retail prices such that margins[17] are preserved. From an economic point of view, a firm's ability to set prices in a given market is driven by several factors which can be assessed separately. This include, for instance, the degree of market competition, the relative market power of sellers and buyers, the homogeneity of products sold in the market, and the homogeneity of production cost structures.

- **Relevant geographic market:** Defining the relevant geographic market is important to identify the area in which the conditions for competition among companies involved in the production of goods are relatively homogenous. If the relevant geographic market in a certain sector is European rather than global, for instance due to specific EU norms, or if transport costs are high, the risk of carbon leakage is more limited than in the case of a global market.[18]

- **Trade intensity:** An important analysis is the extent to which different industrial sectors are exposed to international trade. Trade intensity can be measured, among other ways, by comparing the volume of imports and exports to the size of the domestic market. European manufacturers may not be able to pass increases in production costs on to customers, particularly in sectors where the degree of international competition is high. Indeed, if the level of trade intensity is high, domestic production can more easily be substituted by imports if domestic carbon costs rise.

- **Cost structure and incentives to relocate:** Whilst operational production cost differentials can, in theory, provide incentives to relocate, such decisions are also influenced by the cost structure of industrial sector, and in particular the ratio of fixed to variable cost. In sectors with large investments relative to production costs, a relative

[17] The margin corresponds here to the difference between revenues and production costs.

[18] For instance, the OECD considers that while the construction of ships and boats is a global market, the sale of motor vehicles is a European market; OECD (2024) Defining the geographical level of competition: A taxonomy of industries

operational cost advantage may not be sufficient to trigger a new investment decision in another location. In this respect, profit margins are only one relevant indicator and need to be carefully assessed in the light of the cost structure of the sector considered.

- **Constraints to relocate production:** Are businesses able to easily relocate their production to other jurisdictions, or invest in foreign countries to circumvent asymmetric climate policies in place?[19] Barriers to entry may, in practice, affect the possibility of relocating (e.g. the need to have production facilities in certain countries to meet local content requirements, and/or specific norms and legislations).

3.2.

The EU historical approach to address the risk of carbon leakage

In the EU ETS, the potential risk of carbon leakage has so far been addressed through free allocation of allowances for direct emissions, as well as compensation mechanisms for indirect costs embedded in electricity prices. During phase 1 (2005-2007) and phase 2 (2008-2012), total emission allowances were decided and distributed at national levels by Member States, and were mostly given for free based on past emissions.[20]

From the start of phase 3 in 2013 onwards, industrial sectors classified as at risk of carbon leakage[21] have received as many free allowances as the most emission-efficient installations based on a benchmark of top performers within each sector. Box 1 provides more detailed information regarding the criteria used to determine sectors at risk of carbon leakage.

Free allocation of allowances was intended to reduce the risks of carbon leakage by creating a level playing field between EU producers and foreign competitors, as they alleviate the weight of carbon costs. Moreover, since the beginning of phase 3, the methodology used for allocating free allowances provides an incentive for emission reduction by encouraging less efficient operators to enhance their performance while rewarding those that are already performing well.[22]

[19] This characterises the risk of dynamic carbon leakage.
[20] FSR (2017) Free allowance allocation in the EU ETS
[21] The methodology for defining sectors at risk of carbon leakage is detailed in the text box below.
[22] ECA (2020) The EU's Emissions Trading System: free allocation of allowances needed better targeting, p. 9.

In addition, the ETS Directive allows Member States to compensate companies for increases in electricity prices resulting from the inclusion of carbon costs due to the EU ETS (referred to as indirect emission costs), if these indirect emission costs expose companies to carbon leakage risks.[23]

Box 1: Criteria used to determine sectors at risk of carbon leakage

During the third phase of the EU ETS (2013-2020), two indicators were used to identify sectors at risk of carbon leakage: Carbon Cost Intensity (CCI), which measures carbon costs relative to gross value added, and Trade Intensity (TI), which assesses trade value relative to the size of the European market.[24] To be classified as at risk of carbon leakage, firms needed to exceed 30% in either one of the two or 5% in CCI and 10% in TI.

As of phase 4 (2021-2030), the carbon leakage indicator was defined as the product of the TI and the Carbon Emissions Intensity Indicator (CII). The latter corresponds to the direct and indirect emissions for the sector concerned, divided by gross value added, expressed in $kgCO_2$ per euro of gross value added. Sectors with a carbon leakage indicator above 0.2 are included in the list while sectors with a carbon leakage indicator above 0.15 may also be included on the basis of a qualitative assessment.

The assessment of the CCI takes into account (i) abatement potential – the ability of individual installations to reduce emission levels, (ii) current and projected market characteristics – including the existence of a global reference price which would limit the ability of companies to pass higher costs on to their customers, and (iii) profit margins, as a potential indicator of long-run investment or relocation decisions.[25]

The latest list of sectors at risk of carbon leakage was published in May 2019 by the EC for 2021-2030 and includes 63 sectors and sub-sectors.[26, 27]

[23] EC (2012) Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012.
[24] FSR (2024) EU Emission Trading System. Accessed on 12 March 2025.
[25] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a system for greenhouse gas emission allowance trading within the Union and amending Council Directive 96/61/EC, Article 10b.
[26] Council Decision (EU) 2019/702
[27] EC (2019) Adoption of the Delegated Decision on the carbon leakage list for 2021-2030. Accessed on 17 March 2025.

However, several concerns have been raised regarding the free allowances system. A 2020 ETS report by the European Court of Auditors[28], for instance, underlines the need for better targeting in the free allowances system, noting that these could jeopardise decarbonisation. The report points out that, even after the introduction of benchmarks in 2013, all industrial sectors continued to receive most required allowances for free. Overall, during phase 3 and the early stages of phase 4, free allowances continued to represent more than 40% of the total number of available allowances. The EC noted that, while free allocation is effective against carbon leakage, their financial and climate cost appear to warrant their phase-out,[29] as operators who receive free allowances do not pay for the negative externalities associated with GHG emissions.

Several concerns have been raised regarding the system of free allowances: **free allocations could jeopardise decarbonisation**

3.3.

The introduction of CBAM to enhance the EU approach to carbon leakage

The idea of a Carbon Border Adjustment (CBA) gained traction for the first time ahead of phase 3 of the EU ETS, between 2007 and 2009. These discussions were triggered by the perspective of free allocation being gradually replaced with an auctioning mechanism. In this context, to prevent carbon leakage and create a level playing field between domestic producers and foreign competitors, it was argued[30] that the EU ETS carbon pricing scheme could be expanded to cover emissions from producers located abroad when their goods are imported in the EU, through a carbon border adjustment mechanism. A

[28] *Ibid.*

[29] EC (2021) Commission staff working document impact assessment report – Accompanying the document Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism

[30] For instance, The French government published a non-paper promoting a 'Carbon Inclusion Mechanism' in 2009, requiring importers of goods manufactured outside Europe to buy pollution permits from the EU ETS. Euractiv (2010) France details plans for 'carbon inclusion mechanism'. Accessed on 12 March 2025.

first proposal for a CBA on imports and exports of goods *"subject to significant risk of carbon leakage or to international competition"* was for instance already included in a draft proposal amending the EU ETS in 2007.[31]

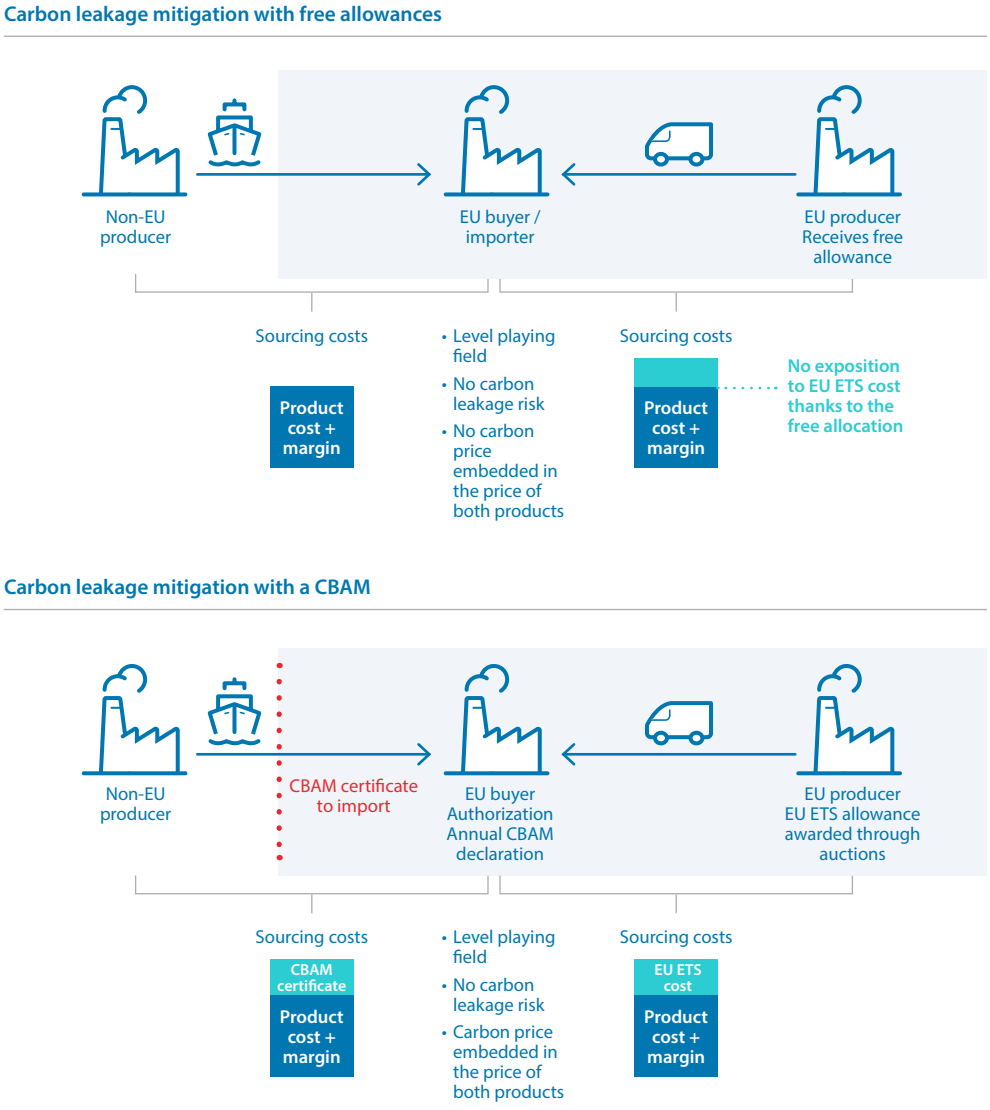
The EU CBAM, introduced through Regulation (EU) 2023/956 (hereafter, the 'CBAM Regulation')[32] aims at addressing carbon leakage risks in a different way to the free allocation system previously in place, by applying equal carbon pricing to both imports and domestic products, hereby levelling the playing field in carbon costs between domestic production and imports.[33] To enable a smooth transition from the current system of free allowances, the CBAM, would be introduced gradually, with free allowances in sectors covered by the CBAM being phased out in stages. More details regarding the CBAM's implementation are presented in section 3.1.

The principle for CBA is simple. Akin to strategic border tariffs in international trade (customs taxes), imported goods in the climate-acting country (or coalition of) are subject to a border tax. The tax's only goal however is to ensure that externalities associated with GHG emissions are equally reflected in the sourcing costs of domestically produced and imported goods. Import tariffs should hence mimic the domestic price on the GHG content of all goods that are not subject to GHG pricing at an equivalent level in the countries of origin.[34]

The introduction of a CBA **prevents carbon leakage** while ensuring that carbon pricing is duly reflected in the price of products at risk of carbon leakage sold in the domestic market

[31] Economix (2022) The case for a carbon border adjustment: Where do economists stand?, p. 4.
[32] Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism (CBAM Regulation).
[33] Mehling & Ritz (2023) From theory to practice: determining emissions in traded goods under a border carbon adjustment, p. 125 Böhringer et al (2012) The role of border carbon adjustment in unilateral climate policy: Overview of an Energy Modelling Forum study (EMF 29).
[34] Böhringer *et al.* (2012) The role of border carbon adjustment in unilateral climate policy: Overview of an Energy Modelling Forum study (EMF 29)

Figure 3. Comparison of carbon leakage mitigation option in the EU ETS: (i) free allowances, (ii) CBAM.



Source: Compass Lexecon.

In theory, a CBA allows countries to therefore engage in asymmetric climate action without it resulting in carbon leakage. Indeed, as highlighted in below, the introduction of a CBA prevents carbon leakage while ensuring that carbon pricing is duly reflected in the price of products at risk of carbon leakage sold in the domestic market. Conversely, with a system of free allocation, carbon pricing is not embedded in the sourcing cost of these products.

In addition to the mitigation of carbon leakage risks, which is presented by the EC as CBAM's overarching objective, the CBAM also contributes to a range of other objectives:[35]

- Contribute to *"a stable and secure policy framework for investments in low or zero carbon technologies"* – for instance by providing visibility to investors on the coverage of carbon pricing in the EU;
- Provide a level playing field between domestic production and imports by ensuring that both are subject to similar levels of carbon pricing – hence limiting carbon leakage risks;
- Encourage producers in third countries who export to the EU to adopt low carbon technologies – by extending the coverage of carbon pricing to goods produced in other jurisdictions and destined to be imported into the EU;
- Minimise the risk of measure being circumvented – the CBAM's potential adverse effects need to be carefully assessed such that mitigating measures may be implemented beforehand.

3.4.

The Carbon Border Adjustment creates incentives to decarbonise for industrials located outside Europe

By design, the CBAM extends the EU ETS carbon price signal beyond European borders. As such, it provides incentives to industrials in third countries to decarbonise and incentivises the widespread use of carbon pricing by trade partners.

The historical approach to carbon leakage was designed as transitory - both the allocation of free allowances and the compensation of indirect carbon costs are presented as transitional mechanisms in the EU ETS Directive.[36] The widespread deployment of carbon pricing around the globe would have the potential to limit the risk of carbon leakage. However, between the introduction of the EU ETS in 2005 and 2024, the share of global GHG emissions covered by carbon pricing schemes only increased from 5% to 24%.[37] The CBAM thus addresses one of the shortcomings of the carbon pricing and carbon leakage framework: the lack of incentives for emitters located outside the EU to reduce

[35] EC (2021) Commission Staff Working document – Impact assessment report accompanying the document "Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism", p. 15.
[36] *Ibid,* p. 8.
[37] World Bank (2024) State and trends of carbon pricing, p. 22.

emissions. Beyond protecting industrials located in Europe from the lack of a level playing field associated with carbon price differentials, the CBAM approach also attempts to provide incentives to industrials located outside Europe to decarbonise.

Indeed, the CBAM extends carbon pricing beyond European boundaries, by applying the EU ETS allowance price to non-domestic emissions associated with goods produced outside of Europe and exported to Europe. As such, the CBAM is expected to alter the viability of exports of highly carbon-intensive goods to Europe. Foreign producers would have an incentive to use less carbon-intensive production technologies to limit the impact of CBAM charges on the competitiveness of their products in the European market.

Moreover, the CBAM may incentivise the use of carbon pricing by third countries. Indeed, importers of CBAM covered goods can claim a reduction in the number of CBAM certificates to buy corresponding to the carbon price already paid in the country of origin for the emissions associated with the declared goods. Therefore, EU trade partners may seek to set up a domestic carbon price. While the carbon price would still be embedded in the price of goods sold in Europe in either case, setting up a carbon price to exempt exports from CBAM charges allows third countries to capture carbon pricing revenues, instead of the EU capturing CBAM revenues. The adoption of a CBA by first mover regions like the EU hence encourages slower-moving jurisdictions to implement carbon pricing, when their efforts are recognised as part of compliance.[38]

Moreover, the uptake of carbon pricing may also be encouraged by Article 6 of the Paris Agreement, which includes provisions for cooperation between countries on climate change mitigation measures through market-based approaches such as carbon pricing. This includes the possibility of trading emission reduction credits between jurisdictions, which may encourage the linking of carbon pricing schemes.[39]

The **CBAM may incentivise the use of carbon pricing** by third countries

[38] Mehling & Ritz (2023) From theory to practice: determining emissions in traded goods under a border carbon adjustment

[39] UNFCCC About Carbon Pricing. Accessed on 12 March 2025.

3.5.

Practical implementation rules are key to ensure the CBAM's efficiency

In practice, several design options need to be discussed for a CBA to effectively reduce the risk of carbon leakage and ensure a level playing field. However, the adequate implementation solution depends on the given economic context and the desired outcomes, and there is no silver bullet CBA design for all jurisdictions.

Despite the apparent simplicity of the principle of a CBA, the practical implementation of such a mechanism raises a number of challenges. There is a trade-off between implementing a mechanism that is as comprehensive as possible, and limiting the complexity for the companies involved and public authorities.

A set of key issues have been identified regarding the detailed design and implementation of the EU CBAM, for instance on the following points discussed extensively in the literature: the coverage of imports and / or exports, the product / sector scope, the methodology to account for the carbon content of covered goods, the use of CBA revenues, or the choice of the adjustment price. We discuss these in turn in greater details below:[40]

- **Coverage of imports and / or exports:** Should a CBA cover imported goods, exported goods or both? A CBA can impose a tax on goods produced in countries with less stringent pricing and imported to the implementing country, to ensure a level playing field between domestic and foreign producers in the domestic market. It can also cover goods produced in the implementing country and exported to countries with less stringent climate policies to restore the competitiveness of domestic goods on the global market, for instance via a rebate on the carbon price paid domestically. Further details on this point in the context of the EU ETS, are available in section 4.2.[41]

- **Product / sector scope:** Which sectors and products be covered by the CBA? The effect of the CBAM is typically greater with an expanded coverage.[42] However, CBAs can focus on sectors for which the likelihood of carbon leakage is greatest, for instance during a first implementation phase for the sake of simplicity.[43] Furthermore, to what extent should the CBAM scope be extended down the value chain? The risk of carbon

[40] See for instance, Zhong & Pei (2023) Carbon border adjustment mechanism: a systematic literature review of the latest developments; Cosbey *et al.* (2019) Developing Guidance for Implementing Border Carbon Adjustments: Lessons, Cautions, and Research Needs from the Literature.
[41] *Ibid.*
[42] Böhringer *et al.* (2012) Alternative designs for tariffs on embodied carbon: A global cost-effectiveness analysis
[43] Zhong & Pei (2023) Carbon border adjustment mechanism: a systematic literature review of the latest developments

leakage generally decreases further downstream, as value added processes lessen the relative impact of carbon costs on the final price of goods. Consequently, extending coverage too far down the value chain could introduce unnecessary administrative complexity without delivering substantial emissions reduction benefits.[44]

- **Methodology to account for the carbon content of covered goods:** How to define the emissions that are embodied in imported / exported goods subject to the CBA? This raises multiple underlying questions:
  - What are the boundaries for emissions accounting? Should the CBA account for scope 1 emissions only, i.e., emissions from sources that are owned and controlled by the producers? Should it account for indirect scope 2 emissions, i.e. embedded in the electricity and heat consumed for the production of the goods? Should it also account for scope 3 emissions, i.e. emissions embedded in other services and goods purchased by the producer?
  - Moreover, how to determine the exact carbon content of covered goods for each emission scope selected for the CBA? Benchmarks can be used, for instance, to determine default emission rates. However, what should the level of granularity of default values be? Should they be specific to each company or defined at national level? Should they be equal for each importer? Using more specific default values provides additional incentives for companies to reduce emissions, but also increases the complexity and implementation costs, especially regarding the gathering and manipulation of foreign data.
- **Use of CBA revenues:** How should the implementing country use the revenues generated from the taxation of imported goods from the CBA? Revenues can be used domestically, but they can also be returned to third countries to alleviate the negative impact a CBA can have on the most vulnerable economies.
- **Adjustment price:** At what price should emissions embedded in imported (or exported) goods be valued? Although implementing countries have an incentive to maximise their own benefits by setting higher CBAM prices, a level playing field between domestic and foreign producers is achieved by applying a CBAM price equal to the difference between carbon prices paid in the two countries. Defining carbon prices paid in a given jurisdiction may prove challenging, given the variety of carbon pricing instruments in place around the world, including within same jurisdictions.

[44] ERCST (2024) Including products further down the value chain in the EU CBAM, p. 12.

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4.
Roadmap for the EU CBAM implementation

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4.
Roadmap for the EU CBAM implementation

We highlight in this section some of the key principles and implementation rules for the EU CBAM that have already been enacted, including:

- The timeline for implementation;
- The rules for CBAM declarations and the purchase and surrender of CBAM certificates;
- The scope of the CBAM, both in terms of sectors and emissions covered;
- The scope of assessment to be carried out by the EC in 2025.

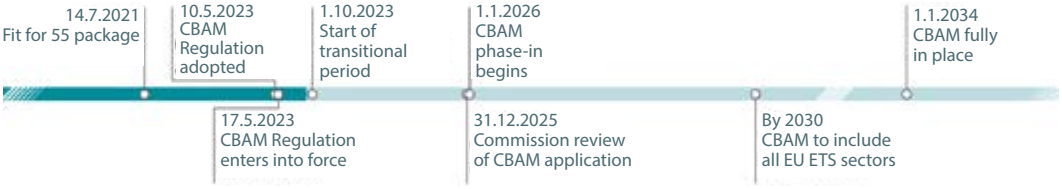
4.1.
The timeline for the finalisation of the CBAM rules and implementation

The CBAM is set to be implemented gradually in the EU. Following a transitional reporting period between 2023 and 2025, the CBAM will become effective from 2026 onwards, with a progressive phase-out of free allowances until 2034. This implementation timeline is summarised in below.

- During the transitional period, from 1 October 2023 to 31 December 2025, obligations for EU importers are limited to monitoring and reporting. Importers of goods from non-EU countries into the EU are only obligated to report GHG emissions embedded in imported products on a quarterly basis, without any financial obligations.[45, 46]

[45] CBAM Regulation, Article 32.
[46] Sandbag (2024) A scrap game – Impacts of the EU Carbon Border Adjustment Mechanisms

Figure 4. CBAM – implementation timeline.

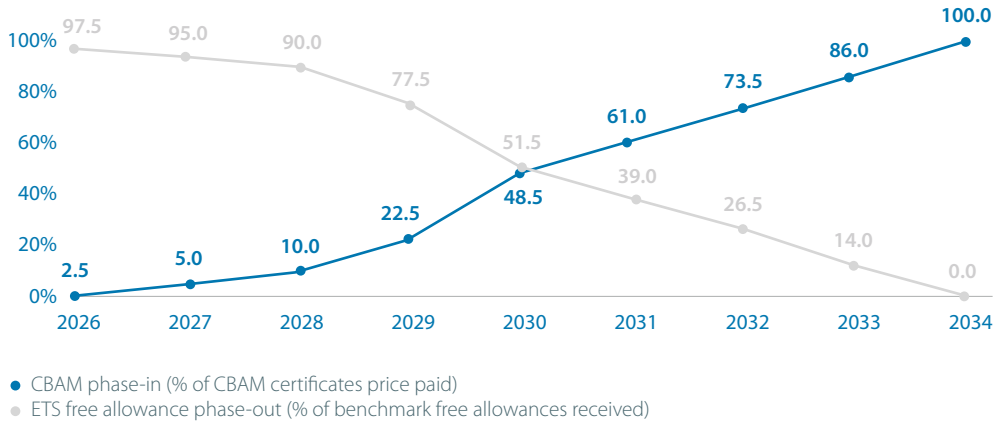


Source: European Parliamentary Research Service (2023) Carbon border adjustment mechanism.

- Before the end of the transitional period, a review of the CBAM rules will be undertaken by the EC, which will then report its suggested amendments to the planned CBAM rules to the Parliament and the Council by the end of 2025. The scope of this monitoring report is detailed in section 4.1.
- From 1 January 2026 onwards, the financial obligations of the CBAM will gradually become effective, and importers will be required to purchase CBAM certificates for the GHG emissions linked to the production of imported goods, when these goods are not subject to comparable carbon pricing in their country of origin.
- From 2026 to 2034 (hereafter, the 'implementation period'), the CBAM will gradually replace the EU ETS free allowances mechanism through an eight-year phase-out of free allowances under the EU ETS, scheduled with a corresponding phase-in of the CBAM. More precisely, the number of CBAM certificates to purchase will gradually increase between 2026 and 2034, as shown in below. For the calendar year 2026, CBAM certificates corresponding to 2.5% of embedded emissions will have to be surrendered, increasing to 48.5% in 2030 and 100% in 2034. The number of free allowances granted to equivalent products covered by the EU ETS will gradually be reduced to zero by 2034.[47] For 2026, the number of free allowances granted to EU producers will cover 97.5% of the emission benchmark of the 10% most emission-efficient operators, and this number will decrease to 51.5% in 2030 and 0% in 2034.
- By 2030, the CBAM should cover all EU ETS sectors.[48]

[47] *Ibid.*
[48] CBAM Regulation, Article 67.

Figure 5. CBAM phase-in between 2026 and 2034 (%).



Source: Compass Lexecon, adapted from EC.

4.2

CBAM certificates are to be issued by the EC, purchased by importers, and are not tradeable

From 2026 onwards, companies importing goods produced outside of the EU will need to buy CBAM certificates, at a price corresponding to the one which would have been paid if the goods had been produced under the EU ETS scheme.

EU importers will have to submit a CBAM declaration each year by 31 August. The annual deadline for declarants, initially set for 31 May by the CBAM Regulation, was moved to 31 August as part of the Omnibus simplification package.[49]

- This CBAM declaration will detail the total quantity of goods imported during the previous year, the total embedded emission per tonne of each type of goods, and the number of certificates that importers must surrender.
- EU importers will also need to surrender the required number of certificates by 31 August for the previous year, and will be liable for a penalty if they fail to do so.[50] This penalty is proportional to the amount

[49] Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2023/956 as regards simplifying and strengthening the carbon border adjustment mechanism – Omnibus I – COM(2025)87 (hereafter, the 'Omnibus simplification package')

[50] EUR-Lex Carbon Border Ajustement Mechanism. Accessed on 12 March 2025.

of emissions that should have been covered by CBAM certificates, valued at 100 EUR_{2013}/tCO_2eq. Moreover, the payment of this penalty does not release the CBAM declarant from the obligation to surrender the outstanding number of CBAM certificates.[51, 52]

At the end of each quarter, CBAM declarants will have to own a number of certificates corresponding to at least 50% of the emissions embedded in the goods they have imported since the start of the year – this share, initially set at 80%, was lowered in the Omnibus simplification package. Importers will be able to buy certificates from the national authorities. The price of CBAM certificates will be calculated by the EC, depending on the weekly average auction price of EU ETS allowances. Although there is no limit on the number of CBAM certificates an importer can purchase, these certificates will not be tradable. However, each year, importers can resell to the competent authorities up to the number of certificates they are required to purchase, at their original price. This amount was previously limited to a third of the total certificates purchased during the previous year, but this rule was amended as part of the Omnibus simplification package.[53] Importantly, any excess certificates that a CBAM declarant holds and that were purchased in the year before the previous calendar year will be cancelled by the EC on 1 July, without any compensation.[54]

Finally, an authorised CBAM declarant will be allowed to claim a reduction in the number of CBAM certificates to be surrendered, corresponding to the carbon price already effectively paid in the country of origin for the declared embedded emissions of CBAM goods. [55]

Moreover, the Omnibus simplification package introduced a specific treatment for 2026. CBAM declarants will be able to purchase CBAM certificates from February 2027 for the emissions of CBAM goods imported during 2026 – the

From 2026 onwards, companies importing **goods produced outside of the EU** will need to buy CBAM certificates

[51] CBAM Regulation, Article 26.
[52] EU ETS Directive, Article 16.
[53] Omnibus simplification package
[54] EUR-Lex Carbon Border Ajustement Mechanism. Accessed on 12 March 2025.
[55] EC (2024) Carbon Border Adjustment Mechanism (CBAM) - Questions and Answers, section 134.

surrendering date for 2026 being 31 August 2027. The applicable price will reflect the price of EU ETS allowances in 2026: the price for CBAM certificates purchased in 2027 for goods imported in a given quarter in 2026 will be the quarterly average of the closing prices of EU ETS allowances in 2026. This provision is intended to give declarants sufficient time to prepare for compliance with the obligations. Moreover, it ensures that declarants are not required to buy CBAM certificates until they are certain on the exact number of certificates to surrender.[56]

4.3.

The scope of the CBAM for the transitional phase includes sectors such as cement, electricity, fertilisers, iron and steel, aluminium and hydrogen

The sectors initially covered during the transitional phase are cement, electricity, fertilisers, iron and steel, aluminium and hydrogen. For each sector, a list of specific products to which the CBAM will apply has been identified in the CBAM Regulation. CBAM covered products can either be classified as simple or complex goods.

Simple goods refer to goods produced from input materials that are considered to have zero embedded emissions. The embedded emissions of simple goods are thus considered to be based solely on the emissions occurring during their production. Complex goods refer to goods which require CBAM-covered goods for their production – so-called precursors. The embedded emissions of complex goods therefore need to include the emissions of such CBAM-covered precursors. In the cement sector, for instance, cement clinker is considered a simple good while Portland cement is considered a complex good as it requires cement clinker for its production.

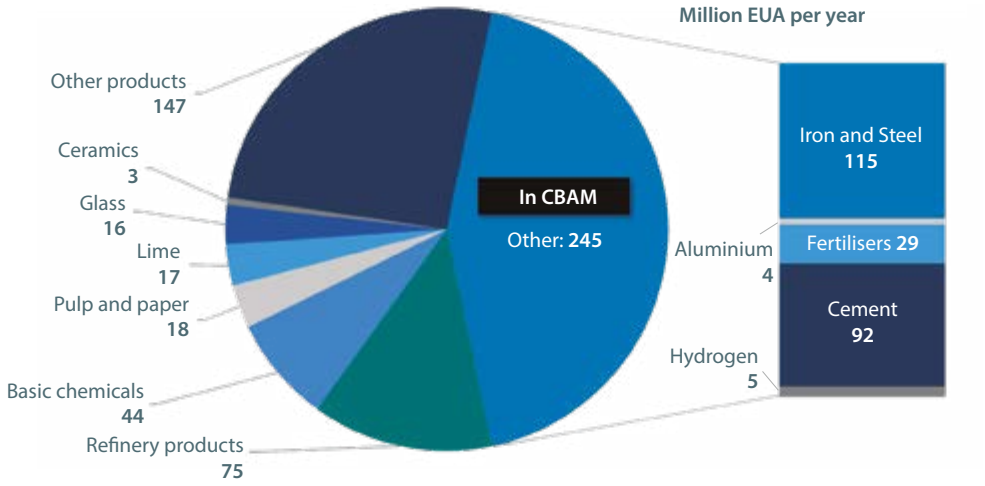
Overall, these sectors would cover around 45% of the free allowances given to industrial sectors under the EU ETS, as highlighted in below.[57, 58]

The choice of sectors and goods covered by the CBAM Regulation results from a multicriteria analysis, based on the following criteria:

- **Relevance in terms of GHG emissions** – Is the sector a significant emitter of GHG, and is there a potential for emission reductions in this sector?

[56] Omnibus simplification package
[57] EC (2023) Carbon Border Adjustment Mechanisms – A new, green way of pricing carbon in imports to the EU, March 2023 presentation.
[58] CBAM Regulation

Figure 6. Free allowances received by industrial sectors in 2021.



Source: Sandbag (2024) *A scrap game – Impacts of the EU Carbon Border Adjustment mechanism*, p. 30.

- **Is there a risk of carbon leakage?** (As defined pursuant to the EU ETS Directive. More detail is available in section 2.1)
- **Practical arguments have also been considered:** Can a product class be clearly defined and unambiguously identified in practice? Does it involve significant complexity and administrative burden for the companies involved?[59, 60]

Moreover, while the CBAM Regulation provides that the CBAM would apply to all CBAM goods with a value of at least 150 EUR, the Omnibus simplification package introduced a new de minimis threshold. The CBAM will only apply to companies importing at least 50 tonnes of CBAM goods per year.[61] With this threshold in place, the EC expects at least 99% of the emissions to remain in the scope of the CBAM, while exempting 90% of EU importers. This is expected to result in compliance cost savings for exempted importers, as well as cost savings for public authorities. The robustness of the threshold will be reviewed in 2027 and every two years thereafter.[62]

[59] CBAM Regulation, Article 31.
[60] EC (2021) Impact Assessment Report accompanying the document 'Proposal for a regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism' – Part 2/2
[61] Omnibus simplification package
[62] EC (2025) Commission Staff Working Document accompanying the document Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2023/956 as regards simplifying and strengthening the carbon border adjustment mechanism

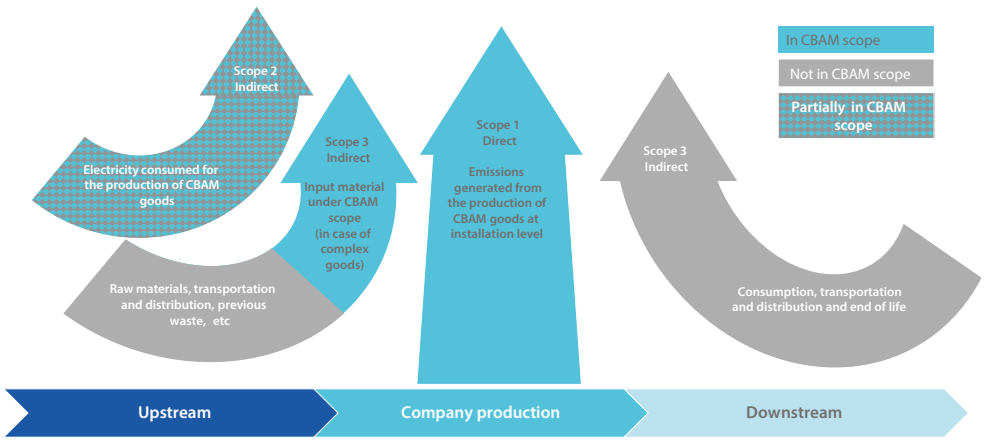
The CBAM will only apply to companies importing at least **50 tonnes of CBAM goods** per year

4.4.

Scope 1 emissions are fully covered, and scope 2 emissions are partially covered for a subset of sectors

Direct emissions, i.e. emissions from the production of goods from on-site activities[63], are fully covered by the CBAM for all sectors mentioned in the previous section. Both the reporting obligation during the transitional phase and the financial levy during the implementation phase will apply to these emissions. However, indirect emissions are only partially covered, as presented in below.

Figure 7. Emissions under CBAM scope.



Source: EC (2023) *Carbon Border Adjustment Mechanisms – A new, green way of pricing carbon in imports to the EU*, March 2023 presentation.

[63] Under the CBAM Regulation, emissions from the production of heating and cooling consumed during the production process are included in direct emissions, irrespective of their location.

More precisely:

- Indirect scope 2 emissions, i.e. GHG emissions that occur off-site due to the consumption of electricity, need to be reported during the transitional phase for all the sectors mentioned above.[64] However, from 2026 onwards, the financial obligation associated with those will only be applied to a subset of CBAM sectors: cement and fertilisers.[65] While indirect emissions are initially exempt from CBAM obligations for aluminium, steel, iron, and hydrogen, the CBAM Regulation plans to include indirect emissions for all CBAM products *"as soon as possible."*[66]

- In the case of complex goods, indirect upstream scope 3 emissions related to input materials that are themselves covered by the CBAM are considered. Other upstream scope 3 emissions, and downstream scope 3 emissions are not covered.

The general approach to determine direct and indirect emissions from imported CBAM goods, other than electricity, relies on actual embedded emissions, that declarants have to report based on the monitoring methodology laid out in the Commission Implementing Regulation (EU) 2023/1773 (hereafter, the 'Implementing Regulation') for the transitional phase.[67] This methodology sets out the detailed calculation rules for each sector. Importers need to identify the relevant categories of goods and production routes and calculate actual emissions by applying the methods defined in annex III of the Implementing Regulation. The methodologies for calculating embedded emission from 2026 onwards will be refined based on the lessons learnt from the transitional period.[68] More details are available in section 4.1.

However, if importers do not have all the necessary information to calculate actual direct or indirect emissions based on these published methods, they may rely on default values, with some limits:

- During the transitional phase, until Q2 2024, embedded emissions could be based on default values without quantitative limits. From Q3 2024 and until the end of 2025, declarants can only report emissions based on default values for complex goods, up to a limit of 20% of the total embedded emissions.[69] These values are set at a 'world average', weighted by production volumes. Simple goods need to rely on actual embedded emissions.

.....

[64] Emissions associated with heating and cooling provided from external sources are considered under the CBAM as direct emissions. Sandbag (2024) A scrap game – Impacts of the EU Carbon Border Adjustment Mechanisms, p. 15.
[65] Sandbag (2024) A scrap game – Impacts of the EU Carbon Border Adjustment Mechanisms
[66] CBAM Regulation, p. 15.
[67] Commission Implementing Regulation (EU) 2023/1773 of 17 August 2023 (Implementing Regulation).
[68] EC (2023) Press release - Commission publishes default values for determining embedded emissions during the CBAM transitional period and updated guidance on reporting obligations. Accessed on 12 March 2025.
[69] EC (2023) Default values for the transitional period of the CBAM between 1 October 2023 and 31 December 2025, p. 5

- When the CBAM becomes effective from 2026 onwards, similar limitations will apply in the use of default values for declared complex goods. However, default values will be set at the average emission intensity of each exporting country, increased by a *"proportionately designed mark-up"*[70] (although the design principles of such mark-up have not been detailed so far to our understanding).

To calculate indirect emissions, the general approach is to use an emission factor reflective of the average carbon content of electricity production in the respective country of import, and to multiply this factor by the amount of electricity consumed to produce the CBAM goods. More precisely:

- For the transitional phase, until December 2025, a 5-year average emission factor for electricity covering the years 2016 to 2020 will be used.
- For the Implementation phase, from 2026 onwards, the factor used will either be (i) the average emission factor of the EU grid, (ii) the average emission factor of the country of origin, or (iii) the average CO_2 emission factor of price-setting sources in the country of origin.[71] The precise methodology for calculating indirect emissions will be reviewed by the EC before the end of the transitional period in its 2025 assessment report, as explained in section 4.1.

Moreover, instead of using default values, the CBAM Regulation states that CBAM declarants may apply actual embedded emissions if a Power Purchasing Agreement (PPA) with an electricity producer has been concluded, or in case of a direct technical link between the manufacturing plant and a source of electricity generation.[72]

[70] *Ibid*, p. 5.
[71] *Ibid*, p. 22.
[72] CBAM Regulation, Annex IV.

If importers do not have all the necessary information to calculate actual **direct or indirect emissions** based on these published methods, they may rely on default values

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5.
Key issues to be addressed to ensure an efficient CBAM framework

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5.

Key issues to be addressed to ensure an efficient CBAM framework

Several points have been identified for review by the EC in the CBAM Regulation. This includes, for instance, the possible expansion of the scope, the review of the technical criteria used to identify goods at risk of carbon leakage, or the rules for calculating embedded emissions.

Other issues have also been raised by stakeholders, which would require further assessment as they may prevent the CBAM from achieving the objectives set out by the EC, as mentioned in section 2.3 of this report. Although our review might not be exhaustive, we highlight in this section some of the main issues that have been reported:

- A lack of provisions for exports which could undermine the competitiveness of EU manufacturers in foreign markets;
- A reshuffling of trade flows and value chains, which could undermine the CBAM's effectiveness in limiting global carbon emissions and preventing carbon leakage;
- The current rules for calculating indirect emissions from electricity consumption may not provide a level-playing field for EU and foreign goods;

Questions have also been raised regarding the CBAM's compatibility with WTO rules, depending on specific implementation rules. In addition, the implementation of the CBAM also casts a new light on some of the well know distributional issues affecting climate policies.[73]

[73] Among other things, the report should contain an assessment of *"the impact of [the CBAM] Regulation on goods […] imported from developing countries with special interest to the least developed countries"*, CBAM Regulation, Article 30.2 (f)

5.1.

Key issues to be addressed ahead of the implementation phase

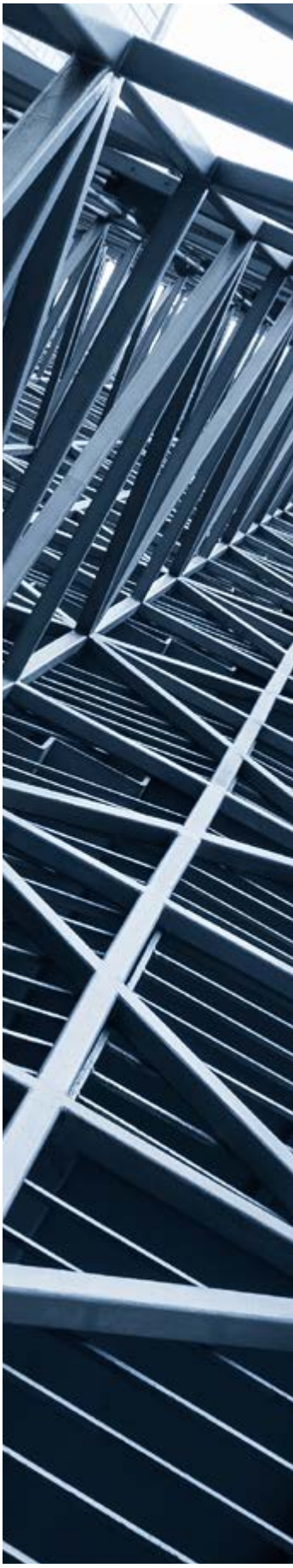
Several options for the CBAM mechanism implementation are still under discussion for the implementation phase, starting in 2026. In particular, a range of topics remains to be addressed by the EC by the end of 2025, as part of the assessment report mentioned in section 3.1. For instance, Article 30 of the CBAM Regulation mentions the following assessment points for this review:

- The EC will assess the possible expansion of the CBAM scope. This includes expanding the emission scope coverage, with an assessment of the relevance of including indirect emissions for products for which only direct emissions are accounted for (i.e. iron and steel, aluminium and hydrogen). This includes embedded emissions related to the transport of goods covered by the CBAM. The EC will also assess the relevance of expanding the product scope coverage, with additional goods that may face carbon leakage risks, such as organic chemicals, plastics, or products further downstream in the value chain from items that are currently covered,[74] and additional precursors used in the manufacturing of goods covered by the CBAM. For this assignment, the EC could use criteria such as: the risk of carbon leakage, GHG impacts, or administrative and technical feasibility.
- The EC will review the criteria used to identify goods at risk of carbon leakage and will publish a timeline ending in 2030 for the inclusion of EU ETS sectors with the CBAM, taking into account their respective carbon leakage risk.
- The EC will assess the technical rules for calculating actual embedded emissions, as mentioned in section 3.4. The methodology for the calculation of indirect emissions will also be specifically reviewed.
- The international impact of the CBAM will be studied, with a focus on the impact of the CBAM on imports from developing countries, and on the progress made in international discussions regarding climate action.
- The EC report will include an assessment of the governance system, as well as an assessment of the CBAM administrative costs.

The report by the EC may be followed by a legislative proposal by the end of the transitional period, to implement potential changes on the basis of these conclusions.

[74] *Ibid.*

While **the CBAM is currently designed to address carbon leakage risks related to domestic consumption,** it does not yet provide a mechanism to address the differential in production costs for exports



5.2.

The lack of provisions for exports could lead to carbon leakage

As it stands, the CBAM only covers goods produced outside of Europe and imported to the EU but does not cover goods produced in the EU and exported abroad. This creates a risk of carbon leakage, hampering the main objective of the CBAM.

Indeed, products originating from the EU and subject to the EU ETS, but no longer eligible to free allocation due to the phase-in of the CBAM, will pay a higher carbon cost than their foreign competitors producing goods under weaker carbon constraints, and will consequently struggle to remain competitive in global markets. This also creates a risk of carbon leakage: with no additional action, the production of these products could be relocated to countries with less stringent carbon policies, at a potentially higher climate cost.

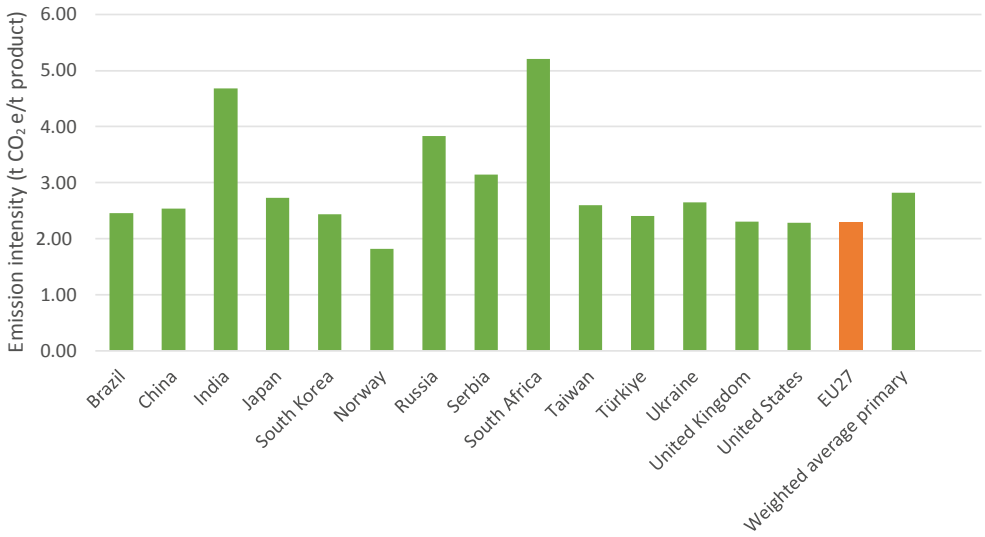
While the CBAM is currently designed to address carbon leakage risks related to domestic consumption, it does not yet provide a mechanism to address the differential in production costs for exports. The potential distortions of competition between EU exports and foreign products sold on foreign markets is not yet covered by the CBAM. Early mentions of export provisions were made when the CBAM Regulation was discussed. For instance, the European Parliament's position of June 2022, as it entered trilogues, included the mention of free allocation to prevent export-related leakage. However, among other things, the uncertain compatibility of exports rebates with WTO rules has prompted the EU to leave this topic out of the current CBAM Regulation.[75] More detail on this topic is provided in section 4.5.

[75] ERCST (2024) Review of Carbon Leakage Risks of CBAM Export Goods, p. 10.

Thus, the lack of provisions for exports might be conducive to a risk of carbon leakage through the loss of competitiveness of EU goods in foreign markets. Certain sectors could be particularly at risk, as highlighted by the ERCST.[76]

- For instance, in the iron and steel sector, the ERCST estimates that by 2030, without any provisions included in the CBAM for steel exports, the cost of flat-rolled products would be 18% higher than world prices. By 2034, this premium would amount to 34%. EU producers, being price takers in global markets, might therefore lose market shares as a result. EU steel could be replaced by more carbon-intensive steel in the global market as the carbon intensity of EU products is typically lower than their main competitors, as shown in **Figure 8** below. This risk is exacerbated by the current challenging market conditions for EU exports, with a global production overcapacity exerting downward pressure on prices.[77] Moreover, if the global share of the EU steel industry declines, new investments in steel production might be directed towards more carbon-intensive facilities. Indeed, while new EU investments are made in electric arc furnaces (EAFs), other exporting countries (e.g. in Asia) involve traditional blast furnaces.[78]

Figure 8. Average carbon intensity of iron and steel products covered by CBAM.



Note: the complete list of CBAM covered products in the iron and steel industry is available here: JRC (2023) *Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners*.

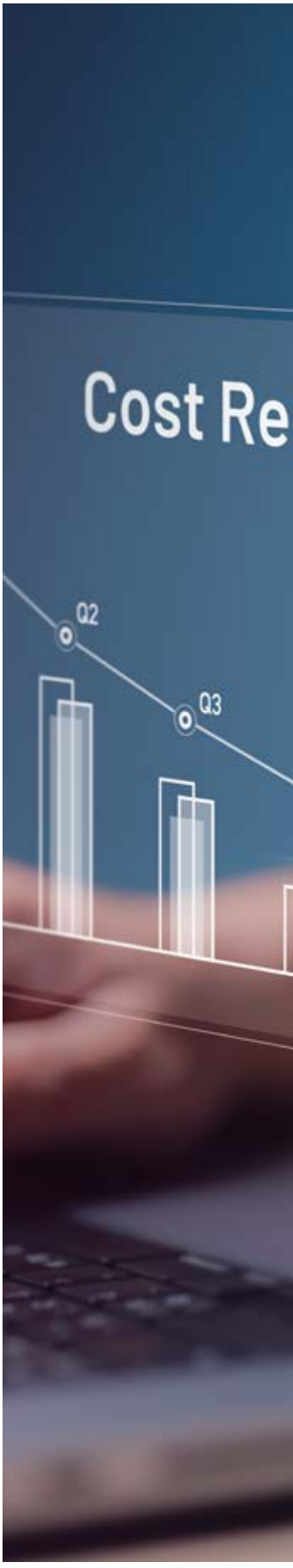
Source: ERCST (2024) *Review of Carbon Leakage Risks of CBAM Export Goods*.

[76] *Ibid*, p. 3.
[77] *Ibid*, p. 7.
[78] *Ibid*, p. 8.

- Similarly, in the fertiliser industry, the ECRST estimates that the cost premium paid by EU producers for calcium ammonium nitrate could amount to 27% by 2030 and 49% by 2034, which would impair the viability of EU exports in the global market. Moreover, the viability of the EU fertiliser sector relies on exports during the winter season when no production is sold on the domestic market. Therefore, the absence of export provisions in the CBAM might threaten the viability of the fertiliser industry.[79]

In practice, several solutions could be implemented as part of a CBA to prevent carbon leakage associated with exports. This includes, for instance, monetary and non-monetary rebates:[80, 81]

- **Monetary rebates:** Symmetrically to imported goods that are subject to a border levy under the CBAM Regulation, goods produced within the EU and destined for exports could receive a monetary rebate on the carbon price paid under the EU ETS. This rebate could be calculated based on a benchmark of the most carbon-efficient producers, or on the actual emissions embedded in the exported goods.
- **Non-monetary rebates:** This approach would grant adjustment allowances to cover the emissions of goods that are exported to countries without a comparable carbon price signal, and the number of additional allowances granted for these products could be based on a benchmark of the most carbon-efficient producers.



5.3.

Expected impacts of the CBAM's implementation include a reshuffling of trade flows and value chains, potentially leading to carbon leakage

The introduction of the CBAM may trigger a reshuffling of trade flows with foreign commercial partners and a reshuffling of global value chains. These reshufflings may allow companies to circumvent the CBAM and the effectiveness of the mechanism in preventing carbon leakage, for instance in the steel and aluminium industry.

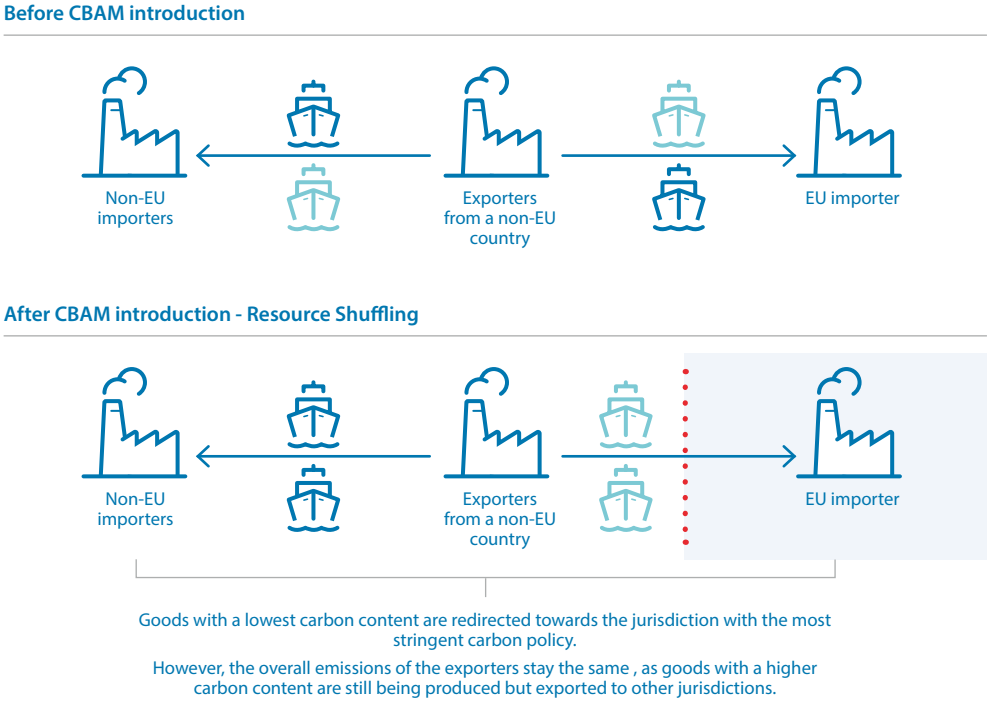
[79] *Ibid,* p. 19.
[80] ERCST (2022) Border Carbon Adjustment in the EU: Treatment of Exports in the CBAM, p. 17.
[81] Free allocation could also be granted to installations producing goods in the scope of the CBAM, regardless of their destination market (EU or abroad). Importers and producers of domestically consumed CBAM covered goods would be subject to a new obligation to surrender 'CBAM certificates', and domestic production destinated to export would be exempted. However, this solution is not compatible with the phase-out of free allowances foreseen under the CBAM Regulation.

Firstly, a reshuffling of trade flows occurs when less carbon-intensive products from one country are redirected towards destination with the highest carbon costs, while more carbon-intensive products are marketed elsewhere. As a result, no new emissions abatement activity takes place, despite full compliance with the CBAM, since higher carbon-intensive products are still being produced in this country but directed towards other destinations.

With the introduction of the CBAM, foreign companies' competitiveness in exporting products to the EU will depend on their carbon content. Hence, companies in exporting countries outside of the EU might reallocate less carbon-intensive materials production (or inputs to the production process, such as low carbon electricity) to products destined to be exported to the EU (this type of reshuffling is called 'input shuffling'). Similarly, EU importers may as well switch to low emissions suppliers within the same country (so-called 'output shuffling'). On the contrary, more carbon-intensive products may be redirected towards the other countries. The overall carbon intensity of production in the exporting country would thus remain constant despite the introduction of the CBAM.

This poses a risk, as the CBAM's financial liability paid by imports can be reduced if it is demonstrated that the imported goods are sourced from a more carbon-efficient production process. An illustration is provided in **Figure 9** below.

Figure 9. Reshuffling of trade flows after the introduction of the CBAM.



Source: Compass Lexecon.

Sectoral analysis shows a significant potential for **resource reshuffling in certain industries**

Secondly, reshuffling may occur within the value chains of goods whose production requires CBAM covered material. EU producers of complex goods that are not covered by the CBAM, but that rely wholly or partly on CBAM-covered materials will face higher input costs due to the ETS applied domestically and CBAM charges at the border, compared to their foreign competitors. The latter may have access to cheaper inputs than EU producers due to differences in carbon pricing and may gain a competitive advantage when exporting their products in Europe.[82]

Therefore, instead of importing input products subject to CBAM liabilities and subsequently manufacturing complex gods on EU soil, EU companies may be incentivised to directly import complex manufactured goods. This could also lead to production relocation as it may become more attractive to move production of complex goods outside of the EU to third countries, if the carbon content of input products is covered by the CBAM but the carbon content of complex goods is not.[83]

Sectoral analysis shows a significant potential for resource reshuffling in certain industries, for instance in the steel and aluminium sectors.

In the steel industry, foreign producers might be able to significantly reduce the carbon intensity of the goods exported to Europe thanks to resource shuffling, hereby increasing the competitiveness of foreign imports compared to domestic producers in the EU market

CRU consulting shows that resource shuffling could significantly reduce the carbon intensity of steel imported by the EU.[84] It estimates the reduction in emissions associated with resource shuffling, as well as the corresponding cost differential incurred due to saved CBAM costs, for flat and long products[85] under two scenarios (output shuffling and input shuffling). Under the output shuffling scenario, emission reduction occurs because imports are supplied by

[82] ERCST (2024) Including products further down the value chain in the EU CBAM, p. 1
[83] *Ibid,* p. 2.
[84] CRU consulting (2021) Assessing the drivers and scale of potential resource shuffling under a CBAM
[85] Long products refer to finished rolled steel products like rail and steel bars, and flat products refer to finished rolled steel products like steel strips and plates; World Steel Association – Glossary. Accessed on 12 March 2025.

producers with lower emissions intensity. Under the input shuffling scenario, indirect emissions due to the use of electricity are additionally removed (e.g. via the contracting of green PPAs).

As shown in Table 1, flat products manufacturers could reduce the emissions intensity of their exports to the EU by 12% to 30% on average between (anonymised) regions A and B, depending on the scenario, relative to the Reference Case. For producers of long products, the reduction in export emissions intensity to the EU can even amount to 73% to 90%.[86]

This reduction in the carbon intensity of steel exported towards the EU, due to resource shuffling, can in turn affect the competitiveness of foreign imports compared to EU domestic producers. With a carbon price of 50 €/t, resource shuffling can allow imports to significantly reduce the share of their liability, creating a cost differential in the order of 9-25% relative to gross value added (GVA) for flat products, and by 47%-53% on average between regions A and B relative to GVA for long products, depending on the scenario considered.

Table 1. Emissions intensity of exports to the EU under shuffling scenarios from 2 anonymised regions.

Region / Product	Shuffling scenario	Intensity (tCO_2/tcs)	Exports to EU (Mt)	Emissions ($MtCO_2$)	% change vs RC
Region A / Flats	Reference case (RC)	1.9	1.0	1.9	0%
	Output Shuffling	1.8	1.0	1.7	-6%
	Input Shuffling	1.5	1.0	1.4	-24%
Region A / Longs	Reference case (RC)	1.1	0.1	0.12	0%
	Output Shuffling	0.4	0.1	0.04	-66%
	Input Shuffling	0.1	0.1	0.01	-89%
Region B / Flats	Reference case (RC)	1.8	2.3	4.2	0%
	Output Shuffling	1.5	2.3	3.4	-18%
	Input Shuffling	1.1	2.3	2.7	-36%
Region B / Longs	Reference case (RC)	1.6	1.2	2.0	0%
	Output Shuffling	0.3	1.2	0.4	-80%
	Input Shuffling	0.2	1.2	0.2	-90%

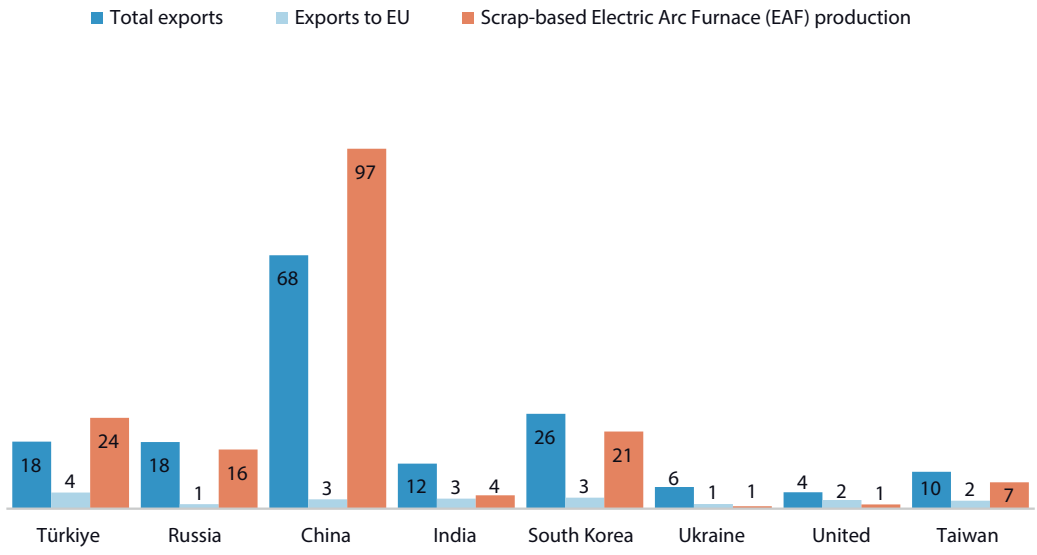
Note: "tcs" refers to "tonne of crude steel". Column "% change vs RC" corresponds to the change in GHG emissions compared to the reference case.

Source: CRU consulting (2021) *Assessing the drivers and scale of potential resource shuffling under a CBAM*.

[86] Average between (anonymised) regions A and B.

Moreover, while flat products are typically produced via blast furnaces, resource shuffling might also result in the use of less carbon-intensive EAF steel for exports of flat products – although this remains relatively uncertain as not all qualities of steel can currently be produced via the EAF route.[87] This could be particularly concerning in the context of the decommissioning of blast furnaces in Europe, before the commissioning of new EAF: if the EU's consumption of flat products is met by foreign EAF in this transition period, this might lead to an increase in the production of foreign highly-intensive blast furnaces to meet the domestic needs of the exporting country. This would in turn result in carbon leakage.

Figure 10. Steel exports and EAF steel production by key EU trade partners in 2022 (Millions tons).



Source: Rhodium Group (2024) Climate Action and Competitiveness: The rise of border carbon adjustments, p. 7.

The rules applicable to re-melted aluminium provide an incentive for foreign aluminium producers to circumvent the CBAM by directing products based on re-melted process scrap towards Europe

Aluminium is highly recyclable, with products made from recycled aluminium exhibiting properties nearly identical to those made from primary aluminium. In 2018, post-consumer recycled aluminium accounted for an average of

[87] CRU consulting (2021) Assessing the drivers and scale of potential resource shuffling under a CBAM, p. 5.

The current CBAM rules applicable for the transitory period stipulate that that process scrap is assigned **zero embedded emissions** when entering another production process

33% of global production.[88] Recycled aluminium for instance involves re-melting process scrap, parts of metal that are cut off during other production processes.

However, the current CBAM rules applicable for the transitory period stipulate that that process scrap is assigned zero embedded emissions when entering another production process. Therefore, the carbon emissions associated with the production of process scrap are not accounted for in the CBAM calculation of the embedded emissions in re-melted aluminium products.

If these same rules were applied during the implementation period, foreign aluminium producers could thus mitigate the financial impact of the CBAM on the competitiveness of their products in the EU market by increasing the scrap content of their metal production, or by selectively sourcing them from production lines that use large amounts of scrap.[89, 90]

Moreover, the ERCST estimates that the price of rolled aluminium sold in Europe could increase by 10-13% due to the CBAM. In turn, this could have a significant impact on the downstream industries, in particular when the value added is relatively low. For instance, the cost of producing aluminium window frame could increase by 13%, which may encourage downstream producers to relocate outside of Europe, or directly import finished products.[91]

[88] Sandbag (2024) A Scrap Game: Impacts of the EU Carbon Border Adjustment Mechanism, p. 28.
[89] *Ibid,* p. 23.
[90] France Stratégie (2025) Decarbonising steel and other base metals: let's send the right signals. Accessed on 12 March 2025.
[91] *Ibid,* p. 4.

5.4.

Should the current rules for indirect emissions be extended to the implementation period, a risk of carbon leakage would arise due to a lack of level-playing field for EU and foreign goods

Indirect scope 2 emissions are planned to be included under the CBAM scope from 2026 onwards for selected sectors (cement and fertilisers, as mentioned in section 3.4), and all CBAM sectors should be covered *in fine*. As such, EU importers of foreign goods would be subject to the surrendering of CBAM certificates for emissions related to the use of electricity or heat in imported products.

However, the treatment of indirect emissions from EU imports under the CBAM, compared to the actual CO_2 price to which EU domestic producers are exposed, might favour foreign companies over their EU competitors in the EU market. This would prevent the CBAM from providing a level playing between domestic production and imports even though this is presented as a key objective by the EC.

Indeed, as detailed in section 3.4, under the current CBAM rules, the specific default values used for the calculation of embedded indirect emissions in foreign goods may use an average CO_2 content for electricity. Meanwhile, the carbon content that is typically reflected in electricity prices in Europe is the GHG content of the marginal production unit, often a thermal plant. Electricity spot prices are set by the marginal production costs of the marginal unit, i.e. the most expensive unit to meet demand at a given time.[92] For each settlement period, electricity units are indeed ranked according to increasing marginal costs, following a merit-order. Units are designated to deliver power based on this merit-order, the cheapest first, and the most expensive last, until demand is met. The price received by all units is set according to the bid price of the most expensive unit needed to meet demand. The spot price hence corresponds to the marginal cost of electricity production, which includes the cost of the ETS allowances needed to cover the emissions of the marginal production plant. Moreover, end consumers are (at least indirectly, through their supplier) exposed to spot prices for their consumption of electricity - forward products, which are used in market procurement strategies to hedge against changes in spot prices, reflect market participants' expectations of future spot prices.

[92] For each settlement period, electricity units are ranked according to increasing marginal costs, following a merit-order. Units are designated to deliver power based on this merit-order, the cheapest first, and the most expensive last, until demand is met. The price received by all units is set according to the bid price of the expensive unit needed to meet demand.

There is a risk that foreign goods might be favoured compared to domestic products, as the average GHG content is often lower than the GHG content of the marginal production unit. At EU level, in 2022, fossil fuel plants were price-setting technologies around 86% of the time, although they only generated 34% of the total electricity produced.[93, 94] Similarly, in France the marginal carbon content of electricity has been estimated by RTE at 0.51tCO_2/MWh,[95] while the average CO_2 content was only 0.032 tCO_2/MWh in 2023.[96]

5.5.
Other issues to be addressed regarding the CBAM

We note that questions have also been raised regarding the CBAM's compatibility with WTO rules, depending on some of the specific implementation rules. In addition, the implementation of the CBAM also casts a new light on some of the well know distributional issues affecting climate policies.

Legal scholars agree that WTO rules generally permit members to modify their ETS systems for imports, as proposed by the EU CBAM.[97] However, the CBAM needs to be compliant with several key principles that entail concrete implementation designs in order to ensure WTO compliance.[98] This includes, for instance, the fact that imports cannot be subject to a liability to which domestic producers are not, the fact that charges should not favour or disadvantage importers from a particular country, or the fact that domestic charges can be replicated to imported products if it is a direct tax, i.e. a charge on the imported products and not the wealth or income of the importer. Moreover, although the lack of provisions for exports under the CBAM regulation might hamper the competitiveness of some EU industries, as mentioned in section 4.2, the legality under WTO rules of export adjustments to the EU ETS and CBAM correcting for this disadvantage has been questioned, for instance by the ERCST.[99, 100, 101]

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[93] Gasparella *et al.* (2023) The Merit Order and Price-Setting Dynamics in European Electricity Markets, Figure 17.
[94] In certain electricity systems, the average emission content of electricity might be higher than the marginal emission content, for instance if coal power plants are providing baseload production.
[95] EC (2022) State Aid SA.63404 (2022/N) – France – Indirect carbon cost compensation in France for 2021-2030, Article 32.
[96] RTE (2023) Bilan électrique 2023, p. 30.
[97] Hillman (2013) Changing Climate for Carbon Taxes: Who's Afraid of the WTO?; Jacques Delors Institute (2022) A European Border Carbon Adjustment Proposal – Greening EU trade 3.
[98] Sandbag (2024) A scrap game – Impacts of the EU Carbon Border Adjustment Mechanisms, p. 20.
[99] ERCST (2022) Border Carbon Adjustment in the EU: Treatment of Exports in the CBAM.
[100] Cosbey *et al.* (2012) A Guide for the Concerned: Guidance on the elaboration and implementation of border carbon adjustment, Box 2.
[101] Moreover, to the extent compatible WTO rules, the CBAM could also provide an opportunity for additional trade policy on top of climate action, for instance to protect the competitiveness of EU exports in global markets, beyond the impact of carbon costs only.

The **lack of technical and financial resources in certain least developed countries** might hinder their transition to less carbon-intensive production systems

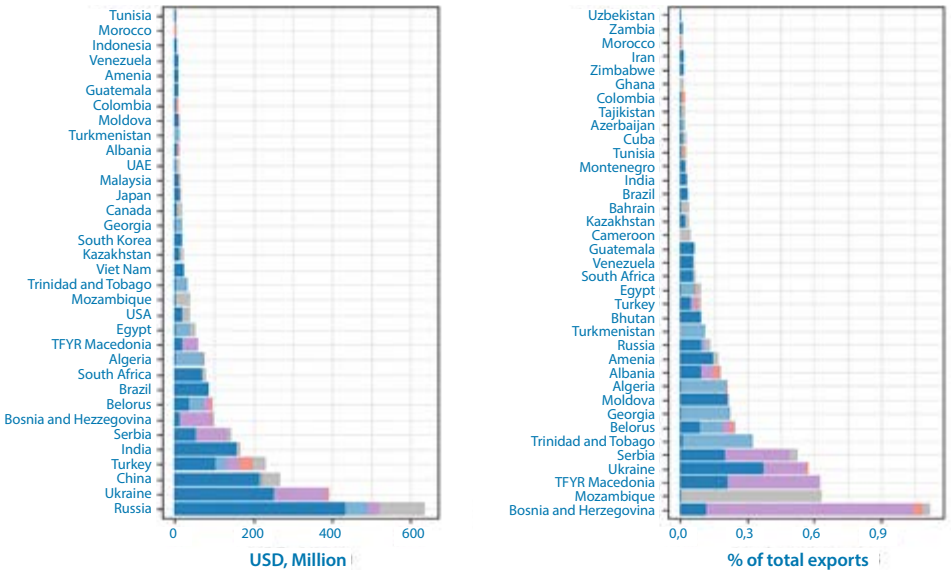
The implementation of the CBAM is also associated to distributional challenges. For instance, the CBAM might impact less developed countries whose exports are largely sold to the EU compared to other developed countries. Although in absolute terms, larger countries like China or India might be the most impacted by the CBAM, the effect may be felt less strongly because of larger internal markets, which decreases the importance of EU trade relative to GDP.[102] The effect might be felt more strongly on smaller countries, with high dependencies on targeted exports to the EU. For instance, **Figure 11** shows that – based on admittedly outdated 2019 data – although most of the CBAM revenues would come from imports from Russia, China and Ukraine, when compared to the total values of exports, the weight would be larger on smaller countries. For some countries, the share of exports impacted by the CBAM compared to the overall economy is significant. This is the case of Mozambique, which relies heavily on aluminium exports to the EU, and for which CBAM product exports to the EU accounts for 6.9% of GDP.[103]

However, the costs of the CBAM are borne in the first place by European importers rather than by third countries. The actual impact of the CBAM for third countries could be in practice limited if demand is relatively inelastic in Europe, or if they can redirect their exports to other markets.

[102] Eicke *et al.* (2021) Pulling up the carbon ladder? Decarbonization, dependence, and third-country risks from the European carbon border adjustment mechanism, p. 8.
[103] Flekkøy (2024) The CBAM effect: Unveiling global sentiments on the Carbon Border Adjustment Mechanism. Accessed on 12 March 2025.

Moreover, the lack of technical and financial resources in certain least developed countries might hinder their transition to less carbon-intensive production systems, which would be required to mitigate the impact of the CBAM on the competitiveness of their products in the EU market. This would in turn prevent the CBAM from achieving one of its objectives – encouraging producers in third countries who export to the EU to adopt low carbon technologies. These distributional concerns could be addressed by redistributing the revenues from carbon import adjustments back to the contributing countries or allocating them toward technology transfers and international climate finance.[104, 105]

Figure 11. Potential CBAM revenue, by country (2019).



Source: AFD (2022) *Impacts of CBAM on EU trade partners: consequences for developing countries*.

[104] ERCTS (2024) Declaration: Calling on the EU to direct revenues from the CBAM towards international climate finance

[105] Eicke *et al.* (2021) Pulling up the carbon ladder? Decarbonization, dependence, and third-country risks from the European carbon border adjustment mechanism, p. 8.

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A review of the EU CBAM's economic principles, expected impacts and outstanding issues

Naturgy Foundation