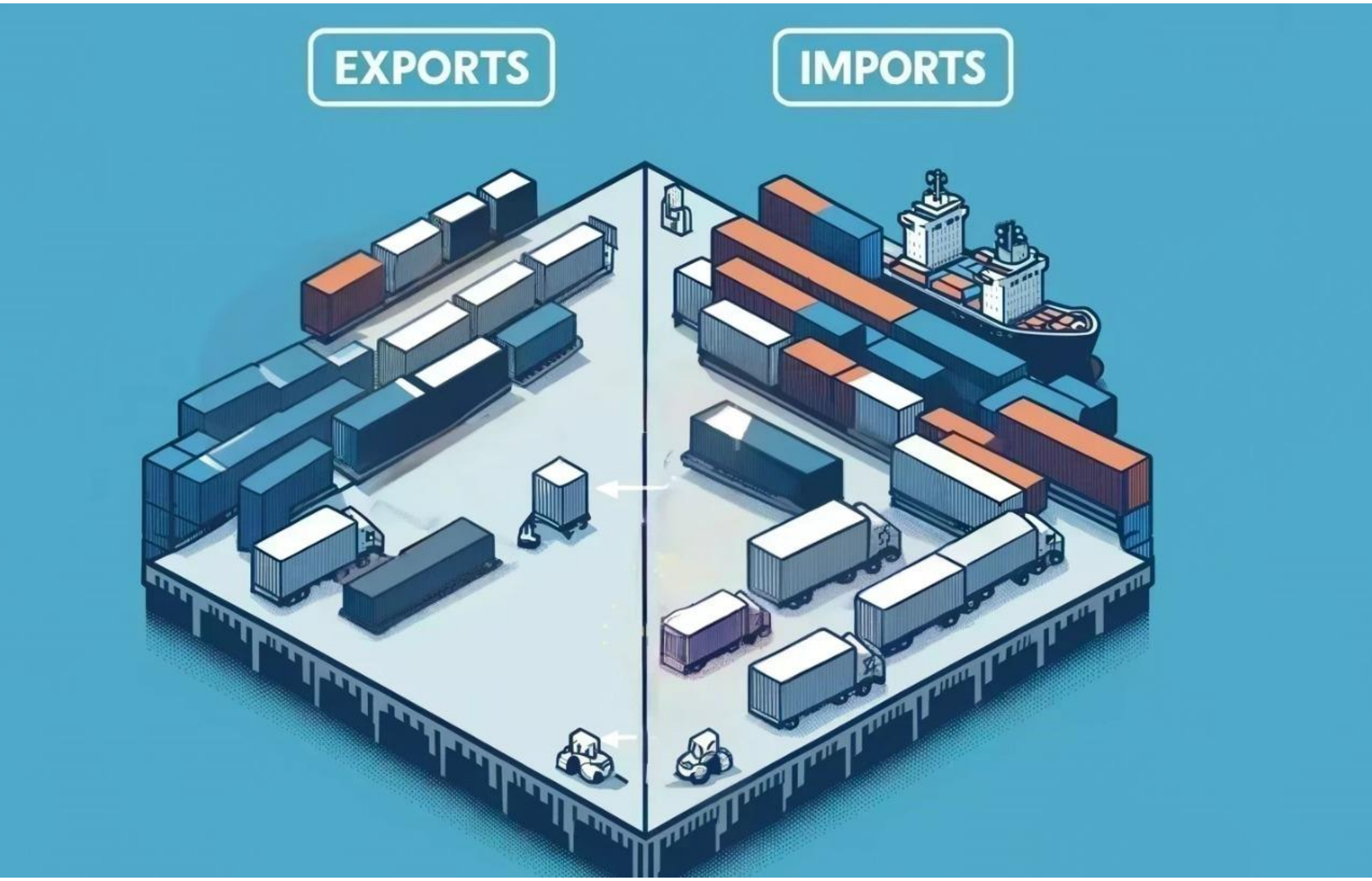
ERCST
Roundtable on Climate Change and Sustainable Transition

2024

Review of Carbon Leakage Risks of CBAM Export Goods



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SUMMARY

- *Exports play a vital economic and environmental role for goods in the EU covered by the CBAM, the role depends not only on the share of production that is exported, but other factors such as capacity utilization levels, seasonality, and cyclical demand.*
- *European producers also face tough competition in export markets due to factors like high input costs, excess production capacities, and aggressive interventions by trade partners.*
- *The CBAM, while addressing carbon leakage within the EU, currently lacks provisions to protect EU exports, posing a risk to a significant segment of the EU industry.*
- *The mandated review of carbon leakage risk should be dynamic and forward-looking and consider each sector's specific circumstances in relation to exports.*

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1. Introduction

The transitional phase of the Carbon Border Adjustment Mechanism (CBAM) is underway, but several unresolved issues persist ahead of the definitive period. One of the issues is the question of exports, particularly within the context of the review under the EU Emissions Trading System (ETS) legislation. This report addresses the carbon leakage risk associated with goods subject to CBAM and manufactured in the EU for export.

Building on previous work conducted ahead of the adoption of the CBAM Regulation with Phases I (2019-2020), II (2020- 2021) and III (2021-2022) of its project "Border Carbon Adjustments in the EU", as well as Phase IV (2023) assessing elements of the CBAM Regulation, the European Roundtable on Climate Change and Sustainable Transition (ERCST) is now extending its analysis of the evolving CBAM into a fifth phase, providing decision makers and stakeholders with a better understanding of critical issues as the CBAM proceeds from adoption to implementation.

Phase V of the ERCST project is intended to provide in-depth analysis of the implementation phase of the CBAM as it progresses to its full operationalization, and to offer a broader view of related developments at the intersection of climate and trade. The present report is the first in a series of three reports that together form the written outputs of the fifth phase of the "Carbon Border Adjustment in the EU" project.

In March 2022, the ERCST released a report on the treatment of exports under the CBAM. The paper reviewed the policy options available to address this issue and reviewed four different approaches. It proposed to use existing product benchmarks as the calculation basis for issuance of non-tradable and non-fungible export adjustment certificates that could be exchanged for EUAs. Following two turbulent years since the release of that proposal, this report aims to study the vulnerability of European exports and why this question remains important and will become even more than it was before the CBAM Regulation was adopted. This report will use a static approach but we urge future reviews and analysis to use a dynamic approach for this complex issue.

Although there several issues that remain unresolved which interact with the lack of an export solution, such as the coverage of products further down the value chain, what to use CBAM revenues for and the potential expansion of CBAM to other sectors – these issues will be reviewed in future report and left out of the scope of this report that focuses on the export issue.

In this report, Section 2 explains why exports matter, and traces the debate on the inclusion of exports. Section 3 highlights recent developments in the global markets for goods covered by the CBAM, and underscores the need for policy certainty for the next investment cycle. Thereafter, Section 4 assesses on a sector-by-sector basis, the vulnerability of exports by looking at the increased costs caused by the loss of free allocation due to the CBAM for two products. Section 5 concludes with takeaways and recommendations for the upcoming review of the EU ETS and the revised EU ETS directive.

2. European Exports under the CBAM: Status Quo

2.1. Why Exports Matter: Understanding Export-related Leakage

The CBAM was introduced to address carbon leakage, which can occur through relocation of existing production, relocation of investments, or a loss of export markets to jurisdictions which have less stringent climate policies. Carbon leakage in export markets results from a loss of competitiveness, where products from jurisdictions with more stringent climate regulation are unable to compete in global markets, and are replaced by products from jurisdictions that have less stringent carbon constraints. For now, the CBAM aims to compensate for the carbon leakage of domestic consumption, but there is no solution for exports.

Table 1 highlights that a considerable portion of each CBAM sector's total EU production is exported annually. Because CBAM goods are largely traded in highly competitive global commodity markets, the possibilities to pass through costs are very limited. If exports are not competitive in export markets due to a higher carbon price and lose this share of production, plants may end up operating at a suboptimal capacity level. At suboptimal capacity levels, plants struggle to cover fixed costs, leading to reduced profitability and financial strain. A failure to find a solution to these issues may eventually lead to decisions to close plants that are no longer profitable.

In addition to the impact on capacity levels, the percentage of exports in each sector offers an incomplete perspective. Each sector has unique circumstances that underscore the significance of exports. Certain sectors have plants that rely heavily on exports, are dependent on exports during certain seasons, or include certain areas in the EU rely heavily on exports. The circumstances of four key sectors – fertilizers, cement, aluminum and iron and steel – will be described in closer detail below.

	2018	**2019**	**2020**
Fertilizers and nitrogen compounds	16,4%	15,9%	17,0%
Cement	5,6%	5,3%	4,2%
Aluminum	19,2%	20,0%	20,2%
Iron and Steel	17,81%	19,19%	17,68%

Table 1: Share of EU27 exports of CBAM products to sector-level production value, 2018-2020

Notes: (i) for each sector EU27 exports and sector-level production value cover NACE codes 'C2015 - Manufacture of fertilizers and nitrogen compounds', 'C2351 - Manufacture of cement', 'C241 - Manufacture of basic iron and steel and of ferro-alloys', 'C242 - Manufacture of tubes, pipes, hollow profiles and related fittings, of steel', 'C243 - Manufacture other products of first processing of steel' and 'C2442 - Aluminum production'

Sources: Based on Eurostat 'Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E') and 'EU trade since 2002 by CPA 2.'

2.1.1. Fertilizer

In the fertilizer sector, exports represent about 16% of total EU production (Table 1), but some of the export-oriented factories sell between 20% and 60% of their production outside the EU. To operate on a large scale, they must be able to deliver products all year round, which means delivering both to the EU and to markets outside the EU which follow different agricultural seasons. If exports are no longer competitive, these fertilizer factories cannot function at full capacity during off-peak seasons in the EU, leading to losses in efficiency and profitability. Figure 1 shows the monthly EU exports of fertilizer products which illustrates the variability between seasons.

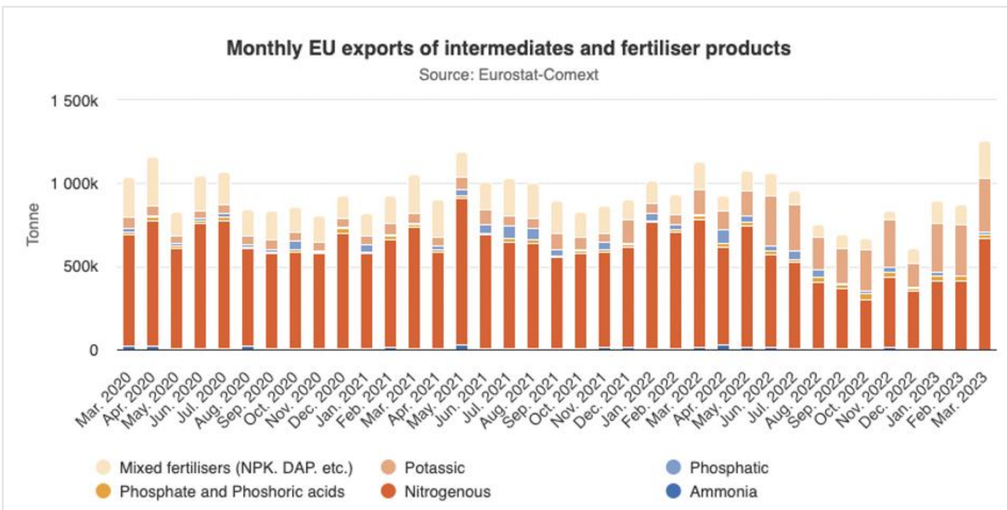


Figure 1: *Seasonality of fertilizer exports*
Source: [Ensuring availability and affordability of fertilisers - European Commission (europa.eu)]

The fertilizer sector's main export countries are Brazil, the United States, Ukraine, the United Kingdom, and China. In these markets, EU producers compete with producers from the United States, Canada, Russia, and North Africa. Figure 2 shows the average carbon intensity of the fertilizer products included in the CBAM of different global producers. EU products compare favorably against their main competitors in terms of carbon intensity. If the EU loses export market shares and is replaced with more carbon-intense products, the end result will be higher global emissions.

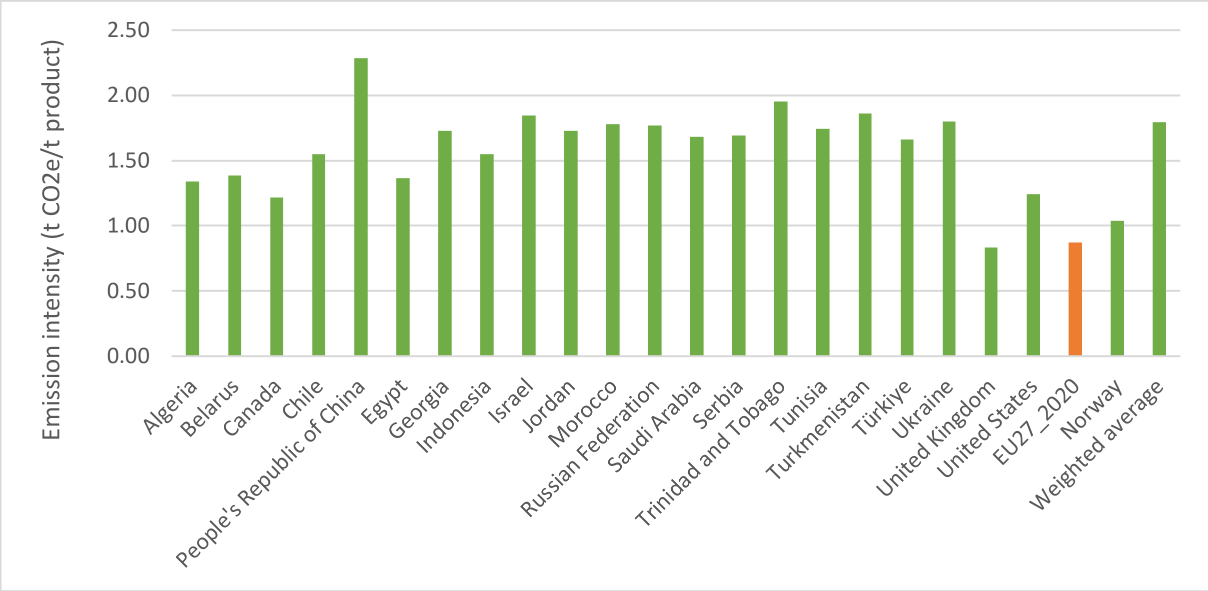


Figure 2: Average carbon intensity of fertilizer products covered by CBAM
Source: Based on JRC "Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners" JRC134682.

2.1.2. Cement

Around 6% of cement production in the EU is exported (Table 1), however the percentages vary largely between countries. In countries close to the EU borders or with seaports the exports are significantly higher, for example Greece and Ireland export more than 40 percent of their cement production, and Portugal and Spain and Croatia also export between 12 and 20 percent. Due to the high carbon intensity of cement the carbon costs makes up a large part of the cost structure, making it particularly vulnerable to export-related carbon leakage. According to existing estimates, carbon costs already account to 8-10% of the total production costs of cement at an ETS price of 55€, and 12-15% at an ETS price of 90€, even with free allocation.[1]

[1] Cembureau, "CO_2 Costs in Cement: Some Calculations", 2021, https://www.cembureau.eu/media/jpthbmva/co2-costs-in-eu-cement-production-december-2021.pdf.

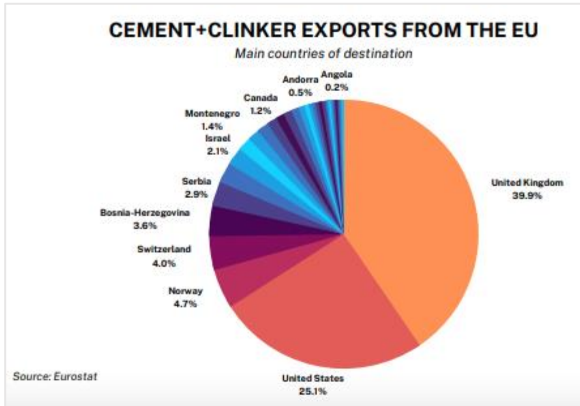


Figure 3: *Cement exports*
Source: Cembureau (2023)[2]

The main countries that the EU cement is exported to are the United Kingdom, United States, Bosnia-Herzegovina, Serbia, and Montenegro. Figure 4 below shows the average EU carbon intensity for the different cement products covered by the CBAM compared to the carbon intensity of cement products originating in the countries it exports to. Again, the carbon intensity of EU production is in the lower range of emission intensities.

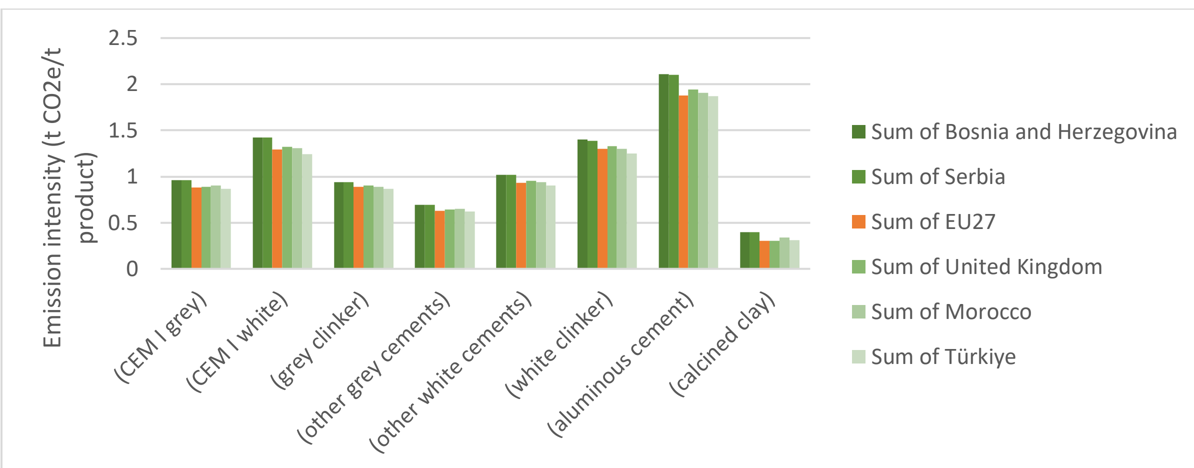


Figure 4 Carbon intensity of products covered by CBAM (Note: The countries that the EU exports to and countries that export to those countries that are also part of the JRC dataset were included in the graph.)
Source: Based on JRC "Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners" JRC134682.

2.1.3. Iron and Steel

Iron and steel exports amounted to around 19% of total EU production (see Table 1 above). The production of steel has high fixed costs, and relies on more than 85-90% of capacity utilization to

[2] Cembureau, "EU Cement Industry Trade Statistics", 2023, https://cembureau.eu/media/11gferby/eu-cement-industry-trade-statistics-data-06-2023-published-09-2023.pdf.

run in optimal cost conditions, which makes iron and steel production sensitive to the loss of exports. Since demand for steel in the EU is cyclical, exports are used as breathing valve when demand in Europe is low. Even a loss of two or three percentage points of exports can be detrimental to the profitability of steel plant because it can push the plant across the threshold at which operations are no longer profitable and thus competitive.

According to the OECD Steel Committee, global excess production capacity for crude steel currently stands at approximately 600 million metric tons (Mt), which is roughly equivalent to the entire production capacity of OECD countries combined.[3] This overcapacity – which is revisited in Section 3.1 below – combined with the need for steel plants to run at high capacity utilization levels leads to steel markets being increasingly competitive with strong downward price pressure.

The trade balance of the EU has decreased (as shown below in Figure 5), as a result of global overcapacity exerting downward pressure on prices, and EU producers being subject to, among other things, increased carbon costs that international competitors are not subject to. This, in turn, has led to capacity utilization levels of the EU steel industry that have decreased from 74% in 2015 to 65% in 2022.[4] Other instances when capacity levels have been this low in the EU show that there is a risk that steelmaking does not come back online after a period of demand decline.[5]

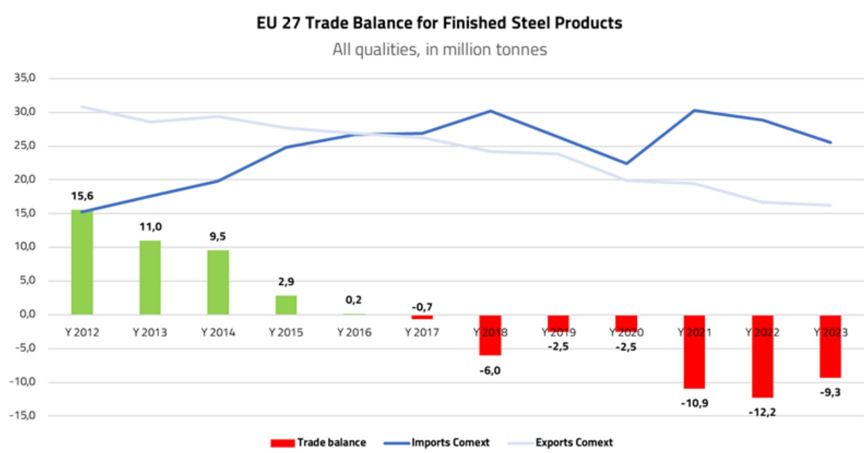


Figure 5: *Trade balance for steel (Source: Eurofer)*

[3] OECD, Latest Developments in Steelmaking Capacity 2023 (Paris: OECD, 2023), https://www.oecd.org/industry/ind/latest-developments-in-steelmaking-capacity-2023.pdf.
[4] For finished steel (flat and long), according to data provided to the authors by Eurofer (2024).
[5]McKinsey, The future of European Steel Industry (2021) https://www.mckinsey.com/~/media/mckinsey/industries/metals%20and%20mining/our%20insights/the%20future%20of%20the%20european%20steel%20industry/the-future-of-the-european-steel-industry_vf.pdfMcKinsey, The future of European Steel Industry (2021) https://www.mckinsey.com/~/media/mckinsey/industries/metals%20and%20mining/our%20insights/the%20future%20of%20the%20european%20steel%20industry/the-future-of-the-european-steel-industry_vf.pdf

The main destinations for EU steel exports in 2023 were the United Kingdom, the United States, Turkey, Switzerland, Mexico, China, Canada and Egypt.[6] Figure 6 below shows that EU products measure favorably against their main competitors in terms of carbon intensity.

In addition to the comparatively lower carbon intensity, new EU investments are exclusively in electric arc furnaces, while most of the new investments in Asia involve traditional blast furnace technology. Additionally, Chinese companies engaging abroad through cross-border investment account for 62% of total cross-border investment in new steelmaking capacity globally.[7] So the effect of having no solution for steel exports in the CBAM are twofold: EU steel will likely be replaced by more carbon-intensive steel if it loses export shares, and new investments in global steel capacity will be channeled towards more carbon-intensive production assets and infrastructure.

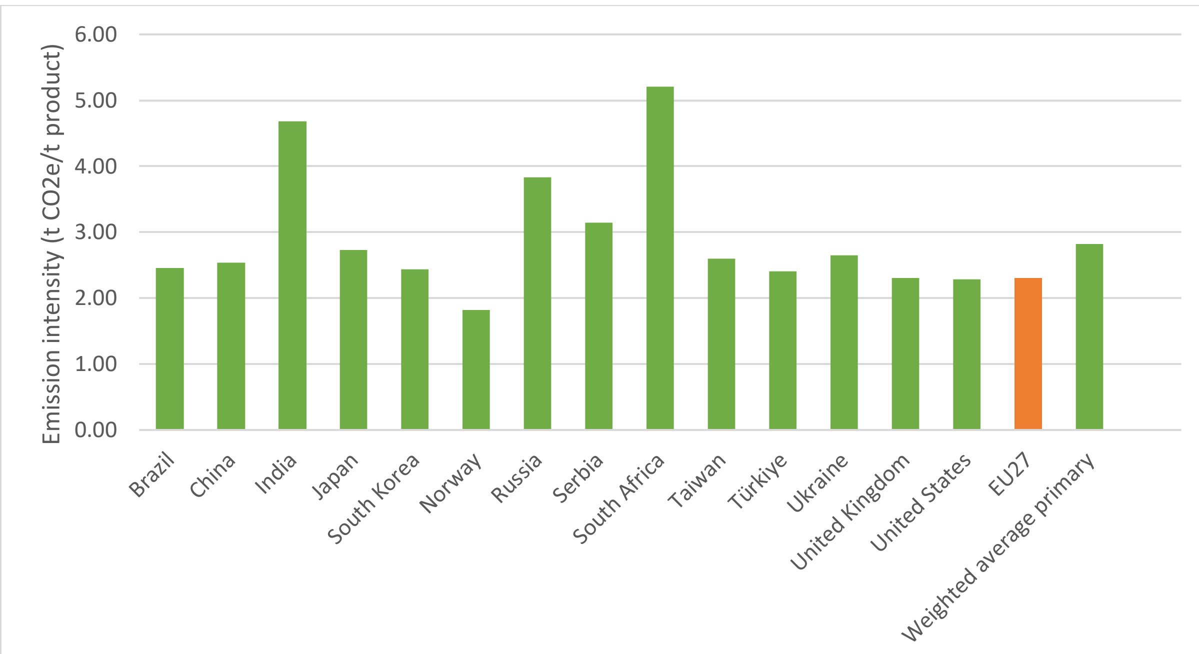


Figure 6: *Average carbon intensity of iron and steel products covered by CBAM*
Source: Based on JRC "Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners" JRC134682.

2.1.4. Aluminum

With respect to aluminum EU exports to non-EU countries represented about 20% of EU production in 2018-2020 (see Table 1). Aluminum exports from the EU are mainly destined for the United Kingdom, Switzerland, the United States, China, Turkey, Mexico, Canada, and Japan,

[6] Eurofer, "Steel in Figures 2023", 2023, https://www.eurofer.eu/assets/publications/brochures-booklets-and-factsheets/european-steel-in-figures-2023/FINAL_EUROFER_Steel-in-Figures_2023.pdf.
[7] OECD, Latest Developments in Steelmaking Capacity 2023 (Paris: OECD, 2023), https://www.oecd.org/industry/ind/latest-developments-in-steelmaking-capacity-2023.pdf.

and the main competition in these markets originates from China, Russia, the Middle East, and the Republic of Korea. The regional average of emissions is shown in Figure 7 below, which again shows EU products comparing favorably with most external competitors.

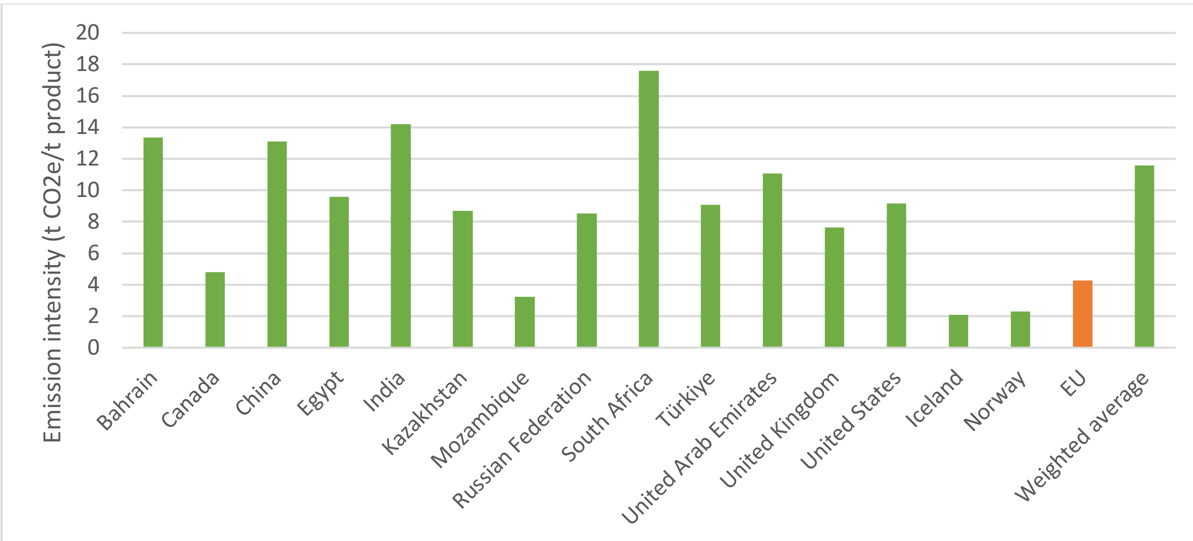


Figure 7: Average carbon intensity of aluminum products covered by CBAM
Source: Based on JRC "Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners" JRC134682.

2.2. A Brief History of the Exclusion of Exports from the CBAM

Since the design options under consideration for the CBAM were first presented during the inception impact assessment process, the solution for EU exports has been under debate and stakeholders have voiced different concerns for and against a solution for export-related leakage. While the CBAM levels the economic playing field on the EU internal market, its current design – covering only imports – does not address potential distortions of competition between EU exports and foreign products sold on foreign markets. The controversy around a solution for export-related leakage centers around this issue.

Stakeholders covered by the CBAM view export provisions as crucial. As explained in Section 2.1 above, and as suggested in greater depth in Section 4 below, having no solution for exports would lead to a competitive disadvantage for EU producers, and the effect could be further increased by lower capacity utilization levels, seasonality, and global excess capacity. The loss of EU market share could in turn have a negative impact on global CO_2 emissions as EU products often have lower carbon intensity than their global competitors.

Other stakeholders have expressed concerns, not necessarily accurate or generally accepted, about the impact of export provisions on EU climate policy ambition, arguing that it would not be coherent with the EU's ambition to encourage higher climate ambition globally. Another common argument against a solution for exports was the heightened risk of its incompatibility under the WTO law system. However, this can only be definitely determined after the introduction of the CBAM and a formal assessment in the WTO dispute settlement mechanism.[8]

When Ursula von der Leyen initially introduced the CBAM in her European agenda in July 2019, there was no reference made to EU exports. Early in the process when several designs were still being considered there was a discussion about export provisions, and the impact of a CBAM design with and without export provisions was assessed by the European Commission in its Impact Assessment, showing that an import-only solution would be less effective in reducing overall leakage rates.[9] Still, solutions for export-related leakage were seen as counterproductive to mitigation efforts and damaging to the EU's climate ambition. Early references to exports were also contained in the European Parliament resolution adopted on March 10, 2021, and in the preceding opinion of the Committee on Economic and Monetary Affairs.

In June 2022 the European Parliament's position going into trilogues stated that it would create a solution for export-related leakage in the form of continued free allocation, and that the Commission should produce a report on solution for export-related leakage, adding a potential legislative proposal for changes to ensure WTO-compatibility. A potential option highlighted as one of the options to be examined was to have the export solution focus on the 10% most efficient installations.

The Council's trilogue position did not include any provision that provided a solution for exports but encompassed a suggestion that would mandate the Commission to report on the application of CBAM, including its impact on carbon leakage concerning exports, before January 1, 2026, and every two years thereafter.

After the trilogues, a version of the Council's position was used that added a reference to the Commission's review of exports, but changed the year to January 2028 and every two years thereafter; no further solution for exports was added to the final version of CBAM that was adopted on May 10, 2023.

Before 31 December 2024, the Commission has to assess the carbon leakage risk for goods subject to CBAM and produced in the EU for export to third countries under a provision in the EU ETS. More recently, a reference to exports was also included in the Commission's communication for a 2040 climate target stating that "[a]s the EU is leading in decarbonizing its industry, additional measures are needed to ensure competitiveness of European exports on global markets."

[8] For in-depth discussion of the legal implications of mechanisms to address export-related leakage, see Andrei Marcu et al., *Treatment of Exports in the EU CBAM*, 2022, https://ercst.org/wp-content/uploads/2022/03/20220318-Exports-Report-CBAM-1.pdf.
[9] European Commission, Commission Staff Working Document, Impact Assessment Report Accompanying the Document Proposal for a Regulation Establishing a Carbon Border Adjustment Mechanism, SWD(2021) 643 final.

3. Competing in the Global Marketplace: An Evolving Context

3.1. Recent Developments in Global Markets for CBAM-Covered Goods

Since the EU CBAM design – with a scope that is limited to imported goods – was first outlined in the legislative proposal of July 2021, the global market for covered products has undergone significant shifts. This section delves into the interplay of market forces reshaping the competitive landscape for these products, with a particular focus on the repercussions for European producers of iron and steel, aluminium, cement, and fertilizers exporting into global markets. Overall, the global market for most basic commodities is undergoing a broader transformation, characterized by intensified competition, fluctuating production capacities, and shifting pricing landscapes.

European producers of the categories of goods included in the scope of the CBAM face the dual pressures of maintaining competitiveness while achieving rapid and deep decarbonization. Competition from foreign producers located in countries with lower production costs and less stringent climate policy objectives introduces a growing discrepancy in production costs, notably in the costs of energy inputs, which is being exacerbated by the growing cost of carbon and substantial investments European producers are already allocating to the reduction of greenhouse gas emissions in line with ambitious European mitigation targets. At the same time, confronted with worsening geopolitical tensions in its neighborhood, the EU has also taken the political decision to secure domestic production capacities of many strategic goods in order to reduce supply chain dependencies.

Implementation of the CBAM will influence these dynamics, albeit with varying implications across different sectors. Historically dominated by European producers, for instance, the iron and steel sector is contending with excess capacities on a global scale, leading to price volatilities and eroding profit margins for European producers. According to OECD data, a persistent trend of expanding production capacities (see Figure 8) has resulted in a record gap between global capacity and crude steel production of 627.7 million metric tonnes in 2022.[10] With declining steel demand and a weak outlook, this expansion of production capacities concentrated in a limited number of countries and driven less by market forces than by aggressive government intervention and pricing strategies aimed at capturing export markets.

China has led this trend, accounting for over half of global crude steel production in 2022 and a steel production capacity that has grown by 735% since 2000,[11] exceeding demand growth in China itself. Other emerging economies in South and Southeast Asia as well as the Middle East

[10] OECD, *Latest Developments in Steelmaking Capacity 2023* (Paris: OECD, 2023), https://www.oecd.org/industry/ind/latest-developments-in-steelmaking-capacity-2023.pdf.
[11] World Steel Association, *2023 World Steel in Figures* (Brussels: World Steel Association, 2023), https://worldsteel.org/wp-content/uploads/World-Steel-in-Figures-2023-4.pdf.

have likewise seen a dramatic expansion of their steel and aluminium industries, however, and even less developed regions such as Africa have recently experienced growth in production capacities, often as a result of outward capacity investments by Chinese companies. A historically high number of trade defence measures initiated by the EU against foreign producers reflect these challenging market conditions, yet have been unable to contain rapidly growing steel imports and declining market shares.

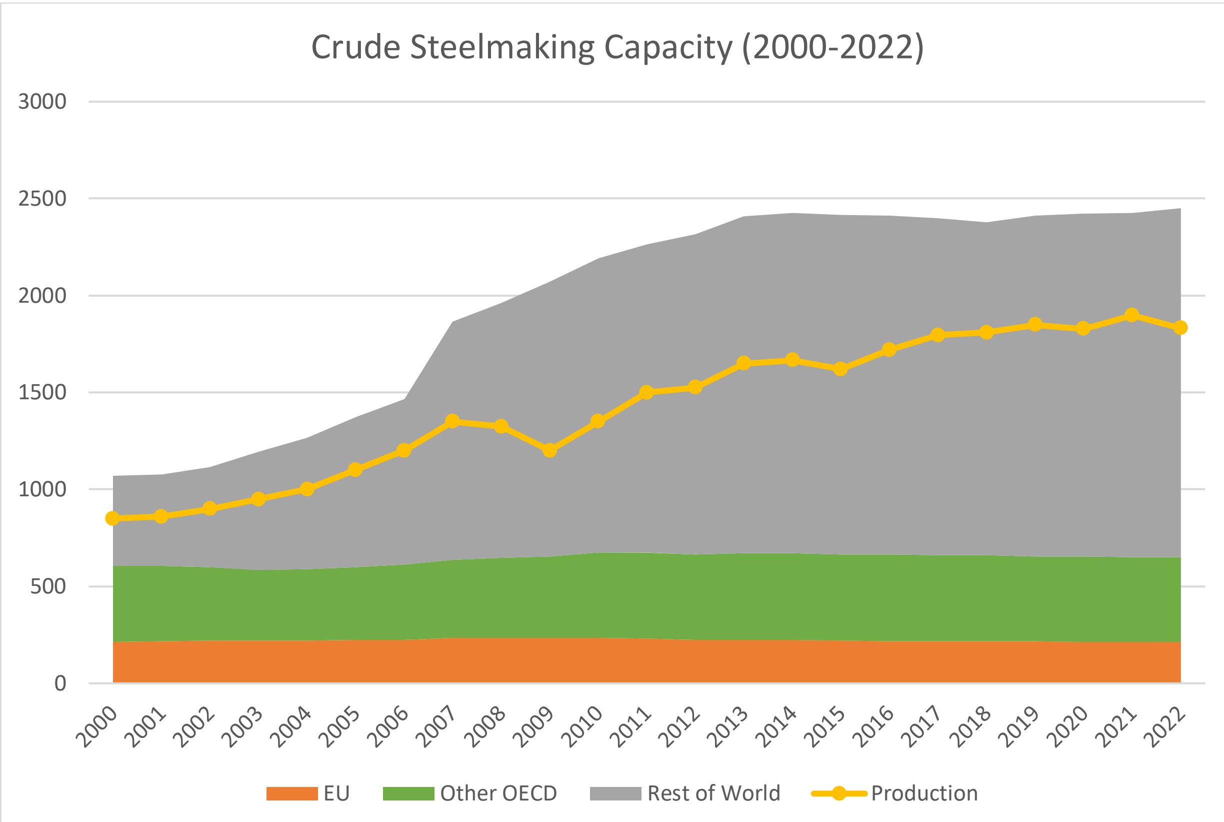


Figure 8: Nominal Crude Steelmaking Capacity, 2000-2022 (data: OECD, 2023)

Similarly, European aluminium producers face mounting challenges as they strive to maintain their foothold in the global market. Although the demand outlook is more favorable in the sector, driven in part by expanding deployment of low-carbon technologies, the high electricity intensity of production and high electricity costs – with industrial users in Europe facing costs that are, on average, more than twice as high as those faced by competing producers abroad (see *Figure 9*)[12] have significantly eroded the competitiveness of European producers.

Due to the price discovery mechanism in European wholesale electricity markets, which reflects the carbon intensity of the marginal producer in the merit order, as well as some degree of cost

[12] Vereinigung der Bayerischen Wirtschaft e. V., *Internationaler Energiepreisvergleich für die Industrie* (Munich: vbw, 2023), https://www.vbw-bayern.de/Redaktion/Frei-zugaengliche-Medien/Abteilungen-GS/Wirtschaftspolitik/2023/Downloads/vbw-Studie_Internationaler-Energiepreisvergleich_Oktober-2023.pdf.

pass-through between interconnected regional power grids, moreover, the carbon costs associated with electricity consumed for aluminium production are substantial even for producers largely drawing their power from carbon-free sources. As with steel, the global aluminium market is experiencing overcapacity, primarily driven by output from China. China accounts for almost 60% of global primary aluminium production, with output growing by 1440% since 2000,[13] while the European aluminium industry has lost more than 30% of its primary production capacity in that period.[14]

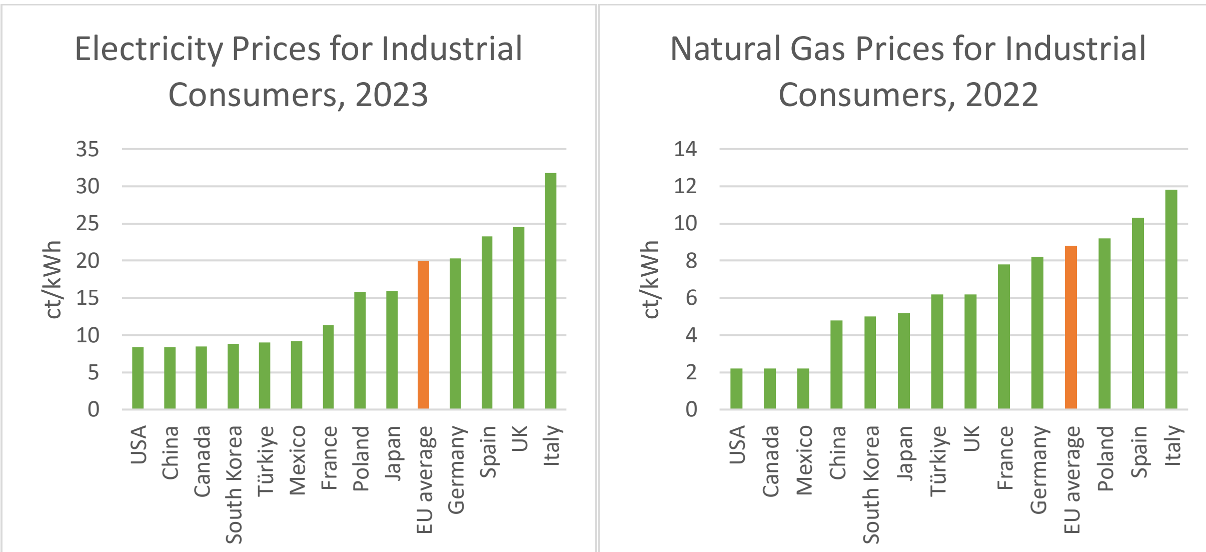


Figure 9: Electricity (2023) and Natural Gas (2022) Prices for Industrial Consumers (data: vbw/Prognos, 2023)

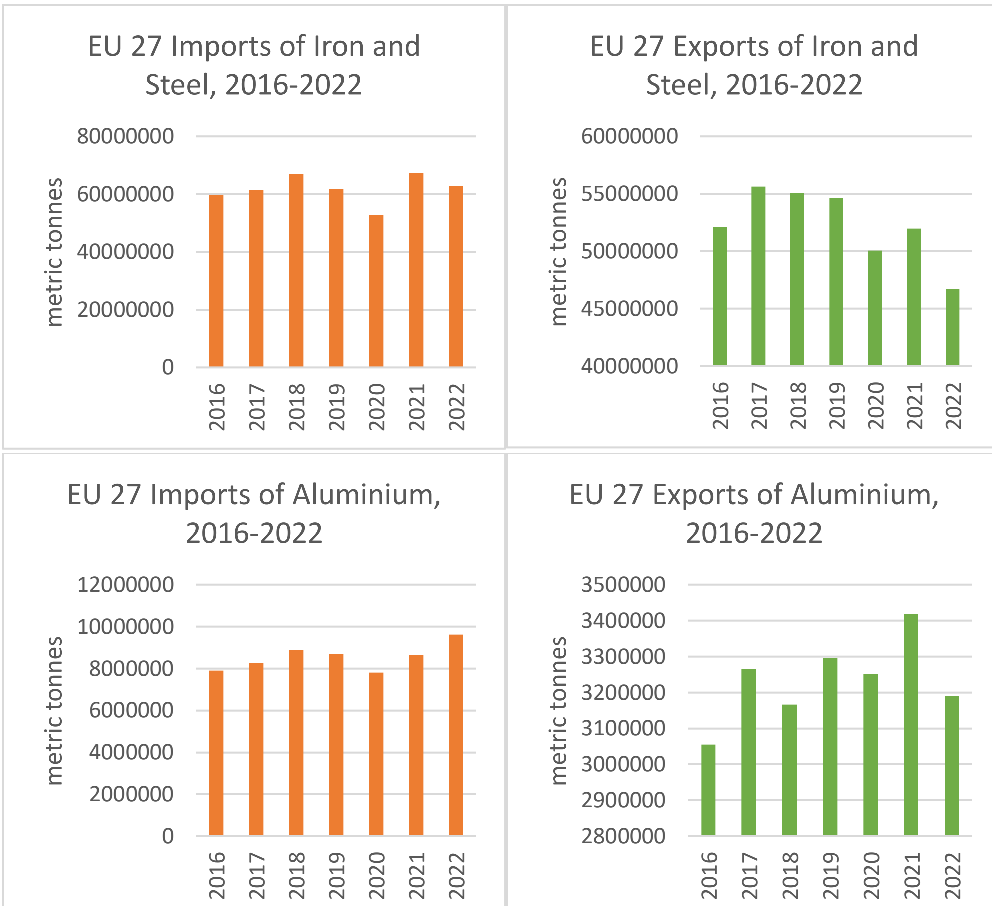
Fertilizer production is also highly energy intensive, relying on natural gas for the production of precursors such as hydrogen, a key ingredient in nitrogen-based fertilizers. Volatility of natural gas prices in Europe and a dramatic increase following the Russian invasion of Ukraine and attendant supply constraints (see *Figure 9*) have had a direct impact on production costs. Meanwhile, a rapidly decreasing allowance supply under the EU ETS – the effect of which is estimated in Section 4 – as well as other tightening climate constraints are applying increased pressure on European fertilizer producers to decarbonize both their production processes and the lifecycle emissions of their products, including emissions of nitrous oxide, a potent greenhouse gas.

European cement producers likewise face a significant decarbonization challenge due to their high energy consumption and carbon-intensive production process, including process emissions from

[13] International Aluminium Institute, "Primary Aluminium Production", 2023, https://international-aluminium.org/statistics/primary-aluminium-production.
[14] European Aluminium, "Draft Council Regulation on an emergency intervention to address high energy prices", 2022, https://european-aluminium.eu/wp-content/uploads/2022/10/2022-09-27-european-aluminium-proposals-on-draft-council-regulation-on-high.pdf.

the calcination of limestone, which is a major source of CO_2 emissions. Due to the weight and low-value nature of cement, the cement industry faces higher transportation costs and a lower trade intensity than the other commodities discussed in this section. Still, for individual producers along the EU external borders and near major ports, selling into foreign markets has historically offered an important source of revenue.

Across the foregoing product categories, increased operating costs have either contributed to a decline in exports, a rise in imports, or a combination of both in recent years, illustrating the challenging economic context European producers currently face in their respective markets. These trends are particularly evident in the fertilizer and cement sectors (see Figure 10).



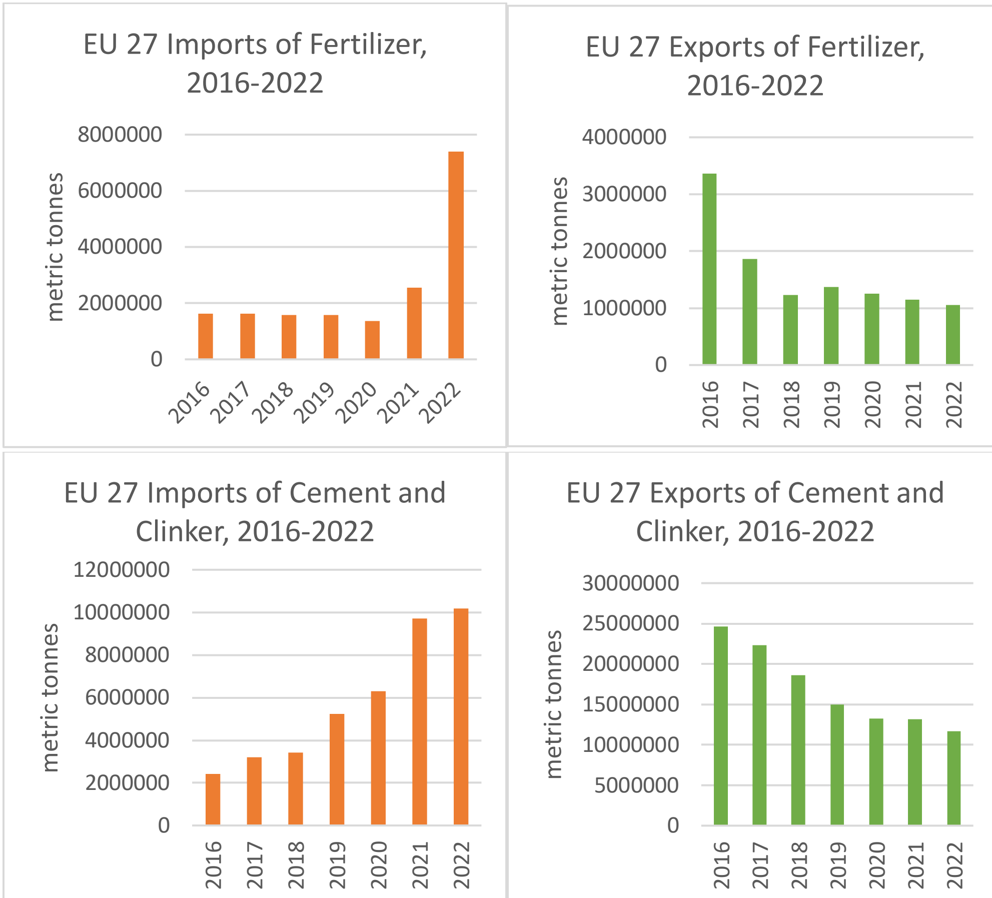


Figure 10: EU 27 Imports and Exports of Iron and Steel (HS2 Codes 72 and 73), Aluminium (HS2 Code 76), Nitrogenous Fertilizers (HS4 Code 3102) and Cement and Clinker (HS4 Code 2523), 2016-2022 (data: Eurostat, 2024)

Aggressive competition and unfair trade practices from foreign trade partners, substantial excess production capacities around the globe, energy costs that – despite recent stabilization – are persistently higher in Europe than they are in competing jurisdictions, and stagnating demand from some major consumers such as the Chinese construction sector, are all contributing to reduced profit margins and capacity utilization levels for European producers. At the same time, the ambitious decarbonization timelines set out under the European Green Deal require the urgent deployment at scale of transformative technologies, such as the use of low-carbon hydrogen as a reducing agent in steel manufacturing, electrification of industrial processes, or carbon capture and storage (CCS) solutions, which still command a considerable premium over conventional production processes.

Doing so, in turn, will require significant investments, which, given the foregoing trends and uncertainties about future energy and raw material costs in Europe, the adequacy of policy solutions such as the CBAM and the proposed Net-Zero Industry Act, and climate policy trajectories and production costs in competing jurisdictions, are proving difficult to justify. Instead, a growing number of European producers are already facing reduced production volumes, or in more drastic cases, shuttering production facilities altogether.[15] The cumulative effect of these challenges is a precarious position for European producers, who must navigate a tightrope of remaining financially viable while investing in the future-proofing of their operations against the backdrop of an increasingly competitive global marketplace in which domestic investments in decarbonization may not provide the necessary returns.

3.2. The Urgency of Action: Policy Certainty for the Next Investment Cycle

Addressing emissions leakage and competitiveness risks for European exporters of goods covered by the CBAM goods is a matter of urgency as implementation progresses to the definitive period beginning in 2026, when free allocation begins its phase out schedule. One reason for this urgency stems from the pending decisions on substantial investments in affected sectors across Europe. As these decarbonize in line with the mitigation targets and timelines set out in the European Climate Law and international commitments, they will be unable to take recourse to gradual or incremental modernization of existing production processes and methods.

In many cases, such as steel and cement, only a transition to altogether different technologies will align with the decarbonization ambition of the EU, foreshadowing a new wave of investment in these sectors. Additional urgency in some sectors stems from parallel policy developments and timelines. For instance, for imports of certain steel products, safeguard measure that are currently in place to prevent economic damage to European steel producers and take the form of tariff-rate-quotas (TRQs) above which a 25% duty is levied on imports are set to expire at the latest by 30 June 2026, just as the CBAM definitive period begins and the decline of free allocation starts to accelerate.[16]

Given this impending transformation, European industry stands at a crossroads. Within less than a decade, many incumbent facilities will no longer be economically viable as the overall supply of allowances under the EU ETS rapidly decreases. Whether European exports receive any leakage protection will influence future investment decisions, determining whether investments in Europe are channeled into new ultra-low-carbon installations or redirected to regions offering more favorable conditions for production and investment, including less stringent environmental constraints. As this upcoming investment cycle unfolds, the direction taken will not only shape the immediate future of the industries already covered by the CBAM, but also set a precedent for additional sectors poised for inclusion.

[15] See, for instance, the development of industrial emissions in Germany during 2023, with a 12 percent emissions drop compared to the previous year mostly attributed to declining industrial output due to stagnating demand and high input costs, Agora Energiewende, *Die Energiewende in Deutschland: Stand der Dinge 2023. Rückblick auf die wesentlichen Entwicklungen sowie Ausblick auf 2024*, 2024, https://www.agora-energiewende.de/fileadmin/Projekte/2023/2023-35_DE_JAW23/A-EW_317_JAW23_WEB.pdf.
[16] European Commission, "EU to decide on steel safeguard extension", 9 February 2024, https://policy.trade.ec.europa.eu/news/eu-decide-steel-safeguard-extension-2024-02-09_en.

Already, anticipated spillover effects under the CBAM have increased pressure to expand its scope horizontally by including additional sectors, and vertically by extending it further downstream in the value chain. As of now, there has been insufficient analysis of the economic impacts of the CBAM – let alone one with an expanded horizontal and vertical scope – in the absence of a solution for leakage in relation to exports. Providing policy clarity and ensuring a level playing field for European producers competing in global markets therefore acquires importance beyond existing CBAM sectors. Having such certainty would offer the much-needed assurance to commit to investments within Europe, fostering innovation, technological advancements, and the adoption of transformative production methodologies.

4. Exports of CBAM-Covered Goods: A Vulnerability Assessment

The previous section makes it clear that CBAM-covered sectors in the EU face headwinds from a variety of directions, with the costs of the ETS being one element, but not the only significant element. This section tries to isolate the costs of the ETS from that broader picture, estimating the extent to which—in the absence of any sort of mechanism for export rebate—ETS reform and CBAM impact the ability of EU industry to compete on international markets.

To do so, we focus on two representative products. From the iron and steel sector we choose a specific variety of cold-rolled steel, and from the fertilizers sector we choose calcium ammonium nitrate (CAN). Both are covered under CBAM, are internationally traded products of their respective sectors, and are the subject of significant EU exports.

4.1. Iron and Steel

We choose to look at CN code 7209 (*Flat-rolled products of iron or non-alloy steel, of a width of 600 mm, cold-rolled "cold-reduced", not clad, plated or coated*). In the EU, this product is mostly produced from primary steel from blast furnace-basic oxygen furnace processes. This is just one of many CBAM-covered iron and steel products, but we use it as a representative indicator of potential impacts.

In the table below we estimate out to 2034 to what extent the costs of this group of products produced in the EU would exceed world prices. Being internationally traded products means that EU producers are, to a large extent, price takers in global markets, and any significant cost premium over world prices would translate into lost markets or economic losses for the producers involved.

As shown in table 4.1, under reasonable assumptions producers of this product would feel only marginal impacts in the early years of ETS reform and the ramp down of free allocation/ramp up of CBAM. But by 2030, cost increases would be enough to translate into real impact, with premiums of 18% over global prices. By 2034, when the CBAM takes full effect, those premiums would be 35%. At rates of difference like this, we can confidently say there would be no export markets for the products involved.

	free allocation[1]	free allocation after CBAM Factor	EUA price[2]	GHG intensity[3]	Cost of C	Global price	Premium over world price[4]	Premium over world price[4]
	tonnes C per tonne crude steel		*€ per tonne C*	*tC per t crude steel*	*€/tonne crude steel*	*€ per tonne*	*€ per tonne*	*percentage*
2024	1.462	1.462	65	1.95	32	700	0	0
2025	1.462	1.462	92	1.92	43	700	11	2%
2026	1.318	1.285	99	1.90	61	700	29	4%
2027	1.300	1.235	107	1.87	68	700	36	5%
2028	1.282	1.154	116	1.84	80	700	49	7%
2029	1.264	0.980	125	1.82	105	700	73	10%
2030	1.247	0.642	135	1.79	155	700	124	18%
2031	1.216	0.474	143	1.75	183	700	151	22%
2032	1.187	0.314	152	1.71	212	700	180	26%
2033	1.158	0.162	161	1.67	242	700	210	30%
2034	1.129	0.000	169	1.63	275	700	244	35%

Table 4.1: Impacts of carbon price in cold-rolled steel (CN 7209)

Note: *All EUR figures expressed in 2023 EUR, except Cost of Carbon, in 2022-2023 EUR.*
1: *Benchmarks for 2024 and 2025 based on benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS, using benchmarks for coke, sinter and hot metal in proportion to their contributions to cold-rolled steel. 2026 is an industry estimate for the 2026 equivalent. 2027 - 2030 assumes annual reductions in the 2026 benchmark at the mid-point between maximum assumed improvement and minimum assumed improvement for phase 4: 1.4%. 2027 - 2034 assumes a higher rate of improvement, using the maximum assumed rate for 2026 - 2030: 2.6%.*
2: *EUA price for 2024 current as of March; for 2025-2030: average of projections by 6 models, per Pahle et al. 2023; for 2031 to 2034: straight-line projection from 2025-2030.*
3: *Base figure (2024, before adjustment) from JRC 2023 Technical Report:* GHG emission intensities of the steel, fertilizers, aluminum and cement industries in the EU and its main trading partners. *Improvement from 2025 - 2030 is estimated at the mid-point between maximum assumed improvement and minimum assumed improvement for phase 4: 1.4%. 2027 - 2034 assumes a higher rate of improvement, using the maximum assumed rate for phase 4: 2.6%.*
4: *Current and future production costs are estimated by assuming that 2024 rate of profit is 5% at world prices, and that production costs are constant (in 2023 EUR) out to 2030.*

4.2. Calcium Ammonium Nitrate (CAN)

CAN is a processed standard blend of fertilizer primarily derived from ammonia and nitric acid, both of which have benchmarks under the ETS. In the common nomenclature it falls under 3102: *mineral or chemical fertilizers, nitrogenous*. Like cold-rolled steel it is just one of many CBAM-covered products of the fertilizers sector, but we use it as a representative indicator of potential impacts. In order to estimate the cost increases from ETS reform/CBAM implementation for this product we broke it down into the amount of ammonia and nitric acid needed to produce the final product. As shown in table 4.2, the results are similar to what we found in the iron and steel sector: in the initial years of the phase out of free allocation and phase in of CBAM there are only marginal impacts. But by 2030 there is a cost premium over world prices of 27%, and by 2034 that increases to 49%. As in the iron and steel sector, we conclude that this translates into essentially an extinction of global markets for this product.

But each sector under the CBAM has its own characteristics that translate into different sorts of impact. In the fertilizers sector, as noted above, sales only take place during growing season, which in the EU is the northern hemisphere's summer months. In order to keep plants running at a viable capacity, this is a sector that has to export during the northern hemisphere's winter months. In other words, losing the winter month exports would not just mean losing some sales and profits in export markets; it would actually impair the viability of operations overall.

	free allocation[1]		free allocation after CBAM Factor		EUA price[2]	GHG intensity CAN[3]		Cost of C	Global price	Premium over world price[4]	Premium over world price[4]
	tonnes C per tonne nitric acid	*tonnes C per tonne Ammonia*	*tonnes C per tonne nitric acid*	*tonnes C per tonne Ammonia*	*€ per tonne C*	*tC per t NH3*	*tC per t NA*	*€/tonne CAN*	*€ per tonne*	*€ per tonne*	*percentage*
2024	0.230	1.570	0.230	1.570	65	1.98	0.77	30	260	0	0
2025	0.230	1.570	0.230	1.570	92	1.95	0.76	41	260	11	4%
2026	0.150	1.522	0.146	1.484	99	1.93	0.75	51	260	21	8%
2027	0.148	1.501	0.141	1.426	107	1.90	0.74	56	260	26	10%
2028	0.146	1.480	0.131	1.332	116	1.87	0.73	63	260	33	13%
2029	0.144	1.460	0.112	1.131	125	1.85	0.72	76	260	46	18%
2030	0.142	1.440	0.073	0.741	135	1.82	0.71	100	260	70	27%
2031	0.138	1.405	0.054	0.548	143	1.78	0.69	114	260	83	32%
2032	0.135	1.370	0.036	0.363	152	1.73	0.67	128	260	97	37%
2033	0.132	1.337	0.018	0.187	161	1.69	0.66	142	260	112	43%
2034	0.129	1.304	0.000	0.000	169	1.65	0.64	158	260	128	49%

Table 4.2: Impact of carbo price in calcium ammonia nitrate (CAN)

Note: *All EUR figures expressed in 2023 EUR, except Cost of Carbon, in 2022-2023 EUR and Global Price in 2024 EUR.*
1: Benchmarks for 2024 and 2025 based on benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS, using benchmarks for ammonia and nitric acid in proportion to their contributions to CAN. 2026 is an industry estimate for the 2026 equivalent. 2027 - 2030 assumes annual reductions in the 2026 benchmark at the mid-point between maximum assumed improvement and minimum assumed improvement for phase 4: 1.4%. 2027 - 2034 assumes a higher rate of improvement, using the maximum assumed rate for phase 4: 2.6%.
2: *EUA price for 2024 current as of March; for 2025-2030: average of projections by 6 models, per Pahle et al. 2023; for 2031 to 2034: straight-line projection from 2025-2030.*
3: *Base figure (2024, before adjustment) from JRC 2023 Technical Report:* GHG emission intensities of the steel, fertilizers, aluminum and cement industries in the EU and its main trading partners. *Improvement from 2025 - 2030 is estimated at the mid-point between maximum assumed improvement and minimum assumed improvement for phase 4: 1.4%. 2027 - 2034 assumes a higher rate of improvement, using the maximum assumed rate for phase 4: 2.6%.*

4: *Current and future production costs are estimated by assuming that current rate of profit is 5% at world prices, and that production costs are constant (in 2023 EUR) out to 2030.*
4*: EUA price for 2024 current as of March 2024; for 2025-2030: average of projections by 6 models, per Pahle et al. 2023; for 2031 to 2034: straight-line projection from 2025-2030.*

4.3. Key Assumptions

In deriving the figures shown in the figures above, we have had to make a number of important assumptions that affect the final results.

4.3.1. ETS Allowance Price

The carbon price will matter a great deal to the costs we are estimating. For estimates going out to 2034 we start with an exercise that gathered together six sets of estimates from different modelling groups, taking the average of those estimates.[17] Those only go to 2030, however, so for the following four years we use a straight-line projection based on those preceding data. All figures are expressed in 2022-2023 Euros.

As an illustration of the sensitivity of our estimates to the price of ETS allowances, if we stopped the progression at the 2030 estimates (€135/tonne) rather than using the straight-line progression (which yields a 2034 estimate of €169/tonne), the resulting premium over world prices in 2034 for cold-rolled steel would be 27%, rather than 35%.

4.3.2. World Prices

Our assumptions about world prices in both goods are also significant; the higher we assume world prices will be, the less the EU carbon costs will matter. For the price of cold-rolled steel we use €700/tonne, which is approximately the ten-year average. For the price of CAN we use Eurostat data to approximate a ten-year average based on volumes and values recorded for imports and exports over that period (adjusted to 2024 Euros).

As an illustration of the sensitivity of our estimates to world prices, if instead of €260.24 we used the ten-year high price – the December 2022 spike at €610.32 – the resulting premium over world prices in 2034 for CAN would be 21%, rather than 49%. That is, more than doubling the global price would more than half the premium.

4.3.3. Cost of Production

We have had to build an estimated cost of production for both sectors. The higher these are, other things being equal, the more impact the cost of carbon will have. In the absence of detailed cost of production data for the two goods—which is not publicly available—we have built a cost of

[17] Pahle, Michael, Joanna Sitarz, Sebastian Osorio, Benjamin Görlach, Patricia Merschel, and Lewis Unstead. *MSR through 2030: impact on market liquidity and considerations for the 2026 reform Input material and takeaways from a workshop in Brussels*. December 6, 2023. Kopernikus-Projekt Ariadne.

production proxy, using the global price for both goods and assuming that in 2024 at that price and paying the prevailing cost of carbon, the average EU producer is making 5% profit. In our calculation of premium over world prices, we assume costs of production and the need for that level of profit will remain constant out to 2034 (in 2023 EUR).

This is a conservative set of assumptions. In fact, if installations invest in the capital to lower GHG intensity (and we assume that they do), the amortized costs of those investments are likely to increase production costs.

4.3.4. Rate of Improvement in GHG Intensity

Our starting rate of assumed GHG intensity is derived from a technical report prepared by the Commission's Joint Research Centre, on the GHG intensity of four CBAM-covered sectors.[18] We assume that the installations producing these two goods will show improvements in GHG intensity out to 2034. From 2027 – 2030 we use an annual rate of improvement of 1.4% -- the mid-point between maximum and minimum assumed rates of improvement used by the Commission in establishing the phase 4 benchmarks.[19] For 2031 – 2034, we assume a more ambitious rate of improvement, using the maximum phase 4 assumed rate.

A higher rate of improvement would reduce the impacts of any given level of EU allowance prices. As an illustration of the sensitivity of our estimates to the assumed rate of improvement, if we assumed no improvement whatsoever in cold-rolled steel production, the resulting premium over world prices in 2034 for those goods would be 43%, rather than 35%.

4.3.5. Summary

The assumptions that we have had to make mean that our estimates are necessarily illustrative, and are not conclusive predictions with respect to either those two sectors or other covered sectors under CBAM. However, that illustration strongly suggests significant impacts for CBAM covered sectors by 2034 and earlier. Moreover, none of our assumptions by themselves seem to be so critical that changing them within reasonable boundaries would deliver fundamentally different results.

According to our assessment, the two goods for which we generated estimates would struggle to compete in world markets even by 2030, but would certainly lose any export markets by 2034, given the global nature of those markets. The markets for all CBAM covered sectors (other than electricity, and perhaps hydrogen) have the same global aspects, and while our analysis cannot say with certainty, it suggests that they might all face the same sorts of fundamental risks. At a

[18] Vidovic, Danko, Alain Marmier, Lovro Zore and Jose A. Moya. *Greenhouse gas emission intensities of the steel, fertilizers, aluminum and cement industries in the EU and its main trading partners*. Publications Office of the European Union, Luxembourg, 2023. doi:10.2760/359533, JRC134682.
[19] DG CLIMA. 2021. *Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS: Benchmark curves and key parameters* (final version issued on 15 June 2021).

minimum it suggests that in-depth analysis is urgently needed to further explore the questions we have explored here.

We noted that in fertilizer markets, the lack of exports combined with seasonality of demand and low storage capacity means that the manufacturing installations probably cannot operate at an economically viable rate of capacity. To a different extent this is also true of sectors such as iron and steel that do not face seasonality of demand. As noted above, below a certain level of capacity utilization, industrial installations are not viable; the OECD has suggested, for example, that capacity utilization rates of below 75% in steel production are not economically viable.[20] And while we don't have data to show what that level is for each sector, a complete loss of export markets certainly pushes some installations closer to those limits, if not past them.

5. Takeaways

The analysis above leads us to a number of conclusions. It is clear that exports have been, and will continue to be an important component of the EU economy, in some cases concentrated in specific sectors, installations or geographical regions.

European exports of goods covered by the CBAM matter both economically and for effective climate action: they are highly relevant for the business case of affected producers, and their substitution in international markets by more carbon-intensive goods would increase global emissions.

Due to a variety of factors, including high input costs, excess production capacities, and aggressive market interventions by trade partners, European producers already face harsh competition in these export markets, with recent years evidencing a rise in imports and a decline in exports in many affected sectors. A calculation of the impact of rising carbon costs on two product categories as free allocation is gradually phased out suggests that, absent additional support, European products will altogether become unable to compete in global markets.

We can also conclude that the importance of exports goes beyond simply incremental questions of market share and international presence, but also impacts the overall viability of producers, given that a certain capacity utilization factor is necessary for installations and enterprises to remain in business.

CBAM, the new approach adopted by the EU to address the risk of carbon leakage, will address – albeit imperfectly – this risk for the domestic market. However, it does not currently have a provision that will extend that protection to exports, and as such puts at risk a significant segment of EU industry. The review mandated in the EU ETS directive to assess the carbon leakage risk

[20] OECD, Latest Developments in Steelmaking Capacity 2023 (Paris: OECD, 2023), https://www.oecd.org/industry/ind/latest-developments-in-steelmaking-capacity-2023.pdf.

for goods subject to the CBAM in relation to exports therefore has great significance if it is to underpin the viability and public acceptance of the European Green Deal.

Our analysis above shows clearly that all sectors are affected, albeit not equally and not in the same fashion, by the export challenge. In addition, the impact is not limited to the economic sphere, but it affects the environmental outcome. EU producers are in many areas better performers when it comes to GHG intensity, and they compete in the global market with producers that are worse performers. Limiting EU exports will impact environmental delivery and the goal of CBAM is not limited to products that enter the EU, but aims at lowering global GHG emissions.

The review mandate that has prompted this report states that the European Commission shall conduct this review as part of its annual EU ETS market functioning report to the European Parliament and Council pursuant to Article 10(5) of the EU ETS Directive. That report is a report that is annually conducted on a routine bases by the European Commission, and contains important information on the state of the EU ETS. However, reviewing the carbon leakage risk in relation to exports is a special task that was assigned to this report, and it therefore requires special attention, including a clearly defined process and distinct visibility. It cannot and should not be simply another chapter in a routine annual report.

In order to ensure visibility, it should have its own process and stakeholder consultations, and should call on the affected sectors to prepare and provide information, preferably through a public forum, in a hearing-like format, to the degree allowed for by EU governance. In assessing the carbon leakage risk, we urge the European Commission to be dynamic and not only look at historical information and trends on cost and carbon leakage. While past developments are a valuable source of information to understand future trends, given the precipitous market and policy developments in the last several years it may not be sufficient. In this case, the move from free allocation to the CBAM has created a totally new dynamic and cost structure, and future trends need to be considered in light of this information. The findings should be presented in draft form and opened for discussion and challenge by all stakeholders.

It must also be recognized that this issue will only gain in importance as additional evidence continues to accumulate not only regarding the importance of exports and their environmental impact, given the superior environmental performance of EU industry in many cases; but also as the issue of exports under the CBAM sectors expands horizontally and vertically to additional sectors and across value chains. Hence, despite the wording of Article 10a(1a) of the revised EU ETS Directive, which states that the "Commission shall assess the carbon leakage risk *for goods subject to CBAM*" (emphasis added), the review should also assess export-related leakage risks for product categories in other sectors and in downstream value chains to which the CBAM may eventually be extended.

Similarly, despite the mandate to assess such leakage risks for European exports "to third countries *which do not apply the EU ETS or a similar carbon pricing mechanism*" (emphasis added), the assessment should also encompass exports to countries such as China, which have a carbon price on relevant products, but with significant differences in the design and governance of carbon pricing systems.

As a simple illustration, there is increased discussion about the inclusion of agriculture in an ETS and the natural solution of a CBAM to protect against the risk of carbon leakage. Agriculture is a significant element of the EU economy, with a significant export component, and not providing an export solution would simply not work.

At the same time, it can be expected that, as sectors increase in sensitivity and visibility, some type of challenge will be forthcoming to the CBAM in international for a such as the World Trade Organization (WTO) or the United Nations Framework Convention on Climate Change (UNFCCC). In our earlier report, we already outlined a solution to address export-related leakage under the CBAM that seeks to minimize legal risks and political frictions.[21]

Finally, the work to undertake this review will be complex and will necessitate making assumptions. We urge full transparency regarding both data and assumptions underlying the assessment of carbon leakage risk related to exports, so that all stakeholders can interact and provide active and valuable input to the upcoming debate.

[21] Andrei Marcu et al., Treatment of Exports in the EU CBAM, 2022, https://ercst.org/wp-content/uploads/2022/03/20220318-Exports-Report-CBAM-1.pdf.

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