

User Guide to the CBAM Simulator

Explore Trade Impacts and Policy Responses Through Interactive Visualisations

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Introduction: Understanding CBAM through exploration

The CBAM Simulator was developed to help stakeholders, especially from non-EU countries, understand the potential implications of the EU Carbon Border Adjustment Mechanism (CBAM) and explore how different national strategies may influence outcomes.

This tool is not designed to forecast specific costs, but rather to provide a flexible, interactive environment where users can simulate scenarios, apply filters, and compare the effects of policy choices on trade flows and carbon-related costs.

All simulations are based on 2023's trade volumes, assuming these volumes will remain constant over time.

The Simulator is designed to illustrate possible evolutions of the CBAM and responses to it by third countries.

Through interactive visualisations, users can:

- Quantify CBAM exposure at country and sector levels.
- Explore response scenarios by third countries, like the introduction of domestic carbon pricing or resource shuffling.
- Combine different scope extensions to measure their impacts.
- Compare response scenarios by third countries.

By providing multiple metrics and scenarios, the Simulator enables governments, analysts, and exporters to test pathways toward low-carbon trade competitiveness.

Getting started: indicators, filters and navigation

List of indicators available in the tool

- Net CBAM Costs (€mn): CBAM fees minus estimated revenue gains due to EU price increases (see explanation below).
- Net CBAM Costs / Value of all traded goods: Net costs as a share of total EU-traded exports.
- CBAM Fees (€mn): Total CBAM fees on CBAM covered goods.
- CBAM Fees / Value of all traded goods: Share of CBAM fees in overall exports to the EU.
- Value of traded CBAM goods (€mn): Annual trade in CBAM-covered products.
- Value of all traded goods (€mn): All goods exported to the EU, CBAM-covered or not.

At the top of the interface, you will find the main filters, which drive how data is displayed across all charts:

Available filters

Partner reactions

- Business-as-Usual: No strategic adjustment by exporting country. The emissions intensity of goods sold to Europe is taken as the country's average.
- Resource Shuffling: Exporters prioritise lower-carbon products for EU markets, such as:
 - Steel goods made using electric arc furnaces (EAF) and higher contents of scrap.
 - Aluminium goods made of higher contents of remelted scrap.
 - Cement products with lower clinker content, and cement rather than clinker.
 - Goods made using higher amounts of green electricity.
- Introduction of Carbon Pricing: Exporting country implements domestic carbon pricing at 25%, 50%, or 75% of the EUA price.

Non-EU carbon price

Sets simulated carbon pricing for the carbon pricing scenario (25%, 50%, or 75% of EUA price). Only active under the relevant scenario.

Scope extensions

- Current Scope: The goods covered by the CBAM are summarised in the table below.

Product category	Products
Aluminium	Unwrought aluminium, aluminium powders and flakes, and all kinds of aluminium products (including bars, rods, wires, plates, sheets, foils, tubes and pipes, tube and pipe fittings, structures, reservoirs, tanks, casks, drums, cans, boxes, other containers, and cables)
Chemicals	Hydrogen
Cement	Cement clinkers, white Portland cements, other Portland cements, aluminous cements, other hydraulic cements, other kaolinic clays
Electricity	Electrical energy
Fertilisers	Nitric acid, sulphonitric acids, urea, ammonia (anhydrous or in aqueous solutions), nitrates of potassium, mixed fertilisers (nitrogenous mineral and chemical fertilisers, and other fertilisers containing nitrogen, phosphorus and/or potassium)
Iron and Steel	Agglomerated iron ores and concentrates (other than roasted iron pyrites), pig iron, ferrous products obtained by DRI and other spongy ferrous products, crude steel, and all kinds of iron and steel products* (including bars, rods, rails, wires, tubes, pipes, sheets and other flat-rolled products, reservoirs, tanks, casks, drums, cans, boxes, containers, as well as screws, bolts, nuts, hooks, and rivets)

	– *except certain ferro-alloys (only ferro-manganese, ferro-chromium, and ferro-nickel are covered), and ferrous waste and scrap (including remelting scrap ingots and steel)
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- **Extension to Indirect Emissions:** Includes emissions embedded in electricity use (scope 2). While the CBAM already covers indirect emissions for cement and fertilisers, it is not the case for other sectors. However, such extension is on the cards, and the European Commission has run a public consultation on the matter. Our scenario includes indirect emissions embedded in all CBAM products.
- **Downstream Extension**
Currently, the CBAM only covers basic materials such as sheets of steel or aluminium. However, extension down value chains, to more finished products such as car parts or cutlery, is also being considered. A legislative proposal is expected by the end of 2025. Our scenario extends the CBAM to vehicle parts and cutlery.
- **Extension to Precursors**

A few basic materials that serve as inputs in the manufacturing of CBAM goods are currently outside the CBAM scope but covered by the EU ETS. The Commission has also run a public consultation on the opportunity to include some of them in the CBAM. In our scenario, the extension would cover ferro-silicon, lime, coke (for steel), alumina and pre-bake anodes (for aluminium).

- **Extension to New Sectors**

The potential inclusion into the CBAM of new sectors is suggested in several places of the CBAM Regulation: article 30(2) (organic chemicals and polymers), recital 35 (refinery products) and recital 34 (organic chemicals). In our scenario, the CBAM is extended to 8 basic polymers, 7 refinery products and 3 chemical products.

Product types

More granular CBAM impacts can be visualised, at product type level.

- **Iron and Steel**
 - Flat steel
 - Flat steel stainless
 - Long steel
 - Long steel stainless
- **Aluminium**
- **Cement**
 - Grey Portland cement
 - Grey clinker
- **Fertilisers**

Navigation summary

- **Global Overview Charts (Map & Treemap)**
Visualise impacts across countries and sectors.
- **Country Details Section**
Deep-dive into individual country-level indicators and charts.

- **Unitary Carbon Costs**

Compare product-level carbon costs between importers and EU producers.

Use Case 1: Global comparison of CBAM costs by scenario

Objective:

Understand how CBAM costs and revenues are spread across the world under different policy and trade scenarios.

A key indicator: Net CBAM costs

Net CBAM costs are calculated as the difference between CBAM fees and revenues from higher selling prices in the EU market for CBAM goods such as steel, aluminium and fertilisers. These higher prices are expected as free allowances are phased out in the EU ETS, which will raise costs for both EU-located factories and imports, which will then be mostly passed through to customers, thus pushing up prices.

Net CBAM Costs (€mn) By country*

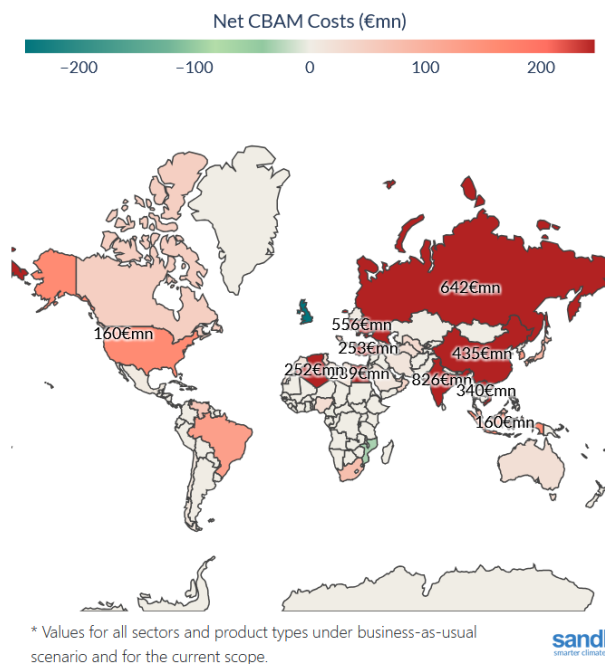


Figure 1. Net CBAM Costs (€mn) by Country. Values for the *business-as-usual* scenario and for the current scope.

Net CBAM Costs (€mn) By country*

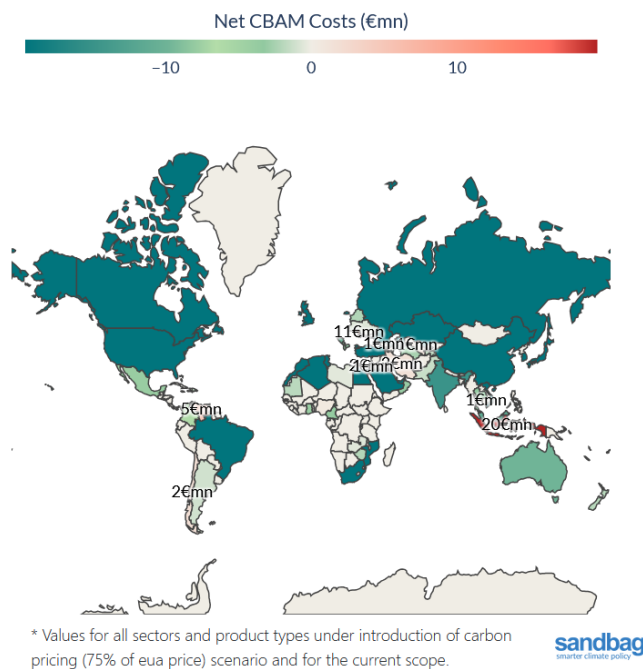


Figure 2. Net CBAM Costs (€mn) by Country. Values for the *introduction of carbon pricing* (75% of EUA price) scenario and for the current scope.

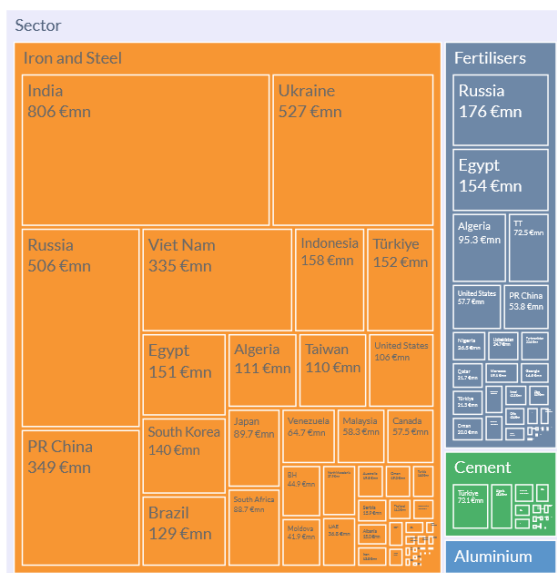
Figure 1 and **Figure 2** illustrate Net CBAM Costs in €mn by country, using the global map view under two different scenarios.

- **Figure 1** shows the Scenario option set to *business-as-usual* scenario and the scope extension set to *current scope*, which means that i) trade partners do not implement any particular measure and ii) the CBAM is not modified beyond its current scope.
- **Figure 2** displays the same indicator with the assumption of unchanged CBAM scope but trade partners responding by introducing a carbon price worth 75% of the EU carbon price ('Scenario' set to *introduction of carbon pricing*, and 'non-EU carbon price' set to *75% of the EUA price*).

In the left-hand map, countries with high exposure, including several large exporters, face net annual costs of up to €800 million, as indicated by the darkest shades on the colour scale.

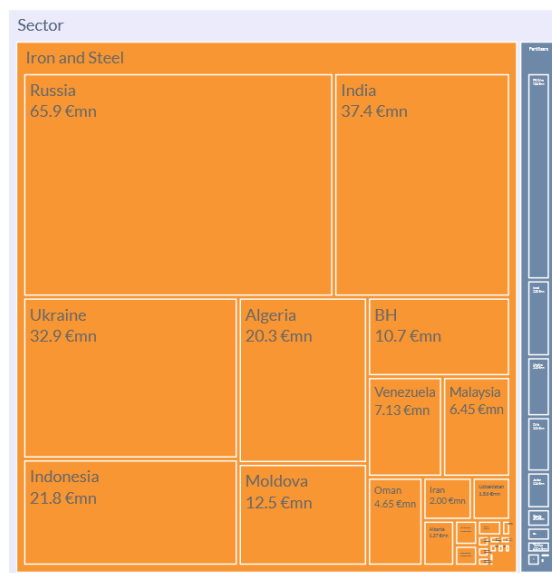
By contrast, in the second map, the maximum net annual costs drop to around €20 million, with many of them turning negative.

Net CBAM Costs (€mn) By sector and country*



* Values for all sectors and product types under business-as-usual scenario and for the current scope.

Net CBAM Costs (€mn) By sector and country*



* Values for all sectors and product types under introduction of carbon pricing (75% of eua price) scenario and for the current scope.

Figure 3. Net CBAM Costs (€mn) by Sector and Country. Values for the business-as-usual scenario and for the current scope.

Figure 4. Net CBAM Costs (€mn) by Sector and Country. Values for the introduction of carbon pricing (75% of EUA price) scenario and for the current scope.

Figure 3 and **Figure 4** present Net CBAM Costs in €mn by sector and country, using the treemap visualisation. Negative net costs (i.e., net revenues) are not displayed in this view.

- Figure 3 shows values for the *business-as-usual* scenario, under the *current scope*.
- Figure 4 reflects the *introduction of carbon pricing* scenario, assuming a domestic carbon price equal to 75% of the *EUA price*.

In both cases, iron and steel remains the most affected sector (larger size of the orange rectangle), followed by fertilisers. These sectors dominate the treemap in size, indicating their significant contribution to overall CBAM costs in many exporting countries.

However, the cement and aluminium sectors undergo a notable shift in the second scenario: they no longer appear in the treemap because the net costs associated with these products become negative. This is because third countries

applying a domestic carbon price, while having their exported products subject to lower CBAM fees, would still benefit from increased EU market prices, leading to net positive financial flows.

Overall, the total net CBAM costs across all sectors decrease by more than tenfold when moving from business-as-usual to the carbon pricing scenario, as is the case for steel in countries like India, from 806€mn to 37€mn, or Russia, from 506€mn to 66€mn.

Use Case 2: Evaluating a country's exposure across scenarios and scope

Objective:

Analyse how a single country's exposure changes under different scenarios and scope extensions.



* Values for Colombia. All sectors and product types are considered. Values for business-as-usual scenario and for the current scope.



Figure 5. Indicators for Colombia. Values for the business-as-usual scenario under the current scope.



* Values for Colombia. All sectors and product types are considered. Values for introduction of carbon pricing (75% of eua price) scenario and for the current scope.



Figure 6. Indicators for Colombia. Values for the introduction of carbon pricing (75% of EUA price) scenario under the current scope.

Figure 5 and **Figure 6** present the most relevant CBAM-related indicators for Colombia, under two different policy scenarios:

- **Figure 5** shows results under the *business-as-usual* scenario.
- **Figure 6** reflects the *introduction of carbon pricing* scenario, with a domestic carbon price set to 75% of the EUA price.

In the business-as-usual scenario, Colombia's CBAM fees are estimated at around €14 million, equivalent to 0.3% of the total value of its exports to the EU. Under the carbon pricing scenario, these fees drop significantly to around €5 million, or 0.1% of export value, a reduction of approximately two-thirds.

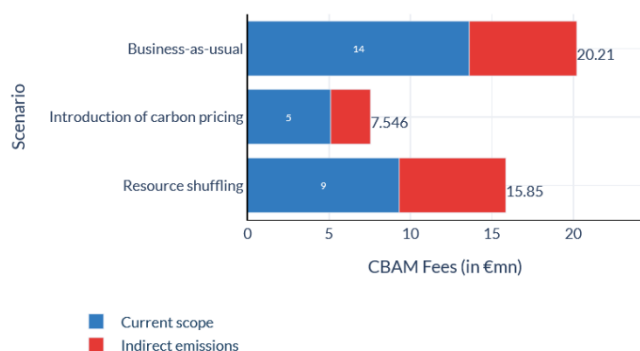
Meanwhile, revenue gains from higher EU market prices remain constant at €12 million across both scenarios, assuming 2023 trade values in both cases.

As a result:

- In the *business-as-usual* case, Colombia faces a net CBAM cost of €2 million (or 0.04% of trade value).
- In the *carbon pricing* scenario, Colombia sees a net gain of €7 million, reflecting a shift from net cost to net revenue.

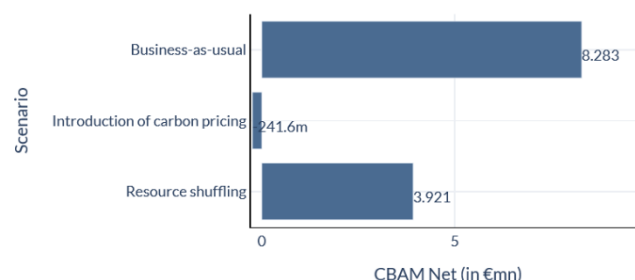
CBAM Fees (in €mn)*

CBAM fees represent the charges applied to products imported from each country under each scenario. These figures are based on 2023 trade volumes, not future projections.



Net CBAM Costs (in €mn)*

Net CBAM costs are derived by subtracting revenues from the price effect—due to higher selling prices in the EU market—from the fees.



* Values for Colombia. All sectors and product types are considered and for extension to indirect emissions. Introduction to carbon pricing scenario uses 75% of EUA price.

Figure 7. CBAM Fees and Net CBAM Costs, both in €mn. Values for Colombia and for extension to indirect emissions.

Figure 7 presents two stacked bar charts for Colombia, under three different CBAM scenarios, assuming a scope extension to include indirect emissions:

- The chart on the left displays CBAM Fees (€mn).
- The chart on the right shows Net CBAM Costs (€mn).

For the *introduction of carbon pricing* scenario, a domestic carbon price at 75% of the EUA price is assumed.

This view highlights how the scope extension affects CBAM exposure across policy choices:

- Business-as-usual scenario: CBAM fees increase from €14 million (current scope) to approximately €20 million, due to the inclusion of indirect emissions. Correspondingly, net CBAM costs rise from €5 million to around €8 million.

- Resource shuffling scenario (exporting lower-carbon products): CBAM fees are reduced to about €16 million, reflecting a strategic shift to cleaner exports. Net CBAM costs fall to €4 million, half the value observed under the business-as-usual scenario.
- Introduction of carbon pricing scenario: CBAM fees increase modestly to about €7.5 million, due to the broader scope. However, thanks to price gains in the EU market, net CBAM costs remain negative, meaning Colombia would experience a net revenue even under the extended scope.

This use case shows how the stacked bar charts help users compare total cost exposure and potential benefits under various partner reactions and scope extensions. The visualisation also underlines how combining domestic carbon pricing or cleaner export strategies can mitigate CBAM impacts, even when scope extensions increase total fees.

Use Case 3: Sectoral focus at product-level unitary costs

Objective:

Assess if a specific country's exporters are at a cost disadvantage compared to EU producers.

IRON AND STEEL PRODUCTS

Flat steel



Flat steel stainless



Long steel



Long steel stainless



ALUMINIUM PRODUCTS

Aluminium



CEMENT PRODUCTS

Grey portland cement



* Values for Malaysia and for the current scope.

Figure 8. Unitary Carbon Costs. Values for Malaysia and for the current scope.

Figure 8 presents unitary carbon costs (in €/ton) for selected products exported from Malaysia, compared to EU producers, under various scenarios.

These stacked bar charts show:

- The EU unitary carbon cost, reflecting expected EU ETS costs after the phase-out of free allocation.
- The unitary CBAM cost Malaysian exporters would face under a business-as-usual scenario.
- The potential reduction in costs under a resource shuffling strategy (e.g., switching to lower-carbon production technologies or product types).

All calculations assume 2023 trade volumes and product mixes.

Key Insights:

- Flat steel: EU producers are expected to face carbon costs of €132/ton. Malaysian exporters, under business-as-usual, would face slightly higher costs (€135/ton), but could reduce this to €77/ton by shifting toward cleaner electric arc furnace (EAF) production and higher scrap usage. This would result in a net advantage of €29/ton, when considering the €106/ton expected price increase in the EU market.
- Stainless long steel: Malaysian exporters face €38/ton in CBAM costs under the business-as-usual scenario, compared to €34/ton for EU producers. With cleaner export selection, they could cut this significantly and achieve a net profit margin of around €20/ton.
- Aluminium: Under a business-as-usual scenario, Malaysian exporters face a €30/ton loss. However, by increasing scrap-based production, they could reverse this to a €101/ton profit, highlighting aluminium as a high-potential opportunity under CBAM with low-carbon production.
- Grey Portland cement: In the business-as-usual scenario, producers face a loss of €16/ton. Shifting to clinker-efficient cement production could not only avoid these costs but result in a €19/ton profit.

This use case demonstrates how the Unitary Carbon Costs section of the tool helps users understand product-level competitiveness under CBAM. It also highlights how strategic changes in technology, inputs, or export focus can shift the balance from loss to profit, even for countries currently seen as high-exposure under CBAM.

General tips to use the CBAM online tool

To help users get the most out of the CBAM visualisation tool, we recommend the following best practices when exploring different views and filters:

- 1) Start with Global Overview Charts

Begin by using the map and treemap charts on the homepage to gain a quick understanding of where CBAM costs are concentrated and which sectors contribute most to those costs. Use the indicator dropdown to switch between total fees, net costs, and ratios relative to trade value.

2) Use Filters to Simulate Policy Scenarios

Explore different outcomes using the following filters:

- Partner Reaction: Choose between *business-as-usual*, *resource shuffling*, and *introduction of carbon pricing*.
- Scope Extension: Toggle the inclusion of *downstream*, *new sectors*, *indirect emissions*, or *precursors* to understand their incremental impact.
- Non-EU Carbon Price: Available when carbon pricing is selected; adjust to 25%, 50%, or 75% of the EUA price to test carbon pricing strength.
- Product Type: Narrow the analysis by sector (e.g. iron and steel) or by specific product (e.g. long steel, aluminium).

3) Drill Down into Country-Specific Impacts

Select a country in the country details section to see a breakdown of:

- Total CBAM Fees and Net Costs
- Changes under different scenarios
- Impact of scope extensions
- Product-level comparisons of carbon costs (Unitary Carbon Costs)

This section is ideal for policy simulations or developing country-specific policy advice.

4) Compare Scenarios Side by Side

To visualize how different policy responses or extensions affect outcomes:

- Set up a scenario with a specific scope.
- Take a screenshot or note the values.
- Switch to an alternative scenario or scope and compare the outputs.

This is particularly useful for before-and-after comparisons when exploring the benefits of carbon pricing or cleaner production pathways.

Emission intensity calculations

Assumed values of key parameters

Table 1. Scrap use in Aluminium production

Country	PR China	Japan	US	Oceania	Ukraine	South America	Middle East	Other Asia	North America
Scrap content in aluminium production	17.0%	82.4%	57.0%	2.7%	61.0%	57.5%	7.3%	58.7%	59.2%

Source: World Aluminium, Global Aluminium cycle 2023, Caixin Global, WEF, JRC

Table 2. Share of scrap in steel products by product type

Country	PR China	EU	India	Japan	US	Russia	S. Korea	Turkey	Brazil	Iran
Scrap per ton of long products	32.61%	98.83%	45.00%	72.47%	95.27%	57.33%	96.80%	92.67%	52.33 %	1.11%
Scrap per ton of flat products	10.00%	26.71%	21.09%	21.09%	67.02%	21.09%	21.09%	21.09%	21.09 %	19.88%
Country	Ukraine	Mexico	Vietnam	Canada	Malaysia	Indonesia	Saudi Arabia	Egypt	UK	Bangladesh
Scrap per ton of long products	26.19%	62.54%	53.29%	68.76%	87.94%	50.65%	12.62%	53.35%	80.33 %	98.71%
Scrap per ton of flat products	21.09%	43.81%	21.09%	28.33%	51.75%	21.09%	12.62%	37.90%	21.09 %	21.09%

Source: netzeroindustry, Global Energy monitor, worldsteel

Table 3. Percentage of steel production routes

Country	PR China	EU	India	Japan	US	Russia	South Korea	Turkey	Brazil	Iran
% BOF	87.3%	56.6%	61.0%	74.0%	27.4%	63.8%	66.4%	35.1%	82.8 %	17.5%
% DRI Coal-based EAF	0.1%	0.0%	11.3%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%	0.0%
% DRI Gas-based EAF	0.0%	0.5%	0.0%	0.0%	3.4%	13.0%	0.0%	0.0%	0.0%	81.5%
% scrap EAF	12.6%	42.9%	27.7%	26.0%	69.2%	21.4%	33.6%	64.9%	17.2 %	0.9%
Country	Ukraine	Mexico	Viet Nam	Canada	Malaysia	Indonesia	Saudi Arabia	Egypt	UK	Bangladesh
% BOF	94.7%	19.1%	66.8%	55.1%	27.1%	69.5%	0.0%	8.9%	73.7 %	20.0%
% DRI Coal-based EAF	0.0%	15.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% DRI Gas-based EAF	0.0%	15.1%	0.0%	14.0%	8.8%	0.0%	87.4%	42.5%	0.0%	0.0%

% scrap EAF	5.3%	50.6%	33.2%	30.9%	64.1%	30.5%	12.6%	48.6%	26.3%	80.0%
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Source: netzeroindustry, IE, Global Energy monitor, worldsteel

Table 4. Clinker-to-cement ratio

Country	Russia	United States	PR China	World average
Clinker to cement ratio	83%	65%	60%	71%

Source: IEA, CemBR, R. Andrew (2019)

Calculations for the current CBAM scope

The calculation made to estimate emission intensities of each product differs depending on the sector. Table 5 lists the calculations for each sector. The values in **blue** are inhouse calculations that vary depending on different parameters stated in section **Erreur ! Source du renvoi introuvable.** Values were updated depending on the scenario.

Table 5. Emission intensity calculations per sector.

Sector	Formula	Explanation
Aluminium	$El_{aluminium\ product} = El_{unwrought\ aluminium} \times (1 - \%Scrap) + El_{transformation}$	Where $El_{unwrought\ aluminium}$ include the EI of primary aluminium, so we we exclude the scrap content, and $El_{transformation}$ is found by taking the difference $El_{JRC_{product}} - El_{JRC_{unwrought\ aluminium}}$ between emission intensities given by JRC for unwrought aluminium (7601) and transformed products.
Iron and steel	$El_{product} = El_{BF-BOF} \times BF - BOF\ \% + El_{DRI\ Gas-based} \times DRI\ Gas\ \% + El_{DRI\ Coal-based} \times DRI\ Coal\ \% + El_{Scrap\ EAF} \times Scrap\ EAF\ \% + El_{Alloy} \times Alloy\ \% + El_{transformation}$	The percentages for BF-BOF, DRI (gas-based: 1.5 tCO ₂ /tonne steel, coal-based: 2.08 tCO ₂ /tonne steel), and EAF come from the Net Zero Industry Tracker. Direct emissions are calculated using the Sandbag methodology, JRC data, and Chinese industry reports, incorporating scrap rates (e.g., 20% in BF-BOF). Alloy rates are either 1% or 10% for non-stainless and stainless products. $El_{transformation}$ is found by taking the difference between emission intensities given by the JRC for basis steel product and transformed products
Cement	$El_{cement\ product} = El_{clinker} \times Clinker\ to\ cement\ ratio + Indirect\ EI$	Where $El_{clinker}$ and $Clinker\ to\ cement\ ratio$ and $Indirect\ EI$ varies depending on the trading partner, the latter depends on the partner's energy mix.
Fertilisers	$El_{fertiliser\ product} = (El_{JRC_{fertiliser\ product}} + El_{JRC_{diammonium\ phosphate}}) / 2$	The values used for fertilisers are those given by JRC, except for the products containing nitrogen, nitrates, phosphates, and potassium, for which we use the average between JRC values and the value of diammonium phosphate (31053000). This is because for these CN codes which group several products, JRC selected the EI of the most emission intensive value products. In contrast, we assume that the products can equally be the most or the least emission intensive ones.

Source: Sandbag

Calculations for scope extensions

New products within existing CBAM sectors: precursors

Iron and steel: Inclusion of lime, coke and additional ferroalloys

We used the following formula to update the emission intensities for steel products following the BF-BOF production route:

$$\begin{aligned}
 EI_{BF-BOF} (with\ precursors) \\
 &= EI_{BF-BOF} (current\ scope) + Alloy\ \% \times (EI_{Alloy} (including\ precursors) - EI_{Alloy} (current\ scope)) \\
 &+ pig\ iron\ \% \times (Lime\ CI_{per\ ton\ of\ steel} + Coking\ Coal\ CI_{per\ ton\ of\ steel})
 \end{aligned}$$

For lime and coke, we used weighted average values from EU installations¹. For the calculation of $EI_{Alloy} (including\ precursors)$, we considered the ferro alloys already considered in the current scope (ferro-manganese, ferro-chromium and ferro-nickel) and added ferro-silicon and silicomanganese, using life cycle assessments for ferroalloy production².

Aluminium: Inclusion of pre-bake anode

We used the following formula to update emission intensities for aluminium products:

$$EI_{Aluminium} (with\ precursors) = EI_{Aluminium} (current\ scope) + EI_{pre-bake\ anode} \times (1 - \%Scrap)$$

in which values linked to pre-bake anode production were taken from an EU27 aluminium benchmark study ordered by the EC³.

¹ European Commission, (2021), Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS Benchmark curves and key parameters

² Haque, Norgate (2012) Estimation of greenhouse gas emissions from ferroalloy production using life cycle assessment with particular reference to Australia

³ Ecofys, Fraunhofer, Öko (2009) Methodology for the free allocation of emission allowances in the EU ETS post 2012. Sector report for the aluminium industry

New products within existing CBAM sectors: downstream products

In the extension to downstream products scope, we considered the list of CN-8 goods mentioned in **Erreur ! Source du renvoi introuvable.** section. We assumed emissions linked to those goods were linked to only one basis product and used the same emission intensities for the new product as for its related basis product. The CBAM fees were therefore calculated using the emission intensity of the basis product for each trading partner and the imported tonnes of product from that given partner.

The new CN-8 products are listed below, together with their related basis products and reason for this mapping. Where multiple basis products were possible, we took the most common one.

Vehicles: Parts and Accessories

Table 6. List of CN-8 products for vehicles parts and accessories and their mapping to their given basis product

CN8 Code	Short description	Basis product	Reasoning
87084091	Parts for gear boxes of closed-die forged steel	Long steel	Gearbox parts (e.g., shafts, gears) are typically made from forged bars or rods, aligning with long steel production.
87086091	Non-driving axles and parts thereof	Long steel	Axles and similar components are almost always from long steel (bars, forgings), due to their need for strength and durability.
87087091	Wheel centres in star form	Long steel	Wheel centres are cast, but if classifying within flat vs. long, they lean closer to long steel due to bulk and shape.
87088091	Suspension systems and parts thereof	Long steel	Suspension parts like control arms, knuckles, and linkages are forged from bars or rods, making this a long steel application.
87089191	Parts for radiators	Long steel stainless	Radiator parts like brackets or tanks could involve flat steel for stamped parts, but forged steel parts (e.g., fittings) typically lean toward long steel. Possibly stainless for some radiator-related parts due to heat and corrosion resistance, especially in premium or heavy-duty applications. However, many fittings and brackets are still carbon/alloy steel.
87089291	Parts for silencers "mufflers" and exhaust pipes	Flat steel stainless	Exhaust systems often use flat steel (sheet) for pipes, mufflers, and casings. Forged fittings might be involved, but the primary material is typically flat steel. Exhaust systems often involve stainless steel because of high-temperature corrosion resistance.
87089491	Parts for steering wheels, steering columns and steering boxes	Long steel	Steering columns, shafts, and mechanical parts are usually forged from bars or rods, making this a long steel application.
87089591	Safety airbags with inflator system and parts thereof	Flat steel stainless	Airbag housings are typically stamped from flat steel, though small inflator parts (e.g., fittings) could involve forgings from long steel. Possibly stainless for inflator components (e.g., pressure vessels) due

			to corrosion resistance, but other parts could still be carbon/alloy steel.
87089991	Parts and accessories of closed-die forged steel	Long steel	Closed-die forged parts are typically made from bars or billets. These are structural or mechanical components requiring strength, so carbon or alloy steel is common.
87089992	Parts and accessories of closed-die forged steel	Long steel	Same as 87089991.
87089993	Parts and accessories of closed-die forged steel	Long steel	Same as 87089991.
87087050	Aluminium road wheels	Aluminium	

Source: Sandbag, Combined Nomenclature (CN) - Goods categorisation

Cutlery

Table 7. List of CN-8 products for cutlery articles and their mapping to their given basis product

CN8 Code	Short description	Basis product
82151010	Sets of spoons, forks or other articles including those with up to an equal number of knives	Flat steel stainless
82151030	Sets consisting of one or more knives and at least an equal number of spoons, forks or other articles	Flat steel stainless
82152010	Sets consisting of one or more knives and at least an equal number of spoons, forks or other articles	Flat steel stainless
82159910	Spoons, forks, ladles, skimmers, cake-servers, fish-knives, butter-knives, sugar tongs and similar kitchen or tableware	Flat steel stainless

Source: Sandbag, Combined Nomenclature (CN) - Goods categorisation

Indirect emissions

For cement and fertilisers, indirect emissions are already included in the existing scope of CBAM calculations.

The methodology for calculating indirect emissions relies on country-specific carbon intensity factors for electricity. These factors are derived using data from Ember, which calculates grid intensity using electricity production data by fuel type sourced from the International Energy Agency (IEA). This approach ensures that the emissions factors reflect the specific energy mix and carbon intensity of electricity generation in each country. Electricity consumption per tonne of production varies significantly depending on the technology used.

Table 8. Electricity consumption in aluminium sector per tonne of production by technology

Route	GJ/tonne of Aluminium
Primary route (bauxite smelting)	58
Secondary route (using recycled scrap)	0.45

Source: ACT

Table 9. Electricity consumption in iron and steel sector per tonne of production by technology

Technology	GJ/tonne of Steel
BF-BOF*	0.39

DRI-EAF	2.42
Scrap-EAF	2.07

* Bear in mind that there can be up to 20% scrap on this route.

Source: JRC

To calculate indirect emissions, the electricity consumption values are multiplied by the grid intensity factor specific to each country and weighted by the share of technology used (or the percentage of scrap utilised). For primary products, this yields the indirect emissions per tonne. For sub-products, the same methodology is applied as for direct emissions, ensuring consistency across the calculation process.

Products from new sectors: organic chemicals, polymers, refinery products

Determining the emissions intensities of chemicals is notoriously challenging, primarily due to the complexity of value chains, simultaneous production of different chemicals and lack of publicly available data. The chemical industry varies also with regions mainly due to the availability of certain types of feedstocks. For example, chemical production from coal is more common in China and South Africa, while natural gas is becoming more common in the US due to increased availability of shale gas⁴

We have mapped the EI of key chemicals, upstream refinery products, and downstream polymers to the list of goods traded. Due to the lack of available country-specific data, we have used assumptions to estimate the EI of traded goods where necessary. In cases where the CN code refers to a group of polymers for example, EI of a representative polymer in this group has been used, with justification.

Refinery products

The 17 finished products of Concawe's linear programming model were distributed to 9 main categories (LPG, Naphtha, Gasoline, Kerosene, Diesel, HO Marine DSL, DMF RMF 0.5%S, HSFO). The EU averages used were the results of the modelling performed in the Concawe study calculating the emissions associated with the refining step of the production process (excluding upstream and downstream emissions). The non-EU EIs for all refinery products were estimated based on the ratio between the EU average (Concawe) and global average⁵ EI of naphtha.

⁴ Basic Chemicals Background Paper, The Basic Chemicals Eligibility Criteria of the Climate Bonds Standard & Certification Scheme

⁵ Eionet, 2021, Greenhouse gas emissions and natural capital implications of plastics (including biobased plastics)

Chemicals

The emissions intensities used for the EU are the weighted average GHG emissions intensity of chemicals produced by all EU installations in 2016/2017, as reported in the EU benchmarking.⁶ The values include all production-related direct emissions (the process direct emissions and the emissions due to fuel use for energy production), as well as the embedded emissions of the fossil feedstock.

Emissions associated with steam cracking products in non-EU countries are estimated using the ratios of ethylene EI in different regions, as reported in the IPCC's Emissions Factor Database.⁷ The global emissions intensity of methanol was also taken from the IPCC database.

Polymers

The emissions associated with crude oil production have been subtracted from the figures reported in the Eionet study as these emissions lie outside the scope of the ETS. An approximation of the embedded emissions associated with refining and steam cracking to produce the polymer feedstocks are included in the figures, however.

For each polymer, the non-EU EI was estimated using global emissions associated with production of each polymer (estimated by Zheng and Suh, 2019)⁸ and production figures reported by Plastic Europe.⁹

The new basis products added for the new sectors' scope are listed below.

Table 10. List of basis products for new sectors scope

Sector	Basis product	CN-8 Code	Product description
Refinery	Naphtha	27101211	Light oils of petroleum or bituminous minerals for undergoing a specific process as defined in Additional Note 5 to chapter 27 (excl. containing biodiesel)
	Gasoline	27101241	Motor spirit, with a lead content $\leq 0,013$ g/l, with a research octane number "RON" of < 95 (excl. containing biodiesel)
	Kerosene	27101921	Jet fuel, kerosene type
	Diesel	27101943	Gas oils of petroleum or bituminous minerals, with a sulphur content of $\leq 0,001\%$ by weight (excl. containing biodiesel, and for undergoing chemical transformation)
	HO marine DSL	27101962	Fuel oils obtained from bituminous materials, with a sulphur content of $\leq 0,1\%$ by weight (excl. for undergoing chemical transformation, and containing biodiesel)

⁶ European Commission, 2021, Update of benchmark values for the years 2021 – 2025 of phase 4 of the EU ETS Benchmark curves and key parameters

⁷ IPCC, 2006 https://www.ipcc-nggip.iges.or.jp/EFDB/find_ef_ft.php

⁸ Zheng, J., Suh, S. Strategies to reduce the global carbon footprint of plastics. Nat. Clim. Chang. 9, 374–378 (2019). <https://doi.org/10.1038/s41558-019-0459-z>

⁹ Plastics Europe, 2022, Plastics – the Facts 2022

Organic chemicals	DMF RMF	27101966	Fuel oils obtained from bituminous materials, with a sulphur content of > 0,1% but <= 0,5% by weight (excl. for undergoing chemical transformation, and containing biodiesel)
	LPG	27111211	Propane of a purity of >= 99%, for use as a power or heating fuel, liquefied
	Ethylene	29012100	Ethylene(2004-2500);Ethylene(1988-1994)
	Propylene	29012200	Propene "propylene"(2004-2500);Propene 'propylene'(1988-1994)
	Butadiene	29012400	Buta-1,3-diene and isoprene(2009-2500);Buta-1,3-diene and isoprene(1988-1993)
	Butene	29010000	Butene "butylene" and isomers thereof(2009-2500);Butene 'butylene' and isomers thereof(1988-1993)
	Benzene	29022000	Benzene
	Toluene	29023000	Toluene
	Xylenes	29024X00	o-Xylene, m-Xylene, p-Xylene, and Mixed xylene isomers
	Styrene	29025000	Styrene
	Vinyl chloride monomer	29032100	Vinyl chloride "chloroethylene"
	Methanol	29051100	Methanol "methyl alcohol"
	Monoethylene glycol	29053100	Ethylene glycol "ethanediol"
	Ethylene oxide	29101000	Oxirane "ethylene oxide"
Polymers	Polyethylene, low density	39011090	Polyethylene with a specific gravity of < 0,94, in primary forms (excl. linear polyethylene)
	Polyethylene, high density	39012090	Polyethylene with a specific gravity of >= 0,94, in primary forms (excl. polyethylene in blocks of irregular shape, lumps, powders, granules, flakes and similar bulk forms, of a specific gravity of >= 0,958 at 23Å,Å°C, containing <= 50 mg/kg of aluminium, <= 2 mg/kg of calcium, of chromium, of iron, of nickel and of titanium each and <= 8 mg/kg of vanadium, for the manufacture of chlorosulphonated polyethylene)
	Polypropylene	39021000	Polypropylene, in primary forms
	Polystyrene	39031900	Polystyrene, in primary forms (excl. expansible)
	Polyvinylchloride	39041000	Poly"vinyl chloride", in primary forms, not mixed with any other substances
	Polyethylene terephthalate	39076100	Poly"ethylene terephthalate", in primary forms, having a viscosity number of >= 78 ml/g
	Polyurethane	39095090	Polyurethanes in primary forms (excl. polyurethane of 2,2'-"tert-butylimino"diethanol and 4,4'-methylenedicyclohexyl diisocyanate, in the form of a solution in N,N-dimethylacetamide)

Source: Sandbag, Combined Nomenclature (CN) - Goods categorisation

Calculation of Price Increase

Free allowances phased out

As **free allowances are phased out** under the EU ETS, EU-based factories will face increasing carbon costs. These costs will likely be passed on to customers, depending on demand elasticity and the effectiveness of CBAM at reflecting EU carbon prices. Based on previous research and the anti-circumvention provisions in the CBAM regulation, we assume a **cost pass-through rate of 80%**. In other words, CBAM goods will be sold in the EU at a **premium equal to 80% of average ETS costs**.

For the calculations, we assumed a **price of €80 per European emission allowance**, close to the market price in February 2025. No adjustments for potential future market changes were included, given the uncertainty about the EU ETS cap and the use of carbon credits after 2030.

Indirect Cost Compensation (ICC) for EU Producers

EU-located plant operators also bear **indirect carbon costs** through electricity consumption. Member States are authorized to compensate for these costs using a **compensation mechanism**. **Indirect Cost Compensation (ICC)** is defined by the formula:

$$ICC = 75\% \times C_t \times P_{t-1} \times E \times AO_t$$

Variables:

- C_t : Fossil-based CO₂ emission factor as defined in the State Aid Guidelines (tCO₂/MWh). For Germany, Austria, and Luxembourg, this is 0.72 tCO₂/MWh.
- P_{t-1} : EUA forward price in year t-1, assumed €80.
- E : Product-specific electricity consumption efficiency benchmark.
- AO_t : Actual output in year t.

ICC covers **75% of total indirect carbon costs**. The **remaining 25% not compensated** is included in the unit carbon costs for EU producers.

Calculation of price increase of indirect emissions

If indirect emissions were covered by the CBAM, indirect cost compensation (ICC) would likely be phased out in the EU and the generalised increase in cost for electricity users would mostly be passed through to customers, leading to higher sale prices. So net costs are calculated as:

$$Net\ CBAM\ costs = CBAM\ fees - revenues\ from\ price\ effect$$

To calculate the price increase caused by the end of ICC, we used the following formula:

$$Price\ effect = pass_through\ rate \times ICC$$

where ICC is given by the formula in **Erreur ! Source du renvoi introuvable.**) and **pass-through rate** is assumed to be **80%**, i.e. the same as was used to estimate the price increase caused by free allocation phaseout in **Erreur ! Source du renvoi introuvable.**