



# The EU ETS at a Turning Point: Balancing Competitiveness and Decarbonisation

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The EU ETS at a Turning Point: Balancing Competitiveness and Decarbonisation

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# EXECUTIVE SUMMARY

## The EU ETS at a structural turning point

The EU Emissions Trading System (EU ETS) has been the cornerstone of EU climate policy for nearly two decades. It has delivered substantial emissions reductions, strengthened investment signals for low-carbon technologies, and created a transparent carbon pricing framework across Member States. The introduction of the Market Stability Reserve (MSR), the use of auction revenues to finance innovation and modernisation, and the integration of additional sectors have reinforced the system's robustness and credibility.

The EU ETS<sup>1</sup> is now entering a new phase. The cap is tightening rapidly, surplus allowances have largely been absorbed, and under the current Linear Reduction Factor (LRF), new allowances would decline to zero toward the end of the 2030s. At the same time, the Carbon Border Adjustment Mechanism (CBAM) is phased in and free allocation for covered sectors is phased out between 2026 and 2034. This transition fundamentally reshapes the challenges for the EU's carbon leakage architecture.

Against this backdrop, political and economic pressures have intensified in the light of the upcoming EU ETS review in the second half of 2026. Rising carbon prices, high energy costs, and uneven global climate ambition have heightened competitiveness concerns in energy-intensive industries. Chemical industry<sup>2</sup> and several Member States<sup>3</sup> have suggested to weaken the carbon price trajectory, prolong free allocation or, in extremis, abandon the ETS<sup>4</sup>. The debate increasingly centres on how to reconcile climate ambition with European industrial resilience.<sup>5</sup>

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<sup>1</sup> This study focuses on the EU ETS, the emissions trading system for stationary installations, aviation, and maritime transport. Where relevant, the new emissions trading system for buildings and road transport is referred to as ETS2.

<sup>2</sup> Industry Association CEFIC published a position paper in July 2025 ([link](#)).

<sup>3</sup> Inter alia Austria, Italy, Czech Republic, Slovakia.

<sup>4</sup> [Evonik-Chef Kullmann: „Die CO<sub>2</sub>-Gebühr für Europa muss weg“ | FAZ](#)

<sup>5</sup> Energy Traders Europe and others, March 2026 ([Link](#))

At the same time, Europe accounts for around 25% of the global pipeline of clean industrial projects, rising to approximately 50% for steel and over 70% for cement, sectors responsible for 15% of global CO<sub>2</sub> emissions. These projects are reference cases for whether deep industrial decarbonisation is economically and politically viable. However, more than 90% of announced clean industrial projects in Europe have not yet reached final investment decision (FID), making policy credibility and stability decisive. Therefore, several energy associations have published a joint statement in support of a strong and stable EU ETS, supported by targeted and selected updates instead of ad-hoc interventions.

In this context, the ETS reform is not a technical adjustment but a structural inflection point: decisions taken in 2026 will shape investment certainty, innovation finance, carbon leakage protection and Europe's climate and industrial policy for the next decade. This study provides evidence-based options to safeguard the integrity of the ETS while addressing legitimate competitiveness concerns through targeted reforms rather than systemic dilution. It wants to inform the debate before the European Commission and the heads of state and government discuss the future of the Union's climate architecture later this month. We point out several policy options that are clearly superior to stark "either or"-choices; together with other recent measures, such as the proposed Industrial Accelerator Act, there is space for sensible, centrist policies to strengthen our competitiveness while maintaining an ambitious climate agenda.

**This report distinguishes between two dimensions of that debate while focussing on the second one:**

- The trajectory of the EU ETS itself – its overall ambition and flexibility.
- The design and future of carbon leakage protection measures under a tightening cap.

We briefly discuss options with regards to the first dimension (see summary in next sub-section). We focus our analysis, however, on options for the second dimension, i.e. on future-proof carbon leakage protection measures under a tightening cap, because these carbon leakage challenges need to be addressed irrespective of whether the

current ETS trajectory is maintained or reformed. Potential reforms of the trajectory (first dimension) would just impact on the urgency of reforms of carbon leakage architecture (second dimension), but not the general requirements to tackle them.

### **The ETS trajectory: Calibrating ambition and flexibility**

In the EU ETS, the cap refers to the legally mandated maximum quantity of CO<sub>2</sub>-equivalents that can be emitted by the sectors subject to the system while meeting the EU's overall emission reduction targets. It is calculated considering that those sectors outside of the ETS will also reduce emissions to a substantial extent. The cap trajectory, then, is the rate at which the legal cap on emissions decreases over time. Changes to the cap trajectory do not necessarily mean that the goal of climate neutrality by 2050 will be missed, but rather that the speed of getting there, or the contribution of the ETS sectors and other sectors, or both, changes.

Revising the cap trajectory would have direct consequences for companies that invested early in decarbonisation under a legally binding and steadily tightening framework. A slower decline of the cap would likely reduce future allowance scarcity and moderate carbon prices, ease short-term pressures but also lower the expected return on early low-carbon investments.

For early adopters, the key concern is regulatory credibility. If the tightening path is perceived as reversible, investment incentives may weaken and future projects may be delayed. Preserving a clear long-term trajectory, while using targeted flexibility measures prioritising the MSR reform to manage volatility, helps maintain the reward structure for early movers without undermining overall ambition.

In summary, changes to the cap trajectory directly affect ambition and should be approached cautiously. By contrast, carefully designed flexibility within the existing framework of the MSR and providing supply flexibility in the long-term by widening the scope of the ETS may help manage volatility without weakening long-term climate objectives.

## Policy Directions for overall stringency and flexibility of the EU ETS

The report identifies three main policy directions around carefully reforming the LRF and prioritizing flexibility by reforming the MSR and extending the scope of the EU ETS to include carbon removals and international credits.

- **Adjusting the Cap:** Lowering the LRF after 2030 would slow the decline of the cap, increase cumulative allowance supply and thereby somewhat ease carbon price pressure and extend the cap timeline beyond 2039. Such adjustments provide additional transition time for energy-intensive industries. However, they would directly affect climate ambition (unless slowed carbon emission reductions in the ETS would be compensated in non-ETS sectors), investment signals, and the credibility of the EU's long-term targets. Any modification of the cap trajectory would therefore need to be carefully assessed against the 2040 and 2050 objectives and the integrity of the overall climate framework: If the political compromise foresees a downward modification of the LRF (currently set at 4.4% from 2030 onwards) it should reflect existing legal obligations and be anchored in the broader transitional flexibility provisions agreed in the context of the EU's 2040 climate target discussions.
  - A 3% LRF could extend the cap trajectory beyond 2040 and increase the cumulative volume of allowances available after 2030 by around 50% compared to the current trajectory.
  - A 2.5% LRF could extend the cap trajectory beyond 2045 and increase the cumulative volume of allowances available after 2030 by more than 80% compared to the current trajectory.
- **Reforming the MSR:** A reform of the Market Stability Reserve (MSR) represents a more targeted way of enhancing flexibility. As the system shifts from surplus management to structural scarcity, the MSR could be recalibrated by refraining from automatic cancellation of allowances. Compared to changes of the LRF, a MSR reform has the advantage, that it does not alter the cap itself and therefore offers a more proportionate way to enhance predictability and resilience with regard to ETS prices in a tightening market, while preserving decarbonisation objectives. Further reform options, like moving to a price-based trigger of the MSR would require more careful consideration to preserve a credible climate policy signal and not undermine the overall stringency of the EU ETS.

- **Expanding Supply Flexibility:** Additional flexibility could come from integrating high-quality carbon removals and allowing limited use of international credits. Such options can enhance robustness but require strict safeguards to maintain the credibility of the cap.

## **Carbon Leakage Protection in Transition**

The core focus of this report is the evolution and reform of the carbon leakage protection architecture under a tightening EU ETS certificate cap. Carbon leakage refers to the risk that firms may shift production to jurisdictions with more lenient carbon regulation or lose market share to more carbon-intensive imports. This would weaken EU industrial capacity, increase supply risks, and raise global emissions. Carbon leakage protection aims at preventing these outcomes by reducing the incentive to relocate production and by limiting substitution towards more emission-intensive production outside the EU.

### **From Free Allocation to CBAM**

Historically, carbon leakage protection relied primarily on free allocation: Industries deemed to be exposed to a genuine risk of carbon leakage and exposed to global competition receive free carbon allowances rather than having to purchase them in an auction while preserving the incentive to reduce emissions, and indirect cost compensation, which compensates electricity-intensive companies for (part of) their indirect carbon costs embedded in electricity prices.

This architecture is changing. The EU ETS certificate volumes are shrinking, implying that a lower certificate volume is available for free allocation and will ultimately decline to zero until 2040 as new means of carbon leakage protection, the Carbon Border Adjustment Mechanism (CBAM) is being phased in. For CBAM-covered sectors, free allocation will decline to zero by 2034.

CBAM introduces a carbon cost on imports of selected basic materials and aims to level the playing field between EU and non-EU producers within the European market. It is not constrained by the shrinking cap and can provide long-term protection for covered products. In addition, CBAM generates revenues and may, in principle, offer stronger protection than free allocation where imports are more carbon intensive, for example for fertilizers imported from North Africa.

## Emerging Gaps and Structural Tensions

However, the emerging Carbon Leakage framework, relying increasingly on CBAM next to free allocation also contains gaps and introduces structural tensions. In particular, three challenges arise:

- **Export exposure:** Sectors covered by CBAM are protected against import competition but, unlike under carbon leakage protection via free allocation, are not shielded from competitive distortions in third-country markets affecting EU exports (i.e. when competing outside of the EU, they are at a disadvantage against producers from regions that do not face a CO<sub>2</sub>-price).
- **Non-CBAM sectors under a shrinking cap:** Sectors outside CBAM remain trade-exposed but face declining free allocation as the EU ETS certificate issuance approaches zero toward 2039.
- **Complexity and downstream effects:** CBAM can create administrative burden, incentives for circumvention, and knock-on effects along value chains.

## Policy Directions for a Coherent Carbon Leakage Framework

The report identifies three main policy directions around refining CBAM, targeting Free Allocation more strategically and preparing for the post-2039 phase:

- **Refining CBAM** – Improving the effectiveness of CBAM should be a priority rather than reopening its fundamental design<sup>6</sup>. As the instrument gradually replaces free allocation for covered sectors, ensuring that it functions robustly and credibly becomes central to the overall carbon leakage architecture.
  - First, **administrative complexity** should be managed by maintaining a focused scope on relatively homogeneous upstream goods with clear emissions boundaries. Extending CBAM too rapidly to complex downstream products risks increasing reporting burdens, raising compliance costs for firms and authorities, and generating trade frictions. Where extensions are considered, they should be selective, gradual and evidence-based, particularly in cases where circumvention risks or significant carbon cost pass-through can be demonstrated.

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<sup>6</sup> As for example suggested by „Stiftung Familienunternehmen“: [„Der EU-Emissionshandel braucht eine Übergangslösung“](#)

- Second, **export exposure** needs to be addressed. While CBAM levels the playing field in the EU market, it does not protect EU producers competing in third-country markets. Targeted and time-limited support mechanisms, such as benchmark-based export support, can help mitigate asymmetric carbon cost burdens without undermining the integrity of the carbon price signal.
- Third, monitoring, reporting and verification rules must be strengthened to reduce **circumvention risks**. As carbon price differentials widen, incentives to re-route trade, alter product classifications or shift minor processing steps will increase. Enhanced data sharing between customs and climate authorities, regular review of trade patterns, and clear anti-circumvention provisions are essential to preserve the credibility of the instrument.

Taken together, a focused, enforceable and gradually evolving CBAM can provide robust protection against import-related leakage while limiting unintended downstream and trade effects.

- **Targeting Free Allocation more strategically and providing more flexibility for free allocation** – The overall volumes available for free allocation will decline in line with the cap. Hence, carbon leakage protection for those sectors outside of CBAM will diminish before the overall cap reaches zero. A targeted use of the remaining allowances and additional flexibility can improve the overall effectiveness of the carbon leakage framework:
  - **Tiered Allocation:** For non-CBAM sectors, remaining free allocation volumes could be used more selectively. A tiered approach based on carbon leakage indicators, such as trade intensity and emissions intensity, could concentrate protection where exposure is highest, compared to today where carbon leakage exposure is binary decision: Sectors facing the highest combined exposure would continue to receive a high share of benchmark-based free allocation, while sectors with lower exposure would receive a reduced share. This would allow limited free allocation volumes to be concentrated where competitiveness risks are most material, as for example in the chemical industry, improving the efficiency and consistency of the carbon leakage framework without increasing the overall cap. A tiered approach would build on existing EU ETS concepts and not induce additional layers of administrative complexity.

At the same time, it would reduce the risk of over-protection in less exposed sectors and help manage the structural tension created by shrinking allowance volumes in a tightening system.

- **Reallocation of allowances freed-up by CBAM** – An additional increase in free allocation volumes – without altering the overall cap trajectory – could be achieved by partly redirecting allowances that are freed up through the phase-out of free allocation for CBAM-covered sectors. As free allocation for these sectors declines between 2026 and 2034, a significant volume of allowances becomes available within the existing cap. Under the current design, these allowances are largely intended to be channelled to the Innovation Fund. While this strengthens support for industrial decarbonisation, it also accelerates the decline of free allocation available to sectors that remain outside CBAM but continue to face carbon leakage risks. Reallocating part of these freed-up allowances to non-CBAM sectors would not increase the overall supply of allowances or weaken the cap. Instead, it would redistribute protection within the existing envelope, thereby maintaining internal consistency of the carbon leakage architecture during the transition. In combination with a tiered, risk-based allocation approach, such a reallocation could ensure that sectors with the highest measured trade and emissions exposure continue to receive targeted protection, while avoiding abrupt increases in residual carbon cost exposure as the cap tightens.
- **Temporary adjustment to the auction share** – A temporary reduction in the proportion of allowances auctioned during a defined transition period could increase the volume available for free allocation and help manage distributional pressures across sectors. However, this would involve fiscal trade-offs, as auction revenues finance innovation, modernisation, and broader EU budgetary priorities. Any adjustment would therefore need to carefully balance competitiveness concerns with funding needs for the green transition.
- **Preparing for the post-2039 phase** – As the cap approaches zero, free allocation becomes structurally unavailable, since no new allowances would be issued and only previously banked allowances or possibly those generated through carbon removal activities, such as negative emissions, would remain in circulation. In this setting, carbon leakage protection can no longer rely on volume-based allocation (=free allocation). Instead, direct cost compensation could serve as a targeted transition instrument.

**Under a (direct) cost compensation approach,** firms would continue to face the full carbon price for every tonne of emissions, thereby preserving marginal abatement incentives. Compensation would take the form of an **ex post financial transfer** rather than an ex-ante allocation of allowances. To avoid undermining the integrity of the carbon price signal, such compensation should be benchmark-based, for example linked to efficient production standards rather than actual emissions and limited to residual emissions that are demonstrably difficult to abate<sup>7</sup>. Strong conditionality would be essential. Eligibility could be tied to credible decarbonisation pathways, the use of best available technologies, and transparent reporting requirements. Compensation rates could decline over time to reflect technological progress and the expectation of continued emissions reductions. In this way, direct cost compensation would not function as a permanent substitute for free allocation, but rather as a temporary and targeted instrument to manage competitiveness risks during the final phase of industrial decarbonisation, while maintaining the environmental integrity of a zero-cap ETS.

**Figure 1 – A Targeted and Adaptive Carbon Leakage Framework**



**Source:** Frontier Economics

<sup>7</sup> With the Indirect Cost Compensation (Strompreiskompensation), there is already a precursor to this on which to build.

## Cross-Cutting and Long-Term Measures

The effectiveness of the EU carbon leakage architecture depends not only on individual instruments such as CBAM, free allocation or compensation mechanisms, but also on strong governance, policy coherence and a credible long-term strategy.

Carbon leakage risks evolve with changes in trade patterns, technology and global climate ambition. Regular reassessment of sectoral exposure, monitoring of cost pass-through along value chains and systematic evaluation of CBAM impacts are therefore essential to adjust allocation tiers, scope and support instruments over time. Clear review mechanisms enhance predictability and reduce regulatory uncertainty.

Carbon leakage protection should also be closely aligned with broader industrial, decarbonisation and trade policies. Instruments such as the Innovation Fund, carbon contracts for difference and infrastructure support reduce structural leakage risks by lowering the cost of low-carbon production. EU ETS and CBAM revenues play a central role in financing these measures and can be strategically deployed to accelerate industrial transformation and gradually reduce reliance on protective instruments.

Indirect cost compensation remains relevant, particularly as electrification increases exposure to electricity price effects, and should be refined while avoiding overcompensation.

Moreover, with the newly proposed Industrial Accelerator Act (IAA), the EU wants to ramp up green lead markets to help with the transition. With a view to the EU's trade policy and standing in the world, there is a real risk, though, that both carbon leakage protection and the IAA are primarily perceived as (and de facto evolve into) discriminatory, mercantilist policies. The cumulative impact of these policies on trade relations needs to be closely watched. Europe's goal should not be wall itself off but rather to incentivize countries to support a rules-based, fair international trade architecture. This is also part of a truly integrated cohesive and sensible policy mix. Against this background, international engagement is critical. Over time, broader adoption of carbon pricing and cooperation under Article 6 frameworks can reduce the need for border measures. Transparent CBAM implementation and constructive engagement with trading partners strengthen legitimacy and durability.

Overall, carbon leakage protection should be conceived as a dynamic and adaptive policy mix rather than a fixed set of instruments.

## Conclusion

The EU ETS is moving into a phase of structural scarcity. This amplifies both competitiveness and climate ambition pressures.

ETS trajectory reforms and carbon leakage measures should be clearly distinguished. Adjustments to the cap trajectory affect the foundation of the system and require careful consideration and should be limited particularly in light of their implications for investment certainty and the credibility of legally binding targets. For companies that have invested early in decarbonisation, a stable and predictable tightening path is central to preserving the expected return on those investments. The focus of reforms should be on increasing flexibility with a MSR reform and increase of supply flexibility instead of undermining the ETS ambition as such.

By contrast, adjustments to the carbon leakage protection architecture such as strengthening CBAM, targeting free allocation more precisely, and preparing complementary tools for the longer term offer a more focused way to enhance EU resilience. If designed in a performance-based and benchmark-oriented manner, these measures can protect exposed sectors while safeguarding the competitive advantage of early adopters. Such a targeted and adaptive policy mix can preserve the environmental integrity of the EU ETS while maintaining industrial competitiveness during the transition to climate neutrality.

**Table 1 – Overview of policy options**

						
Policy option	<b>Refine CBAM</b>	<b>Export support mechanisms</b>	<b>Tiered free allocation</b>	<b>Reallocate allowances</b>	<b>Conditional free allocation</b>	<b>Direct cost compensation</b>
	Improved MRV, anti-circumvention rules, focused scope, selective extensions	Temporary Decarbonisation Fund or benchmark-based export rebate	Risk-based differentiation using emissions and trade intensity	Adjust auction share or reallocate CBAM-freed allowances	Link allocation to decarbonisation commitments or performance criteria	Ex post, benchmark-based, conditional compensation of residual carbon costs
Criteria						
Political Feasibility	Politically feasible, trade-sensitive	Popular with exporters; legal/WTO risk	Politically feasible but reallocation between sectors needs to be managed	Politically viable compromise.	Acceptable, but industry pushback	Politically acceptable as temporary backstop
Admin	Admin-heavy (MRV, enforcement)	Admin moderate to complex (benchmarking)	Admin manageable (builds on existing system)	Admin straightforward	Admin demanding (monitoring, compliance)	Admin moderate (benchmarks, eligibility)
Efficiency	Efficient for import leakage; preserves incentives	Improves symmetry if benchmark-based	More efficient than binary targeting	Transitional reshuffle; incentives unchanged	Strong incentives if tech-neutral	Efficient if carbon price fully passed through
Distributional Effects	Shifts burdens to downstream and partners	Favors export-oriented firms	Reallocates support to high-exposure activities	Shifts value across sectors/budgets	Benefits early adopters	Targets residual/hard-to-abate sectors
Outcome						
	Cuts import leakage and circumvention	Reduces CBAM-related export exposure	Improves targeting and reduces over-protection	Eases transition for non-CBAM sectors	Aligns leakage protection with decarbonisation	Provides a competitiveness backstop under a zero cap

Source: Frontier Economics

# 1. EU ETS AT A TURNING POINT: BALANCING COMPETITIVENESS AND DECARBONISATION

The EU Emissions Trading System (EU ETS<sup>8</sup>) for stationary installations, aviation and maritime sits at the centre of the EU's decarbonisation framework. But EU climate policy does not operate in isolation. EU firms sell into global markets and compete with imports into the EU.

## **The EU ETS at a Crossroads: Building on a Strong Track Record**

The EU Emissions Trading System is no longer a standalone instrument but forms the backbone of a broader and increasingly integrated EU climate policy architecture. EU ETS covers power generation, energy-intensive industry, aviation and maritime transport, and accounts for roughly 40 percent of the EU's greenhouse gas emissions. Since 2005, emissions in ETS sectors have declined by around 40 percent, with particularly rapid reductions in the power sector driven by fuel switching, renewables expansion and the strengthening carbon price signal.

In parallel, the EU has established ETS2, which extends emissions trading to buildings and road transport fuels – sectors that were previously regulated primarily under the Effort Sharing Regulation (ESR). Together, buildings and road transport account for roughly one third of EU emissions. While these sectors have also reduced emissions over time, progress has been slower and more uneven compared to ETS sectors, reflecting structural constraints and the absence, until now, of an explicit carbon price.

The ESR continues to apply to remaining non-ETS sectors, setting binding national targets, while ETS 2 gradually introduces a harmonised carbon pricing framework upstream for fuel suppliers in buildings and transport. Together, ETS, ETS-2 and the ESR form the core of the EU's climate policy architecture, complemented by renewable energy and energy efficiency targets, industrial support instruments such as the Innovation Fund. Ensuring coherence and predictability across this architecture is critical, as changes to the trajectory or design of ETS may have implications for cost distribution, investment signals and political acceptability across the wider system.

Beyond its environmental impact, the ETS has created a transparent and technology-neutral investment signal. It has mobilised significant public revenues through auctioning, which have been channelled into climate and energy measures at national and EU level. Instruments such as the Innovation Fund and the Modernisation Fund are directly linked to the system and provide targeted support for breakthrough technologies and infrastructure. The introduction of the Market Stability Reserve has further enhanced the system's robustness by addressing structural imbalances and strengthening price stability.

Given this central role, uncertainty about the long-term trajectory or design of the ETS can have material implications. The system is deeply embedded in the EU's broader climate

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<sup>8</sup> As opposed to the newly introduced emission trading system for road transport and buildings (ETS2)

framework, interacts with instruments such as CBAM and sector-specific support schemes, and underpins long-term investment decisions in capital-intensive industries. Any significant ambiguity regarding its future development may affect investment confidence and alter expectations about carbon price trajectories. Ensuring clarity and predictability in the evolution of the ETS is therefore critical for maintaining both economic efficiency and environmental effectiveness.

**The EU ETS regulatory framework needs to find the balance between competitiveness and environmental effectiveness.**

The EU’s decarbonisation policies also interact with two other priorities. First, competitiveness: EU industry needs conditions that support investment, growth, and fair competition with producers outside the EU. Second, security of supply and resilience: Europe needs to avoid new dependencies and reduce exposure to disruptions in critical value chains. This relates to a criticism frequently levelled at the ETS (and similar pricing schemes): That it is better suited at pushing polluting technologies out of the market than in incentivising new, „clean“ technologies to enter the market. With the EU’s industrial basis coming more under strain, this „blind spot“ becomes more relevant and needs to be addressed.

**Figure 2 - Industrial emissions (verified emissions of stationary installations, 2024)**



**Source:** Frontier Economics based on EU ETS Data Viewer  
**Note:** Part of ETS but not shown here are maritime and aviation sectors.

Carbon pricing instruments, including the EU ETS, can create a risk of carbon leakage. Firms may shift production to jurisdictions with more lenient carbon regulation or lose market share to more carbon-intensive imports. That can weaken EU industrial capacity, increase supply risks, and raise global emissions. Carbon leakage protection aims to prevent these outcomes by reducing the incentive to relocate production and by limiting substitution towards higher-emission production outside the EU.

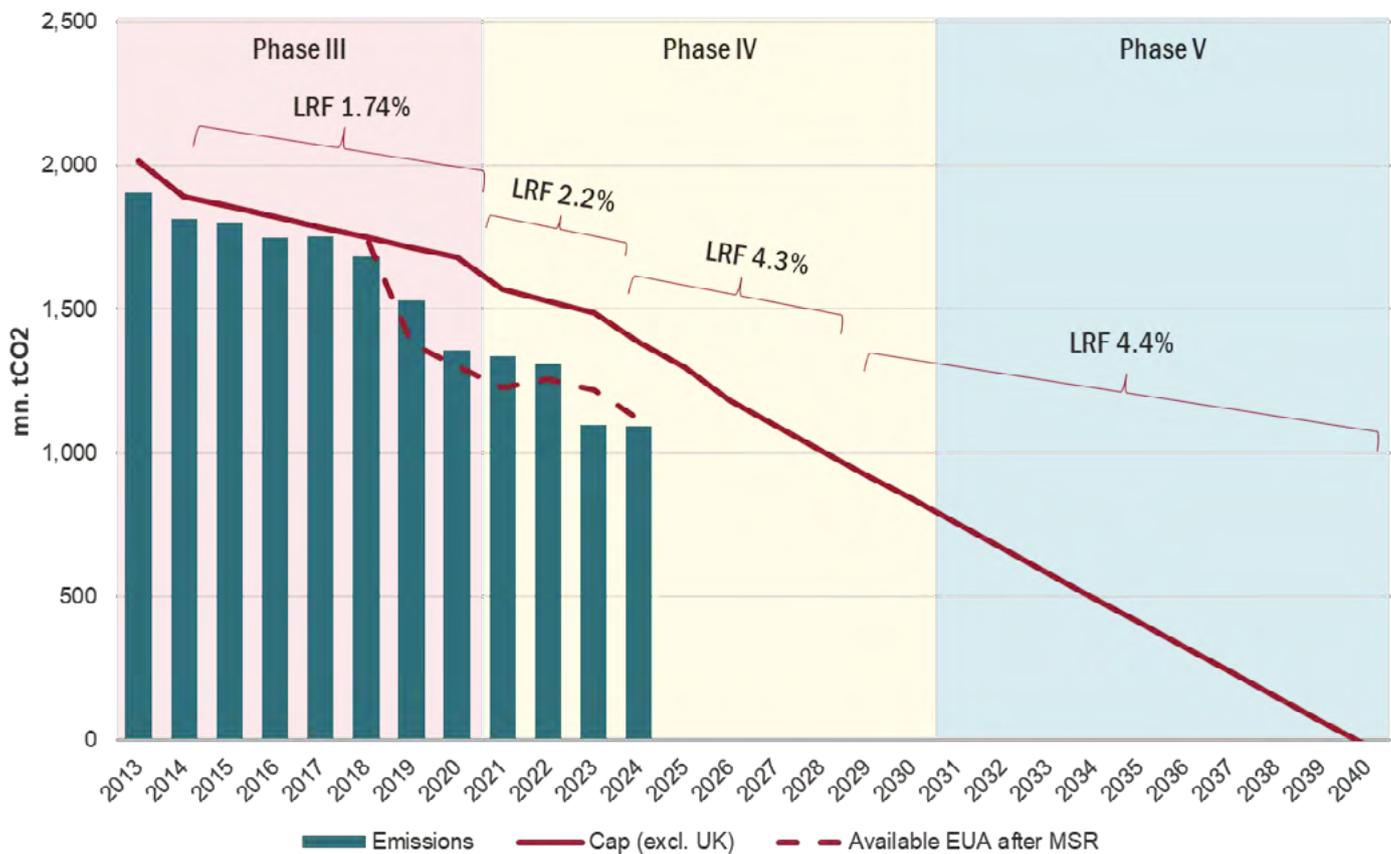
Today, carbon leakage protection relies mainly on two measures: free allocation of EU ETS allowances and compensation for indirect carbon costs embedded in electricity prices. This architecture is changing. The EU ETS certificate volumes are shrinking, implying that a lower certificate volume is available for free allocation. As a new means of carbon leakage protection, the Carbon Border Adjustment Mechanism (CBAM) is introduced gradually. The transition raises concerns and has triggered calls to extend existing provisions and to close remaining gaps.

### **EU ETS: changes ahead of trading Phase V**

**Figure 3** shows the level of historical emissions in comparison to the annually decreasing cap on emissions. While the regulatory framework for Phase V still has to be confirmed, it is expected that a continuation of the current speed at which the cap decreases, so-called Linear Reduction Factor (LRF), would lead to a cap of zero towards the end of the 2030s. A cap of zero does not automatically imply that no emissions would be allowed under the EU ETS but rather that no new allowances would be made available under the current scope. Market participants could still submit allowances that have been banked in previous years or purchase allowances generated by the inclusion of negative emissions (through carbon capture and storage), while the feasibility of the latter option is still unclear from today's perspective.<sup>9</sup>

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<sup>9</sup> [The European Union's Industrial Carbon Management Strategy](#)

**Figure 3 - EU ETS Allowance volumes**

**Source:** Frontier Economics based on EU ETS Data Viewer

**Note:** Part of ETS but not shown here are maritime and aviation sectors.

The European Commission is already exploring ways to improve the EU's carbon leakage and has proposed measures to close loopholes to prevent circumvention and strengthen the effectiveness of EU's Carbon Border Adjustment Mechanism's (CBAM). At the same time industry statements<sup>10</sup> highlight the urgency and political sensitivity of revisiting the European carbon leakage protection architecture while keeping decarbonisation incentives intact and maintaining a competitive environment for European industries. The 2026 Commission work programme has announced a climate package, with a proposal to update the EU ETS and associated carbon leakage instruments expected by July 2026.

### Carbon pricing meets industrial reality

Rising carbon prices under the ETS, together with persistently high energy costs, have intensified pressure on energy-intensive industries. Several industrial representatives and some member states have publicly argued that the combination of high EU carbon and energy prices is squeezing margins, weakening investment incentives in Europe, and risking relocation of production.

At the informal EU Leaders' retreat in Alden Biesen and a few days earlier at the Antwerp European Industry Summit in February

<sup>10</sup> For example several industry associations in a joint statement in June 2025 ([link](#)).

2026 these concerns have been echoed in discussions. Several leaders, including Germany's chancellor Friedrich Merz the hosting Belgian Prime Minister, Bart De Wever, highlighted competitiveness pressures facing industry and called for review of certain ETS parameters and for greater use of ETS and CBAM revenues to support industrial transition. These concerns are reflected in the position of the European chemical industry<sup>11</sup>, which has argued that the combined burden of high carbon prices and elevated energy costs risks undermining investment in EU production. Industry representatives have called for a careful calibration of the ETS trajectory, continued and more targeted carbon leakage protection for trade-exposed segments, and effective use of ETS and CBAM revenues to finance decarbonisation technologies such as electrified crackers, green hydrogen and carbon capture. At the same time, the sector has emphasised that CBAM does not address export exposure and that uneven global climate ambition may lead to relocation risks if policy tightening outpaces technological feasibility.

The political debate coincided with significant volatility in carbon markets: after rising above €90 per tonne in January, EUA prices fell sharply in February as markets reacted to signals of potential policy adjustment. This episode illustrated how sensitive carbon prices are to political uncertainty around the future design and stringency of the ETS.

At the same time, European Commission President Ursula von der Leyen emphasised the ETS's central role in delivering the EU's climate goals and pushed back against proposals that would dilute the carbon price signal, suggesting instead that targeted

support measures and revenue recycling should be used to alleviate cost pressures. The debate reflects a broader divide: industry and some national governments want relief from combined cost pressures, while the Commission and climate advocates argue that weakening the core ETS framework risks undermining decarbonisation and investment incentives. This tension is feeding into the formal ETS review process slated for later in 2026, with stakeholders calling for adjustments that preserve both environmental integrity and industrial competitiveness.

### Structure of this paper

In this paper, we focus on the future design of the EU ETS' carbon leakage framework, i.e. the measures that aim at preventing relocation of industrial activities to geographies with more lenient carbon regulations. However, we also touch upon the overall stringency and flexibility of the EU ETS. Accordingly, the paper is structured as follows:

- We start by discussing the overall ambition of the EU ETS and options to adjust the trajectory going forward as part of the 2026 review process in **section 2**.
- We present the current EU ETS framework for carbon leakage protection and challenges to that system arising from a decreasing cap on emissions and introduction of the CBAM as new instrument in **section 3**.
- In **section 4**, we elaborate on different ways to address these challenges before we discuss cross-cutting themes and long-term measures in **section 5**.

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<sup>11</sup> <https://cefic.org/resources/cefic-position-on-the-future-of-the-ets-priorities-for-the-chemical-industry/>

## 2. EU ETS TRAJECTORY: TRADING CLIMATE AMBITION FOR COMPETITIVENESS?

In recent weeks, the future of the EU Emissions Trading System has featured prominently in political and public debate, with growing tension between climate ambition and industrial competitiveness. In this section, we discuss latest political developments around and elaborate on policy options that target the overall stringency of the EU ETS and the climate ambition associated with it.

### CALIBRATING THE EU ETS: LRF AND MSR REFORM OPTIONS

#### Extending the cap by decreasing the LRF

One potential reform option for Phase V of the EU ETS would be to extend the effective emissions cap by lowering the Linear Reduction Factor (LRF) after 2030. The LRF determines the annual decline of the overall cap and therefore directly shapes allowance scarcity and the long-term carbon price signal. Under Phase IV, the LRF was increased significantly to align the system with the EU's 2030 climate target, leading to a steeper annual reduction in allowances.

Reducing the LRF in Phase V would slow the annual decline of the cap and increase the cumulative volume of allowances available over time. In practical terms, compared to the status quo, this would also mean that new allowances (albeit at small volume, see below) will be issued post 2039, something the current LRF effectively ends by that date. This would ease compliance costs, reduce short- to medium-term carbon price pressure, and provide additional transition space for energy-intensive

industry. In this sense, a lower LRF would not target leakage at the sectoral level but rather address the overall pace of emission reduction.

If the aim is to increase the cumulative volume of EU ETS allowances available for auctioning or free allocation while formally maintaining the long-term ambition of carbon neutrality by 2050 (see **Figure 4**), a reduction of the LRF could be considered:

- Reducing the LRF from 4.4% (status quo) to 4% increases the supply of allowances after 2030 (cumulative) by 10%.
- An LRF of 3% would increase cumulative supply by around 50% and extend the cap trajectory to approximately 2043 instead of 2039.
- A 2.5% LRF could extend the cap trajectory beyond 2045 and increase the cumulative volume of allowances available after 2030 by more than 80% compared to the current trajectory.
- Extending the cap trajectory to 2050 could be achieved by implementing an LRF of 2%, which would more than double the cumulative allowance supply after 2030.

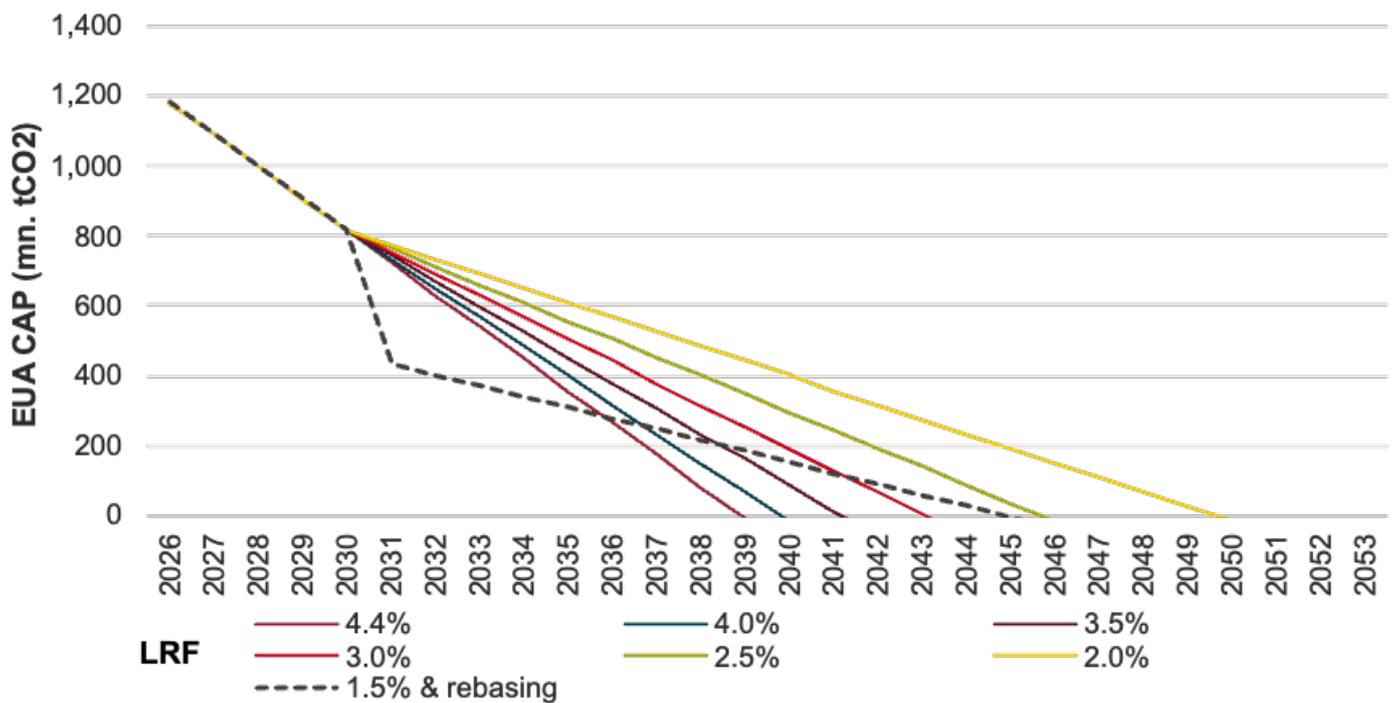
Such adjustments would have significant implications for carbon price expectations and investment incentives, particularly for firms that have invested early under the current tightening trajectory. As ETS sectors have historically been front runners in emission reductions, a slower decline of the ETS cap

would imply that greater mitigation efforts would need to come from non-ETS sectors if the EU is to remain on a credible pathway toward climate neutrality by 2050.

If the aim is to simply extend the timeline for industry to adapt while keeping the overall total supply of allowances unchanged, the combination of a reduced LRF and a one-off rebasing<sup>12</sup>, similar to Phase IV, could be considered. A combination of a one-off rebasing of 350 mn. tCO<sub>2</sub> and a reduced LRF

of 1.5% would extend the cap towards 2045 while keeping the overall supply unchanged. Such a strong reduction of supply in the short term, however, is very likely to create extreme price reactions as the effective supply of allowances would be cut by half in 2031. Nonetheless, a combination of rebasing and LRF adjustment could be framed as a response to competitiveness concerns, particularly if carbon leakage risks persist or if industrial transformation proceeds more slowly than anticipated.

**Figure 4 - Development of the EU ETS Cap under different LRF scenarios**



Source: Frontier Economics

However, this option involves clear trade-offs. A lower LRF would weaken the ETS contribution to the EU’s longer-term climate objectives, including the 2040 target and climate neutrality by 2050. It could dilute investment signals for breakthrough technologies and potentially undermine regulatory credibility if perceived

as a rollback of ambition. Moreover, reducing ambition within the ETS would shift mitigation pressure to other sectors if the overall EU climate goals were still to be achieved or require compensatory policy measures elsewhere.

<sup>12</sup> Rebasing refers to a one-off reduction of the cap. Two one-off cap reductions (rebasing adjustments) have been implemented before 2030: a reduction of 90 million allowances in 2024 and a further reduction of 27 million allowances in 2026.

### **Adjusting the MSR to provide more flexibility while maintaining LRF stringency**

The Market Stability Reserve (MSR) plays a central role in managing surplus allowances and maintaining scarcity in the EU ETS. Since its introduction, the MSR has absorbed a significant share of excess allowances and, through the cancellation mechanism, permanently reduced the overall cap. Under the current rules, allowances held in the MSR above a certain threshold are automatically cancelled. This mechanism has strengthened the system by making surplus withdrawals permanent and reinforcing long-term scarcity. The upcoming 2026 review of the EU ETS and the Market Stability Reserve offers an opportunity to reassess whether the current volume-based trigger mechanism, centred on the Total Number of Allowances in Circulation (TNAC), remains fit for purpose.

A reform option<sup>13</sup> would be to discontinue automatic cancellation, meaning that allowances placed in the MSR would remain in the reserve rather than being permanently removed from the system. This would effectively increase long-term allowance supply relative to the status quo, although in a more indirect manner than lowering the LRF.

#### **This approach could offer several advantages:**

- First, it would increase long-term flexibility. Allowances placed in the MSR would remain available as a strategic reserve rather than being permanently removed. In a context of high uncertainty such flexibility can enhance system resilience.

- Second, it would improve supply predictability. Automatic cancellation introduces an endogenous tightening mechanism that depends on surplus developments, which can be difficult for market participants to forecast. By halting permanent cancellation, the long-term supply path becomes more transparent and anchored primarily in the Linear Reduction Factor, strengthening regulatory predictability.
- Third, it could ease excessive long-term price pressure without formally weakening the cap trajectory. Rather than lowering the LRF – which would signal reduced climate ambition – maintaining allowances in the reserve provides a softer adjustment lever. This may be particularly relevant if decarbonisation costs prove higher than expected or if competitiveness concerns intensify.

Importantly, discontinuing automatic cancellation does not necessarily imply weaker environmental effectiveness. The cap would continue to decline annually according to the LRF. The reform would simply separate structural ambition, determined by the cap, from surplus management, handled by the MSR.

#### **Introducing a Price-Triggered MSR Instead of Volume Triggers**

The existing MSR was designed primarily to address structural oversupply following the financial crisis and the large influx of international credits. That task has largely been achieved. The central challenge for the coming

<sup>13</sup> For example, proposed by [Jos Delbeke](#).

decade may instead be the risk of excessive carbon price escalation and increased volatility in a structurally tightening market.

Under the current system, the MSR responds to surplus levels, not directly to price developments. A price-based trigger would instead activate allowance releases when prices exceed a predefined threshold, with the objective of moderating excessive upward price pressure.

This approach offers several advantages. It directly addresses political and competitiveness concerns related to very high carbon prices, improves short-term predictability for industry, and reduces the risk of destabilising price spikes. As structural oversupply has largely been absorbed, shifting the MSR's role from surplus correction to price moderation reflects the maturing of the ETS.

However, such a reform would alter the character of the system. A price-triggered MSR introduces elements of active price management and moves the ETS closer to a hybrid model between cap-and-trade and a carbon tax. Key design questions would include the level and symmetry of the corridor, the automaticity of intervention, and governance safeguards to maintain credibility.

In sum, a price trigger could enhance political durability and cost predictability, but it requires careful consideration to preserve a credible climate policy signal and long-term investment signals.

## EXPANDING SUPPLY FLEXIBILITY

An alternative to adjusting the cap or MSR parameters is to increase supply flexibility by broadening the sources of compliance within the EU ETS:

- One option is the integration of high-quality carbon removals, such as BECCS or DACCS<sup>14</sup>, into the ETS. This could support the development of negative emission technologies and align the system with net-negative pathways after 2050. However, strict rules on permanence, additionality and quantitative limits would be essential to avoid weakening mitigation incentives in covered sectors.
- A second option is allowing limited use of Article 6 international credits. Carefully designed access to high-integrity credits could moderate price spikes and strengthen international carbon market cooperation. At the same time, robust quality control and clear limits would be necessary to prevent environmental risks and avoid repeating past oversupply problems.
- A third avenue is closer coordination or eventual integration with ETS2<sup>15</sup>. A larger, more comprehensive carbon market would increase liquidity and improve cost-effectiveness across sectors. However, the ETS2 has not been introduced yet and differences in sectoral coverage and political sensitivity would require careful transition management.

<sup>14</sup> BECCS (Bioenergy with Carbon Capture and Storage) and DACCS (Direct Air Carbon Capture and Storage) are processes that capture CO<sub>2</sub> and permanently store it (BECCS: capturing CO<sub>2</sub> while generating energy from biomass; DACCS: capturing CO<sub>2</sub> directly from ambient air), delivering net carbon removal.

<sup>15</sup> As for example discussed by the Think Tank Bruegel ([Link](#)).

Overall, expanding supply flexibility can enhance resilience and political durability, but must be calibrated to preserve environmental integrity and the credibility of the cap. At the same time, shifting abatement efforts from the EU ETS to the ETS2 can cause friction with the in itself critical implementation of the emission trading system for buildings and road transport.

### **Conclusion: Maintaining integrity while enhancing flexibility**

The EU ETS is entering a new structural phase. The cap is tightening rapidly, surplus allowances have largely been absorbed, and the system is transitioning from managing oversupply to operating under increasing scarcity. At the same time, industrial competitiveness concerns have intensified, driven by high carbon prices, energy cost pressures, and uneven international climate ambition. This creates a visible tension between maintaining climate ambition and ensuring economic resilience.

Reform options differ in their implications and in the degree to which they affect the core architecture of the system.

Adjustments to the **Linear Reduction Factor** or to the overall cap trajectory would directly influence the EU's long-term climate ambition. Such measures could ease compliance costs and reduce short- to medium-term carbon price pressure, potentially providing additional transition space for industry. However, they also carry broader implications for investment signals, target consistency, and regulatory credibility. For that reason, any reconsideration

of the cap trajectory would require careful assessment of its interaction with the EU's 2040 and 2050 objectives and with the broader policy framework. Any reform should be embedded in the broader transitional flexibility framework agreed in the context of the EU's 2040 climate target discussions.

Changes to the cap trajectory have direct implications for companies that invested early in decarbonisation under the expectation of a steadily tightening and legally binding framework. A slower decline of the cap, for example through a reduced Linear Reduction Factor, would increase allowance supply and likely moderate future carbon prices. While this could ease short-term cost pressures, it would also reduce the scarcity value that underpins the business case for early low-carbon investments.

For early adopters, this raises concerns about regulatory credibility and investment certainty. If the long-term tightening path is perceived as reversible, the expected returns on early decarbonisation efforts may diminish, and future investment decisions across the sector could be delayed. Conversely, maintaining a clear and predictable cap trajectory preserves the reward structure for early movers, while operational flexibility – for example through adjustments to the Market Stability Reserve – may help manage volatility without fundamentally weakening long-term ambition.

The distinction between altering structural ambition and improving system flexibility is therefore particularly relevant for safeguarding the incentives of early adopters.

A reform of the **Market Stability Reserve** may offer a more proportionate avenue for enhancing flexibility. The MSR was designed to address structural oversupply. As the system moves into a phase of tightening supply, recalibrating its functioning could help improve predictability, moderate volatility, and strengthen resilience without formally altering the cap. Options such as adjusting cancellation rules or exploring price-responsive elements merit further examination, provided that credibility and long-term investment incentives are preserved.

**Expanding supply flexibility** through the inclusion of high-quality carbon removals, limited use of international credits, or closer coordination with other carbon markets could also contribute to system robustness. These options would need to be designed with strong safeguards to maintain credibility and avoid undermining the cap.

In the next sections, we dive into the details of the current and future carbon leakage architecture. The challenges identified and discussed in the remainder of the paper are valid under the current cap but also under a reformed trajectory.

### 3.

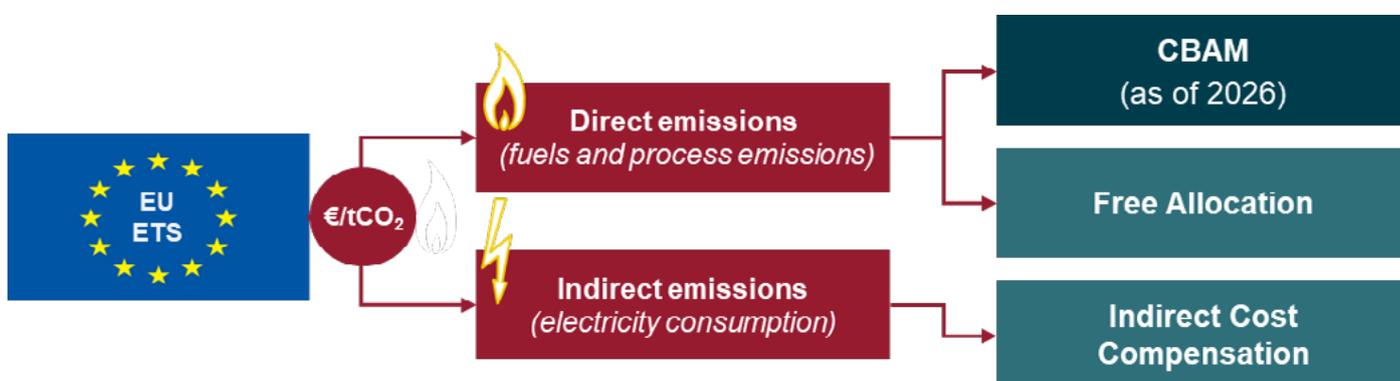
## THE EVOLVING CARBON LEAKAGE ARCHITECTURE: PHASING-OUT FREE ALLOCATION, WHILE PHASING-IN CBAM

Important pillars of the EU's carbon leakage protection for industrial installations have been the free allocation of EU ETS certificates and the indirect cost compensation. In this section, we provide an overview of the current carbon leakage protection framework, discuss latest and future amendments as well as implications and challenges that arise in the evolving carbon leakage framework in the light of an overall decreasing cap on emissions in the EU ETS.

### CURRENT INSTRUMENTS: FREE ALLOCATION AND INDIRECT COST COMPENSATION

While the mechanics for these carbon leakage protection mechanisms have recently been updated<sup>16</sup>, the system is also undergoing a larger change: For those products captured by CBAM<sup>17</sup>, the number of free allocations is gradually reduced between 2026 and 2034 alongside the ramp-up of CBAM coverage. This fundamentally changes the logic of EU carbon leakage protection for basic materials such as iron & steel, cement and fertilisers.

**Figure 5 - EU ETS carbon leakage protection architecture (simplified)**



**Source:** Frontier Economics

Under the EU ETS, compliance costs from direct emissions<sup>18</sup> are reduced through free allocation of certificates to industrial installations<sup>19</sup>, which are at the risk of carbon leakage. Mainly industrial sectors that are

energy-intensive and operate under particular global competition are eligible for free allocation of EU ETS certificates. Power generation generally does not receive free allowances, with limited exceptions.

<sup>16</sup> The EC has adopted an amendment for the indirect cost compensation on 23 December 2025, see Commission amends ETS State aid Guidelines. An update on the benchmarks for free allocation is outstanding at the time of writing.

<sup>17</sup> Iron & steel, aluminium, fertilizer, cement, hydrogen, electricity as well as selected precursors and downstream products.

<sup>18</sup> Process and combustion emissions.

<sup>19</sup> Eligibility for free allocation is defined in the EU's carbon-leakage list for 2021–2030, set out in Commission Delegated Decision (EU) 2019/708.

Free allocation is largely benchmark-based. For many products, the EU sets product benchmarks (emissions per unit of product) based on the average performance of the 10% most efficient installations in that sector. Benchmarks are reduced incrementally, and subject to upper and lower limits to the applied change, to encourage companies to decarbonise and advance innovation. An eligible installation receives its free allocation based on its historic activity (production) level. The next update of the benchmarks is expected in the first half of 2026 to be applied to free allocation between 2026 until 2030.

The EU's **indirect cost compensation** scheme is a state-aid framework that lets EU countries partly reimburse electricity-intensive companies for the EU ETS carbon costs that are passed through into electricity prices (so-called indirect emission costs).<sup>20</sup> It is not one single EU-wide payment program. Instead, Member States set up national compensation schemes (budget, application process, etc.) subject to the general framework provided by the EU (EU ETS State Aid Guidelines).

## EXCURSUS: FREE ALLOCATION FROM AN ECONOMIC AND A COMMERCIAL PERSPECTIVE

Free allocation mainly changes who pays for allowances, not how many tonnes are emitted. The EU ETS cap fixes the total number of allowances in circulation, so free allocation does not, by itself, increase the overall quantity of emissions.

From an industry perspective, free allocation lowers the direct compliance cost compared to full auctioning, especially for energy-intensive, trade-exposed sectors. This supports short-run cash flow and reduces the risk of abrupt cost shocks. In turn, it helps mitigate relocation incentives and carbon leakage risk in the transition, while firms adapt and invest.

Even with free allocation, the core logic of the EU ETS, i.e. providing incentives to abate emissions, remains intact: every tonne of CO<sub>2</sub> emitted has an opportunity cost. Firms can use an allowance for compliance, but they could also sell it or bank it for future use. That opportunity cost preserves incentives to abate – provided allowances remain tradable and free allocation is not linked to actual emissions. Moreover, the strength of innovation incentives hinges on the stringency of the cap, how quickly benchmarks tighten, and what firms believe about the future availability of free allocation, especially as CBAM phases in.

This is why design details matter. Under the EU ETS, free allocation is typically based on product benchmarks (reflecting emissions intensity of top-performing installations), adjusted for activity levels and declining over time in aggregate. This creates two key incentives:

- An incentive to outperform peers on carbon efficiency, because allocation volumes depend on benchmarks rather than an installation's own technology.

<sup>20</sup> The ETS Directive (Directive 2003/87/EC) provides for Member States to take financial measures for sectors exposed to carbon leakage due to costs passed on in electricity prices. Only firms in eligible sectors can receive compensation. Payments are typically calculated using a formula tied to (a) a CO emission factor for electricity, (b) an ETS carbon price reference, and (c) efficiency benchmarks, with caps to prevent overcompensation. The State Aid Guidelines set different maximum compensation rates (e.g., 80 % for some sectors and 75% for others, as adopted by the EC on 23 December 2025) and allow additional caps such as linking compensation to a share of company gross value added in some cases. In addition, beneficiaries must meet requirements around energy audits/management systems, and, under the amended rules, Member States can require things like investing at least 50% of the aid into projects that substantially cut emissions.

- A weaker incentive to reduce output in carbon-intensive sectors than under full auctioning, because future allocation of free allowances is (partly) linked to production levels.

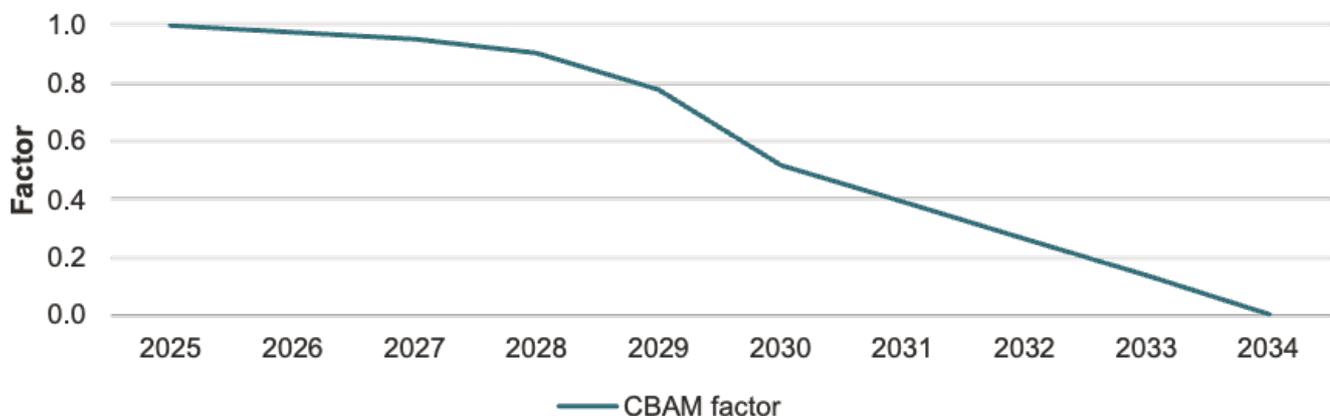
## THE CBAM TRANSITION AND PHASE-OUT OF FREE ALLOCATION

The level of free allocation is determined by product and fallback benchmarks and annual reduction rates. Benchmarks are reviewed and updated in each allocation period to reflect technological progress and changes in production processes. The European

Commission is expected to update the benchmarks for the second half of trading Phase IV (2026–2030)<sup>21</sup> in “early 2026”.<sup>22</sup> For benchmarks the annual reduction rates are increased and range between 0.3% and 2.5% depending on the sector.

For those sectors that currently receive free allocation and whose products will also fall under CBAM, free allocation is said to decrease from 97.5% in 2026 to 0% by 2034. The “CBAM Factor” parameterises the reduction in free allocation volumes. The following figure illustrates the evolution of this factor between 2025 and 2034.

**Figure 6 - Phase-out of free allocation: Evolution of the “CBAM Factor”**



**Source:** Frontier Economics based on [Guidance Document n°1 on the harmonised free allocation methodology for the EU ETS – 2024 revision](#)

<sup>21</sup> Phase IV spans from 2021 to 2030. The update of industrial benchmarks for the second half of Phase IV (2026–2030) is governed by the EU ETS Directive and the Benchmarking Regulation (Delegated Regulation (EU) 2019/331).

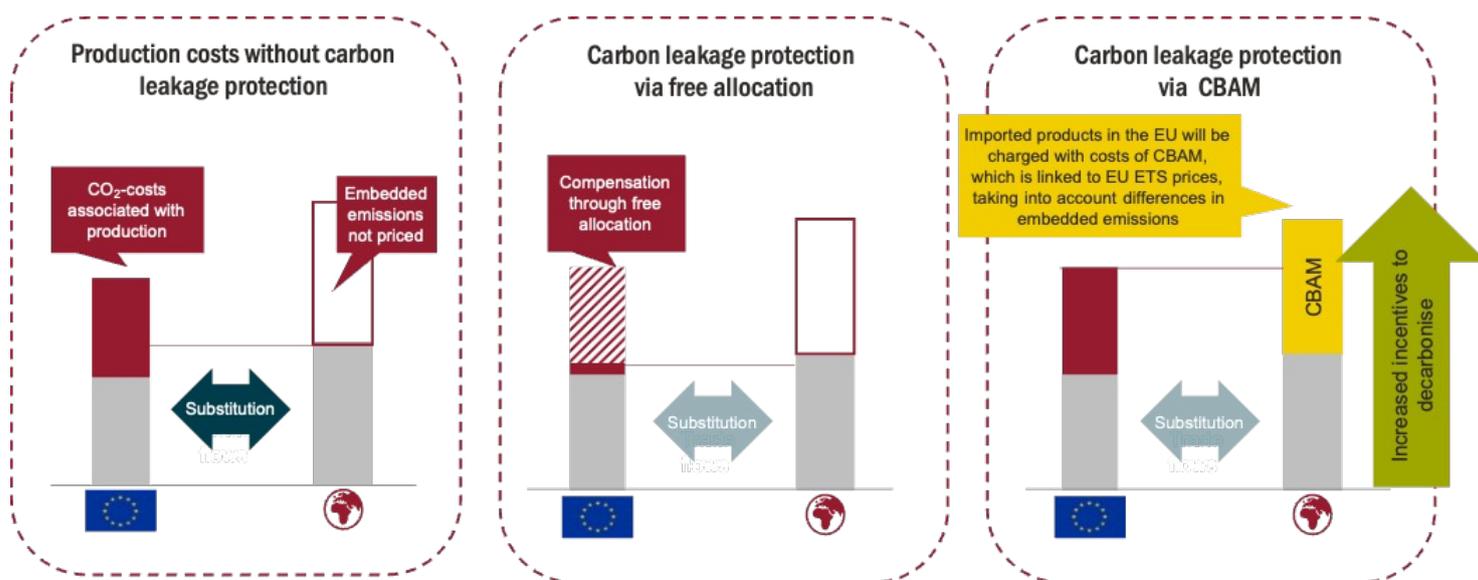
<sup>22</sup> Commission Implementing Regulation (EU) 2025/2620 of 16 December 2025

CBAM introduces carbon pricing to imported products whose domestic counterparts are subject to the EU ETS. Thereby CBAM intends to prevent carbon leakage by introducing a CO<sub>2</sub> price on foreign goods that have so far not been subject to carbon pricing or subject to a lower CO<sub>2</sub> price than within the EU. Hence, CBAM internalises the carbon externality for emitters in other parts of the world.

Compared to the current system of free allocation, CBAM does not offer protection

against carbon leakage by lowering the cost burden on domestic producers, but by introducing additional cost for producers outside of the EU in jurisdictions with more lenient carbon regulation as shown in **Figure 7**. The current design of the CBAM, however, only covers imports to Europe and does not mitigate competitive disadvantages of EU producers exporting to global markets where they might face competitors that are not subject CO<sub>2</sub> pricing.

**Figure 7 – Principles of CBAM vs. free allocation**



**Source:** Frontier Economics

During the initial “definitive period” that started on 1 January 2026, the scope is limited to several products which can be described as rather homogenous and that currently receive free allocation based on product benchmarks<sup>23</sup>: iron & steel, aluminium, fertilizer, cement,

hydrogen, electricity as well as selected precursors and downstream products.<sup>24</sup> The underlying rationale is to limit the complexity required to measure and report the embedded CO<sub>2</sub> emissions for imports.

<sup>23</sup> With the exception of electricity, which is not eligible for free allocation.

<sup>24</sup> See [Carbon Border Adjustment Mechanism – Taxation and Customs Union](#)

In response to feedback received from industry, the EC has suggested a number of measures recently, shortly before the start of the “definitive period” that started on 1 January 2026:

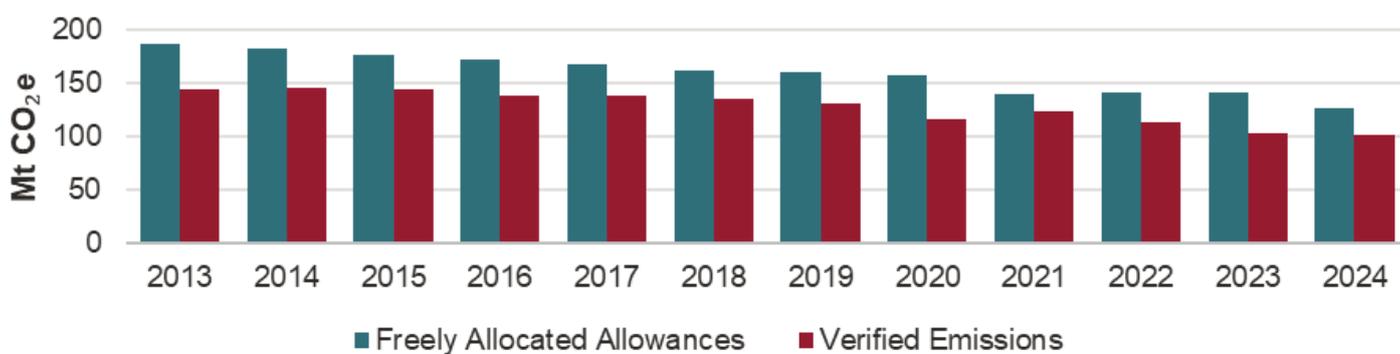
- In December 2025 the EC proposed measures to
  - close loopholes to prevent circumvention,
  - extend the scope of EU’s Carbon Border Adjustment Mechanism’s (CBAM) to selected downstream products<sup>25</sup> and
  - launch the Temporary Decarbonisation Fund to temporarily support EU producers of CBAM goods and mitigate carbon leakage risks, with a focus on reimbursing a portion of the EU-ETS carbon costs for goods still facing carbon leakage risks (likely export-facing activities).<sup>26</sup>
- In October 2025 simplifications for CBAM, centring around a new exemption threshold for importing companies, came into force.<sup>27</sup>

## CASE STUDY: FREE ALLOCATION FOR CBAM AND NON-CBAM PRODUCTS

Free allocation matters most where trade exposure is high and the CBAM transition changes the rules. We illustrate this with two sectors that sit on different sides of the current CBAM boundary: Iron & Steel (covered by CBAM) and Chemicals (only partly covered by CBAM).

Iron & Steel receives benchmark-based free allocation under the EU ETS. The sector is both carbon intensive and trade exposed, so it has historically qualified for high levels of protection. In our time series, two trends move in the same direction: Free allocation declines steadily over time in parallel to verified emissions. The fall in emissions likely reflects a mix of lower production and process efficiency improvements. For much of the period, total free allocation to the sector exceeds verified emissions, which means firms can cover compliance needs without buying additional allowances and may hold or sell surplus allowances.

**Figure 8 – free allocation and verified emissions: Iron & Steel**



**Source:** Frontier Economics based on EU ETS data viewer

<sup>25</sup> 180 steel and aluminium-intensive products, like machinery and appliances.

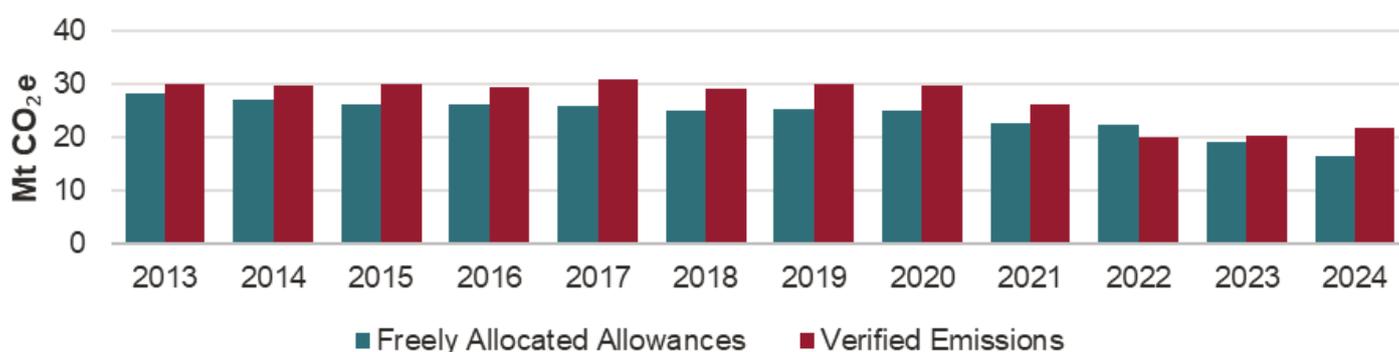
<sup>26</sup> See [Commission strengthens the Carbon Border Adjustment Mechanism](#)

<sup>27</sup> See [Officially published: Simplifications for the Carbon Border Adjustment Mechanism \(CBAM\) – Taxation and Customs Union](#)

The chemicals sector is also treated as carbon-leakage exposed under the EU ETS and receives benchmark-based free allocation. The pattern in our data is similar but less “surplus-heavy” than steel: Free allocation declines steadily over time, while verified emissions trend downwards, with year-to-year

variation. This combination suggests gradual decarbonisation, but also sensitivity to market cycles, operating rates and fuel mix but is also explained by the different extent to which chemical products, accumulated in the graph, receive benchmarked free allocation.

**Figure 9 - free allocation and verified emissions: Chemicals**

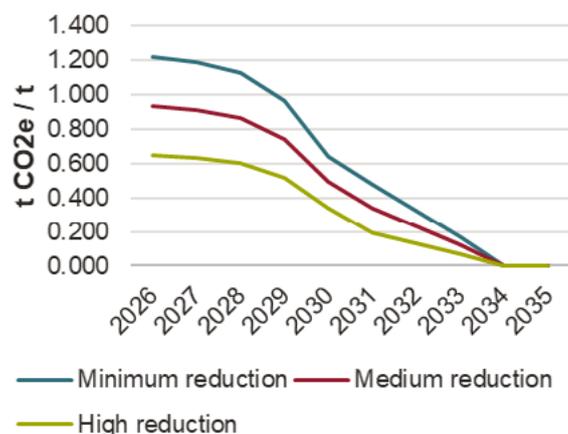
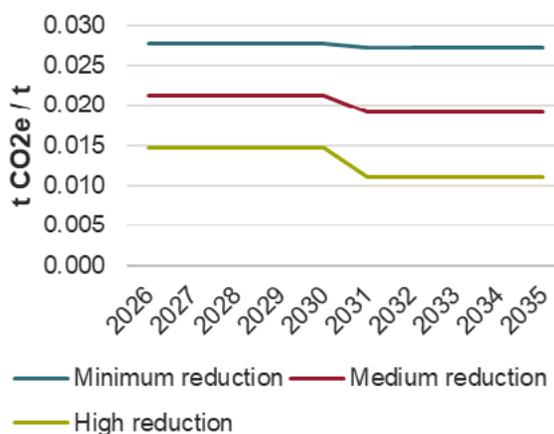


**Source:** Frontier Economics based on EU ETS data viewer

To understand how protection evolves going forward, we develop forward-looking scenarios for benchmarks. We depict one product for each of the two sectors, hot metal (covered CBAM) as example for the iron & steel industry, and refinery products (not covered by CBAM) as example for the chemical industry. We vary the annual benchmark reduction rate from 0.2% p.a. (slow tightening) to 2.5% p.a. (fast tightening) and explore intermediate paths. We then combine each benchmark path with the other parameters that determine effective protection per unit of output, most importantly the CBAM factor during the transition, to

calculate the free allocation per unit of output (tCO<sub>2</sub> allowances per tonne of product) under each scenario.

As the graphs below show, the free allocation expressed in tCO<sub>2</sub> per tonne of product for sectors covered by CBAM decrease towards zero by 2034 while the non-CBAM goods continue to receive free allocation, although also declining due to updated benchmarks. Whether or not the non-CBAM sector will continue to receive constant free allocation also depends on the application of the Cross Sectoral Correction Factor beyond 2030.

**Figure 10 - Modelled initial free allocation per sector****Hot Metals****Refinery Products**

**Source:** Frontier Economics

## DRIVERS FOR REFORM: UPDATING THE EU CARBON LEAKAGE ARCHITECTURE

The EU's architecture for carbon leakage protection will change from today towards 2035 and beyond. With the carbon leakage protection, the EC aims to protect the competitiveness of European industry in covered sectors, preserve incentives to decarbonise within Europe, and support investment in cleaner production rather than relocation to jurisdictions with weaker climate constraints. This supports the EU's ambition to remain a climate early adopter and helps underpin delivery of EU climate goals while contributing to global emissions reductions consistent with international climate targets.

Against this backdrop, the current carbon leakage architecture is in the midst of a significant transition. The emerging framework introduces clear strengths, but also new limitations and risks that need to be understood.

### Introducing CBAM can bring advantages

The shift (for some industrial sectors and products) from carbon leakage protection via EU ETS free allocation to CBAM can bring several advantages. These include:

- Long-term carbon leakage protection:** CBAM can provide a long-term mechanism that is not constrained by the shrinking availability of EU ETS allowances for free allocation as the overall cap declines.
- Carbon costs for non-EU producers:** By requiring importers to account for embedded emissions (or recognise an equivalent carbon price paid abroad), CBAM helps internalise the CO externality associated with production outside the EU. This could increase incentives for producers to decarbonise, provided that non-EU production with a higher carbon intensity than European production no longer has an advantage (due to lack of carbon pricing prior to CBAM) over European production.

- In addition, it is possible that non-EU producers do not fully charge CBAM-induced carbon costs on top of their previous product prices. Rather, foreign producers could absorb some of the carbon costs.<sup>28</sup>

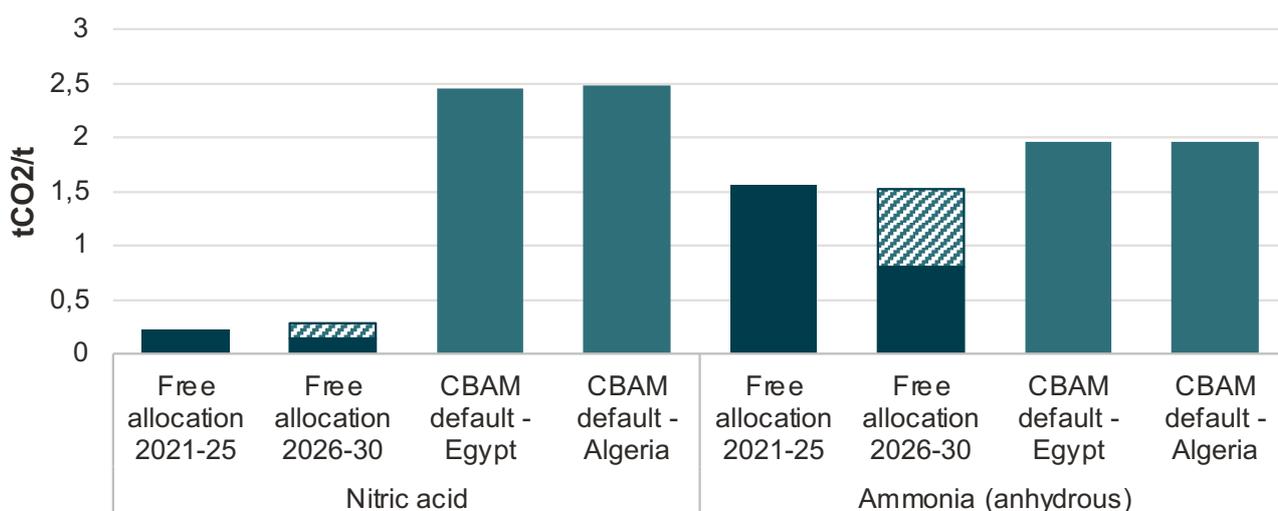
■ **Stronger protection where imports are more carbon-intensive:** For some products, the embedded-emissions intensity applied under CBAM (based on actual embedded emissions or based on default values where verified data is not provided) may exceed the benchmark (based on 10% most efficient EU installations in the sector) used to calculate free allocation. In such cases, CBAM can increase the relative degree of protection for EU production compared to the previous system. The text box below shows the level of protection provided by CBAM compared to free allocation based on the example of fertilizers.

### COMPARISON OF CBAM DEFAULT VALUES AND EU ETS BENCHMARKS – EXAMPLE OF FERTILIZERS

Fertilizers represent one of the most complex products included in CBAM, with emissions from ammonia (NH<sub>4</sub>), nitric acid (HNO<sub>3</sub>), energy use and precursors (e.g., natural gas), requiring detailed calculation. Apart from Russia, the largest volumes of fertilizers are being imported into the EU from Egypt and Algeria.

For nitric acid and ammonia (anhydrous) the CBAM default values<sup>29</sup> applied to imports from Egypt and Algeria exceed the benchmark that is used to determine the products' free allocations. Assuming that the same carbon price is applied, the carbon pricing effect from CBAM (relying on default values) is in these examples larger than the shielding of the EU ETS carbon pricing through free allocation. Hence, for these two products, CBAM may

#### Free allocation benchmarks and CBAM default values



**Note:** The free allocation benchmark for 2026–2030 is depicted as a range, calculated based on the minimum and maximum reduction rates.

<sup>28</sup> Power price developments in the Western Balkans vis-à-vis their EU neighbours after the start of the definitive phase of CBAM seem to indicate this effect (see [For the EU's Balkan neighbours, CBAM starts to bite](#)).

<sup>29</sup> Commission Implementing Regulation (EU) 2025/2621 of 16 December 2025 laying down rules for the application of Regulation (EU) 2023/956 of the European Parliament and the Council as regards the establishment of default values. ([Link](#)).

■ **Additional EU revenues:** CBAM generates revenues that would not arise if the corresponding carbon-leakage protection were delivered through free allocation of EU ETS allowances instead: The European Commission is expecting to generate 1.5 billion Euros in CBAM revenues by 2028, these revenues will be collected by Member States whose national authorities are in charge of selling CBAM certificates. Of these revenues, 75% should contribute to the EU's own resources. The remaining 25% should contribute to the proposed Temporary Decarbonisation Fund, which provides targeted financial support to EU producers of CBAM goods that still face a high risk of carbon leakage as free allowances are phased out under the EU Emissions Trading System (EU ETS). The EC proposal also foresees that 30% of the revenues generated by auctioning EU ETS allowances should contribute to the EU's own resources.<sup>30</sup>

### **But challenges for the carbon leakage architecture remain**

The current carbon leakage architecture does not coherently protect all of EU's industry – both in scope and across time. The effect on the EU's industry varies by a number of aspects, for example by (sub-)sector, by product purpose (EU consumption vs. export) and by value chain level (upstream vs. downstream).

In general, we can group the remaining challenges between direct effects of the EU ETS and carbon leakage and indirect effects of the EU ETS on the competitiveness of industry and wider economic effects.

### **Challenges to the effectiveness of the changing carbon leakage framework directly affect the industry**

Remaining challenges relate to the effectiveness of the carbon leakage framework. These affect sectors exposed to a genuine risk of carbon leakage which are now covered by CBAM and whose free allocation will gradually decrease in line with the CBAM introduction and those not covered by CBAM.

- **Export exposure: CBAM sectors at a disadvantage** – There is no carbon leakage protection for EU export goods from CBAM-sectors, i.e. goods produced in the EU and sold outside the EU. As a result, export-oriented producers can remain exposed to carbon leakage risks in third-country markets, where competitors may not face similar carbon costs.
- **Complexity and loopholes: CBAM importers face regulation** – There are risks of high complexity and loopholes around CBAM: CBAM's methodology must translate complex production realities into a carbon cost at the border. Importers and authorities must manage detailed reporting, verification, and documentation requirements across diverse supply chains, often involving multiple inputs, processing steps, and countries of origin. Moreover, where verified plant-level data is not available, the use of default values can misstate embedded emissions – either overstating them for efficient producers or understating them for high-emission production – weakening the “level playing field” in practice.<sup>31</sup> The complexity

<sup>30</sup> EU Commission Own Resources Fact Sheet ([Link](#))

<sup>31</sup> Methodological boundaries also matter: the treatment of indirect emissions under CBAM does not mirror the EU's existing approach to electricity-related carbon costs via indirect cost compensation, and differences in scope, calculation rules, and eligibility can leave residual cost gaps for EU producers or uneven burdens across products.

of CBAM in practice creates compliance costs and practical frictions that can be disproportionately challenging for products with fragmented value chains, and it increases the risk of errors, disputes, and delays.

In addition, CBAM creates incentives for circumvention, as firms may seek to restructure supply chains, modify product classifications, or shift minor processing steps to avoid coverage.

- **Free allocation to non-CBAM goods: Reducing certificate volumes available for free allocation sectors** – The EU ETS system is tightening, also reducing certificate volumes available for free allocation for sectors not part of CBAM: Numerous sectors continue to be classified as at significant risk (reflected in a Carbon Leakage Exposure Factor (CLEF) = 1) while remaining outside CBAM. As the initial CBAM design focussed on homogenous basic materials and associated selected precursors or downstream products these sectors, expanding the CBAM framework to other products will inherently become more complex. Therefore, carbon leakage protection still relies primarily on EU ETS free allocation, yet the overall volume of EU ETS allowances declines over time, pushing free allocation downward as the system tightens toward low levels. The result is that non-CBAM sectors will face a shrinking carbon leakage protection, with potentially higher residual leakage risk unless additional or alternative measures are introduced. This challenge is relevant for the time period until the EU ETS cap as it is known today reaches zero. Extrapolating today's

linear reduction factor forward implies no new allowances by 2040, hence, no ability to provide free allocation to non-CBAM sectors that are exposed to a risk of carbon leakage.

- **CBAM might shift emissions into the EU, increasing the EU's abatement task:** CBAM is expected to reduce global emissions by shifting production incentives: emissions may be (temporarily) somewhat higher within the EU as domestic producers retain higher market shares, but this is more than offset by larger emissions reductions abroad. This means that the domestic abatement task becomes larger: more emissions must be reduced within the EU to stay on track with EU climate targets, raising the importance of complementary policies that accelerate low-carbon investment and deployment.

Changes to the carbon leakage framework not only affect those companies that are subject to the EU ETS but can also have knock-on effects in upstream- or downstream industries as well as wider economic and trade effects:

- **Downstream pressure:** Knock-on effects along value chains with inputs from CBAM sectors – CBAM currently covers only selected upstream parts of industrial value chains, while most downstream goods are not included. CBAM operates like a tariff on certain carbon-intensive inputs, thus creating predictable knock-on pressures along value chains. When covered inputs become relatively more expensive, downstream activities face a competitiveness hit – both through relative price effects (competing with imports of

finished goods that do not face the same adjustment) and through a cost shock (higher input costs that cannot always be passed on).

The risk is particularly pronounced for sectors that are trade-exposed and have limited ability to pass on higher costs to final consumers<sup>32</sup>. Over time, this can lead to production shifts, reduced investment in EU-based downstream activities, or increased reliance on imported finished goods. This dynamic typically generates demands to extend the instrument to additional products and sectors, as excluded activities seek comparable protection to avoid being disadvantaged by the initial, narrower coverage. This is what, in late 2025, has motivated the Commission to propose including select downstream products in the CBAM.

- **Trade impediment: Carbon border tax with trade-reducing effect for the economy**  
– CBAM brings (unintended) macroeconomic side effects<sup>33</sup>. At least in the short run, CBAM can raise EU national income through a terms-of-trade effect<sup>34</sup>, reflecting the EU's market size and the fact that part of the policy burden is borne by foreign exporters via higher import prices or reduced margins. At the same time, CBAM tends to reduce overall EU trade with the rest of the world, as it increases the cost of imports for CBAM products and thereby dampens cross-border flows. If CBAM is expanded to more products and value-chain stages, this trade-reducing effect can grow and become a more material drag on long-run economic growth.

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<sup>32</sup> For example, automotive or machinery manufacturing and plastics converting or downstream chemicals products

<sup>33</sup> [The EU's Carbon Border Adjustment Mechanism and the interplay of climate and trade policy](#)

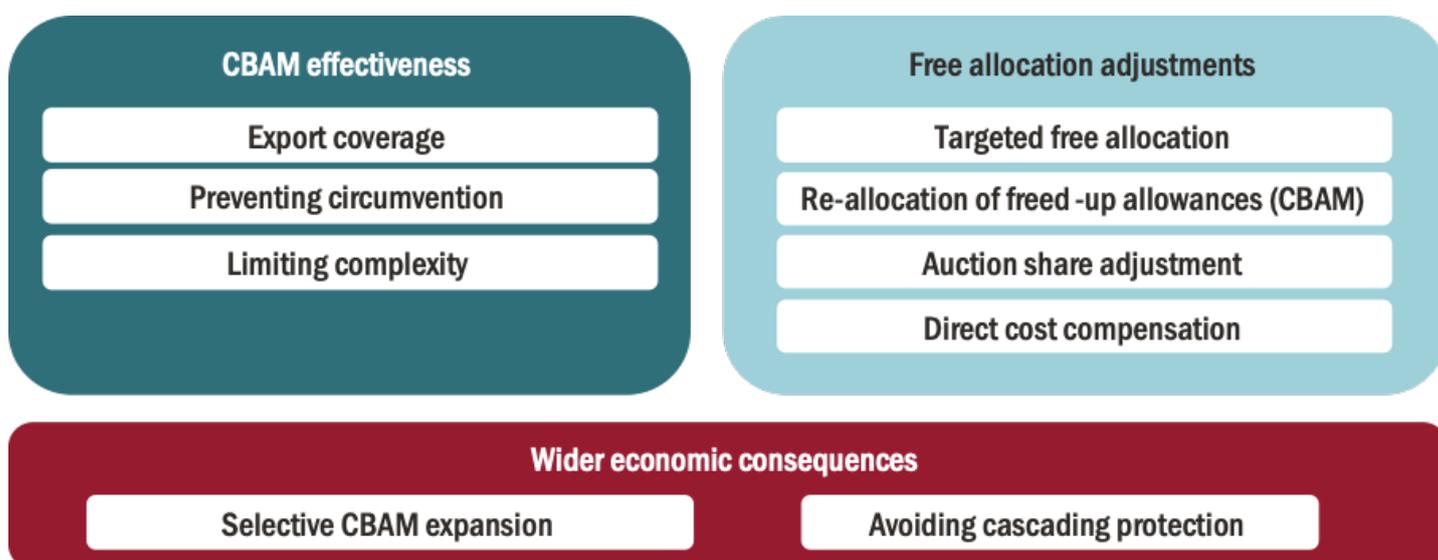
<sup>34</sup> A "terms of trade effect" describes how changes in the prices of a country's exports relative to its imports impact its real national income and welfare, essentially showing how much more (or less) purchasing power the country gains or losses from international trade.

## 4. POLICY OPTIONS: FUTURE-PROOF CARBON LEAKAGE PROTECTION

A range of policy options can help address the different challenges outlined above. They differ in political feasibility, administrative complexity, economic efficiency, and distributional impacts across sectors and value chains. In practice, the most robust approach is likely a policy mix: strengthening the long-term international

benchmark, improving the functioning and scope of CBAM where appropriate, reforming free allocation (or replacing it with more transparent compensation), and developing complementary tools to address export exposure.

**Figure 11 – Overview of policy options to address EU ETS carbon leakage**



**Source:** Frontier Economics

### THE LONG-TERM GOAL: INTERNATIONAL COLLABORATION ON CLIMATE CHANGE

From a first-best economic perspective, the most effective way to address carbon leakage is through broad-based international coordination on climate policy. If major trading partners were to apply comparable carbon pricing or equivalent climate regulation, the risk of relocation and loss of competitiveness

would be significantly reduced, and the need for border measures or sector-specific protection would diminish.

In practice, full global carbon pricing remains unlikely in the near term. More realistic pathways include cooperation within smaller climate clubs, bilateral agreements, or linking of emissions trading systems. The ongoing efforts to align EU and UK carbon pricing frameworks illustrate how partial integration can reduce competitiveness concerns while

maintaining carbon reduction ambitions<sup>35</sup>. While such cooperation cannot substitute for domestic carbon leakage protection in the short run, it provides an important benchmark against which other policy instruments should be assessed.

## INCREASING THE EFFECTIVENESS OF CARBON LEAKAGE PROTECTION UNDER CBAM

As described above, carbon leakage protection of CBAM goods might suffer the following pitfalls that lower the overall effectiveness of carbon leakage protection: Incomplete coverage related to exports, loopholes and circumvention, misaligned carbon leakage protection due to the complexity of the instrument. In the following, we discuss options to deal with these pitfalls in more detail.

### Addressing incomplete export coverage through support mechanisms or cost-compensation

CBAM provides protection for EU producers competing with imports in the internal market, but it does not address competitiveness in export markets. As described above, EU producers selling into third countries continue to face carbon costs under the EU ETS, while their competitors abroad may not face comparable constraints and costs. As free allocation for CBAM-covered products is phased out, this exposure becomes more pronounced.

Several policy options could address this gap. The latest European Commission Proposal

foresees additional carbon leakage protection under the Temporary Decarbonisation Fund (see box below). The mechanism addresses the loss in competitiveness in third-country markets, i.e. export markets. While this instrument potentially offers a solution for exports under CBAM, it is currently only available in 2026 and 2027, years in which the financial impact from CBAM is limited due to a CBAM Factor of 97.5% (2026) and 95% (2027).

**Temporary and targeted export support mechanisms**, such as the proposed Temporary Decarbonisation Fund, can help mitigate leakage risks during the transition period. Such mechanisms can be designed to reimburse part of the carbon costs associated with export production, while remaining time-limited to preserve decarbonisation incentives.

## INNOVATION FUND FINANCES DECARBONISATION IN SECTORS AT RISK OF CARBON LEAKAGE

The Innovation Fund applies to sectors that receive free allocation by supporting deep decarbonisation investments that would not be delivered by the ETS carbon price alone. These sectors, such as steel, cement, chemicals and refining, remain eligible because free allocation is intended to address short-term carbon leakage risks, not to finance major technology shifts.

The Fund is financed from EU ETS auction revenues and is expected to mobilise around €40 billion over the period 2020 to 2030, based on revenues from roughly 530 million allowances<sup>36</sup>. Funding is allocated through periodic competitive calls and auctions, with

<sup>35</sup> [Linking the EU and UK emissions trading systems](#)

<sup>36</sup> EU Innovation Fund ([Link](#)).

several billion euros available at any given time – for example, recent 2024 to 2025 calls amount to around €4.5 to €5 billion<sup>37</sup>.

In practice, the Innovation Fund provides support for first-of-a-kind or large-scale deployment of innovative low-carbon technologies, including process changes, electrification, hydrogen use and carbon capture. Funding is based on the additional cost of the innovative project compared to a conventional reference technology, rather than on emissions compliance costs, which avoids overlap with free allocation.

An alternative approach is a **benchmark-based refund of ETS costs for exported goods**. This would function as a partial and carefully designed export rebate, based on efficient production benchmarks rather than actual emissions. While such an approach can improve competitiveness in third-country markets, it must be designed cautiously to avoid weakening the EU ETS price signal or raising concerns under international trade rules.

### **Preventing circumvention through effective MRV and selective extensions of CBAM**

CBAM creates incentives for circumvention, as firms may seek to restructure supply chains, modify product classifications, or shift minor processing steps to avoid coverage. These risks increase as price differentials between EU producers of CBAM-covered and non-EU production goods widen over time.

Policy options to address circumvention include **improving Monitoring, Reporting, and Verification (MRV)**. In particular, this means

strengthening **customs controls and anti-circumvention provisions**, improving data sharing between authorities, and regularly reviewing trade patterns to identify emerging loopholes. **Selective extensions of CBAM to key precursors or simple downstream products** can also help close the most material gaps where circumvention risks are high.

However, tighter circumvention controls and broader scope increase administrative burdens. Policymakers therefore face a trade-off between robustness and complexity, reinforcing the case for targeted rather than blanket solutions.

### **Managing complexity through a limited CBAM scope**

CBAM relies on detailed emissions accounting, reporting, and verification across international supply chains. Even under the current scope, compliance is resource-intensive for firms and authorities. As CBAM expands to more complex products, these challenges grow.

One option is to **limit CBAM expansion** to products with relatively homogeneous production processes and clear emissions boundaries. Simplified default values can reduce administrative burden, provided firms retain the option to demonstrate lower actual emissions through verified data. **Phased implementation** and pilot phases can also help authorities build capacity and refine methodologies before expanding scope further.

Managing complexity is critical not only for effectiveness but also for acceptability across industry and politics. Excessive administrative

<sup>37</sup> EU Innovation Fund Calls for proposals ([Link](#)).

costs can undermine support for CBAM and weaken its role as a credible long-term instrument. However, it comes as clear trade-off to the prevention of circumvention discussed above.

## FREE ALLOCATION DRAINING: AVOIDING NEW CARBON LEAKAGE RISKS

Many sectors deemed at risk of carbon leakage under the Commission's criteria are not covered by CBAM. For these sectors, benchmark based free allocation under the EU ETS therefore remains the main instrument to mitigate competitiveness impacts. As a short-term measure, the European Commission could tighten benchmarks at the smallest possible pace. However, as the overall ETS cap tightens over time, the absolute volume of allowances available for free allocation declines mechanically. This holds even if the underlying carbon leakage risk does not diminish, since the constraint is driven by the shrinking cap rather than changes in exposure or trade intensity.

This creates a structural tension. On the one hand, non-CBAM sectors continue to face trade exposure and competitive pressure from jurisdictions with weaker climate constraints. On the other hand, the shrinking cap limits the scope for maintaining existing levels of protection through free allocation alone. Without reform, this creates the risk of leaving some non-CBAM sectors increasingly exposed, potentially leading to production relocation or loss of market share.

## A tiered approach to free allocation to ensure effective use of remaining free allowances

One option to address this challenge is to move from the current largely binary carbon leakage classification towards a more granular, tiered approach to free allocation. Under such a system, the share of free allocation would be differentiated more explicitly based on measured carbon leakage risk, for example combining emissions intensity and trade exposure.

Sectors facing the highest residual leakage risk could continue to receive a high share of benchmark-based free allocation, while sectors with lower exposure would see a gradual reduction. This would allow limited free allocation volumes to be concentrated where they are most needed, improving the effectiveness of protection without increasing the overall volume of allowances allocated for free. Of course, on the downside, sectors that currently receive 100% of benchmarked free allowance might risk receiving less free allocation going forward.

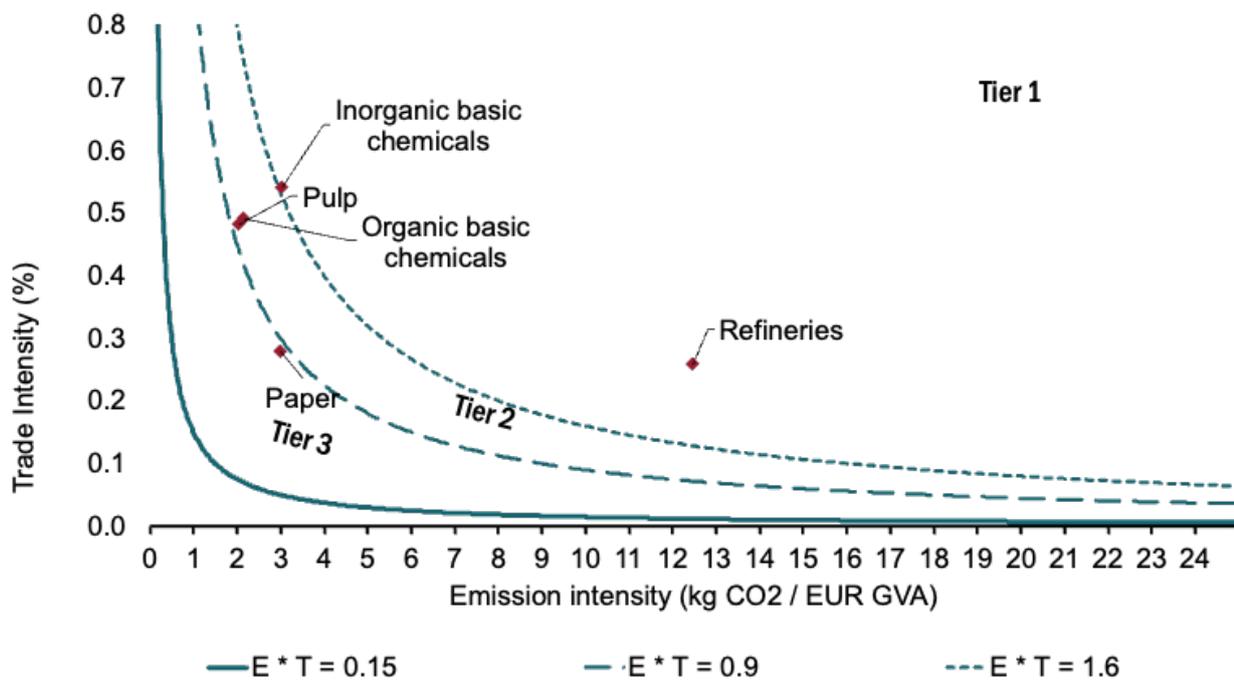
A tiered approach was already proposed by Members of the European Parliament (Committee on Environment, Public Health and Food Safety – ENVI)<sup>38</sup> and can build on existing EU ETS concepts, such as the carbon leakage exposure factor, but would apply them in a more targeted way. By maintaining benchmark-based allocation and dynamic activity-level adjustments, such a system can preserve incentives to improve emissions intensity while reducing the risk of over-protection in less exposed sectors.

<sup>38</sup> Amendment 40 during the 2016 EU ETS Revision).

**Figure 12** illustrates the idea of a tiered approach where the amount free allocation depends on the product of trade intensity (TI) and emission intensity (EI), the specific thresholds would need to be defined with care, and we use the proposed thresholds

according to Amendment 40. Sectors that fall under Tier 1, i.e. are exposed to the highest risk of carbon leakage, e.g. inorganic basic chemicals or refineries, receive more free allocation than sectors that fall under Tier 3.

**Figure 12 - Tiered free allocation (example)**



**Source:** Frontier Economics

**Note:** Example based on Phase IV preliminary carbon leakage list

### Adjusting the auction share in the EU ETS

A complementary lever is the balance between auctioning and free allocation within the EU ETS. Adjusting the auction share, which is currently set to 57% of the annual cap, for example by reducing the proportion of allowances auctioned, could increase the volume of allowances available for free allocation to non-CBAM sectors during the transition period until the cap reaches zero by 2039.

Such an adjustment would not affect the overall emissions cap, but it would redistribute allowances between market participants. This can help smooth the transition for exposed sectors, particularly if CBAM-related changes lead to asymmetric impacts across the economy. Compared to the tiered allocation, this option also does not reduce free allocation provided to individual sectors compared to the status quo.

As described above, from the 3.2 bn. tCO<sub>2</sub> under the current cap after 2031, roughly 1.4 bn. tCO<sub>2</sub> would be available for free allocation (including CBAM sectors). This is based on the fixed auction share of 57%. Decreasing the auction share to for example 40% would increase volume available for free allocation by 40% to 1.9 bn. tCO<sub>2</sub>.

However, reducing auction volumes has fiscal implications. Auction revenues increasingly finance climate and energy policies at both EU and Member State level, and part of these revenues contribute to the EU's own resources. Any change to the auction share would therefore involve trade-offs between competitiveness support and public funding for decarbonisation. This reinforces the case for using this lever selectively and potentially on a temporary basis.

### **Making allowances freed up by CBAM available to non-CBAM sectors**

As free allocation for CBAM-covered products is phased out, allowances that would otherwise have been allocated for free are freed up within the EU ETS. These freed-up allowances should be allocated to the Innovation Fund and in turn finance decarbonisation in the relevant sectors.

One policy option is to make part of these allowances available to sectors that remain outside CBAM and continue to face significant carbon leakage risks. Reallocating these allowances can help offset the declining availability of free allocation caused by the tightening cap. When combined with a tiered approach, allowances freed up by CBAM could be directed primarily to sectors with the

highest measured leakage exposure, rather than being distributed uniformly across all non-CBAM sectors.

This approach has several advantages: It improves internal consistency of the carbon leakage architecture, ensures that protection is not withdrawn abruptly from non-CBAM sectors as CBAM is introduced elsewhere, and avoids increasing the overall allowance supply. At the same time, it preserves the environmental integrity of the EU ETS, as the total cap remains unchanged and does not reduce free allocation to other sectors.

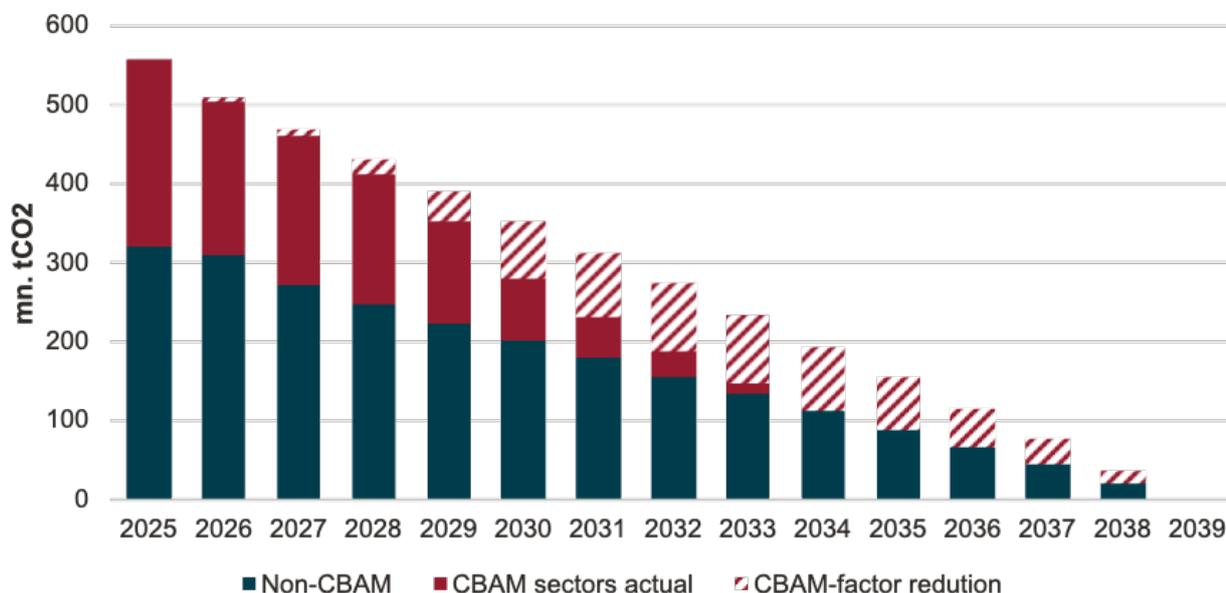
## **DEVELOPMENT OF FREE ALLOCATION VOLUMES FOR NON-CBAM SECTORS**

Following the general reduction of the cap towards 2039, the total amount of allowances available for free allocation falls proportionately. While the initial free allocation in 2025 amounted to 557 mn. tCO<sub>2</sub>, responding to a value of 41 bn. EUR.<sup>39</sup> Free allocation to CBAM sectors amounted to 240 mn. tCO<sub>2</sub> in 2025, leaving c. 320 mn. tCO<sub>2</sub> for non-CBAM sectors.

To understand the leverage of the CBAM-factor and the impact on total free allocation, we define a scenario for free-allocation demand across the EU ETS. We assume that, absent of the introduction of CBAM, free allocation to CBAM sectors would develop based on an average reduction of benchmarks<sup>40</sup> to 83% for 2026–2030 (compared to 2025) and 75% for 2031 and 2040. The upper limit of the overall cap reduction is enforced by the implementation of the Cross Sectoral Correction Factor.

<sup>39</sup> Based on the average EU ETS price of 74 €/tCO<sub>2</sub> in 2025.

<sup>40</sup> Derived from historical free allocation volumes and an average update rate 1,4% p.a.

**Figure 13 – Development of free allocation for CBAM and non-CBAM sectors**

**Source:** Frontier Economics based on EU ETS data viewer

### Strengthening conditionality in free allocation

The conditionality attached to free allocation could be strengthened by linking (part of) the allocation more explicitly to verifiable decarbonisation commitments and outcomes. This could be used as a complementary measure to the adjustments discussed above, which aim to preserve free allocation for exposed sectors in the medium- to long-term.

Conditionality in the form of environmental contributions is already embedded in the current allocation framework, but only to a limited extent. Tightening these requirements can effectively convert free allocation from a mainly compensatory instrument into a more targeted investment incentive.<sup>41</sup> At the same time, stronger conditionality entails costs

and risks. It can narrow firms' option space, particularly if technology-based criteria steer the direction of innovation or exclude certain decarbonisation pathways, and it increases administrative complexity and compliance risks. To limit distortions and ensure credibility, any strengthened conditionality should be designed to remain technology neutral where possible and be aligned with other EU level support instruments pursuing similar objectives (e.g., the Innovation Fund) to avoid inconsistent incentives and fragmented project selection.

### With the ETS end game looming, direct cost compensation could represent an alternative

If the EU ETS cap declines to zero by 2039, the system effectively becomes a pure carbon

<sup>41</sup> M. Pahle (2026), Notbremse vs. Boxenstopp: Abflachen der Cap und Verlängerung der freien Zuteilungen im EU ETS.

pricing obligation with no free allocation and no residual allowance scarcity management. Assuming that some fossil emissions will (at least temporarily) remain past 2039, the price of allowances would either be set by negative emissions to off-set remaining emissions or by the value of banked allowances.

In this setting, a system of direct cost compensation – similar to the known and established framework of indirect cost compensation – could be introduced to not address allowance scarcity, but rather competitiveness risks arising from asymmetric global carbon costs during the final phase of industrial decarbonisation.

- **Preserving marginal abatement incentives under a zero cap:** With no new allowances available, installations would need to fully internalise carbon costs through compliance payments or through offsetting emissions by negative emissions elsewhere. Direct cost compensation can be designed as an ex-post financial transfer that does not reduce the marginal cost of emitting. Firms would still face the full carbon price for every tonne of residual emissions, maintaining incentives to eliminate emissions entirely where technically feasible.
- **Addressing residual emissions that are structurally hard to abate:** Even under a zero-cap trajectory, certain industrial processes may retain limited, unavoidable emissions for some time. Direct cost compensation can be limited to benchmarked residual emissions that are demonstrably difficult to eliminate, preventing disproportionate cost burdens while avoiding blanket support for continued emissions.
- **Managing competitiveness risks during the endgame of decarbonisation:** As the cap approaches zero, carbon prices may become highly volatile or very high in the absence of sufficient abatement options. Direct compensation can help prevent abrupt loss of industrial activity or carbon leakage during this endgame phase, especially where international competitors face lower or no carbon constraints.
- **Complementarity with CBAM in a zero-cap environment:** CBAM can address competitiveness at the border for covered products, but gaps are likely to remain for downstream products, complex value chains, and exports. Direct cost compensation provides a backstop for these exposures without reopening allocation or reintroducing implicit free allowances.
- **Strong conditionality as a core design feature:** In a zero-cap system, compensation must be tightly conditional. Eligibility could be linked to credible decarbonisation pathways, mandatory use of best available technologies, and declining compensation rates over time. This ensures that compensation supports the transition rather than locking in residual emissions.
- **Policy role after 2039:** Under a zero ETS cap, direct cost compensation becomes a targeted transition instrument rather than a permanent leakage measure. Its function is to manage distributional and competitiveness impacts in the final stages of decarbonisation, while preserving a uniform carbon price signal and avoiding a return to free allocation or volume-based exemptions.

### Combining instruments: a targeted transition framework

In practice, the strongest policy response is likely to combine the instruments described above. A **tiered free allocation framework can determine which sectors receive protection and at what intensity. Adjustments to the auction share and the reallocation of allowances freed up by CBAM can then provide the necessary allowance volume to implement this targeting in practice.**

Combining these instruments is important to ensure political feasibility. While reallocation from the auction share or from freed-up allowances does not reduce free allocation to certain sectors compared to the status quo, a tiered allocation without additional certificates from adjusted auctions or reallocated allowances would. In its purest form, tiered allocation would therefore raise distributional questions and require careful calibration. The exact definition of allocation tiers, including thresholds and the carbon leakage factor, would need to be further elaborated.

Such a combined approach allows policymakers to manage the transition in a controlled way. It maintains carbon leakage protection where it remains justified, avoids unnecessary over-allocation, and preserves incentives to decarbonise through benchmark tightening and declining overall caps. Importantly, by keeping allocation benchmark-based and performance-oriented, it safeguards the competitive advantage of early adopters that have invested early in low-carbon production, rather than rewarding inefficient incumbents. At the same time, it provides flexibility to adapt the system over time as CBAM expands, international climate policies evolve, and leakage risks change.

### DOWNSTREAM PRESSURE: REDUCING FOLLOW-ON ISSUES AND CONCERNS OF INDIRECT LEAKAGE

One option to address these risks is the **selective extension of CBAM to downstream products**. Where emissions accounting is feasible and pass-through from upstream inputs is high, extending CBAM can help level the playing field between EU and non-EU producers of finished goods. However, such extensions increase administrative complexity and may raise trade concerns, particularly as products become more heterogeneous and value chains more fragmented.

Where CBAM extension is not practical, targeted compensation mechanisms can be considered. These could take the form of direct cost compensation for demonstrable carbon cost pass-through, financed through ETS or CBAM revenues. To preserve incentives to decarbonise, compensation could be benchmark-based and limited to a share of upstream carbon costs rather than fully reimbursing them.

**Demand-side measures** offer a complementary approach. Product standards, green public procurement, and labelling requirements can help create markets for low-carbon products and reward EU producers that invest in cleaner production. Such measures address competitiveness challenges without directly compensating carbon costs and can be particularly effective for downstream products sold primarily within the EU market.

## TRADE IMPEDIMENT: MANAGING MACRO-ECONOMIC IMPACTS

Several policy options can help manage the macro-economic effects associated with CBAM on non-EU ETS upstream products, while preserving its environmental integrity.

- A first option is to maintain a **focused CBAM scope** that prioritises upstream products with high emissions intensity, significant trade exposure, and relatively homogeneous production processes. This limits unnecessary disruption to trade while targeting sectors where carbon leakage risks are most material.
- A second option is the **strategic use of CBAM revenues**. Recycling revenues to support industrial decarbonisation, infrastructure investment, or competitiveness measures within the EU can help offset higher input costs and mitigate negative economic impacts. Revenue use can also strengthen the political acceptability of CBAM by visibly linking border charges to the green transition.
- A third option is to **enhance international engagement with key upstream trading partners**. Technical assistance, data cooperation, and recognition of equivalent carbon pricing or regulatory measures abroad can reduce reliance on default values and encourage convergence in climate policies. Over time, this can lower CBAM liabilities for efficient non-EU producers while supporting global emissions reductions.

## Implications for CBAM design and future expansion

The macro-economic effects observed for non-EU ETS upstream products provide important lessons for the future design and potential expansion of CBAM. As CBAM coverage broadens, similar trade and price effects can be expected, potentially at larger scale.

This strengthens the case for a gradual, **evidence-based approach to CBAM expansion**, with regular assessment of trade impacts, emissions outcomes, and competitiveness effects. It also underlines the importance of aligning CBAM design with broader EU trade, industrial, and climate strategies, to ensure that carbon leakage protection supports long-term competitiveness rather than creating new vulnerabilities.

## Avoiding cascading protection

Addressing downstream leakage risks raises important questions about system boundaries and policy coherence. Extending protection too far down the value chain risks creating cascading layers of compensation, increasing complexity and diluting the carbon price signal. At the same time, failing to address material downstream impacts can undermine the effectiveness of upstream protection and weaken the EU industrial base.

This highlights the need for **clear criteria to identify downstream sectors** where intervention is justified. These criteria could include the degree of cost pass-through from EU ETS-covered inputs, trade exposure, emissions intensity of upstream inputs, and the

feasibility of emissions accounting. Applying such criteria can help ensure that downstream measures remain targeted, proportionate, and consistent with the overall objectives of the EU carbon leakage architecture.

## CONCLUSION: A TARGETED AND COHERENT CARBON LEAKAGE FRAMEWORK

The evolving EU carbon leakage architecture faces a dual challenge: ensuring effective protection for exposed sectors while

preserving the integrity and investment signal of the EU ETS. The transition from free allocation to CBAM for selected sectors, combined with a steadily tightening cap, increases the need for a more targeted and internally coherent framework.

The policy options discussed in this study address different challenges and differ in their wider impact against the criteria of feasibility, complexity, efficiency and distributional effects, as summarised in the table below.

**Table 2 - Overview of policy options**

						
Policy option	<b>Refine CBAM</b>	<b>Export support mechanisms</b>	<b>Tiered free allocation</b>	<b>Reallocate allowances</b>	<b>Conditional free allocation</b>	<b>Direct cost compensation</b>
	Improved MRV, anti-circumvention rules, focused scope, selective extensions	Temporary Decarbonisation Fund or benchmark-based export rebate	Risk-based differentiation using emissions and trade intensity	Adjust auction share or reallocate CBAM-freed allowances	Link allocation to decarbonisation commitments or performance criteria	Ex post, benchmark-based, conditional compensation of residual carbon costs
<b>Criteria</b>						
Political Feasibility	Politically feasible, trade-sensitive	Popular with exporters; legal/WTO risk	Politically feasible but reallocation between sectors needs to be managed	Politically viable compromise.	Acceptable, but industry pushback	Politically acceptable as temporary backstop
Admin	Admin-heavy (MRV, enforcement)	Admin moderate to complex (benchmarking)	Admin manageable (builds on existing system)	Admin straightforward	Admin demanding (monitoring, compliance)	Admin moderate (benchmarks, eligibility)
Efficiency	Efficient for import leakage; preserves incentives	Improves symmetry if benchmark-based	More efficient than binary targeting	Transitional reshuffle; incentives unchanged	Strong incentives if tech-neutral	Efficient if carbon price fully passed through
Distributional Effects	Shifts burdens to downstream and partners	Favors export-oriented firms	Reallocates support to high-exposure activities	Shifts value across sectors/budgets	Benefits early adopters	Targets residual/hard-to-abate sectors
<b>Outcome</b>						
	Cuts import leakage and circumvention	Reduces CBAM-related export exposure	Improves targeting and reduces over-protection	Eases transition for non-CBAM sectors	Aligns leakage protection with decarbonisation	Provides a competitiveness backstop under a zero cap

Source: Frontier Economics

**Three main directions are relevant:**

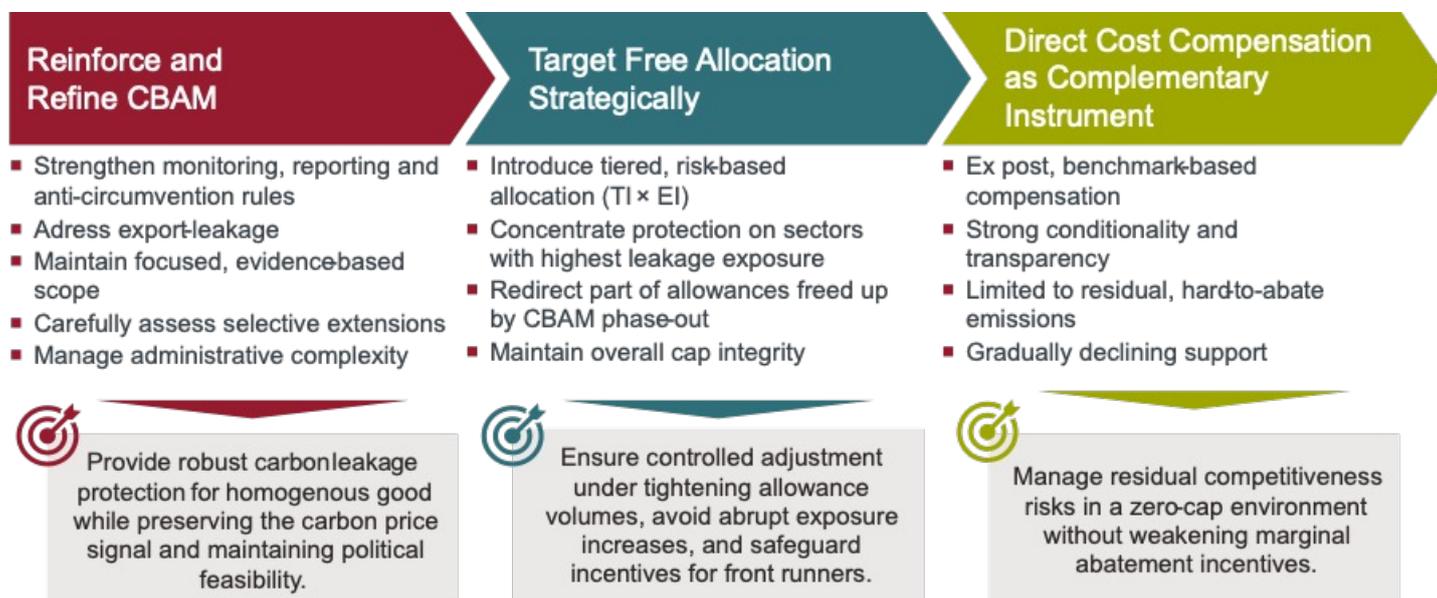
- First, increasing the effectiveness and robustness of CBAM should remain a priority. This includes strengthening monitoring and anti-circumvention rules, addressing export leakage and carefully considering selective extensions where justified, and managing administrative complexity to maintain political and economic feasibility. CBAM should remain focused and evidence-based, avoiding overly broad expansion that could generate excessive trade frictions or cascading protection demands.
- Second, remaining free allocation volumes should be used more strategically. A tiered, risk-based approach can ensure that sectors with the highest measured carbon leakage exposure continue to receive protection during the transition. Redirecting a portion of allowances freed up by the CBAM phase-out to non-CBAM sectors, or reallocating allowances from auction volumes to free allocation, could help maintain internal consistency and avoid

abrupt exposure increases, while keeping the overall cap unchanged, even if this reduces the Innovation Fund envelope and/or Member State revenues.

- Third, in the longer term, particularly as the cap approaches zero, direct cost compensation may become a relevant complementary instrument. In a setting where free allocation is no longer structurally available, well-designed cost compensation can manage residual competitiveness risks without undermining the carbon price signal, provided strong conditionality and clear limits are applied.

Taken together, these elements point toward a targeted policy mix: reinforce and refine CBAM, concentrate free allocation where leakage risks are highest, and gradually prepare for alternative compensation tools in the longer run. Such an approach would strengthen the coherence and durability of the EU carbon leakage architecture while maintaining alignment with the EU’s long-term climate objectives.

**Figure 14 - A Targeted and Adaptive Carbon Leakage Framework**



## 5. CROSS-CUTTING AND LONG-TERM MEASURES

The effectiveness of the EU carbon leakage architecture does not depend solely on the design of individual instruments such as CBAM, free allocation, or compensation mechanisms. It also relies on cross-cutting governance, complementary policies, and a credible long-term strategy that aligns competitiveness, decarbonisation, and external relations. The measures discussed below apply across product categories and help ensure that carbon leakage protection remains effective as the EU ETS tightens and CBAM evolves.

### **Governance, monitoring, and adaptive review**

Carbon leakage risks are not static. They evolve with changes in global trade patterns, technological progress, climate policies in third countries, and the scope and stringency of EU regulation. Regular and transparent review mechanisms are therefore essential.

A strengthened governance framework could include periodic reassessment of carbon leakage exposure by sector and product, monitoring of cost pass-through along value chains, and systematic evaluation of CBAM impacts on trade and competitiveness. Such reviews would provide an evidence base for adjusting free allocation tiers, CBAM scope, default values, and compensation mechanisms over time.

Clear governance also supports predictability for industry. By signalling how and when policy adjustments may occur, it can reduce

regulatory uncertainty and support long-term investment decisions in low-carbon technologies.

### **Alignment with industrial and decarbonisation policies**

Carbon leakage protection should be closely aligned with broader EU industrial and climate policy instruments. Support measures aimed to facilitate low carbon technologies (e.g. carbon contracts for difference, innovation funding, infrastructure investment, and industrial power price) play an important role accompanying the EU ETS architecture. In line with the European Commission's considerations of providing more industrial support, one could also consider frontloading EU ETS revenues to strengthen and scale up support mechanisms for low carbon technologies, helping accelerate deployment and investment certainty alongside the ETS price signal.

A closer alignment of carbon leakage protection with broader EU industrial and climate policy instruments can reduce reliance on carbon leakage protection over time by lowering production costs of low-carbon technologies and accelerating their deployment. Conditionality in leakage protection instruments, where used, should therefore be coordinated with existing support schemes to avoid duplication and conflicting incentives.

Demand-side measures, including product standards and green public procurement, can further reinforce this alignment by creating lead markets for low-carbon products and improving the commercial case for investment in cleaner production.

### **Maintaining and refining indirect cost compensation**

Indirect cost compensation remains an important component of the carbon leakage architecture, particularly for electricity-intensive sectors. As electrification becomes a key decarbonisation pathway for industry, exposure to electricity price impacts from the EU ETS may increase rather than decline.

Refining indirect cost compensation to reflect evolving electricity systems, increasing shares of renewable generation, and changing market structures will be important. At the same time, maintaining safeguards against overcompensation and ensuring consistency across Member States can help preserve both competitiveness and the integrity of the carbon price signal.

### **External relations and long-term international cooperation**

In the long run, international cooperation remains the most robust solution to carbon leakage. Broader adoption of carbon pricing or equivalent climate policies by major trading partners would reduce the need for border measures and sector-specific protection.

The EU carbon leakage architecture, and CBAM in particular, will continue to shape the EU's external relations. Active engagement

with trading partners, transparency on methodology, and recognition of equivalent climate measures abroad – including high-integrity carbon pricing systems or Article 6 cooperation frameworks – can help reduce tensions and encourage convergence in climate ambition. Technical assistance, capacity building, and data cooperation can further support this process, particularly for developing countries seeking to strengthen their monitoring, reporting and verification systems.

Framing carbon leakage protection as part of a broader climate cooperation strategy, rather than a purely defensive trade instrument, can strengthen its legitimacy and durability over time. This framing is also more credible if the European Commission can pair conditionality with a tangible incentive package, offering a clear “carrot”, for example around market access, to encourage partners to cooperate on climate action.

### **A dynamic and coherent policy mix**

Taken together, these cross-cutting measures highlight that carbon leakage protection should be understood as a dynamic policy mix rather than a fixed set of instruments. As CBAM matures, free allocation declines, and global climate policies evolve, the balance between instruments will need to be revisited.

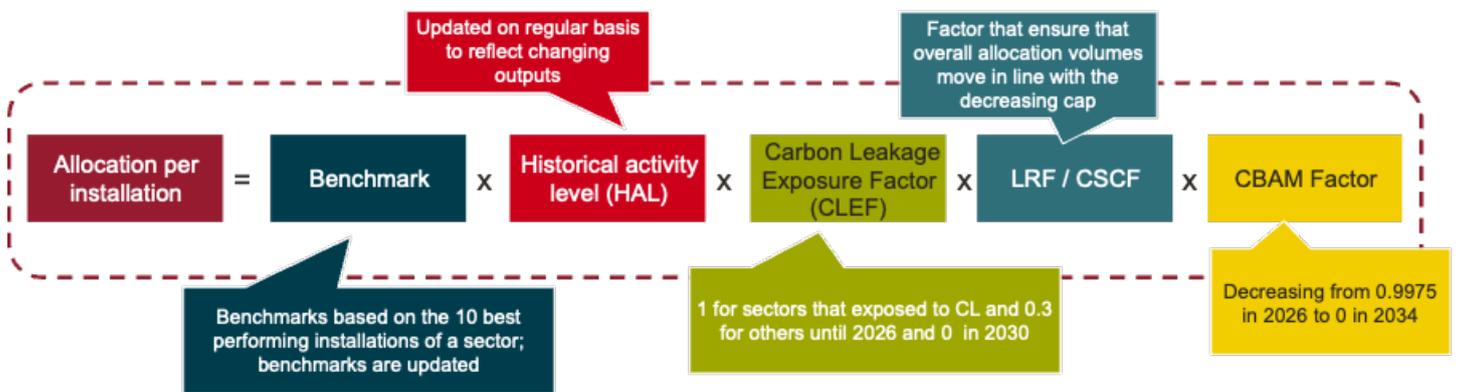
A coherent framework that combines targeted protection, strong decarbonisation incentives, adaptive governance, and international engagement offers the best prospect of safeguarding EU competitiveness while remaining consistent with long-term climate objectives.

# ANNEX A DETAILS ON THE FUNCTIONING OF FREE ALLOCATION

The allocation of free allowances to industrial installations is based on a harmonised methodology. The allocation is ex-ante (based

on historic data), and is calculated at the sub-installation level, following the basic formula set in the following figure.

**Figure 15 - Free allocation to industrial installations**



Source: Frontier Economics

**The current framework contains the following core elements:**

- **Product Benchmark (BM):** Each benchmark for a standardised product (e.g. cement clinker, hydrogen, steel) reflects the average emissions intensity of the 10% most efficient EU installations in the sector. Where no product benchmark exists, “fall-back” benchmarks apply. Benchmarks are reduced over time to reflect expected technological improvements. For 2021–2025, annual reduction rates range between 0.2 % and 1.6 %, depending on the rate of progress observed in each sector. These will be revised again for 2026–2030 based on new data and the maximum update rate is said to increase to 2.5% p.a.

- **Activity-Level Adjustments:** From Phase IV onward, free allocations are **dynamically adjusted** to reflect changes in actual production. If an installation’s activity level deviates by more than ±15 % from the historical average over two years, its free allocation is correspondingly increased or decreased. This ensures that benchmark-based allocation remains aligned with real-world production and avoids over- or under-allocation.
- **Carbon Leakage Exposure Factor (CLEF):** Installations in sectors deemed at risk of carbon leakage receive 100% of their benchmarked allocation (CLEF = 1). Non-exposed sectors receive a decreasing share, declining from 30% in 2026 to 0% by 2030.

- **Linear Reduction Factor (LRF) and Cross-Sectoral Correction Factor (CSCF):**  
The LRF ensures that the individual free allocation decreases in line with the overall decreasing cap on the new allowances. Currently, the LRF is set to 4.3% and will increase to 4.4% in 2028. CSCF ensures that the total calculated (bottom-up) free allocation for industry does not exceed the legal maximum.
  
- **CBAM Factor:** CBAM covers a subset of EU ETS sectors (e.g. steel, aluminium, cement, hydrogen). For this CBAM subset, free allocation is phased out gradually between 2026 and 2034. A decreasing CBAM factor is applied (e.g. 97.5% in 2026, 77.5% in 2029, 0% in 2034). For sectors/products outside CBAM, free allocation continues (subject to updated benchmarks), maintaining protection while keeping incentives to decarbonise.

## ABOUT US

EPICO KlimalInnovation is an independent think tank that advances constructive, market-based, and innovation driven climate and energy policies through clear concepts and viable, balanced solutions. We create a network that brings together key stakeholders in climate and energy policy to establish and implement a socially broad-based agenda. We provide a platform for actors from politics, business, science, and civil society to engage, consult, contribute, and advance solution-oriented approaches.

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