Analytical Annex: Free Allocation for CBAM Sectors

Analytical Annex to the Free Allocation for CBAM Sectors Chapter of the UK Government, the Scottish Government, the Welsh Government and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland Consultation on Carbon Leakage as part of the Free Allocation Review

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Purpose, executive summary

This Annex provides an overview of the analysis underpinning the Government Free Allocation Review: Carbon Leakage Consultation. This considers the potential adjustment to sectors covered by the UK carbon border adjustment mechanism (CBAM), in Chapter 2 of the consultation. We outline the three broad options as presented at consultation, and the analysis underpinning them.

The consultation outlines the approach and any adjustment to Free Allocation for industries covered by the UK CBAM, which Government has committed to implementing by 2027. Additionally, the consultation explores interactions with the UK emissions trading scheme (ETS) more broadly, and the possible considerations in recalibrating Free Allocation policy for sectors covered by the CBAM compared to those that are not.

The objectives of the policy outlined at consultation are to mitigate carbon leakage, help UK industry decarbonise, and meet the wider objectives of the UK's Free Allocation Review. While carbon leakage is affected by several factors, this consultation covers only the adjustment of Free Allocation for CBAM sectors and does not assess other carbon leakage policies. Key conclusions from evidence and analysis in this Annex include:

- A CBAM seeks to charge a carbon price on products in five sectors,[1] when imported into the UK, comparable to the carbon price faced by UK producers. This aims to level the playing field, in terms of carbon costs, for these producers in the UK market, and therefore aims to prevent potential carbon leakage from the UK.
- Both policies aim to address carbon leakage but in different ways: a CBAM raises the carbon costs on imported goods, while Free Allocation lowers effective carbon prices for UK producers. The two will therefore have different ultimate impacts and implications for carbon leakage.
- A sectoral effective carbon price[2] will be charged on embodied emissions for CBAM products. The effective carbon price is reduced by Free Allocation. Free Allocation may therefore be reduced, or fully removed, for sectors covered by a CBAM to allow the CBAM to become effective and as the CBAM provides carbon leakage protection to such sectors.
- We consider the key parameters for CBAM adjustment: start and end year, extent (reduction to zero or partial reduction), trajectory (curve) and sectoral variation. All options considered involve a phased reduction, to support gradual CBAM implementation, and to ensure impacts to business are gradual and therefore lower risk.
- We also explore key decisions necessary to implement the adjustment: where in the Free Allocation Methodology the adjustment will be applied, the precise industries covered,[3] and whether the adjustment applies at installation or sub-installation level. These points were all considered in the consultation.
- In qualitative assessment, we outline the central trade-off: a faster phase out raises the price signal to both domestic and importers to decarbonise and increases the CBAM effect, but is a sharper cost increase and may create carbon leakage risks. The optimal option will depend on objectives, sectoral characteristics, and policy context.
- In quantitative evidence, we find that CBAM sectors currently receive high proportions of free allocation, meaning the effective ETS cost they face is lower, although this varies by

[1] Aluminium, cement, fertilisers, hydrogen, and iron and steel

[2] Or CBAM Rate, the price applied to the embodied emissions for imported CBAM products will reflect explicit carbon pricing in the UK and adjust for free allowances and other reductions to the carbon price paid domestically. See HMRC & HMT (2024) Consultation on a UK CBAM

[3] Such as 4-digit NACE or specified ETS Benchmarks

sector and operator. The phased removal of Free Allocation would significantly reduce Free Allocation and increase their effective carbon price.

Introduction

In 2023, the UK Government published a Government Response to the consultation which confirmed that the Government will implement a UK CBAM by 2027.[4] The CBAM aims to address carbon leakage through charging a comparable carbon price on imported products covered by the CBAM. Carbon leakage is the movement of production and associated emissions from one country to another due to different levels of decarbonisation effort through carbon pricing and climate regulation. As a result of carbon leakage, the objective of decarbonisation efforts – to reduce global emissions – could be undermined.

Currently, to mitigate the carbon leakage risk for sectors covered by the UK ETS, a proportion of UK ETS allowances (UKAs) are assigned to operators in exposed sectors for free. This reduces exposure to the carbon price for operators receiving this Free Allocation, while preserving the economic incentive for decarbonisation and the emissions cap across the ETS sectors. The UK ETS[5] Authority committed to maintain current levels of Free Allocation for industrial sectors until 2026, subject to changes in activity.

The UK CBAM aims to ensure that highly traded goods[6] face a comparable carbon price when imported into the UK. This seeks to increase decarbonisation incentives while protecting against carbon leakage from the UK. In advance of the introduction of the UK CBAM, Free Allocation remains the primary policy for mitigating the carbon leakage risk associated with the UK ETS. With the introduction of the UK CBAM, imports of covered products will be charged a comparable carbon price for embodied emissions, ensuring imports face similar carbon costs and incentives to UK producers. The UK CBAM will apply to the emissions embodied in imports of specified goods in five sectors: aluminium, cement, fertilisers, hydrogen, and iron and steel. Although the CBAM is a different approach to carbon leakage than Free Allocation, the two policies are closely related. The interaction between the two policies will be considered, and consideration will be paid to the wider UK Government carbon leakage policy context.

The liability applied by the CBAM will depend on the greenhouse gas emissions intensity of the imported good and the gap between the carbon price applied in the country of origin (if any) and the carbon price that would have been applied had the good been produced in the UK. CBAM liability will lie directly with the importer of imported products within scope of the UK CBAM based on emissions embodied in imported goods. This system will not involve the purchase or trading of emissions certificates.[7]

The UK ETS Authority launched two consultations on 18 December 2023 on proposed changes to the UK ETS that will ensure it continues to support progress toward net zero across the UK. The Free Allocation Review explores how to better target Free Allowances for industries most at risk of carbon leakage.[8] The UK CBAM will work cohesively with the UK ETS, including Free Allowances, to ensure imported products are subject to a carbon price comparable to that incurred by UK production, mitigating the risk of carbon leakage.

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[4] Department for Energy Security & Net Zero (2023): Factsheet: UK Carbon Border Adjustment Mechanism

[5] The UK ETS works on a cap-and-trade system in which the market determines the price of allowances. Total carbon emissions and allowances under the scheme are capped, reducing over time to incentivise decarbonisation.

[6] A highly traded good is one with a high intensity of import and export activity.

[7] Section 6.36 of HMT's 2024 consultation states: "The government proposes referencing the average of the UK ETS auction price over the preceding quarter to the quarter in which the goods were imported. For example, if goods were imported in quarter 2, the average UK ETS price from quarter 1 would be the basis for the UK CBAM rate" https://www.gov.uk/government/consultations/consultation-on-the-introduction-of-a-uk-carbon-border-adjustment-mechanism

[8] Department for Energy Security & Net Zero (2023) UK Emissions Trading Scheme: free allocation review

In this annex to the consultation document, we discuss the broad options for adjustment to Free Allocation for CBAM sectors and assess their carbon leakage risk, impact on ETS effectiveness, technical feasibility, and affordability to Government.

Box A: Carbon leakage causes and channels

Carbon leakage is the displacement of emissions from one country to another due to different levels of decarbonisation effort through carbon pricing and climate regulation. Carbon leakage is complex and may occur through different channels. Most prominently, it occurs through the competitiveness channel: a climate policy such as an emissions trading scheme or carbon tax raises production costs for firms compared to those in other locations with lower climate costs. In some industries, these higher costs lead to lower competitiveness, which in turn may drive firms to relocate (**industrial relocation**) or lose sales to competitors with lower carbon costs (**import substitution**).

Broadly, businesses are at greatest risk in industries which are highly traded, carbon intensive, highly competitive, and subject to climate policies that are not implemented consistently internationally. Nonetheless, it should be noted that carbon leakage is complex, varies by firm and industry, and there are potential channels whereby carbon pricing and regulation can improve competitiveness.

Free Allocation seeks to mitigate this risk by identifying high-risk industries and providing some UK ETS Allowances (UKA) for free. This reduces the amount of UKA firms must purchase, reducing exposure to the carbon price. A UK CBAM works differently, by introducing carbon prices to importers competing in the UK market. The removal of Free Allocation gradually increases the carbon prices for UK and foreign firms. This is only effective on imports into the UK market.

An import-only CBAM does not protect against export leakage, assuming Free Allocation is removed. There are different channels through which carbon costs impact competitiveness and may lead to carbon leakage, such as through competitiveness of production in domestic markets relative to imports, competitiveness in export markets, competitiveness driving investment choices between domestic and international markets, and competitiveness goods along the value chain.

While Free Allocation lowers carbon costs for UK production regardless of destination, a CBAM levied on imports only supports competitiveness for items covered by the CBAM and bought in the domestic market.[1] However, **the CBAM does not necessarily protect UK producers competing on export markets.** In addition, if CBAM goods face a higher carbon price when bought in the UK market, these may pass through the supply chain to downstream goods (e.g. steel for automobiles). **If costs for these downstream goods increase, relative to international competitors, there is a potential risk of downstream carbon leakage**, through lower competitiveness for the downstream product.

Assessment criteria

Different approaches to Free Allocation adjustment will have complex knock-on impacts, both on different policies and different industries, potentially in terms of output, emissions, and carbon leakage. We attempt to consider the key types of impact of different illustrative policy options. These are broad criteria for assessing options, rather than a detailed impact assessment of precise policies:

I. **Mitigating carbon leakage risk**: Both Free Allocation and a UK CBAM aim to mitigate the risk of carbon leakage – the displacement of emissions due to carbon policy – while retaining incentives for effective decarbonisation and lower emissions. We aim to assess the impact of policies in how well they may mitigate carbon leakage, including in the UK domestic market, international markets in which UK producers compete (export leakage), and other carbon leakage risks, such as investment or leakage to downstream products, which use CBAM products as inputs.

II. **Impact on ETS effectiveness**: The scheme will continue to be an important lever for delivering an economically efficient transition to net zero. Appropriate pricing of emissions in accordance with the polluter pays principle incentivises decarbonisation and green innovation. This gives businesses covered by the UK ETS the flexibility to decide how to decarbonise most effectively. It does so at least cost across the sectors covered by the scheme while providing revenue to help fund public services, including to support the net zero transition.[9]

III. **Technical feasibility**: To what extent can options be implemented consistently and operate within ongoing rules and reporting requirements; do they add complexity or challenges or align with the implementation of the UK ETS, Free Allocation, the implementation of UK CBAM; and are there risks of any unintended consequences.

IV. **Affordability to Government**: We consider the impact of options on Government affordability. Options may have an impact on Government finances through both the Free Allocation channel (as fewer allowances are given by Government to operators, depending on adjustment option) and the CBAM channel (faster reduction in Free Allocation lowers the Free Allocation Support Rate, increasing the CBAM rate and potential CBAM revenues).

Other analytical considerations

Consumer impacts and cost pass through:

We primarily assess the impact of options on carbon leakage. Free Allocation can significantly reduce the cost of the UK ETS for participants. The removal of this results in potentially marked increases in production costs. However, these increases to effective carbon prices do not necessarily lead to leakage. In cases where businesses and industries can pass a greater proportion of carbon costs on to final prices, there may be lower leakage risks but still negative impacts to consumers and producers, through higher costs, higher prices and reduced production.

The cost pass through rate refers to how much the market price of a product will increase if carbon pricing raises the marginal cost of production.[10] If carbon pricing raises the marginal cost of production by £2, and final products increase by £1, there is a cost pass through of 50%. This rate of cost pass through will differ by industry, depending on product differentiation, market conditions, trade, and the presence of competitors. In general, the greater the cost pass through, the greater the potential consumer impact but the lower carbon leakage risk. This is one approach to considering the competitiveness implications of options and distribution of final impacts. While this Annex discusses these impacts qualitatively, the UK ETS Authority will consider these impacts comprehensively in a full Impact Assessment of options alongside the response to this consultation.

Long term vs transitional impacts:

The design of Free Allocation adjustment for CBAM sectors should consider both the long-term impacts (e.g. carbon leakage risk when Free Allocation adjustment is complete) and during the transition (i.e. the period when Free Allocation support is being adjusted towards its long-term value). Both impacts, and their potential interaction, should be considered in the policy appraisal. For example, a relatively faster adjustment results in an earlier increase to effective carbon prices – this may increase the effectiveness of the ETS and raise effective carbon prices, but results in a sharper price shock and lessens the time for gradual business preparedness.

[9] Source: DESNZ (2022) link

[10] See Neuhoff & Ritz – Energy Policy Research Group (1988) Carbon cost pass-through in industrial sectors

Analytical caveats:

- First, it should be noted that decarbonisation and carbon leakage depend on the package of policies and different mitigation measures in place. Policies should ultimately be assessed according to their wider context of decarbonisation and leakage policies.
- Second, carbon leakage risk is multifaceted and varies for individual industries and firms; variation in impact across and within sectors is likely, depending on market characteristics, cost pass through, competition, and abatement potential. While this Annex aims to highlight this where possible, it does not aim to consider detailed industry variation. Instead, we aim to assess the overall intent and impact of options, considering impact to all affected sectors.

Analytical approach and evidence used:

We seek to utilise a range of analysis and evidence to assess the illustrative options and assess the policy context. We present three main types of evidence and analysis in this Annex:

Section 1: Technical descriptions of illustrative options and adjustment parameters

a. How a CBAM adjustment could be applied, and technical parameters
b. Presentation of illustrative options

Section 2: Qualitative multicriteria assessment of options

Section 3: Quantitative evidence and other potential impacts of options

a. Potential sector scope for Free Allocation adjustment
b. Historic Free Allocation for UK CBAM sectors
c. Potential export and downstream leakage risk

Annex A: Technical considerations for application of Free Allocation adjustment

Section 1: Adjusting Free Allocation for CBAM sectors

As outlined in the consultation, there are several broad approaches to the adjustment for CBAM covered sectors. We seek to build on this consultation by outlining the several parameters for Free Allocation adjustment, outlining how the adjustment could take place within the ETS and Free Allocation methodology, and illustrating these broad options in more depth.

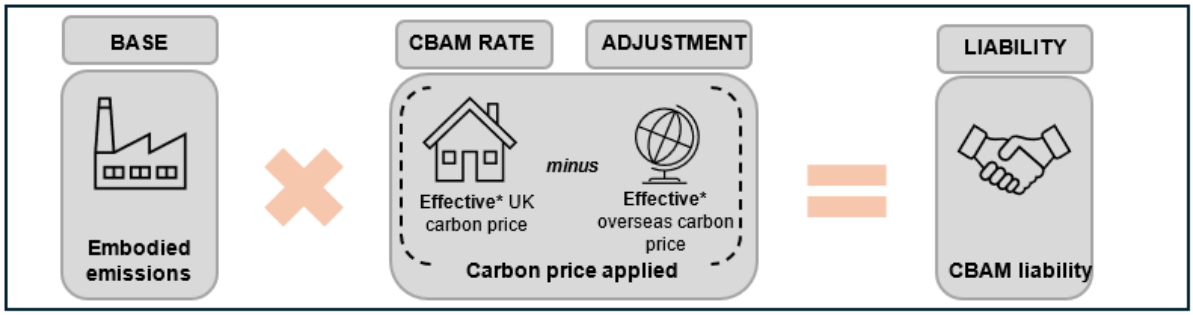
Technical implementation of adjustment

Adjustment to Free Allocation may increase the effect of the UK ETS through raising the effective carbon price for UK producers.[11] The UK CBAM subsequently supports the goals of the ETS, by mitigating carbon leakage risks of the ETS, enabling price incentives on domestic and foreign producers. The approach to determining CBAM liability will be calculated on the basis of effective carbon price: the price payable for embodied emissions for CBAM goods or the 'UK CBAM Rate'. This approach intends to charge both UK and foreign producers equivalent carbon prices for embodied emissions in products sold in the UK domestic market.

As noted in Section 6.36 of the HMT and HMRC consultation of March 2024,[12] the 'CBAM Rate' will be the effective carbon price applied to the embodied emissions, reflecting the explicit carbon price faced in the UK, and adjusting for Free Allowances and other reductions to the carbon price paid domestically.

The Government has outlined that it intends to calculate a single CBAM Rate for each sector. This CBAM Rate will account first for the **explicit carbon price** faced, and then adjust for any policy provided to **reduce the impact of the explicit price**. This includes adjusting for both Free Allocation (on direct emissions) and Carbon Price Support (for indirect emissions). For this Consultation, on Free Allocation design and potential adjustment, we **only consider the Free Allocation adjustment and its impact on the effective CBAM Rate.**

Figure 1: Calculation of effective carbon prices for CBAM products

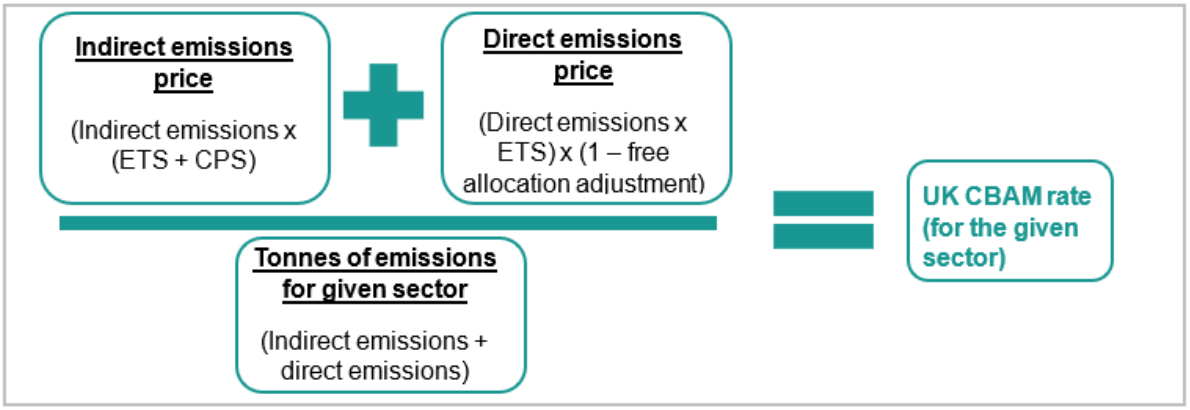


Source: HMT & HMRC CBAM Consultation

[11] It should be noted, however, that free allocation does not affect the UK ETS cap, so should not significantly change market price. Additionally, recipients of free allocation still face decarbonisation incentives through the UK ETS as they could reduce emissions and sell allowances (the opportunity cost of emissions).

[12] See HMT & HMRC (March 2024) Introduction of a UK carbon border adjustment mechanism from January 2027 Consultation

Figure 2: Determining the Effective UK carbon price (CBAM Rate) for a given sector[13]



Source: HMT & HMRC CBAM Consultation

UK Government is developing the methodology for the Free Allocation adjustment within the calculation of the CBAM Rate. We therefore do not outline the precise calculation by which Free Allocation and direct emissions in the UK ETS features in this calculation. Nonetheless, in general, negative adjustment to Free Allocation for CBAM sectors will increase the effective carbon price faced by covered sectors over time, all else equal.

Technical implementation – parameters for adjustment

There are also several options for implementing the Free Allocation adjustment. Some key parameters are discussed below.

It is useful to divide parameters and outcomes into two types:

1) Some policy parameters affect the **static, long-run value of Free Allocation**. This concerns the final value for Free Allocation for sectors (i.e. after any transitional period).
2) Some policy parameters affect the **short-run, transitional period** for Free Allocation. This concerns **adjustment of Free Allocation over time** towards its long-run value.

Table 1: Free Allocation - CBAM adjustment parameters and options

Parameter	Description
A: Adjustment start year	Year of first adjustment to FA. This could be from first year UK CBAM is effective (2027) or could be delayed for a given period.
B: Adjustment period	The length of transitional adjustment period, from no adjustment to static, long-run value. Some proposals suggest a 10-year transition period, but this could be varied.
C: Trajectory of adjustment	Precise values of adjustment in each year of transition – i.e. whether decrease in Free Allocation is linear, initially slow and accelerating, or vice versa. Any form of curve is feasible to apply.

[13] In addition to the power sector's participation in the UK ETS, the UK's Carbon Price Support (CPS) policy charges an additional carbon tax of £18 per tonne CO2 for GB power generators (excludes NI) using fossil fuels.

D: Extent of adjustment	The static, long-term value of Free Allocation for CBAM-covered sectors. This could be no adjustment (100%), the full removal of all Free Allocation (0%), or some non-zero value adjustment
E: Uniform or sectoral adjustment	The adjustment values could be applied equivalently to allocation for any sub-installation within scope, could be tailored to individual sectors, or varied for sectors in specific circumstances. Most proposals considered here imply a uniform (non-sectoral) adjustment.

We also consider the technical implementation of the adjustment. This would define where and how in the Free Allocation methodology the CBAM adjustment would take place.

Options analysed

This Annex assesses the options as outlined in the Government consultation, detailed below. Options should be considered illustrative and could be varied by the above parameters.

The consultation primarily considers phased adjustment to Free Allocation for CBAM sectors over time. The introduction of a UK CBAM is a novel policy and may have significant impacts. A gradual adjustment to Free Allocation for CBAM sectors aims to support policy implementation and minimise risks to industry. The immediate removal of Free Allocation risks introducing a sharp change in incentives and costs to affected business, reducing preparedness and risking adverse impacts. An immediate removal of Free Allocation is therefore not considered here. A phased approach allows adaptation for both business and Government and allows for the CBAM effect to increase over time.

Options considered for consultation:
Option 1: Do nothing: Retain current methodology for Free Allocation, with no adjustment to CBAM-covered sectors. While other changes to Free Allocation methods may affect installation and sectoral Free Allocation, there would be no differentiation between CBAM and non-CBAM sectors. **Options 2: Top-down Free Allocation adjustment to zero:** For sectors within scope (defined as covered by the UK CBAM), any installation would receive a reduction to final Free Allocation according to a defined adjustment factor. Under this option, covered sectors would see Free Allocation gradually adjusted. **2.1a: Linear adjustment from 2027:** A linear reduction to Free Allocation from the year of UK CBAM implementation (2027). **2.2a: Accelerated adjustment (2027):** As above, adjustment from 2027 with a greater reduction in early years, but slowing in later years. **2.3a: Slow adjustment (2027):** As above, adjustment begins in 2027, slower initially, accelerating in later years. ***Delayed start:*** *Any of the above illustrative options could be delayed in their starting years; we also vary each Option 2 with a start year of 2029, two years after UK CBAM implementation:* **2.1b: Linear adjustment from 2029:** Linear adjustment from 2029, two years after the CBAM starts

2.2b: Accelerated adjustment (2029): Accelerated adjustment from 2029

2.3b: Slow adjustment (2029): Slower adjustment from 2029

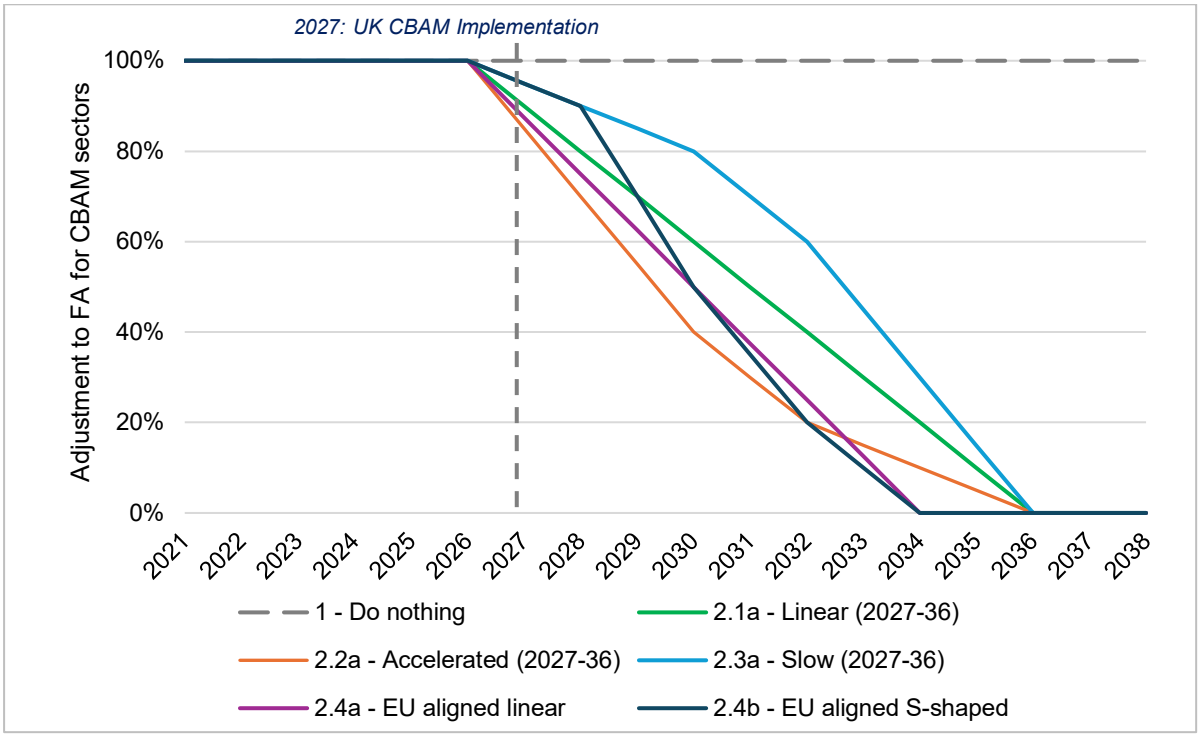
Option 2.4 EU Aligned Free Allocation adjustment to zero: It is also possible to design adjustment towards different objectives, such as aligning timing or adjustment curve to the announced EU CBAM, which begins in 2026 and reaches zero in 2034. In this case, the trajectory of the curve, and the length of phase out could be altered to meet this objective:

2.4a: Adjustment beginning in 2027, linear reduction of 12.5 p.p. per year, to zero by 2034

2.4b: Adjustment beginning in 2027, with S-shaped curve (similar to the EU) to zero by 2034

Option 3: Top-down adjustment to non-zero: As above, adjusting Free Allocation for CBAM covered sectors during a transitional period, but keeping in a non-zero Free Allocation level in the long run. This would aim to provide mitigation against potential remaining carbon leakage risk not covered by the CBAM

Figure 3: Illustrative presentation of options 1 & 2 (excluding delayed 2029 starts)



Option 1 – Do nothing

The 'Do Nothing' scenario entails no adjustment to Free Allocation to CBAM sectors, with no change to the current methodology for distributing FA. Although changes to the methodology are possible under the ongoing Free Allocation Review, this option excludes any active treatment or adjustment for CBAM covered industries.

Without an active mechanism to reduce Free Allocation for CBAM sectors, Free Allocation coverage may remain high, in some cases near 100%. By extension, the effective carbon price may be near-zero for CBAM sectors, reducing the effect of the CBAM. This may vary by sector, and Free Allocation may reduce through other factors.

Options 2 – Top-down Free Allocation adjustment for CBAM sectors

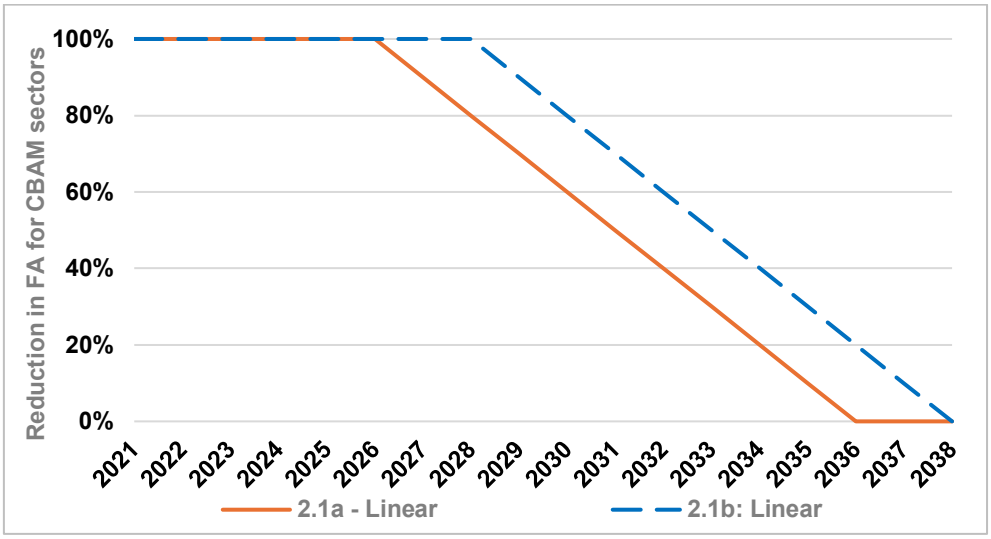
This option would involve the gradual adjustment of Free Allocation over the course of a given period. This would result in CBAM-covered sectors receiving reduced Free Allocation during and after the adjustment period, and facing higher effective carbon prices, all else equal. This would likely involve adding a Free Allocation reduction factor to preliminary Free Allocation calculation each year for each in-scope sub-installation.[14]

We present several illustrative adjustment options under Option 2, varying the adjustment trajectory (speed) and the start year, but holding the length of the adjustment period constant at ten years. These should be considered illustrative and other parameters could also be varied between the different adjustment options.

Option 2.1a and 2.1b (delay)

A top-down linear adjustment would result in a consistent removal of Free Allocation each year of the transition period. For a 10-year adjustment, each year the adjustment factor decreases by ten percentage points (p.p.), either starting in 2027 for 2.1a (UK CBAM start) or 2029 for 2.1b. Each CBAM-covered installation would see its preliminary Free Allocation multiplied by the ten percentage points (p.p.) adjustment factor each year, reaching zero by 2036 in option 2.1a and zero by 2038 in option 2.1b.

Figure 4: Linear adjustment implementation; 2027 vs 2029 (illustrative)



Option 2.2a and 2.3a

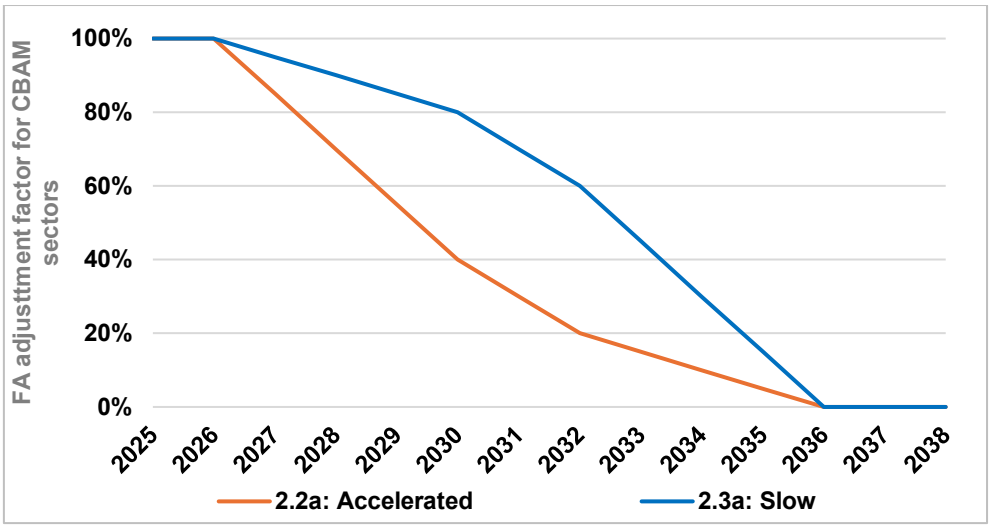
We also consider a faster and a slower adjustment scenario. As above, each in-scope sub-installation would have its Free Allocation multiplied by a pre-determined adjustment factor each year, reaching full adjustment by 2036. Delayed versions (not presented) would begin adjustment in 2029.

Broadly, Option 2.2 (accelerated) sees adjustment of 15 p.p. for four years, 10 p.p. for three years, and by 5 p.p. for four years. Option 2.3 (slower) is the reverse. The accelerated adjustment thus increases the pace of Free Allocation removal, increasing the effective carbon price more quickly. This option would present the greatest export risk, but it could potentially

[14] 'Scope' would likely reflect a set of given SIC4 industries which are considered covered by the UK CBAM. The current 'preliminary Free Allocation Methodology' involves splitting each installation into individual products or processes (sub-installations), and accounting for three key elements: carbon leakage exposure factor, the product/process benchmark, and the activity level of the installation. See The Greenhouse Gas Emissions Trading Scheme (Amendment) Order 2020 for full details

positively impact on the ambition of firms' decarbonisation, due to the higher relative carbon costs.

Figure 5: Fast and slow initial Free Allocation adjustment options (illustrative)

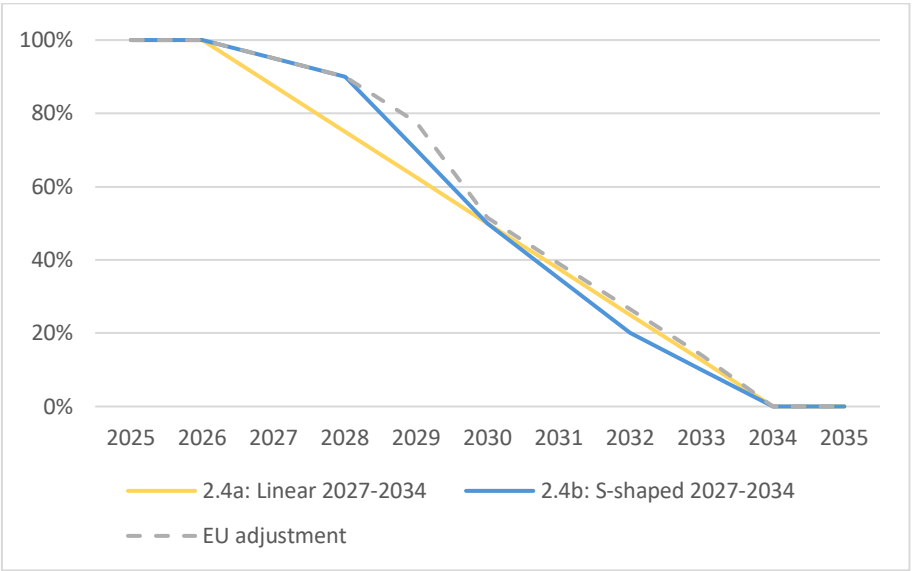


Option 2.4a and 2.4b

We also consider potential adjustment trajectories which broadly align with the announced FA adjustment of the EU for the implementation of its CBAM. This begins adjustment in 2026, the first year of EU CBAM, and reaches zero by 2034, as below. There may be advantages to broadly aligning the timing of the UK CBAM adjustment to FA to the EU's FA adjustment trajectory for CBAM covered sectors.

We outline two illustrative approaches to achieve this goal, with each starting in 2027 but reducing more quickly to reach a comparable level to the EU FA CBAM adjustment. Firstly, Option 2.4a shows a linear reduction of equal reduction each year. Option 2.4b shows a 'S-shaped trajectory, with gradual adjustment at the start and end but with faster adjustment in the middle, as below.

Figure 6: EU adjustment vs options 2.4a and 2.4b



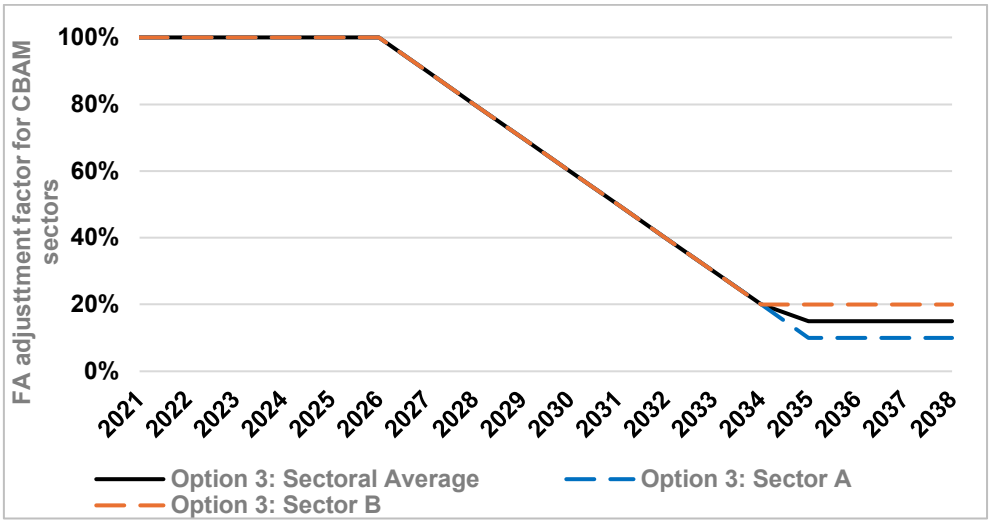
It should be noted that while these approaches aim to match the adjustment curve of the EU free allocation for CBAM sectors, several factors may determine the effective carbon prices of the individual ETSs, and the effective CBAM Rates. Therefore, seeking to align adjustment curves may not guarantee comparable carbon prices or scheme outcomes.

Option 3 – Top-down adjustment to non-zero

Option 3 involves phasing down the Free Allocation received by CBAM affected to a certain level, with some Free Allocation retained to mitigate potential carbon leakage risk, such as for exports.

Figure 7 examines an illustrative partial adjustment, with variations in the level of Free Allocation received by different CBAM covered sectors. This variation in the level of Free Allocation received by different CBAM sectors could, for example, be calibrated on their sectoral level carbon leakage risk. Figure 7 does not vary the transition period within which the adjustment factor is applied, or the pace of adjustment between sectors; however, this is purely for illustrative coherence.

Figure 7: Illustrative presentation of delayed Free Allocation adjustment options



Section 2: Qualitative assessment of options

We aim to assess each of the broad policy options according to key criteria. This aims to capture the main objectives that Free Allocation adjustment for CBAM sectors aims to meet, and how options differ in terms of impacts. We therefore aim to consider both the rationale for intervention, and the key impacts of options.

The key criteria against which we assess illustrative options are:

I. **Mitigating carbon leakage risk**
II. **Impact on ETS effectiveness**
III. **Technical feasibility**
IV. **Affordability to Government**
V. **Any other considerations, risks, or potential unintended consequences**

While not a comprehensive assessment of all impacts, this section aims to highlight the key trade-offs when adjusting Free Allocation. Importantly, a faster reduction increases the (effective) carbon price signal to both domestic and importing firms, and raises the effect of the UK CBAM, more quickly. At the same time, a sharper cost increase may reduce business readiness and harm competitiveness relative to foreign firms (e.g. on export markets), raising leakage risks.

This reflects the fact that a CBAM and Free Allocation address carbon leakage in different ways and are not perfect substitutes. As in Box A (Introduction), Free Allocation lowers the effective carbon price faced by UK producers regardless of destination market. In contrast, an import-only CBAM only covers products imported into the domestic market and (when combined with removal of FA) raises the effective carbon price to both UK and foreign producers. An import-only CBAM provides no protection against carbon leakage into export markets.[15] Therefore, the removal of Free Allocation and replacement with an import-only CBAM means domestic firms face higher costs resulting from carbon emissions than competitors. As such, the two policies are not perfect substitutes and may differ in sectoral competitiveness and carbon leakage. While we identify these potential channels for carbon leakage, this may vary by sector and context.

It should be noted this appraisal does not assume changes to other carbon leakage policies, beyond Free Allocation and CBAMs. Nonetheless, a comprehensive approach may require a package of policies to address carbon leakage risk in future. UK Government will continue to explore alternative approaches to mitigate export leakage as it develops its carbon leakage and industrial decarbonisation measures. The UK ETS Authority will engage with UK Government as it develops approaches in this space to ensure the role of Free Allocations is considered

Carbon leakage is the movement of production and associated emissions from one country to another due to different levels of decarbonisation effort through carbon pricing and climate regulation. Carbon leakage is multifaceted, but we primarily consider the competitiveness channel, which acts as follows: a climate policy (e.g. an ETS) raises production costs above those in other locations; in some industries (typically competitive, traded, and emissions-intense), higher costs lead to lower competitiveness, which in turn may drive industrial relocation or import substitution to jurisdictions with lower carbon costs.

[15] Unless such export markets are themselves covered by a carbon border adjustment or equivalent

Table 2: Assessment of options against criteria[16]

Criteria / Option	Do nothing – no adjustment to Free Allocation (FA)	Adjustment to zero (Linear / faster)	Adjustment to zero (slower or EU aligned, delayed)	Partial adjustment to non-zero
Carbon leakage mitigation	Continues comprehensive carbon leakage coverage for Energy Intensive sectors	Faster reduction of FA, a comprehensive carbon leakage mitigation, means leaving potential risk of CL through other channels (if unaddressed) in short run	Relative to fast adjustment, more gradual adjustment means more time for adjustment and lower carbon leakage risks in transitional period	In short run, similar to any adjustment, dependent on trajectory
Long-run carbon leakage mitigation	As above	Export carbon leakage is not covered as FA is adjusted to zero	Export carbon leakage is not covered as FA is adjusted to zero	Potentially lower carbon leakage risks in long-run, if feasible and accurate
Impact on ETS effectiveness	Doesn't actively lower FA (although FA may fall through other means): continues support for covered sectors but mutes price signal, lowering decarb incentive relative to adjustment and CBAM. Reduces effect of CBAM as Rate may remain near-zero	Compatible with broader ETS operation and FA rules. Increases decarbonisation signal through higher effective UK ETS prices initially	Compatible with broader ETS operation and FA rules. Slower adjustment means reduced decarbonisation signal relative to a faster adjustment	Compatible with ETS operation, but may reduce ETS effectiveness in long-run, and raise issues through the continuation of FA for CBAM sectors, through having two closely interacting carbon leakage policies indefinitely
Technical feasibility	Feasible for ETS in the short-run, as no direct adjustment to FA required, but in long-run requires ongoing FA adjustment for CBAM	Feasible to implement, through adjustment within FA methodology. Precise results to be developed	Feasible to implement, through adjustment within FA methodology. Precise results to be developed	Some difficulties in accurately and clearly deriving adjusted Carbon Leakage Indicator values – see Potential Implementation of Option 3
Affordability & fiscal impact	No difference in ETS revenue; implies zero/low CBAM revenues	Greatest impact to Government affordability and revenue through fewer FA allocated and greater CBAM revenues	Similar to any adjustment to zero; lower benefits relative to a faster adjustment due to slower CBAM effects and revenue	This option is likely affordable to Government, but raises lower revenues relative to a long-run adjustment to zero
Other impacts				Potential risk to consistency with World Trade Organisation Rules and other trade related obligations.

Green: significant benefits or no risk; Amber: potential benefits or minor risks; Red: significant costs or risks; White: NA

Section 3: Quantitative evidence

This section presents quantitative evidence and data which may inform the assessment of options. This should be considered as contextual, supporting evidence, rather than a comprehensive impact assessment. We include the following key pieces of quantitative evidence:

a) Potential sector scope for Free Allocation adjustment
b) Historic Free Allocation for UK CBAM sectors
c) Potential export and downstream leakage risk

[16] The categories in Table 2 cover a range of criteria, however, the mechanisms upon which they are scored are methodologically coherent, when assuming a longer implementation period grants improvements in technical feasibility.

Potential sector scope for adjustment to CBAM

In line with the prior consultation on the UK CBAM, we base this analysis on the five sectors in scope for the UK CBAM: aluminium, cement, fertilisers, hydrogen, and iron and steel.

CBAM scope is based on a set of CN (Combined Nomenclature) product codes, listed for each sector. Scope for the UK ETS, in contrast, applies to a set of 'regulated activities' where combustion exceeds a threshold.[17] The two schemes are therefore based on different eligibility, and neither on the basis of specific industry (or SIC4) codes. However, it is possible, and likely necessary, to identify a set of affected industries in order to determine scope for adjustment for CBAM sectors. We identify a set of potential industries for CBAM sectors with any active installation in the UK ETS below:[18]

Table 3: CBAM sectors aligned to UK ETS industries

CBAM sector	SIC4 / Industry
Aluminium	24.42 (Aluminium production)
Cement	23.51 (Manufacture of cement)
Fertiliser	20.15 (Manufacture of fertilisers and nitrogen compounds)
Hydrogen	20.11 (Manufacture of industrial gases)
Iron and steel	24.10 (Manufacture of basic iron and steel and of ferro-alloys) 21.20 (Manufacture of tubes, pipes, hollow profiles and related fittings, of steel)

Historic Free Allocation for CBAM sectors

We assess the characteristics of these 'CBAM sectors' by aggregating UK ETS data relating to the SIC codes within each sector, as in Table 4 below. First, we note that these sectors relate to a relatively small number of installations, between 1 and 20. This means only around 70 installations, at present, would see their Free Allocation adjusted under a UK CBAM. The relatively small numbers of installations underlines that there is a notable potential for annual volatility[19] in emissions and Free Allocation – and therefore Support Rates – of UK CBAM sectors. We also note there are significant variations in size between the UK CBAM sectors, in terms of numbers of installations, emissions and Free Allocation.

Table 4: Number of installations, emissions and Free Allocation for combined CBAM sectors

	# Installations	Emissions 2021	Emissions 2022	Emissions 2023	FA 2021	FA 2022	FA 2023
Iron & Steel	20	11,870,000	10,110,000	9,380,000	10,320,000	10,280,000	8,640,000
Aluminium	4	160,000	160,000	130,000	140,000	130,000	130,000
Fertiliser	2	1,250,000	640,000	40,000	1,480,000	1,370,000	650,000
Cement	11	6,280,000	5,920,000	5,170,000	5,290,000	5,160,000	5,120,000

[17] Participating in the UK ETS

[18] While there is a larger set of possible all SIC4 industries aligning to CBAM sectors, not all have an active installation in the UK ETS. We base this on the published UK ETS Registry data on Emissions and Surrenders

[19] Given scheme year FA is calculated on a sub-installation basis, and is based on activity/output, product and carbon leakage exposure factor – and not directly emissions in the scheme year – it is possible FA may not track emissions exactly. This potential volatility may be more acute when there are few sub-installations in a sector.

Hydrogen	1[20]	220,000	170,000	160,000	160,000	160,000	120,000

Source: UK ETS Registry – Compliance Report

Export and downstream leakage risk

As above, the CBAM raises comparable carbon prices on the embodied emissions of imported, covered products, aiming to mitigate carbon leakage from ETS costs in the UK domestic market. However, UK producers face higher carbon prices through the reduction in free allocation, which may have complex impacts in export markets in which UK producers compete.

This impact depends, amongst other factors, on whether the increase in carbon prices improves or reduces competitiveness in the given export market. In some cases, when export markets are covered by a carbon border adjustment (the EU), the higher carbon prices for UK producers of CBAM goods may offer a competitive advantage, through reducing CBAM liability in these export markets, which some other competitors (with unpriced emissions) face. On the other hand, in the case of export market without CBAMs, UK producers may face reduced competitiveness as they face higher carbon costs compared to competitors. In the latter case, there is a potential channel for carbon leakage. By extension, different adjustment options may increase or decrease these effects, depending on the speed of adjustment of Free Allocation: a faster adjustment raises the effective carbon price more quickly and may have larger effects (both positive competitiveness and negative leakage risks) to export markets.

We consider the evidence on the export intensity of UK production in CBAM sectors. Export intensity to non-EU markets could be considered a proxy for potential export leakage risk, albeit as a simple 'risk marker' rather than confirmed modelling of expectations of export leakage in any given policy scenario. Nonetheless, those UK sectors with a higher producer share of exports to non-CBAM markets may constitute higher export leakage risks.

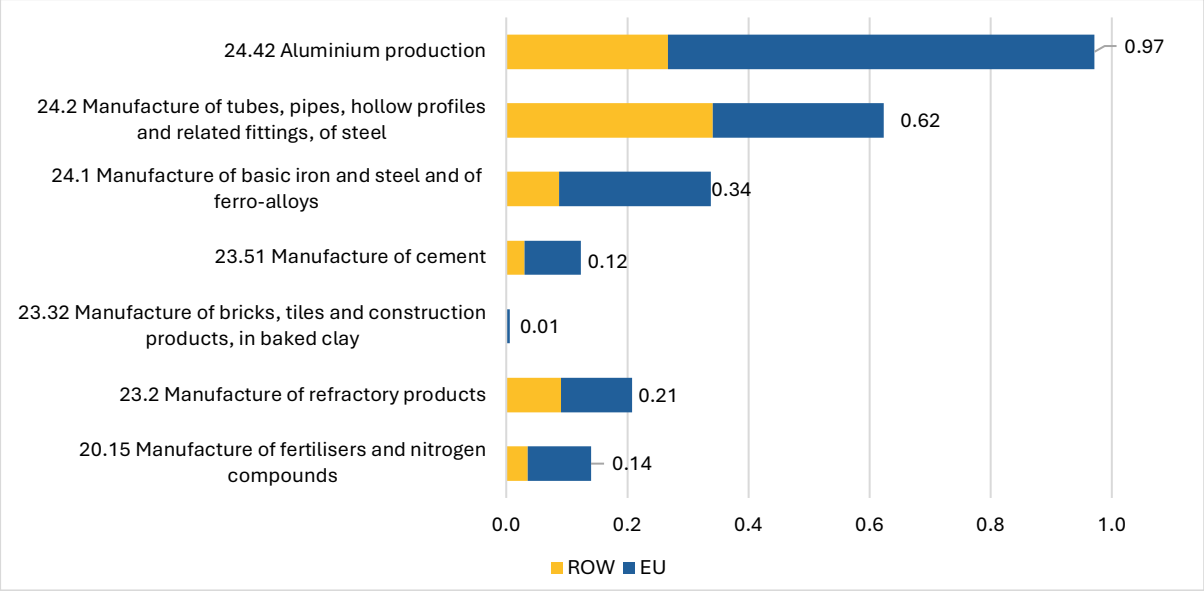
Figure 8 shows the export intensity of UK production for the UK CBAM subsectors (SIC4 codes as above).[21] This compares the value of exported production to EU and Rest of World (ROW) markets, divided by UK domestic production. For example, around a third of basic iron and steel manufacture (34%) goes to export markets, the majority of which is to EU. We differentiate between EU and ROW markets because EU exports may face a lower export leakage risk compared to ROW given the expected implementation of the EU CBAM.

This indicates that some subsectors have very high export intensities (for instance, almost all UK production goes to foreign markets in aluminium production); other sectors have high export intensities (such as, tubes of steel,), and most other sectors have an export intensity below 20% of total domestic production. This indicates that not all sectors are likely to have an equivalent carbon leakage risk due to their differing reliance on export markets. Nonetheless, all else being equal, we may expect that a slower adjustment may reduce the short-term risk of export carbon leakage, compared to a fast, steep increase in carbon costs. This is because a fast adjustment could lead to UK firms facing significant asymmetries in cost compared to foreign competitors in export markets.

[20] This installation is a hydrogen producer: Teesside Hydrogen Plant, BOC Limited

[21] Excluding manufacture of industrial gases due to lack of data

Figure 8: Export intensity of UK industries potentially covered by UK CBAM



As above, it should be noted that an increase in effective carbon costs for UK producers may have positive and negative competitiveness impacts, depending on export market characteristics amongst other factors. This analysis should be considered as context but not projections of the impact of such policies.

However, the above export intensity figures highlight the EU as the predominant export market for most CBAM goods, and suggests that a CBAM *may* improve UK competitiveness relative to competitors (with unpriced emissions) into this market.[22] Nonetheless, ROW markets represent a significant destination for UK exporters for many CBAM goods, suggesting the competitiveness and/or leakage to these countries should be considered, although noting export leakage is complex and dependant on many factors.

Downstream carbon leakage

A similar channel for leakage could be identified for 'downstream' products. This arises as UK CBAM products face increased carbon prices if combined with lower Free Allocation. This raises the production costs of UK goods compared to a scenario where full, unadjusted Free Allocation is retained. Any product which uses the CBAM sector as an input to downstream goods may therefore face these higher prices. For example, take a complex downstream product, such as cars, for which several CBAM products are required for intermediate production – such as steel . As in the export example, UK producers of CBAM products may face higher production costs than foreign producers (who do not face comparable carbon prices). These costs flow to firms purchasing CBAM goods, creating a potential asymmetry: producers of the downstream product face lower embodied carbon prices in foreign jurisdictions than in the UK. This creates a potential channel through which production moves to foreign jurisdictions (industrial relocation) or through which the UK imports more of these goods (import substitution). As a result, UK emissions fall while foreign emissions rise.

[22] Any exporter of a CBAM product into the EU is expected to face the EU carbon price on embodied emissions, based on the producer's domestic carbon price. Countries with a lower effective carbon price will therefore face costs to export into the EU. If UK producers of CBAM products receive lower FA, they face a higher carbon price and lower the EU CBAM liability for exporters. This may present an advantage, when exporting to the EU, for firms in jurisdictions with a (high) carbon price compared to those with lower or no carbon price.

Potential implementation of Option 3 – adjusted Carbon Leakage Indicator (CLI)

To assess the feasibility and potential values for adjusted CLI values within Option 3 (the partial adjustment of Free Allocation to a non-zero long-term value), UK Government commissioned NERA to undertake an assessment of whether quantitative carbon leakage indicators for CBAM sectors could be constructed to quantify potential export and downstream leakage risk, using primarily public data and through a transparent methodology. This was undertaken as a hypothetical exercise to explore the feasibility of creating a methodology which may be used for Free Allocation adjustment, but should not be considered a full risk assessment, nor an assessment of the wider impacts of this option.

The analysis indicated that it is feasible to develop quantitative indicators for export intensity of UK production from public datasets (as above), using a modified version of trade intensity based on public trade and economic output data at a sectoral level. In contrast, the research found it is complex to build indicators which consistently capture potential downstream leakage risk for UK CBAM sectors with publicly available and transparent data. While further analysis and policy development could explore this, this initial study indicates that it may be difficult to reliably develop robust, clear indicators which comprehensively capture the remaining leakage risk in this scenario – in practice, such indicators may only be able to capture export leakage risk.

Annex A: Technical considerations for application of Free Allocation adjustment

There are several considerations for how a CBAM adjustment could be applied. In practice, the adjustment would need to be applied as a change in the Free Allocation methodology, either as a change to an existing component, or as an additional parameter. There are several key decisions which may be necessary to practically implement the adjustment, covered in this section:

A. Point of application in the Free Allocation Methodology – timing in the calculation and parameter
B. Application: whether adjustment applies at an installation or sub-installation level
C. Scope: which sectors, installation or sub-installations are considered 'in scope' of the CBAM and therefore will receive adjustment

A – Application in the Free Allocation methodology

There is a potential decision as to where in the Free Allocation methodology the adjustment is applied. As noted in the consultation, it is necessary to add or adjust a parameter in the Free Allocation methodology. Whilst it may be possible to adjust an existing parameter, a potentially clearer approach would be to add a new CBAM component to preliminary Free Allocation.

This would be used to calculate the allocation for each installation or sub-installation using an adjusted version of the following equation, with the change marked in red:

$$FA_{si,y} = HAL_{si,y} \times Benchmark_{si,y} \times CLEF_{si,y} \times CBAM_{si,y}$$

Where:

- $FA_{si,y}$: Preliminary annual Free Allocation for the sub-installation (si) in year (y) (expressed in UKAs/year).
- $HAL_{si,y}$: Historical activity level as determined and verified in the baseline data collection
- $Benchmark_{si,y}$: Emissions intensity benchmark
- $CLEF_{si,y}$: Carbon Leakage Exposure Factor for the process emissions sub-installation in year y.
- $CBAM_{si,y}$: Carbon Border Adjustment Mechanism Factor for the process emissions sub-installation in year y, if relevant

In this case, an additional parameter for the CBAM adjustment factor would be applied, **only for installations or sub-installations deemed in scope.**

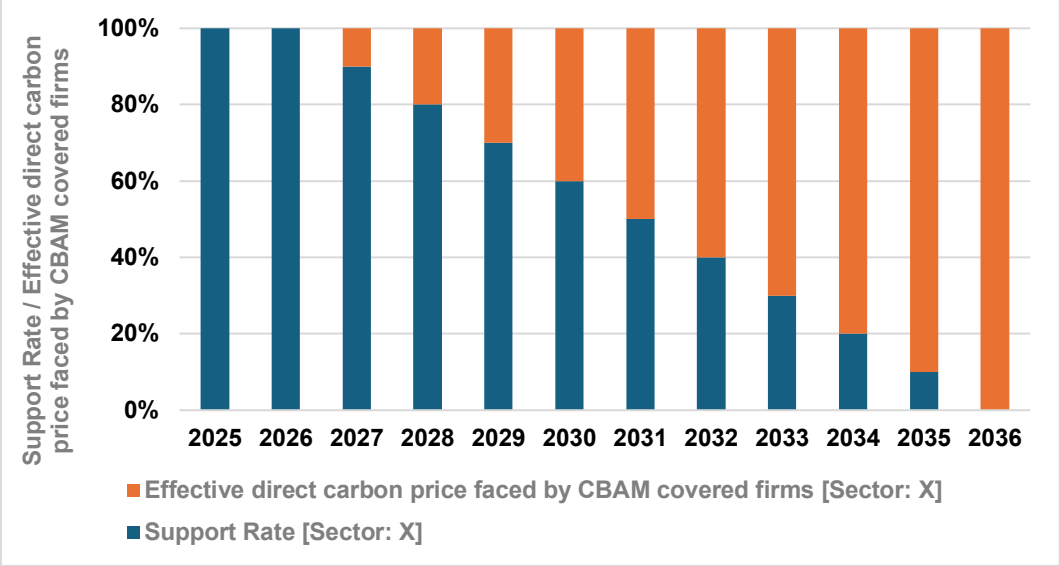
The values for this parameter would be outlined precisely for each option, such as the following for the linear option. As a case study, we apply this calculation to an archetypal installation:

Table 5: Potential CBAM adjustment factor

	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
CBAM adjustment factor	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
Preliminary FA (before CBAM adjustment)[23]	1m	1m	1m	1m	1m	1m	1m	1m	1m	1m	1m
Preliminary FA (after CBAM adjustment)	1m	0.9m	0.8m	0.7m	0.6m	0.5m	0.4m	0.3m	0.2m	0.1m	0

If the Support Rate for a given sector started at exactly 100% (zero effective carbon price), and responded exactly to the Free Allocation adjustment, all else being equal (including Free Allocation and emissions), the Support Rate would also reduce linearly in line with the adjustment, with the effective CBAM Rate as the opposite. In this case, in 2030, the sector would face an effective carbon price (CBAM Rate) of 40%.

Figure 9: Support Rate / Effective direct carbon price faced by CBAM covered firms

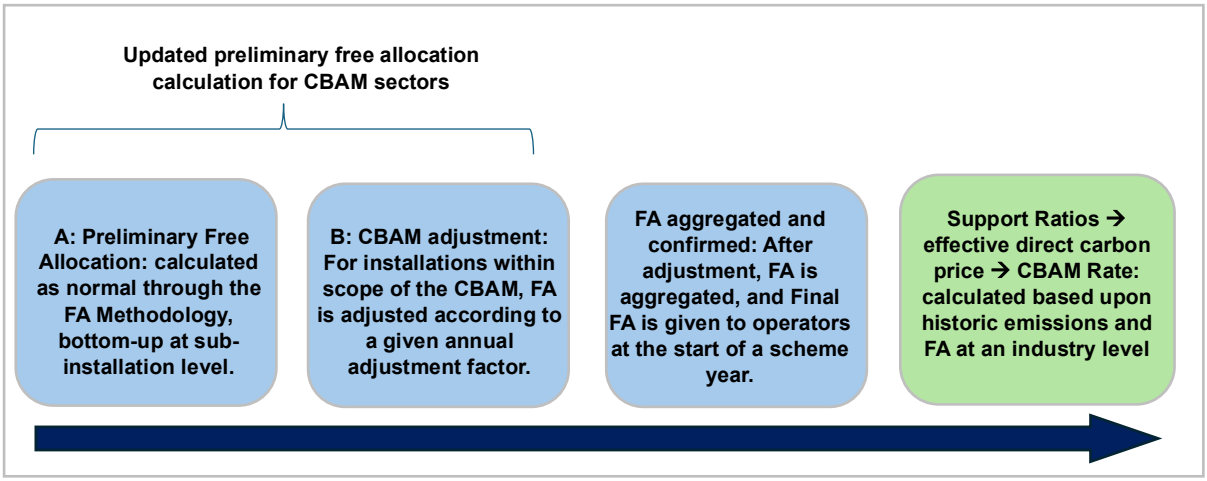


This Figure outlines the effective direct carbon price in opposition to the Support Rate, for a hypothetical sector which receives an adjustment to its Free Allocation to zero (Option 2). It seeks to highlight the inverse relationship between Free Allocation levels and the effective carbon price faced within the CBAM Rate calculation.

There is also a potential decision as to when in the Free Allocation methodology the adjustment is applied. This primarily concerns whether it is applied as part of the preliminary calculation, and before any final adjustments (such as a Cross-Sectoral Correction Factor), or before. It is likely that the adjustment could take place within the preliminary Free Allocation calculation, as below. In the case of Option 3, an updated long-term value for Free Allocation may be required. The effective carbon price would then be calculated based on historic emissions and Free Allocation.

[23] We assume, for simplicity and to isolate the impact of the FA CBAM adjustment, that baseline FA does not change for the CBAM covered sector, although in practice this FA is likely to change over time and allocation periods to reflect potential changes to the parameters in the FA Methodology, such as the Benchmark

Figure 10: Broad approach for implementing adjustment



B – Application: whether adjustment applies at an installation or sub-installation level

There is a potential decision as to whether the adjustment to Free Allocation takes place at the installation or sub-installation level. This would consider either that all activity within a given installation as CBAM covered and adjusted – likely by industry NACE4 code – or that activity should be disaggregated to sub-installation level, and CBAM coverage determined for individual products or processes – likely based on Benchmarks. The latter may involve creating two different versions of some Benchmarks to reflect that some sectors are CBAM covered and some are not. The UK ETS Authority is seeking further views at consultation.

C – Scope

Finally, there is likely to be a decision as to which specific sectors are considered 'in scope' of the UK CBAM and therefore will receive adjustment. This is discussed above in 'Potential sector scope for adjustment to CBAM'. This section outlines one potential method and set of industries for CBAM scope and adjustment, but it should be noted that other potential methods and levels of application may be derived, such as determining CBAM coverage at the sub-installation or Benchmark level. The UK ETS Authority is seeking further views at consultation.