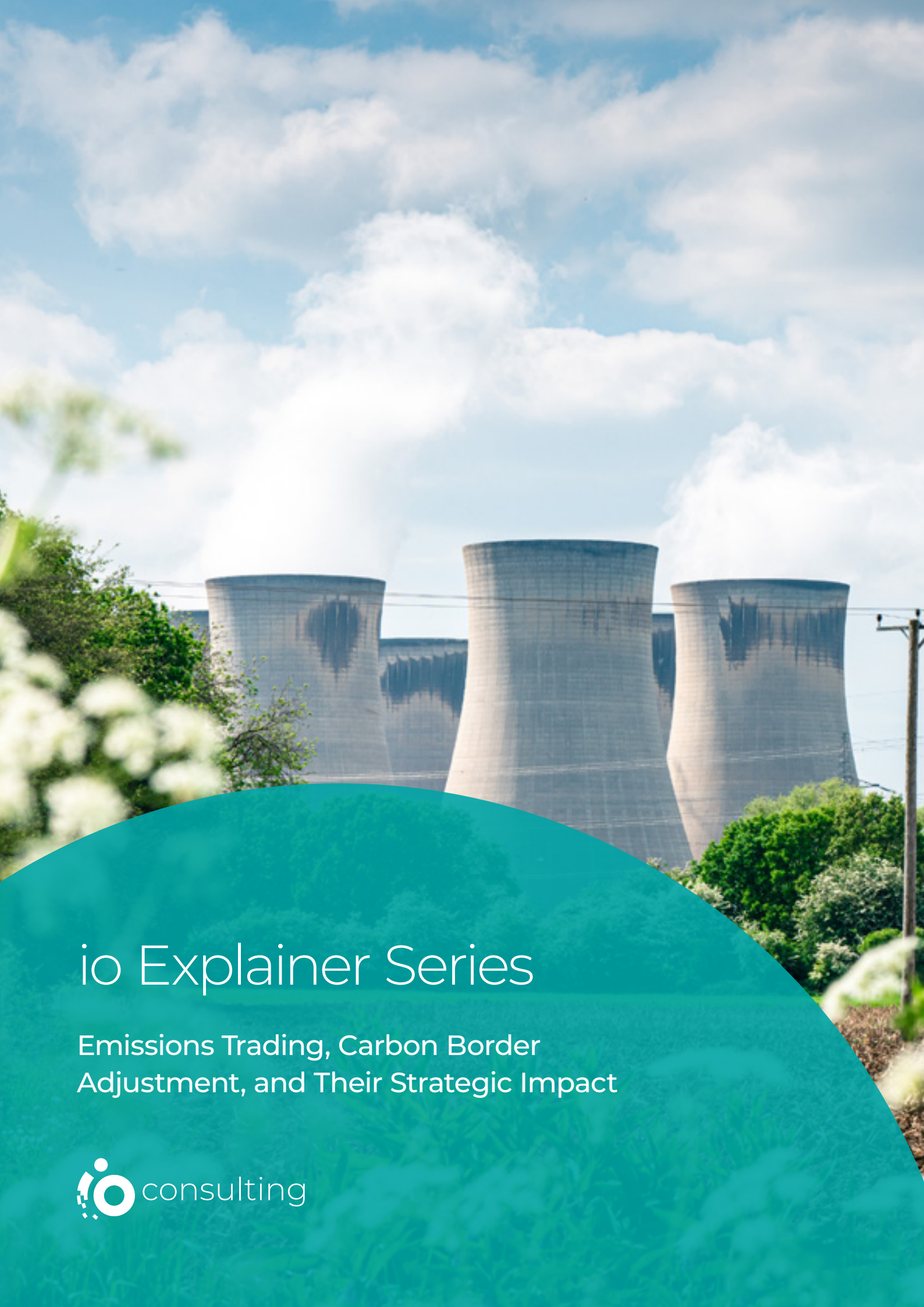


A photograph of three large, grey, cylindrical cooling towers of a nuclear power plant. They are set against a bright blue sky with scattered white clouds. In the foreground, there are green trees and bushes, some of which are slightly out of focus. A large, semi-circular teal graphic element covers the bottom half of the image, serving as a background for the text.

io Explainer Series

Emissions Trading, Carbon Border
Adjustment, and Their Strategic Impact



01 Context





The Rise of Carbon

Carbon pricing has become the principal policy instrument for delivering national and corporate net-zero commitments. More than thirty jurisdictions now operate Emissions Trading Systems (ETS), collectively covering almost a quarter of global greenhouse-gas emissions.

An ETS caps total emissions within defined sectors and allocates or auctions tradable allowances, each representing one tonne of CO₂-equivalent. Companies that cut emissions below their allowance can sell surplus permits; those that exceed must buy additional ones. The market thereby identifies the lowest-cost abatement opportunities.

A photograph of two large white wind turbines on a green, hilly landscape. In the background, there are rolling green hills and a small white lake. The sky is overcast with grey clouds. The image serves as a background for the title and part of the content.

02

The EU Emissions Trading System (EU ETS)

Established in 2005, the EU ETS is the world's most mature carbon market. It covers power generation, heavy industry, and intra-EEA aviation across 30 participating countries (i.e. 27 EU countries plus Iceland, Liechtenstein and Norway).

- › The system operates under a declining emissions cap in line with the EU's "Fit for 55" and 2050 net-zero targets.
- › Regulated installations receive a mix of free allowances (to mitigate carbon-leakage risk) and auctioned permits.
- › At compliance year-end, each operator must surrender allowances equal to verified emissions.

A landscape photograph showing a white wind turbine on a green, grassy hill. In the background, there are rolling green hills and mountains with patches of snow. The sky is a pale blue. A large, semi-circular grey shape is overlaid on the top right of the image, containing text. A teal shape is overlaid on the bottom left corner.

The carbon price is currently around €78 per tonne CO₂ (Oct 2025) and acts as a real financial signal to decarbonise. Free allocations are being phased down; industrial sectors such as cement, steel, and aluminium now face growing uncovered cost exposure.



03

The UK Emissions Trading Scheme (UK ETS)

Following Brexit, the UK launched its own ETS in 2021. Structurally similar to the EU system, it covers power, industry, and aviation but operates under independent governance by the UK ETS Authority (comprising UK Government, Scottish Government, Welsh Government, NI DAERA).

- › UK Allowance (UKA) prices trade around £42 per tonne CO₂, somewhat lower than the EU level.
- › The cap will tighten sharply from 2028 in line with the UK's Sixth Carbon Budget (2033–37), calling for 77% reduction on 1990 levels.
- › Free allocations remain for carbon-leakage-exposed industries, including cement, but will decline over time.

An aerial photograph of an industrial facility, likely a power plant or refinery. In the foreground, a large, cylindrical metal cooling tower is visible, with a thick plume of white steam or smoke rising from its top. The tower's surface is made of vertical metal panels. In the background, there are various industrial structures, including storage tanks, pipes, and buildings. A body of water is visible in the distance, surrounded by green hills under a blue sky with some clouds. The image is framed by teal-colored curved shapes in the top right and bottom left corners.

While not currently linked, both ETs share the same objective: a predictable, economy-wide carbon price to drive least-cost abatement.

04

Global Momentum

ETS frameworks now operate in China, South Korea, California-Québec, New Zealand, and Switzerland, with emerging systems planned in Japan, Turkey, Brazil, and the UAE.

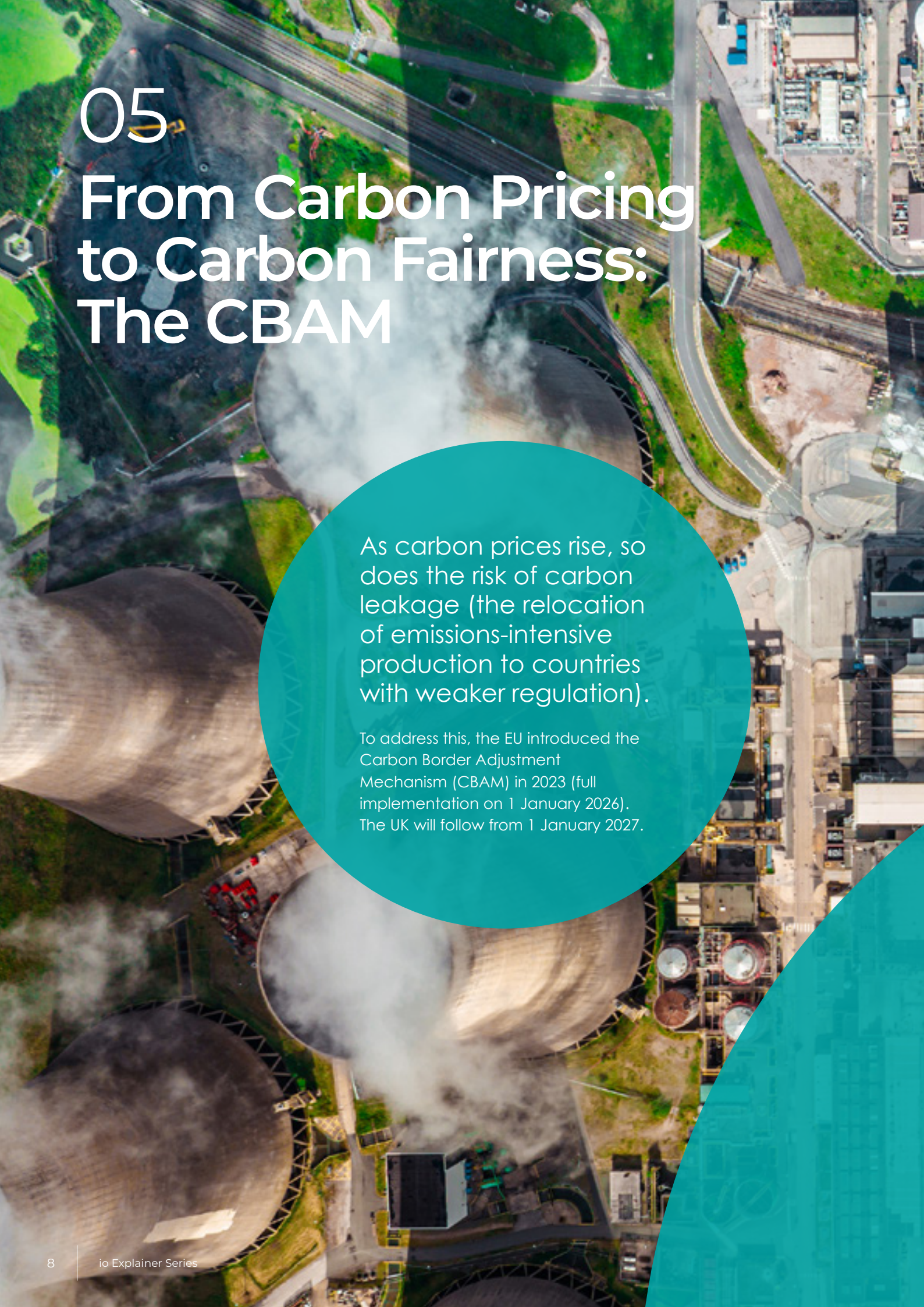
Scale of Implementation

In Latin America, Chile is piloting a national ETS through 2025, Mexico plans full implementation by 2026, and Brazil has approved draft legislation for a national market. Across Africa, South Africa's carbon tax includes tradable offset elements, while Morocco is developing a voluntary ETS with EU support. In the Middle East, the UAE and Saudi Arabia are designing domestic carbon markets aligned with corporate and national net-zero goals.

As of 2025, more than 45 national or regional ETSs are in force, covering roughly 20% of global greenhouse gas emissions (ICAP Status Report 2025).

Together they mark a decisive global shift: emissions are no longer an externality—they are a cost of doing business.



An aerial photograph of an industrial facility, likely a power plant or refinery. Several large, cylindrical cooling towers are visible, each emitting a thick plume of white steam or smoke that rises into the air. The facility is surrounded by greenery and infrastructure, including roads and railway tracks. The overall scene is captured from a high angle, providing a comprehensive view of the industrial complex and its surroundings.

05

From Carbon Pricing to Carbon Fairness: The CBAM

As carbon prices rise, so does the risk of carbon leakage (the relocation of emissions-intensive production to countries with weaker regulation).

To address this, the EU introduced the Carbon Border Adjustment Mechanism (CBAM) in 2023 (full implementation on 1 January 2026). The UK will follow from 1 January 2027.



Purpose: To impose an equivalent carbon charge on imported goods so that domestic and foreign producers face the same effective carbon cost.

Coverage: Initially cement, iron & steel, aluminium, fertilisers, and hydrogen (electricity included in the EU version but not yet in the UK).

Mechanics:

- › Importers declare embedded emissions for covered goods.
- › They pay an adjustment reflecting the local carbon price (EU ETS or UK ETS) minus any verified carbon price already paid abroad.
- › The UK will operate a tax-based model via HMRC's customs system, rather than the EU's certificate-trading registry.

Exceptions:

- › In the EU, small consignments under €150 are exempt from CBAM obligations (to reduce administrative burden) and/ or micro-installations producing <2 t CO₂ per year (rare in heavy industry) are excluded.
- › In the UK, Importers will need to register and report only if annual imports exceed £50,000 in covered goods over the previous 12 months

This approach preserves competitiveness, ensures integrity of domestic decarbonisation, and aligns with WTO principles by linking the charge explicitly to carbon content.

An aerial photograph of a landscape. In the top left, there are brown, harvested fields. A multi-lane highway runs diagonally from the top left towards the bottom right. To the right of the highway is a lush green area with trees. Further right, there are several large industrial buildings with grey roofs and parking lots. A large, dark, circular area, possibly a landfill or a large pond, is visible in the lower middle section. The bottom half of the image is overlaid with a semi-transparent teal circle containing text.

06

Dieter Helm's Influence

Oxford economist Professor Dieter Helm has long championed the concept of border carbon adjustment.

In *The Carbon Crunch* (2012) and *Net Zero* (2020), he argued that the UK and EU have “de-industrialised their way to lower emissions” by importing carbon-intensive goods rather than reducing global emissions.

Helm's remedy was a Carbon Border Tax—precursor to today's CBAM—applying the domestic carbon price to all goods consumed, regardless of origin. His reasoning, is based on 3 pillars:

- › Production-based accounting misrepresents true carbon responsibility.
- › Without border adjustment, high-carbon imports undercut domestic producers and undermine net-zero credibility.
- › A universal carbon price, applied through trade, converts climate ambition into enforceable economics.

The UK CBAM announced in 2024 mirrors this logic almost exactly, effectively operationalising Helm's long-standing argument.



07

Sector Example: Cement





Current Position

Cement is among the most carbon-intensive commodities (~0.8–0.9 t CO₂ per t cement). The UK industry is relatively efficient—modern dry-process kilns, >50% alternative-fuel use, and emissions >50% lower than 1990—but it remains exposed to cheaper imports.

- › The UK imports roughly 15–25% of its cement and clinker, mainly from Ireland, Spain, Turkey, and North Africa.
- › Domestic producers are covered by the UK ETS; many foreign producers are not.
- › **Result:** imported cement can be £4–5 per tonne cheaper, purely due to avoided carbon cost.

Impact of EU CBAM Reforms

The EU Carbon Border Adjustment Mechanism (CBAM), moving to full implementation in 2026, introduces commodity-based carbon pricing for imports such as cement and clinker.

- › EU importers will no longer enjoy a “free ride”, they must purchase CBAM certificates covering the embedded CO₂ at the EU ETS price.
- › EU producers (e.g. in Spain and Ireland) exporting to the UK will continue to bear these EU ETS costs and may later face UK CBAM adjustments once the UK mechanism begins in 2027.
- › Non-EU exporters (e.g. Turkey, North Africa) will continue to avoid carbon costs until the UK CBAM applies.

Outlook: The carbon-driven price gap between imported and UK-produced cement persists for now but is expected to narrow from 2026–2027 as both EU and UK CBAMs take effect, levelling the competitive field and aligning cross-border carbon costs.

How ETS Works in Practice

A UK cement plant emitting 850,000 tonnes of CO₂ in a given year might receive 750,000 free allowances (UKAs) under the UK ETS, reflecting its historical production and efficiency benchmark. It must therefore purchase 100,000 additional UKAs to cover its verified emissions.

At a carbon price of £42 per tonne, this equates to a £4.2 million compliance cost.

1. Trading Allowances

The UK ETS is a market-based system, allowing firms to buy and sell allowances on the open market or through government auctions.

Two main markets exist:

- › Primary auctions, where the UK government sells new allowances.
- › Secondary markets, where firms trade existing allowances with one another, often via brokers or carbon exchanges.

The price fluctuates with demand, reflecting industrial activity, fuel prices, and policy expectations.

2. Selling Surplus Allowances

If the plant invests in alternative fuels or clinker substitution and cuts emissions to 700,000 tonnes, it now holds 50,000 spare UKAs.

At £42/t, these are worth: $50,000 \times £42 = £2.1$ million

This converts decarbonisation into direct financial value — emission reductions become tradable assets.

3. Buying Additional Allowances

If output rises to 900,000 tonnes, the plant must buy 150,000 UKAs at the prevailing market price.

If the market tightens (due to reduced supply or increased demand), prices can spike, increasing compliance costs.

There is no price cap; instead, the Market Stability Reserve (MSR) manages liquidity by releasing or withholding allowances to stabilise prices.

4. What if There Aren't Enough Allowances?

If an operator cannot secure enough UKAs before the compliance deadline:

- › It must pay a £100/t penalty for missing allowances, and still
- › Surrender the missing allowances the following year.

This ensures that fines can't be used as a cheaper alternative to compliance.

5. The Role of the Cap and Market Stability

The total number of UKAs issued each year is deliberately reduced to ensure continued decarbonisation:

- › The UK ETS Authority sets a declining annual cap consistent with the UK's carbon budgets and Net Zero 2050 trajectory.
- › Between 2024 and 2030, the cap is expected to tighten by roughly 30–35%, reducing total available allowances.
- › The Market Stability Reserve (MSR) automatically removes surplus allowances from circulation if the market becomes oversupplied, maintaining scarcity and a meaningful carbon price.

This avoids the oversupply problem seen in the early EU ETS years and ensures that there is always a financial incentive to decarbonise.

6. Strategic Effect

The result is a self-reinforcing system:

- › The declining cap ensures that total emissions fall.
- › The market price ensures reductions occur where they're cheapest.
- › Tradeability turns carbon efficiency into a commercial advantage.

Over time, this pushes all participants toward lower-carbon operations or rising costs if they fail to act.

Impact of CBAM



To illustrate the CBAM mechanism, consider a theoretical case:

A Turkish cement producer emits around 850,000 t CO₂ annually across all operations and faces no domestic carbon price.

If 100,000 tonnes of this cement were imported into the UK, with an average emissions intensity of 0.85 t CO₂ per tonne, the embedded emissions would be:

$$100,000 \times 0.85 = 85,000 \text{ t CO}_2$$

At a UK ETS carbon price of £42/t CO₂, the CBAM liability would be:

$$85,000 \times £42 = £3.57 \text{ million}$$

This charge would be paid by the UK importer, ensuring that imported cement faces the same carbon cost as domestic production under the UK ETS.

Cement sold domestically in Turkey or exported elsewhere would not incur UK CBAM charges.

08

Strategic Implications

For Policy and Markets

- › ETS ensures progressive domestic decarbonisation.
- › CBAM extends this to trade, globalising the carbon price signal.
- › Together, they prevent “carbon leakage” and align climate ambition with industrial competitiveness

For Industry

- › Rising carbon costs drive fuel switching, process efficiency, and CCUS investment.
- › Leaders in low-carbon production gain advantage once CBAM removes the “cheap carbon” gap.
- › Carbon pricing improves life-cycle transparency and ESG credibility.

For the UK and EU

Both jurisdictions are setting global standards for carbon-aligned trade.

Alignment of ETS and CBAM frameworks will be crucial to maintain smooth border treatment and mutual carbon recognition.



09 Key Takeaways





Mechanism	Purpose	Real-Economy Effect
ETS	Cap domestic emissions and let the market set a carbon price	Creates a cost of carbon that drives industrial decarbonisation
CBAM	Apply the same carbon price to imports	Prevents carbon leakage and protects competitiveness
Combined Impact	Align domestic and trade policy	Globalises the carbon price signal

Summary Insight

The EU and UK are now implementing the most coherent climate-economy architecture to date:

ETS delivers domestic discipline; CBAM ensures fairness and global reach.

Together they transform carbon from a compliance cost into a strategic determinant of competitiveness, investment, and long-term industrial resilience.



