



Reforming the EU Emissions Trading System and the Future of European Carbon Pricing

Balancing Europe's climate ambitions with the economic and political challenges of ETS2

Executive Summary

EU Emissions Trading System at a Glance

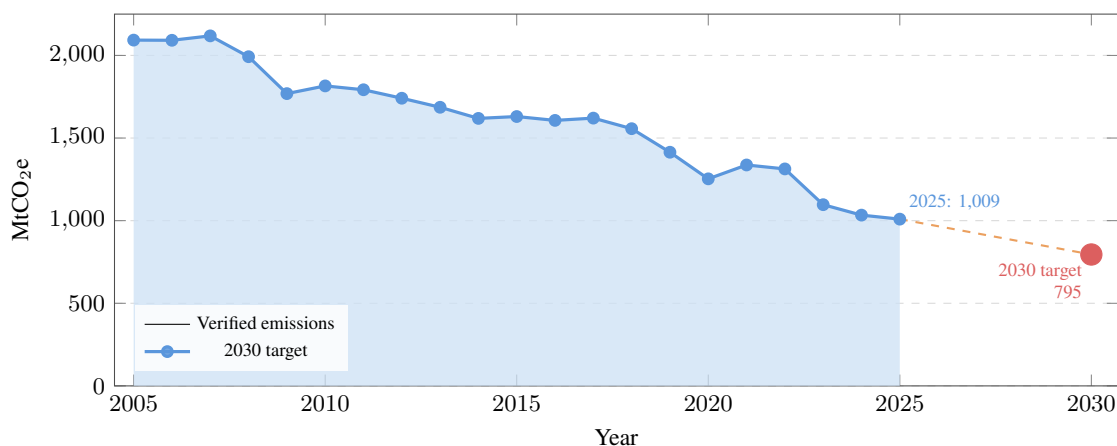
- Launched in **2005** as the world's first major carbon market
- Covers approximately **37% of EEA greenhouse gas emissions**
- Covers around **10,000 installations** in the energy and manufacturing sectors
- Stationary-installation emissions fell by **51% between 2005 and 2024**
- Current legislation targets a **62% reduction in ETS emissions by 2030**, relative to 2005

The European Union Emissions Trading System (EU ETS) has been a central instrument of European climate policy since its introduction in 2005. Through a declining emissions cap and a market for tradable allowances, it prices greenhouse gas emissions from electricity and heat generation, energy-intensive industry and aviation, with maritime transport incorporated from 2024. The system now covers approximately 37% of greenhouse gas emissions across the European Economic Area and around 10,000 energy and manufacturing installations (European Commission, 2024; EEA, 2026). Following its 2023 revision under the Fit for 55 package, the ETS cap is designed to deliver a 62% reduction in covered emissions by 2030 relative to 2005.

The system has delivered substantial emissions reductions. Emissions from stationary installations fell by approximately 51% between 2005 and 2024, driven particularly by decarbonisation in the power sector, fuel switching and increased renewable-energy deployment (EEA, 2026). The ETS has also become an important source of transition finance: allowance auctions generated €38.8 billion in 2024 and more than €230 billion between 2013 and 2024, supporting national climate expenditure, the Innovation Fund and the Modernisation Fund (European Commission, 2025). Its increasing stringency, however, has intensified concerns over industrial competitiveness, carbon leakage and the distribution of carbon-pricing costs.

These tensions will become more important as free allocation is progressively phased out alongside the Carbon Border Adjustment Mechanism (CBAM), while ETS2 will extend carbon pricing to fuels used in buildings, road transport and additional sectors from 2027. The next phase of reform must therefore preserve the ETS's environmental effectiveness while maintaining industrial competitiveness and political support. This brief evaluates the system's economic, environmental and social performance, assesses the implications of ETS2, and considers how European carbon pricing should develop beyond the current framework.

Figure 1: EU ETS Stationary Installation Emissions and the 2030 Target, 2005–2030



Source: European Environment Agency, EU ETS Union Registry (July 2026); European Commission (2025). Historical values are adjusted to reflect the current scope of the EU ETS. The 2030 target represents a 62% reduction relative to 2005.

Context and Background

The EU Emissions Trading System operates through a cap-and-trade mechanism. A fixed quantity of allowances limits aggregate emissions from covered activities, with each allowance permitting the emission of one tonne of CO₂ equivalent. Regulated operators must surrender allowances equal to their verified annual emissions and can trade allowances between themselves. As the cap declines, allowances become increasingly scarce, creating a financial incentive to reduce emissions where abatement is cheaper than purchasing additional allowances (European Commission, 2026).

The system has been progressively strengthened since its introduction in 2005. Early phases relied heavily on free allocation and experienced substantial allowance surpluses, weakening the carbon-price signal. Phase III (2013–2020) introduced a single EU-wide cap and greater auctioning, while the Market Stability Reserve (MSR) began operating in 2019 to manage accumulated surpluses. Phase IV began in 2021 and was subsequently strengthened by the 2023 Fit for 55 reform, which increased the rate at which the emissions cap declines and expanded the scope of the system (European Commission, 2023; European Commission, 2026).

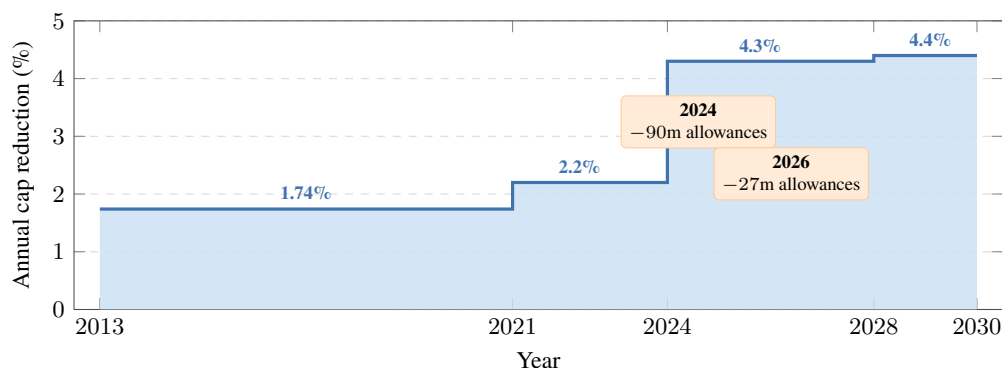
Figure 2: Development of the EU Emissions Trading System, 2005–2026



Source: European Commission (2023; 2026).

The 2023 reform significantly tightened the cap. The Linear Reduction Factor (LRF), which determines its annual decline, increased from 1.74% during Phase III to 2.2% from 2021, 4.3% for 2024–2027 and 4.4% from 2028. The reform also introduced one-off reductions of 90 million allowances in 2024 and 27 million in 2026. Together, these changes are intended to reduce emissions covered by the ETS by 62% by 2030 relative to 2005 (European Commission, 2023; European Commission, 2026).

Figure 3: Tightening of the EU ETS Linear Reduction Factor



Source: European Commission (2023). The 2023 ETS revision increased the Linear Reduction Factor and rebased the cap through one-off reductions in 2024 and 2026.

The reform also broadened the scope of carbon pricing. Maritime transport entered the existing ETS in 2024, while free allocation to aviation is being phased out in favour of full auctioning from 2026. The system continues to combine auctioning with free allocation for parts of industry, while the MSR adjusts allowance supply when significant market imbalances emerge (European Commission, 2025; European Commission, 2026). The result is a considerably more stringent and comprehensive system than that introduced in 2005. The ETS now combines a rapidly declining emissions cap with broader sectoral coverage and mechanisms for managing allowance supply.

Economic Impact and Competitiveness

The economic effect of the EU ETS operates principally through the allowance price. Firms capable of reducing emissions below the cost of purchasing allowances have an incentive to abate, allowing reductions to occur where they are comparatively inexpensive while creating a common investment signal for efficiency, electrification and low-carbon technologies. The strength of this signal has increased considerably: the average allowance price rose from approximately €5/tCO₂ in 2017 and €25/tCO₂ in 2020 to €83.6/tCO₂ in 2023, before declining to €64.8/tCO₂ in 2024 (EEA, 2025).

Figure 4: Evolution of the EU ETS Allowance Price, 2019–2026

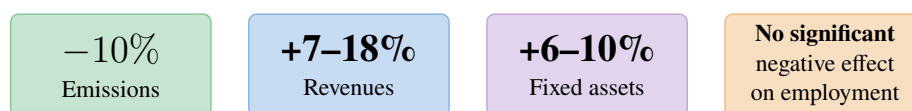


Source: ICAP Allowance Price Explorer (2026); European Environment Agency (2025). The EEA reports annual average prices of €83.6/tCO₂e in 2023 and €64.8/tCO₂e in 2024.

Higher carbon prices create potential competitiveness risks for energy-intensive and trade-exposed industries, particularly steel, cement, chemicals and fertilisers. Where firms cannot pass carbon costs to consumers or reduce emissions economically, production could relocate to jurisdictions with weaker climate constraints, creating “carbon leakage”. Free allocation has historically reduced this exposure, while CBAM is intended progressively to replace this protection for covered sectors as their free allowances are phased out (European Commission, 2026).

Existing empirical evidence nevertheless finds little indication that the ETS has produced substantial aggregate competitiveness losses. Dechezleprêtre, Nachtigall and Venmans estimate that the ETS reduced emissions from regulated installations by approximately 10% between 2005 and 2012 without a statistically significant negative effect on employment or profits. Regulated firms instead recorded estimated revenue increases of 7–18% and increases in fixed assets of 6–10%, depending on model specification (Dechezleprêtre, Nachtigall & Venmans, 2018; OECD, 2023). Broader OECD reviews similarly find that most ex-post studies of carbon pricing detect no statistically significant effects on indicators including turnover, value added, employment, profits, productivity or foreign investment (Ellis, Nachtigall & Venmans, 2019).

Figure 5: Estimated Effects of the EU ETS on Regulated Firms



Source: Dechezleprêtre, Nachtigall and Venmans (2018; 2023), OECD. Estimates cover the first two trading phases (2005–2012); ranges reflect alternative model specifications.

There is also evidence of an investment and innovation response. OECD assessments report that ETS-regulated firms increased investment in fixed assets and that carbon pricing has encouraged low-carbon innovation; earlier research estimates that the ETS increased low-carbon patenting among regulated firms relative to comparable firms not subject to the system (OECD, 2021; OECD, 2024). These effects are economically important because competitiveness depends

not only on the immediate cost imposed by carbon pricing, but also on whether firms respond by increasing productivity and reducing their future exposure to carbon costs.

The ETS also generates substantial financial resources that can support this adjustment. Auctions produced €38.8 billion in 2024, of which €24.4 billion accrued directly to Member States, €6.3 billion to the Modernisation Fund, €2.4 billion to the Innovation Fund and €5.6 billion to the Recovery and Resilience Facility. Since 2013, cumulative auction revenues had exceeded €258 billion by the end of 2025 (EEA, 2025; European Commission, 2026).

Table 1: **Allocation of EU ETS Auction Revenues, 2024**

Recipient / Instrument	Revenue	Principal role
EU Member States	€24.4bn	National climate and energy expenditure
Modernisation Fund	€6.3bn	Energy-system modernisation and transition investment
Recovery & Resilience Facility	€5.6bn	REPowerEU and energy-transition investment
Innovation Fund	€2.4bn	Low-carbon technology and industrial decarbonisation
Total auction revenue	€38.8bn	

Source: European Environment Agency (2025); European Commission (2026).

The historical evidence should nonetheless be interpreted cautiously when assessing future competitiveness. Much of the strongest causal evidence covers 2005–2012, when allowance prices averaged around €20/tCO₂ and vulnerable industries received substantial free allocation (OECD, 2023). The current environment combines materially higher carbon prices with a faster-declining cap and the progressive replacement of free allocation by CBAM. Past resilience therefore does not establish that further increases in carbon costs will be economically neutral.

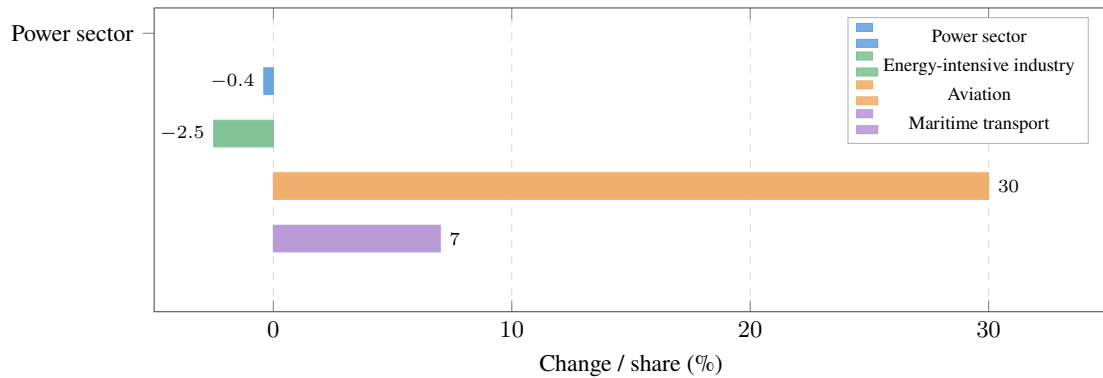
The policy challenge is consequently not simply to minimise the allowance price, but to preserve a credible carbon signal while increasing firms' capacity to respond to it. Recycling ETS revenues into clean technology, industrial decarbonisation and energy infrastructure can lower future compliance costs, while CBAM seeks to reduce the competitive asymmetry between European and foreign producers. A weaker carbon price could protect carbon-intensive production in the short term but reduce incentives to invest; tightening the system without adequate investment conditions could instead raise industrial costs before viable low-carbon alternatives are available. Competitiveness therefore depends increasingly on whether carbon pricing is accompanied by the investment conditions required for European industry to decarbonise.

Environmental and Social Effectiveness

The environmental record of the EU ETS is broadly positive, but observed emissions reductions cannot be attributed to carbon pricing alone. Emissions from stationary installations fell by approximately 51% between 2005 and 2024, with the largest reductions occurring in electricity generation (EEA, 2025). Fuel switching, renewable-energy deployment, improvements in energy efficiency and wider climate policy have also contributed, meaning the ETS operates most effectively as part of a broader decarbonisation framework (EEA, 2025; OECD, 2024).

Sectoral differences reinforce this point. Power generation has responded relatively strongly because firms can substitute between fuels and access mature renewable technologies, while harder-to-abate sectors face greater technological and infrastructure constraints. Aviation emissions returned close to pre-pandemic levels by 2024, while maritime transport entered the ETS only in 2024 and remains at an early stage of integration (EEA, 2025). Carbon pricing is therefore most effective where firms have viable alternatives through which to respond to the price signal.

Figure 6: Uneven Decarbonisation Across EU ETS Sectors



Source: European Commission (2026); European Environment Agency (2025). Power and industrial values refer to changes in 2025; aviation compares 2024 with 2013; maritime refers to its share of ETS emissions in 2024.

The social effect of carbon pricing depends largely on how its costs are distributed. Higher energy prices can be regressive where lower-income households devote a larger share of disposable income to energy and have fewer resources to invest in alternatives such as efficient housing or low-carbon transport (OECD, 2021; OECD, 2023). However, household responses and the design of transfers can significantly alter this outcome, making policy design central to the distributional impact of carbon pricing (OECD, 2023).

Under the existing ETS, many costs reach households indirectly through electricity and product prices rather than direct compliance obligations. Revenue recycling therefore plays an important role in maintaining fairness and political legitimacy. Since 2023, Member States have been required to devote ETS revenues, or an equivalent financial value, to climate and energy purposes, allowing the system to finance decarbonisation while offsetting part of the transition cost (European Commission, 2026; OECD, 2021).

Table 2: Selected Evidence on the Environmental and Social Effects of Carbon Pricing

Source	Main finding	Policy implication
EEA (2025)	EU ETS stationary emissions have fallen substantially, particularly in power generation, but carbon pricing operates alongside renewable deployment and fuel switching.	Environmental effectiveness depends on complementary energy and technology policy.
OECD (2021)	Carbon-pricing burdens can be regressive when energy expenditure represents a larger share of lower-income household budgets.	Distributional effects need to be addressed through policy design rather than lower carbon prices alone.
OECD (2023)	Household responses and revenue recycling can substantially alter the incidence of higher carbon prices.	Targeted transfers and investment can reduce regressivity while maintaining the price signal.
EEA / European Commission (2026)	Revenue recycling increasingly supports climate investment and transition measures.	The legitimacy of carbon pricing depends partly on how visible costs are matched by visible benefits.

Sources: European Environment Agency (2025); OECD (2021; 2023); European Commission (2026).

The overall record is therefore positive but conditional. Carbon pricing has supported substantial emissions reductions, yet its effectiveness depends on the availability of technologies and infrastructure that allow firms and households to adjust. Distributional pressures can similarly be reduced through targeted investment and revenue recycling. These issues become more important under ETS2, where carbon pricing will extend more directly to household heating and road transport.

ETS2 and the Extension of European Carbon Pricing

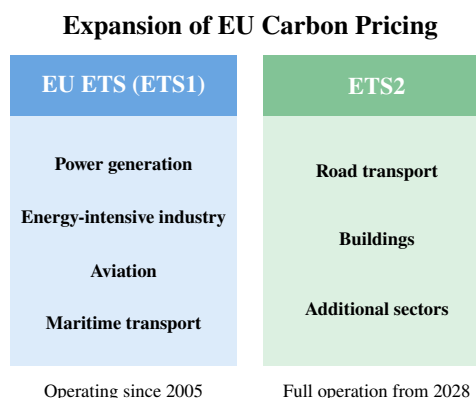
ETS2 represents the next major expansion of European carbon pricing, extending emissions trading to fuels used in buildings, road transport and additional sectors not covered by the existing ETS. Compliance obligations fall on upstream fuel suppliers rather than directly on households or motorists. Following its postponement, the system is scheduled to become fully operational in 2028 (European Commission, 2026).

Its distributional implications are nevertheless more direct than under ETS1. Higher fuel costs can be transmitted to household heating and transport expenditure, while the ability to reduce consumption varies considerably. Households with efficient buildings, public transport or access to low-carbon technologies can adjust more easily than those facing financial, geographic or infrastructure constraints. ETS2 therefore combines the carbon-price signal with mechanisms intended to contain excessive price volatility and support investment in alternatives to fossil-fuel consumption (European Commission, 2026; European Parliament, 2023).

From ETS1 to ETS2

The two systems remain legally separate. ETS1 principally covers electricity generation, energy-intensive industry, aviation and maritime transport, whereas ETS2 targets fuel combustion in buildings and road transport alongside additional sectors.

This distinction moves European carbon pricing closer to everyday energy consumption. Its effectiveness will consequently depend not only on the allowance price, but also on whether households and businesses can realistically substitute away from fossil fuels.



Source: European Commission (2026).

ETS2 includes several safeguards to limit disruption during its introduction. Auction volumes will be 30% higher than normal in 2028, while a dedicated Market Stability Reserve can release additional allowances if supply becomes too tight. Further allowances may also be released if prices exceed €45/tCO₂ in 2020 prices, adjusted for inflation, or rise excessively rapidly (European Commission, 2026).

Table 3: Mechanisms for Managing the Introduction of ETS2

Mechanism	Key provision	Purpose
Front-loaded auctions	+30% in 2028	Improve liquidity and reduce supply shortages.
Price safeguard	€45/tCO ₂ trigger	Allows additional allowances to be released if prices become excessive.
Market Stability Reserve	Dedicated ETS2 reserve	Adjusts allowance supply when market imbalances emerge.

Source: European Commission (2026). The €45/tCO₂ threshold is expressed in 2020 prices and adjusted for inflation.

The Social Climate Fund provides the main distributional support, financing measures such as building renovation, cleaner heating and low-emission transport for vulnerable households, micro-enterprises and transport users (European Commission, 2025). The aim is to reduce exposure to future carbon costs by improving access to lower-carbon alternatives.

ETS2 therefore extends carbon pricing into sectors where households differ significantly in their capacity to adjust. Its effectiveness will depend on maintaining the price signal while using investment and safeguards to make cleaner transport and heating realistically accessible.

Policy Options

One approach would be to place greater emphasis on containing near-term carbon costs for European industry through transitional free allocation and greater flexibility in allowance supply. This could reduce exposure for energy-intensive sectors facing high abatement costs and international competition, consistent with the Commission's 2026 proposal to increase allocation under the heat and fuel fallback benchmarks. However, prolonged protection would weaken the effective carbon-price signal, reduce auction revenues and risk delaying investment in low-carbon production (European Commission, 2026).

A more stringent approach would preserve the rapidly declining allowance supply, limit interventions that weaken scarcity and continue the phase-out of free allocation as CBAM develops. A stronger and more predictable carbon constraint would reinforce incentives for efficiency, electrification and low-carbon investment, supporting the EU's 2030 and 2040 climate objectives. The principal risk is that carbon costs could rise faster than firms' access to affordable electricity, infrastructure and commercially viable low-carbon technologies, increasing competitiveness and carbon-leakage pressures (European Commission, 2026).

A third approach would preserve the declining cap while using ETS revenues and EU-level instruments more systematically to reduce firms' future exposure to carbon costs. Investment could focus on industrial electrification, clean production technologies and enabling infrastructure, with temporary carbon-leakage protection retained where necessary. This broadly reflects the direction of current EU policy, combining a strong carbon-price signal with instruments such as the Innovation Fund and Modernisation Fund to support investment in decarbonisation (European Commission, 2026). It therefore seeks to maintain the environmental effectiveness of the ETS while addressing the investment constraints that can prevent firms from responding to higher carbon prices.

Recommendations

The EU should preserve a progressively tightening carbon constraint while directing a greater and more predictable share of ETS revenues towards industrial decarbonisation. Evidence from earlier phases of the ETS suggests that substantial emissions reductions can coexist with industrial activity, but remaining emissions are increasingly concentrated in sectors where abatement is more expensive and technologically difficult. Weakening the carbon price would reduce incentives to invest, while tightening it without adequate infrastructure and finance risks increasing costs before firms can realistically adjust. Support should therefore prioritise electrification, clean industrial processes and the infrastructure required to make low-carbon production commercially viable (OECD, 2021; European Commission, 2026).

Transitional protection should nevertheless remain where credible carbon-leakage risks persist. Free allocation should become progressively more targeted as CBAM develops and increasingly support, rather than substitute for, investment in decarbonisation. The Market Stability Reserve should similarly retain its capacity to address exceptional supply imbalances without becoming a mechanism for routinely suppressing allowance prices. This would provide firms with greater transitional resilience while preserving the scarcity signal on which the environmental effectiveness of the ETS depends (European Commission, 2026).

The same principle should guide ETS2. Its introduction in 2028 should be accompanied by investment in building renovation, cleaner heating, public transport and low-emission mobility, particularly for households least able to respond to higher fossil-fuel prices. Price safeguards can moderate short-term disruption, while the Social Climate Fund should be used to reduce longer-term exposure by expanding access to lower-carbon alternatives (European Commission, 2025; European Commission, 2026). The next phase of European carbon pricing should therefore combine a credible tightening of the carbon constraint with investment that enables firms and households to respond to it.