

# The Role of Carbon Pricing in Combating Climate Change: Mechanisms, Implementation and Impact

24 May 2024

## Executive Summary

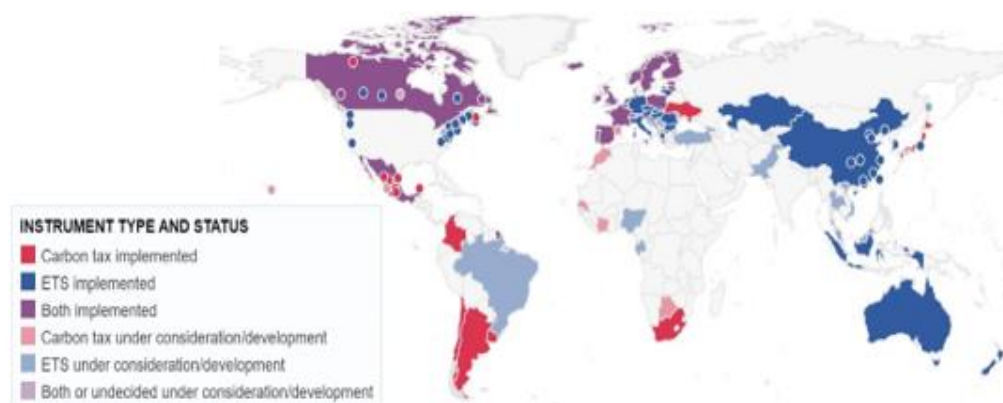
- Carbon pricing, primarily in the form of a carbon tax or an Emissions Trading System (ETS) is utilised as a cost-effective way of encouraging green innovation, emissions reductions, and the global transition to a low-carbon economy
- Whilst growth in numbers of globally implemented carbon pricing mechanisms plateaued in 2023, there are promising signs of uptake from emerging market countries, which would add to global carbon pricing coverage
- Carbon pricing revenues reached record highs in 2023, allowing investment into climate and biodiversity programmes
- Although progress with carbon pricing has been swift in recent years, the actual prices of carbon are still insufficient if we are to achieve the Paris Agreement goals

The carbon pricing landscape continues to be a cost-effective policy lever in the global effort to combat climate change, as highlighted by the release of the World Bank’s annual [State and Trends of Carbon Pricing Report](#), published this week. At their core, carbon pricing mechanisms are market-based strategies aimed at lowering global emissions by assigning a monetary value to greenhouse gas emissions and revolve around the idea of internalizing the external costs of carbon emissions. These costs, often borne by society in the form of health impacts, property and infrastructure damage, livelihood loss, and ecosystem degradation, are not typically factored into the price of goods and services.

The map below (chart 1) shows jurisdictions with carbon taxes or emissions trading systems implemented, under development or under consideration

**Chart 1. Compliance carbon pricing instruments around the world**

Source: 2023- <https://carbonpricingdashboard.worldbank.org/>.

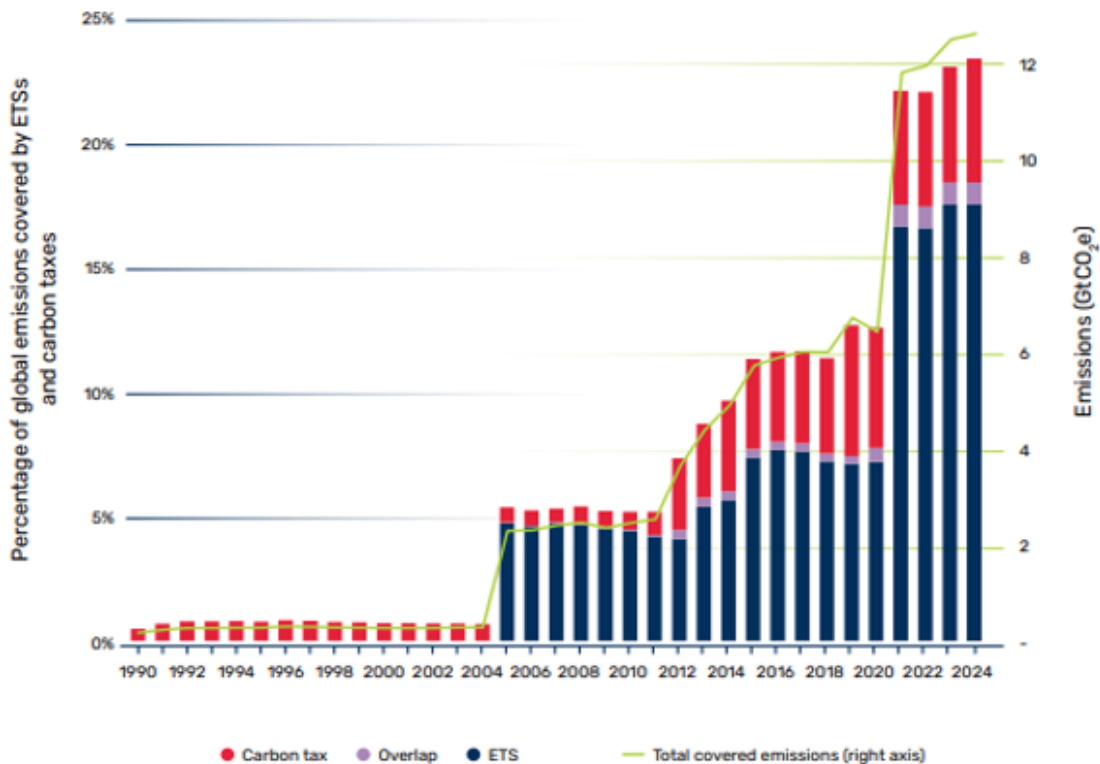


## Why Price Carbon?

There are primarily two approaches to carbon pricing: implementing carbon taxes or utilising a market-based emissions trading system (ETS), both of which can be implemented at sub-national, national, and international levels. According to the World Bank’s [2024 State and Trends of Carbon Pricing Report](#), there are now 104 carbon pricing instruments implemented globally, of which 38 are carbon taxes and 37 are ETS. The remaining 29 are governmental carbon crediting mechanisms. These instruments cover around 24% of global emissions, a promising increase from a decade ago, when only 7% of global greenhouse gas emissions were covered by carbon pricing policies<sup>ii</sup> <sup>iii</sup>.

**Chart 2. Global GHG emissions covered by ETS and carbon taxes**

Source: 2024 State and Trends of Carbon Pricing, World Bank, page



By imposing a price on carbon, policymakers seek to facilitate an equitable transition to a low-carbon economy in three key ways.

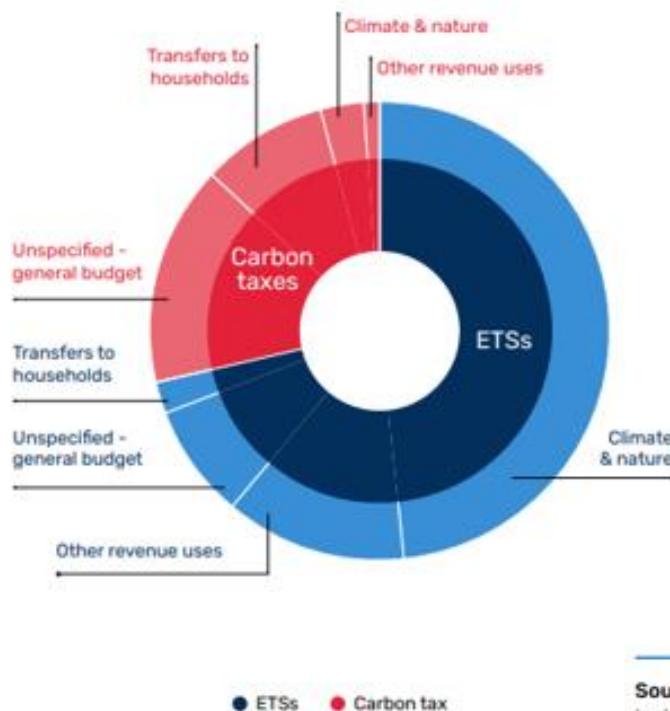
- *Firstly, by imposing costs on polluting activities carbon pricing aims to render low-carbon alternatives more economical and change both consumer and corporate preferences, stimulating investment for low-carbon alternatives<sup>iv</sup>.*
- *Secondly, and also relating to stimulating green investment, carbon pricing is based on the "polluter pays" principle and aims to have the ability to transfer the burden back to*

those responsible for greenhouse gas emissions<sup>v</sup>. By holding emitters accountable economically, carbon pricing provides a clear economic signal, encouraging companies to invest in emission reduction measures and innovate towards cleaner production methods. Not only does it hope to be a cost-effective means of encouraging clean innovation within the market, it also aims to promote equitability by transferring the burden of emitting back to the emitter<sup>vi</sup>.

- Finally, the revenue generated from carbon pricing can be reinvested into initiatives aimed at further reducing emissions or mitigating the impacts of climate change, such as decarbonisation schemes or low-carbon infrastructure. Revenues from carbon pricing are also sometimes used to re-distribute to low-income households disproportionately affected by carbon pricing due to their higher energy expenditures, ensuring the policy levers remain equitable<sup>vii</sup>. 2023 saw a record \$104 billion in carbon pricing revenues, of which the majority of these funds were allocated to climate and biodiversity programmes and the largest single contributor was from the European Union’s ETS<sup>viii</sup>.

### Chart 3. Revenue usage from carbon taxes and ETS in 2022

Source: 2024 State and Trends of Carbon Pricing, World Bank, page 30



Source: Based on I4CE Data.<sup>56</sup>  
Includes revenue usage from largest carbon pricing instruments by revenue in 2022

## The Actual and Ideal Price of Carbon

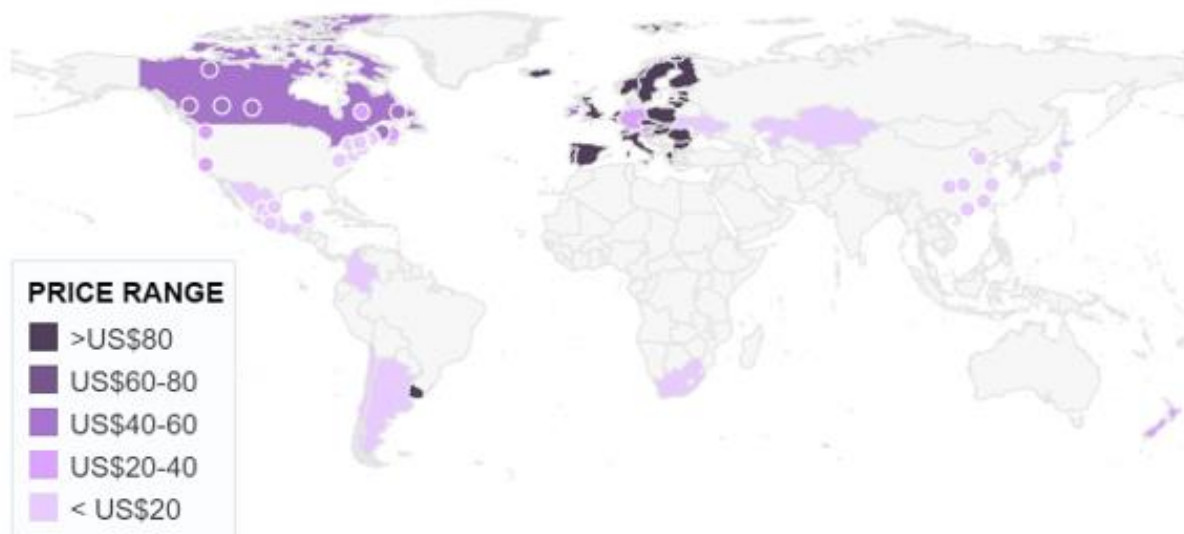
The actual price of carbon from these mechanisms can vary significantly, however, depending on the region, the method of pricing, and the current market conditions. For example, in the European Union's Emissions Trading System (ETS), carbon prices have seen a substantial rise, reaching \$96.29 in 2023. In contrast, carbon prices in other markets, such as those in developing countries or regions with less stringent environmental regulations, can be considerably lower, with the Chinese National ETS pricing carbon at just \$8.15.

It is largely acknowledged that the ideal price of carbon would reflect the marginal abatement costs of greenhouse gas emission reduction.<sup>ix</sup> However, high carbon prices are generally seen as more effective in driving significant emission reductions and send a stronger economic signal. This works to promote investment in clean energy technologies, whereas lower prices may not provide adequate financial incentives to spur substantial corporate and consumer behaviour. Whilst carbon pricing levels have continued to rise in recent years, the World Bank reports that they are currently insufficient to meet the 2030 price range recommended by the High-Level Commission on Carbon Prices which argues a price of \$226-385 per Tco2e would be required to limit temperature rise to well below 1.5 °C.<sup>x</sup>

The heat map below (chart 4) shows the level of the main price set by emissions trading systems or carbon taxes in each jurisdiction (US\$/tCO<sub>2</sub>e).

**Chart 4: Price of carbon around the world, 2023**

**Source:** Price of carbon around the world, 2023 <https://carbonpricingdashboard.worldbank.org/>



## Carbon Taxes

Under a carbon tax system, governments impose a price on each tonne of greenhouse gas emissions produced by entities. There are two main forms of carbon taxes: emission-based taxes, which are levied based on the quantity of carbon emitted by an entity, and taxes on goods that are carbon-intensive. These taxes can be imposed on sub-national, national and international levels<sup>xi</sup>.

Carbon taxes are utilised by both developed and emerging market countries. Many EU member states have adopted carbon taxes, with Scandinavian countries, Norway, Finland, and Sweden implementing them in the early 1990s. Recently, other developed nations have followed suit: Canada introduced subnational carbon taxes between 2008 and 2019, Japan established a national carbon tax in 2012, and France and Spain implemented national taxes in 2014. Notably, the USA lacks both a national carbon tax and subnational regional carbon taxes. Emerging market nations have also started implementing carbon taxes. Mexico introduced a carbon tax in 2014, South Africa in 2019, and both Chile and Colombia in 2017<sup>xii</sup>. However, the carbon price of these taxes tends to be lower than those in developed nations, with the carbon price of aforementioned emerging market taxes ranging from \$3.78 to \$8.92 per TCO<sub>2e</sub>.

Whilst carbon pricing is often heralded as a cost-effective emissions reduction strategy, the mechanisms can sometimes result in carbon leakage, where companies or economies shift carbon-intensive production to countries with less stringent climate policies therefore undermining global transition efforts. To address this issue, carbon taxes like the Carbon Border Adjustment Mechanism (CBAM) have been introduced on imported goods. CBAMs aim to apply a carbon price to a range of goods to prevent ambitious domestic climate actions from leading to carbon leakage and seek to encourage cleaner industrial production in countries with lower climate ambitions, thus facilitating the global transition to a low-carbon economy<sup>xiii</sup>. Further, supporters of CBAM carbon taxation argue that it is likely to become a particularly useful tool in reducing emissions from heavy coal users such as India, China, and South Africa, as they are pressured to reduce emissions in their exports<sup>xiv</sup>.

The European Union (EU) has been at the forefront of implementing CBAM, introducing the world's first carbon border tax as a regulation in May 2023<sup>xv</sup>, with a transition period extending until the end of 2025<sup>xvi</sup>. Following suit, the United Kingdom (UK) announced in December 2023 its plans to implement a CBAM by 2027<sup>xvii</sup>. The decision came after a consultation process, which ran from March to June 2023, assessing carbon leakage and decarbonisation efforts<sup>xviii</sup>. In the UK's CBAM, the liability will solely rest on importers of products covered by the scheme, based on the emissions contained in those imported goods. Unlike some systems, the UK CBAM will not involve the buying or trading of emission certificates. It will instead place a carbon price on some of the most emission-intensive industrial goods imports and will primarily focus on sectors such as aluminium, cement, ceramics, fertiliser, glass, hydrogen, iron, and steel. The exact specifications, design, and implementation of the UK CBAM will be formalised in 2024, including a comprehensive list of products falling within its scope, however, regulators have already confirmed the UK CBAM will apply to Scopes 1 and 2 emissions, as well as select embodied emissions, aligning with the UK's emissions trading schemes and broader climate action goals.

## Emissions Trading Systems (ETS)

Emissions Trading Systems (ETS) have emerged as vital mechanisms in the global fight against climate change, providing a market-based approach to reducing greenhouse gas emissions. The concept of ETS was first launched in the USA during the 1990s, with a programme addressing SO<sub>x</sub> and NO<sub>x</sub> emissions, specifically targeting those from power plants responsible for acid rain. Subsequently, the US delegation played a significant role in negotiating the establishment of cap-and-trade mechanisms at the Kyoto Protocol in 1997<sup>xxix</sup>.

Emissions Trading Systems often work on a 'cap and trade' principle: the regulator sets a fixed quantity of carbon allowances, known as the 'cap,' and requires polluters to surrender these allowances for each unit of greenhouse gas emissions. By establishing both supply and demand for emission allowances, ETS creates a market value for emissions<sup>xx</sup>. An annually declining 'cap' ensures emission reductions over time and corporations are encouraged to reduce emissions through innovative measures and technologies as low-emitters can sell surplus allowances to those facing higher reduction costs<sup>xxi</sup>. Similarly to carbon taxes, revenues from ETS are often earmarked for decarbonisation funds to support the global low-carbon transition<sup>xxii</sup>.

Emissions Trading Systems (ETS) are also being implemented globally at both international and national levels across developed and emerging markets. Notable ETS programmes have been established in the UK, Canada, Australia, New Zealand, China, South Africa, and South Korea, among others<sup>xxiii</sup>. Although the World Bank argued in its 2024 State and Trends of Carbon Pricing report that 2023 saw limited uptake in carbon pricing adoption, it highlighted how there are promising signs of ETS uptake in middle-income countries, such as India, Turkey, and Brazil. In 2022, India established the legal foundation for an ETS, intending to implement an intensity-based ETS that will expand upon an existing energy efficiency scheme for emission-intensive industrial sectors. At COP28 in late 2023, Turkey announced its plans to launch a two-year pilot phase of implementing an ETS which would apply to energy and industrial sectors, which would commence in 2025 pending the enactment of necessary legislation. Brazil has also started legislative work on an ETS, intending to implement the carbon pricing instrument by the end of the decade. The development of ETS in large middle-income countries is crucial in global efforts to combat anthropogenic climate change, as those under consideration in Brazil, India, and Turkey have the potential to cover 3% of global greenhouse gas emissions<sup>xxiv</sup>.

Like carbon taxes, one of the most notable carbon ETS systems comes from EU regulators. The EU's Emissions Trading System, launched in 2005, stands as the largest and most renowned cap-and-trade system globally<sup>xxv</sup>. Regulating a wide array of industries, including power plants, industrial facilities, and, more recently, aviation and maritime transport<sup>xxvi</sup>, the EU ETS is heralded as a key factor in driving emissions reductions across Europe and notably, between 2013 and 2022, 76% of all EU ETS auctioning revenues were spent on climate programmes, such as renewable energy and energy efficiency<sup>xxvii</sup>. Further, the EU ETS 2 will come into effect in 2027, and cover additional sectors such as building and road transport<sup>xxviii</sup>.

## Similarities and Differences between Carbon Pricing Mechanisms

Both carbon tax and emission trading schemes (ETS) serve as crucial tools in carbon pricing mechanisms, sharing commonalities such as assigning a price to carbon emissions, promoting cost-effectiveness, and generating revenue for governments. These mechanisms aim to internalise the environmental cost of carbon emissions, incentivising businesses and individuals to adopt more sustainable practices<sup>xxix</sup>.

Despite these similarities, the two main types of carbon pricing differ significantly in terms of emissions reduction certainty and implementation complexity. An ETS provides emissions reduction certainty by setting a declining cap on the total allowable emissions, thus ensuring that the mitigation targets are met. In contrast, a carbon tax offers price certainty by fixing the tax rate on greenhouse gas emissions, though it does not guarantee a specific mitigation outcome.

In some ways, a carbon tax is more straightforward to implement, as it provides pre-determined costs that are easier for businesses to factor into their investment decisions. However, an ETS is more flexible, as it offers mechanisms such as offsets and allowance trading, which can lead to more cost-effective emissions reductions but also introduce greater complexity in its implementation<sup>xxx</sup>. Ultimately, as both carbon pricing methods have their own set of advantages and disadvantages, many regulators chose to implement these mechanisms in tandem, like some EU member states, Mexico, Canada and the UK, to name a few.

## The Future of Carbon Pricing

Quantifying the exact impact of carbon pricing mechanisms is challenging, but they are widely recognised as a crucial market-based tool for encouraging emissions reductions and promoting cleaner innovation and investment<sup>xxxi</sup>. However, if we want to meet the warming targets of Paris, carbon is still underpriced globally by these mechanisms. It is important therefore that these mechanisms are utilised alongside other emission reduction efforts and policies.

Despite this, the World Bank's annual carbon pricing review remains optimistic about the future of carbon pricing, focusing specifically on the trend of increasing adoption of carbon pricing instruments in middle-income countries such as India, Turkey, and Brazil. It will be interesting to follow the progress of these mechanisms in the next few months, especially given the substantial share of global emissions they represent, and we hope that these notable strides towards carbon pricing implementation will prompt other countries to follow suit or carbon pricing instruments to expand to a broader set of sectors.

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<sup>i</sup> <https://www.worldbank.org/en/programs/pricing-carbon#:~:text=They%20begin%20to%20capture%20what,through%20a%20price%20on%20carbon.>

<sup>ii</sup> <https://openknowledge.worldbank.org/server/api/core/bitstreams/de3e6372-811f-47b3-989e-70ced694f9a8/content>

<sup>iii</sup> <https://carbonpricingdashboard.worldbank.org/>

<sup>iv</sup> <https://unfccc.int/about-us/regional-collaboration-centres/the-ciaca/about-carbon-pricing#:~:text=Carbon%20pricing%20curbs%20greenhouse%20gas,development%20compatible%20with%20climate%20protection.>

<sup>v</sup> [https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2014/02/PB\\_case-carbon-pricing\\_Bowen.pdf](https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2014/02/PB_case-carbon-pricing_Bowen.pdf)

<sup>vi</sup> <https://carbonpricingdashboard.worldbank.org/what-carbon-pricing#:~:text=It%20can%20help%20to%20mobilize,transition%20to%20a%20decarbonized%20economy.>

<sup>vii</sup> <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2015/11/Bowen-policy-brief-2015.pdf>

<sup>viii</sup> <https://openknowledge.worldbank.org/server/api/core/bitstreams/de3e6372-811f-47b3-989e-70ced694f9a8/content>

<sup>ix</sup> <https://www.gov.uk/government/publications/valuing-greenhouse-gas-emissions-in-policy-appraisal/valuation-of-greenhouse-gas-emissions-for-policy-appraisal-and-evaluation>

<sup>x</sup> <https://openknowledge.worldbank.org/server/api/core/bitstreams/de3e6372-811f-47b3-989e-70ced694f9a8/content>

<sup>xi</sup> <https://www.c2es.org/content/carbon-tax-basics/#:~:text=Under%20a%20carbon%20tax%20the,greenhouse%20gas%20emissions%20they%20emit.>

<sup>xii</sup> <https://carbonpricingdashboard.worldbank.org/compliance/instrument-detail>

<sup>xiii</sup> [https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism\\_en#:~:text=Why%20CBAM%3F-CBAM,production%20in%20non%20DEU%20countries.](https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en#:~:text=Why%20CBAM%3F-CBAM,production%20in%20non%20DEU%20countries.)

<sup>xiv</sup> <https://www.imf.org/en/Publications/fandd/issues/2019/06/what-is-carbon-taxation-basics>



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- <sup>xv</sup> <https://www.carbontrust.com/news-and-insights/insights/what-is-cbam-and-how-will-it-impact-your-business>
- <sup>xvi</sup> <https://researchbriefings.files.parliament.uk/documents/CBP-9935/CBP-9935.pdf>
- <sup>xvii</sup> <https://www.gov.uk/government/consultations/addressing-carbon-leakage-risk-to-support-decarbonisation/outcome/factsheet-uk-carbon-border-adjustment-mechanism>
- <sup>xviii</sup> <https://www.gov.uk/government/consultations/addressing-carbon-leakage-risk-to-support-decarbonisation/outcome/factsheet-uk-carbon-border-adjustment-mechanism>
- <sup>xix</sup> <https://www.lse.ac.uk/granthaminstitute/explainers/how-do-emissions-trading-systems-work/#:~:text=The%20origins%20of%20cap%2Dand,emissions%20to%20combat%20acid%20rain.>
- <sup>xx</sup> <https://icapcarbonaction.com/en/about-emissions-trading-systems>
- <sup>xxi</sup> [https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/what-eu-ets\\_en](https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/what-eu-ets_en)
- <sup>xxii</sup> [https://www.ecb.europa.eu/press/economic-bulletin/articles/2022/html/ecb.ebart202206\\_01~8324008da7.en.html](https://www.ecb.europa.eu/press/economic-bulletin/articles/2022/html/ecb.ebart202206_01~8324008da7.en.html)
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- <sup>xxv</sup> <https://ourworldindata.org/carbon-pricing>
- <sup>xxvi</sup> [https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/scope-eu-emissions-trading-system\\_en](https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/scope-eu-emissions-trading-system_en)
- <sup>xxvii</sup> <https://www.eea.europa.eu/en/analysis/indicators/use-of-auctioning-revenues-generated>
- <sup>xxviii</sup> [https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/ets2-buildings-road-transport-and-additional-sectors\\_en](https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/ets2-buildings-road-transport-and-additional-sectors_en)
- <sup>xxix</sup> <https://www.epa.ie/our-services/licensing/climate-change/eu-emissions-trading-system/>
- <sup>xxx</sup> [https://icapcarbonaction.com/system/files/document/icap\\_briefs-en-brief-9.pdf](https://icapcarbonaction.com/system/files/document/icap_briefs-en-brief-9.pdf)
- <sup>xxxi</sup> <https://www.lse.ac.uk/granthaminstitute/news/how-robust-is-the-evidence-on-carbon-pricing/>