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Carbon Pricing: Governments Increasingly Make Polluters Pay for Climate Change

Andrew Reid, Energy Finance Analyst

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Key Findings

Carbon pricing schemes currently apply to about one-quarter of global emissions and have raised more than US$500 billion from polluters to date.

Revenues from carbon pricing schemes will continue increasing. Of the 196 signatories at COP21 in Paris, more than two-thirds have defined carbon pricing use in their Nationally Defined Contributions.

The European Union's Carbon Border Adjustment Mechanism will incentivise other trading partners to implement some form of carbon pricing system.

Global carbon pricing receipts were only 1% of the economic cost of climate change in 2022. On the basis that the 'polluter pays', the cost to emitters is likely to increase significantly in the coming decades.

Executive Summary

Carbon pricing is increasingly being used as a policy instrument to meet net-zero commitments, to fund a fair transition and redistribution of costs from polluters to lower-carbon energy, and to support more vulnerable households and businesses through the transition journey. The first carbon tax was introduced in Finland in 1990.[1] There are now 66 global jurisdictions with carbon pricing and 48 countries with some kind of revenue-generating carbon price scheme in operation.[2]

We expect this trend to continue as the number of territories with carbon pricing schemes increases (as part of their Nationally Determined Contributions), more sectors and a higher proportion of each country's emissions are covered by carbon pricing over time, and the European Union's Carbon Border Adjustment Mechanism (CBAM) and potentially other international trading mechanisms take effect. While this may take a decade or more to materialise, the impact could be significant.

We consider the EU Emissions Trading System (ETS) to be the global test case and indicator of the future direction of carbon pricing. The scheme points to increased pricing given the more aggressive emissions reductions ambitions and the introduction of the CBAM, in addition to market mechanisms to support higher pricing and the impact of carbon pricing as an emissions reductions tool. It is also clear that the revenues from the EU ETS will in part support the additional costs of lower-carbon energy for industry and households, an important consideration for the effective rollout of emissions reduction goals.

Despite this, carbon pricing is still a policy mechanism to incentivise switching towards and investment into lower-carbon solutions and is not necessarily reflective of the actual costs of global warming. The cost of climate change is estimated to be US$10 trillion, or 10% of global GDP,[3] in 2022. Revenues from carbon pricing are nearing US$100 billion, albeit they only account for about 1% of the global cost to society of these emissions.

There is a clear economic incentive to implement and increase the revenue-generating capacity of carbon pricing schemes. Governments will ultimately be responsible for supporting their countries through the energy transition and rectifying the cost of global warming within their territories. They will be required to provide investment towards lower-carbon energy and industry.

The implications for society and how our economies are run are significant. Covering the cost and mitigating the impact of climate change is crucial. It's also clear that while carbon pricing as a policy tool will continue to increase, current carbon pricing levels are too low to cover the costs of emissions on society. If the polluter is to pay, the costs to emitters over the coming decades are likely to be quite material.

[1] Tax Foundation. Carbon Taxes in Europe. 5 September 2023.
[2] World Bank and IEEFA analysis of country-level ETSs or carbon tax schemes generating revenue in 2022.
[3] World Bank. World Development Indicators.

Introduction

Carbon pricing attempts to capture the external cost of greenhouse gas (GHG) emissions that the public or other stakeholders ultimately pay for because of climate change.[4] External costs include those related to damaged crops or property, economic productivity and health impacts from heat waves, droughts, rising sea levels and air quality.

While challenging to determine, estimates of the cost of global warming are significant. Investment bank J.P. Morgan estimated that climate-related disasters cost the global economy US$650 billion during the three years between 2016-2018.[5] The Swiss RE Institute[6] expects it to reduce global GDP by 10% by 2050; Oxford Economics[7] suggests the real impact may be as much at 20%. Advisory services firm Deloitte forecasts as much as a US$170 trillion reduction in GDP through to 2070[8] due to climate change.

Historically, the impact of global warming has not been borne by those creating carbon and other greenhouse gas emissions, but by those that experience its effects. The introduction of a carbon price supports the 'polluter pays' principle where the costs of pollution are borne by those causing it, rather than the person or wider community that suffers the effects of environmental damage.[9]

These costs are linked to a price, normally a dollar or corresponding value per metric tonne of carbon dioxide (CO_2) and the equivalent of other GHGs.[10] As they now must pay, those responsible for GHG emissions are presented with an economic choice: change their practices and reduce their emissions or continue emitting and pay the additional cost. If carbon prices are high enough, emitters will be incentivised to reduce emissions, while governments can raise revenue to finance global warming impact mitigation or adaptation and support investment in lower-carbon technologies.

Carbon pricing is increasingly being used to support decision-making and policy across governments, businesses and investors. Governments may employ carbon pricing as an economic instrument to encourage reduced emissions, to consider the impact of higher or lower emissions on the cost of policy decisions and to raise revenues. Businesses use it to understand the potential risks and revenue opportunities within their organisations, while investors are increasingly using it to understand the potential impact of climate change on long-term investment decisions.

[4] World Bank. Carbon Pricing Dashboard.
[5] Morgan Stanley. Five Sectors That Cannot Escape Climate Change. February 2020.
[6] Swiss Re Institute. The economics of climate change. 22 April 2021.
[7] Oxford Economics. Temperature volatility comes at a price to worldwide growth. 1 December 2022.
[8] Deloitte. The turning point. 20 June 2022.
[9] UK government. Environmental principles policy statement. 31 January 2023.
[10] British Geological Survey. The greenhouse effect.

The Use of Carbon Pricing Is Growing, and Growing Fast

Two primary mechanisms are used by governments to price carbon and apply this to polluting entities within their jurisdictions: emissions trading schemes (ETSs) and carbon taxes.

- **Emissions trading scheme**: This is usually a cap-and-trade system where the host government sets a 'cap' on the maximum amount of emissions and creates permits or allowances for each unit of emissions allowed under the cap. Emitting firms must obtain and surrender a permit for each unit of their emissions, normally measured as a tonne of CO_2 equivalent (CO_2e). Firms that don't have enough permits must cut back their emissions or buy them from another firm or at auction. The price of these permits increases when there is high demand and falls if demand reduces.[11] A government that seeks to reduce emissions will cut the number of permits available in the market, forcing emitters to lower their emissions in parallel.

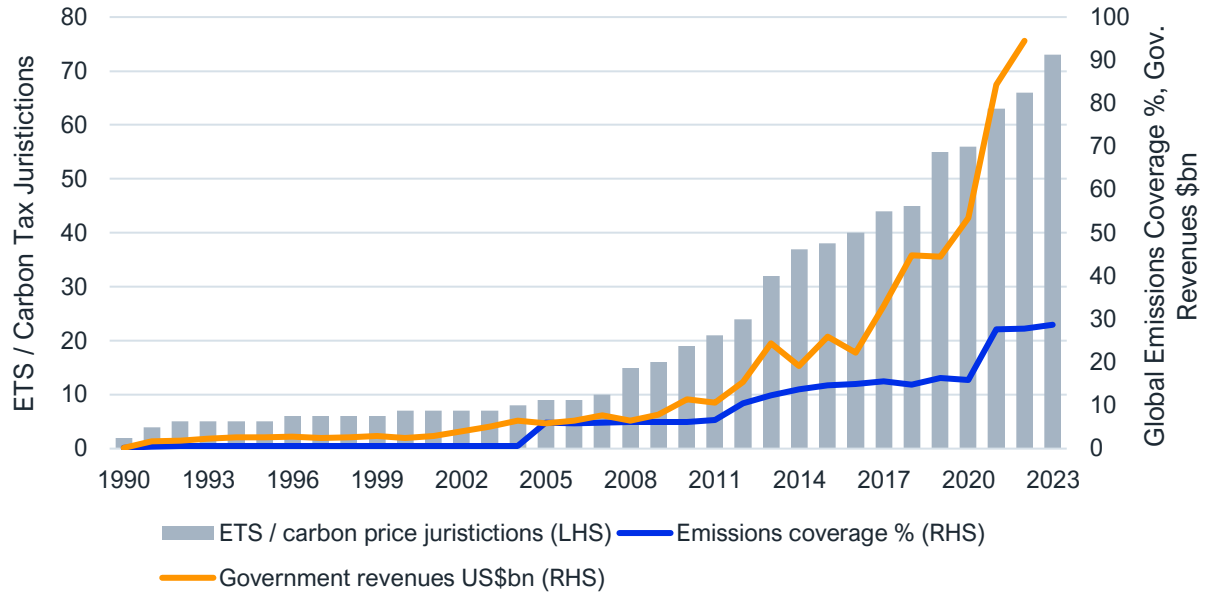
- **Carbon tax**: This mechanism sets a price for carbon by applying an explicit tax rate on GHG emissions, set by the host government. This differs from an ETS in that there is no linkage to an emissions reduction outcome from the carbon tax.[12]

The first carbon tax was introduced in Finland in 1990.[13] There are now 66 global jurisdictions with carbon pricing, of which 51% are ETSs and 49% are direct carbon taxes. Of these jurisdictions, many are regional ETSs or tax schemes across provinces within Canada, the U.S. and China. There are also dual systems in operation where regions or countries operate an ETS and carbon tax scheme. Presently, there are 48 countries with some kind of revenue-generating carbon price scheme in operation.[14]

Their increased use as a global economic policy tool really started to come into effect during 2007 whereupon other jurisdictions outside Europe implemented some form of carbon pricing. This has been further bolstered by the 2015 COP21 climate summit in Paris, which introduced a legally binding international treaty on climate change. It was adopted by 196 parties where each signatory is required to create and implement a climate action plan or Nationally Determined Contribution (NDC).[15] According to the United Nations, some two-thirds of the NDCs submitted thus far include carbon pricing to achieve their emissions reductions targets.[16]

[11] Grantham Research Institute on Climate Change and the Environment. How do emissions trading systems work? 11 June 2018.
[12] World Bank. Carbon Pricing Dashboard.
[13] Tax Foundation. Carbon Taxes in Europe. 5 September 2023.
[14] World Bank and IEEFA analysis of country-level ETSs or carbon tax schemes generating revenue in 2022.
[15] United Nations Climate Change. The Paris Agreement.
[16] United Nations Climate Change. About Carbon Pricing.

Figure 1: Revenue and Emissions Coverage of Carbon Taxes and ETSs, 1990-2023



Source: The World Bank Carbon Pricing Dashboard, IEEFA analysis.

About one-quarter of global emissions presently fall under some form of scheme, while their revenue-generating capability reached US$95 billion in 2022. In the 1990-2004 period, carbon pricing applied to a minute proportion of global emissions. The introduction of the European Union ETS in 2005 raised global applicability by 4.4 percentage points. Further material increases were experienced in 2012 with the introduction of the Japan ETS, which accounted for a further 2.2% of global emissions, and in 2013 Chinese regional schemes added 5%. A step change occurred in 2020 with the proposed introduction of the China National ETS, which added 8.9% so that by 2023, 23% of global emissions were under a carbon pricing mechanism.[17]

[17] World Bank Carbon Pricing Dashboard.

The Price of Carbon Under ETSs and Carbon Tax Schemes

While a meaningful proportion of global emissions are covered by some form of carbon pricing, the economic impact is not the same across jurisdictions due to material differences in carbon tax levels and ETS market prices. Carbon pricing is relatively new to many territories, and as governments seek to reduce emissions over the longer term, there are policy distortions that impact its influence in the short run.

For instance, the carbon price may only apply to a proportion of the countries' GHG emissions, and there is the issuance of 'free' ETS allowances while firms introduce lower-carbon technologies and solutions. Also, too many allowances in circulation may create a drag on pricing, or ETS prices or tax levels may be set too low to provide an incentive to decarbonise or have a meaningful economic impact on polluters.

The EU ETS is a case in point. In its initial trading periods from 2005, many of the allowances were issued for free, creating a drag on pricing. In the third phase from 2013-2020, 40% of allowances were auctioned; however, there remained significant free allowances within the manufacturing and aviation sectors. Recognising the limited impact of carbon pricing to that point, new reform was introduced in 2018 to better manage the number of free permits in the market. This, complemented by the Market Stability Reserve in 2019, allowed authorities to increase or decrease permits in the market to regulate the price.[18] Since these interventions, the EU ETS has increased significantly from an average price of €14 during 2008-2019 to €63 from 2020-2023.[19]

[18] Clean Energy Wire. Understanding the European Union's Emissions Trading Systems (EU ETS). 10 April 2024.
[19] S&P. European Long-Term ETS Carbon Price Outlook—EU ETS Planning Case. September 2023.

Table 1: Q1 2023 Carbon Price Ranges and 2022 Global Revenue Raised (in US$)

	Carbon Tax	ETS
High Price	155.87	96.30
Average	41.53	28.94
Median	31.74	20.87
Low	0.08	1.08
2022 Revenue ($bn)	30,992	63,508
Europe	17,788	56,754
Europe %	57%	89%

Source: The World Bank Carbon Pricing Dashboard, IEEFA analysis.

The World Bank provides a dashboard of global ETS and carbon tax rates; as of Q1 2023, the average carbon tax price was US$42 per tonne of CO_2 and US$29 for ETSs. The variance between the high and low range is material. This, combined with country-specific policies around free allowances or the proportion of emissions covered by carbon pricing, significantly impacts the revenue raised and economic cost to polluters of these policies.

Europe leads the way in applying carbon pricing. During 2022, the region accounted for 79% of global revenue raised, cornerstoned by the EU ETS, the world's largest carbon pricing scheme from an economic perspective. All the EU's 27 member states are bound by the ETS, and it applies to emitting firms across energy-intensive sectors, aviation and maritime transport.[20] It applies to 38% of the region's GHG emissions[21] (2.7% of global emissions), raising US$42 billion in revenue during 2022 at an average ETS price of US$96.30.[22]

The materiality of the EU ETS is set to increase. In 2023, the bloc raised its 2030 decarbonisation target to reduce emissions by 55% relative to 1990 levels. This is in part supported by revisions to the EU ETS so that by 2027, it will include emissions from buildings, road transport and additional sectors not presently covered by the existing system.[23] It is expected that by 2030, the EU "ETS 2" will cover 75% of the region's emissions,[24] almost doubling the size of the scheme.

Notably, major polluters such as China, which is responsible for 29% of global emissions, raised US$184 million through regional ETS pilot schemes in 2022 with ETS prices that ranged from US$4.60 to US$12.96. The China ETS was introduced in 2021 and consolidates regional schemes into a national system. It covers 40% of the country's emissions, initially focusing on the power sector.[25] It is expected that the coverage will widen, and as it will be linked to emissions reductions

[20] European Commission. Scope of the EU Emissions Trading System.
[21] Tax Foundation. Carbon Taxes in Europe. 5 September 2023.
[22] World Bank Carbon Pricing Dashboard, IEEFA analysis.
[23] European Commission. ETS2: buildings, road transport and additional sectors.
[24] Carbon Market Watch. Can the EU's expanded Emissions Trading System ensure a just transition for vulnerable Europeans and the climate? 5 October 2023.
[25] International Carbon Action Partnership. China National ETS.

targets, free allocations will reduce and increased auctioning of permits will drive higher pricing in time.

As we have seen in Europe, the introduction of carbon pricing takes time to fully implement and gain traction. If managed correctly, it can become a powerful tool for emissions reduction and supporting investment.[26] In the case of the EU ETS 2, revenues will be partially used to support vulnerable households and micro-enterprises through a dedicated Social Climate Fund, to encourage a more fair and inclusive (or 'just') energy transition. Member states will be required to use the remaining revenues for climate action and social measures.

On a global scale, Europe's emissions footprint of 6.7%[27] is relatively small despite being a major economic bloc. As the EU ETS matures and expands its coverage across the region, it is also ensuring that emissions are not 'offshored' and that products entering the region have the EU ETS price applied to their respective emissions. In effect, the EU is applying its carbon pricing rules to other trading partners, which will in turn encourage lower-emissions activity or the introduction of meaningful carbon pricing structures in these countries.

The Start of an International Market? The Introduction of the Cross Border Adjustment Mechanism

Europe is the global leader in carbon pricing. While its impact is more muted in other countries, the introduction of the EU Carbon Border Adjustment Mechanism (CBAM) is a notable policy instrument that will have a significant effect on global carbon pricing.

On 1 October 2023, the CBAM was introduced in its transitional phase, whereupon imports entering the EU are assessed and a carbon intensity calculated. The importer is then liable for the equivalent EU ETS payment at prevailing prices. If an equivalent ETS or carbon tax is paid in the host country, this will be netted off, and the importer will have to pay the difference, assuming the EU ETS price is higher.

The purpose of such a policy is twofold: firstly, to protect EU producers from potentially cheaper imports of products from territories where climate policies and carbon prices are less onerous—commonly referred to as 'carbon leakage'; and secondly, to encourage jurisdictions outside of the EU to implement more stringent climate policies and emissions reductions.

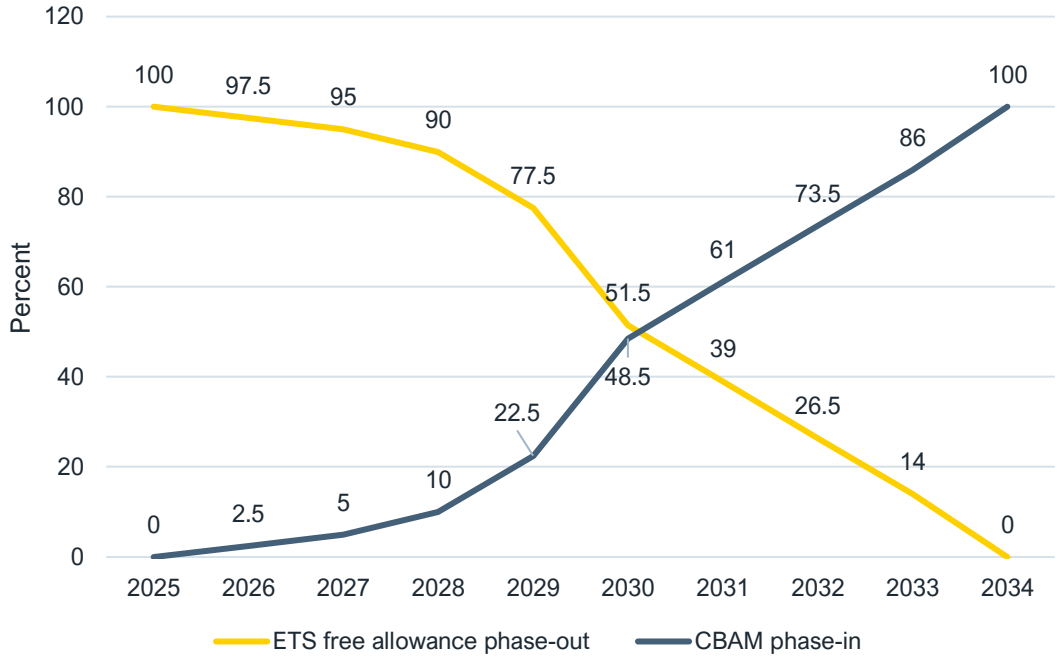
The initial transition phase of the policy will run until 1 January 2026, whereupon imports of cement, iron and steel, aluminium, fertilisers, electricity and hydrogen will be liable for EU carbon pricing. The transition phase has been introduced to allow importers to calculate and agree with the EU their

[26] Swedish House of Finance. Carbon Pricing Significantly Reduces Emissions: New Study. 16 January 2024.
[27] European Union EDGAR Database.

embedded GHG emissions and set up relevant reporting and administration.[28] The applicability of the EU ETS to the CBAM will be introduced over eight years to install parity.[29]

The introduction of the CBAM coincides with an increase in the coverage of the EU ETS 2 to include emissions from buildings, transport and marine, in addition to a planned phase-out of free allowances to align with the region's emissions reductions. As Figure 2 shows, over 50% of free allowances will be eradicated by 2030, while a similar level of CBAM coverage will be implemented. By 2034, there will be no free allowances and the CBAM will be fully in place.

Figure 2: Free Allowance Phase-out and Introduction of the CBAM



Source: PwC. EU deal reached on the CBAM.

While the CBAM is still in its introductory phase, the future implications of the policy are significant. China is one of the EU's largest trading partners, with US$657 billion of imports from the country in 2022.[30] As the CBAM begins to take effect, the cost to Chinese businesses will be considerable. Paying the equivalent EU ETS price will encourage higher pricing within the China ETS unless the exported goods are produced and transported with lower emissions. As a leading exporter and trade partner to the rest of Asia and the U.S., China may also put pressure on more territories to follow.

As we progress through the rest of this decade and enter the early 2030s, it is likely that continued support of climate policy and the use of carbon pricing to encourage emissions reduction will

[28] European Commission. Carbon Border Adjustment Mechanism.
[29] Boston Consulting Group. The Start of CBAM: A Major Landmark for Global Trade and Carbon Accounting. 29 September 2023.
[30] Trading Economics. European Union Imports By Country.

become increasingly relevant. The EU ETS, which we consider to be the global test case and indicator of the future direction of carbon pricing, points to increased pricing given the more aggressive emissions reductions ambitions and the introduction of the CBAM, in addition to market mechanisms to support higher pricing and the impact of carbon pricing as an emissions reductions tool. It is also clear that the revenues from the EU ETS will in part support the additional costs of lower-carbon energy for industry and households, an important consideration for the effective rollout of emissions reduction goals.

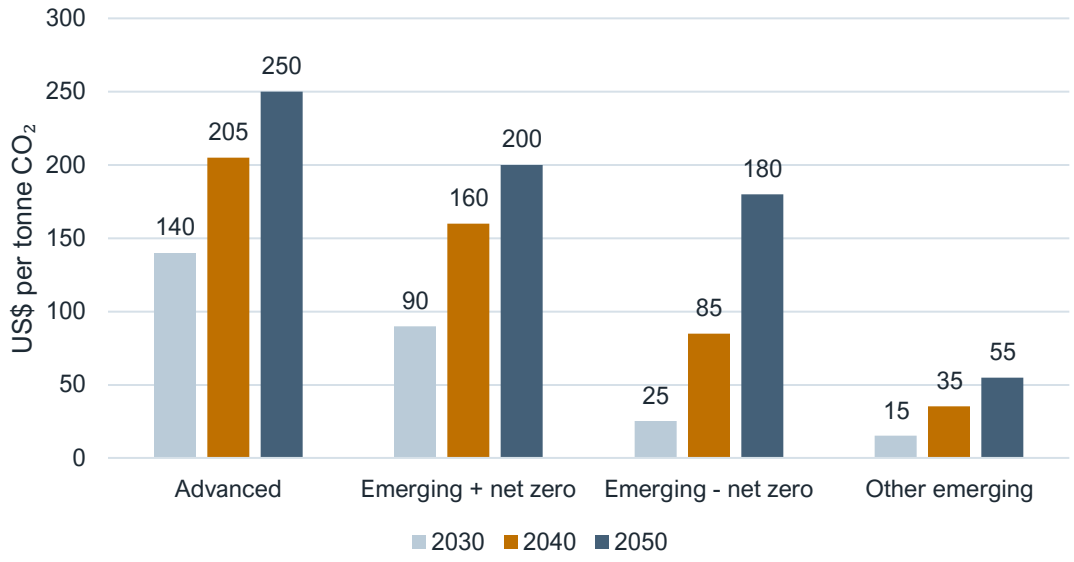
The Outlook for Carbon Prices

Forecasts relating to future carbon prices vary considerably and are exceptionally challenging to predict. Carbon pricing is complex given it is not a perfect market and is heavily influenced by government policy and country-specific requirements. Each territory will have different emissions reductions goals, political and industry pressures, and propensity to pay, among other factors.

The International Energy Agency's Global Energy and Climate Model provides a range of assumptions on carbon pricing through to 2050. It is expected that 'advanced' or OECD countries will pay higher prices for emissions reduction relative to other emerging countries with or without net-zero policies. This is due to the principle of 'common but differentiated responsibilities' in relation to climate change, which says those countries that bear most responsibility and have the greatest resources should shoulder more of the cost burden.[31]

[31] Britannica. Common but differentiated responsibilities.

Figure 3: Carbon (CO_2) Prices for Electricity, Industry and Energy Production in Selected Regions for the Net-Zero-By-2050 Scenario



Source: International Energy Agency, Global Energy and Climate Model 2023 key input data.

Figure 3 illustrates the estimated carbon prices in a net-zero-by-2050 scenario and highlights the upward trend in pricing. Within advanced economies, it is expected to increase to US$140 per tonne of CO_2 by 2030 before rising by 79% to US$250 per tonne by 2050. Emerging economies with net-zero pledges include China, India, Indonesia, Brazil and South Africa. They are also expected to see higher carbon pricing relative to present levels, reaching US$200 by 2050.[32]

There are many predictions relating to future carbon prices, and like all forecasts they vary; however, there is an expectation that future prices will increase. There will also be country-specific or regional variances due to the extent they use carbon pricing as a policy instrument. For example, the London Stock Exchange Group predicts that as the EU seeks to reduce emissions by 90% by 2040, the cost of the EU ETS could increase beyond €400 per tonne of CO_2e by that date.[33]

Carbon pricing is increasingly being used as a policy instrument to meet net-zero commitments, to fund a fair transition and redistribution of costs from polluters to lower-carbon energy, and to support more vulnerable households and businesses through the transition journey. Despite this, carbon pricing is still a policy mechanism to incentivise switching towards and investment into lower-carbon solutions and is not necessarily reflective of the actual costs of global warming.

[32] International Energy Agency. Global Energy and Climate Model 2023 key input data. October 2023.
[33] EURACTIV. EU carbon price to hit €400 mark with 90% climate goal: analysts. 5 October 2023.

Carbon Pricing Values Are Too Low to Account for the Damages of Climate Change or the Social Cost of Carbon

Carbon pricing usually takes the form of an ETS or direct tax on emissions, and while prices are set by market mechanisms or governments, they do not necessarily reflect the actual cost of emissions to society. To understand the economic impact of each additional tonne of carbon emissions, integrated assessment models (IAM) are used to predict the climate impact and economic cost of global warming, referred to as the social cost of carbon (SCC).

An IAM examines four key areas to determine the cost of carbon: future projections of GHG emissions; the effects of past and future emissions on the climate system; the impact of these changes; and translation of these into economic damages, discounted to a present value.[34] Several SCC models are used to calculate emissions costs, namely the DICE, PAGE and FUND. Each uses different assumptions regarding the impact of climate variables such as temperature and sea levels on economic damages.[35]

As different assumptions can be used and discount rates applied, estimates of the SCC can vary considerably. A meta-study from 2019 found the average SCC of 58 sub-studies was US$55 per tonne of CO_2e but with estimates ranging from minus US$13 to US$2,386.[36] It was also noted that there was a correlation between higher central estimates of SCC and more recent publication dates, given ongoing improvements in our understanding of the magnitudes of projected physical and the associated economic impacts of climate change.

While there are different values attributed to the SCC, what is clear is that prices are generally higher than current ETSs or carbon taxes. Pindyck's 2019 study published in the Journal of Environmental Economics and Management narrowed down the likely range of SCC, based on a survey of economists and nature scientists. It found that the suggested band for SCC pricing was between US$80-300 per tonne of CO_2e.[37] A 2022 study published in Nature that employed the greenhouse gas impact value estimator model found the preferred mean estimate of SCC to be US$185 per tonne by using updated scientific understanding of the impacts of climate change.[38]

If we were to assume an SCC price of US$185 per tonne, the economic cost of climate change would have been US$10 trillion, or 10% of global GDP,[39] in 2022, based on the ~54 gigatonnes of

[34] International Monetary Fund. The Social Cost of Carbon: Valuing Carbon Reductions in Policy Analysis. 10 September 2012.
[35] Most of the published SCC estimates are derived from one of three IAMs: William Nordhaus's dynamic integrated climate economy (DICE) model, Richard Tol's climate framework for uncertainty, negotiation and distribution (FUND) model, and Chris Hope's policy analysis for the greenhouse effect (PAGE) model.
[36] Nature. Comprehensive evidence implies a higher social cost of CO_2. 1 September 2022.
[37] Journal of Environmental Economics and Management. The social cost of carbon revisited. 25 February 2019.
[38] Nature. Comprehensive evidence implies a higher social cost of CO_2. 1 September 2022.
[39] World Bank. World Development Indicators.

CO_2e released into the atmosphere that year.[40] As climate policy and behavioural changes lower emissions globally, the social costs of carbon based on this analysis will reduce each year. However, as net-zero policies will take decades to take effect, the costs of global warming externalities will continue to be absorbed by society for some time to come.

Conclusions

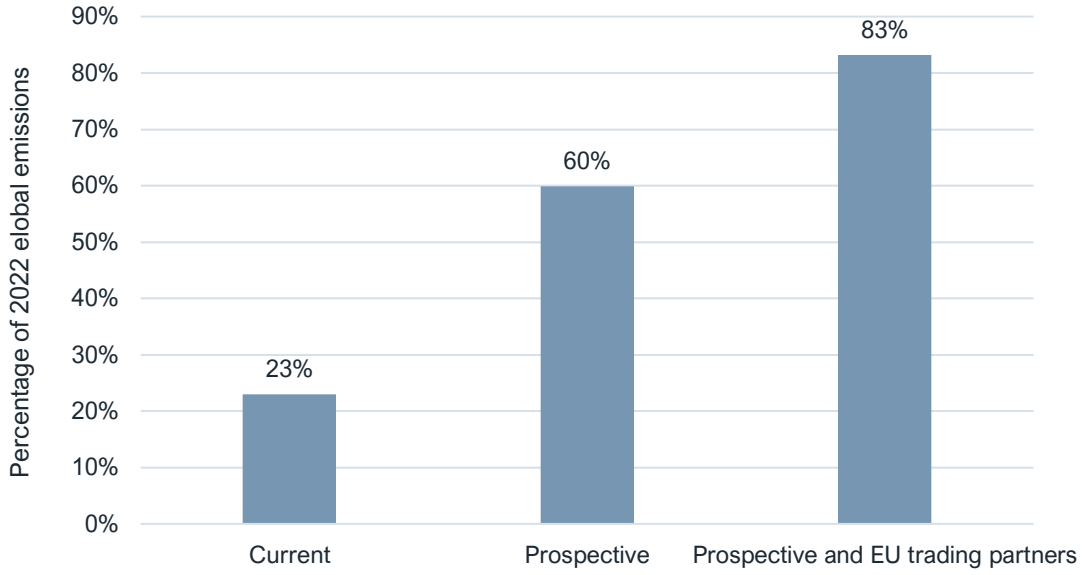
The use of carbon pricing across countries has been increasing and will likely continue to do so. Allied to this, the extent of its economic impact will also rise as ETS prices and carbon tax rates increase. This will be supported by the maturation of such schemes globally and the requirement for governments and other stakeholders to encourage investment in lower-carbon technologies, support lower-income households and businesses through the transition, and help pay for the enormous, ongoing economic damage created by global warming.

As we have illustrated, revenues from carbon pricing are nearing US$100 billion, albeit they only account for about 1% of the global cost to society of these emissions. As the EU ETS demonstrates, it takes time for carbon pricing to take effect, but when it does, the impact can be material.

We expect this trend to continue as the number of territories with carbon pricing schemes increases (as part of their Nationally Determined Contributions), more sectors and a higher proportion of each country's emissions are covered by carbon pricing over time, and CBAM and potentially other international trading mechanisms take effect. While this may take a decade or more to materialise, the impact could be significant.

[40] European Union EDGAR Database.

Figure 4: Potential Carbon Pricing Emissions Coverage



Source: EU EDGAR database, World Bank Carbon Pricing Dashboard, Eurostat, IEEFA analysis.

Figure 4 illustrates how current and future policy may impact carbon pricing coverage from the 23% of global emissions today. On the basis that each country with a prospective carbon pricing scheme implements this, and reaches 100% emissions exposure, prospective coverage could increase to 60%. Add to this the key trading partners of the EU and those likely to be affected by the CBAM, the coverage increases to 83% with the additions of 'major polluters': the U.S., India and Russia. While trade between the top polluters and the EU is a relatively small proportion of overall exports, the assumption is that major trading partners with emerging carbon pricing schemes such as China will be incentivised to create CBAM structures, which in turn will put pressure on all leading economies to follow suit.

Importantly, however, there is a clear economic incentive to implement and increase the revenue-generating capacity of such schemes. Governments will ultimately be responsible for supporting their countries through the energy transition and rectifying the cost of global warming within their territories. They will be required to provide investment towards lower-carbon energy and industry. Those that trade heavily with the EU will see considerable economic leakage if they don't have some form of carbon pricing as their payments will land in the EU as opposed to their own treasuries.

The implications for society and how our economies are run are significant. Covering the cost and mitigating the impact of climate change is crucial. It's also clear that while carbon pricing as a policy tool will continue to increase, current carbon pricing levels are too low to cover the costs of emissions on society. If the polluter is to pay, the costs to emitters over the coming decades are likely to be quite material.

About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. www.ieefa.org

About the Author

Andrew Reid

Andrew Reid is a partner at NorthStone Advisers and an energy finance analyst at IEEFA Europe, providing research and editorial support to offshore related topics and reports. Andrew has worked for over two decades across the global upstream industry in research and consulting roles with a leading investment bank, a big four advisory firm, and an independent boutique.

A graduate of both Aberdeen universities, Andrew holds an MA (hons) in Economics from the University of Aberdeen and an MBA from the Aberdeen Business School.

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