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CLIMATE ENERGY FINANCE

A Price on Carbon: Building Towards an Asian CBAM

A focus on the harmonisation and integration of carbon pricing mechanisms in Asia-Pacific for the steel, aluminium and cement value chains.

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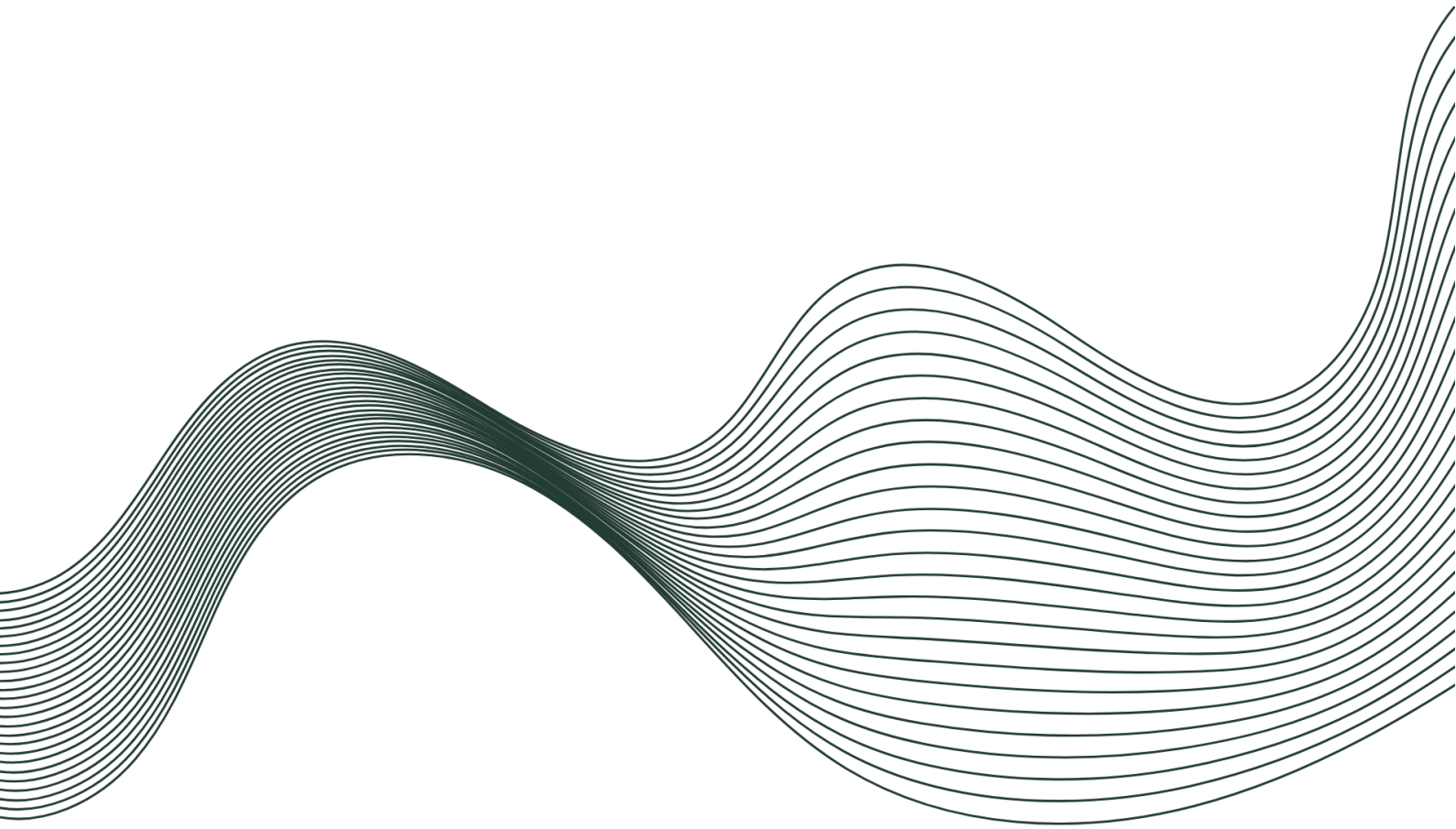

About Climate Energy Finance

Climate Energy Finance (CEF) is an Australian based, philanthropically funded think tank established in 2022 that works pro-bono in the public interest on mobilising capital at the speed and scale needed to accelerate decarbonisation and the energy transition consistent with the climate science.

We conduct research and analyses on global financial issues related to the energy transition from fossil fuels to clean energy, as well as the implications for the Australian economy, with a key focus on the threats and opportunities for Australian investments, regional employment and value-added exports. Beyond Australia, CEF's geographic focus is the greater Asian region as the priority destination for Australian exports, particularly India and China. CEF also examines convergence of technology trends in power, transport, mining and industry in accelerating decarbonisation. CEF is independent, works with partners in the corporate and finance sector, NGOs, government and the climate movement.

About the Authors – Matt Pollard

Matt Pollard, Net Zero Transformation Analyst, focuses on the significant growth opportunities future-facing companies have in the electrified transport and energy transition. He has a Bachelor of Economics from the University of Queensland, majoring in International Trade and Finance. Previously, Matt spent 2.5 years studying biotechnology, focusing on chemistry and nanotechnology at the University of Queensland. Matt has published numerous reports and op-eds on the energy transition, with a focus on the strategic opportunities for Australia to become a renewable energy powered value-added critical minerals superpower, ideally in partnership with our key trade partners.

About the Authors – Tim Buckley

Tim Buckley, CEF's founder, has 35 years of financial market experience covering the Australian, Asian and global equity markets from both a buy and sell side perspective. Before starting CEF as a public interest thinktank in 2022, Tim founded the Australia and Asian arms of the global Institute for Energy Economics and Financial Analysis in 2013 and was Australasian Director until 2022.

Prior to this, Tim was a top-rated equity research analyst over 2 decades, including as head of equity research in Singapore at Deutsche Bank; MD and head of equity research at Citigroup for 17 years; and head of institutional equities at Shaw & Partners. From 2010-2013, Tim was co-MD of Arkx Investment Management, a global listed clean energy investment start-up jointly owned with Westpac Bank. Tim is widely recognised and extensively published as an expert on Australian and international energy transition and the accelerating shift of global capital to decarbonisation, and is a sought after commentator and advisor.

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Important information

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Our Approach

Climate Energy Finance (CEF) sees a regulated, progressively rising price on carbon in international trade across Asia as the critical policy instrument to unlock the global green commodities opportunity, and catalyse investment into industrial decarbonisation at a speed and scale commensurate with the climate emergency.

This report investigates a pathway towards the joint development of a regional carbon border adjustment mechanism, to build on and strengthen domestic carbon pricing mechanisms in economically-advanced, industry-intensive economies across the Asia-Pacific.

In developing this report, CEF conducted extensive research and analysis on the current landscape of domestic carbon pricing mechanisms implemented across economically-advanced East Asian and Pacific regions, and the momentum of carbon pricing in developing Indo-Pacific economies, examining the opportunities to enhance collaboration and cooperation with the European Union (EU) and UK, leveraging the EU ETS and more recent initiatives to phase-in an EU CBAM. CEF undertook a detailed review process with key stakeholders in the industrial energy transformation landscape, including producers in the steel, aluminium and cement value chains, policymakers, NGOs, advisory and industry representative bodies.

This report was written to demonstrate to policymakers in industry-intensive economies, including Australia and economically-advanced Asia-Pacific nations, the essential role carbon pricing will play in the net zero transformation. It outlines how the harmonisation of such policies across jurisdictions through international collaboration on the joint development of carbon pricing in trade – i.e., via a regional carbon border adjustment mechanism (CBAM) – can unlock clean commodity value chains to achieve the region’s collective climate ambition and economic targets via a least-cost pathway.

Report on a Page

CEF calls for coordinated, targeted government intervention from key industrial economies across the Asia-Pacific to correct the persistent global market failure of unpriced emissions in the production of fossil fuel-intensive commodity processing required to achieve net zero. We argue that this should take the form of an Asian Carbon Border Adjustment Mechanism and that Australia is well positioned to take a leading role in its development.

To achieve this, CEF advocates for the following orchestrated set of support measures that form the critical policy pillars required to catalyse industrial decarbonisation and electrification, including in steel, aluminium and cement supply chains, elevate global climate ambition, and position Australia and its key trading partners to leverage the clean commodity transformation that will rapidly emerge in a decarbonised global economy.

1. Progressively rising domestic price on carbon

A sufficiently high carbon price drives investment into industrial decarbonisation and commercialisation of low-emission technologies. The current rate of investment remains well below necessary levels.

2. Carbon Border Adjustment Mechanisms

CBAMs provide a pathway to level the playing field by applying an equivalent carbon price on imported goods to that of domestic goods covered under a carbon pricing mechanism.

3. Strategic support to scale clean commodity production

Market-based incentives are required to supplement the lack of a sufficiently high carbon price in global markets, ensuring competitiveness in global trade for low-emission commodities as domestic production of carbon-intensive products is phased out.

4. International Collaboration

Orchestrated market incentives across value chains distribute the cost to governments, and ultimately taxpayers, leveraging supply-based incentives in producing economies that complement demand-side incentives in consumer economies.

An Asian CBAM accelerates the phase-out of less efficient support measures for clean commodity production by pricing in emissions across key exporters and importers in Asia. This harmonised approach is in the national interest of all industrialised economies as it provides a mechanism to achieve the least-cost pathway energy transition.

Overview for Policymakers

A price on carbon in international trade is the single most effective measure to drive the transformation to a decarbonised global economy, and is key to addressing a key systemic global market failure: the failure to internalise onto polluters' balance sheets the negative externality of the greenhouse gas emissions they produce, and the escalating climate crisis that fossil fuel use has created.

CEF calls for a regulated, progressively rising price on carbon in international trade in Asia to reflect the social cost of the carbon emissions embedded in the production of emissions-intensive industrial commodities, and to effectively value those embodying renewable energy in their production, thus incentivising "embodied decarbonisation".

This will accelerate the least-cost pathway to decarbonising currently emissions-intensive industries, such as steel, aluminium and cement, pivotal to the global transition to net zero.

CEF believes a carbon price in trade across Asia is the critical policy instrument to drive the global green commodities opportunity and catalyse investment into decarbonisation at a speed and scale commensurate with the climate emergency.

Finance cannot credibly be mobilised into decarbonisation at anywhere near the required speed and scale without a credible price signal. A carbon price is central to establishing certainty on future expectations, and is decisive to both driving capital flows into the energy transition that is the necessary precondition of industrial decarbonisation, and away from the continued global financing of fossil fuel production and consumption.

CEF calls for an initial focus on the joint development of a regional CBAM by Australia, China, South Korea, Singapore and Japan, starting with the high emissions, world-leading steel, aluminium and cement value chains. These economically-advanced economies play a globally significant role in the production of the above commodities, which account for 15% of global greenhouse gas emissions, and their respective supply chains.

CEF calls for policymakers in these key regions to elevate and integrate the below pillars of techno-industrial policies that, deployed as an orchestrated, targeted set of reforms, will accelerate the clean commodity transformation, foster trade, employment, technology and capital transfer across value chains, diversify market incentives across regions to minimise the cost of the net zero transition to taxpayers, and position the Asia-Pacific as a leader in a global net-zero economy.

Pillar 1: Domestic Carbon Pricing

An Asian CBAM would complement and strengthen domestic compliance carbon mechanisms adopted in these economies, collectively raising ambition and strengthening the growing suite of climate, energy and industrial policies across the region.

Critically, a CBAM is the policy solution to addressing the key challenges of **carbon leakage** in trade-exposed industries – where high-emitting industries move offshore to jurisdictions with less rigorous or absent carbon pricing – ensuring industrial emitters across the region fairly bear the social cost of the negative externalities of their production.

There is a strong case for the initial joint development of an Asian CBAM in economies that have already introduced, or are in the process of implementing, domestic compliance carbon markets in which participation is mandatory (as opposed to voluntary):

- China's national emissions trading scheme (ETS) is the world's largest ETS by covered emissions, exceeding that of the European ETS almost 5 times over, despite currently applying only to the nation's power sector. In 2025 China confirmed the expansion of its ETS to cover steel, aluminium and cement industries.
- South Korea introduced Asia's first ETS, covering almost 90% of the country's emissions.
- Australia's Safeguard Mechanism has introduced an ETS for its largest industrial emitters.
- Japan is also expected to transition its voluntary national ETS to a compliance mechanism from 2026.

As detailed throughout this report, there is also carbon pricing momentum in developing and emerging economies across the Indo-Pacific, and CEF recommends the integration of such economies into a regional CBAM over time under the common but differentiated responsibilities principle.

Pillar 2: Regional Carbon Border Adjustment Mechanism

In carbon pricing mechanisms introduced to-date, there remains significant challenges with concessions provided to trade-exposed, emissions-intensive industries in these carbon markets. Such concessions have resulted in carbon prices remaining well below the threshold required to drive investment into carbon mitigation and development of low-emissions industrial commodities production pathways using renewable energy. Further, carbon pricing concessions provided to export-oriented industries to maintain competitiveness in global markets undermine the credibility and momentum of each country's energy transition.

There is broad consensus that introducing import-focused carbon border adjustment mechanisms is critical to scaling the breadth and price of compliance carbon markets.

There remain real geopolitical challenges, including perceived reduced competitiveness in global markets of export-oriented industries that economically-advanced Asian countries depend on for economic resilience. In isolation, there is a first mover disadvantage in introducing the policy architecture for a high, economy-wide carbon price.

However, goods across the steel, aluminium and cement value chains produced in East Asia and the Pacific have primarily intraregional trade flows. A collective regional commitment across Asia to embed carbon pricing in such trade would therefore overcome first mover disadvantage, as it lifts regional climate ambition, leveraging the political and economic strength of industrialised economies to support emerging and developing regional economies to also accelerate their energy transitions towards the goal of a global net zero economy.

Pillar 3: Market Incentives to Ensure Competitiveness of Clean Commodities in International Trade

In the short- and medium-term, government intervention is required through supportive budgetary and other measures to alleviate the cost premium of value-adding commodities via low-emission pathways – i.e., using renewable energy. This is vital to addressing the market failure of unpriced externalised carbon emissions and to developing green industrial capabilities. Market incentives level the playing field as carbon prices rise over time to correct this key market failure.

In this interim period, where a sufficient price on carbon is yet to be established, CEF advocates for the following complementary, orchestrated set of support mechanisms across the steel, aluminium and cement value chains:

Supply-side market incentives targeted at reducing the cost of production to improve competitiveness of green commodities in traditional markets, including:

- Production-linked incentives, e.g. production tax credits to lower the cost premium of green commodities by subsidising various factors of production, e.g. green hydrogen as a feedstock to green iron, or credits for end product, e.g. green iron, alumina, aluminium, etc.
- Concessional financing, e.g. concessional debt and equity to reduce financing costs in capex-intensive facilities.
- Enabling infrastructure to reduce capex intensity of green commodity facilities value-adding with renewable energy, including public provision of electricity infrastructure, common user infrastructure, support for renewable energy deployment and streamlining developmental and environmental approvals.

Demand-side market incentives targeted at increasing demand for green commodities to spur investment, including:

- Consumer incentives for end-use products with low embodied carbon content.
- Public procurement with emissions-intensity benchmarks.
- Cost-bridging subsidies, including contracts for difference (CfDs) or multilateral clean commodity trading initiatives to finance the cost gap between green commodities and traditional commodities through tradable carbon credits.

Technology innovation incentives that address market failures that would otherwise limit investment into research, development, demonstration and commercialisation of low-emission technologies by providing financial incentives to first mover firms that generate spillover benefits to decarbonisation for the rest of the industry and help catalyse a green commodity value chain across Asia.

This report emphasises that a price on carbon both underpins and enables these market-based government interventions – key pillars of future-facing green techno-industrial statecraft.

We note that Asia cannot afford to replicate open-ended Western models which extend generous government support to industry without commensurate measures to phase this support out over time while maintaining decarbonisation momentum.

Carbon prices ensure targeted public subsidies are time-bound and lead to lasting decarbonisation. As carbon-intensive 'grey commodity' market prices rise to reflect the inclusion of the price on carbon, the cost differential with green products reduces, enabling the phaseout of cost-bridging policies such as production credits and CfDs. Such market incentives mitigate the distortionary effect of CO_2 pricing, ensuring minimising deadweight loss as low-emission alternatives replace lost production of carbon-intensive commodities.

Asian economies can replicate the model introduced by the EU, which is capitalising its low-emission innovation funds with revenues generated from the EU ETS, as well as direct additional carbon revenues to support the deployment of renewable energy generation, energy storage and enabling common-user infrastructure.

Pillar 4: Regional Collaboration

A joint commitment to introduce a price on carbon in international trade across Asia in key industrial sectors is the single most effective lever to unlock the energy transformation at least-cost to governments, and ultimately taxpayers.

Market-based government support measures are required for green commodity production in emerging, export-oriented clean commodity corridors **whilst commensurate carbon prices are not implemented in import markets**. Without clarity on the progression of carbon pricing regimes, and subsequent carbon border adjustment mechanisms, there is an early mover disadvantage in embodying decarbonisation for export-focused commodities as taxpayer-funded support measures are required to supplement the lack of a carbon price in import economies.

The commitment to jointly build towards a regional CBAM for key economies in the steel, aluminium and cement value chains ensures the need for less efficient policies in the interim, like production credits and cost-bridging demand-side incentives, are limited as exported commodities compete in global markets for buyers that are covered under compliance carbon markets.

2025 has already seen how a model of international collaboration on carbon pricing has significantly raised collective ambition on emissions reductions in hard-to-abate industries.

The landmark achievement by the International Maritime Organisation (IMO) in April 2025 to embed carbon pricing in international trade is a momentous signal to global leaders that international collaboration on climate policies can be done.[1] The IMO's Net Zero Framework is the world's first framework that has introduced mandatory declining emissions intensity limits, as well as carbon pricing across an entire industry sector.

The Framework will also direct carbon revenues generated from the compliance scheme to reward low-emission ships, support innovation, research, infrastructure and just transition initiatives in developing countries, and fund capacity building and technology transfer.

CEF applauds the shared future-facing vision EU states, the UK, China, Japan, South Korea and India demonstrated in their supportive votes for this landmark reform. CEF urges policymakers across the Asia-Pacific to build on this momentum by collectively building towards an Asian CBAM for steel, aluminium and cement value chains.

[1] IMO, IMO Approves Net-Zero Regulations for Global Shipping, 11 April 2025

Key Recommendations for Australia

As Australia gears up to bid to host COP31 in late 2026, CEF urges the Australian government to grasp our comparative advantage we can leverage in a decarbonised global economy in which green industrial commodities (e.g. green iron) play an increasing role.

The circumstances are propitious at this time. Australia is brilliantly placed to champion momentum towards a carbon price in regional trade throughout the Asia-Pacific via an Asian CBAM, leveraging foundational international climate forums and regional trade agreements already implemented, including COP31, the Paris Agreement formed in COP21, The Climate Club and the Inclusive Forum on Carbon Mitigation Approaches.

In doing so, Australia will demonstrate that its transition from a petrostate to a clean energy superpower is more than just a slogan, and establish itself a key player in accelerating the region's progress toward decarbonisation.

The Albanese federal government has been given a crystal-clear mandate in its second-term by the electorate, rejecting the division and climate denialism that has plagued Australia's political landscape thus far and green-lighting our energy and industrial transformation. Now is the time for conviction and courage to double down and move at the speed the climate science dictates, seizing the magnitude of Australia's opportunities in the global energy transition, both domestic and export-oriented.

This calls for Australia to leverage its abundant natural endowment of critical minerals, future-facing metals, renewable energy resources and existing trade relationships with the world leaders in production of clean technologies of which Australia has become a raw material supplier of choice.

There is immense value for Australia in strengthening collaboration on international climate, trade and carbon policy with our key trading partners. Australia's economic and political influence as a middle power within the economically-advanced Asia-Pacific lies in our status as the trading partner of choice for much of the region's industrial base. We are the world's largest iron ore and metallurgical coal exporter and a globally significant exporter of bauxite, alumina, thermal coal and LNG.

Australia now has a time-critical opportunity to pivot to green commodities and reposition as a zero-emissions trade and investment leader, playing a significant role as global supply chains decarbonise. Onshoring clean commodity industries in Australia, in partnership with its allies in the Asia-Pacific presents a pathway to an immense step-change in investment into Australia's industrial capabilities, its skills base, and its economic growth and complexity. Onshoring industry into Australia in partnership with Asian world leaders is also vital to the economic resilience of our key trading partners that rely on export-oriented industries.

The Australian government has driven momentum by introducing a price on carbon applied to its largest industrial emitters through the reformed Safeguard Mechanism. CEF recognises and applauds this increased ambition on industrial decarbonisation, and strongly supports the government's progress toward a complementary investigation into the integration of an Asian CBAM to strengthen and complement the Safeguard Mechanism.

As mentioned in the above section, regional collaboration and harmonisation of carbon pricing is key to achieving the net zero transformation via a least-cost pathway. Regional

collaboration on carbon pricing is in Australia's national interest in leveraging its comparative advantage in new energy trade and embodying decarbonisation.

As outlined through this report, Australia's key trading partners are already signalling future regulatory environments in which climate-focused industrial policies are increasingly paramount. To align the expectations of its policy trajectories with its key trading partners, Australia must make clear its commitment to decarbonisation to accelerate these efforts.

A failure by Australia to recognise and act on its influence as a key economic agent in shaping the emerging global and regional green commodities boom presents a significant risk domestically to its future security and economic resilience as the viability of its historic dependence on fossil fuels enters gradual, but inevitably terminal, decline in a net zero global economy.

CEF urges Australian policymakers to foster foreign direct investment into Australia in partnership with Australian firms in renewable energy and value-adding of industrial commodities. An accelerated transition to a net zero global economy is in Australia's national interest, but we must ensure Australia remains the partner of choice.

Executive Summary

Government's Role in Addressing Persistent Market Failures

A key responsibility of governments is to establish the regulatory environment in which markets operate, and to intervene when systematic failures persist and non-government means are unable to resolve the failure in an equally effective manner. Market failures arise when there is a deviation from the economically efficient outcome, often as a result of the misalignment between private incentives and the broader interests of society.

Market failures often emerge when goods are over- or under-provided relative to the expectations of an efficient market, i.e. when the transaction generates externalities, both positive and negative. The nature of a good that generates external costs outside of a transaction has negative spillover effects. Conversely, a good that generates external benefits outside of a transaction generates positive spillover effects. Unpriced greenhouse emissions are a negative externality of the use of fossil fuels, and are a key market failure globally that must be addressed by urgent, concerted action.

One of the most influential finance reports on climate change ever produced, the 2006 Stern Review on The Economics of Climate Change, laid bare the incontrovertible truth: Climate change is a result of the greatest market failure the world has seen. The evidence on the seriousness of the risks of inaction or delayed action is now overwhelming. We risk damages on a scale larger than the two world wars of the last century. The problem is global, and the response must be a collaboration on a global scale.

The negative spillover effects of goods produced with unpriced greenhouse gas emissions are currently borne worldwide, and are increasingly borne disproportionately by populations in emerging and developing economies. The economic impacts of unpriced negative externalities are being realised through rapidly rising insurance premiums, reduced productivity, biodiversity loss and damages as a result of increasing frequency and severity of natural disasters.

To quantify some of these negative spillover effects, climate-related catastrophes resulted in losses of US$320bn in 2024, up 30% from 2023. Of that, about US$140bn were insured.[2] Labour hours lost to heat exposure were equivalent to an estimated US$835bn in potential income losses in 2023 as global temperatures continue to soar. Average global surface temperatures are now already 1.6ºC above 1850-1900 levels as of 2024.

Despite the rapid growth in renewable energy installations and electrification, emissions from fossil fuel combustion hit a new all-time high as global coal consumption continued to rise in 2024.[3] Understanding such trends are clear when observing through the lens of the economics of negative externalities. As the spread between the private marginal cost of production and the social marginal cost of production increases, the quantity of a good produced is greater than its efficient allocation.

It is imperative that the carbon embedded in global trade is accounted for on the balance sheets of corporations profiting from these externalities. A sufficiently high carbon price will

[2] FT, Catastrophes Cost World $320bn in 2024, Reinsurer Reports, 09 January 2025
[3] Nat Bullard, Decarbonisation: 2021 Things, The Complex, Reagents, 30 January 2025

incentivise investment in carbon abatement, climate mitigation, and the commercialisation of low-emission technologies, reducing long-term exposure to financial and regulatory risk.

The lagging rate of investment into decarbonisation of industrial processes behind that of other globally significant sources of emissions, including electricity, heat and transport, is no clearer demonstration of the urgency in which governments must act in a collective and coordinated manner to catalyse clean industry investment.

Global energy transition investment surged to US$2.1 trillion in 2024, renewable energy and deployment of electrified transport dominate clean energy investment trends. In 2024, low-carbon electricity sources rose to 40.9% of global electricity generation, with solar and wind the fastest growing generation technologies, accounting for a combined 15%.[4] Clean generation met 79% of the increase in global electricity demand in 2024, with wind and solar deployments expected as a source of majority of capacity additions as the world invested US$728bn into renewables in 2024, and investments into energy storage soaring 36% to US$53.9bn.[5]

Notwithstanding over a decade of strong positive growth in energy transition investment, capital flows into clean industries fell 43% in 2024 to US$28bn, accounting for just 1.3% of global investment.[6] Whilst just 1.3% of energy transition investment, direct industrial process emissions are responsible for over 21% of global emissions, and nearly 31% when including indirect emissions from energy demand.[7] Since 2005, direct industrial emissions have risen 41% to 2023.[8]

The empirical evidence demonstrates that carbon pricing, even at low levels, translates to a decrease in emissions in covered sectors. As Professor Frank Jotzo and colleagues at the Australian National University have demonstrated, it works.[9]

To drive material change in the investment decisions of incumbent industrial emitters – including in the iron and steel, aluminium and cement value chains, which emit significant amounts of greenhouse gases, collectively 15% of global emissions – economies must adopt policies that will place a progressively rising carbon price on emitters.

In CEF's view this is pivotal to correcting the catastrophic market failure that underpins the existential threat of accelerating climate change. To see material progress, CEF emphasises that global leaders in the production of goods across industrial commodity value chains must lead by example, and must collectively uphold climate action as a global public good. In order to shift global capital at speed and scale to address the rapidly accelerating climate crisis, world superpower economies, and influential middle powers like Australia, must act now, and must act together.

The Solution: A Price on Carbon

A carbon price steers an economy towards the lowest-cost pathway for reducing emissions, with investment decisions determined by the lowest marginal cost of abatement. A

[4] EMBER, Global Electricity Review 2025, 08 April 2025
[5] BloombergNEF, Energy Transition Investment Trends 2025, 30 January 2025
[6] BloombergNEF, Energy Transition Investment Trends 2025, 30 January 2025
[7] UNIDO, Explainer Brief: Decoding Industrial Decarbonisation
[8] Ebid. Data from EDGAR 2024 database with IPCC classifications.
[9] Environmental and Resource Economics Journal, Carbon Pricing Efficacy: Cross-Country Evidence, 19 June 2020

sufficiently high price on carbon drives investment into carbon abatement, mitigation and commercialisation of low-emission technologies to reduce exposure to the financial liability.

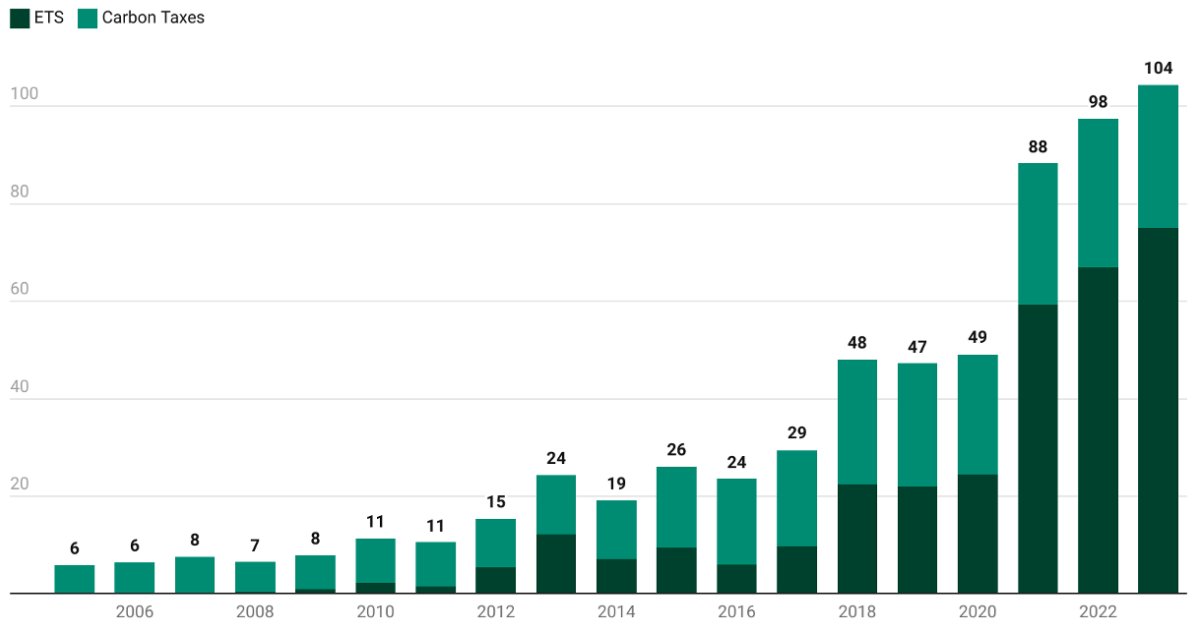
Carbon taxes and ETSs, the main mechanisms in which carbon prices are introduced, are anchored by a polluter pays principle, in which entities responsible for emitting greenhouse gases bear the social costs associated with GHGs by paying an impost expressed as a monetary unit per tonne of carbon dioxide equivalent (tCO_2-e) emitted. Section 2 provides a summary of how these mechanisms operate. As of April 2024, there are 75 carbon taxes and ETSs in operation, covering ~ 24% of global emissions.

In this report, CEF recognises that carbon compliance markets are additional taxes that increase the price of the majority of goods covered as fossil fuel pathways dominate global market share in steel, iron and cement production, and that CBAM's by nature, are tariff measures applied to imports. However, CEF emphasises the key point that **when there is a tax, there is a revenue**.

Auction-based carbon pricing mechanisms in an ETS, where a government sells emissions permits (in contrast to issuance of free allocations of carbon credits), have the critical advantage of generating significant revenues that can be directed into support for other decarbonisation and climate change mitigation policies, including first-of-a-kind capital deployments in low-emission technology innovation. This is also the case for revenues generated by some carbon tax frameworks.

Revenues from global carbon pricing in 2023 exceeded US$104bn for the first time, driven primarily by the higher prices realised in the EU ETS - see Figure ES1.[10] As of 2024, cumulative global carbon pricing revenues will have exceeded US$700bn.

Figure ES1: Global Carbon Pricing Revenues (USD)



Source: World Bank [11]

[10] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[11] World Bank, State and Trends of Carbon Pricing Dashboard: Revenues, updated 01 April 2024

Even with strong positive momentum in carbon revenues, prices remain significantly below levels required to catalyse wide-spread behavioural change in industrial sectors. In 2017, the High-Level Commission on Carbon Prices concluded that prices globally needed to be US$40-80/tCO$_2$-e in 2020, and reach real US$50-100/tCO$_2$-e by 2030 to limit temperature rise to well below 2ºC. The IEA has long modelled a 2050 developed economy carbon price of US$250/t. However, in 2024, only seven carbon pricing instruments covering less than 1% of global GHG emissions reached or exceeded the inflation-adjusted minimum level of US$63/tCO$_2$-e (real USD 2024).[12]

The Commission, led by Nobel Laureate Professor Joseph Stiglitz and Lord Nicholas Stern, acknowledged that while well-designed carbon pricing measures are an indispensable part of the strategy required to reduce emissions in an efficient way, in isolation it is not sufficient to induce change at the pace and scale required. Comprehensive carbon pricing regimes must be deployed in conjunction with a complementary architecture of other support measures to address various other market and government failures and imperfections in the efficient allocation of resources.[13]

Absent a high carbon price in trade, market incentives are vital to scaling clean commodity production

It is important to address that without the introduction of additional complementary government support measures to facilitate investment into green commodity production, carbon prices only increase the cost of production, posing significant risks to the competitiveness of export-oriented industries into markets that have not yet priced in the externality of embedded emissions in the production processes.

For regions and economies that are early movers in comprehensive carbon pricing that also have a low comparative advantage in the 'new energy trade'[14] and production of low-cost, low-emission energy that underpins the economics of decarbonisation and electrification, there is a significant risk that increasing ambition on climate action can result in the gradual erosion in their industrial capacity. This is evident in the European Union, which has seen the gradual decline in production of energy-intensive industries.

Established in 2005, the EU ETS was the world's first supranational ETS. The ETS was the EU's policy response to their commitments under the UNFCCC's Kyoto Protocol – the international climate agreement that recognised the role industrialised economies played in the growth of GHG emissions, requiring emissions reduction in accordance with an agreed country-specific target (Quantified Emission Limitation and Reduction Objectives under the Kyoto Protocol).

Whilst under the EU ETS, the EU has seen emissions from electricity, heat generation and industry fall by 47% from 2005 to 2023. For covered sectors under the EU ETS, emissions have fallen by a CAGR of -3.6%, and at a -4.3% CAGR since 2013. However, a significant proportion of the bloc's emissions reductions have been the structural decline in its industrial base as energy price inflation has eroded the profitability of industrial producers.

[12] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[13] Carbon Pricing Leadership Coalition, Report of the High-Level Commission on Carbon Prices, 29 May 2017
[14] Superpower Institute, The New Energy Trade, November 2024

In 2010, the EU produced 173 Mt of crude steel, 102 Mt from coal-based blast furnaces, and 71 Mt from electric furnaces. At this time, the steel industry directly employed almost 370,000 workers.[15] In 2023, the EU produced 126 Mt of crude steel, a 27% decline, with coal-based primary production falling to 70 Mt. Direct employment over the same time also fell 18%, a drop of 67,000 employees.[16]

Similarly, primary aluminium production in the EU has fallen from 3,055 kt in 2005 to just 962 kt in 2023, a fall of 69%. Over the same time frame, net imports of aluminium into the EU have risen 66% to 6,900 kt in 2023.[17]

As carbon prices rise to correct the market failures of unpriced negative externalities, **market incentives are required to level the playing field, as well as support first and early movers in the production of green commodities**. A complementary, orchestrated set of support mechanisms by governments across the steel, aluminium and cement value chains must be introduced alongside a rising domestic carbon price and border adjustment. In the short- and medium-term, government intervention through supportive budgetary measures to alleviate the cost premium of value-adding commodities via low-emission pathways is vital to addressing market failures and developing industrial capabilities.

This report emphasises that a price on carbon both underpins, and enables these key pillars of future-facing green techno-industrial statecraft. Carbon prices ensure targeted public subsidies are time-bound, and lead to lasting decarbonisation. As carbon-intensive 'grey commodity' market prices rise to reflect the inclusion of the price on carbon, the cost differential with green products reduces, enabling the phaseout of cost-bridging policies such as production credits and CfDs. Such market incentives will mitigate the distortionary effect of carbon pricing, ensuring deadweight loss is minimised as low-emission alternatives replace lost production of carbon-intensive commodities.

Asian economies can leverage the learnings of more comprehensive carbon pricing regimes introduced globally to strengthen and accelerate action on industrial decarbonisation. To ensure the competitiveness of emerging, low-emission commodity value chains, countries must work collaboratively on comprehensive carbon pricing, as well as introduce complementary market support measures. Strengthening climate-focused trade policies can ensure supply-oriented support in regions with comparative advantages in clean energy production are harmonised with demand-oriented support in key demand markets.

As noted in Key Recommendations for Australia, above, this report urges Australian policymakers to foster foreign direct investment in partnership with Australian firms in renewable energy and value-adding facilities. An accelerated transition to a net zero global economy is in Australia's national interest, but we must ensure Australia remains the partner of choice.

As carbon pricing measures are increasingly adopted, onshoring industry into Australia in partnership with Asian world leaders is vital to the economic resilience of our key trading partners that rely on export-oriented industries.

[15] EUROFER, European Steel in Figures 2019, 03 June 2019
[16] EUROFER, European Steel in Figures 2024, 06 June 2024
[17] European Aluminium, Industry & Market Data: European Aluminium Supply by Source, accessed May 2025

Carbon Pricing Momentum in Asia

The prerequisite for the adoption of a CBAM, is a carbon pricing mechanism that applies to domestic emitters. A key aspect of this report was to demonstrate the momentum of carbon prices across economically-advanced East Asian and Asia-Pacific countries, as well as emerging and developing economies in Southeast Asia.

CEF has identified strong momentum across Asia on the recognition of the importance of carbon pricing to achieve climate commitments, and material progress in introducing, expanding, and strengthening carbon markets across the region.

Since their respective implementations, the 17 national and sub-national compliance carbon pricing instruments introduced in the Asia-Pacific region have generated a cumulative revenue of US$4.35bn, with the opportunity for significant acceleration and expansion.[18]

As the global leader in the production of steel, aluminium and cement, the report aims to emphasise the importance of China's role in establishing price signals for its trading partners across the value chains.

The China national ETS, introduced in 2021, is part of its objective to undertake the largest decoupling of economic and emissions growth ever attempted globally. In 2025 China will shift its focus from managing energy consumption and intensity to "dual control of carbon emissions", in which both the total volume of emissions and emissions intensity per unit of GDP baselines will be used to accelerate the green transformation.

2025 has seen a significant step change in the national ETS, with China confirming the expansion of its ETS to the cement, steel and aluminium industries in 2025.[19] As China shifts increasingly towards export-orientation, it recognises the growing impacts of carbon pricing mechanisms in key export markets. Critically, cement, steel and aluminium are the industrial sectors exposed to the EU CBAM. The introduction of these products into the national ETS will increase coverage by ~3,000 Mtpa CO_2-e, boosting national coverage of emissions to 65% (~8,000 Mt CO_2-e) – equivalent to ~5% of global emissions.

CEF is optimistic that China's world leadership in manufacturing, technology, domestic installation and exports of almost all zero-emissions industries of the future, and its significant investment in building up its national ETS, puts it in strong alignment with the EU and UK on the need for collaborative global action to create alignment of efforts consistent with the climate science. With the US withdrawing from global leadership, this gives a significant opportunity for China to assume a positive central role in partnership with other countries and regions working in good faith.

Section 4 of this report provides a detailed overview of the carbon pricing momentum across Australia, economically-advanced East Asia and parts of developing and advanced Asia-Pacific. The carbon pricing mechanisms, in which an Asian CBAM would complement, are summarised in the figure ES2 below.

[18] CMI, Carbon Markets Gain Momentum in Asia as Regional Leaders Convene, 05 August 2024
[19] ICAP, China to Expand National ETS to Cement, Steel and Aluminium in 2024, 12 September 2024

Figure ES2: Summary of Carbon Mechanisms in Asia

Country	Mechanism	Coverage	Prices
China	National production- adjusted cap and trade ETS since 2021.	5,200 Mt CO_2-e (2023) in the power sector. ETS will expand to cement, steel and aluminium in 2025. Expected to cover an additional 3,000 Mt CO_2-e.	US$13.33 (2024)
Korea	National cap and trade ETS since 2015.	567 Mt CO_2-e (2024) in the power, industry, buildings, transport, aviation, maritime and waste sectors.	US$6.78 (2024)
Japan	Compliance baseline and credit GX-ETS expected in 2026.	To be announced.	-
Australia	National baseline and credit ETS, Safeguard Mechanism, reformed in 2023.	136 Mt CO_2-e (2024) across mining & extractives, industry, transport, aviation and waste sectors.	US$22.62 (2024)
New Zealand	National cap and trade NZ ETS since 2008.	19.1 Mt CO_2-e (2025) in mining & extractives, power, industry, buildings, transport, aviation, aviation, maritime, waste and forestry sectors.	US$35.91 (2024)
Singapore	Carbon tax since 2019.	41.6 Mt CO_2-e (2022) in manufacturing, power and waste sectors.	US$18.48 (2024)
India	Carbon Credit Trading Scheme (CCTS) under development, expected in 2026.	Expected to cover aluminium, chloroalkali processes, cement, fertiliser, iron and steel, pulp and paper, petrochemicals, petroleum refining and textile sectors.	-
Vietnam	Pilot ETS planned between 2025-2027.	Expected to cover steel, cement and thermal power stations.	-
Indonesia	Intensity-based ETS since 2023.	256.8 Mt CO_2-e (2024) in the power sector	US$3.66 (2024)
Malaysia	Voluntary carbon market since 2022, creating infrastructure for domestic ETS.	To be announced.	-
Thailand	Carbon pricing instruments are being investigated.	To be announced.	-
Philippines	National cap and trade ETS under investigation.	To be announced.	-

An Asian CBAM

CEF strongly advocates for a mechanism to operationalise a region-wide carbon price as the most effective way to direct private investment into clean technologies aligned with global emissions reduction goals. However, carbon pricing systems worldwide often fail to accelerate decarbonisation in heavy-emitting sectors like steel, cement and aluminium, primarily due to free emissions allowances for trade-exposed industries, which undermine the price signal.

CBAMs complement and work in tandem with domestic carbon prices, penalising economies that fail to price GHGs and incentivising them to act, levelling the international playing field as international carbon markets emerge, building momentum in global decarbonisation, and protecting emissions-intensive trade-exposed domestic industry sectors in jurisdictions with high carbon prices by limiting 'carbon leakage' (where industries move offshore to countries with less ambitious or absent carbon pricing to avoid carbon liabilities).

Until such time as there is a globally harmonised price on carbon, CEF sees an Asian CBAM as providing the clearest pathway to address the challenge of import-focused carbon leakage, and must be introduced alongside comprehensive market-based incentives to ensure the competitiveness of low-emission goods in traditional markets.

The collective development towards an Asian CBAM amongst key trading partners in East Asia and the Asia-Pacific can minimise the public cost of the energy transformation by reducing the supplementary market subsidies that bridge the gap between green commodities and their carbon-intensive counterparts.

CEF proposes a regional Asian CBAM – jointly developed by Australia, China, Singapore, Japan and South Korea. This would be the most cost-effective way to prevent carbon leakage, catalyse industrial decarbonisation, and reduce reliance on public subsidies. Harmonising carbon pricing and standards across these countries would boost investment and enable credible clean commodity trade.

The Asian Development Bank and other institutions underscore the importance of integrated international carbon pricing frameworks to streamline compliance, increase transparency, and improve market efficiency. Greater participation and interoperability between Asian carbon markets would enhance price discovery and liquidity, better reflecting the true cost of emissions abatement.

Implementation of an Asian CBAM could accommodate varying national pricing models. With most Asian systems operating on baseline-and-credit principles (except Korea's cap-and-trade), a common CBAM can still function by using harmonised default emissions values and baseline comparisons, similar to the EU CBAM. CEF supports accelerated phasing in of liabilities and alignment with international definitions of "green" products.

Standardising emissions accounting across countries will facilitate cross-border trade in carbon credits, particularly for steel, cement, and aluminium. Applying the polluter-pays principle, revenues from carbon tariffs could fund administrative costs and support vulnerable countries' adaptation needs.

MRV systems must be harmonised. CEF points to ISO and CEN standards, and initiatives like ResponsibleSteel, as critical to standardising emissions reporting. These frameworks allow for equitable accounting approaches that reflect differing national development levels,

especially important for south-east Asia. Independent third-party verification will be essential for MRV integrity.

International cooperation through agreements like the Paris Agreement, Inclusive Forum on Carbon Mitigation Approaches (IFCMA), and the Climate Club is key. The Paris Agreement's Article 6 enables emissions credit transfers between countries and supports common MRV rules. The Climate Club, while not including China, offers a framework to align sectoral standards, facilitate green industrial trade, and scale industrial decarbonisation.

An Asian CBAM, aligned with these efforts, could drive harmonisation across borders, boost investor confidence, and advance credible, verifiable emissions reductions compatible with a 1.5ºC climate pathway.

As emphasised in The Superpower Institute's latest report: 'A Green Iron Plan for Australia', a system of international carbon prices, designed to reach net zero in the middle of the century, would be the best way to decarbonise global production and trade of commodities. In the absence of global carbon pricing, governments are required to introduce less efficient domestic policies to correct the global market failure.[20]

To limit the impacts of global warming, the international community will need a system of international carbon prices that reflect the social cost of carbon, supported by carbon border adjustments. CEF supports and reinforces the key recommendations of The Superpower Institute, urging the federal government to use international platforms to advocate for a system of international carbon prices. This must be done so with ambition high enough to demonstrate Australia's commitment to the Paris Agreement with policies that impose or simulate the effects of a carbon price consistent with net zero carbon emissions by 2050.

[20] TSI, A Green Iron Plan for Australia: Securing Prosperity in a Decarbonising World, 26 May 2025

Section 1. Why a Price on Carbon is Needed

We need a regulated, progressively rising price on carbon in international trade to value embodied decarbonisation and hence accelerate the least-cost global energy transition and industrial decarbonisation.

Creating a price signal on externalised carbon pollution unlocks private decarbonisation and energy transition capital at the speed and scale required. There is virtually unlimited capital available, but currently the cost of fossil fuels is socialised onto the public globally and future generations, meaning there is no signal to unlock finance.

Carbon pricing catalyses investment into green industry including green metals opportunities, time-limiting public subsidies to decarbonise industry until such time as a carbon price bridges the gap to make low-emission products the least-cost pathway.

Clear policy direction and future expectations of rising carbon pricing and measures that reduce free allocations of carbon credits drive private investment into decarbonisation in partnership with international public financing – i.e. ECAs, development banks, etc.

Compliance carbon markets are critical, including the credibility of measurement, reporting and verification (MRV). It is not enough to rely on voluntary carbon market mechanisms to provide the policy leverage required.

In June 2020, ANU Professors Rohan Best, Paul Burke and Frank Jotzo conducted a study on the efficacy of carbon pricing, analysing empirical evidence from 142 countries over more than two decades, of which 42 had a carbon price of some form by the end of the study period.[21] The result: countries with carbon prices yielded a 2 percentage point reduction in carbon emissions relative to countries without carbon pricing. Over time, this spread leads to significantly different trajectories in the embedded emissions of an economy. The study concluded that, on average, an extra euro per tonne price on carbon is associated with a lowering in the growth rate of emissions in the covered sectors of approximately 0.3 percentage points.[22]

In 2017, the High-Level Commission on Carbon Prices concluded that carbon prices needed to be US$40-80/$tCO_2$-e in 2020, and reach US$50-100/tCO_2-e by 2030 to be on track to limit temperature rises to well below 2ºC. Less than 4% emissions covered by carbon pricing measures in 2020 incurred costs above US$40/$tCO_2$-e – the lower end of recommended 2020 prices to be Paris Agreement compliant.[23] By 2024, only seven carbon pricing instruments, covering less than 1% of global GHG emissions, reached price levels at or above the inflation-adjusted minimum level of US$63/$tCO_2$-e (real USD 2024) set by the High Level Commission.[24]

Despite this, the empirical evidence demonstrates that carbon pricing, even at low levels, translates to a decrease in carbon emissions in covered sectors. It works, as evidenced by

[21] Environmental and Resource Economics, Carbon Pricing Efficacy: Cross-Country Evidence, 19 June 2020
[22] The Conversation, Carbon Pricing Works: The Largest-ever Study Puts it Beyond Doubt, 14 July 2020
[23] World Bank, State and Trends of Carbon Pricing 2021, 06 March 2021
[24] World Bank, State and Trends of Carbon Pricing 2024, 21 May 2024

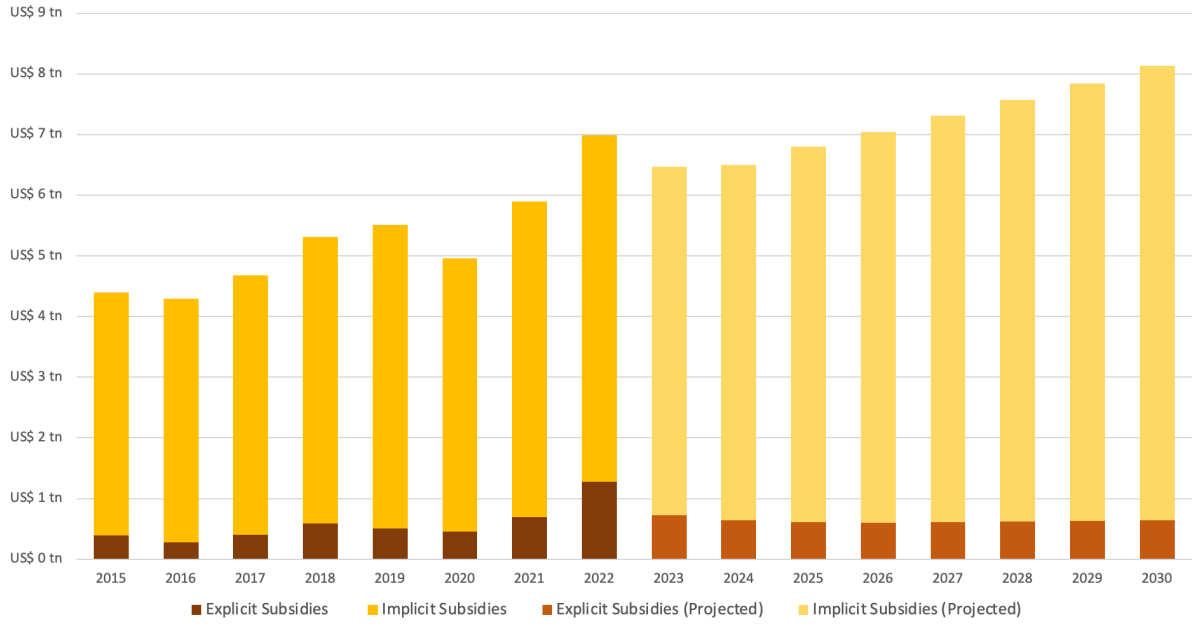
Bayer and Aklin (2020) that even with EU ETS prices well below the social cost of carbon, carbon market regulation and future expectations of prices, the ETS was associated with 1.2 billion tonnes of CO_2-e reductions from 2008 to 2016.[25]

A carbon price steers an economy towards the lowest-cost pathway for reducing emissions, as investment decisions on carbon abatement and mitigation projects are determined by the lowest cost of marginal abatement. As prices rise, capital flows are driven into carbon abatement and development of low-emission technologies to reduce exposure to the financial liability of a high carbon price, as the cost of inaction exceeds that of emissions reduction. To drive material change in the investment decisions of incumbent industrial emitters, primarily in the steel, aluminium and cement value chains, economies must adopt policies that will place a progressively rising carbon price on emitters.

While the investigation into and the development and implementation of carbon pricing mechanisms globally is increasing, momentum continues to be undermined by the persistence and propagation of explicit and implicit fossil fuel subsidies. Explicit subsidies refer to subsidies where the retail price of fossil fuels are below a fuel's supply cost. For a non-tradable product (e.g. electricity), the supply cost is the domestic production cost. Implicit subsidies occur when the retail price fails to include external costs, inclusive of standard consumption taxes. External costs include contributions to climate change, encompassing GHG emissions and local health damages through harmful pollutants.

In 2022, the International Monetary Fund (IMF) identified that explicit fossil subsidies reached an all-time high of US$1,275bn, with implicit subsidies also reaching a new high of US$5,708bn.[26] As energy demand continues to rise globally, and with the slow adoption of carbon pricing initiatives, the IMF forecasts implicit fossil fuel subsidies to reach almost US$7.5tn by the end of this decade – see Figure 1.0.

Figure 1.0: Global Fossil Fuel Subsidies



Source: International Monetary Fund

[25] PNAS, The European Union ETS Reduced CO2 Emissions Despite Low Prices, 06 April 2020
[26] IMF, Fossil Fuel Subsidies Data: 2023 Update, 24 August 2023

The world cannot expect to move and accelerate forward on the pathways to decarbonisation and phase-out of fossil fuels whilst global economies, including those that promote the future prosperity of becoming green energy superpowers, continue to subsidise the use of fossil fuels used in the manufacture of these vital commodities.

For public and private capital to effectively co-invest into the economic transformation at the speed and scale necessary to limit the globally devastating impacts of the climate crisis, the world must be steadfast in its commitment to shift the trajectory of climate, energy and industrial policy. To unlock private capital into clean industrial capital expenditure, the key industrial regions of Asia, including China, Japan and Korea, as well as the economies that provide much of the raw material supply chains, including Australia, must introduce a market signal to decarbonisation now. This can be made possible by such governments demonstrating that the inevitable policy response to the climate, energy and cost-of-living crisis is a phase-out of fossil fuel subsidies, and a phase-in of carbon pricing mechanisms.

Section 1.1. Carbon Pricing Key to Addressing Grey Discounts in Metals and Materials

To drive material change in the investment decisions of incumbent industrial emitters – including in the iron and steel, aluminium and cement value chains, which emit significant amounts of greenhouse gases, collectively 15% of global emissions – economies must adopt policies that will place a progressively rising carbon price on emitters. In CEF's view this is pivotal to correcting the catastrophic market failure that underpins the existential threat of accelerating climate change. Asia, and primarily China, dominates the production of steel, aluminium and cement - see Figure 1.1.1. Catalysing investment into decarbonisation is critical to achieving global net zero targets.

Figure 1.1.1: Key Emission Metrics for Steel, Aluminium and Cement

Metric	Steel	Aluminium	Cement
Scope 1-2 Emissions	2.8 Bn tCO_2-e	1.12 Bn tCO_2-e	2.4 Bn tCO_2-e
Global Average Emissions Intensity	1.91 tCO_2-e/t	14.8 tCO_2-e/t	0.58 tCO_2-e/t
Share of Global Emissions	7%	2%	6%
IEA NZE Scenario 2050 Demand (from 2023)	1.3x	1.8x	0.94x
Investment Required by 2050 for Net Zero	US$3.6 trillion	US$543 billion	US$1.42 trillion
China Share of Production (2023)	54%	59%	51%

Source: World Economic Forum (2024); WorldSteel (2024); International Aluminium Institute (2024)

The green premium is often described as a challenging barrier to adoption and deployment of low-emission alternatives, with much of the conversation and dialogue centred on

generating sufficient demand from collective purchasing agreements and advanced market commitments (AMCs) to support the production of low-emission goods and services.

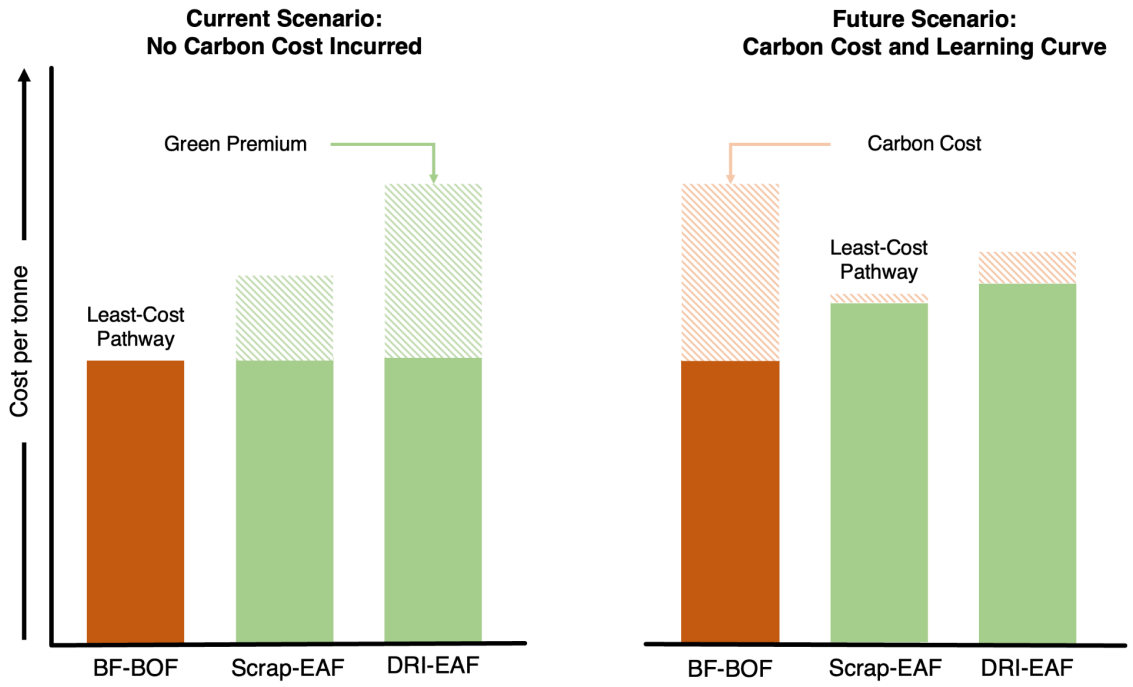
In the context of materials and metals production, green premiums represent the price difference in production costs between goods produced via the dominant fossil fuel pathways and that of technologies or production pathways that do not require fossil fuels or generate emissions in the process.

Addressing the green premium can be achieved by two ways - as illustrated in Figure 1.1.2:

1. **Price parity through the price deflation of green production factors**. In the context of green commodities, this is reducing the levelised cost of electricity for renewable energy and capital expenditure intensity of low-emission technologies and enabling infrastructure, i.e. grid transmission, battery firming, electrolysers for hydrogen production, etc.
2. **Price parity through the internalisation of the social cost of production**. This is achieved via a regulated, progressively rising price on carbon in emissions-intensive and trade-intensive economies.

CEF believes that, in order to achieve a structural transformation of this magnitude, economic actors must simultaneously introduce an intergenerational policy architecture to phase-in carbon pricing for industrial emitters, and scale ambition of techno-industrial policies and budgetary measures in the short-term to bridge the premia and support first movers.

Figure 1.1.2: Impact of Carbon Pricing in Driving Decarbonisation in the case for Iron and Steel Decarbonisation



Source: Climate Energy Finance
Note: Refer to Box 1 below for technology definitions used in this illustration

A key example of AMCs in heavy industry is the World Economic Forum's First Movers Coalition, a coordinated, public-private partnership aimed at leveraging the purchasing power of its members to catalyse a sufficient demand and price signal for corporations to prioritise low-emission technologies and production pathways.[27]

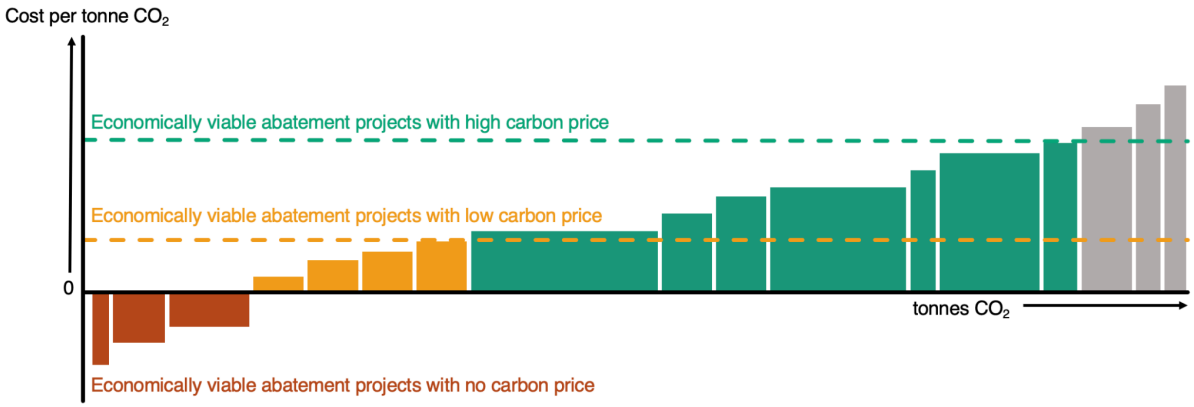
CEF sees the sole framing of demand-side challenges around the 'green premium' as an obfuscation of the underlying reality that the dominant fossil fuel pathways for metals and materials have maintained artificially low production costs due to the sustained global market failure of externalising the environmental impact of their production. Simply, **the grey discount**.

The rate of private investment into carbon abatement and mitigation technologies for the key emissions-intensive, trade-exposed industrial sectors continues to be hamstrung by the grey discount – the market-distorting implicit fossil fuel subsidy driving the spread between carbon-intensive products and those using low or zero-emissions production techniques.

There are already some instances in which industrial majors are moving to proactively decarbonise operations to contain emerging carbon liabilities. Rio Tinto estimates its annual carbon compliance cost would be US$300m pa by 2030 if it did not reduce its current emissions profile, with the annual cost rising to US$600m by 2040.[28] Nearly half of Rio Tinto's emissions are now covered by legislative carbon penalty schemes and Rio Tinto has signed three of the largest firmed renewable energy PPAs in Australian history since the start of 2024 to enable decarbonisation of its Australian alumina and aluminium operations.

However, Rio Tinto is yet to make any material investments into decarbonisation of its largest and most profitable commodity, iron ore. Decarbonisation of Australia's electricity grid, with its world-leading renewable energy resources, is already a positive investment case. To incentivise investments into harder-to-abate emissions abatement projects, industrial emitters must be covered by a carbon price sufficiently high to shift projects down the marginal abatement cost curve - as illustrated in Figure 1.1.3. A price on carbon will unlock sustainable financing for abatement technologies (as discussed in Section 1.2), with investment cases supported further by carbon price revenue distributions into supporting RD&D and commercialisation of low-emission technologies.

Figure 1.1.3. Marginal Abatement Cost Curve with Carbon Pricing



Source: Climate Energy Finance

[27] WEC, First Movers Coalition

[28] AFR, Rio TInto Says Carbon Price Pain Justified Action on Emissions, 9 December 2024

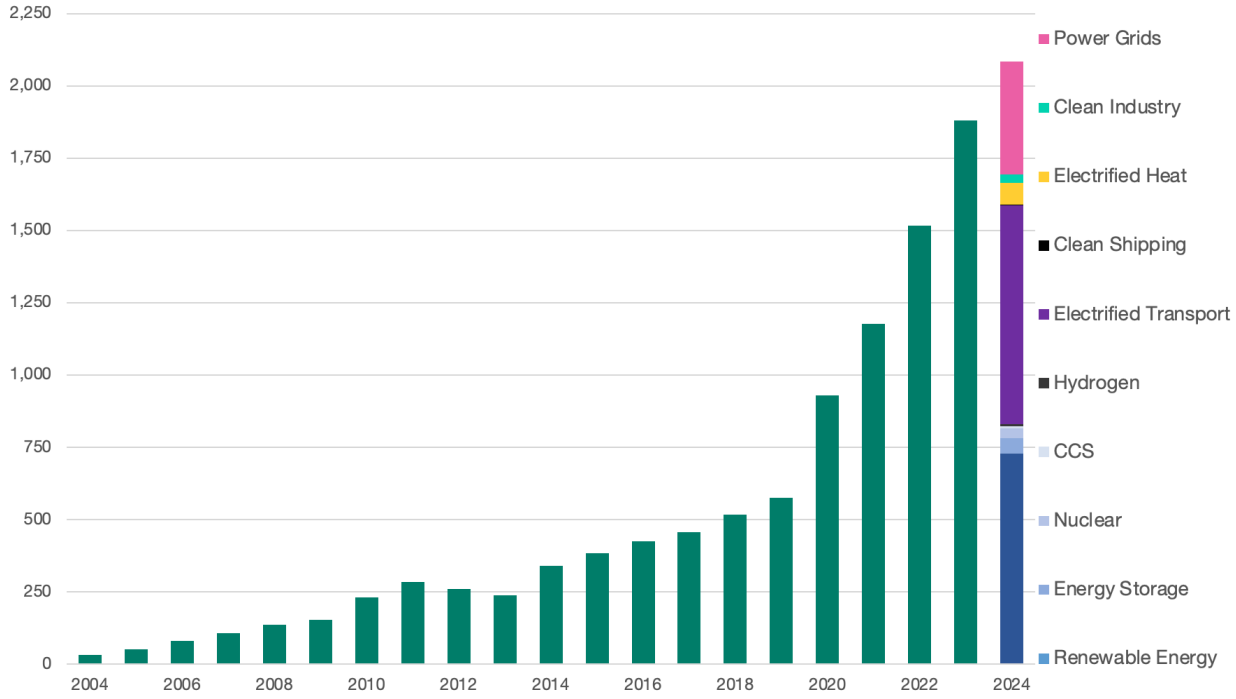
Section 1.2. Carbon Pricing and Unlocking Finance

On 10 January 2025, BlackRock announced to institutional clients that it had caved in to domestic US political pressure and bailed out of the Net Zero Asset Managers, a voluntary global group self-described as committed to 'the goal of net zero greenhouse gas emissions by 2050 or sooner'.[29] The announcement followed a string of the US' six largest banks quitting the Net Zero Banking Alliance.[30] This reflects a major new geopolitical reality, with the US for now exiting the global playing field. This will likely reorient world commitments by other nations who accept and continue to act on the climate science.[31]

While investment into decarbonisation technologies is increasingly underpinned by commercially viable and scalable solutions, in large part thanks to China's ongoing global leadership, even as the US continues to back its legacy fossil fuel incumbents, compliance carbon pricing remains critical to unlocking finance into abatement projects currently uncommercial with externalised emissions costs.

Global energy transition investment reached US$2.1tn in 2024, up 11% from investments in 2023. Renewable energy and electrified transport dominate clean energy investment trends, accounting for US$728bn and US$757bn respectively in 2024, with energy storage investments surging 36% to US$53.9bn. However, investments into clean industries fell by 43% in 2024 to just US$28bn, accounting for just 1.3% of global energy transition investment – Figure 1.2.1.[32] Similarly, investments into hydrogen dropped 42% yoy to US$8bn in 2024.

Figure 1.2.1: Global Energy Transition Investment



Source: BloombergNEF

[29] Financial Times, BlackRock Quits Climate Change Group in Latest Green Climbdown, 10 January 2025
[30] This included JPMorgan, Citigroup, Bank of America, Morgan Stanley, Wells Fargo and Goldman Sachs.
[31] Bloomberg, Wall Street Is Rewriting Its Energy-Sector Playbook, 2 April 2025
[32] BloombergNEF, Energy Transition Investment Trends 2025, 30 January 2025

Globally, there is some adoption of shadow carbon pricing (SPC) in global financial institutions and multilateral development banks (MDBs) to quantify the risks and opportunities associated with embedded carbon emissions of an investment as part of the cost-benefit analysis process. For example, the European Investment Bank's (EIB) SPC rises from €80/tCO_2-e in 2020 to €250/tCO_2-e by 2030, €525/tCO_2-e by 2040, and €800/tCO_2-e by 2050.[33] The European Bank for Reconstruction and Development, Asian Development Bank, Asian Infrastructure Investment Bank (AIIB), Australia's NSW State Treasury and World Bank all have varying degrees of SPCs applied to their investment frameworks.

The progression from fragmented SPCs in select investment frameworks to an economy-wide price on carbon to accelerate investments into clean industries at a speed and scale required to achieve global emissions reduction objectives will require the adoption of compliance carbon markets, and associated border adjustment mechanisms.

An analysis on unlocking climate finance in the Asia-Pacific region by the International Monetary Fund (IMF) identified three major challenges that has hindered finance to-date, and hurdles that must be addressed to restructure global capital investments, including:

1) persistent large gaps in data, disclosures and taxonomies that hinder climate risk reporting and analysis, undermining investor confidence in directing private investments toward climate action
2) **conflicting national policy approaches, including the introduction of climate-pricing mechanisms amid widespread subsidisation of fossil fuels compounded by inadequate institutional coordination and oversight**
3) different timelines to reach net zero under the common but differentiated responsibilities provision of the Paris Agreement, and
4) a complex global environment with increasing geoeconomic fragmentation that continues to threaten collective and cooperative action on climate change.[34]

To collectively decarbonise emissions-intensive industries, in which Asia dominates global production, sustainable finance taxonomies need to be agreed then implemented at speed, and must be interoperable and comparable to economies with advanced taxonomies. The interoperability of green taxonomies is key to the development of cross-border financial flows. The biggest difference between China and the EU in green taxonomy is in technical screening standards and criteria.

There is momentum in regional harmonisation, with ASEAN releasing its third iteration of the ASEAN Taxonomy for Sustainable Finance[35] in December 2024, aligning the classification of sustainable activities and assets across the region, with screening criteria for six focus sectors and three enabling sectors. The Australian Sustainable Finance Initiative (ASFI) has completed the design of a finance taxonomy, which was delivered to the government in February 2025 for approval and is expected to be published in June 2025.[36]

A commitment to jointly develop an Asian CBAM, either initially across advanced economies (AEs) or expanded to emerging markets and developing economies (EMDEs), could provide a mechanism to harmonise and standardise sustainable finance taxonomies and carbon accounting frameworks, default emissions intensity benchmark values, and emissions

[33] EIB, EIB 2023 Sustainability Disclosures in Accordance with the SASB Framework, 22 July 2024
[34] IMF, Unlocking Climate Finance in Asia-Pacific: Transitioning to a Sustainable Future, 29 January 2024
[35] Sustainable Finance Institute Asia, ASEAN Taxonomy for Sustainable Finance V3, 20 December 2024
[36] ASFI, Australian Sustainable Finance Taxonomy

verification and certification. Doing so would unlock the ability of developmental and international financing institutions to accelerate the deployment of clean industry technology investment, as well as enabling investments into renewable energy generation, storage, and power grid infrastructure.

An Asian CBAM could effectively provide the price signal in international trade to address the challenges of unlocking sustainable financing at scale, providing a coherent policy direction for carbon pricing implementation and the phase-out of fossil fuel subsidies. This would also address the gaps in compatibility and interoperability of emissions taxonomies and disclosures, and ensure economic cooperation in decarbonising trade-exposed, emissions-intensive industries in an uncertain global environment that is increasingly characterised by isolationist and protectionist trade and foreign policy measures.

Across 2024, Australia's second largest bank by market capitalisation, Westpac, held consultations with more than 150 of Australia's large industrial emitters.[37] From these discussions, the four key themes identified as challenges limiting the ability to achieve operational emissions reductions were the need for:

- A **clearer strategic direction** in policy and regulation, particularly energy supply and affordability to underpin the energy transition
- Significant **investment in fixed asset infrastructure**, particularly to increase low-emission projects, the availability of PPAs and expanded capacity of the grid
- **Research and development** to accelerate breakthrough technologies
- Cross-industry and **value chain collaboration**.

A commitment from Australia and developed Asian economies to jointly work towards integrating a carbon price in regional trade would provide the clear policy direction required to mobilise sustainable finance in building out the enabling infrastructure for green metals and materials manufacture. Increasing carbon tax revenues can be directed into research and development across the value chains to support the commercialisation of low-emission technologies to further accelerate industrial decarbonisation.

The EU has demonstrated such policies, with the EU Innovation and Modernisation Funds capitalised by the EU ETS. The vast majority of funds generated from the ETS are directed into the energy sector to support the energy transition, as well as providing support for low-income regions affected by climate change, improving public transport to reduce the over reliance on oil in mobility, and integrating energy efficiency measures into the system.

As Chung Keeyong, Ambassador and Deputy Minister for Climate Change at Korea's Ministry of Foreign Affairs (MFA), says, traditional international forums play a role in shaping climate and trade policy, but geopolitical tensions and nonbinding commitments often limit effectiveness. A more agile, issue-based climate-trade approach can align trade policies with climate action. Such initiatives can establish common frameworks for clean technology investment and energy security while ensuring trade mechanisms drive decarbonisation rather than reinforce carbon-intensive practices.[38]

CEF believes an Asian CBAM, to complement and strengthen domestic carbon pricing mechanisms across Asia, is key to achieving the public-private co-investment required at a speed commensurate with the rapidly escalating climate crisis.

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[37] CMI, Evolving Markets, Emerging Solutions: CMI Westpac Carbon Market Report, 01 April 2025
[38] Korea JoongAng Daily, Why Climate Must be at the Core of Global Commerce, 24 February 2025

Box 1. Carbon Pricing Revenues: Enabling Iron and Steel Decarbonisation Technology Commercialisation

Given East Asia's global dominance in iron and steel production and regional trade, a carbon price signal in intra-Asian trade is critical to the acceleration of RD&D by iron and steel incumbents into decarbonisation. Like the EU (see Sec. 3), revenues generated from carbon pricing can be used to commercialise low-emission technologies and reduce the grey discount to drive momentum towards true economic price parity.

Blast furnace - basic oxygen furnace (BF-BOF) steelmaking continues to dominate global steel production, accounting for 71% of steel in 2024. Average BF-BOF processes emit ~ 2.33 tCO_2-e/t, with emissions generated from the burning of coke in blast furnaces accounting for ~ 86% of all value chain emissions. Scrap - electric arc furnace (EAF) pathways are the second most common pathway, with average emissions intensities of 0.68 tCO_2-e/t, primarily due to the use of fossil-based electricity in key production regions, including China, Japan and South Korea.

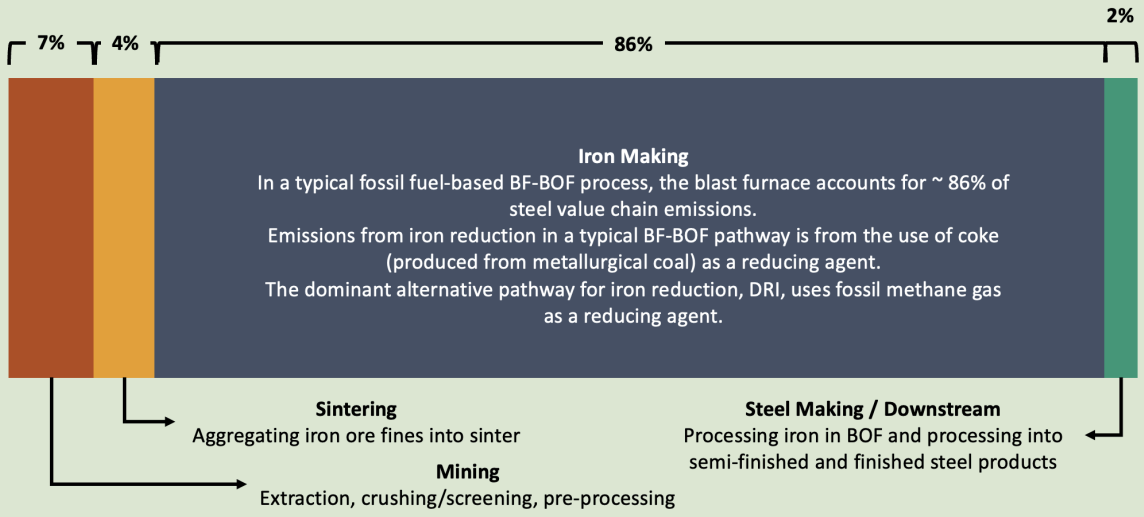
The decarbonisation of ironmaking is the largest opportunity to reduce emissions from the steelmaking value chain. Transitioning to electrified or green-hydrogen based ironmaking technologies, even with methane gas used in the reduction of iron ore, can have significant emissions reduction potential. Methane gas or hydrogen-based direct reduction iron (DRI) plants abate the need for coking coal in the steelmaking value chain, eliminating the need for coal in the ironmaking process.

Global economies and corporate leaders must actively and collaboratively prioritise capital and resources into RD&D to commercialise iron reduction and processing technologies. There is some momentum in the development of decarbonised technologies, with projects shifting up the Technology Readiness Level (TRL) curve in:

- **Renewable hydrogen-based DRI**: Stegra DRI-EAF, HYBRIT DRI-EAF, Hy4Smelt DRI-ESF, Calix ZESTY Flash Ironmaking, Metso Outotec ESF, POSCO HyREX Fluidised Bed DRI, NeoSmelt Australia
- **Electrolysis**: Element Zero, Boston Metals, Electra
- **Emerging pathways**: HELIOS sodium-based reduction

A collective Asian CBAM would generate further revenues to subsidise first-of-a-kind capital deployments in low-emission technologies. An Asian CBAM can provide the impetus to standardise iron and steel carbon accounting methodologies and low-emission definitions to integrate the industry into regional sustainable finance taxonomies to unlock international financing. This can position Asia as a future global leader in clean industrial commodities, as it has successfully achieved with other clean technologies.

Figure B1. Average Emissions in Steel Value Chain from Dominant BF-BOF Pathway



Source: Mineral Research Institute of WA (2023) [39]

[39] MRIWA, WA Green Steel Opportunity, updated 6 November 2023

Box 2. Carbon Pricing Revenues: Enabling Alumina and Aluminium Decarbonisation Technology Commercialisation

A path towards a high carbon price signal for industrial sectors across Asia is critical to accelerating the decarbonisation of aluminium and alumina production. Asia-Pacific accounts for two thirds of global production of aluminium with China at 59% in 2024, and other Asia-Pacific jurisdictions accounting for a combined 9% of global production. China and Australia are the largest producers of alumina globally, accounting for 70% of production in 2024.[40]

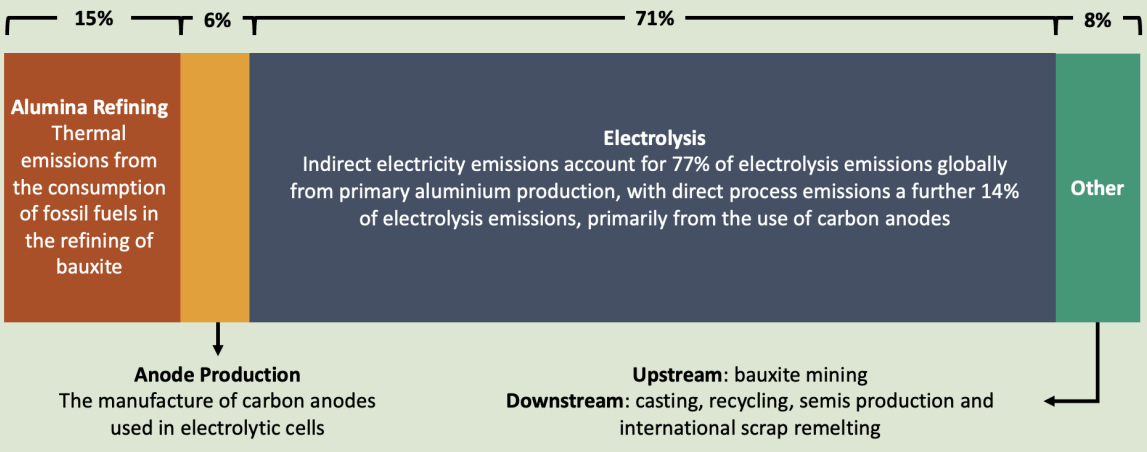
The dominant process for aluminium production is the Hall-Héroult smelting process which uses large amounts of electricity. China's aluminium industry is largely powered by captive coal-fired power plants, with ~ 90% of all energy demand for aluminium from coal, despite the grid intensity of coal falling to 59% across China in 2024.[41] Whilst Australia's aluminium smelters are grid connected, riding the rising share of renewable energy penetration, its alumina refineries remain reliant on fossil fuels for thermal energy requirements. There are a number of technology levers currently under investigation across the value chain:

Electricity decarbonisation: transitioning to renewable energy electricity sources will reduce the use of fossil fuel-based electricity, mitigating Scope 2 emissions in the electrolysis process. (TRL 10)

- **Inert anodes**: Rio Tinto and Alcoa are implementing carbon free smelting cells in Canadian aluminium smelters under the ELYSIS joint venture at demonstration scale. Inert anodes can reduce direct process emissions during electrolysis. (TRL 7)
- **Variable energy smelting**: Technologies like EnPot are commercialising variable energy consumption pots that can fluctuate demand by up to ±30%, allowing smelters to operate on a greater share of intermittent renewable energy and reduce requirements for firming capacity.
- **Alumina refining**:
  - Mechanical vapour recompression (MVR), addressing process emissions from digestion, responsible for 70% of global emissions from alumina refining. (TRL 7)
  - Hydrogen and electric calciners can address the remaining 30% of energy emissions in alumina production, decarbonising the calcination process. (TRL 4-9)

China's coal-fired power plants are now captured under the China national ETS, however, still for now receive 100% free allocation for emissions allowances. Adopting trade-oriented carbon pricing mechanisms is critical to alleviating the challenges of carbon leakage in these key producing economies, and will accelerate the rise in realised carbon prices that will drastically improve the economic case for investments into marginal abatement technologies.

Figure B2. Global Average Aluminium Value Chain Emissions



Source: International Aluminium Institute (2024)

[40] IAI, Primary Aluminium Production 2024, 2024
[41] CEF, Monthly China Energy Update: February 2025, 18 February 2025

Box 3. Carbon Pricing Revenues: Enabling Cement Decarbonisation Technology Commercialisation

An Asian CBAM could support the decarbonisation of cement and lime production across Asia-Pacific, as well as work to harmonise low-emission definitions and emissions verification and certification as global economies increasingly adopt climate policies for trade-exposed industries.

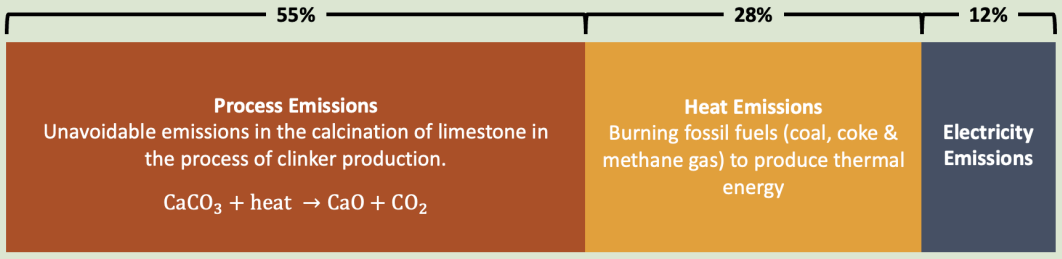
In 2023, global cement production generated 2.4 Bn tCO_2-e, equivalent to ~ 6% of global emissions. 55% of process emissions in the production of Portland cement, the dominant cement composition globally, is due to the release of CO_2 in the calcination of limestone. The use of limestone in the value chain means the generation of CO_2 is unavoidable – see Figure B3. However, there is still a significant portion of emissions across the value chain that can be decarbonised with mature and emerging technologies. For instance, the energy used in the production of cement is heavily reliant on carbon-intensive fossil fuels, with coal and petroleum coke accounting for 77% of energy demand in global cement production, followed by 15% from methane gas, but just 4% from both renewable and non-renewable waste.

To address the issue of process emissions, multiple companies are focussed on the integration of carbon capture, utilisation and storage (CCUS) technologies to abate emissions from the production of lime and clinker. There are a number of decarbonisation technologies under investigation or in phases of development globally, however almost all levers' marginal cost of abatement exceed that of carbon pricing mechanisms in operation.

- **CCUS in calcination**: post-combustion CCUS projects have been trialed at pilot and demonstration scale, with an estimated TRL of 7-8 in 2024. An example of emerging low-emission cement and lime technologies is Calix's Leilac technology, a novel calciner with CCS and indirect flexible heating, with the ability to utilise electricity, biomass and hydrogen at variable production rates.
- **Supplementary cementitious materials (SCMs)**: SCMs, like fly ash, slag and natural pozzolans are relatively mature pathways, with a TRL of 7-9 in 2024, however are limited in wide-scale adoption due to lack of high-quality SCM availability and lack of standardisation.
- **Electrification and alternative fuels**: sustainable waste materials to displace fossil fuels, in conjunction with the use of renewable hydrogen and kiln electrification
- **Electricity decarbonisation**: transitioning to renewable energy electricity sources will reduce use of fossil fuel-based electricity, mitigating indirect emissions in the manufacturing process.

Carbon pricing mechanisms can provide budgetary support measures in key industrial economies to accelerate the deployment of such technologies. The EU Innovation Fund is one of the world's largest funding programs for the deployment of net zero and innovative technologies, aimed at accelerating market solutions to decarbonise Europe's heavy industries, and is 100% funded by the EU ETS. The EU has perfectly demonstrated how carbon taxes and emissions pricing mechanisms can generate huge tax revenues, which can then be directed into technologies, grants, auctions and subsidies to derisk new technology development to underpin the energy transition. From 2020 to 2030, the Innovation Fund is expected to be capitalised to €40bn. The EU Innovation Fund has provided support for a number of large-scale projects to decarbonise cement and lime production, a model which could be replicated in an Asian CBAM.

Figure B3. Global Cement Supply Chain Emissions



Source: Beyond Zero Emissions (2017) [42]

[42] Beyond Zero Emissions, Rethinking Cement: Zero Carbon Industry Plan, August 2017

Section 2. Carbon Pricing Mechanisms

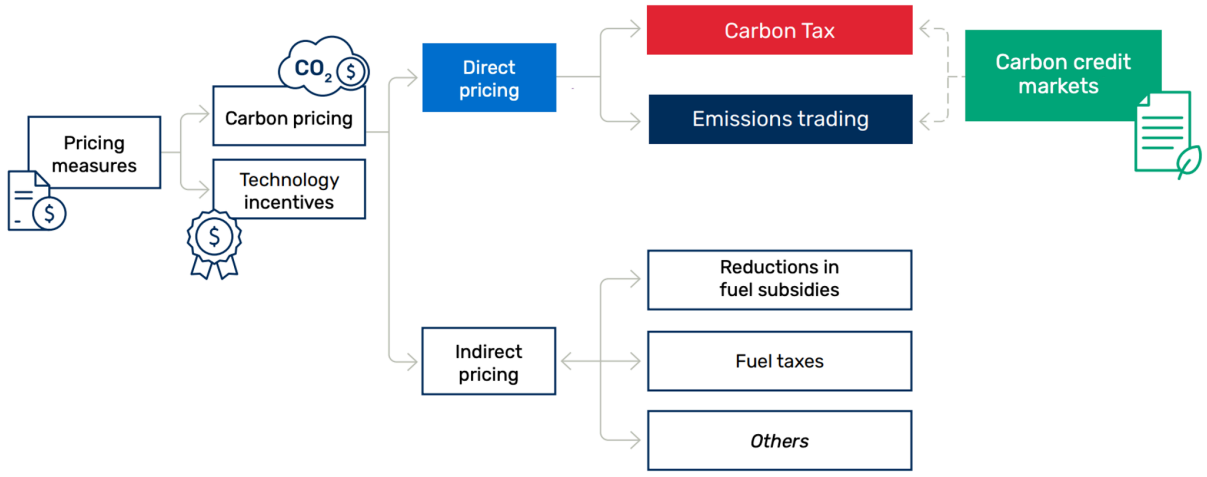
Carbon pricing aims to internalise into corporate balance sheets the currently externalised costs of consumption of carbon-intensive fuels or the use of carbon-intensive industrial processes, to align with the social cost of those activities. If carbon pricing measures are designed with sufficient ambition to mitigate emissions, the burden of carbon imposts creates the economic incentive and price signal required for the changes in investment, production and consumption patterns required to achieve emissions reduction trajectories that are in line with the climate science as well as catalysing and accelerating innovation, development and demonstration of low and zero-emissions technologies.[43]

Direct carbon pricing reduces GHG emissions by introducing a price signal linked to the emissions generated from emissions-intensive processes and consumption. Direct carbon pricing is categorised into 'compliance' instruments or 'carbon crediting' mechanisms (CCM), in which participation is voluntary. The main compliance instruments used globally are carbon taxes, in which governments levy a fee for GHGs emitted, and emissions trading schemes (ETS).

Indirect carbon pricing refers to instruments that change the price of products associated with carbon emissions so that the price is not directly proportional to the actual emissions profile of the product. Indirect pricing instruments are implemented globally, operating both as positive and negative carbon pricing signals.

Fuel taxes, such as the fuel excise and customs duties placed on imported petroleum products into Australia (e.g. diesel), provide an indirect price signal to limit consumption by placing an impost on volumes consumed. Conversely, Australia's Fuel Tax Credit Scheme provides a negative indirect carbon price signal for industrial users of imported diesel fuel in the form of a consumption-linked subsidy that reduces the unit price, incentivising higher consumption of the fuel and therefore increasing carbon emissions. The various carbon pricing mechanisms used in the global policy ecosystem are illustrated below in Figure 2.1.

Figure 2.1: Pricing policy ecosystem



Source: World Bank [44]

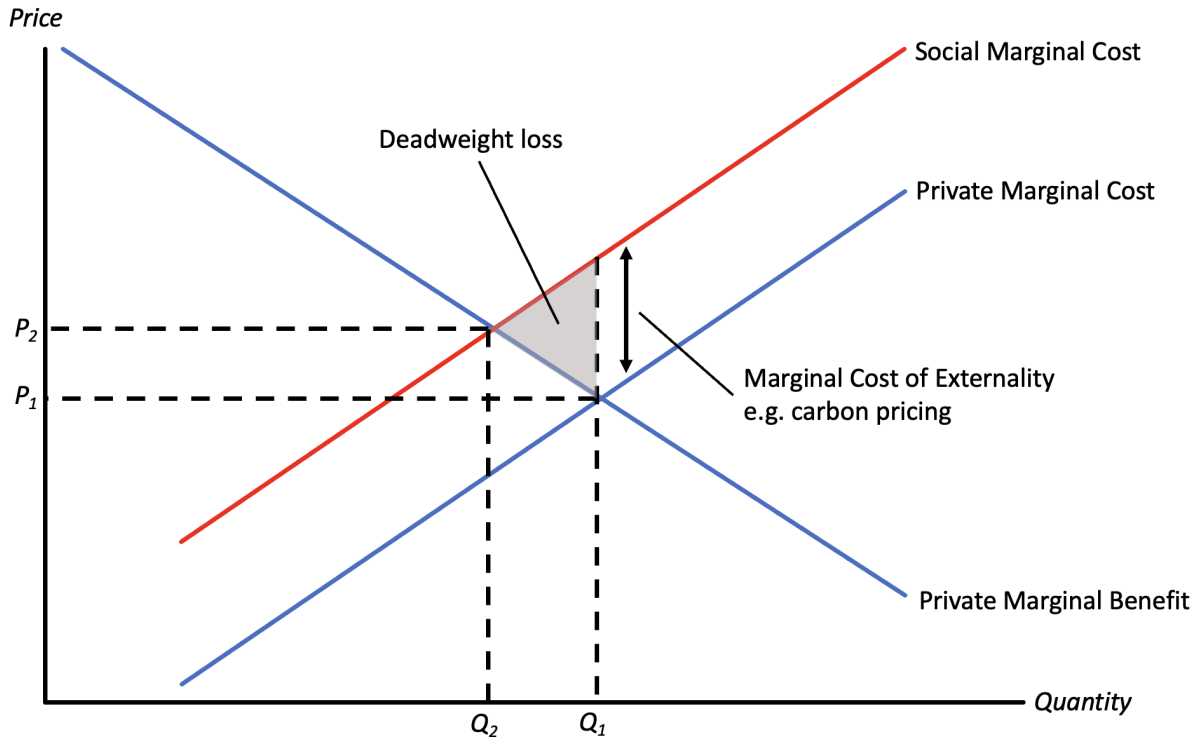
[43] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[44] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024

In October of 2006, Lord Nicholas Stern, IG Patel Professor of Economics at the London School of Economics, Chairman of the Grantham Research Institute on Climate Change and the Environment, and former Chief Economist of the European Bank for Reconstruction and Development, published the 'The Economics of Climate Change: The Stern Review', one of the most influential finance reports on climate change ever produced.[45] The message was clear: 'The problem of climate change involves a fundamental failure of markets: those who damage others by emitting greenhouse gases generally do not pay.' Stern said:

'Climate change is a result of the greatest market failure the world has seen. The evidence on the seriousness of the risks of inaction or delayed action is now overwhelming. We risk damages on a scale larger than the two world wars of the last century. The problem is global, and the response must be a collaboration on a global scale'.[46]

The user-pays principle is the principle that all costs associated with the use of a resource should be included in the price of the goods and services that result from the use. Under the European Environment Agency's definition in relation to the consumption of natural resources, the user-pays principle calls upon the user of a natural resource to bear the cost of running down natural capital - see Figure 2.2.[47]

Figure 2.2: Economics of Negative Externalities



Source: Climate Energy Finance

Carbon pricing mechanisms contribute towards environmental and decarbonisation objectives via the least-cost pathway. When an entity is required to evaluate a set of currently available mitigation options or the prevailing carbon price, an entity will always opt for the lowest marginal cost of abatement.

[45] LSE, The Economic of Climate Change: The Stern Review, 30 October 2006
[46] The Guardian, Stern: Climate Change a 'Market Failure', 29 November 2007
[47] European Environment Agency, User-pays Principle

An implementation gap remains between countries' commitments towards climate change mitigation and implemented policies. As of April 2024, there are 75 ETS and carbon tax mechanisms in operation worldwide, covering ~ 24% of global emissions. However, carbon price levels continue to fall short of the ambition needed to achieve the Paris Agreement goals.

An absence of compliance carbon pricing in high-emission sectors will result in an over reliance by industrial entities on voluntary participation in **carbon credit markets (CCMs)** in the guise of meeting corporate social responsibilities. CCMs trade carbon credit units that are generated through voluntarily implemented mitigation activities. Carbon credits can represent emissions reductions or emission avoidance, as well as emissions removal from the atmosphere, i.e. sequestering carbon through afforestation or direct carbon capture and storage (CCS). Carbon credits are retired once the benefit has been claimed for voluntary or compliance purposes. The most common form of CCMs are:

- **International CCMs**, which are administered by an international organisation with authority of national governments, this includes mechanisms like Article 6 of the Paris Agreement.
- **Governmental CCMs**, which are administered by one or more governments, including Australia's Carbon Credit Unit (ACCU) Scheme.
- **Independent CCMs**, which are administered by non-governmental organisations, such as Verra and Gold Standard.

To drive real decarbonisation at a speed and scale commensurate with the urgency required to limit global warming and the devastating global effects of climate change, it is critical for economies to develop national compliance pricing mechanisms that can effectively integrate into an international ecosystem.

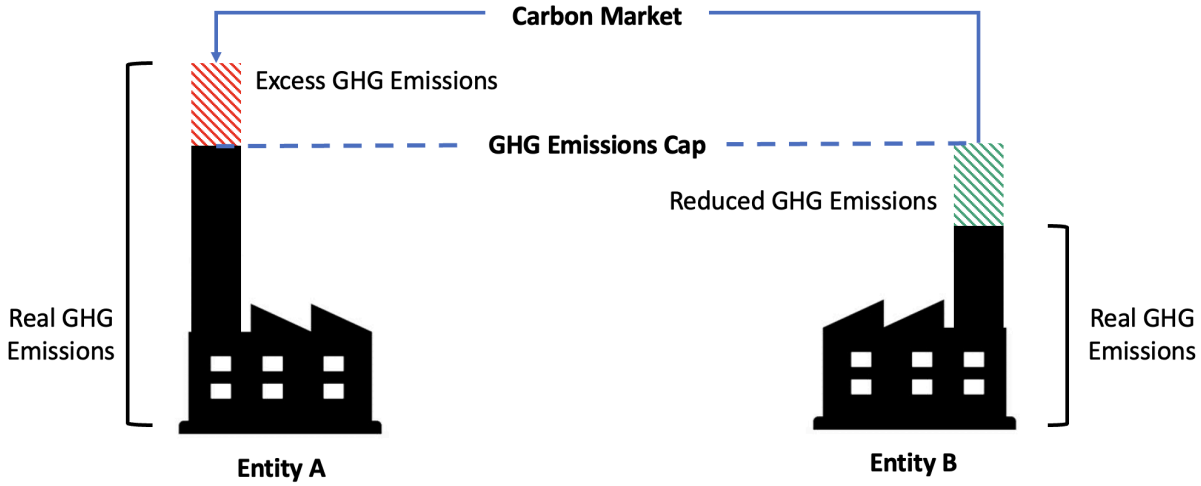
Emissions Trading Schemes

In an **ETS**, the government places a limit on the amount of allowed GHG emissions from covered entities. Entities must surrender emissions units to cover their emissions within a compliance period. Each unit represents the right to emit a certain volume of emissions, and can be traded between covered entities.[48] The carbon price of emissions units in an ETS is typically dictated by market dynamics, with prices a function of supply and demand of the emissions units. ETSs may be structured as cap-and-trade schemes or baseline-and-credit schemes.

A **cap-and-trade mechanism** is a tradable permit system for GHG emissions. The governing body sets a limit (cap) on the GHG emissions that can be emitted, with entities covered by the mechanism required to hold an emission unit for each tonne of GHG emitted. The total number of allowances reflects the size of the cap in the ETS.[49] As such, the carbon price is dependent on the supply-demand equilibrium of allowances. Once a cap is established, the governing body distributes tradable permits, either through free allocation, or through auctions. An example of the trading mechanism between entities is shown in Figure 2.3.

[48] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[49] UNFCCC, Cap-and-trade Programme

Figure 2.3: Schematic of a Cap-and-Trade Mechanism

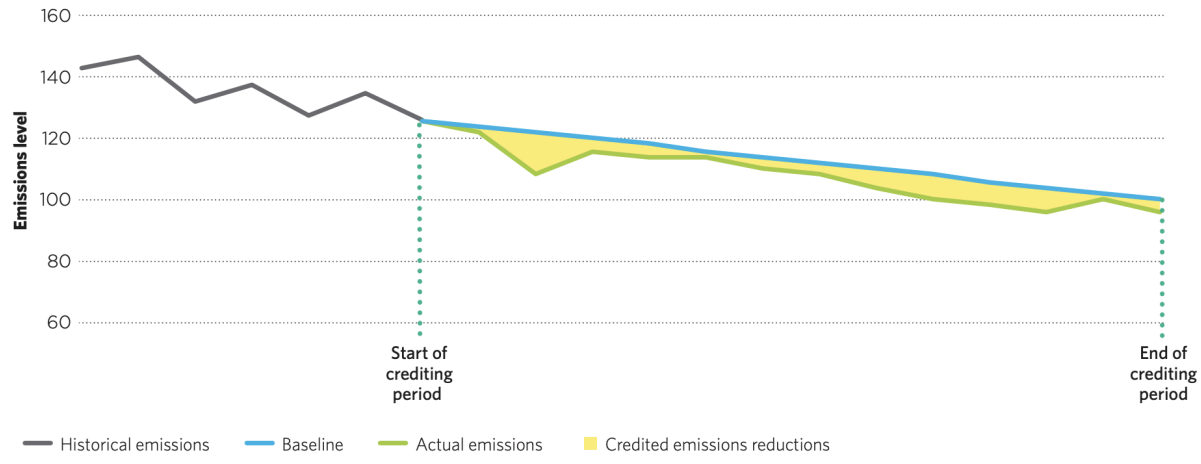


Source: Climate Energy Finance

Baseline-and-credit schemes identify, measure and provide incentives (credits) for activities that reduce emissions below a baseline. A baseline is established against which performance can be measured, forming a pathway between now and the future, and represents a scenario of emissions levels in the absence of an emissions production project.[50] An illustration of the mechanism is shown in Figure 2.4.

If a covered entity generates emissions below the baseline during a specific time period, it is eligible to generate credits. Entities that generate credits are able to sell excess supply on the ETS. Various baseline-and-credit ETSs implemented globally allow for credits to be banked for future emissions reductions, or borrowed from future periods. Alternatively, an entity that generates emissions above the emissions intensity baseline is liable to purchase credits or borrow from future periods.

Figure 2.4: Schematic of a Baseline-and-Credit Mechanism



Source: Climate Change Authority [51]

[50] Climate Change Authority, Key Characteristics of Baseline and Credit Schemes, June 2020
[51] Climate Change Authority, Key Characteristics of Baseline and Credit Schemes, June 2020

A key distinction between the **ETSs** mentioned above is that a cap-and-trade mechanism requires covered entities to obtain permits **before** GHGs are emitted, as the allowances represent the right to emit a specific quantity of GHGs. Conversely, a baseline-and-credit mechanism provides credits for emissions avoidance relative to a baseline, **after** the GHGs have been emitted.

In cap-and-trade schemes, the allocation of emission allowances are typically distributed freely, or sold on auction. The distribution of free allocations is predominantly via grandparenting or benchmarking criteria.

Grandparenting refers to allocating allowances according to an entity's historical emissions in a base year or period. Grandparenting tends to disproportionately favour high emitters, thus improving the political feasibility of implementation as it avoids high initial costs for covered entities, and has a history of being badly gamed by incumbent vested interests to delay / defray the real cost of compliance and decarbonisation. Benchmarking refers to distributing allowances based on performance indicators, rewarding energy efficient installations and facilitates a more efficient integration and assimilation of new facilities.[52]

Auctions have the advantage of more accurately reflecting allowance demand and providing covered entities the equal opportunity to purchase credits. A key advantage of auctions is the ability to **generate revenues** for the regulator/governing body that can be directed into support for other climate change mitigation policies. Carbon pricing revenues exceeded US$104bn for the first time in 2023, driven primarily by the higher prices realised in the EU ETS.[53]

Auctions form the primary market, with either static or dynamic auctions revealing the carbon price bidders are willing to pay on the secondary trading market, in which allowance prices are determined by market forces of supply and demand in the trading scheme.

All but four ETSs in various jurisdictions around the world freely allocate allowances to varying degrees, mostly as a way of easing the transition to a carbon-constrained world and protecting the competitiveness of domestic industries while still providing a price signal to incentivise emissions reduction. More than a third of ETS globally freely allocate 100% of allowances. The EU and New Zealand both allocate ~50% of their allowances for free as of April 2024. The compliance mechanisms adopted to date that do not provide free allocation are:[54]

- **Austrian National ETS** (NEHG): established in October 2022 to cover fossil fuels that were not already covered by the EU ETS. The NEHG did not introduce a new carbon price, but built on the existing energy taxes (fuel tax, coal tax, and natural gas tax), with the production, import, or supply to consumers as taxable events. Only a limited number of energy distributors and producers are subject to the NEHG. The current allowance price is set at €55/t in 2025.
- **German National ETS**: established in 2021 to cover fuel emissions not covered by the EU ETS. The scheme is phased-in over time with an increasing fixed price per tonne of CO_2 through to 2026, followed by auctions with minimum and maximum prices thereafter. The fixed price was set at €45/t in 2024, up from €30/t in 2023. In 2024,

[52] ICAP, Allocation: How Emissions Allowances are Distributed (Brief 5), 14 December 2023
[53] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[54] Information provided below is extracted from the International Carbon Action Partnership ETS Map.

the German National ETS generated €12.97bn in government revenues, making it the second largest ETS by revenue adopted globally, behind only the EU ETS.[55]

- **US Regional GHG Initiative** (RGGI): A mandatory ETS covering ten north-eastern states, with a 30% reduction in the aggregate emissions cap to 2030 relative to 2020. All RGGI covered facilities must surrender allowances for all covered emissions. In 2023, the weighted average auction price was US$12.81/t.
- **Massachusetts Limits on Emissions from Electricity Generators**: established in 2018 to cover the power sector in the state, and complement the RGGI. Since 2021, 100% of allowances are auctioned off quarterly, with revenues generated directed towards further GHG emission reduction initiatives, as well as fund adaptation programs and projects targeting communities adversely impacted by air pollution. The Scheme places a cap on emissions from the power sector, declining by 223,876 tCO_2 pa until the sector reaches 1.8 $MtCO_2$ by 2050. In 2024, the cap was set at 7.6 $MtCO_2$. In 2023, the weighted average auction price was US$8.77/t.

As CEF emphasises throughout this report, the key to phasing out free allocation in both dynamic price and fixed rate carbon markets is the introduction of carbon border adjustment mechanisms to address the challenges of carbon leakage. Asia is responsible for the vast majority of the production of emissions-intensive, trade-exposed products. Implementing a timely, regulated, and progressively-rising carbon price in Asia is key to decarbonising industry in the region at speed and scale, with global implications for emissions reduction.

Carbon Taxes

Through a **carbon tax**, a government levies a fee on covered entities for their GHG emissions, providing a financial incentive to reduce emissions. Under a consumption-based carbon tax, the government sets the price on carbon emissions, with the resulting volume of emissions reductions achieved by the policy determined by the response of the emitting entities to the carbon tax.[56]

As of April 2024, there are 39 carbon taxes implemented globally, slightly higher than ETSs (36). Of the top 10 highest carbon prices in compliance markets, 8 are carbon taxes, including Uruguay, Liechtenstein, Switzerland, Sweden, Finland, Norway, Netherlands, Ireland and Canada.[57] There are a number of different carbon tax schemes globally, with the main variations being the mechanism to distribute the income generated by the tax or carbon levy.[58] These include:

- **Fee and Dividend**: a carbon fee is imposed upon fossil fuel companies, based on the CO_2-e content of fossil fuels produced when they are extracted (i.e. well or mine), or when imported (collected at port of entry). The fee is progressive, rising over time to accelerate progress. All fees collected are distributed as a dividend to every legal resident on an equal basis, eliminating the issue of regressive taxation mechanisms that disproportionately benefit high-income individuals.

[55] ICAP, Allowance Price Explorer
[56] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[57] World Bank, State and Trends of Carbon Pricing Report 2024, 21 May 2024
[58] Daniel H. Miller and Dr James E. Hansen, Why Fee and Dividend Will Reduce Emissions Faster Than Other Carbon Pricing Policy Options, November 2019

- **Fee and Tax Offset**: a carbon fee structure is set and collected analogous to a fee and dividend scheme, however the income is used to offset a different tax liability, e.g. corporate income tax or personal income tax rates. Tax offset schemes inherently benefit corporations and high-income individuals, as unlike tax credits, offsets cannot be carried forward into future income periods, thus benefiting lower-income levels the least. In this system, those on lower incomes indirectly pay for the levies as higher costs are passed onto to consumers.
- **Fee and Spend/Block Grants**: carbon fees are collected as above, however tax incomes are used for government expenditure (spend) or distributed to state governments (block grants). An advantage of this scheme is the ability for governments to direct carbon tax incomes into clean energy projects and budgetary measures that incentivise and facilitate industrial decarbonisation and demand-destruction of fossil fuels.

An example of a carbon tax (fee) mechanism was Canada's Federal Fuel Charge, a consumption-based levy on the consumption of fuels like gasoline (petrol) and natural gas. Provinces and territories decide on a levy for their respective regions, as long as it meets or exceeds the minimum national standard – the federal benchmark. The benchmark was set at \$50/t CO_2-e in 2022, rising by C\$15/t each year to C\$170/t in 2030. In 2025 (C\$95/t), the Federal Fuel Charge for gasoline is set at C\$0.2091/litre (i.e. 2.2kg CO_2/litre).[59]

The carbon pricing scheme was essentially a fee and dividend structure, with all income generated by the Federal Fuel Charge and provincial/territorial equivalents returned as a dividend directly to individuals via the Canada Carbon Rebate, with a proportion directed to farmers, SMEs and Indigenous governments.

However, following the inauguration of Mark Carney as Leader of the Liberal Party and Prime Minister of Canada in March 2025, the Federal Fuel Charge was scrapped, prioritising the introduction of a suite of electrification and decarbonisation incentives to promote the adoption of clean technology. The Carney Government has continued the Federal Carbon Benchmark, and plans to strengthen the industrial emitter carbon pricing mechanism, the Output-Based Pricing System (OBPS) (Canada's industrial ETS), as well as introduce a national CBAM to accelerate industrial decarbonisation.[60]

In Australia, renowned economist Professor Ross Garnaut and public policy expert Professor Rod Sims – co-founders of The Superpower Institute – have put forth the case for a Carbon Solutions Levy (CSL).[61] The CSL would impose the European carbon price (EUA (EU allowances) secondary market price) on every tonne of carbon extracted from below the ground or imported into Australia. If implemented by 2030-31, the CSL could generate an annual revenue in excess of \$100bn.[62]

The proposal would allocated revenues generated by the CSL to:

- A new Superpower Industries Innovation Scheme (SIIS) to support early investments into new green economy industries. The SIIS would be administered by the Australian Renewable Energy Agency (ARENA), providing grants of up to 50% of capital costs for

[59] Government of Canada, Fuel Charge Rates for Listed Provinces and Territories 2023-2030, 03 December 2021
[60] Mark Carney, Mark Carney Presents Plan for Change on Consumer Carbon Tax, January 2025
[61] The Superpower Institute, Restoring Prosperity by Building the Superpower, 14 February 2024
[62] The Conversation, Ross Garnaut and Rod Sims have Proposed a \$100 billion-a-year Fossil Fuel Tax – and it's a Debate Australia Should Embrace, 16 February 2024

at least the first 103 facilities, up to a cap, depending on how much learning and scale can be leveraged.
- Support the financing of the enabling electricity transmission infrastructure and hydrogen storage and transport necessary to realise Australia's superpower opportunity.
- Reduce the taxpayer-funded liabilities of the Capacity Investment Scheme (CIS) to accelerate renewable energy generation and storage deployments.

As part of the CSL proposal, The Superpower Institute has advocated for the implementation of an Australian CBAM to ensure local industries are not disadvantaged by the levy, and allow green products to compete within Australia on a levy playing field with those that contribute to global warming.

Carbon Border Adjustment Mechanisms (CBAMs)

Building on domestic carbon pricing mechanisms, including variations of ETSs and carbon taxes, are policies designed to equalise the effective carbon price paid for goods, irrespective of climate policies implemented in a jurisdiction where goods are produced and subsequently exported. The policy objective of a CBAM is to achieve climate policy parity between goods produced domestically within the scope of a carbon pricing regime, and that of imported internationally produced goods, thereby avoiding carbon leakage while providing an incentive to decarbonise production pathways and commercialise low-emission technologies.[63]

Most ETSs and carbon taxes implemented globally to date utilise facility-level, or installation-level, activity-based or measurement-based carbon accounting methodologies to determine carbon emissions. This practice can be effectively implemented in both baseline-and-credit and cap-and-trade mechanisms, as the ultimate objective of these climate policies is to reduce emissions intensity and aggregate emissions across covered sectors.

As discussed in Section 3.2 below, the EU will soon phase in the world's first CBAM to complement and strengthen its supranational ETS. The verification of facility-level emissions reporting for product carbon footprint declarations of imported goods remains a global challenge, and may translate to increased reliance on product-specific default average emissions intensity determinations to supplement accurate, measured emissions data. As domestic carbon pricing mechanisms continue to be implemented globally, and subsequent carbon border adjustments introduced, the harmonisation and standardisation of emissions accounting methodologies will become imperative as greater emphasis is applied to supply chain transparency and product-level sustainability reporting.

In Section 6, CEF proposes the integration of independently-verified carbon accounting frameworks, based on internationally-recognised standards set by International Organisation for Standardisation (ISO), into compliance frameworks (e.g. EU CBAM-approved methodologies), providing a pathway to harmonise carbon compliance. This could also provide the mechanism to expand the future scope of carbon border adjustments from manufacturing Scope 1 and 2 emissions, to broader Scope 3, embedded value chain emissions.

[63] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024

Section 3. EU ETS and CBAM: The Benchmark

Section 3.1. EU ETS

Established in 2005, the European Union ETS (EU ETS) was the world's first supranational ETS. The ETS was the EU's policy response to their commitments under the UNFCCC's Kyoto Protocol – the international climate agreement that recognised the role industrialised economies played in the growth of GHG emissions, requiring industrialised countries to reduce GHG emissions in accordance with an agreed country-specific target. The Protocol was adopted on 11 December 1997, but owing to a complex ratification process, did not come into force until 16 February 2005.

Introduced as the first cap-and-trade carbon mechanism 20 years ago, the EU ETS is now the most developed and effective compliance carbon pricing mechanism implemented globally. The EU ETS had a phased introduction, and has been enhanced in subsequent phases to improve the effectiveness of the policy to drive decarbonisation. Whilst the EU ETS in 2025 is an effective price signal in the EU electricity sector, the first decade of its implementation was badly gamed by incumbent vested interests, a lesson new ETS implementations need to avoid given the clear climate science-driven need for action, noting other developed markets have benefitted from the last two decades of near 100% externalisation of their carbon pollution costs.

Phase 1 (2005-07):

- The initial 3-year ETS pilot phase of 'learning by doing' to develop the necessary policy instrument to meet its legally-binding emissions reduction target established under the 1997 Kyoto Protocol. The ETS only covered carbon emissions from power generators and energy-intensive industries. Penalty for non-compliance was capped at €40/t.
- Phase 1 allowed the EU to develop the infrastructure needed to monitor, report and verify emissions from the entities covered, as well as facilitate free trade in compliance credits across the trading bloc. The initial phase was successful in establishing a recognised price on carbon.
- During the pilot phase, almost all emissions allowances were freely allocated. Issuance far exceeded actual emissions, placing significant downward pressure on prices, eventually falling to zero. Importantly, the design of the pilot meant credits banked could not be carried forward into the subsequent phase.

Phase 2 (2008-12):

- In Phase 2, the EU ETS was expanded to Iceland, Liechtenstein and Norway. Covered entities were also permitted to surrender international credits, totalling ~1.4Bn t CO_2-e over the phase.
- The accounting methodologies and verification of emissions data in Phase 1 informed the subsequent phase to more accurately allocate allowances, and thus reduced the cap on the scheme. The proportion of free allocation fell to ~90% over the period. The penalty for non-compliance was increased to €100/t.

Phase 3 (2013-20):

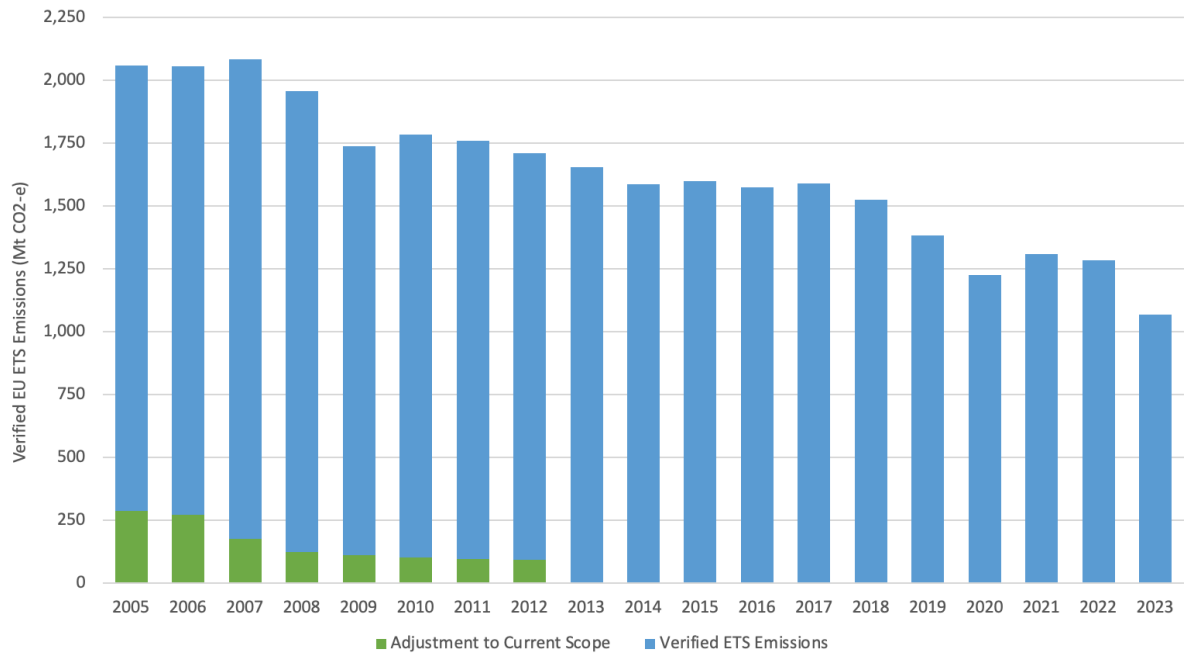
- In Phase 3, the EU introduced a single EU-wide emissions cap, replacing the previous national emission caps. Auctioning became the default method for allowance allocation.

Phase 4 (2021-30):

- In July 2021, the EU Commission introduced the 'Fit for 55' package – a set of proposals to reform the trading bloc's climate and energy policy, a package that introduced the Green Deal, designed to achieve climate-neutrality by 2050 and decouple growth from resources use, and strengthened the ambition of the ETS to reduce EU emissions by at least 55% by 2030.
- The reforms to the EU ETS lifted the target to 62% below 2005 by 2030 for covered entities, up from the previous target of a 43% reduction, ensuring the EU will meet its legal obligation under the Fit for 55 targets. This was achieved by raising the linear reduction factor (LRF) from 2.2% to 4.3% from 2024-27, and to 4.4% from 2028-30, as well as two rebasings of the cap, reducing by 90 Mtpa in 2024 and an additional 27 Mtpa in 2026.[64]

From 2005 to 2023, the EU ETS helped drive down emissions from electricity, heat generation and industry by 47%, while simultaneously generating over €200bn in auction revenues, generating nearly €44bn in 2023 alone.[65] From 2005 to 2023, accounting for the expanded scope of the current EU ETS, emissions have fallen by a CAGR of -3.6% and -4.3% since 2013 (Phase 2) – as shown in Figure 3.1.1.

Figure 3.1.1: EU ETS Verified Emissions from Stationary Installations



Source: European Environment Agency [66]

[64] International Carbon Action Partnership, EU Adopts Landmark ETS Reforms and New Policies to Meet 2030 Target, 03 May 2024
[65] EU Commission, 2024 Carbon Market Report, 19 November 2024
[66] European Environment Agency, EU Emissions Trading System (ETS) Data Viewer, updated 11 September 2024

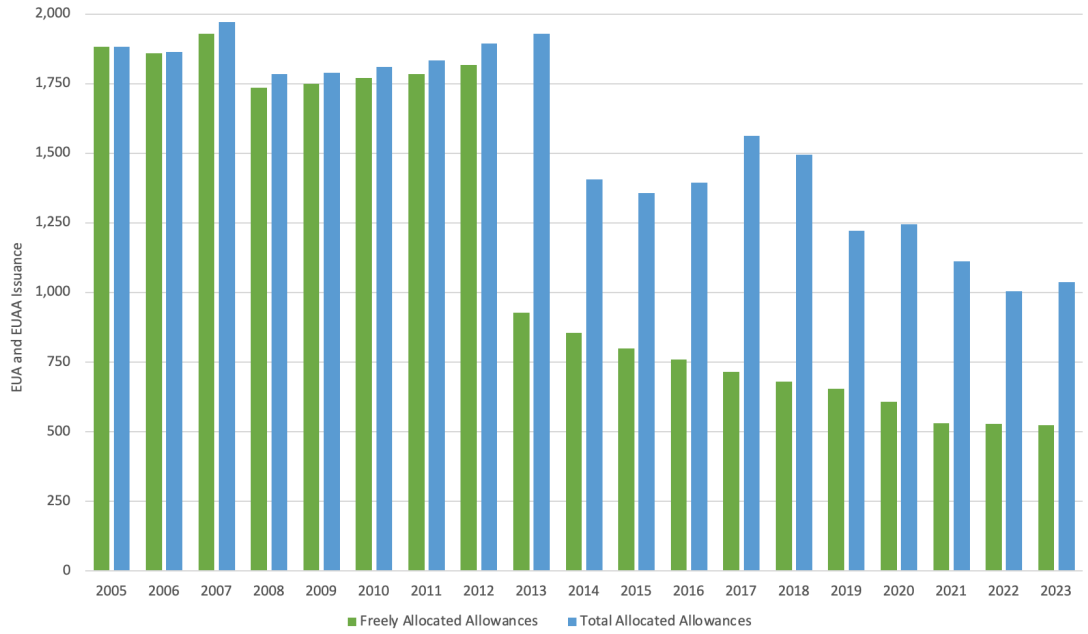
In 2023, 513,644,500 EU allowances (EUAs and EUAAs) were auctioned or sold generating total revenues of nearly €44bn. This is primarily directed into Member States' budgets, in addition to the Innovation and Modernisation Funds, as well as the Resilience and Recovery Facility's budget for the REPowerEU plan, designed to phase out Russian fossil fuel imports.[67]

In 2018, the EU established the **Market Stability Reserve** (MSR) to promote long-term balance and resilience in the EU ETS. As a result of the 2008 global financial crisis, emissions were considerably lower than anticipated, lowering demand for allowances. Combined with a high influx of international carbon credits, which were able to be used in exchange for EUAs (up until 2020), the surplus of allowances in the ETS exceeded 2.1 billion (2.1Bn t of CO_2-e) in 2013.[68]

The MSR adjusts the supply of allowances to be auctioned based on the total number of allowances in circulation (TNAC). When the TNAC exceeds 833 million, the MSR withdraws allowances from auctions, reducing future supply. When the TNAC falls below 400 million, the MSR releases 100 million allowances for auction. On 01 January 2023, 2.5 billion allowances in the MSR holdings were invalidated. On 01 January 2024, a further 381 million.

Whilst auctioning is currently the main method for allowance distributions in the EU ETS, a significant volume of allowances allocated to installations are free – see Figure 3.1.2. Free allocation is a transitional measure used to address specific industrial sectors at risk of carbon leakage, or emission-intensive trade-exposed (EITE) sectors. Free allocation is based on specific sector performance benchmarks, which reflect an average emissions intensity of the 10% most efficient installations in each sector. Emissions beyond the benchmarks require allowances to be bought on the market. Such benchmarks are also reduced incrementally over time to incentivise sector decarbonisation.

Figure 3.1.2: EU Allowances Issued and Allowances Freely Allocated



Source: European Environment Agency [69]

[67] EU Commission, 2024 Carbon Market Report, 19 November 2024
[68] EU Commission, Market Stability Reserve
[69] European Environment Agency, EU Emissions Trading System (ETS) Data Viewer, updated 11 September 2024

The EU's carbon leakage list identifies the sectors at risk of carbon leakage, with such industries eligible to receive free emissions allowances. The current list for 2021-30 identifies 63 sectors[70] and sub-sectors covering ~94% of industrial emissions in the EU ETS.[71]

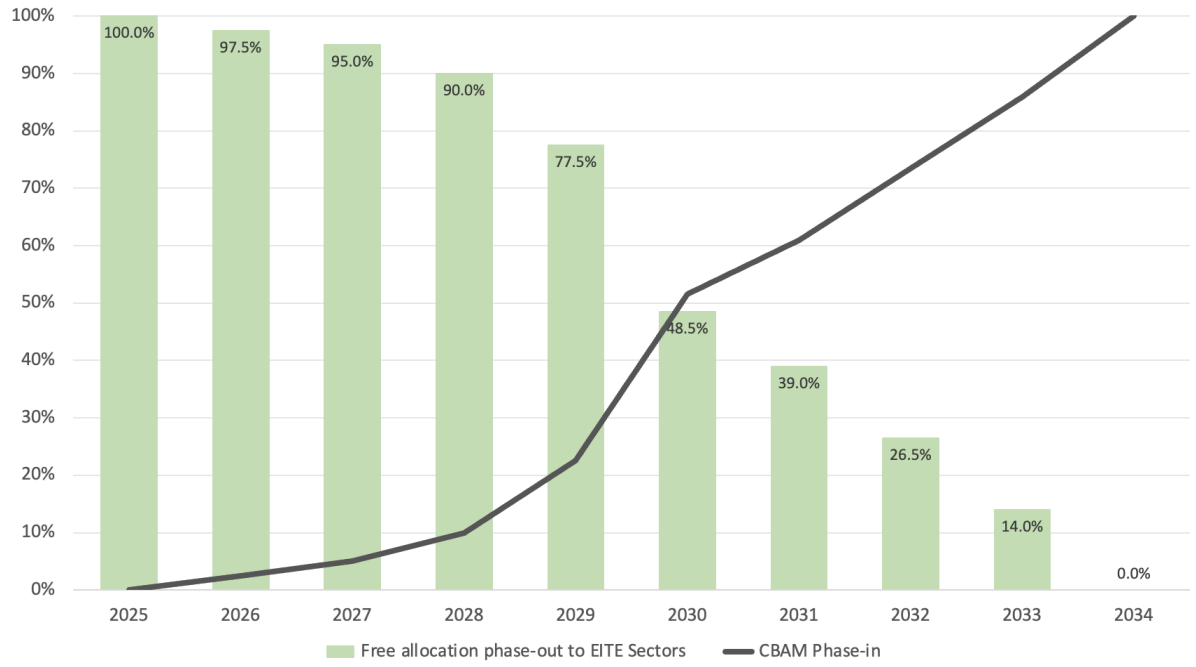
Without a pricing mechanism to impose equivalent carbon costs on imports of emissions-intensive products, EITE entities will continue to delay investments into material emissions reduction solutions, as the entities are not required to pay the carbon cost up until the benchmark emission intensity.

Section 3.2. EU CBAM

The EU's landmark 2023 reforms to the EU ETS included the introduction of the EU CBAM to address the risks of carbon leakage and accelerate investments into decarbonisation for domestic producers within emissions-intensive industries. The EU CBAM provides the mechanism to verify embedded carbon emissions generated in the production of specific goods imported into the EU, imposing an equivalent carbon price to bridge the gap between any carbon prices paid prior, and the carbon price that is paid by a domestic producer of the same product.

Such a mechanism will allow for the phase-out of the temporary measures of free allocation of allowances to trade-exposed industrial emitters in the EU, with the proportion of freely distributed allowances falling in line with the share of emissions covered for imported goods. In 2026, the rate of free allocation for domestic producers will fall by 2.5%, meaning an effective 97.5% proportion of free allocation. The rate will progressively ratchet up until no producer receives freely distributed credits by 2034 – demonstrated in Figure 3.2 below.

Figure 3.2: Phase-in of CBAM will Phase-out Free Allocation for Industry



Source: European Parliament [72]

[70] See Appendix A for the list of products on the EU carbon leakage list over Phase 4 (2021-30).
[71] EU Commission, 2024 Carbon Market Report, 19 November 2024
[72] European Parliament, At a Glance: Fit for 55 Explainer: Carbon Border Adjustment Mechanism, 2023

The EU CBAM will be introduced in phases, with the initial transitional phase from 2023-25, and the definitive regime from 2026 onwards. From 2026, EU importers will be required to register with national authorities to purchase CBAM certificates, the price of which will be calculated depending on the weekly average price of EU ETS allowances. Importers will be required to declare embedded emissions and surrender the corresponding number of CBAM certificates annually. If importers can prove that a carbon price has already been paid during the production of the imported goods, the corresponding amount can be deducted.

On 01 October 2023, the CBAM was applied, with the first reporting period for importers ending 31 January 2024. During this period, importers of goods will only have to report embedded GHG emissions (both direct and indirect), without the need for the purchase and surrender of CBAM certificates.

The CBAM will initially apply to imports and precursors of **cement**, **iron** and **steel**, **aluminium**, **fertilisers**, **electricity** and **hydrogen**.

For non-EU producers of products initially covered under the EU CBAM, producers will be required to report to the importing entity or customs representatives on a quarterly basis. Emissions reporting obligations are detailed in CBAM Regulation (EU) 2023/956, with the application of the Regulation detailed in Commission Implementing Regulation (EU) 2023/1773.[73] Reporting requirements include:

- The **quantity** of the commodity exported into the EU during the previous quarter
- **Direct CO_2 emissions** embedded during the production of the goods exported, at installation or production site level
- **Indirect emissions** embedded in the goods resulting from the production of electricity which is consumed during the production of the goods
- **Any carbon price due or paid** in the country of origin for the embedded emissions in the imported goods, minus any rebate or other forms of compensation (e.g. freely allocated emissions allowance)
- Contextual information on the imported goods related to the **production route** and any relevant **sector-specific parameters** outlined under the CBAM regulation legislation.

On 06 February 2025, the European Commissioner for Climate Action, Wopke Hoekstra, told the UK Financial Times the EU wanted to restrict the CBAM to the largest importers of emissions-intensive products, reducing the administrative and compliance costs for more than 80% of EU companies through an exemption to imported emission monitoring and reporting. The objective of the compliance exemption would be a part of the trading bloc's push to drastically reduce red tape and boost productivity.[74]

During the CBAM's transitional phase, a report to the European Commission identified only 10% of companies in Germany and Sweden expected to report embedded emissions had done so, which included companies that would be outside of the initial scope of the CBAM. Less than 20% of the companies in the CBAM scope are responsible for more than 95% of the emissions embedded in imported products.

On 26 February 2025, the Commission adopted an 'Omnibus' package of proposals aimed at reducing the administrative and compliance costs for SMEs across EU sustainability reporting

[73] Official Journal of the EU, Commission Implementing Regulation (EU) 2023/1773, 17 August 2023
[74] FT, Brussels to Exempt Most EU Companies from Carbon Border Tax, 06 February 2025

taxonomies, namely sustainable finance reporting and due diligence, European investment programmes and the EU CBAM. The Commission expects the Omnibus measures will deliver total annual administrative cost savings of ~€6bn and to mobilise additional public and private investment capacity of €50bn.[75]

The Omnibus package has received significant pushback from environment organisations, with the reforms marked as a major setback for transparency, accountability and sustainable finance. The Corporate Sustainability Reporting Directive (CSRD), the Corporate Sustainability Due Diligence Directive (CSDDD) and the EU Taxonomy are the backbone of Europe's corporate sustainability framework, which are essential to unlocking the investments needed to bring the EU Green Deal to life.[76]

As part of the simplification measures applicable to the EU CBAM, the Commission has:

- **Exempted small importers** from CBAM obligations, mostly SMEs and individuals. This will be managed via the introduction of a new CBAM cumulative annual threshold of 50 tonnes of material per importer, thus eliminating obligations for 90% of importers (~182,000), whilst still covering over 99% of emissions in the original scope.
- **Simplified compliance** for entities that remain in scope, including the calculation of embedded emissions and reporting requirements and the authorisation of CBAM declarants (i.e. importers of CBAM products).

As it relates to emissions accounting and reporting requirements, the new amendments include:[77]

- The simplification of the use of default values for emissions reporting, with default values set to be based on the average emissions intensity of the ten highest-emitting countries for which reliable data is available, thus providing strong carbon leakage protection.
- A change to the calculation of downstream processing emissions for steel and aluminium, which will no longer need to be calculated separately, instead focusing on precursor materials used in production. If imported steel or aluminium is produced in a jurisdiction that is not covered by an ETS, the reporting activity will only require a mass allocation of precursor materials to finished products.

The sale of CBAM certificates will begin in February 2027, pushed back from the previous requirement to purchase and deposit CBAM certificates quarterly in 2026. However, the **financial obligation remains unchanged**, with importers required to surrender CBAM certificates in 2027 for emissions embedded in products imported in 2026. While the CBAM certificate sales will be deferred, the financial risk will not be, with carbon cost obligations still beginning on 1 January, 2026.[78]

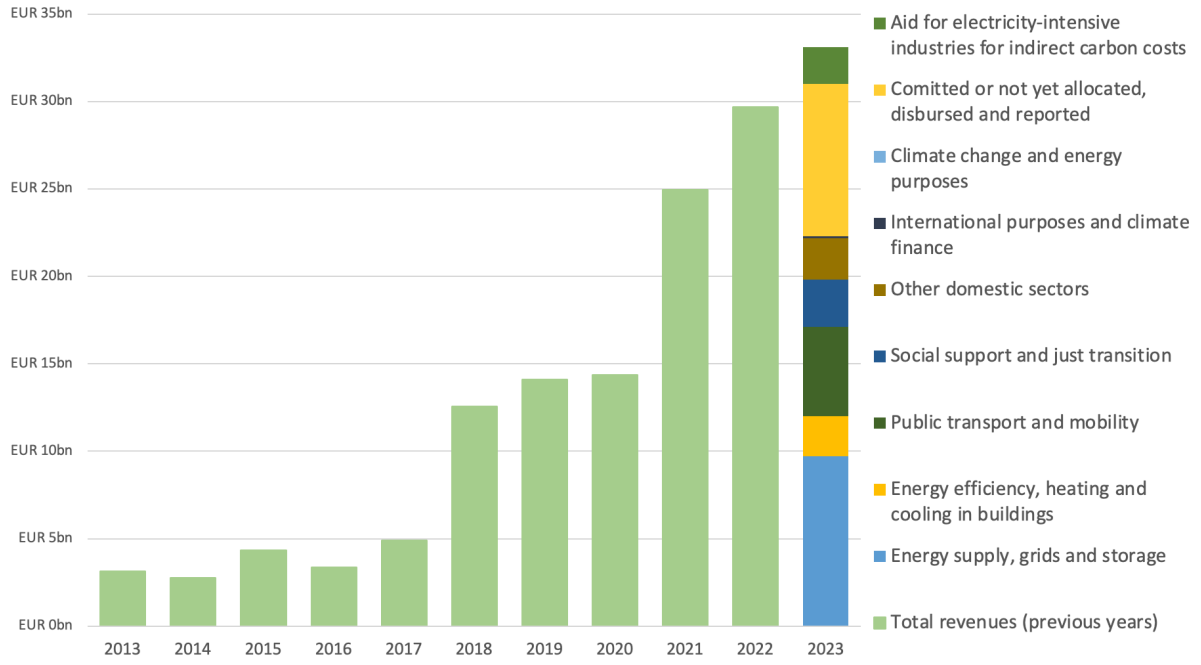
[75] EU Commission, Commission Simplifies Rules on Sustainability and EU Investments, Delivering over €6 billion in Administrative Relief, 26 February 2025
[76] WWF, Von der Leyen's Deregulation Omnibus: A Devastating Blow to EU Environmental Objectives, 26 February 2025
[77] Carbon Chain, Nativating CBAM Changes: What Importers and Manufacturers Must Prepare For, 26 February 2025
[78] EU Commission, Proposal for a Regulation of the European Parliament and of the Council Amending Regulation (EU) 2023/956 as Regards Simplifying and Strengthening the CBAM, 26 February 2025

Section 3.3. Revenues Generated from EU ETS and CBAM

In 2023, total auction revenue from the EU ETS amounted to €43.6bn, indicating an average price of ~€85/t over the year.[79] Of this, €33bn went directly to Member States, €0.3bn to Iceland, Liechtenstein, Norway and Northern Ireland, €7.4bn supplied to the ETS Innovation Fund and ETS Modernisation Fund, and the remaining €2.8bn directed into the Resilience and Recovery Facility, which Member States use to advance the clean energy transition and improve energy security.

In 2023, 29% (€9.7bn) of all distributions to Member States went into increasing energy supply, through investments into energy generation, enabling grid infrastructure and energy storage. The vast majority of funds generated from the ETS are directed into the energy sector to support the energy transition, provide support for low-income regions affected by climate change, improve public transport to reduce the over reliance on oil and petroleum in mobility, and integrate energy efficiency measures into the system – as Figure 3.3 details.

Figure 3.3: Distribution of Auction Revenues to Member States



Source: European Environmental Agency [80]

As the EU CBAM is progressively phased-in, demand for CBAM certificates and the increased volume of allowances distributed via auctions will see a marked increase in revenues generated by carbon pricing – revenues that are invested back into the energy system and industrial sectors to further elevate the speed and scale of the energy transition. As the EU ETS cap continues to decline at the LRF, the market dynamics will drive the EU carbon price to the levels commensurate with limiting the global impacts of climate change.

Critically, the EU ETS and subsequent EU CBAM perfectly demonstrate the efficacy of reforming industrial policy to correct the historical market failure of emitters not paying the

[79] EU Commission, 2024 Carbon Market Report, 19 November 2024
[80] European Environment Agency, Auctioning Revenues and Reported Usage 2013-2022, Scope EU-27, 19 December 2024

social cost of their products. The correction to a user-pays model is urgently required in other emissions-intensive, industrial economies to drive decarbonisation.

ETS Modernisation Fund

The ETS Modernisation Fund supports 13 lower-income Member States (as of 2024) in meeting the 2030 climate and renewable energy targets by supporting the roll out of projects that modernise energy systems and improve energy efficiency. The total funding of the Modernisation Fund is 438 million allowances, with 2.5% of the total quantity of allowances auctions between 2024-30 directed to the Fund.[81] The Fund supports investments into 6 priority areas of the energy system:

- Generation and use of energy from renewable sources, including renewable hydrogen
- Heating and cooling from renewables
- Reduction of overall energy use through energy efficiency, including in industry, transport, buildings, agriculture and waste
- Energy storage and modernisation of networks, including demand-side response management, district heating, grid transmission and interconnection between Member States
- Support for low-income households, including in rural and remote areas, to address energy poverty and to modernise their heating systems and infrastructure for zero-emission mobility
- Just transition in carbon-dependent regions to support redeployment, reskilling and upskilling of workers, education, job-seeking initiatives and start-ups.

ETS Innovation Fund

The EU Innovation Fund is one of the world's largest funding programmes for the research, development and demonstration of net-zero and innovative technologies. The Innovation Fund focuses on accelerating commercialisation and bringing to market solutions to decarbonise European energy and industry, while fostering competitiveness. The Fund is financed via the EU ETS, through the liquidation of 530 million allowances over 2020 to 2030. The total funding is dependent on the market carbon price, but assuming an average €75/t price from 2020 to 2030, this will amount to ~€40bn over the decade.[82]

The latest available data identified over €3.5bn of funding support to 39 large-scale and 15 small-scale projects in energy-intensive industries, hydrogen production, renewable energy generation, and manufacturing of components for energy storage and renewables.[83]

Section 3.4. EU Support for International Carbon Pricing

In February 2024, the EU established the Task Force for International Carbon Pricing and Markets Diplomacy, an initiative aimed at promoting the implementation of carbon markets worldwide, and the development of robust frameworks for GHG emission reduction policies. International carbon pricing mechanisms have a key role to play in accelerating ambition for decarbonisation and filling the investment gap for climate change mitigation across regions

[81] EU Commission, Modernisation Fund
[82] EU Commission, Innovation Fund
[83] EU Commission, 2024 Carbon Market Report, 19 November 2024

and economic sectors, with robust, interoperable standards on environmental and social integrity a key pillar to their success.[84]

EU and China

Between 2014-17, the European Commission collaborated with China on a 3-year project to support the design and implementation of a domestic ETS in China. The bilateral partnership allowed for the EU to provide technical assistance for capacity building and operational support for the 7 sub-national pilot ETSs and the establishment of China's national ETS.[85]

At the 2018 EU-China summit, the parties signed an MoU to enhance their cooperation on emissions trading. On 18 June 2024, EU Commissioner Wopke Hoekstra and Minister Huang Runqiu, on behalf of China's Ministry for Ecology and Environment, signed an updated MoU at the 5th High Level Environment and Climate Dialogue in Brussels.[86]

The MoU outlined the mutual recognition of the importance of enhancing cooperation and complementarity of the two largest ETSs globally, and the mutual benefits to both China and the EU that can emerge for a more comprehensive partnership on emissions trading.

CEF is optimistic that China's world leadership in manufacturing, technology, domestic installation and exports of almost all zero-emissions industries of the future, and its significant investment in building up its national ETS, puts China in strong alignment with the EU and UK on the need for collaborative global action to create alignment of efforts towards the climate science. With the US withdrawing from global leadership, this gives a significant opportunity for China to assume a positive central role in partnership with other countries and regions working in good faith.

EU and Korea

The European Commission provides technical assistance and capacity building support for the Korea ETS, launched in 2015.

EU and UK

In January 2025 UK Prime Minister, Sir Keir Starmer, is reported as seeking to relink the UK and EU emissions trading schemes. Since Brexit, when the EU and UK separated their carbon markets, UK permits have traded at a significant discount to those traded in the EU. CEF sees any relinking of these schemes as a significant positive, lifting cooperation and consistency to deepen the liquidity of both markets and help both sides transition to net zero.[87]

The reintegration of the UK ETS into the EU would avoid border and trade frictions caused by the introduction of the EU CBAM on critical industries including steel, cement and fertiliser. Under the terms of the Trade and Cooperation Agreement, the UK government and the EU agreed to consider linking the respective carbon pricing schemes and to co-operate on carbon pricing.

[84] EU Commission, International Carbon Pricing and Markets Diplomacy
[85] EU Commission, International Carbon Market
[86] EU Commission, MoU to Enhance Cooperation on Emissions Trading Between the European Commission and the Ministry of Ecology and Environment of the People's Republic of China, 18 June 2024
[87] FT, Keir Starmer Looks to Link UK and EU Emissions Trading Schemes, 28 January 2025

Section 4. Carbon Pricing in Australia and Economically Advanced East Asia

In March 2025, it was reported trade chiefs from China, Japan and South Korea, including Korea's Industry Minister Ahn Duk-geun, Japan's Minister for Economy, Trade and Industry Yoji Muto, and China's Minister for Commerce Wang Wentao, renewed the call for an open, fair flow of goods and pledged to deepen economic times between the economies moving forward.[88]

In a joint statement, the representatives highlighted the 'need for ongoing trilateral economic and trade cooperation to effectively address emerging challenges and achieve tangible outcomes in key areas'. As part of strengthening trilateral economic ties, the Ministers pledged to strengthen the Regional Comprehensive Economic Partnership (RCEP), a framework to streamline supply chains and enhance trade and investment between the three major economies, as well as ASEAN, Australia and New Zealand. Minister Ahn Duk-geun stated that 'it is necessary to strengthen the implementation of RCEP, and to create a framework for expanding trade cooperation among the three countries through Korea-China-Japan FTA negotiations'.[89]

Section 4.1. China

The adoption of a national carbon pricing mechanism was, in part, a solution to the People's Republic of China's objective to undertake the largest decoupling of economic and emissions growth ever attempted globally. From 1980 to the early 2010s, China's GDP grew more than 500%, and with it, China's emissions went from globally marginal to now dwarfing the second largest emitter, the USA, in aggregate (the US is still the largest in per capita terms).[90]

China's national ETS began operating in 2021 as a regulated cap-and-trade mechanism. The national ETS covers the power sector in China, covering 2,162 thermal power plants (including captive plants), each of which emit equal to or greater than 26,000 tpa CO_2-e. The national ETS encompassed 5,240 Mt CO_2-e in 2024, representing 40% of China's domestic emissions profile.

To effectively build capacity and the necessary infrastructure to monitor, report, verify and allocate emissions in a national ETS, China initially developed eight provincial-level pilot ETSs in industrialised regions, covering various sectors. A summary of the coverage of China's pilot ETSs can be found in Appendix B. The operation of the pilot ETSs were used to inform and refine the development of the national ETS.

Throughout the pilot ETS phase, the integrity and accuracy of data collection posed a significant challenge. In 2022, the Ministry for Ecology and Environment (MEE) disclosed cases of negligence and fraud by four third-party emissions verification consultations that were employed by provincial-level environment ministries to assess the accuracy of the monitoring and reporting of emissions for power companies.[91] The cases ranged from inefficiency and incompetence to active involvement in falsifying emissions data and coal

[88] Bloomberg, China, Japan, S. Korea Renew Free-Trade Call, Vow to Build Ties, 30 March 2025
[89] The Straits Times, China, South Korea and Japan Agree to Strengthen Free Trade, 30 March 2025
[90] ADB, Background Paper: China's ETS: Origins, Characteristics, and Lessons for Greater Asia, 2024
[91] S&P Global, China's Emissions Fraud Cases Signal Challenges in Carbon Market Rollout, 18 March 2022

sampling. In February 2024, the State Council adopted improved ETS regulations, lifting the ETS in the policy hierarchy compared with the previous ministry-level management rules and strengthening non-compliance penalties.[92] The updated regulations added a three-tier (national-provincial-municipal) review mechanism, further improving the accuracy of third-party verification.[93]

Like most policies in China, the nation implemented the mechanism with 'Chinese characteristics', primarily that the ETS is configured as a bottom-up, facility-level, intensity-based emissions cap, with the cap dependent on production, or more specifically, electricity generated from thermal power plants – effectively operating as a facility-level baseline mechanism. This is in contrast with EU ETS, the most established cap-and-trade mechanism, which introduces an enforceable cap on total emissions, reducing linearly over time.

However, this is expected to change. On 2 August 2024, China's State Council issued a statement on 'Accelerating the Construction of Notice on the Work Plan for the Carbon Emission Dual Control System'. This announced the implementation of a new mechanism for the comprehensive transformation from dual control of energy consumption to dual control of carbon emissions, in which both the total volume of emissions and emissions intensity per unit of GDP baselines will be used to accelerate the green transformation.[94] Professor Boqiang Lin of the China Institute for Studies in Energy Policy highlighted China's energy and climate developments in 2025 will focus on advancing its dual-carbon goals through several key initiatives.[95]

Only China Emission Allowances (CEAs), each representing 1 tonne of CO_2-e emitted, can be traded on the National ETS. CEAs are allocated free of charge at entity level according to 70% of historic output multiplied by a benchmark factor that is set according to the volume and source of the energy produced. A unit load (output) adjustment factor is applied which provides more allowances to entities operating at load rates less than 85%.[96]

In July 2024, China's MEE released the draft allowance allocation plans for the power sector for 2023 and 2024, including the introduction of restrictions on banking and borrowing of allowances.[97] From 2023 onwards, the national ETS compliance periods were shortened to annually, down from the previous two-year cycles (i.e. 2019-20, 2021-22).

To improve liquidity in the carbon market, banking of allowances was limited to 1.5x the entity's net sold allowances from 2019-2024. Borrowing from a future compliance period was also removed in the updated allowance plans for the power sector. In 2024, Chinese ETS prices averaged RMB 98 per tonne (US$13.37), up 50% from an RMB 68.35 per tonne (US$9.34/t) average in 2023 – see Figure 4.1.[98]

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[92] ICAP, China Strengthens Legal Foundation for National ETS, 23 February 2024
[93] CarbonBrief, China's Carbon Market to Cover Steel, Aluminium and Cement in 2024, 23 September 2024
[94] General Office of the State Council, Notice on Issuing the Work Plan for Accelerating the Establishment of a Dual Control System for Carbon Emissions, 02 August 2024
[95] Carbon Brief, 2025 Government Policies; China's First Energy Law; What to Watch in Year Ahead, 09 January 2025
[96] King & Wood Mallesons, China's National Carbon Market: A Guide for Investors, August 2022
[97] ICAP, China Releases Draft Allocation Plan for Power Sector for 2023 and 2024, 31 July 2024
[98] Carbon Herald, China's Carbon Market Sees Off Successful 2024 But Challenges Persist, 15 January 2025

Figure 4.1: China National ETS Historical Pricing: Up 50% yoy in 2024

Source: International Carbon Action Partnership

Section 4.1.1. Extension of National ETS to Steel, Cement and Aluminium

On 9 September 2024, China's MEE released the draft work plan to expand the sectoral coverage of the national ETS to include the cement, steel and aluminium industries,[99] with implementation expected in 2025. As China's industries shift increasingly towards export-oriented models, China recognises the impacts of increasing integration and expansion of carbon pricing mechanisms in key export markets. Critically, cement, steel and aluminium are the industrial sectors exposed via the introduction of the EU CBAM.

The introduction of cement, steel and aluminium into the national ETS would bring an additional 1,500 entities into the fold, increasing coverage by ~3,000 Mtpa CO_2-e, boosting national coverage of emissions to 65% (~8,000 Mt CO_2-e) – equivalent to ~5% of global emissions.

As China's 'cap-and-trade' ETS operates from a facility-specific, production-adjusted baseline, the effectiveness of the scope expansion to key emissions-intensive industrial sectors will be dependent on the carbon accounting and emissions intensity benchmarks it places on domestic producers in order to align with internationally accepted benchmarks and frameworks. On 24 January 2025, China's MEE released the guidelines for the introduction of national ETS GHG emissions accounting and reporting for the steel industry, as well as the technical guidelines for the accounting, reporting and verification of GHG emissions by enterprises for the steel industry.[100] China's MEE is yet to publish the allowance allocation plans based on the guidelines it has drafted for the cement, steel and aluminium industries.

Currently, the Chinese national ETS only covers the power sector, and more specifically, freely allocates CEAs to coal and methane gas power plants up until a benchmark emissions

[99] ICAP, China to Expand National ETS to Cement, Steel and Aluminium in 2024, 12 September 2024
[100] MEE, Notice on the Issuance of Two National Carbon Emission Trading Market Technical Specifications (CETS-AG-03.01-VO1-2024), 24 January 2025

intensity. Table 4.1.1 highlights the current emission intensity benchmarks for thermal power plants' production-adjusted baselines for the current compliance period of 2024.

Table 4.1.1: Benchmark Values for Allowance Allocation in Power Sector in National ETS

Power Plant	Benchmark (tCO_2/MWh)			Benchmark (tCO_2/GJ)		
	2022	2023	2024	2022	2023	2024
Conventional Coal (> 300 MW)	0.8177	0.7950	0.7910	0.1105	0.1038	0.1033
Conventional Coal (< 300 MW)	0.8729	0.8090	0.8049			
Unconventional Coal	0.9303	0.8285	0.8244			
Methane Gas	0.3901	0.3305	0.3288	0.056	0.0536	0.0533

Source: International Carbon Action Partnership [101]

In comparison, the average emissions intensity for coal-fired power stations operating in Australia over 2022-23 was 0.931 tCO_2-e/MWh, equating to a 17% higher emissions intensity for Australian power stations than China's free allocation benchmark in 2023.[102] For grid-connected methane gas power stations that produced over 100 GWh pa over 2022-23, the average emissions intensity was 0.555 tCO_2-e/MWh, 68% higher than the intensity benchmark for China's gas power plants free allocation in 2023.

CEF expects the extension of the domestic carbon pricing mechanism to cement, steel and aluminium would likely also be implemented at competitive emissions intensity thresholds, thus minimising the carbon liability for exports to key trading markets, and maximising the opportunity to keep carbon liability revenues of Chinese producers onshore, as opposed to transferring these to the EU economy through CBAM certificates.

Lauri Myllyvirta, co-founder of Centre for Research on Energy and Clean Air (CREA), highlighted that the addition of iron and steel under the national ETS, under a single product variable, would create an opportunity to accelerate decarbonisation.[103] With the growing adoption of EAFs, a technology-agnostic, sector-wide industry average emissions-intensity benchmark would drive higher utilisation of EAFs and increase the pressure for traditional BF-BOF producers to decarbonise.

However, given the existing framework to benchmarking emissions intensities for the power sector, with separate benchmarks for coal and gas, it is probable China will introduce pathway-specific intensities, separating BF-BOF producers from scrap-EAF producers. This would likely encourage EAF producers to prioritise export markets over domestic demand.

On 21 March 2025, China's MEE issued the 'Work Plan for the National Carbon Emission Trading Market to Cover the Steel, Cement and Aluminium Smelting Industries', confirming that 1,500 entities within the above industrial sectors would be covered by the national ETS

[101] ICAP, China Releases Allocation Plan for Power Sector for 2023 and 2024, 18 November 2024
[102] CER, Electricity Sector Emissions and Generation Data 2022-23, 04 April 2024
[103] CarbonBrief, China's Carbon Market to Cover Steel, Aluminium and Cement in 2024, 23 September 2024

in 2025, with emissions compliance starting 2024.[104] The ETS will launch with a trial implementation phase from 2024 to 2026, with the aim to consolidate and verify carbon emissions and scale participation capacity for entities. MEE will provide full free allocation of CEAs based on verified emissions reported in 2024. 2025 and 2026 allowance quotas will be determined from the 2024 actual emission intensities of producers. Emission intensity values will begin tightening from 2027.

[104] MEE, Notice on Issuing the "Work Plan for the National Carbon Emission Trading Market to Cover the Steel, Cement and ALuminium Smelting Industries", 21 March 2025

Section 4.2. South Korea

Launched in 2015, the Korea ETS (K-ETS) was Asia's first national compliance ETS, and the second national ETS adopted globally, behind the EU. As of 2024, the K-ETS covers ~89% of South Korea's domestic GHG emissions, covering 804 of the largest emitters in the power, industrial, buildings, waste, transport, domestic aviation and domestic maritime sectors. In 2024, the K-ETS' emission cap reached 547.9 Mt CO_2-e.[105]

Revenues generated from the auctioning of allowances is directed into the Climate Response Fund, which supports emissions mitigation infrastructure, low-carbon innovation, and technology development for small- and mid-sized companies. However, only 3% of emission allowances are currently auctioned.[106]

2024 saw record low prices for Korean Allowance Units (KAUs), averaging US$6.40/t, trading a significant discount to the average US$22.90/t prices realised in 2019 – see Figure 4.2.1. In 2024, regulators of the K-ETS introduced more lenient carryover rules for KAUs, allowing entities with surplus to roll over quotas up to 3 times the net annual KAUs the entity sells annually. In 2023, industrial emitters were allocated a surplus of 23.4 million allowances.

Figure 4.2.1: K-ETS Historical Pricing

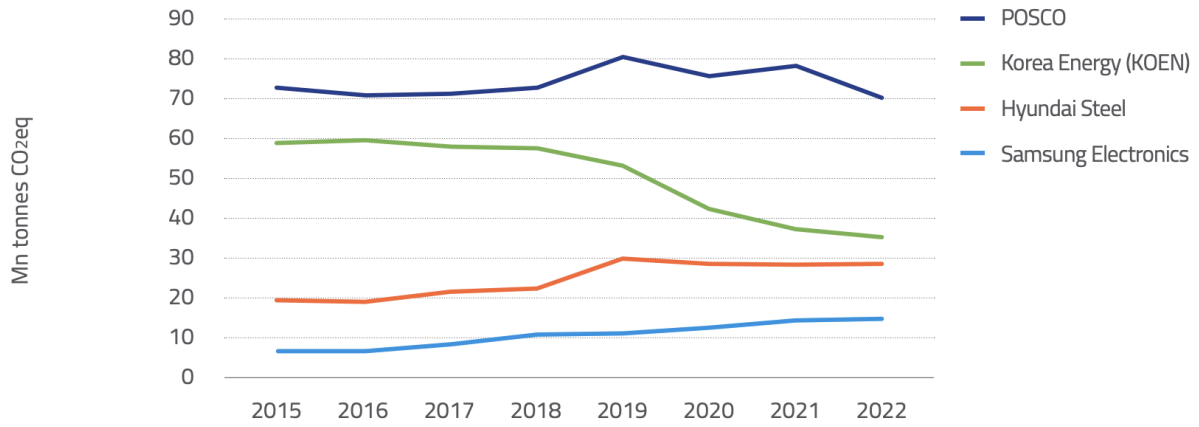
Source: International Carbon Action Partnership

Influential heavy emitters in Korea's industrial sector have failed to make significant reductions in emissions, including the nation's two largest steel producers, POSCO and Hyundai Steel, despite the K-ETS being in operation for a decade – see Figure 4.2.2.

The K-ETS freely allocates allowances to emissions-intensive trade-exposed (EITE) sectors based on production costs and trade intensity benchmarks. In order to accelerate industrial decarbonisation and maximise the effectiveness of carbon pricing, Korea must implement a mechanism that will progressively phase-out the free allocation to EITE entities, and ensure imports of equivalent products pay the carbon costs to mitigate carbon leakage.

[105] ICAP, Emissions Trading Worldwide: Status Report 2024, 10 April 2024
[106] ICAP, Emissions Trading Worldwide: Status Report 2024, 10 April 2024

Figure 4.2.2: GHG Emissions of Heavy Emitters in Korea



Source: Solutions for our Climate [107]

The free allocation of allowances is a major headwind to decarbonisation, and continues to undermine the effectiveness of the K-ETS at driving emissions reductions. The 2023 'Master Plan for Carbon Neutrality and Green Growth' published by the Korean Government eased the 2030 GHG emissions reduction target for the industrial sector from 14.5% to 11.4%, shifting the burden for decarbonisation in line with Korea's Nationally Determined Contribution (NDC) to overseas emissions reduction, including an expanding role for international carbon crediting mechanisms.

Under the EITE provisions (Article 19 of the Enforcement Decree of the Emissions Permits Trading Act), the steel industry received a full free allocation of KUAs. In the third phase of the K-ETS (2021-25), 21 of the 28 sectors that received 100% free allocation were industrial, accounting for 94% of emissions from the 28 sectors. The K-ETS's free allocation, coupled with the lenient cap from excessive emission allowances distributed, has led to significant revenues generated from the sale of free permits on the secondary market. Analysis by Plan1.5, a Korean climate-focused non-profit organisation, identified POSCO and Hyundai Steel have generated KRW 196.5bn (US$145.6m) in revenues from selling excess permits provided for free.[108]

On 7 February 2025, S&P Global reported South Korea's Ministry of Environment has commenced the development of a government body specialising in addressing the EU CBAM and other international environment regulations to support domestic manufacturers in mitigating impacts of the EU CBAM and upcoming CBAM-alike policies.[109]

[107] SFOC, End the Free Emissions: Recommendations for Reforming K-ETS Based on Market Activation Scenario Analysis, 13 June 2024
[108] SFOC, End the Free Emissions: Recommendations for Reforming K-ETS Based on Market Activation Scenario Analysis, 13 June 2024
[109] S&P Global, South Korea to Set Up Government Body to Navigate EU CBAM, 07 February 2025

Section 4.3. Japan

In April 2010, The Tokyo Metropolitan Government launched the Tokyo Cap-and-Trade Program, Japan's first compliance ETS. Covering ~20% of the metropolitan area's emissions profile, the Tokyo ETS covers facilities in factories, heat suppliers, large buildings, and facilities that consume a significant volume of fossil fuels. The Tokyo ETS enforces a cap at a facility-level, serving as a baseline for emissions reduction. Currently, 100% of allowances in the Tokyo ETS are freely allocated to the reduced 'baseline'. In its fourth iteration, entities have a compliance factor of a 48-50% reduction in emissions below base-year emissions.[110]

In February 2023, Japan's Cabinet approved the Green Transformation (GX) Policy, a 10-year roadmap of Japan's decarbonisation strategy in order to achieve its NDC of 46% emissions reduction by 2030, and carbon neutrality by 2050.[111] Japan's GX Roadmap is the proposed transformation of the entire economic and social system from an economy and industrial structure dependent on fossil fuels to 'structures driven by clean energy' – driving economic growth through emissions mitigation.[112]

The GX Roadmap aims to mobilise JPY 150 trillion (~US$1 trillion) of public and private capital investment into decarbonisation industries. The roadmap also targets carbon pricing mechanisms via an emissions trading scheme (GX-ETS) for high-emission sectors, and the introduction of a carbon levy for fossil fuel importers, with the price on carbon gradually ratcheting up to increase investment into clean energy sources and to cut reliance on fossil fuels.

Following the Tokyo ETS, Japan introduced a national voluntary baseline-and-credit ETS, the GX-ETS, in April 2023. The GX-ETS has been operating in its pilot phase since October 2023, with the initial phase of the GX-ETS planned until March 2026.

In December 2024, a leading price reporting agency, Fastmarkets, reported the Government of Japan plans to introduce national compliance carbon pricing measures to accelerate activity into emissions reduction investments, transiting the GX-ETS into a compliance ETS in 2026.[113] The new compliance system is expected to initially cover 300-400 large-scale industrial emitters, covering steel, power, chemical and automotive facilities that emit more than 100,000 tpa CO_2-e.

The Government of Japan is expected to allocate emissions quotas to each firm individually, with facilities emitting less than the established quota able to sell surplus carbon credits to other emitters, and firms exceeding the allocated emissions cap required to purchase additional carbon credits.

Section 4.3.1. Joint Crediting Mechanism

Japan has also established and implemented the Joint Crediting Mechanism (JCM), an international carbon crediting mechanism to assist it in achieving its GHG emissions reduction targets under the Paris Agreement's NDCs. The JCM aims to facilitate the transfer of decarbonisation technologies and infrastructure through investment by Japanese entities into partner countries, thereby reducing and/or removing GHG emissions in the partner

[110] ICAP, Japan - Tokyo Cap-and-Trade Program
[111] ICAP, Japan's Cabinet Approves Plans for National ETS, 22 February 2023
[112] GR Japan, Overview of Japan's Green Transformation (GX), January 2023
[113] Fastmarkets, Japan Mulls Mandatory Carbon Trading; Asian Steelmakers on Alert, 10 December 2024

country. The mechanism then allows Japan to use the emissions reductions for domestic carbon credits.[114]

As of December 2024, Japan has signed bilateral agreements with 29 countries under the JCM across 255 projects, the majority of which are in Indonesia (50), Thailand (49), and Vietnam (48).

Section 4.3.2. METI Price Signal for Low-Emission Steel

On 27 January 2025, Japan's Ministry of Economy, Trade and Industry (METI) announced the expansion of subsidies for Clean Energy Vehicles (CEVs) to vehicles produced using low-emission steel. The decision by METI marks a small step forward in Japan's outlook for decarbonising its iron and steel industry, introducing a demand-pull support mechanism for EVs using low-emission steel, with consumers eligible to receive up to JPY 50,000 (A$518) per vehicle.[115] However, dramatically more action and speed are required.

The new subsidy will build on the reformed 'Subsidies to Promote the Introduction of Clean Energy Vehicles' introduced by METI in June 2024, providing up to JPY 850,000 (A$8,804) for EVs and JPY 550,000 (A$5,697) for PHEVs to accelerate the shift towards electrified and decarbonised mobility, where internal combustion engine (ICE) and hybrid energy (HEV) vehicles vehicles dominate domestic sales – see Figure 4.3.1.

Figure 4.3.1: METI Green Steel Subsidy for Automakers

Vehicle	Subsidy	With Green Steel Subsidy
EV	JPY 150,000 – 850,000 (AUD 1,554 – 8,804)	JPY 200,000 – 900,000 (AUD 2,072 – 9,322)
Light EV	JPY 150,000 – 550,000 (AUD 1,554 – 5,697)	JPY 200,000 – 600,000 (AUD 2,072 – 6,215)
PHEV	JPY 150,000 – 550,000 (AUD 1,554 – 5,697)	JPY 200,000 – 600,000 (AUD 2,072 – 6,215)
FCEV	Up to JPY 2,555,000 (Up to AUD 26,413)	Up to JPY 2,605,000 (Up to AUD 26,931)

Source: METI [116], Climate Energy Finance

The automotive sector is a clear first market mover for decarbonised metals and minerals, with the ability to distribute green premiums across vehicles and a large customer base, leveraging the consumer facing nature of the auto sector. However, when every global EV

[114] Ministry of Foreign Affairs of Japan, Joint Crediting Mechanism (JCM), updated 22 February 2024
[115] METI, FY2024 Supplementary Budget "Clean Energy Vehicle Introduction Promotion Subsidy", 27 January 2025
[116] METI, Handling of Subsidies to Promote the Introduction of Clean Energy Vehicles in Fiscal Year 2025, 27 January 2025

maker is battling for hard-fought yards against the world-leading EV brands of China, automakers are looking for every measure possible to protect the margins on their vehicles.

Analysis by Transition Asia in July 2024 determined the green premium on Japanese EVs for 100% green steel would amount to ~US$200-210 (A$315-330) per vehicle.[117] The new policy measure by METI would more than cover the green premium added to the cost of EVs in Japan. Given an average of 0.9 tonnes of steel is used per passenger vehicle, the demand-pull mechanism is an implicit price signal for industry in Japan of the value in which METI places on low-emission products, pricing it at A$575/tonne of steel.

If METI implemented an internationally-accepted emissions intensity threshold, such as the IEA's 400 kg CO_2-e/t-cs for low-emission steel, this effectively introduces an implicit carbon price of A$300/t (US$192/t), determined as the value per tonne of CO_2 emissions from the difference in low-emission steel (0.4t/t) and the traditional BF-BOF (2.33t/t) steelmaking route used in the majority of Japan's steel industry.

However, Japan's steel industry, championed by the Japan Iron and Steel Federation (JISF) , has established a 'mass balance' approach to reducing the emissions embedded in Japan's iron and steel production.[118] Mass balance approaches refer to the allocation of CO_2-e emissions reduction certificates generated from separate projects with additionality that has been proportionately applied to the emissions content of iron and steel products. Japan's major steel producers, Nippon Steel, JFE Steel and Kobe Steel, all employ the mass balance approach to produce 'green steel', circumventing the need to invest into decarbonisation technologies and production pathways that reduce embedded emissions.

JISF guidelines for mass balance follow the framework of:

1. **Calculate embedded emissions intensity of steel products**, complying with ISO 201915 or JIS Q 20915. Emissions are verified by a third party.
2. **Identify carbon emission reduction projects and calculate emission reduction volumes**, complying with ISO 14064. Projects must be within the organisation and meet financial additionality requirements, i.e. an additional cost burden.
3. **Issue reduction certificates for steel products**, using mass balance model in ISO 22095 (Chain of custody), transferring reduction certificates to customers.

SteelWatch has urged Japan's Ministry of Environment not to include mass balance accounting in its guidelines to the Act on Promoting Green Procurement, citing the IEA's low-emission steel definitions clearly state that offsetting emissions from outside the supply chain or aggregation of emissions reductions credits/certificates across multiple units of production and/or supply chains is not permitted for near-zero emissions recognition.[119]

The JISF guidelines allow for an entity-level mass balance approach, pooling emissions reduction projects within a corporate boundary to virtually allocate emissions reduction certificates to promote the sale of 'green steel'.

In the broader context for Japan's planned carbon pricing measures, it is important for METI to publicly release the carbon accounting methodologies, green product definitions and

[117] Transition Asia, The Green Steel Premium for Cars and Buildings is Negligible, 25 July 2024
[118] JISF, Role of Green Steel Upon the Application of the Mass Balance Approach in the Pathways Toward Carbon Neutrality, November 2023
[119] SteelWatch, SteelWatch Comment on Proposed Revisions to Japan's Act on Promoting Green Procurement, 12 December 2024

emission thresholds it will use to determine products and producers that will benefit from the models approved under the new subsidy scheme, to build international credibility and standing. Absent a credible price on carbon that introduces a polluter-pays principle on the embedded emissions of products, it is vital for the future integrity and efficacy of public capital used to catalyse investment into industrial decarbonisation that market incentives are provided to products that meet internationally-accepted thresholds and criteria.

For METI to introduce a market signal to produce green materials and a price signal for the value of embedded decarbonisation for international markets, METI must adopt internationally-accepted carbon accounting frameworks that will result in capital flows to low-emission pathways.

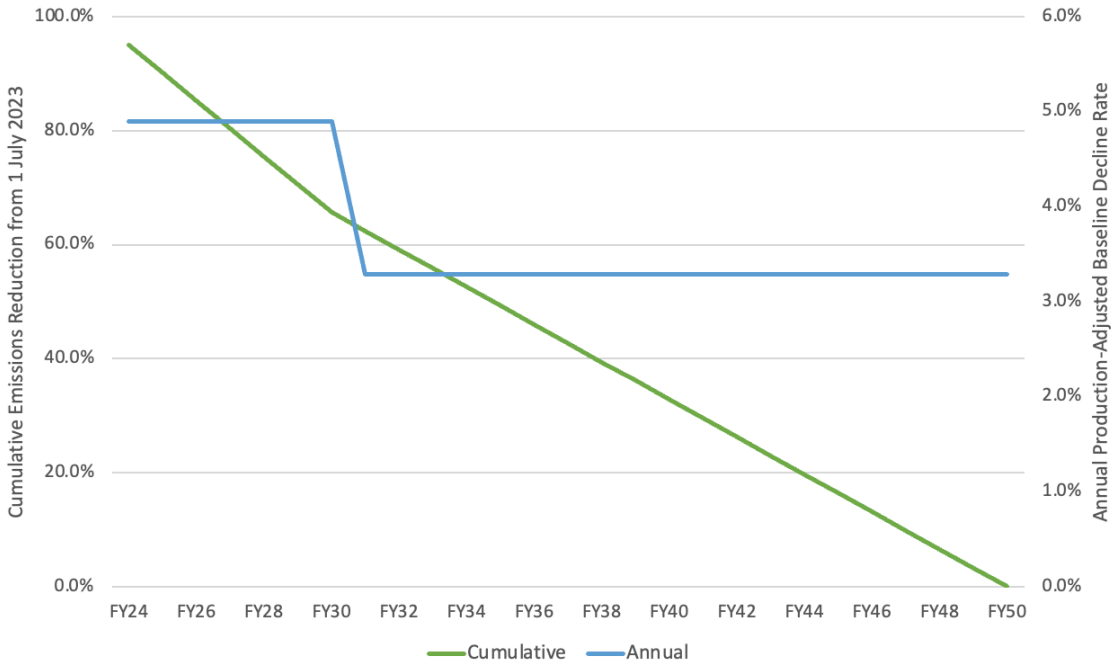
Section 4.4. Australia

The Safeguard Mechanism (SGM) is the Australian Government's policy for reducing emissions at Australia's largest industrial facilities. The SGM was first introduced on 1 July 2016, requiring Australia's highest emitting facilities to keep their emissions below a baseline limit. The SGM applies to all industrial facilities emitting more than 100,000 tpa CO_2-e, covering facilities within mining, oil and gas production, manufacturing, transport and waste. The SGM applies the emissions baseline to the electricity sector via a 'sectoral' baseline mechanism, with all generators connected to each of Australia's main electricity grids collectively meeting the legislated reduction.

The SGM underwent a significant reform in 2023, with the amendments enforced from 1 July 2023. The previous iteration of the Safeguard Mechanism would set baseline emissions at business-as-usual levels. Although some facility baselines adjusted with annual production, the overall emissions baseline remained relatively consistent over time. Despite the Safeguard Mechanism's purpose to hold accountable the industrial facilities that contributed significantly to Australia's emissions, covered facilities' emissions rose 7% from July 2016 to 2020-21 to 140 Mt CO_2-e, accounting for 28% of the emissions in 2020-21.[120]

The reforms restructured the SGM as a baseline-and-credit ETS, with the legislated limits (baselines) declining predictably and gradually to assist Australia in achieving its NDC commitments of 43% emissions reduction target by 2030, relative to 2050, and net zero by 2050. To implement the gradual emissions reduction, baseline emissions ceilings will reduce annually in-line with the nation's commitment to achieving the interim emissions reduction, declining at 4.9% per annum from 2023 to 2030.

Figure 4.4.1: Safeguard Mechanism Output-Adjusted Emissions Pathway



Source: Climate Energy Finance

[120] RepuTex, The Economic Impact of the ALP's Powering Australia Plan, December 2021

The reforms implemented in May 2023 meant covered facilities will be required to deliver a proportional share of Australia's interim climate target to 2030. Net emissions from all covered safeguard facilities must not exceed 100 Mt CO_2-e in 2029-30, and zero from 2049-50.[121] In the 2023-24 reporting period, 219 facilities were covered under the SGM, with a combined emissions profile of 136 Mt CO_2-e.[122]

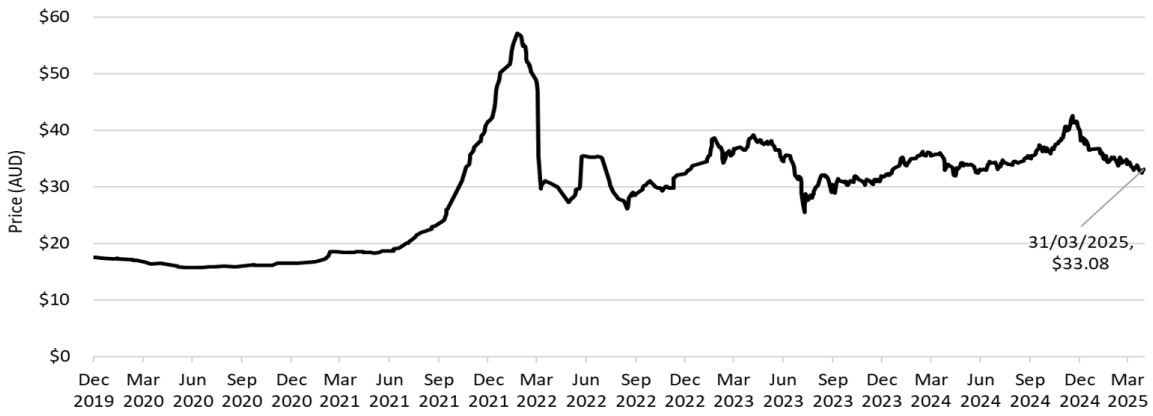
Like the EU ETS and K-ETS, Australia's SGM has concessions for covered facilities whose main product is trade exposed and faces an elevated risk of carbon leakage. Under SGM rules, trade-exposed baseline-adjusted (TEBA) facilities have reduced baseline reduction targets for 3 years based on an assessment of the cost impact of the SGM on a facility relative to the facility's revenue in a financial year.

For TEBA facilities, the baseline reduction is 1% pa. In 2023-24, 17 facilities were granted TEBA exemptions, including both Whyalla and Port Kembla steelworks, as well as multiple alumina and aluminium facilities.

When Safeguard facility's emissions are below the production-adjusted baseline, the facility will generate Safeguard Mechanism Credits (SMCs), each representing one tonne of CO_2-e emissions below the baseline. SMCs are tradable credits, designed to incentivise facilities to reduce their emissions beyond their baselines. SMCs can be banked by Safeguard facilities to meet future baseline obligations, or sold on the Unit and Certification Registry to facilities that require SMCs to meet their current baseline obligations.

Safeguard facilities are also able to use Australian Carbon Credit Units (ACCUs) to meet their baselines. ACCUs are tradable financial products, generated through eligible carbon abatement projects under the ACCU Scheme, ranging from reforestation to energy efficiency schemes. ACCU prices are determined by market dynamics, with average prices maintaining ~ $30-40/t (US$19-25/t) since 2022 – see Figure 4.4.2.

Figure 4.4.2: Generic ACCU Volume-weighted Average Prices



Source: Clean Energy Regulator [123]

Following the reforms to the SGM in May 2023 (2QCY23), purchases and holdings of ACCUs by Safeguard and Safeguard-related facilities have continued to rise. From 2Q2023 to

[121] DCCEEW, Safeguard Mechanism Reforms, May 2024
[122] CER, Safeguard Mechanism Data 2023-24, updated 15 April 2025
[123] CER, Quarterly Carbon Market Report - March Quarter 2025 (data release), 17 April 2025

1Q2025, holdings by Safeguard and Safeguard-related facilities have increased from 11.6 million ACCUs to 26 million ACCUs, a 124% rise – accounting for 57% of all holdings.[124]

For facilities that exceed or are expected to exceed their production-adjusted baselines, the SGM has flexibility mechanisms to provide the least-cost solution to managing emissions for a covered entity, including:

- Surrendering ACCUs or SMCs. If a Safeguard facility surrenders ACCUs equal to or more than 30% of its baseline, it must provide a statement to the Clean Energy Regulator setting out why more onsite abatement has not been undertaken.
- Borrowing up to 10% of the baseline from future periods. Borrowing carries a 10% p.a. interest rate after borrowing occurs from periods 2026-27 and beyond (2024-25 and 2025-26 have a 2% discount rate applied).
- Applying for a 2-5 year multi-year monitoring period (MYMP).
- Applying to become a TEBA.
- Applying for an exemption if the exceedance is a direct result of natural disaster or criminal activity.

2023-24 was the first compliance period of the SGM following the major reforms, and marked the first period with a decline in emissions baselines. As illustrated in Figure 4.4.3, the reforms removed nearly all headroom from aggregate facility baselines.[125] As a result, 142 of the 219 facilities incurred a cumulative liability of 9.2 $MtCO_2$-e, which led to facilities surrendering 1.4 million SMCs and 7.1 million ACCUs. Compliance obligations under the SGM saw ACCU surrenders rise 479% compared to 2022-23. 62 facilities generated 8.3 million SMCs in 2023-24.

Figure 4.4.3: Cumulative SGM Baselines and Emissions

Source: Clean Energy Regulator [126]

[124] CER, Quarterly Carbon Market Report - March Quarter 2025 (data release), 17 April 2025
[125] CER, Safeguard Mechanism Data 2023-24, updated 15 April 2025
[126] CER, Safeguard Mechanism Data 2023-24, updated 15 April 2025

MRV: Determining Baselines for Safeguard Facilities

The SGM only applies to **Scope 1 emissions** from covered facilities in mining, manufacturing, transport, waste and oil and gas production sectors. Baselines, or emissions-intensity determinations (EIDs) are determined from facility-specific emission-intensity values (FEIVs), calculated from a facility's historical production and emissions data. Baselines are calculated on a hybrid approach of FEIVs and default EIVs (DEIVs), which are industry average intensities for Australian facilities that produce equivalent products (product variables, or PVs). DEIVs are set by the Federal Government's DCCEEW.

Initially, baselines are heavily weighted towards FEIVs, slowly transitioning to DEIVs to incentivise further decarbonisation. As FEIVs are based on historical emissions data, facilities operating on a BaU scenario will therefore meet their baselines with relative ease compared to the latter half of the decade. Table 4.4.1 details the breakdown of ratios to 2029-30.

Table 4.4.1: Ratio of Emission Intensity Baseline Values

Ratio	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
DEIV	10%	20%	30%	40%	60%	80%	100%
FEIV	90%	80%	70%	60%	40%	20%	0%

Source: DCCEEW [127]

Scope 1 emissions for Safeguard facilities **exclude Scope 1 emissions** from **on-site electricity generation** from emissions intensity calculations. Emissions-intensive, value-added industries in Australia that primarily generate emissions through their electricity consumption, therefore, have significantly lower obligations under Safeguard rules. However, as only Scope 1 emissions are counted, covered facilities must address the hard-to-abate aspects of their products, e.g. fossil fuel consumption for heat and mobility in iron and bauxite production, carbon anodes in aluminium production. Table 4.4.2 shows the baseline emission intensities for Australia's alumina, aluminium, iron and steel producers.

Table 4.4.2: EIVs of Safeguard Facilities in Alumina, Aluminium, Iron and Steel

Facility	Emitter	PV	FEIV (CO2-e/t)	DEIV (CO2-e/t)
Kwinana Alumina Refinery	Alcoa of Australia Limited	Alumina	0.559	0.545
Pinjarra Alumina Refinery	Alcoa of Australia Limited	Alumina	0.292	0.545
Queensland Alumina Limited Refinery	QUEENSLAND ALUMINA LIMITED	Alumina	0.863	0.545
Rio Tinto Yarwun	RTA Yarwun Pty Ltd	Alumina	0.550	0.545
Wagerup Alumina Refinery	Alcoa of Australia Limited	Alumina	0.436	0.545
WOR01	South32 Worsley Alumina Pty Ltd	Alumina	0.627	0.545

[127] Department of Climate Change, Energy, Environment and Water (DCCEEW), Safeguard Mechanism Reforms, May 2024

Bell Bay Smelter	RIO TINTO ALUMINIUM (BELL BAY) LIMITED	Aluminium	1.897	1.940
Boyne Smelters Limited	RIO TINTO ALUMINIUM LIMITED	Aluminium	1.843	1.940
Portland Aluminium Smelter	Alcoa Portland Aluminium Proprietary Limited	Aluminium	2.028	1.940
Tomago Aluminium Smelter	TOMAGO ALUMINIUM COMPANY PTY LTD	Aluminium	1.977	1.940
Liberty Primary Steel Whyalla Steelworks	ONESTEEL MANUFACTURING PTY LIMITED	Primary Iron	1.864	2.080
Port Kembla Steelworks	BLUESCOPE STEEL (AIS) PTY. LTD.	Primary Iron	2.118	2.080
Liberty Primary Steel Whyalla Steelworks	ONESTEEL MANUFACTURING PTY LIMITED	Primary Steel	2.150	2.070
Port Kembla Steelworks	BLUESCOPE STEEL (AIS) PTY. LTD.	Primary Steel	1.907	2.070

Source: Clean Energy Regulator [128], DCCEEW [129]

Of the 8.3 million SMCs generated in 2023-24, 74% were generated from coal, oil & gas facilities. While cumulative baseline headroom has been eliminated, there is still a significant buffer between facility emissions and baselines for the fossil fuel sector. Conversely, Australia's largest iron ore producer, Rio Tinto, had 5 of its iron ore mining facilities exceed their baselines by more than 30%, requiring the surrender of almost 436,000 ACCUs to meet its 30% exceeded baseline obligations.

For the electricity sector in Australia, the SGM applies a single, sectoral baseline for all electricity generators that are connected to the main electricity grids of Australia, including the National Electricity Market (NEM), South West Interconnected System (SWIS), and the North West Interconnected System (NWIS). Individual generators are not covered as long as total sector emissions do not exceed the baseline. The baseline is set at 198 Mt CO_2-e, well above the total grid-connected electricity emissions of 139 Mt CO_2-e recorded in 2022-23.[130]

Australia's carbon market is already seeing significant growth in traded volumes. The first decline of emissions baselines under the SGM in 2024 saw traded volumes growing 49% yoy to 35 million ACCUs, with the value of the ACCU market growing to a record high of A$1.1bn in 2024, up 31% from 2023, driven primarily by secondary spot trading.

For domestic producers, the Safeguard Mechanism is designed to be flexible and provide facilities with lowest cost options to reduce their emissions over time. A border carbon adjustment would mirror that flexibility to the treatment of imports. A well designed CBAM can provide a high degree of flexibility compared to other policy responses, like mandatory emissions product standards, and would not carry the risk of goods becoming ineligible for entry into the Australian market at a future point in time.

[128] CER, Emissions Intensity Determination Data for Safeguard Facilities, 19 December 2024
[129] DCCEEW, Safeguard Mechanism: Prescribed Production Variables and Default Emissions Intensities, 24 September 2024
[130] CER, Electricity Sector Emissions and Generation Data 2022-23, 04 April 2024

Australian Carbon Leakage Review: Prof. Frank Jotzo

In March 2023, the Australian Government announced it would undertake a review of carbon leakage as part of the introduction of the reformed SGM. The review, conducted by Professor Frank Jotzo, underwent an initial consultation round in November 2023. A second consultation round was released in November 2024 on the preliminary findings of the carbon leakage investigation.[131] The review encompassed:

- An assessment of the carbon leakage risks
- Development of policy options to address carbon leakage
- An assessment of the feasibility of an **Australian CBAM**, particularly in relation to steel and cement.

The Jotzo Review identified that multilateral and plurilateral initiatives to address carbon leakage are ideal, in particular an internationally agreed approach for a CBAM. "Whilst some international initiatives focused on carbon leakage are prospective, consensus or broad-based agreement on any international solution will take time to develop and will not replace the need for domestic policy action in the short- and medium-term."

The Review identified value in deepening collaboration with like-minded trade and climate partners, and the role Australia can play in the global landscape to support the development and implementation of commonly accepted and interoperable approaches.

Supporting International Collaboration in Carbon Markets

In 2022, Australia's federal Climate Change Authority recommended the Australian Government to develop and publish a National Carbon Market Strategy.[132] Designed with broad economic coverage, appropriate guardrails, and supporting policies to drive transformational investments, an ambitious carbon market strategy in Australia can play a vital role in linking the sectoral transition plans, and facilitate GHG mitigation outcomes in the international setting.

The Carbon Market Institute (CMI) has reinforced the value of a National Carbon Market Strategy for Australia.[133] CMI's 2024 National Carbon Market Strategy policy brief reiterates the importance of Australia's engagement with international carbon markets, ensuring high integrity outcomes that support Australia's net zero transition and contribute to global climate action. This included:

- **Supporting international cooperative initiatives to harmonise carbon market frameworks**, including through the G7 Climate Club, WTO, and other international monetary bodies that develop methodologies on carbon accounting and verification
- Developing a roadmap for linking Australia's carbon pricing mechanisms with international emissions trading schemes and policies
- Ensuring the surrender of ACCUs does not dilute the fundamental driver of the Safeguard Mechanism to deliver at-point, facility-level decarbonisation projects of Safeguard facilities.

As CMI emphasised in its 2025 CMI Westpac Carbon Market Report, 'Evolving Markets, Emerging Solutions', the Australian Government will not formally consider international

[131] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024
[132] CCA, Review of International Offsets, August 2022
[133] CMI, A National Carbon Market Strategy for Australia, CMI policy brief, 28 June 2024

credit trading in the Safeguard Mechanism until the 2026 review.[134] However, it would be a failure of imagination, economics and diplomacy to miss the opportunity to share Australia's pragmatic, technological and administration skills built up over more than a decade of involvement in compliance and voluntary markets.

CEF supports the comments made in May 2025 by Dr Steven Kennedy, Secretary to the Treasury, that while carbon emissions remain undervalued by markets, and thus an underinvestment in reducing emissions, this is not an unmovable constraint.[135]

For Australia's SGM to integrate into our key trading partners' domestic carbon pricing mechanisms, and harmonise over time with the EU ETS, the SGM must price in the Scope 2 emissions embedded in products from the generation of electricity used in the manufacture. With value-added iron reduction technologies becoming increasingly electrified, and electrolysis based technologies shifting further down the TRL, coupled with electricity emissions being the largest source of value chain emissions in aluminium production, the integration of Scope 1 and 2 emissions is vital.

The SGM already requires historical emissions reporting on the emissions intensity of a facility's electricity demand for on-site generation (reported as t CO_2-e/MWh) and is published as a sub-category in the determination of facility-specific EIVs. However, this does not extend to grid-connected facilities.

As part of the upcoming 2026-27 Safeguard Mechanism Review by the Department of Climate Change, Energy, the Environment and Water (DCCEEW), CEF recommends the inclusion of emissions reporting and verification of Scope 2 electricity emissions for products to better align with other national carbon pricing mechanisms, or the integration of the Federal Government's Guarantee of Origin (GO) Scheme to report the embedded emissions intensity of products including iron/steel, alumina/aluminium, cement and hydrogen.

Australian Guarantee of Origin (GO) Scheme

In November 2024, the Australian Government passed a bill through Parliament establishing the Guarantee of Origin (GO) Scheme under the re-industrialisation policy of a Future Made in Australia.[136] The GO Scheme is a product-based emissions accounting framework to measure and verify the embedded emissions of products across supply chains, developed from internationally agreed standards.

The GO Scheme is designed to initially cover renewable energy (REGO) and its derivative products (Product GO - PGO), like green hydrogen, expanding and replacing the existing renewable certification schemes in Australia like the Large-scale Generation Certificates (LGCs) under the Renewable Energy Target. PGOs will initially only cover hydrogen production, but will be expanded to other low-emission industries, including green metals and low-carbon liquid fuels. With the current SGM framework omitting embedded Scope 2 emissions from emissions intensity baselines, producers of low-emission, value-added products that utilise renewable energy and/or hydrogen in the process can provide the emissions verification and certification required to meet carbon compliance obligations in Australia's export markets, like the EU CBAM or a future Asian CBAM.

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[134] CMI, Evolving Markets, Emerging Solutions: CMI Westpac Carbon Market Report, 1 April 2025
[135] Treasury, Dr Steven Kennedy PSM Post-Budget Economic Briefing, 28 May 2025
[136] DCCEEW, Guarantee of Origin Scheme, updated 24 January 2025

Need for Urgent Action to Address Australia's Fossil Fuel Problem

If Australia is serious about emissions reductions and tracking towards net zero, we must acknowledge the inconvenient truths of fossil fuels and Australia's role in their propagation. As the latest GHG inventory data revealed in May 2025, changes to land uses and its forestry sector have been the sole driver of emissions reductions to date, not structural changes in Australia's dependence on fossil fuels.[137]

Australia's headline emissions have reduced 27% compared to 2005. However, excluding land use, land use changes and forestry (LULUCF), emissions have decreased by only 3%.[138] Australia's stationary energy emissions, excluding electricity, have risen over 20% since 20025, with fugitive emissions from fossil fuel extraction and emissions from industrial processes also rising since 2005.

Beyond Australia's domestic emissions, the coil, oil and gas exported from Australia generates an annual climate bomb three times larger than its domestic carbon footprint, responsible for ~ 1.2 billion tonnes CO_2-e of global emissions directly attributable to fossil fuel exports.[139] Emissions accounting principles means these are not counted towards Australia's international commitments under the Paris Agreement, but Australia must recognise the central role it plays in contributing to global emissions.

Fossil fuels are embedded in almost all aspects of our lives, but there are substitutes. Currently, these substitutes are not easy to source, and they do not come cheap, but if Australia's national interest is to transition from a petrostate to a clean energy superpower, Australia must be a key driver in the innovation, investment and international coordination required to enable the transition away from fossil fuels.

Australia must recognise and act on its influence as a key economic agent in shaping the 'creative-destruction' of the net zero transformation – driving the emerging global and regional green commodities boom and the simultaneous phase out of its fossil fuels industry.

CEF urges Australian policymakers to foster foreign direct investment into Australia in partnership with Australian firms in renewable energy and value-adding of industrial commodities. An accelerated transition to a net zero global economy is in Australia's national interest, but we must ensure Australia remains the partner of choice.

[137] Renew Economy, Australia's latest emissions data reveal we still have a giant fossil fuel problem, 03 June 2025
[138] DCCEEW, Quarterly Update of Australia's National GHG Inventory: December 2024, 30 May 2025
[139] The Conversation, Dug up in Australia, burned around the world - exporting fossil fuels undermines climate targets, 12 August 2024

Section 5. The Case for Expanding the Scope for CBAM to Developing Asia

The United Nations Framework Convention on Climate Change (UNFCCC) enshrined the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) in its 1992 treaty.[140] "The global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions."

In 2016, the Paris Agreement built on the equitable contribution principle, adding "... social and economic conditions, *in the light of different national circumstances*." [141]

Compliance carbon markets are increasingly being investigated and discussed in developing economies in south-east Asia, building on the momentum the region has had in voluntary carbon credit mechanisms. A number of countries, including Indonesia, Vietnam, and Thailand have developed projects under Japan's Joint Crediting Mechanism (JCM). South-east Asian countries have also recognised the need to develop compliance mechanisms to comply with the EU ETS and CBAM.

The key to integrating carbon pricing mechanisms, especially those that remain in development or under consideration, is to construct the carbon taxonomy to align with internationally-recognised standards and frameworks, ensuring a high degree of allowance auctioning to reduce the carbon tax liabilities paid by exporters into regions with CBAM's. Revenues generated by compliance mechanisms can replicate the architecture of the EU ETS, distributing revenues to energy-intensive sectors to further accelerate investments into decarbonisation and electrification.

Section 5.1. India

India adopted the legal basis for a carbon market, including an ETS, in 2022, and established the institutional framework for the system over 2023, outlining roles and responsibilities of the various governing authorities. India's intensity-based ETS would build on the existing scheme for energy efficiency in emission-intensive industrial sectors, with the potential to evolve into a compliance carbon market.[142]

In July 2024, India's Ministry of Power's Bureau of Energy Efficiency (BEE) and Ministry of Environment, Forest and Climate Change announced the Indian Government had adopted detailed regulations for the planned compliance carbon market, the Carbon Credit Trading Scheme (CCTS).[143]

The CCTS would initially cover entities from nine industrial sectors, including aluminium, chloralkali processes, cement, fertiliser, iron and steel, pulp and paper, petrochemicals, petroleum refining, and textiles, with plans to expand the scope in the future to coal-fired power generation.[144] The BEE will develop sectoral GHG emission intensity trajectories and

[140] UNFCCC, United Nations Framework Convention on Climate Change, 1992
[141] UNFCCC, The Paris Agreement, 2016
[142] World Bank, State and Trends of Carbon Pricing 2024, 21 May 2024
[143] BEE, Detailed Procedure for Compliance Mechanism under CCTS - V1.0, July 2024
[144] ICAP, India Adopts Regulations for Planned Carbon Market, 02 September 2024

adjust baseline intensity values for covered entities based on the BEE's determination for the level of contribution for each sector towards India's NDC.

On 22 February 2025, India's Union Minister for Power, Manohar Lal, confirmed the CCTS will launch by mid-2026.[145] The Minister highlighted the importance of the measure for exporters of steel and cement and the increasing requirements under the EU CBAM. "Those using fossil fuels or emitting carbon will have to buy carbon credits, while those using power from non-fossil sources will earn credits that they can sell in the market". The Indian Energy Exchange Ltd, Power Exchange Ltd, and Hindustan Power Exchange Ltd are expected to develop carbon credit trading platforms to facilitate the market.

Set to operate as a baseline-and-credit mechanism, entities that produce materials in the sectors covered would likely be compared against a benchmark emissions intensity value to determine the volume of credits issued or required to be surrendered each compliance period. However, India's first green taxonomy for industrial materials falls significantly below the ambition of any internationally-recognised guideline or framework to be classified as low-emission products.

On 12 December 2024, India's Union Minister of Steel and Heavy Industries, Shri H.D. Kumaraswamy, released the first national green steel taxonomy, with a net-zero emissions intensity target for 2070.[146] The Ministry of Steel's green steel taxonomy defined 'green steel' as steel produced with an **emissions intensity below 2.2 tCO_2-e/t-finished steel** (fs). The taxonomy defined further ratings for 'green steel', with:

- **Three-star green-rated**: Emissions intensity between 2.0 - 2.2 tCO_2-e/t-fs
- **Four-star green-rated**: Emissions intensity between 1.6 - 2.0 tCO_2-e/t-fs
- **Five-star green-rated**: Emissions intensity lower than 1.6 tCO_2-e/t-fs.

The emissions intensity would cover Scope 1 and 2, with limited Scope 3 for non-integrated steel producers, including agglomeration (i.e. sintering, pelletisation, coke production), beneficiation, and embodied emissions in purchased raw materials and intermediary products, but excluding upstream mining and downstream emissions and transportation. As part of the green steel taxonomy release event, India's steel secretary Sandeep Poundrik stated India was also investigating the mandating of green steel for government projects.[147]

Under this taxonomy, steel exports from India into the EU would still pay a significant carbon penalty despite being covered by the national CCTS. While the ambition of India's CCTS remains well-below the levels required to drive decarbonisation in its industrial sectors, capacity-building and implementing the carbon reporting and verification architecture is a critically important step for future iterations to build on to integrate long-term into a global carbon market.

Section 5.2. Vietnam

In January 2025, Vietnam approved a roadmap for implementing a domestic carbon market to accelerate the nation's progress towards its NDC targets. Building on the 2020 mandate (Decision No.232/QD-TTg) to the Ministry of Natural Resources and Environment (MONRE)

[145] Economic Times, India to Launch Carbon Market by 2026, Says Power Minister, 22 February 2025
[146] Indian Government PIB, Union Minister of Steel and Heavy Industries, Shri H.D. Kumaraswamy, Releases India's Green Steel Taxonomy, 12 December 2024
[147] Reuters, India Announces Formula for Classifying Green Steel, 12 December 2024

to develop a national MRV system and carbon pricing mechanism, the roadmap will introduce a pilot ETS by June 2025, with full implementation scheduled for 2029.[148]

The Vietnamese government will establish the regulatory framework for both a compliance ETS and market for carbon credits, as well as develop sectoral decarbonisation pathways and emission allowance plans for covered entities. MONRE will allow Certified Carbon Credits (CCCs) to be sourced from both domestic and international carbon credit markets, including the Clean Development Mechanism (CDM), the Joint Crediting Mechanism (JCM), and Article 6.4 of the Paris Agreement.

MONRE is set to construct the carbon accounting frameworks that will define emission limits for covered entities, and replicate a trajectory similar to the implementation of the EU ETS in using a pilot phase to determine effective allowance allocation plans for high-emitting facilities, and develop the necessary infrastructure and administrative capacities to effectively and accurately manage the MRV requirements for international carbon crediting schemes. To support the management of the carbon trading, the Vietnamese Government will use the Hanoi Stock Exchange to operate the credit trading platform.

From 2029, Vietnam will expand the scope and sectoral coverage of the national ETS and introduce allowance auctioning mechanisms to eventually phase out free allocation to drive industrial decarbonisation.

Section 5.3. Singapore

Singapore first introduced a carbon tax in January 2019, applied at S$5/t-$CO_2$-e for five years. In 2024, the carbon tax was raised significantly to S$25/t-$CO_2$-e, and is set to be further raised to S$45/t-$CO_2$-e in 2026 and 2027, and expected to rise to S$50-80/t-$CO_2$-e by 2030.

More importantly beyond its domestic decarbonisation objectives, Singapore is a global trade hub, and particularly so for the intraregional trade of emissions-intensive commodities, like iron ore, steel, alumina and aluminium across Asia. As CEF advocates for the joint development of an Asian CBAM to build upon and strengthen domestic carbon pricing mechanisms across Asia, Singapore can play a critical role in leveraging administrative and financial expertise in capacity building for international, trade-focussed carbon compliance, supported by established operations by commodity majors across steel and aluminium supply chains. In 2024 Singapore and Australia announced a new collaboration to establish a green shipping corridor.[149]

As a trusted partner across the world, Singapore can play an important role in scaling the alignment and collaboration of carbon pricing mechanisms across economically-advanced Asia, developing Asia, and large Western economies.

[148] International Carbon Action Partnership, Vietnam Approves Carbon Market Roadmap, Pilot ETS to Launch in June 2025, 11 February 2025
[149] DFAT, Singapore and Australia Green and Digital Shipping Corridor, March 2024

Section 5.4. Summary of Compliance Carbon Mechanisms in Asia

Figure 5.4.1 below summarises the momentum in the investigation and development of compliance carbon markets in developing Asia, collated by CMI.[150]

Figure 5.4.1: Summary of Compliance Carbon Pricing in Asia-Pacific's Key Economies and Sectoral Coverage

Country	NDC Target	Compliance Mechanism	Credit Acceptance
India	**2030**: Reduce emissions intensity by 45% relative to 2005 levels. **2050**: Net zero.	**ETS**: Carbon Credit Trading Scheme (CCTS) under development, expected to launch in 2026. The ETS will initially cover aluminium, chloralkali processes, cement, fertiliser, iron and steel, pulp and paper, petrochemicals, petroleum refining, and textiles	**Domestic**: Carbon Credit Certificates (CCCs) **International**: To be confirmed.
Vietnam	**2030**: Reduce emissions by 43.5% compared to BaU levels. **2050**: Net zero.	**ETS**: Pilot ETS is planned to be implemented between 2025-2027 to cover steel, cement and thermal power stations.	**Domestic**: Certified Carbon Credits (CCCs) **International**: To be confirmed.
Indonesia	**2030**: Reduce emissions by 31.9% below BaU (unconditional); up to 43.2% below BaU (conditional). **2050**: Carbon neutrality.	**ETS**: Phase 1 (2023-24) of mandatory ETS covers 99 coal-fired power stations (≥ 25 MW). **Tax**: A carbon tax is anticipated in 2025.	**Domestic**: Persetujuan Teknis Batas Atas Emisi Pelaku Usaha (PTBAE-PU) **International**: Through mutual recognition agreed by the Minister of Environment and Forestry.
Malaysia	**2030**: 45% reduction of economy-wide carbon intensity relative to 2005 levels (unconditional). **2050**: Net zero.	Feasibility study with the World Bank underway to explore implementing carbon pricing mechanisms.	**Domestic**: To be confirmed. **International**: To be confirmed.
Thailand	**2030**: 30% reduction (unconditional) and 40% (conditional) compared to BaU. **2050**: Net zero.	Under investigation to develop either an ETS or a carbon tax.	**Domestic**: To be confirmed. **International**: To be confirmed.
Philippines	**2030**: Philippines is targeting an emissions reduction and	**ETS**: A national ETS and cap on GHG emissions for	**Domestic**: To be confirmed.

[150] CMI, International Carbon Market Update: States and Trends in the Asia Pacific, August 2024

Country	NDC Target	Compliance Mechanism	Credit Acceptance
	avoidance of 75% by 2030 against a BaU baseline of 3,340.3 Mt CO_2-e. Only 2.71% is unconditional, with the difference (72.29%) conditional. **2050**: To be determined.	high-emitting sectors is under investigation, following the approval of the 'Low Carbon Economy Act of 2022' House Bill in May 2023.	**International**: To be confirmed.
China	**2030**: Peak CO_2 emissions and reduce emissions intensity by over 65% from 2005 levels. **2050**: Carbon neutrality.	**ETS**: National ETS has been operational since 2021 covering the power sector. Cement, steel and aluminium are expected to be integrated into the ETS.	**Domestic**: China Emissions Allowances (CEAs). **International**: To be confirmed.
Japan	**2029-30**: Reduce emissions by 46% relative to 2012-13 levels. **2050**: Net zero.	**Carbon Tax**: A carbon tax is set at JPY 289 (A$2.87) per tonne CO_2. **ETS**: Voluntary ETS (GX-ETS) is operational and will transition to a mandatory scheme in 2026.	**Domestic**: To be determined. **International**: Japan aims to secure 100Mt of international credits through the Joint Crediting Mechanism (JCM) to meet its 2030 NDC target.
South Korea	**2030**: 40% reduction below 2018 levels. **2050**: Carbon neutrality.	**ETS**: Korean ETS (KETS) has been operational since 2015, covering seven sectors: power, industry, buildings, waste, transport, domestic aviation and maritime.	**Domestic**: Korea Unit Allowances (KUAs) **International**: South Korea aims to secure 37.5Mt of international credits to meet its 2030 NDC target.
Australia	**2030**: 43% reduction below 2005 levels. 2035: Expected to be confirmed soon at a 65-75% reduction. **2050**: Net zero.	**ETS**: Safeguard Mechanism reformed in 2023, now operating as a baseline-and-credit ETS covering emissions-intensive industrial facilities.	**Domestic**: Safeguard Mechanism Credits (SMC) and Australian Carbon Credit Units (ACCU). **International**: Australia intends to use high-integrity international credits to meet its 2030 target.

Source: CMI [151]

[151] CMI, International Carbon Market Update: States and Trends in the Asia Pacific, August 2024

Section 6. Building Towards an Asian CBAM

CEF strongly advocates for the introduction of a progressive, rising whole of economy carbon price, both domestically and internationally, as a clear indication of policy direction. This is the most effective mechanism to align private investment in clean energy technologies and production methods with global emissions reduction objectives.

Emission-intensive producers within the steel, cement and aluminium sectors globally, including regions with compliance carbon pricing mechanisms, have demonstrated little to no impact on increasing the pace of private investment into decarbonisation.

Across all compliance mechanisms, the common inadequacy is that carbon liabilities for trade-exposed industries are alleviated by governing bodies providing free allocation of emissions allowances for emitters on the basis of carbon leakage.

Until such time as there is a globally harmonised price on carbon that covers both traded and non-traded products, a carbon border adjustment mechanism provides the clearest pathway to addressing the challenge of carbon leakage.

CEF believes a commitment by Australia, China, South Korea and Japan to jointly develop a carbon border adjustment, an **Asian CBAM**, is the least-cost pathway to accelerate and crowd-in private sector investment into decarbonisation and electrification at a speed and scale commensurate with the global climate crisis, and ensure the impacts of global warming are mitigated to the best possible degree.

This pathway is critical to reducing the dependence of industry on significant taxpayer funded incentives and budgetary support measures to catalyse clean commodity trade and phase out the dominance of fossil fuels embedded in steel, cement and aluminium.

The Asian Development Bank has continued to emphasise the critical need for international carbon pricing frameworks to coordinate, unify, and harmonise fragmented carbon pricing systems to achieve climate ambition, whilst minimising the administrative and compliance costs for entities exposed to international trade of historically emissions-intensive commodities.[152] Multilateral carbon pricing mechanisms will rely on regulatory harmonisation, transparency, support and trust.

International cooperation is essential to encourage the ambitious responses needed to address climate change. Coordinated and effective response actions play a vital role in supporting industrial decarbonisation by assisting the distribution of advanced decarbonisation technologies, enabling access to finance and promoting harmonised regulatory approaches.[153]

The integration of the carbon markets in Asia can facilitate price discovery, improve liquidity provisions and better manage risk exposures for governments and covered entities. Increasing international carbon market participation will increase liquidity, allowing market equilibriums to better reflect the marginal cost of abatement.

[152] Asia Development Bank, Asia-Pacific Climate Report 2024, 01 October 2024
[153] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024

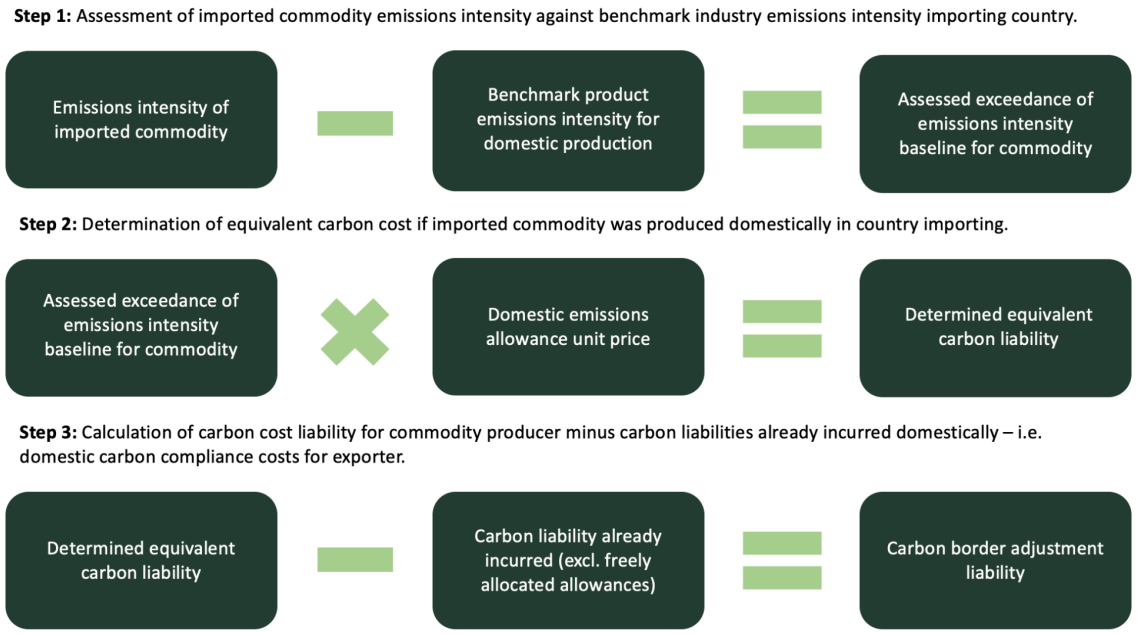
Section 6.1. How an Asian CBAM Could be Implemented

Australia's Safeguard Mechanism and Japan's GX-ETS both operate as a baseline-and-credit mechanism. Although China's national ETS is classified as a cap-and-trade mechanism, as it operates from a facility-specific, production-adjusted baseline, the adjusted 'caps' for facilities essentially mimic those of a baseline-and-credit mechanism. The key exception is that Korea's K-ETS operates as a cap-and-trade system. An Asian CBAM could provide an incentive to introduce a baseline-and-credit structure for sectors covered by an Asian CBAM – initially steel, cement and aluminium – however the CBAM can still operate effectively with varied national pricing mechanisms.

Developing an Asian CBAM with a baseline-and-credit architecture for covered sectors can facilitate the harmonisation and interoperability of carbon accounting frameworks and standards, and, as a result, minimise administrative and compliance costs and capacity through commonly-adopted methodologies.

Allowing importers to rely on appropriate industry-specific or technology-specific emission intensity values reduces compliance and transaction costs. Default values can be developed on a country-by-country or production method-by-production-method basis. The practice of combining country and production pathway-specific accounting methodologies is already gaining traction in other markets, with the EU CBAM introducing both accounting measures, and the UK set to use product default values using global average embodied emissions weighted by production volumes of key trading partners. A schematic of the calculations is shown in Figure 6.1.1 below, building on the framework outlined in Australia's Carbon Leakage Review.[154]

Figure 6.1.1: Potential Asian CBAM Liability Calculation



Source: Jotzo Carbon Leakage Review, Climate Energy Finance

[154] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024

Using the principles of the EU CBAM, the calculation of a carbon border liability in an Asian CBAM would compare the emissions intensity of the product against the internationally-accepted standard for the product, with respect to the production pathway and sector classification depending on the taxonomy adopted. Like the EU CBAM, an Asian CBAM would also factor in the carbon costs incurred in the country of origin in determining the carbon liability paid upon import.

Like the EU CBAM, the design of an Asian CBAM could phase-in the carbon liability over time, progressively increasing the percentage of emissions above the standardised sectoral or product baseline. Given the timeline to adoption of the EU CBAM in comparison to the timeframe in which a mechanism like an Asian CBAM would require to be adopted with a high standard of emissions monitoring, reporting and verification, CEF would recommend an accelerated phase-in of emissions covered by the CBAM.

As border carbon adjustments are measures implemented to address carbon leakage, an Asian CBAM for international trade of products within the steel, aluminium and cement value chains would incur a carbon tariff in line with the Member Party's domestic carbon price, determined by the respective national ETSs. i.e. Japanese-produced steel that is exported to China would pay the market price of China's national ETS for any emissions exceeding the relevant baseline, minus the carbon liability incurred domestically via the GX-ETS (post 2026). Examples of how an Asian CBAM could operate are outlined below in Figure 6.1.2.

Figure 6.1.2: Carbon Border Adjustment Liability Calculation Scenarios

Scenario	Carbon Border Adjustment Calculation
Scenario 1. Commodity with emissions intensity greater than baseline in a baseline-and-credit ETS with carbon costs already incurred, exported to jurisdiction with a baseline-and-credit ETS.	**Export Jurisdiction Assumptions:** ● Commodity emissions intensity: 2.3 tCO_2-e/t. Export country baseline intensity: 2.1 tCO_2-e/t. Carbon price in production jurisdiction: US\$10/tCO_2-e. **Import Jurisdiction Assumptions:** ● Import country baseline intensity: 1.8 tCO_2-e/t. ● Equivalent carbon price in import jurisdiction: US\$25/tCO_2-e. **Step 1: Assessed Excess Emissions Intensity:** 2.3 tCO_2-e/t - 1.8 tCO_2-e/t = 0.5 tCO_2-e/t. **Step 2: Equivalent cost for production in importing jurisdiction:** 0.5 tCO_2-e/t x US\$25/tCO_2-e = US\$12.5/t. **Step 2.b. Carbon costs incurred (minus free allocation):** 2.3 t CO_2-e/t - 2.1 t CO_2-e/t = 0.2 t CO_2-e/t. 0.2 t CO_2-e/t x US\$10/tCO_2-e = US\$2/t. **Step 3: Calculate border carbon liability:** US\$12.5/t - US\$2/t = US\$10.5/t. The importer incurs a CBA liability of US\$10.5/t of product.

Scenario	Carbon Border Adjustment Calculation
Scenario 2. Commodity produced in jurisdiction with cap-and-trade ETS that provides 50% free allocation (50% auction) with an emissions intensity higher than importer jurisdiction's relevant baseline under a baseline-and-credit ETS.	**Export Jurisdiction Assumptions:** ● Commodity emissions intensity: 12 tCO_2-e/t. Export country free allocation: 50% Carbon price in production jurisdiction: US$20/$tCO_2$-e. **Import Jurisdiction Assumptions:** ● Import country baseline intensity: 8 tCO_2-e/t. ● Equivalent carbon price in import jurisdiction: US$60/$tCO_2$-e. **Step 1: Assessed Excess Emissions Intensity:** 12 tCO_2-e/t - 8 tCO_2-e/t = 4 tCO_2-e/t. **Step 2: Equivalent cost for production in importing jurisdiction:** 4 tCO_2-e/t x US$60/$tCO_2$-e = US$240/t. **Step 2.b. Carbon costs incurred (minus free allocation):** 12 tCO_2-e/t x US$20/$tCO_2$-e x 50% (free allocation) = US$120/t. **Step 3: Calculate border carbon liability:** US$240/t - US$120/t = US$120/t. The importer incurs a CBA liability of US$120/t of product.
Scenario 3. Commodity produced in jurisdiction with a baseline-and-credit ETS and is below the relevant emissions intensity baseline. Commodity is exported to cap-and-trade ETS with no free allocation.	**Export Jurisdiction Assumptions:** ● Commodity emissions intensity: 1.1 tCO_2-e/t. Export country baseline intensity: 1.8 tCO_2-e/t. Carbon price in production jurisdiction: US$50/$tCO_2$-e. **Import Jurisdiction Assumptions:** ● Import country free allocation: 0% ● Equivalent carbon price in import jurisdiction: US$25/$tCO_2$-e. **Step 1: Assessed Excess Emissions Intensity:** As domestic producers incur carbon costs on all emissions, excess emissions intensity is intensity of production: 1.1 tCO_2-e/t. **Step 2: Equivalent cost for production in importing jurisdiction:** 1.1 tCO_2-e/t x US$25/$tCO_2$-e = US$27.5/t. **Step 2.b. Carbon costs incurred (minus free allocation):** No carbon costs paid as the commodity is below emissions intensity baseline in production jurisdiction. **Step 3: Calculate border carbon liability:** US$27.5/t - 0 = US$27.5/t The importer incurs a CBA liability of US$27.5/t of product.

Scenario	Carbon Border Adjustment Calculation
Scenario 5. Exporter and importer jurisdictions both have baseline-and-credit ETS with the same emissions intensity baselines. Commodity is below baseline.	**Export Jurisdiction Assumptions:** ● Commodity emissions intensity: 0.55 tCO_2-e/t. Export country baseline intensity: 0.6 tCO_2-e/t. Carbon price in production jurisdiction: US$100/$tCO_2$-e. **Import Jurisdiction Assumptions:** ● Import country baseline intensity: 0.6 tCO_2-e/t. ● Equivalent carbon price in import jurisdiction: US$100/$tCO_2$-e. **Step 1: Assessed Excess Emissions Intensity:** 0.55 tCO_2-e/t - 0.6 tCO_2-e/t = - 0.05 tCO_2-e/t. Product is below emissions intensity baseline, importer does not incur a CBA liability.
Scenario 4. Commodity produced in jurisdiction with baseline-and-credit ETS and is above the relevant emissions intensity baseline. Commodity is exported to jurisdiction with a carbon tax.	**Export Jurisdiction Assumptions:** ● Commodity emissions intensity: 2.3 tCO_2-e/t. Export country baseline intensity: 1.9 tCO_2-e/t. Carbon price in production jurisdiction: US$50/$tCO_2$-e. **Import Jurisdiction Assumptions:** ● Equivalent carbon tax in import jurisdiction: US$10/$tCO_2$-e. **Step 1: Assessed Excess Emissions Intensity:** As domestic producers incur carbon costs on all emissions, excess emissions intensity is intensity of production: 2.3 tCO_2-e/t. **Step 2: Equivalent cost for production in importing jurisdiction:** 2.3 tCO_2-e/t x US$10/$tCO_2$-e = US$23/t. **Step 2.b. Carbon costs incurred (minus free allocation):** 2.3 tCO_2-e/t - 1.9 tCO_2-e/t = 0.4 tCO_2-e/t. 0.4 tCO_2-e/t x US$50/$tCO_2$-e = US$20/t. **Step 3: Calculate border carbon liability:** US$23/t - US$20/t = US$3/t. The importer incurs a CBA liability of US$3/t of product.

As an Asian CBAM places a carbon price on imported commodities equivalent to that of domestically produced commodities, the CBAM would address carbon leakage.

CEF would strongly advocate for a commitment from Member Parties to the Asian CBAM to progressively increase the carbon prices in the respective national compliance carbon pricing mechanisms, and create standardised baseline pathways to reduce the threshold to that of internationally-accepted definitions of ‘green products’ over time for regions that have implemented baseline-and-credit ETSs.

The standardisation and harmonisation of carbon accounting frameworks will facilitate the international trade of commodity carbon credits created from the differential between the embedded emissions of the product and the emissions intensity baseline. The interoperability of standards translates to uniform determinations of the volume of credits issued to facilities and entities covered by the national compliance systems. As highlighted in Section 3, the ability to integrate compliance markets internationally by deepening the liquidity of each market. This can also facilitate the acceleration of baseline reductions to subsequently drive material investments into decarbonisation by limiting the banking and borrowing against future period rules that have contributed to the throttling of investments to-date.

The polluter-pays principle can also apply to the administrative and compliance expenses incurred by the Member Governments of the Asian CBAM. As outlined in the Paris Agreement Crediting Mechanism, a share of the revenues generated from the trading of credits can be used to cover such expenses, as well as assist developing country Members that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.[155]

A number of stakeholders within Australia's major industries have demonstrated their support for the development of international collaboration and coordination in carbon pricing mechanisms, including Fortescue, Australia's third largest iron ore producer and industry decarbonisation leader with commitments to deliver real zero Scope 1 and 2 emissions by 2030, and Scope 3 by 2040, and the Business Council of Australia:

It is important that agreements that are struck between trade partners that have carbon border adjustment policies, and those that are considering them, to streamline the process for trade of emissions intensive and emissions free products. Customers must have confidence in the integrity of the product they are purchasing through the use of government programs like the Australian Guarantee of Origin product scheme. The interoperability of these schemes across jurisdictions is key to maintaining consumer confidence and accurate emissions accounting across the life cycle of a product. – ***Fortescue****.*[156]

'The design of a CBAM should aim to minimise the cost of emissions accounting and compliance, recognising the complexity of accounting for emissions across what may be complex supply chains' – ***Business Council of Australia****.*[157]

Section 6.2. Harmonising MRV and Standards in an Asian CBAM

The success of an international trade-based carbon border adjustment is heavily dependent on the interoperability of monitoring, reporting, and verification of emissions embedded in traded commodities. Currently, the existing standards for steel, cement and concrete do not provide a precise, consistent and comparable carbon accounting methodology, with different interpretations on underlying assumptions driving material variations in embedded emissions.

The most prominent standards for product-level carbon accounting methodologies remain those governed by the International Standards Organisation (ISO) and The European

[155] Climate Analytics, Article 6.4 Progress Update: Work of the Supervisory Body on the Paris Agreement Crediting Mechanism, July 2024
[156] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024
[157] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024

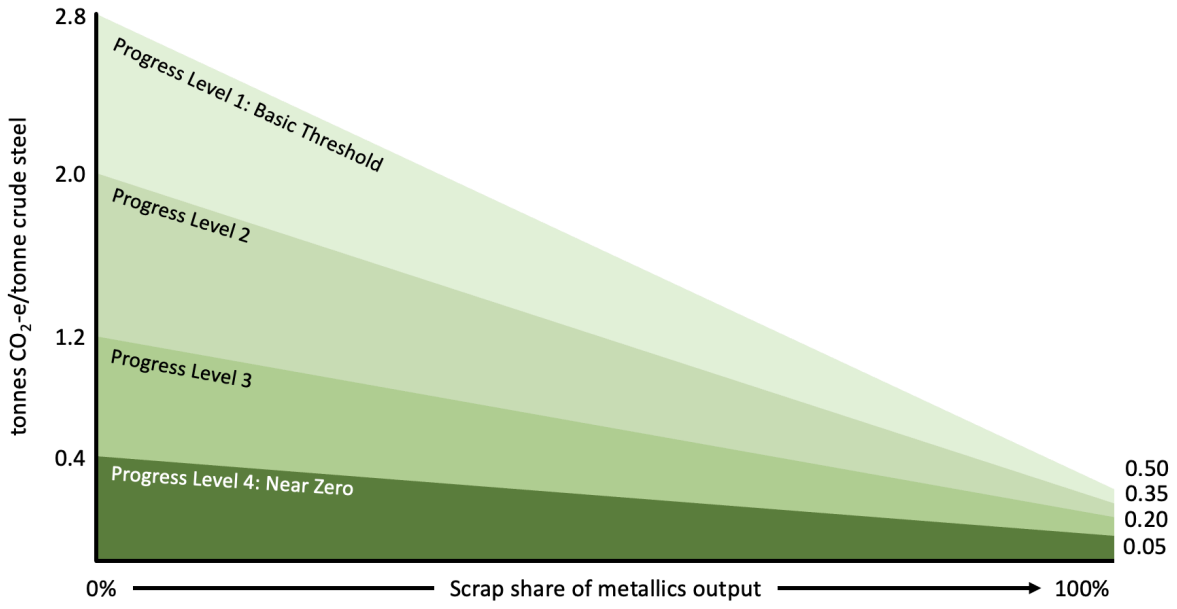
Committee for Standardisation (CEN). Whilst various industry associations have developed standards and certification schemes, such as the ResponsibleSteel Standard[158] and the Global Steel Climate Council's (GSCC) Steel Climate Standard, the majority have enhanced and built on the frameworks established under the ISO and CEN standards. These are the foundational standards that can support the harmonisation and interoperability of global emissions reporting and carbon accounting across the steel, cement, and concrete ecosystems.[159]

For the steel sector, ResponsibleSteel's sliding scale can embed the principles of common but differentiated responsibilities in international carbon markets by shifting the contributions to that in line with the varied national circumstances.

As countries have undergone economic development and industrialisation, cheaper, mature production pathways have been prioritised for materials needed for construction and industrial applications. As a result, fossil fuel intensive pathways, such as BF-BOF steel production, have resulted in a higher proportion of coal-based steelmaking to total national production than global averages.

A broader Asian CBAM, in which developing south-east Asian economies integrate with China, Japan, South Korea and Australia, could be accelerated by designing emissions accounting methodologies to provide an equitable distribution of GHG emission reductions. In the case of steel, emissions intensity values for baseline-and-credit mechanisms can incorporate models developed by international standards and framework organisations, such as ResponsibleSteel's sliding scale for decarbonisation progress – illustrated in Figure 6.2.1.

Figure 6.2.1: ResponsibleSteel Decarbonisation Progress Levels for Steel



Source: ResponsibleSteel

[158] ResponsibleSteel, Understanding ResponsibleSteel's Decarbonisation Progress Levels, 23 September 2024
[159] UNIDO Industrial Deep Decarbonisation Initiative, Driving Consistency in the Greenhouse Gas Accounting System, 05 December 2023

Various reporting frameworks already rest upon overlapping standards and methodologies, primarily from the International Organisation for Standardisation (ISO) and the European Committee for Standardisation (CEN/EN).

The standards set by ISO/(C)EN lay the foundation in which most environmental attribution certificates are designed. **Product Category Rules (PCRs)** establish specific methodologies for how **Life Cycle Assessments (LCAs)** are conducted for various product families (i.e. steel, cement, etc.). Such assessments are required to have independent third-party verification to certify emission monitoring. E.g. ISO 20915:2018 provides specific rules for calculating emissions for steel production. From this, **Environmental Product Declarations (EPDs)** can be produced, which are comprehensive and standardised documents that provide verified information on the LCAs of a product, examining various categories including GHG emissions.

Global not-for-profits, such as ResponsibleSteel and the GSCC Steel Climate Standard, which have developed proprietary certification frameworks, building on these EN and ISO frameworks for stationary installation emissions monitoring. A summary of the harmonised standards, MRV frameworks and carbon accounting methodologies required to ensure the successful interoperability of an Asian CBAM is shown below in Figure 6.2.2 – as developed by the IDDI.[160]

Figure 6.2.2: Universally Recognised Principles to Align Carbon Accounting

Greenhouse Gas Protocol Accounting Principles	
Relevance	Ensure the GHG inventory appropriately reflects key activities and decision-making.
Completeness	Account for all GHG emission sources without double counting.
Consistency	Use consistent rules across industries, organisations and products to create comparability and interoperability.
Transparency	Maximise disclosure of assumptions and data use and embed visibility and transparency into accounting methodologies.
Accuracy	Ensure that quantification of GHG emissions reflects actual emissions and processes.
Additional Considerations Highlighted by the IEA	
Facilitates Decarbonisation	Supports system decarbonisation solutions by enabling emissions-reducing practices for all parties.
Minimises Complexity	Builds on existing foundations to avoid starting from scratch and leverage existing momentum.

[160] UNIDO Industrial Deep Decarbonisation Initiative, Driving Consistency in the Greenhouse Gas Accounting System, 05 December 2023

At the COP28 World Climate Action Summit in December 2023, the Industrial Transition Accelerator (ITA) was launched – a global initiative to deliver Paris Agreement-aligned ambition across heavy industry and transport. The ITA includes stakeholders from global leaders in industry, energy, financial institutions and governments to drive investment at the necessary speed and scale for rapid decarbonisation. Standards and associated frameworks need to address at least one of the following:

- A method to measure the impact – i.e. an **emissions accounting methodology**, including a clear system boundary,
- **Thresholds** for low-emission products – i.e. a low-emissions definition,
- A **comprehensive verification** scheme, via an independent certification system.

The existing MRV for the established ETSs in China, Korea and Australia is summarised in Figure 6.2.3 below.

Figure 6.2.3: MRV Framework for Established ETSs in Asia-Pacific

ETS	MRV
China ETS	**Monitoring**: Entities are required to self-monitor based on approved plans. **Reporting**: Entities must submit previous year's emissions by the end of April each year. **Verification**: Provincial-level ecological and environmental authorities are responsible for verifying GHG emissions. **Framework**: MRV guidelines, secondary data sets, and verification guidelines are available for the eight sectors expected to be covered by the ETS long-term. The MEE amends the MRV guidelines and technical specifications every year.
Korea ETS	**Monitoring**: Entities self-monitor emissions. **Reporting**: Annual reporting from previous year must be submitted by the end of March. **Verification**: Third-party verification. Emissions are reviewed and certified by the Certification Committee of the Ministry of Environment by the end of May.
Safeguard Mechanism	**Monitoring**: Emissions are monitored based on NGER guidelines, facility-specific emissions intensity values and industry emissions intensity values. **Reporting**: Annual self-reporting under guidelines defined in NGER Act. **Verification**: Verification according to guidelines defined in NGER Act. The Guarantee of Origin Scheme will provide verification of embedded emissions with products that use renewable energy and its derivatives – e.g. hydrogen.

Source: International Carbon Action Partnership

A summary of the standards and frameworks developed for the steel, cement and aluminium value chains is available in Appendix 6.

Independent verification will be required to validate production emission intensities, and should be administered by established accrediting bodies, or expanding the remit of international cooperative organisations and intergovernmental arrangements.

Section 6.3. Carbon Accounting and the Shift from Facility-Level to Product-Level Emissions as Carbon Pricing Progresses

As carbon prices expand to cover internationally traded commodities, the harmonisation of product-level carbon accounting frameworks will be critical in minimising compliance and administrative costs for producers, importers and regulatory bodies.

As first mover buyers and advanced market commitment (AMC) coalitions purchase low-carbon products, the need for low-carbon, product-level emissions data is required. In addition, as other aspects of sustainable sourcing are scrutinised to similar degrees to that of carbon emissions (i.e. water stewardship, human rights, labour rights, stakeholder engagement, decommissioning, etc.), supply chain transparency will become increasingly important.

As carbon pricing mechanisms also expand to cover multiple sectors across value chains, transparency and auditability of embedded emissions up until the point of production of a traded commodity, i.e. cradle-to-gate emissions, will be key. This imperative is elevated further as carbon border adjustments phase-in, and border carbon liabilities are adjusted based on carbon prices already paid for emissions embedded in the imported product.

Highlighted in various sections above, the energy transformation will likely see a global restructure of value chains and energy-intensive manufacturing processes to that of regions with comparative advantages in the production of low-cost renewable energy. As a result, supply chains will become more diversified and globalised as integrated producers in centralised production hubs decouple aspects of the manufacturing processes.

Globally, we are seeing industrial sectors beginning to shift focus from facility-level analysis to product-level transparency, primarily driven by customer demand. To date, this has led to increasing adoption of EPDs in industrial sectors, with EPDs providing a verified emissions assessment. Global aluminium producers, including Alcoa and Norsk Hydro, have developed EPDs for a range of their lower-carbon aluminium products. Steelmakers including BlueScope, Infrabuild, ArcelorMittal, Nippon Steel, Tata Steel, SSAB, Thyssenkrupp Steel, and POSCO, have all produced EPDs, with the majority based on cradle-to-gate LCAs, aligning with ISO 21930 and EN 15804 for PCRs.

In May 2022, the China Iron and Steel Association (CISA) launched the China Steel Industry Full Industry Chain EPD Platform, developing standardised EPDs for Chinese steelmakers. By January 2023, the Platform had developed 35 EPDs for 10 Chinese enterprises, including the Baowu Group (world's largest steel producer), Shougang Group, Shagang Group, Baogang and Jiugang. This included 6 EPDs for iron ore and iron ore pellets by Baowu Resources across its subsidiaries, the first EPDs for upstream products in the steel value chain.[161] The EPDs were developed using LCAs in accordance with ISO 14025. In October 2024, Sweden's

[161] Baowu Resources, Baowu Resources First Released Iron Ore and Pellet Product EPD Reports, 12 January 2023

EPD International signed an MoU with CISA and China's Baowu Group to explore the potential for a mutual recognition agreement in the respective systems and PCRs on steel.[162]

However, static product declarations often rely on various assumptions, functional units, system boundaries, as well as industry-average benchmarks of proprietary emission benchmarks rather than product-specific data. Lack of transparency over the process and assumptions used can make verification and auditing difficult, and disproportionately impact small and medium enterprises in administrative costs in the creation of static declarations.

A regulatory environment with an effective carbon compliance regime should be based upon fundamental carbon accounting principles that prioritise the measurement, reporting and verification of emissions from original producers of such emissions, i.e. Scope 1 emissions. Scope 1 emissions are only calculated once: where they occur, and thus, where emissions should be monitored, reported and audited.

If a carbon accounting framework begins with the allocation of Scope 1 emissions embedded in its purchased inputs, and are added to the emissions produced by its own process and applied to its finished products, the cradle-to-gate emissions assessment can be transferred to immediate customers via a dual invoice. This methodology therefore can work effectively no matter how complex, distributed or diverse a commodity's supply chain is, as each producer needs only to measure its own emissions and apply the embedded emissions of its inputs provided by upstream suppliers. Each producer does the internal allocation process and then transfers, with its invoice, the embedded emissions to its customers.

An example of this would be a DRI producer in Australia exporting to a steel producer in Korea to be processed in an EAF under an Asian CBAM.

1. An iron ore miner assigns their Scope 1 emissions to their output, creating an emissions intensity for its iron ore specific to that producer.
2. Electricity producers assign their Scope 1 emissions to their output based on fossil fuel consumption per unit of electricity generated. This emissions intensity is transferred to the iron ore producer.
3. Embedded emissions intensity (including electricity emissions) is then transferred to the DRI producer, which adds the emissions to that of its Scope 1 emissions as well as emissions transferred from the electricity purchased by the DRI producer.
4. Carbon costs paid under the Safeguard Mechanism by the iron ore producer or electricity provider are also transferred to the DRI producer via a transparent, audited emissions ledger.
5. The DRI producer exports the product alongside an assessment of the embedded emissions and carbon costs paid thus far.
6. Under an Asian CBAM, border carbon adjustments are determined based on the cradle-to-gate emissions, and carbon costs paid, and are compared to that of an equivalent domestic DRI producer in Korea. A carbon border adjustment is applied and paid for by the importing steel producer.
7. The imported DRI is then added to the Scope 1 emissions of the steel producer, as well as purchased electricity emissions provided by the domestic energy supplier in Korea.

[162] EPD International, Interest in Strengthening Cooperation Between IES and the Steel Industry in China, 02 October 2024

Using a transaction-based carbon accounting framework provides a verifiable, transparent report on the embedded emissions and carbon prices already paid in each transaction across a supply chain, irrespective of where precursor or input materials are produced. This can then be used by or the importer of finished steel products, e.g. the EU to be used in car manufacturing and for compliance under the EU CBAM, and ultimately be seen by the end consumer of a product.

Carbon prices are therefore only paid on the marginal emissions of a final product, i.e. emissions above that of embedded emissions of its inputs (gate-to-gate emissions), whilst also capturing total carbon prices paid for embedded emissions across the value chain.

An international carbon accounting framework that provides transparency of cradle-to-gate emissions puts accountability of producers to redesign their products, re-engineer their processes, and source low-carbon products and services from their suppliers and transportation companies.

In an increasingly diversified product supply chain world, outward-oriented carbon compliance regimes, such as an Asian CBAM, should support the seamless exchange of emissions data between entities, ensuring compatibility and regulatory compliance across jurisdictions. An Asian CBAM needs to scale credible emissions accounting and enhance transparency and trust of verifiable carbon accounting, and evolve over time to align to best practice standards.

Issues raised against CBAMS on the basis of the violation of free-trade laws and WTO principles only manifest when regulators apply highly approximated industry-wide, country-wide, or region-wide average emissions intensity default values, which become discriminatory against producers of low-embodied emission producers in these jurisdictions.

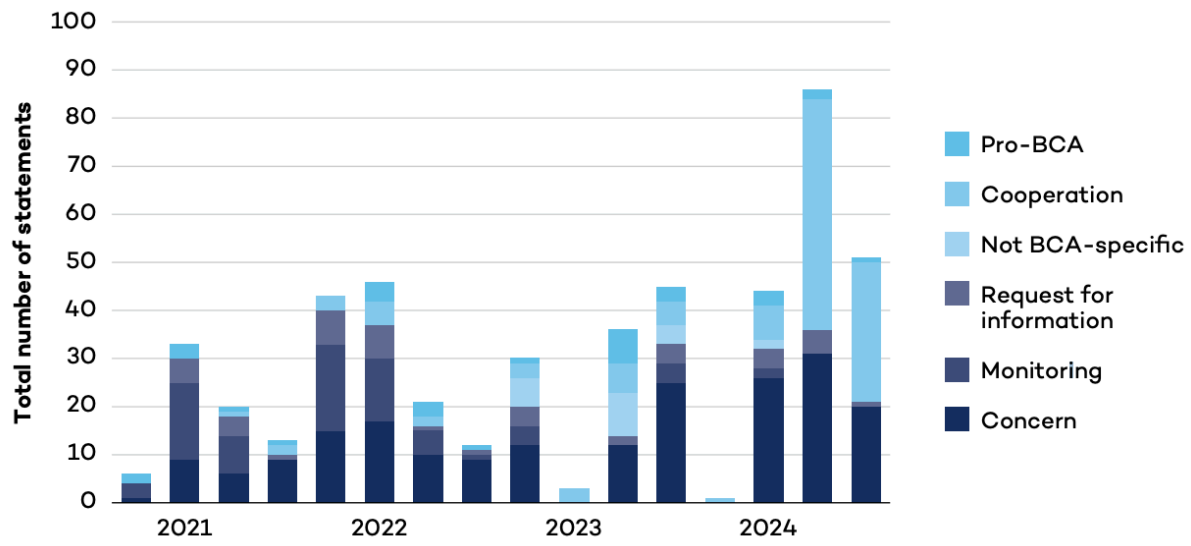
As trade barriers and restrictions are increasingly adopted by large economies, it is critical to design and harmonise intraregional carbon pricing mechanisms such that they do not restrict trade, but rather enable the trade of clean commodities. The harmonisation of carbon accounting frameworks, and the transparency and verifiability of embedded emissions based on facility-level emissions applied across their respective outputs, is key to minimising the overdependence on blunt, discriminatory default emissions values that hinder global progress towards decarbonisation.

Section 6.4. International Climate Agreements Can Form the Basis an Asian CBAM

Multilateral and plurilateral initiatives can play an immediate role by contributing to the development of commonly accepted and interoperable policy approaches that support effective and efficient implementation of domestic policies, particularly carbon border adjustments.[163]

Momentum and discussions are increasing within key Asia-Pacific economies on joint development and collaboration for international carbon mitigation and emission reduction platforms. The WTO has been a core platform for the discussion of carbon border adjustments, with the International Institute for Sustainable Development (IISD) identifying 519 official statements concerning border adjustments from 2020 to 2024. Originally dominated by concerns on potential violations against WTO compliance rules, the impact of such mechanisms on trade, increasing protectionism and burdens of implementation, the dialogue has now shifted materially to cooperative discussions and pro-border adjustment engagement – see Figure 6.4.

Figure 6.4: Quarterly Distribution of the Tone of BCA-related Statements, 2020-2024



Source: IISD [164]

Trade-related climate measures, like an Asian CBAM, can enable the development of comprehensive accounting methodologies, high-ambition definitions, and practical certification systems that will be vital in driving investments toward the commercialisation of deeply decarbonised industrial projects required to achieve the collective duty to reach net zero.

[163] DCCEEW, Frank Jotzo's Carbon Leakage Review: Consultation Paper 2, 14 November 2024
[164] IISD, The State of BCAs 2025, 28 February 2025

Section 6.4.1. The Paris Agreement

Article 6.2: Parties shall, where engaging on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards NDCs, promote sustainable development and ensure environmental integrity and transparency, including in governance, and shall apply robust accounting to ensure, inter alia, the avoidance of double counting, consistent with guidance adopted by the Conference of the Parties serving as the meeting of the Parties to this Agreement.

Article 6.4: A mechanism to contribute to the mitigation of GHG emissions and support sustainable development is hereby established under the authority and guidance of the Conference of the Parties serving as the Meeting of the Parties to this Agreement for use by Parties on a voluntary basis. It shall be supervised by a body designated by the Conference of the Parties serving as the Meeting of the Parties, and shall aim:

- To promote the mitigation of GHG emissions while fostering sustainable development;
- To incentivise and facilitate participation in the mitigation of GHG emissions by public and private entities authorised by a Party;
- To contribute to the reduction of emission levels in the host Party, which will benefit from mitigation activities resulting in emission reductions that can also be used by another Party to fulfil its NDCs, and
- To deliver an overall mitigation in global emissions.

The **Paris Agreement's Crediting Mechanism** (PACM) allows countries to raise climate ambition and implement national action plans via a lower-cost pathway. The PACM provides an opportunity to achieve verifiable international emissions reduction among countries that choose to voluntarily collaborate on climate mitigation projects through the transfer of verified emission credits between partner countries to meet their respective nationally determined contributions.

The Agreement established the Supervisory Body (PACM-SB) to oversee the Mechanism, operating under the authority of the Agreement and its Parties. The PACM-SB will provide accreditation to an organisation or governing entity with sufficient institutional capacity, competence, and impartiality needed to perform emissions verification and certification in accordance with the Article's rules and regulations.[165]

CEF believes a single, collective CBAM would minimise the administrative burden and costs associated with MRV as opposed to independent, fragmented border adjustment policies of importers of emissions-intensive products.

As part of the scope of the PACM-SB, the Body is developing methodologies, standardised baselines and methodological tools to form the framework for international emissions reductions and removals. This will introduce an internationally-recognised systematic approach to quantify and verify emission reductions, including a standardisation for emission intensity baselines and downward adjustments to align with climate targets.[166]

Australia, China, South Korea, and Japan are all Parties to the Agreement.

[165] UNFCCC, Paris Agreement Crediting Mechanism: Accreditation
[166] UNFCCC, Paris Agreement Crediting Mechanism: Methodologies

Section 6.4.2. Inclusive Forum on Carbon Mitigation Approaches

The Inclusive Forum on Carbon Mitigation Approaches (IFCMA) is the OECD's flagship initiative to optimise emissions reduction efforts through better data and information sharing, evidence-based mutual learning and inclusive multilateral dialogue.

As part of the IFCMA's programme, the Forum has published in-depth research and analysis on the development of accurate, timely and granular product-level and sector-level carbon intensity metrics.[167]

The EU, Australia, Japan, South Korea, New Zealand, Philippines, and Singapore are members of the IFCMA across the Asia-Pacific.

Section 6.4.3. The Climate Club

The Climate Club is an intergovernmental forum on industrial decarbonisation, serving to develop the enabling frameworks for increased collective action across borders to ensure the full and effective implementation of the Paris Agreement and limit temperature increases to 1.5ºC. The Climate Club is also committed to accelerating sectoral decarbonisation, particularly in the industry sector. An interim Secretariat of the Climate Hub is hosted by the OECD in tandem with the IEA.

The Climate Club's objectives are centred across three pillars:

1. **Advancing ambitious and transparent climate change mitigation policies** by developing a common understanding of the effectiveness and economic impact of policies, strengthening emissions measurement and reporting mechanisms, and engaging in dialogue on carbon leakage and other risks to mitigation efforts.
2. **Transforming industries** to advance the enabling conditions for substantial industrial decarbonisation by aligning, as far as possible, methodologies, standards, sectoral pathways and expanding markets for green industrial products.
3. **Boosting international climate cooperation and partnerships** to encourage and improve the enabling environment for industrial decarbonisation in emerging markets and developing economies to leap-frog into a climate-friendly industrial development.

The Climate Club's 43 members include the EU, Australia, Japan, South Korea, Indonesia, New Zealand, Singapore, Thailand, and other steel producing economies like Sweden, Turkey, Ukraine, Germany, and the US. In 2024, its members represented 65% of steel and iron exports, 59% of cement exports, 62% of global GDP and 25% of global industrial emissions. China is not a part of the Climate Club.

An Asian CBAM can directly address the three pillars of the Climate Club through the creation of a common, harmonised approach to accelerating industrial decarbonisation. It is positive to see the Climate Club's momentum in socialising and engaging in the mutually-beneficial economic and environmental outcomes that can emerge from an interoperable system for emissions accounting and MRV in emissions-intensive industrial sectors, including the convergence of near-zero emission threshold values for steel and cement production compatible with a 1.5ºC pathway.[168]

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[167] IFCMA, Towards More Accurate, Timely, and Granular Product-Level Carbon Intensity Metrics: Challenges and Potential Solutions. 04 November 2024

[168] The Climate Club, Climate Club 2024 Annual Report, 31 January 2025

Appendix

A: EU Carbon Leakage List Sectors

510	Mining of hard coal
610	Extraction of crude petroleum
710	Mining of iron ores
729	Mining of other non-ferrous metal ores
891	Mining of chemical and fertiliser minerals
899	Other mining and quarrying n.e.c.
1041	Manufacture of oils and fats
1062	Manufacture of starches and starch products
1081	Manufacture of sugar
1106	Manufacture of malt
1310	Preparation and spinning of textile fibres
1395	Manufacture of non-wovens and articles made from non-wovens, except apparel
1411	Manufacture of leather clothes
1621	Manufacture of veneer sheets and wood-based panels
1711	Manufacture of pulp
1712	Manufacture of paper and paperboard
1910	Manufacture of coke oven products
1920	Manufacture of refined petroleum products
2011	Manufacture of industrial gases
2012	Manufacture of dyes and pigments
2013	Manufacture of other inorganic basic chemicals
2014	Manufacture of other organic basic chemicals
2015	Manufacture of fertilisers and nitrogen compounds
2016	Manufacture of plastics in primary forms
2017	Manufacture of synthetic rubber in primary forms
2060	Manufacture of man-made fibres
2311	Manufacture of flat glass
2313	Manufacture of hollow glass
2314	Manufacture of glass fibres
2319	Manufacture and processing of other glass, including technical glassware
2320	Manufacture of refractory products
2331	Manufacture of ceramic tiles and flags
2351	Manufacture of cement
2352	Manufacture of lime and plaster
2399	Manufacture of other non-metallic mineral products n.e.c.
2410	Manufacture of basic iron and steel and of ferro-alloys
2420	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
2431	Cold drawing of bars
2442	Aluminium production
2443	Lead, zinc and tin production
2444	Copper production
2445	Other non-ferrous metal production
2446	Processing of nuclear fuel
2451	Casting of iron

B: Chinese Provincial Pilot ETSs

Province	Year	Sectors	Cap (Mt CO_2)	Average Price
Beijing	2013	Power, industry, transport and buildings.	44.0 (2022)	2023 Auction: CNY 115 (USD 16.26) Market: CNY 90.96 (USD 12.84)
Guangdong	2013	Industry and domestic aviation.	297.0 (2023)	2023 Market: CNY 75.01 (USD 10.58)
Shanghai	2013	Power, industry, transport, buildings, domestic aviation and maritime.	100 (2022)	2023 Auction: CNY 70.90 (USD 10.00) Market: CNY 66.96 (USD 9.45)
Shenzhen	2013	Industry, transport and buildings.	28 (2023)	2023 Market: CNY 46.37 (USD 6.55)
Tianjin	2013	Industry.	74 (2023)	2023 Market: CNY 32.20 (USD 4.54)
Hubei	2014	Industry.	180.0 (2022)	2023 Auction: CNY 42.73 (USD 6.03) Market: CNY 38.78 (USD 5.47)
Chongqing	2014	Industry.	79.4 (2020)	2023 Market: CNY 29.82 (USD 4.09)
Fujian	2016	Industry and domestic aviation.	116.2 (2022)	2023 Market: CNY 23.25 (USD 3.28)

Source: International Carbon Action Partnership ETS Map

C1: Summary of Major Steel Standards and Frameworks

Name	Org.	Description	Accounting	Low-Carbon Definitions	Certification	Uptake & Scope
Responsible Steel International Production Standard	Responsible Steel	Standard and certification system for responsible sourcing and production of steel.	Yes	Yes	Yes	Low; Global
The Steel Climate Standard	GSCC	Criteria for evaluating and certifying lower-carbon steel products.	Yes	Yes	Yes	Low; Global
Low Emission Steel Standard (LESS)	WV Stahl (German Steel Association)	A labeling system that allows carbon intensity comparison between steel products.	Partial	Yes	Partial	In develop-ment; Regional
CBAM	EU	Measurement tool for the embodied carbon emissions of imported products.	Yes	No	Yes	Low; Regional
Worldsteel LCI Methodology	World Steel Association	Emissions accounting methodology for steel.	Yes	No	No	High; Global
Label Program Approach	US EPA	Defines, identifies, and labels low-embodied-carbon building materials.	No	Yes	No	Medium; Global
FMC Steel Commitment	FMC	Purchase commitment for near zero emissions steel.	No	Yes	No	Low; Global
IEA Near Zero Emissions Steel Definition	IEA	Definition proposals for near-zero emissions steel to inform future policy.	No	Yes	No	Low; Global
ISO 21930/ EN 15804	ISO/CEN	Principles, definitions for	Yes	Yes	Yes (EPDs and PCRs)	High; Global

Name	Org.	Description	Accounting	Low-Carbon Definitions	Certification	Uptake & Scope
		construction products and services EPDs				
Steel Accounting Guidance	RMI	Guidance for steel companies to report and reduce the emissions impact of their products.	Yes	Yes	No	Low; Global

C2: Summary of Major Aluminium Standards and Frameworks

Name	Org.	Description	Accounting	Low-Carbon Definitions	Certification	Uptake & Scope
ASI Performance Standard Certification	ASI	Promotes responsible production via ESG guidance.	Yes	Yes	Yes	High; Global
ASI Chain of Custody (CoC) Standard	ASI	Assures ASI sustainable product standards across supply chains.	No	No	Yes	Medium; Global
IAI Carbon Footprint Methodology	IAI	Established methodologies for quantifying aluminium production emissions	Yes	No	No	High; Global
Aluminium GHG Emissions Reporting Guidance	RMI	Establishes performance metrics to improve transparency in product climate claims.	Yes	No	No	Low; Global
ISO 21930/ EN 15804	ISO/CEN	Principles and definitions for construction products and services EPDs	Yes	No	Yes (EPDs and PCRs)	High; Global
FMC Aluminium Commitment	FMC	Buyer commitments for low carbon aluminium	No	Yes	No	Low; Global

CBAM	EU	Measurement tool for the embodied carbon emissions of imported products.	Yes	No	Yes	Low; Regional

C3: Summary of Major Cement and Concrete Standards and Frameworks

Name	Org.	Description	Accounting	Low-Carbon Definitions	Certification	Uptake & Scope
Concrete Sustainability Council Certification	CSC	Supply chain certification system for cement and concrete production.	Yes	Yes	Yes	Medium; Global
GCCA EPD Tool	GCCA	Simplifies EPD creation for producers of cement and concrete, soon to include GCCA definitions for low-emissions).	Yes	In Develop-ment	Yes (EPDs)	Medium; Global
ISO 21930/ EN 15804	ISO/CEN	Principles and definitions for construction products and services EPDs	Yes	No	Yes (EPDs and PCRs)	High; Global
IEA Near-Zero Emissions Cement Definition	IEA	Definition proposals for near-zero emissions cement to inform future policy.	No	Yes	No	Low; Global
FMC Cement & Concrete Commitment	FMC	Purchase commitment for near-zero emissions cement and concrete.	No	Yes	No	Low; Global
Label Program Approach	EPA	Defines, identifies, and labels low-embodied-carbo n building materials.	No	In Develop-ment	No	Medium; Global
CBAM	EU	Measurement tool for the embodied carbon emissions of imported products.	Yes	No	Yes	Low; Regional

Source: ITA, in partnership with RMI [169]

[169] ITA and RMI, Mapping the Landscape of Low-Emissions Product Standards, September 2024