Global Climate Policy Project
at Harvard and MIT

Technical Report

Putting Climate Coalitions into Practice

A Common Framework for Balancing Competitiveness and Equity

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Technical Report of the Global Climate Policy Project (GCPP) Working Group on Climate Coalitions

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Global Climate Policy Project at Harvard and MIT

About the Project

The Global Climate Policy Project (GCPP) is a joint initiative between Harvard and MIT dedicated to identifying and advancing innovations in global climate policies and institutions. Existing frameworks, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, have established an important foundation for climate action but are not sufficient to manage the risks of a changing climate. With financial support from the Salata Institute for Climate and Sustainability at Harvard University, the Weatherhead Center for International Affairs at Harvard University, the MIT Climate Project, the MIT Center for Energy and Environmental Policy Research, MIT Future Energy Systems Center, and the Hewlett Foundation, GCPP puts forward ideas and policy proposals that complement the UNFCCC and address critical gaps in trade, finance, security, and other areas.

By convening leading academics, policymakers, industry experts, and members of civil society, GCPP drives research-backed policy proposals that can shape the global dialogue and accelerate urgent climate action.

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Members of the GCPP Working Group on Climate Coalitions

This report reflects proposals and technical analysis developed by the GCPP, informed by extensive consultation and substantive feedback from the GCPP Working Group on Climate Coalitions, a diverse group of experts from both developed and developing countries, including many of the world's major emitters. Members brought expertise from government, international financial institutions, the private sector, academia, and civil society. This report builds on the Working Group's 2025 Flagship Report *Building a Climate Coalition: Aligning Carbon Pricing, Trade, and Development.*

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All members of the Working Group serve in an individual capacity. This report does not necessarily represent the views of the institutions to which they are affiliated. Working Group members participate on a voluntary basis and do not receive financial compensation for their contributions. Members all agree with the broad thrust of the analysis and recommendations presented in the report but should not be taken as agreeing with every aspect of the proposal.

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List of Abbreviations

BCA	border carbon adjustment
CAD	Canadian dollar (C$)
CBAM	carbon border adjustment mechanism
CEA	China Emission Allowance
CIF	Climate Investment Funds
CNY	Chinese yuan (renminbi) (¥)
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COP	Conference of the Parties (to the UNFCCC)
CPS	Carbon Price Support (UK)
EACR	Effective Average Carbon Rate (OECD)
ECC	effective carbon cost
EEA	European Economic Area
ETS	emissions trading system
EU	European Union
EUA	European Union Allowance
EUR	euro (€)
GATT	General Agreement on Tariffs and Trade
GBP	Great British pound (£)
GHG	greenhouse gas
HIC	high-income country
ICAP	International Carbon Action Partnership
IMF	International Monetary Fund
LIC	low-income country
LMIC	lower-middle-income country
MDB	multilateral development bank
MIC	middle-income country
MRV	measurement, reporting, and verification
MSR	Market Stability Reserve
Mt	million metric tons
NDC	Nationally Determined Contribution (under the Paris Agreement)
NZU	New Zealand Unit
OBPS	Output-Based Pricing System (Canada)
OECD	Organization for Economic Cooperation and Development
SBCE	Sistema Brasileiro de Comércio de Emissões (Brazil)
SGD	Singapore dollar
SME	small- and medium-sized enterprise
TCP	total carbon price (World Bank)
TPRM	Trade Policy Review Mechanism (WTO)
UKA	UK Allowance
UMIC	upper-middle-income country
UNFCCC	United Nations Framework Convention on Climate Change
USD	US dollar ($)
WTO	World Trade Organization

Executive Summary

Climate-related disasters across the globe—including intense heatwaves, wildfires, droughts, and floods—are underscoring the urgency of the clean energy transition. The war in Iran has further highlighted the energy security and resilience benefits of clean-energy investment. But governments are simultaneously grappling with geopolitical rivalries, pressures on energy supply and affordability, and tight fiscal constraints. Against this backdrop, climate policies will need to advance decarbonization while addressing countries' broader economic, security, and political priorities.

A climate coalition can let countries that are ready to act move first and create incentives for others to follow. As the Global Climate Policy Project at Harvard and MIT set forth in its 2025 flagship report, *Building a Climate Coalition: Aligning Carbon Pricing, Trade, and Development* (the 2025 GCPP report), members of the coalition would commit to a carbon price floor in agreed industries and apply border carbon adjustments (BCAs) to imports from nonmembers, thereby helping ensure that firms face comparable carbon-related costs. The coalition would also offer incentives for low- and middle-income countries to join, including technology and capacity-building support, climate finance, and preferential market access.

Over the past year, carbon pricing systems have come into direct contact across borders, setting the stage for such an approach. On January 1, 2026, the European Union's Carbon Border Adjustment Mechanism (CBAM) entered its compliance phase, becoming the first policy to charge imports for their embedded emissions. Countries including Australia, Thailand, Türkiye, and the United Kingdom are contemplating BCAs of their own, alongside domestic carbon pricing. Whether these measures develop into a patchwork of unilateral approaches or coordinated rules will depend on decisions governments make over the next few years.

At COP30 in Belém, 17 countries and the European Union endorsed the Declaration on the Open Coalition on Compliance Carbon Markets (the Open Coalition), which formally launched in May 2026 with Brazil, China, and the European Commission—three of the largest compliance carbon markets—at the helm.[1] The Declaration reflected the endorsing countries' intention to discuss experiences and share lessons on carbon pricing, carbon accounting, high-integrity offsets, and verification systems, while exploring options to promote interoperability across compliance carbon markets in the long term.[2]

Converging on common standards is far easier now than after rules are set. For the first time, major economies are developing their carbon markets in parallel, just as trade brings them into direct contact and at a point where key design choices remain open. The Open Coalition can serve as a platform for advancing common standards and beginning a dialogue on deeper interoperability—helping reduce trade frictions, address competitiveness and carbon leakage concerns, and provide the investment certainty needed to advance industrial decarbonization and mobilize transition finance.

This report models a hypothetical alignment on carbon pricing in four industries—iron and steel, aluminum, cement, and fertilizer—between the countries that endorsed the declaration on the Open Coalition in Belém as an illustrative example of the coalition approach. **The results show that cooperation centered on carbon pricing and trade measures could deliver substantial climate and economic benefits (Figure ES1):**[3]

- **Far greater emissions impact.** Annual emission reductions reach approximately 557–584 million metric tons (Mt), roughly fifteen times larger than those achieved through current policies alone. These reductions correspond to approximately 1.1% of global annual greenhouse gas emissions (1.5% of global carbon dioxide emissions). The steel industry accounts for the largest share of these emission reductions, followed by cement and aluminum.

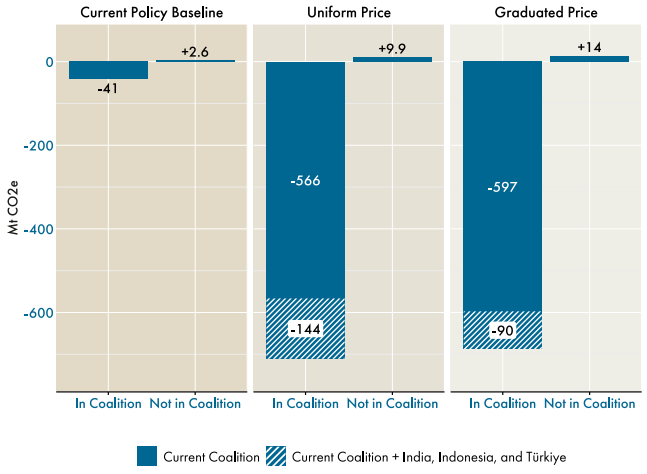
- **Significant new revenues.** An illustrative coalition could generate approximately USD 145 billion annually in carbon pricing revenues for participating countries. An overwhelming majority of these revenues are generated domestically rather than through BCAs.

- **Manageable price impacts.** Updated modeling continues to indicate that coordinated carbon pricing leads to moderate increases in commodity prices relative to current policies. In coalition member countries, steel prices increase 0.6%–1.4%; aluminum prices increase 2.6%–3.0%; cement prices increase 3.0%–3.1%; and fertilizer prices increase 3.5%–4.2%, all relative to current policies. These modest price increases allow producers of lower-carbon materials to capture a "green premium," helping to support investment in cleaner production methods.

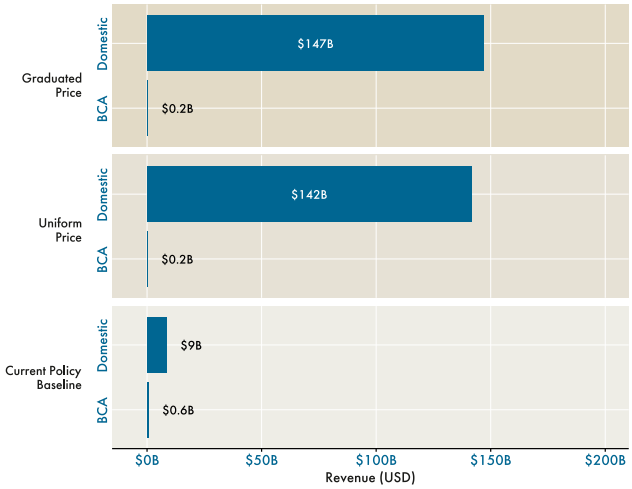
- **Minimal output losses and carbon leakage.** Across the four target industries, output in coalition member countries declines by no more than 2.5% relative to current policies. When coalition membership is based on graduated carbon prices by income group, output losses for low- and lower-middle-income countries are even smaller.

Figure ES1: Climate coalition impacts on climate and economic outcomes

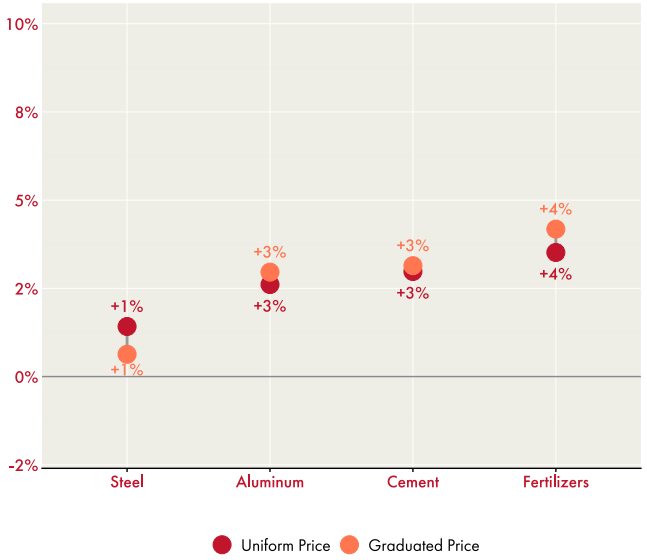
(a) A climate coalition leads to significantly greater emission reductions than the *Current Policy Baseline*[4]



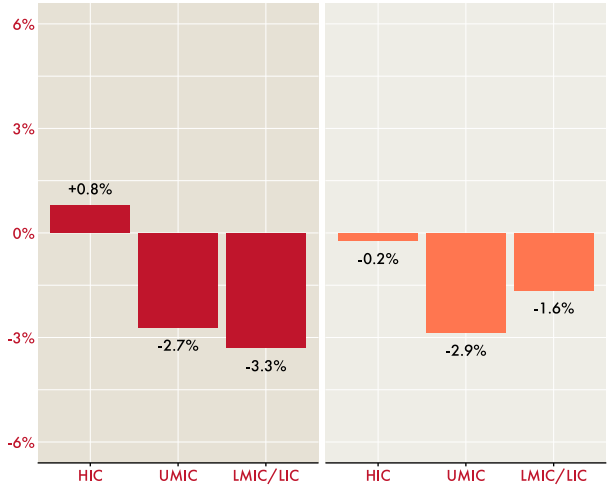
(b) A climate coalition generates substantial revenue primarily through domestic carbon pricing



(c) Coalition members experience moderate changes in prices relative to the *Current Policy Baseline*



(d) Differentiated carbon price floors mitigate output losses for lower-income countries



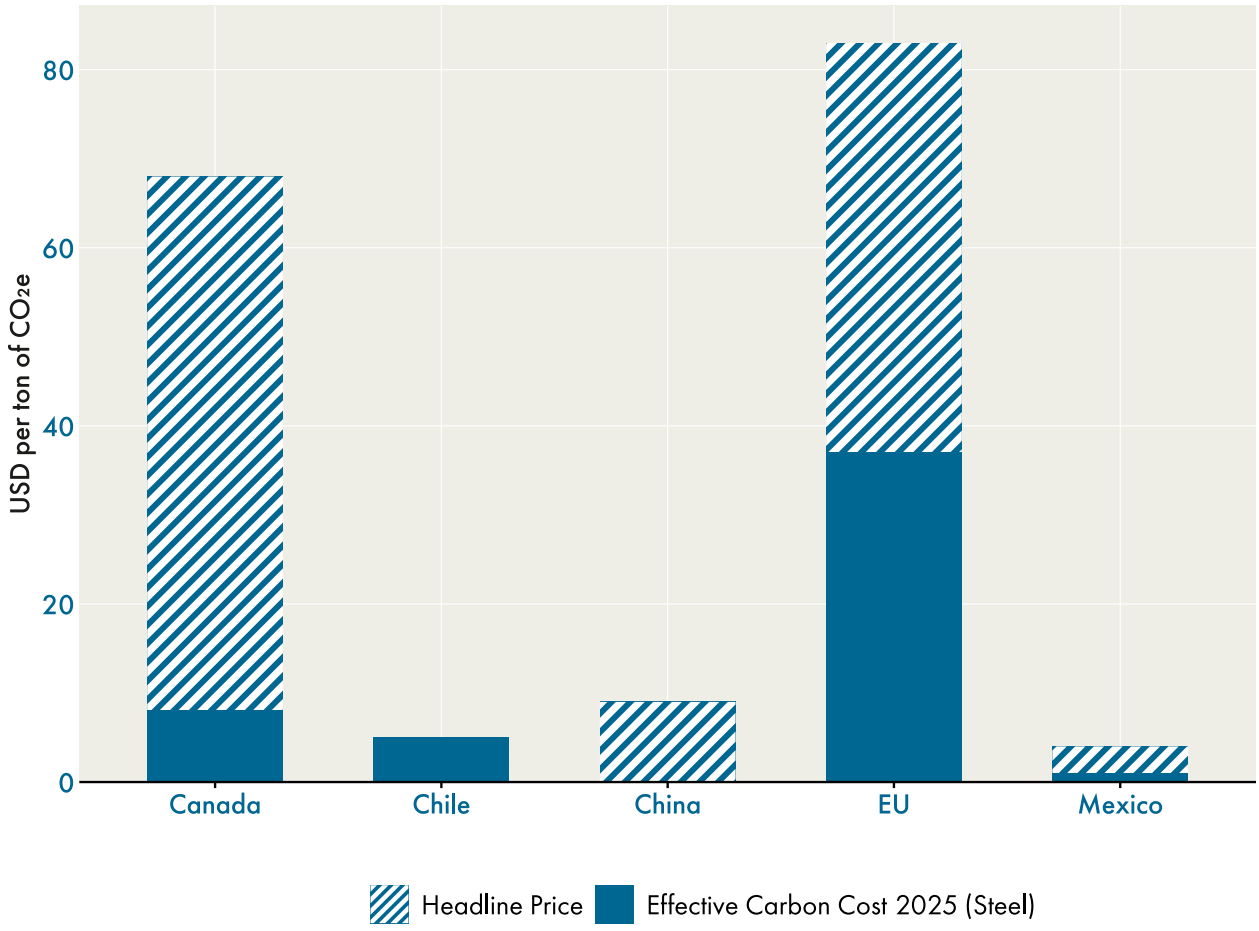
Notes: Figure ES1(a) shows simulated annual changes in greenhouse gas emissions (CO_2e) from steel, aluminum, cement, and fertilizer production. In Figure ES1(b), domestic revenue reflects the total revenue generated by domestic carbon price floors, measured net of the carbon pricing revenue coalition members already collect under existing policies. BCA revenue refers to fees paid by importers to coalition countries under the border carbon adjustment. In Figure ES1(c), points show simulated percentage changes in average commodity prices in coalition countries relative to the *Current Policy Baseline*. The bars in Figure ES1(d) show simulated percentage changes in coalition output by World Bank income group relative to the *Current Policy Baseline*. All graphs use 2025 as the reference year. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

This report also sets forth a novel and pragmatic pathway for achieving interoperability: a common framework for assessing carbon pricing comparability. A rules-based framework that balances competitiveness and equity objectives allows coalition members to establish that their carbon pricing systems, though different in form, are sufficiently comparable in effect. The ability to compare effort across different types of systems helps coalition members preserve national policy autonomy, supports broad participation, and establishes a foundation for a constructive dialogue on trade and climate.

At the center of the framework is a metric—**effective carbon cost (ECC)**—which captures the average carbon price, per metric ton of CO_2-equivalent emissions (CO_2e), borne by regulated facilities. By accounting for the effect of policy design features that alter what firms ultimately pay, such as coverage, free allocation, and output-based benchmarks, the ECC lets policymakers compare what different systems mean for competitiveness.

Applying this metric to emissions from the steel, aluminum, cement, and fertilizer industries in Open Coalition countries in 2025 reveals, notably, that **headline carbon prices can overstate how far apart systems are in terms of effective cost to regulated entities (Figure ES2)**. For example, in the steel industry, a gap of USD 75 per metric ton of CO_2e ($/t) between the headline carbon prices for the European Union and China shrinks to roughly $35/t once free allocation and other design features are considered.

Figure ES2: Headline prices can substantially exceed the ECCs that firms face



Notes: Select countries represented. Total bar height reflects the headline carbon price, while the solid segment shows the effective carbon cost. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

The second element of the framework establishes the level of carbon pricing effort expected from each participating jurisdiction: the **expected carbon price**. To balance competitiveness and equity, the framework could assess comparability against differentiated benchmarks that reflect countries' economic and structural circumstances, while preserving incentives for progressively stronger climate action.

The common framework could accommodate these differences in one of two ways:

- **Income-based differentiation.** One approach would be to establish carbon price floors with differentiated commitments by income group. This could take the form of a tiered graduated price, as described by the International Monetary Fund (IMF) and the 2025 GCPP report, or a continuous graduated price that rises with per capita income.[5] Alternatively, coalition members could agree on a uniform minimum effective carbon price—for example, $25/t—while allowing low- and middle-income countries a longer transition period before the minimum price takes effect.

- **Broader country-specific benchmarks.** While income provides an important indicator of a country's capacity to undertake industrial decarbonization, it may not fully capture differences in the feasibility and cost of carbon pricing. Countries with similar income levels can face markedly different structural conditions. For example, Brazil's extensive hydropower resources provide comparatively favorable conditions for decarbonizing energy-intensive industries, whereas Indonesia's greater reliance on coal-fired electricity implies higher transition costs. A more refined approach would therefore develop **country-specific benchmarks based on a broader set of structural fundamentals**, such as **economic capacity** (e.g., income per capita and institutional capacity), **industrial significance** (e.g., heavy-industry emissions per capita and global industrial importance), and **structural decarbonization costs** (e.g., marginal abatement costs and heavy industry as a share of GDP).

The first two elements of the carbon pricing comparability framework address the need for methodologies to establish both the carbon pricing effort that jurisdictions actually deliver and the level of effort that can reasonably be expected given their structural circumstances. The third element of the framework compares these two measures to determine whether jurisdictions provide sufficiently comparable carbon pricing effort to support mutual recognition.

Under this approach, coalition members would assess each jurisdiction's ECC relative to its expected carbon pricing benchmark. Jurisdictions whose ECCs are broadly consistent with their expected benchmark could be recognized as providing comparable carbon pricing effort, even where they rely on different policy instruments or face different structural conditions. Coalition members would ultimately need to determine the degree of deviation that can be deemed consistent with any agreed framework and whether that threshold should shift over time as carbon pricing systems mature. Importantly, jurisdictions may pursue different emissions targets, complementary policies, or decarbonization pathways while nevertheless providing comparable levels of carbon pricing effort under the framework.

The review process for assessing comparability could combine standardized reporting, independent technical review, peer dialogue, and transparency to encourage continued alignment while preserving national control over domestic carbon pricing policies.

For the coalition approach to gain traction, create incentives for expanded participation, and promote greater climate ambition, implementation needs to begin quickly. **Several conditions favor action.** Notably, the world's

largest carbon markets are at stages where design choices remain open and the EU CBAM's entry into its compliance phase has given exporting countries a concrete reason to seek recognition of their own carbon prices. **Further, as this report documents, carbon pricing systems are currently more comparable in effort than their headline prices suggest, creating an opportunity for coordination now.**

These conditions will not last. If systems consolidate around incompatible standards and trade frictions harden into precedent, the cost of coordination will rise with each year of delay. Moreover, several jurisdictions have committed to phasing out some features of their pricing systems, such as free allocation, that currently bring these systems closer together. This report identifies some of the technical work that global and regional forums, like the Open Coalition, could take up now to begin turning the aspirations expressed at Belém into action.

Executive Summary Endnotes

1 European Commission Directorate-General for Climate Action, "EU, Brazil and China Launch Open Coalition to Boost Integrity and Effectiveness of Carbon Markets" (May 7, 2026), https://climate.ec.europa.eu/news-other-reads/news/eu-brazil-and-china-launch-open-coalition-boost-integrity-and-effectiveness-carbon-markets-2026-05-07_en.

Andorra, Armenia, Brazil, Canada, Chile, China, the European Union, France, Germany, Guinea, Mexico, Monaco, New Zealand, Norway, Rwanda, Singapore, the United Kingdom, and Zambia endorsed the Declaration on the Open Coalition on Compliance Carbon Markets at COP30 in Belém, Brazil. Brazil then worked with the European Commission and China to build on this early momentum over the subsequent six months, and the Open Coalition was formally launched in May 2026 in Florence, Italy. Brazil will chair the Open Coalition for its first two years, with China and the European Commission serving as Co-Chairs. Membership is open to any jurisdiction operating a nationwide compliance carbon market, whether an emissions trading system or carbon tax, and Germany and New Zealand joined as the first new members. Subnational authorities operating eligible mechanisms can participate as observers. The Open Coalition's initial technical work will be formalized in a work plan adopted at their first meeting on September 14, 2026, in Wuhan, China. See: European Commission Directorate-General for Climate Action, "EU, Brazil and China Launch Open Coalition to Boost Integrity and Effectiveness of Carbon Markets."

2 *Open Coalition on Compliance Carbon Markets* (November 7, 2025), https://www.gov.br/mre/pt-br/canais_atendimento/imprensa/notas-a-imprensa-backup/declaracao-sobre-a-coalizao-aberta-de-mercados-regulados-de-carbono/OpenCoalitiononComplianceCarbonMarkets.pdf.

3 The analysis treats current Open Coalition signatories as an illustrative case and assumes implementation consistent with the coalition vision set out in GCPP's 2025 report; it does not imply that signatories have adopted or committed to all the policies modeled here. The modeled coalition proposal covers four industries: iron and steel, aluminum, cement, and fertilizers. Throughout the report, "steel" is used to denote "iron and steel."

4 See Section 3.

5 Ian W.H. Parry, Simon Black, and James Roaf, *Proposal for an International Carbon Price Floor Among Large Emitters*, International Monetary Fund Staff Climate Notes (2021), https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468.

1. Introduction

Coordination among willing subsets of countries has emerged as a practical complement to the consensus-based process that exists under the Conference of Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). Ambassador André Corrêa do Lago, President of COP30, framed Belém as a COP of implementation, and emphasized that countries can act on that agenda without unanimity.[1]

The Global Climate Policy Project at Harvard and MIT made the case for this approach in its 2025 flagship report, *Building a Climate Coalition* (the 2025 GCPP report), which drew on a working group of experts from the world's major emitting countries. That report showed that a coalition focused on the heavy industries and grounded in coordinated carbon pricing and trade measures can deliver large emission reductions while protecting competitiveness and recognizing equity considerations. **This report builds on GCPP's previous work by setting out a practical framework for coalition design and implementation.**

The report proceeds as follows: Section 2 delineates the growing momentum toward a climate coalition, as conceived in the 2025 GCPP report, and emphasizes how recent policy developments, from EU decarbonization partnerships to efforts to advance border carbon adjustments, can drive tangible progress in overcoming the collective action problem and encouraging broader climate action. Section 3 highlights the climate and economic impacts of an interoperable coalition, updating the analysis in the 2025 GCPP report and modeling a hypothetical alignment on carbon pricing in four industries—steel, aluminum, cement, and fertilizers—as an illustrative case.

As Section 4 shows, countries that have adopted carbon pricing operate diverse systems, tailored to their unique economic and political situations, including emissions trading systems and carbon taxes, mass-based caps, and tradable performance standards. Even where similar approaches are used, different coverage, price levels, and allocation rules apply. Full market linkage across these diverse systems is neither feasible nor necessary in the near term. Rather, **Section 4 develops a common framework for assessing the comparability of carbon pricing effort, articulating the rationale for such a framework and proposing core design principles and elements, including approaches to assessment, reporting, and review.**[2] Section 5 concludes and previews the roadmap for sequencing technical and political steps laid out in Appendix A.

Section 1 Endnotes

1 André Aranha Corrêa do Lago, "Twelfth Letter from the President," January 27, 2026, https://cop30.br/en/brazilian-presidency/letters-from-the-president/twelfth-letter-from-the-president.

2 Appendix E provides a detailed comparison of carbon pricing systems for steel, aluminum, cement, ammonia, and power in countries that endorsed the declaration on the Open Coalition.

2. Recent Developments: Emerging Momentum toward a Climate Coalition

Since the publication of the 2025 GCPP report, governments have expanded the use of carbon pricing and, in some cases, BCAs, while also strengthening industrial decarbonization partnerships and international cooperation on carbon accounting. No single initiative reflects the full coalition architecture proposed in the 2025 report. Nevertheless, broader developments over the past year indicate growing convergence around several core elements of the climate coalition concept the report outlined, including the launch of the Open Coalition in May 2026. These developments also highlight political and implementation challenges that have become more salient as countries move from policy design to execution.

This section examines recent developments through the lens of the coalition framework described in GCPP's 2025 report. It highlights areas where governments are converging on common approaches, areas where important gaps remain, and the implications of these developments in terms of priorities for future policy and technical work.

Carbon pricing and trade policy are becoming increasingly intertwined

Developments over the past year reinforce the 2025 GCPP report's central observation: carbon pricing and trade policy increasingly need to be designed together. The compliance phase of the EU CBAM began January 1, 2026, and the United Kingdom plans to implement its own CBAM beginning in 2027. Several other jurisdictions, responding to industry concerns about the competitiveness implications of domestic carbon pricing, have proposed or begun evaluating BCAs or related trade measures (Table 1). This suggests the European Union's experience is becoming a reference point for other governments, which are watching the first large-scale implementation of a BCA closely as they consider their own approaches to addressing carbon leakage and preserving industrial competitiveness.[1]

> *As more jurisdictions introduce BCAs, early coordination could reduce complexity and establish common standards before divergent approaches become entrenched.*

Recent initiatives also highlight a growing risk that proliferating unilateral BCAs could raise compliance costs for firms and inhibit trade. Early-stage BCAs (Table 1) share a broad focus on carbon-intensive heavy industry but may differ in the specific industries they cover; whether they include indirect (Scope 2) emissions from the power sector; implementation timelines; measurement, reporting, and verification (MRV) requirements; and other details.[2] Without more coordination, regulatory fragmentation may lead to constraints on trade and carbon leakage. As

more jurisdictions introduce BCAs, early coordination could reduce complexity and establish common standards before divergent approaches become entrenched.

Several governments have begun acknowledging these risks and exploring opportunities for greater coordination. The United Kingdom's Trade and Business Commission recommended that the United Kingdom and European Union agree to reciprocal exemption from each other's CBAMs as both jurisdictions move toward linking their emissions trading systems.[3] Australia's Carbon Leakage Review similarly emphasized continued engagement with multilateral initiatives to develop interoperable approaches to border carbon adjustments.[4]

Table 1: Overview of border carbon adjustments globally and implementation status[5]

Jurisdiction	Status	Industries	Emissions Accounting Boundary
Australia[6]	Under consideration as part of 2026-27 Safeguard Mechanism Review	Cement and clinker initially proposed	Scope 1 if aligned with domestic Safeguard Mechanism
Brazil[7]	ETS law authorizes consideration of a BCA; no implementation date established	Undefined	Undefined
Canada[8]	Canada considered a BCA in 2020 and then-candidate for prime minister Mark Carney proposed a CBAM in 2025	Undefined	Undefined
Chile[9]	Government feasibility study proposed for 2029	Undefined	Undefined
EU[10]	Implemented as of January 2026	Iron and steel, aluminum, cement, fertilizers, hydrogen, electricity	Scope 1 + Scope 2 for cement and fertilizers only
Korea[11]	Government feasibility study initiated in 2025; no implementation date established	Undefined	Undefined
Norway[12]	Adopted EU CBAM in June 2026; 2027 target implementation	Iron and steel, aluminum, cement, fertilizers, hydrogen, electricity	Scope 1 + Scope 2 for cement and fertilizers only
Serbia[13]	Implemented import tax on carbon-intensive products as of January 2026	Iron and steel, aluminum, cement, fertilizers, electricity	Undefined
Taiwan[14]	Government target for 2027 implementation	Steel and cement initially proposed	Scope 1 + Scope 2 if aligned with domestic carbon fee
Thailand[15]	Government target for 2031 implementation	Undefined	Undefined
Türkiye[16]	Potential BCA following ETS implementation; not before 2028	Undefined	Scope 1 if aligned with domestic ETS
UK[17]	Implementation scheduled for January 2027	Iron and steel, aluminum, cement, fertilizers, hydrogen	Scope 1; Scope 2 included in 2029

Note: Table summarizes proposed and implemented BCAs and related measures in selected jurisdictions as of July 2026.

Early implementation of unilateral BCAs has underscored the value of a cooperative framework to provide consistency and predictability

The first year of EU CBAM implementation has demonstrated both the strengths and limitations of unilateral BCAs. Beyond establishing an important precedent for addressing carbon leakage, sparking interest in carbon pricing, and encouraging governments to consider the interaction between carbon pricing and trade policy, CBAM implementation has also exposed several structural challenges that are difficult for any jurisdiction to resolve on its own.

First, the European Union's implementation experience illustrates how unilateral BCAs remain vulnerable to domestic political pressures, as recent debates over fertilizer illustrate. Following concerns from European farmers about rising input costs, several EU Member States called for the proposed Article 27a provision—the so-called "kill-switch"—to be adopted and applied to fertilizer imports, or other measures to reduce price impacts on fertilizer imports. The European Commission ultimately introduced an industry-specific adjustment, despite objections from other governments that such exemptions could undermine the mechanism's credibility.[18]

The treatment of Scope 2 emissions highlights a similar dynamic. Because EU producers receive compensation for indirect electricity costs under the EU Emissions Trading Scheme (ETS), the CBAM excludes Scope 2 emissions for imports of steel, aluminum, and hydrogen to maintain competitive neutrality. However, this also means that CBAM calculations do not take into account the carbon intensity of electricity inputs in exporting countries. For electricity-intensive products such as aluminum, where indirect emissions account for the majority of embedded emissions, exporters who can access power from low-carbon grids receive little recognition for that advantage.[19]

The European Commission's proposal to postpone its phase-out of free allocations likewise reflects the difficulties of acting unilaterally. The 2026 EU ETS review proposal would reintroduce 15% of the free allocation for CBAM-covered sectors scheduled for phase-out in 2028. This will slow the CBAM phase-in and extend the free allocation phase-out from 2034 to 2038 (Appendix C).

These examples show how domestic political pressures can erode the consistency, predictability, and efficacy of unilateral BCAs. A broad climate coalition, by contrast, could strengthen the durability of border adjustment rules by balancing domestic political pressures across multiple jurisdictions and by introducing the benefits of adhering to a collective agreement instead of leaving design decisions solely to individual governments.

Second, implementation of the EU CBAM has highlighted the difficulty of applying a single jurisdiction's administrative framework across countries with widely differing climate policies and institutional capacities. For example, CBAM consultations have underscored the difficulty of assessing comparable carbon policies using measurement, reporting and verification (MRV) procedures developed for the European Union's own regulatory system.[20] Requests for greater flexibility in recognizing domestic carbon pricing instruments, simplifying reporting requirements, and providing technical assistance for MRV reflect a broader concern that unilateral BCAs may inadvertently disadvantage developing countries whose implementation pathways and administrative capacities differ from those of advanced economies.[21]

There has also been an active policy debate surrounding the use of emission offsets in meeting CBAM obligations. In May 2026, the European Commission advanced this discussion by publishing a draft implementing act on the carbon price paid in third countries. The draft articulates a permissive approach to domestic carbon credits when these credits are part of third-country compliance schemes and a 10% cap for use of Article 6 credits. However,

the nearly 200 individual responses to the draft act reveal varying support for offsets, which allow countries to fund credit-generating projects but weaken incentives for domestic carbon pricing. Given countries' divergent views, a coalition might have greater legitimacy in advancing a common approach to offsets, such as a single integrity standard that supports a well-regulated market for emission credits.[22]

Positive incentives for decarbonization are beginning to address equity concerns

The 2025 GCPP report argues that an effective policy framework for addressing the trade impacts of carbon pricing should include a complementary package of measures to promote the adoption of low-carbon technologies, expand climate finance, and strengthen institutional capacity to encourage participation among low- and middle-income countries and support higher levels of climate ambition.

Recent bilateral and multilateral initiatives increasingly combine policies for protecting domestic competitiveness with financial and technical support for industrial decarbonization. Notably, negotiations between the European Union and India have linked discussions of CBAM with financial support for decarbonizing India's steel and aluminum industries, which are expected to account for the vast majority of India's CBAM-exposed exports.[23] The EU–India Free Trade Agreement also provides that any CBAM relief or recognition granted by the European Union to another third country must also be extended to India.[24] Finally, it notes that countries will consider mutual recognition of accreditation bodies for carbon pricing, a provision that reflects growing interest in transparent and rules-based approaches to recognizing comparable climate policies across trading partners.

The EU–India example is indicative of a broader trend toward North–South cooperation in industrial decarbonization efforts. Promising examples are emerging of industrial firms from Europe incentivizing low-carbon production capacity in emerging economies. For example, Germany's H2Global initiative has developed a public procurement model using financial agreements such as double auctions and contracts for difference (CfDs) to guarantee long-term demand for green hydrogen imports, starting with production in Egypt.[25]

Multilateral development banks (MDBs) are playing an increasingly important role in supporting industrial decarbonization in developing economies. For example, Indonesia's Ministry of Industry is engaging the World Bank to provide USD 500 million in 2027 to support its decarbonization roadmap, which will include a pillar on implementing low-carbon production processes.[26] Working in collaboration with MDBs, the Climate Investment Funds (CIF) launched its Industry Decarbonization investment program in 2024. This is the first global concessional finance initiative focused on investing in industrial greenhouse gas emissions reduction in developing countries. Its first investments, in Mexico and Brazil, aim to unlock more than USD 5 billion in co-financing to support both direct investment in private companies and system-level cluster development in hard-to-abate industries.[27]

The strategy of leveraging private sector support should pay off further as the investment potential of low-carbon technologies grows. In 2025, the Climate Club's Global Matchmaking Platform connected investors and technology providers to more than 20 decarbonization projects in 20 countries, including six projects that are already underway to develop sectoral roadmaps and monitoring systems.[28] The World Business Breakthrough Barometer 2026 found that a majority of businesses surveyed saw an increase in the investment attractiveness of low-carbon steel, cement, and fertilizer technologies over the past year.[29]

Precedents are also emerging to finance industrial decarbonization using both domestic carbon pricing and BCA revenues. The EU Innovation Fund, which recycles EU ETS revenues into clean technology development

in the European Union, expects to generate approximately EUR 40 billion for the period 2020–2030.[30] In July 2026, the European Union established the Industrial Decarbonization Bank to support further decarbonization in existing facilities alongside new low-emission production.[31] With respect to the EU CBAM, the European Parliament is considering a separate proposal for a Temporary Decarbonization Fund to support EU producers of CBAM-covered goods, financed by 25% of CBAM revenues.[32] While these policies do not direct revenue outside the European Union, they provide a potential model for using revenues to support decarbonization, which is particularly relevant as the use of remaining CBAM revenues is still under discussion.

Developments over the past year suggest that several elements of the framework proposed in the 2025 GCPP report are gaining traction. Carbon pricing and trade policy are becoming more closely connected. Financing for industrial decarbonization and technology partnerships are expanding alongside carbon pricing efforts. At the same time, experience with unilateral border carbon adjustments has underscored the importance of more coordinated approaches. These developments indicate that many of the analytical and institutional questions identified in the 2025 GCPP report are becoming increasingly central to international climate policy discussions. The next section examines the economic and climate implications of formalizing coordination through a multilateral climate coalition.

Section 2 Endnotes

1 Appendix C provides further details on EU CBAM implementation and early lessons.

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3. Climate Coalition Impacts and Feasibility

Cooperation on carbon pricing is evolving from conceptual proposal to emerging policy agenda. While Open Coalition endorsing countries differ in the design and maturity of their carbon pricing systems, their participation in the coalition reflects a shared interest in exploring options for developing interoperable compliance carbon markets. This section examines the potential implications of deeper coordination among these countries as an illustrative application of the broader coalition framework presented in the 2025 GCPP report.

Using the countries that have formally endorsed the Open Coalition as a demonstration case, this analysis assesses a coalition grounded in an existing initiative. Although the Open Coalition provides the empirical basis for this analysis, the results are informative for other countries considering interoperable carbon pricing arrangements, illustrating both the benefits that could be achieved through greater coordination among current participants and the additional gains that could result from broader membership.

3.1 UPDATED MODELING OF CLIMATE COALITION SCENARIOS

This report updates the analysis in the 2025 GCPP report in three important respects.

First, rather than modeling a possible climate coalition, the analysis is based on countries that have formally endorsed the Open Coalition, including the European Union and the 17 countries that endorsed the Open Coalition at COP 30, as well as Iceland, Liechtenstein, and Switzerland via their formal linkage to the EU ETS.[1] Although several participating countries have not yet committed to implementing domestic carbon pricing, the analysis demonstrates the benefits that could be achieved by establishing interoperable carbon pricing systems over time.

Second, the *Current Policy Baseline* has been updated to reflect recent developments in carbon pricing worldwide. Whereas the 2025 GCPP report, in order to simplify the modeling analysis, applied carbon prices in the baseline only to producers in the European Union, United Kingdom, and European Free Trade Association, the updated baseline for this analysis incorporates effective carbon costs for each coalition member with a carbon pricing system recognized by the CBAM. The analysis adjusts statutory carbon prices to account for industry- and product-specific free allocation and performance-based standards (e.g., blast furnace versus electric arc furnace steelmaking), providing a more realistic representation of the carbon costs currently faced by producers, as described in more detail in Section 4. As a result, the comparison presented here measures the benefits of coalition formation against a more precise policy baseline than in the 2025 GCPP report.

Third, the modeling analysis incorporates updated plant-level production, capacity, and emissions data from Climate TRACE and CRU Group, together with revised assumptions that reflect the latest empirical evidence on market responses to carbon pricing.[2]

Following the analytical framework developed in the 2025 GCPP report, the approach referred to there as the *Model without Trade Frictions* is applied to two coalition scenarios and results are compared with the updated *Current Policy Baseline*, as described in Box 1. All values assumed in the modeling scenarios, as summarized in Table 2, are illustrative and would ultimately be determined through negotiation among coalition members (Section 4.2). The coalition applies carbon pricing to emissions from fuel combustion and chemical processes (Scope 1) as well as emissions from electricity used for production (Scope 2) in the steel, aluminum, cement, and fertilizer industries.

- *Uniform Price Coalition*. Coalition members adopt a common carbon price floor of USD 50 per metric ton of carbon dioxide equivalent emissions ($50/t).[3]

- *Graduated Price Coalition*. Coalition members adopt differentiated carbon price floors of $25/t for low- and lower-middle-income countries (LIC/LMIC), $50/t for upper-middle-income countries (UMIC), and $75/t for high-income countries (HIC).[4]

- *Current Policy Baseline*. This baseline reflects implementation of the EU and UK CBAMs together with existing domestic carbon pricing systems worldwide, represented through effective carbon costs that account for coverage, free allocation and other forms of carbon cost relief, and output-based benchmarks.

Table 2: Overview of coalition scenarios

	Current Policy Baseline	Uniform Price	Graduated Price
Country membership	European Union, United Kingdom, Iceland, Liechtenstein, Norway, Switzerland	European Union, Andorra, Canada, Chile, Iceland, Liechtenstein, Monaco, New Zealand, Norway, Singapore, Switzerland, United Kingdom, Armenia, Brazil, China, Mexico, Guinea, Rwanda, Zambia	
Carbon price floor	$75/t	$50/t	HIC: $75/t UMIC: $50/t LMIC/LIC: $25/t
Border adjustment	$75/t	$50/t	$75/t
Free allowances	Yes	No	No

Notes: All scenarios are measured relative to a 2025 regulation baseline that reflects existing domestic carbon pricing. The *Current Policy Baseline* adds the EU and UK CBAMs. Under the *Graduated Price* scenario, domestic carbon price floors vary by income group, while all members apply a $75/t border adjustment.

Box 1: Modeling Overview

The analysis uses a microeconomic supply and demand model to simulate the effects of carbon pricing on steel, aluminum, cement, and fertilizers—the four emissions-intensive industries considered throughout the report.[5] The model treats goods from different countries as perfect substitutes and assumes that producers can freely reallocate exports across markets in response to policy changes, leading to potentially abrupt shifts in trade flows.

We use plant-level data to simulate global supply and demand in the four emissions-intensive industries subject to carbon pricing in our scenarios. The data include production, capacity, marginal cost, and emissions from 2025 for 1,056 steel plants, 190 aluminum plants, 2,158 cement plants, and 268 fertilizer plants.[6] The model considers two markets—coalition member countries, which impose domestic carbon prices and BCAs, and the rest of the world—and simulates producers' choices over which market they supply in order to maximize profits. Producers reduce their emissions intensity in response to carbon prices and adjust their capacity utilization in response to changes in profitability. In equilibrium, supply equals demand in each market and for each industry. Goods from each industry are assumed to be homogeneous commodities and are treated as perfect substitutes across countries. Under these assumptions, producers can immediately redirect production across markets in response to changes in relative profitability. The model compares static equilibrium outcomes under each policy scenario and does not model the transition path between equilibria.

In the 2025 GCPP report, the *Model with Trade Frictions* and the *Model without Trade Frictions* produced nearly identical results across principal outcomes. Accordingly, this report relies only on the *Model without Trade Frictions*, which provides a simpler presentation while producing materially similar conclusions. The Online Technical Modeling Appendix and Online Appendix to the 2025 GCPP report provide more detail on modeling approaches and data.

3.2 CLIMATE COALITION IMPACTS ON CLIMATE AND ECONOMIC OUTCOMES

A coordinated climate coalition continues to deliver emission reductions well beyond those achieved under the Current Policy Baseline *while generating substantial revenues for participating countries and producing only moderate changes in domestic commodity prices and industrial output.*

The 2025 GCPP report found that a coordinated climate coalition could achieve substantially greater emission reductions than the *Current Policy Baseline* while generating significant fiscal revenues and limiting impacts on industrial competitiveness. Updated modeling for this report reinforces these conclusions. Although the magnitude of estimated impacts differs from GCPP's 2025 analysis because of changes in coalition membership and, to a lesser extent, changes in the reference baseline, our central findings remain unchanged. A coordinated climate coalition continues to deliver emission reductions well beyond

those achieved under the *Current Policy Baseline* while generating substantial revenues for participating countries and producing only moderate changes in domestic commodity prices and industrial output.

Key finding #1: A climate coalition leads to significantly greater emission reductions than the Current Policy Baseline

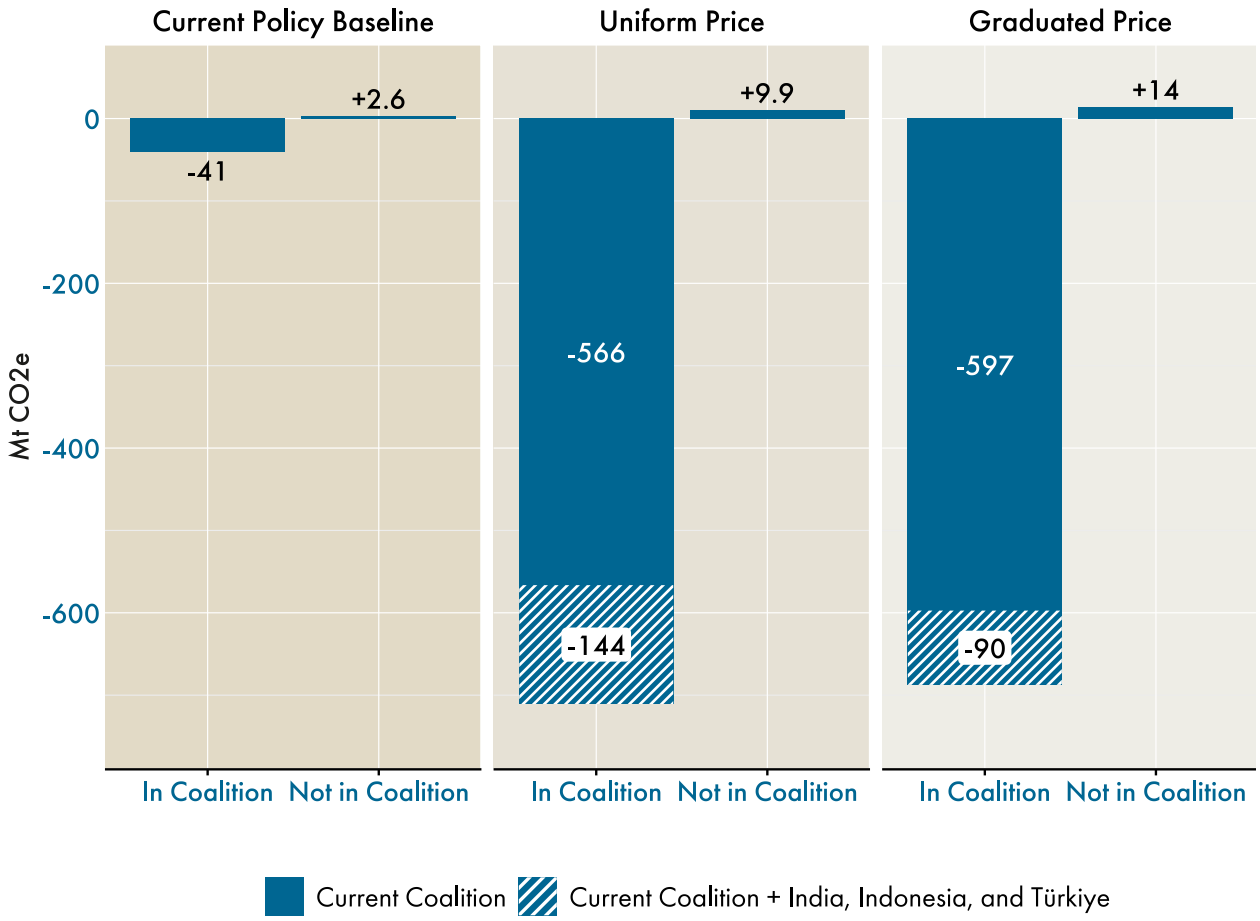
Updated modeling for this report continues to show that a coordinated climate coalition substantially outperforms the *Current Policy Baseline* in reducing emissions from target industries. As in the 2025 GCPP report, both the *Uniform Price* and *Graduated Price* scenarios produce emission reductions that are an order of magnitude larger than those achieved through current policies alone.

Annual emission reductions under the *Uniform Price* and *Graduated Price* scenarios reach approximately *557–584* million metric tons of CO_2 equivalent (Mt CO_2e), roughly fifteen times larger than the *Current Policy Baseline* (Figure 1). These reductions correspond to approximately 1.1% of global annual greenhouse gas emissions (1.5% of global CO_2 emissions).[7]

Emission reductions are driven primarily by the steel sector, which accounts for more than half of total reductions across both coalition scenarios, followed by cement and aluminum; emission reductions from fertilizer production are comparatively smaller (Figure 2).

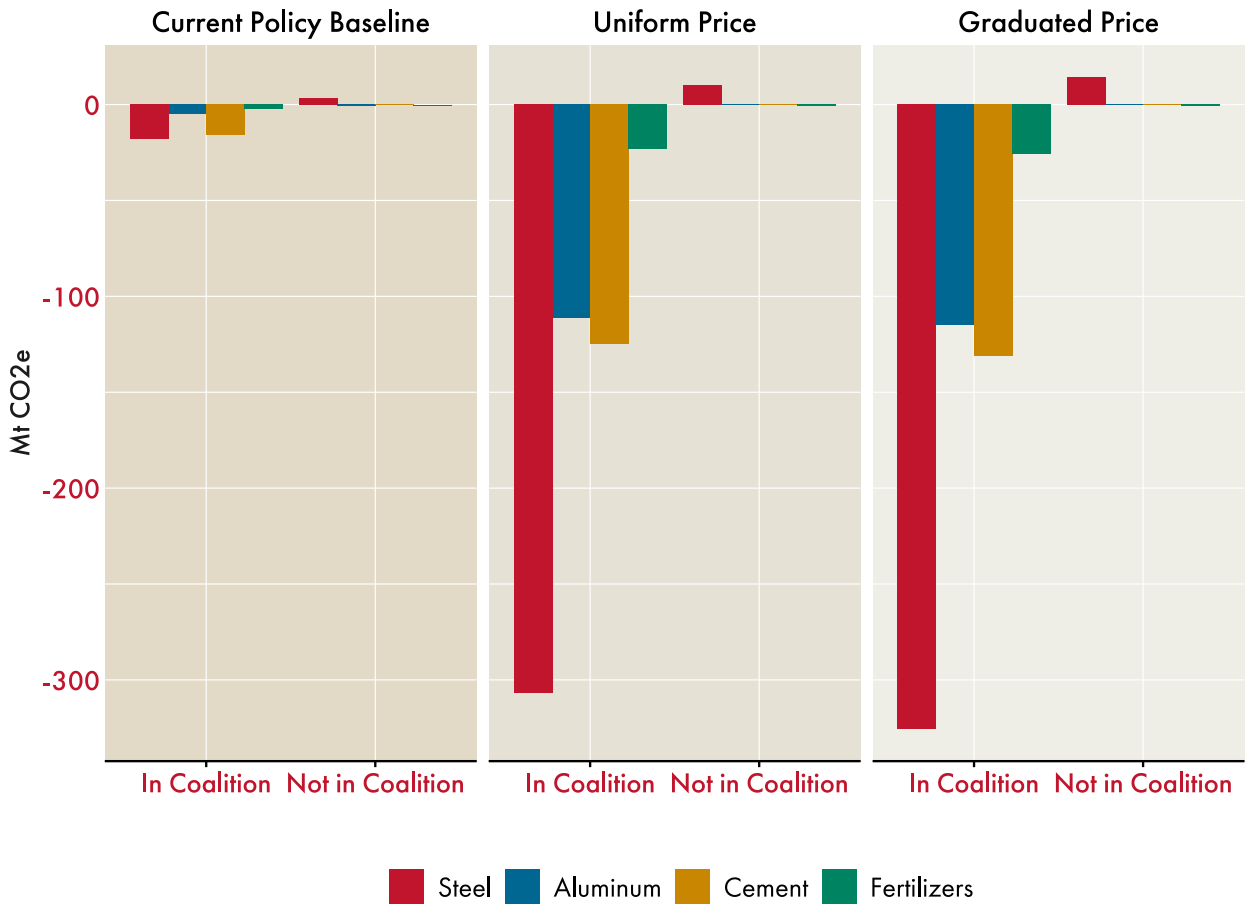
The analysis also demonstrates the importance of continued coalition expansion. Including India, Indonesia, and Türkiye in the *Uniform Price* scenario increases annual emission reductions by an additional *145.7* Mt CO_2e and 93.0 Mt CO_2e under the *Graduated Price* scenario. This additional reduction is equivalent to approximately 0.4% and 0.2% of global CO_2 emissions, respectively.

Figure 1: A climate coalition leads to significantly greater emission reductions than the *Current Policy Baseline*



Notes: Bars show simulated annual changes in greenhouse gas emissions (CO_2e) from steel, aluminum, cement, and fertilizer production, using 2025 as the reference year. Negative values indicate emission reductions and positive values indicate emission increases. Positive values among non-coalition countries reflect emission leakage as production shifts outside the coalition. Solid bars show results for the current coalition; striped portions show the additional effect of adding India, Indonesia, and Türkiye. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Figure 2: Steel accounts for more than half of the emission reductions generated by a climate coalition



Notes: Bars show simulated annual changes in greenhouse gas emissions (CO_2e) by industry, using 2025 as the reference year. Negative values indicate emission reductions and positive values indicate emissions increases. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

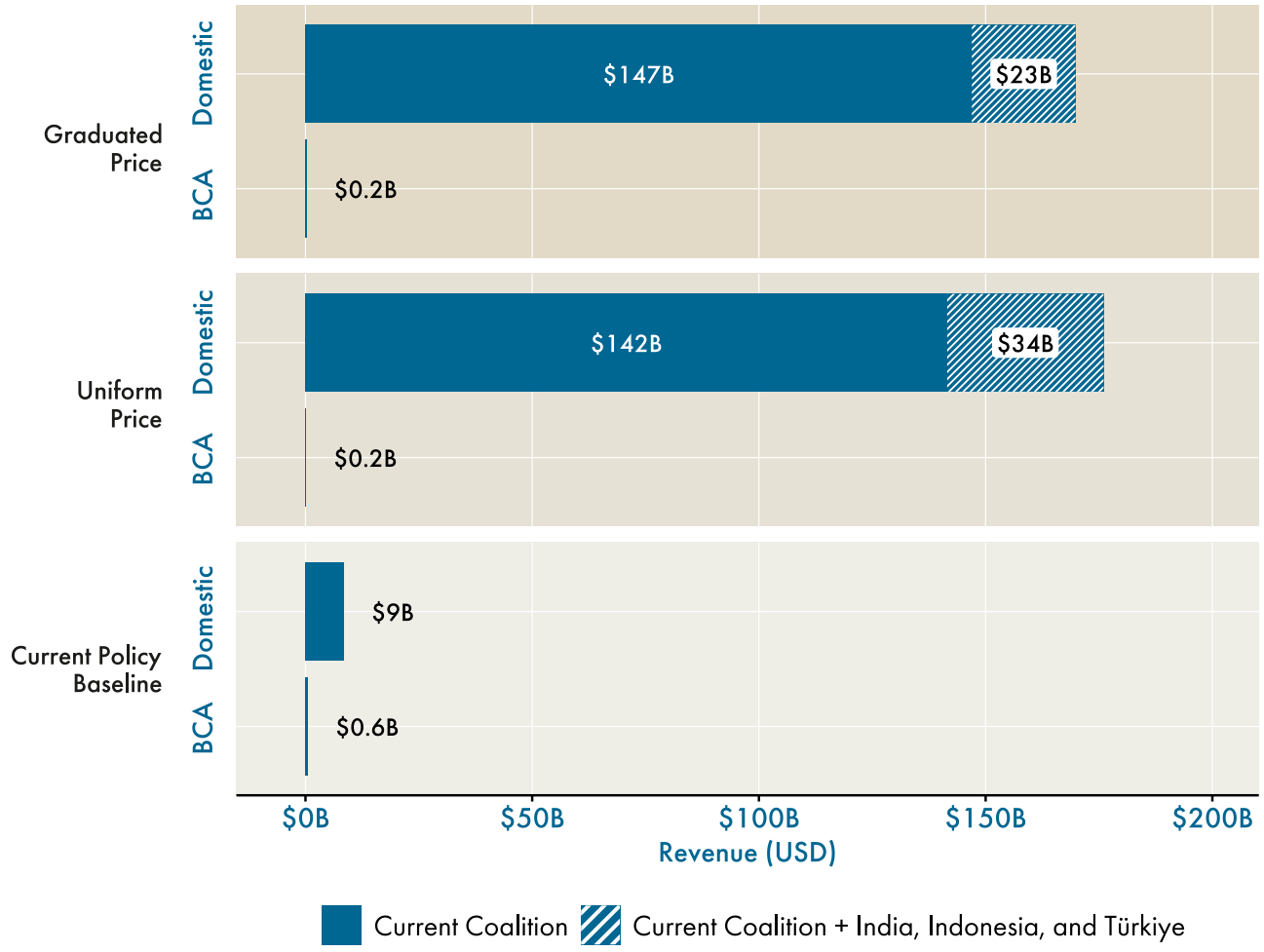
Key finding #2: A climate coalition generates substantial revenues for a broad set of countries

The coalition scenarios generate approximately USD 145 billion annually in carbon pricing revenues for participating countries, with total revenues from carbon pricing approximately fifteen to sixteen times larger than under the *Current Policy Baseline* (Figure 3). As in the 2025 GCPP report, the overwhelming majority of these revenues are generated domestically rather than through BCAs.

These revenues are broadly distributed across coalition members and can represent a meaningful share of general government revenue in some countries (Figure 4). Under a uniform carbon price, low-income countries such as Zambia could generate annual revenue equivalent to 1.4% of total government revenue—approximately USD 103 million. Larger upper-middle-income economies such as Brazil could generate approximately USD 4.4 billion in annual revenue—around 0.5% of total government revenue—under either pricing approach. These revenues could help improve countries' fiscal positions, support social spending and climate investments, and be used to address other development needs. Subject to the approval of domestic legislatures, high-income countries could choose to direct a portion of carbon pricing revenues toward the diffusion of low-carbon technologies, climate finance, and capacity building in low- and middle-income member countries.

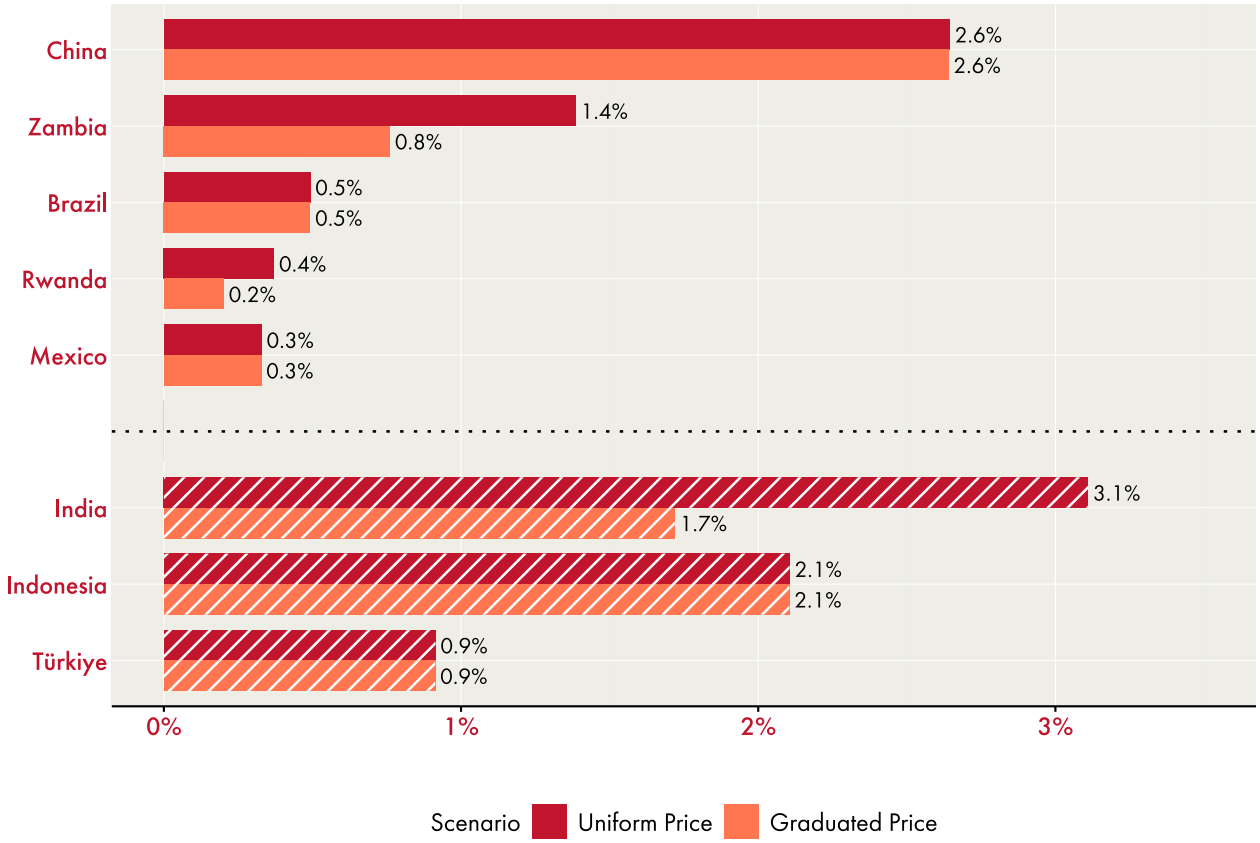
The updated analysis also demonstrates that adding India, Indonesia, and Türkiye generates an additional USD 34.5 billion in annual government revenue under the *Uniform Price* scenario and USD 22.8 billion under the *Graduated Price* scenario.

Figure 3: A climate coalition generates substantial revenue primarily through domestic carbon pricing[8]



Notes: The figure shows simulated annual effects with 2025 as the reference year. Domestic revenue reflects the total revenue generated by domestic carbon price floors, measured net of the carbon pricing revenue coalition members already collect under existing policies. BCA revenue refers to fees paid by importers to coalition countries under the border carbon adjustment. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Figure 4: Both coalition scenarios generate meaningful revenue as a share of general government revenue



Notes: Bars show simulated annual domestic carbon pricing revenue as a share of 2025 general government revenue for selected coalition members. General government revenue is drawn from the IMF *World Economic Outlook* database, with exchange rates from the World Bank *World Development Indicators*. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Key finding #3: Coalition members experience a moderate increase in prices

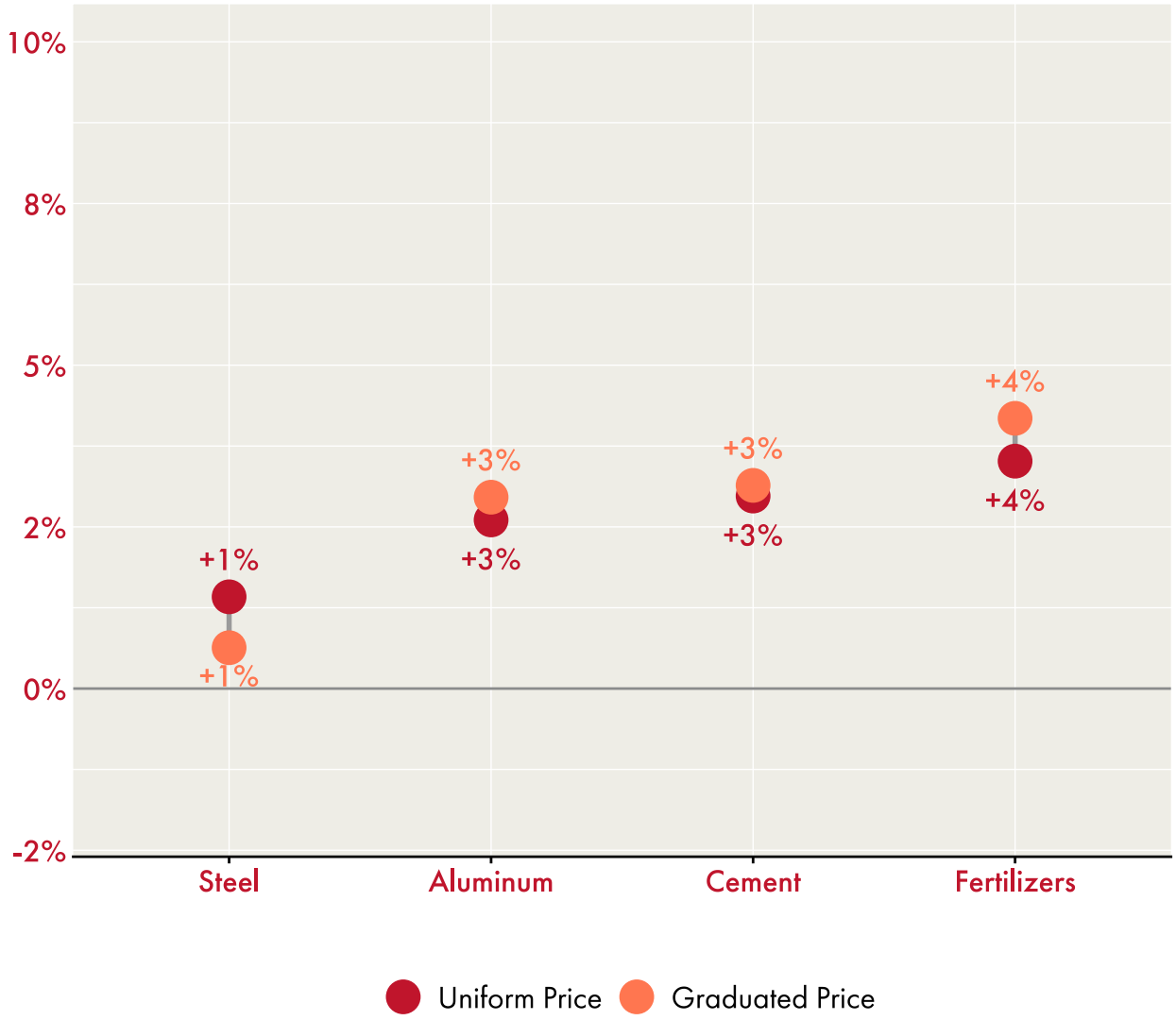
Updated modeling continues to indicate that coordinated carbon pricing produces moderate increases in commodity prices relative to the *Current Policy Baseline*.

In coalition member countries, steel prices increase 0.6%–1.4%, aluminum prices increase 2.6%–3.0%, cement prices increase 3.0%–3.1%, and fertilizer prices increase 3.5%–4.2%, all relative to the *Current Policy Baseline* (Figure 5).[9]

These findings are qualitatively consistent with the 2025 GCPP report, which concluded that coalition formation produces manageable price increases in emissions-intensive commodities.

Modest increases in commodity prices allow producers of lower-carbon materials to capture a "green premium," helping to support investment in cleaner production methods.[10] More broadly, changes in commodity prices should not be interpreted as equivalent changes in the prices ultimately paid by consumers. As emphasized in the 2025 GCPP report, primary materials typically account for only a small share of the final cost of manufactured products, implying considerably smaller impacts on downstream consumer prices.[11]

Figure 5: Coalition members experience moderate changes in prices relative to the *Current Policy Baseline*



Notes: Points show simulated percentage changes in average commodity prices in coalition countries relative to the *Current Policy Baseline*, using 2025 as the reference year. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Key finding #4: Industrial producers in coalition countries do not substantially reduce output, suggesting emissions leakage will be minimal

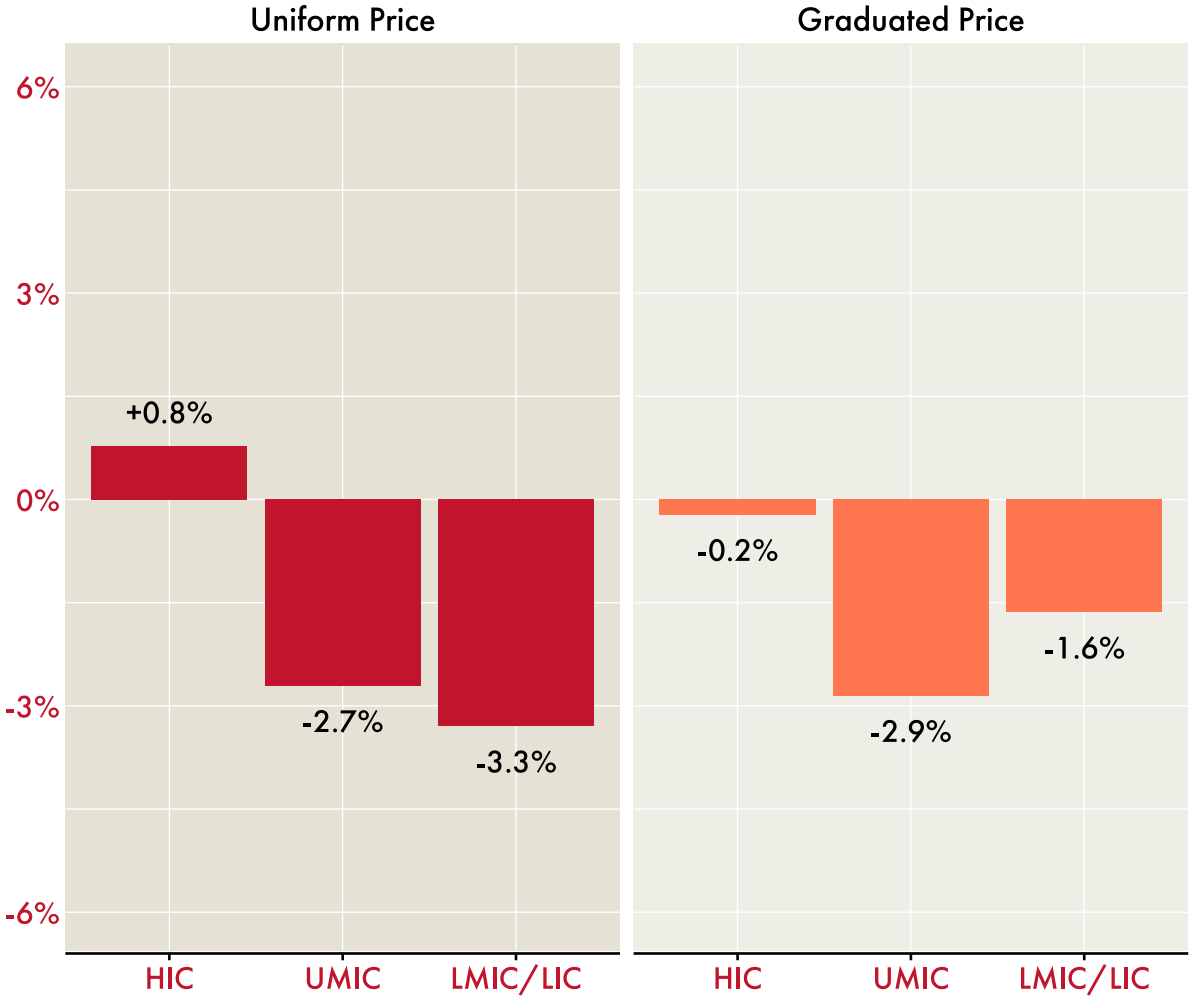
The updated analysis also reinforces the conclusion that coordinated carbon pricing can achieve substantial emission reductions without materially reducing industrial production.

Across the four target industries, output in coalition member countries declines by approximately 2.2%–2.5% relative to the *Current Policy Baseline*, with the smaller decline under the *Uniform Price* scenario and the larger decline under the *Graduated Price* scenario for every industry. By industry, output falls 2.1%–2.5% for steel, 2.4%–2.5% for aluminum, 2.4%–2.5% for cement, and 1.5%–2.0% for fertilizer, depending on the policy scenario.

The distribution of output effects also remains broadly consistent with findings in the 2025 GCPP report. Under the *Graduated Price* scenario, lower-income countries experience smaller output reductions than in the *Uniform*

Price scenario (Figure 6). This finding suggests that differentiated carbon price floors can better balance climate ambition with economic development objectives while preserving most of the coalition's climate benefits.

Figure 6: Differentiated carbon price floors mitigate output losses for lower-income countries, better supporting their economic growth



Notes: Bars show simulated percentage changes in coalition output by World Bank income group relative to the *Current Policy Baseline*, using 2025 as the reference year. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

We also examine lower carbon price floors of USD 10/20/30 per ton, calibrated around the effective carbon cost faced by EU producers, as an indication of the price levels that could help facilitate near-term coordination. While these lower price floors reduce the magnitude of the estimated effects, the central findings remain unchanged: a climate coalition continues to deliver substantial emission reductions and fiscal revenues, with only moderate impacts on commodity prices and industrial output (Appendix D).

3.3 POLITICAL AND ADMINISTRATIVE FEASIBILITY

Updated modeling also reinforces the conclusions of the 2025 GCPP report regarding the political and administrative feasibility of implementing a climate coalition. The principal design challenge remains balancing environmental effectiveness, equity, competitiveness, and administrative simplicity.

The choice between a uniform price and a graduated price continues to represent the central policy tradeoff. A uniform carbon price offers a simpler framework for coordination and may facilitate deeper integration over time. A graduated approach better reflects differences in income and fiscal and administrative capacity, while also adhering to the principle of common but differentiated responsibilities. Our updated modeling indicates that differentiated carbon price floors reduce output losses for lower-income countries while preserving most of the coalition's emission benefits. Determining the appropriate price tiers and establishing transparent criteria for countries to move between them would remain important political and technical decisions (Section 4).

Design features identified in the 2025 GCPP report offer important options for strengthening coalition participation. These include phased convergence toward a common carbon price, targeted use of free allocation during transition periods, differentiated treatment for lower-income countries, and recycling carbon price revenues to households, firms, and industrial decarbonization projects. Complementary measures, including technology cooperation, climate finance, institutional capacity building, and preferential market access, could further broaden participation and support higher levels of climate ambition.

One promising option to strengthen the political viability of a graduated approach is to treat exporting firms in LICs and middle-income countries (MICs) differently from firms that sell into the domestic market. For example, LICs and MICs could be allowed into the coalition as long as their domestic carbon price is at the level set by the *Graduated Price* scenario, but the carbon price on their exports to other coalition members could be raised to match the importing member's domestic price via an export tax. Relative to the *Current Policy Baseline*, this would allow LICs and MICs to keep the additional revenue from the higher price applied to exports, while addressing the competitiveness concerns of HICs. Our model projects that this change would lead to minimal changes in the *Graduated Price* scenario, with output and prices only slightly lower in coalition LMICs/LICs, and output and prices slightly higher in HICs.

Administrative feasibility has improved since publication of the 2025 GCPP report. Implementation of the EU CBAM and the continued expansion of carbon pricing systems have accelerated investment in emissions measurement, reporting, verification, and product-level carbon accounting.[12] These developments have created institutional capabilities that could support the implementation of a multilateral climate coalition.

At the same time, significant implementation challenges remain. The design of coalition BCAs raises important questions about consistency with World Trade Organization (WTO) rules, as discussed in Box 2. Coalition members would also need to establish common or compatible approaches to accounting for embedded carbon emissions, verifying emissions, recognizing carbon prices paid in other jurisdictions, and other issues, which we discuss in Section 4. These challenges point to an important and emerging policy agenda which this report endeavors to advance, as highlighted in the roadmap presented in Appendix A.

Box 2: Key WTO Considerations in the Design of Coalition BCAs

The WTO provisions relevant to the coalition depend on how coalition members design their BCAs and how the WTO resolves interpretive questions that have not yet been tested. To promote consistency with WTO rules, coalition agreements should be mindful of the potential application of Article II (Schedules of Concessions) and the nondiscrimination principles contained in Article I (the Most Favored Nation clause) and Article III (the National Treatment clause) of the General Agreement on Tariffs and Trade (GATT). Article II prohibits countries from charging nontariff duties on imports, while Articles I and III prohibit discrimination among imports based on origin and against imports relative to domestic products. If the framework violates these provisions, coalition members could design their BCAs to satisfy Article XX (General Exceptions), which provides environmental exceptions to measures that may otherwise violate GATT provisions.

How BCAs are classified turns on their design and the corresponding domestic carbon pricing scheme and determines which WTO provisions apply. If a BCA is classified as an import charge, Article II generally prohibits charges beyond those permitted by a member's tariff schedule.[13] However, charges may be able to exceed this limit if classified as internal charges, either by being triggered by an "internal factor," such as the sale of the product sale, or by being equivalent to internal charges imposed on like domestic products.[14]

Internal charges would be subject to Article III, which may also apply to BCAs linked to ETSs if considered internal regulations.[15] Article III generally requires that imports face no higher charges or less favorable regulatory treatment than "like" domestic products.[16] Some have argued that products with different embedded emissions should not be considered "like" products.[17] However, a WTO panel may not agree, as the criteria used for determining whether products are "like" has largely been based on competition.[18] BCAs would also be subject to Article I, which prevents discrimination between imports from different WTO members by requiring that any advantage given to an imported product also be given to "like" products from all other WTO members.[19] If BCAs treat products from countries with stringent climate policies more favorably than "like" products from countries with no climate policies, this may constitute an advantage in violation of Article I.[20] One WTO panel suggested that origin-neutral measures may not *per se* violate Article I, potentially allowing differentiation based on production methods.[21] However, other panels have found that production methods are not legitimate means by which to differentiate products.[22]

Even if measures are inconsistent with Articles I, II, and III, they may be upheld under Article XX.[23] This Article provides a list of exceptions that justify noncompliance with other provisions, including exceptions for measures that are "necessary to protect human, animal or plant life or health" under Article XX(b), and measures "relating to the conservation of exhaustible natural resources" if made "in conjunction with restrictions on domestic production or consumption" under Article XX(g). Article XX(b)'s "necessary" standard has required balancing the measure's contribution and proportionality against available less trade-restrictive alternatives.[24] Article XX(g)'s requirement that a measure be "reasonably related" to its objective may make it a more viable route.[25] One WTO panel held that clean air is an exhaustible natural resource, which could be viewed as a potential analog to carbon reduction.[26] Because coalition members' BCAs would be implemented in conjunction with domestic carbon price floors, they are likely to satisfy Article XX(g)'s domestic-restrictions requirement.[27]

Measures must also satisfy Article XX's chapeau, which requires that they not constitute "arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade."[28] WTO adjudicators have emphasized the importance of "basic fairness and due process," requiring that the application of BCAs be transparent and predictable and provide opportunities for exporting countries to be heard.[29] Coalition members would also need "serious good faith efforts to reach an agreement" on climate measures with all affected countries before implementing BCAs.[30] Existing climate agreements and fora, such as the UNFCCC and the Paris Agreement, may help satisfy this requirement, along with the coalition's planned engagement with non-members, although bilateral negotiations with non-members may still be necessary.[31] Moreover, to be consistent with past WTO Appellate Body decisions, BCAs should provide "sufficient flexibility" for exporters to adopt policies "comparable in effectiveness" but "suitable to [each country's] specific conditions" rather than coercing the adoption of particular climate regimes.[32] Designing BCAs in accordance with these requirements may bring them into compliance with WTO rules, even if BCAs are ultimately found to be inconsistent with Articles I, II, and III.

Section 3 Endnotes

1 European Commission, "About the EU ETS," accessed July 22, 2026, https://climate.ec.europa.eu/eu-action/carbon-markets/about-eu-ets_en.

2 Sources for production and emissions data by industry are as follows: Manufacturing and Industrial Processes sector – Cement Manufacturing Emissions, Iron & Steel Manufacturing Emissions, and Chemicals, Climate TRACE Emissions Inventory dataset, TransitionZero, accessed June 22, 2026, https://climatetrace.org; Multicommodity Costs and Emissions Data, proprietary 2025 plant-level dataset prepared for the Massachusetts Institute of Technology, CRU Group, June 2026. See the Online Technical Modeling Appendix for more information.

3 Emissions data used for this section only reflect CO_2 emissions and do not include other GHGs.

4 The graduated carbon price floor levels and income-based country groups in our modeling follow Ian W.H. Parry, Simon Black, and James Roaf, "Proposal for an International Carbon Price Floor Among Large Emitters," *Staff Climate Notes* (International Monetary Fund, 2021), https://www.imf.org/en/publications/staff-climate-notes/issues/2021/06/15/proposal-for-an-international-carbon-price-floor-among-large-emitters-460468. *See also* Eric Metreau, Kathryn Elizabeth Young, and Shwetha Grace Eapen, "Understanding Country Income: World Bank Group Income Classifications for FY26," World Bank Blogs (The World Bank Group, July 1, 2025), https://blogs.worldbank.org/en/opendata/understanding-country-income--world-bank-group-income-classifica.

5 Modeling draws from Kimberly Clausing, Jonathan Colmer, Allan Hsiao, and Catherine Wolfram, "The Global Effects of Carbon Border Adjustment Mechanisms," NBER Working Paper No. 33723 (National Bureau of Economic Research, Apri*l 2025; revised July 2026),* https://doi.org/10.3386/w33723.

6 Comparison with the World Steel Association and U.S. Geological Survey indicates that the underlying supply data only capture approximately 67% of China's 2025 crude steel production. To account for this incomplete coverage, Chinese production and capacity are scaled proportionally to match the reported national production total. The resulting estimate of global steel production is within 0.7% of the World Steel Association's reported 2025 total. The underlying cement data capture approximately 62% of reported global production, with the largest coverage gaps in China and India. Differences partly reflect the exclusion of standalone grinding facilities and may also reflect differences between modeled plants' activity and national production statistics. Because the source of the remaining gap cannot be identified consistently, the data are not scaled to national totals. This incomplete coverage likely makes estimated emission reductions and carbon pricing revenues conservative; scaling Chinese production to reported national output would increase both by approximately 16%.

7 Monica Crippa, Diego Guizzardi, Federico Pagani, Manjola Banja, Marilena Muntean, et al., *GHG emissions of all world countries – 2025 Report* (Publications Office of the European Union, 2025), https://edgar.jrc.ec.europa.eu/report_2025.

8 Sources for Figure 3 are as follows: 2025 General Government Revenue (National Currency), World Economic Outlook database, IMF, https://www.imf.org/en/Publications/WEO/; 2025 Official Exchange Rate (LCU per US$, Period Average), World Development Indicators, World Bank, 2025, https://data.worldbank.org/indicator/PA.NUS.FCRF.

9 Where a range is reported, the first value corresponds to the Uniform Price scenario and the second to the Graduated Price scenario.

10 Kimberly Clausing, Jonathan Colmer, Allan Hsiao, and Catherine Wolfram, "The Global Effects of Carbon Border Adjustment Mechanisms," *NBER Working Paper No. 33723* (National Bureau of Economic Research, April 2025; revised July 2026), https://doi.org/10.3386/w33723.

11 The 2026 global commodity market has been characterized by supply-side disruptions and elevated energy costs, contributing to higher prices for metals and fertilizers, including aluminum and ammonia. This report does not account for these developments, as the analysis is based on 2025 market conditions. Consequently, the quantitative impacts of carbon pricing could differ under the commodity price environment observed in 2026. World Bank Group, *Commodity Markets Outlook* (Washington, DC: World Bank, April 2026), https://openknowledge.worldbank.org/entities/publication/3ede6f8c-ba03-4176-867c-40e604698570.

A recent analysis finds that, even under full pass-through of carbon costs, downstream price effects in housing, wheat, and wind-farm construction are less than one-tenth of the price effect on upstream inputs (steel, cement, and ammonia-based fertilizer). Government of Australia, Department of Climate Change, Energy, the Environment, and Water, "Carbon Leakage Review – Consultation Paper 2" (November 2024), https://storage.googleapis.com/files-au-climate/climate-au/p/prj2f030fe5577e16a3ffbb9/page/Carbon_Leakage_Review_Consultation_Paper_2_November_2024.pdf.

12 World Bank, *State and Trends of Carbon Pricing 2026* (World Bank, Washington, DC, 2026), https://hdl.handle.net/10986/44787.

13 General Agreement on Tariffs and Trade 1994, art. II:1(a)–(b), 1867 U.N.T.S. 190.

14 Joel P. Trachtman, "WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes," *National Tax Journal 70, no.* 2 (201 7): *472,* https://doi.org/10.17310/ntj.2017.2.09; GATT 1994, art. II:2(a).

15 Whether Article III applies only to taxes and regulations on products rather than production processes such as emissions intensity is debated. This distinction may determine whether a BCA would be classified under Article III or would instead be subject to Article II or Article XI, which prohibits quantitative restrictions. See Joel P. Trachtman, "WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes," *National Tax Journal 70,* no. 2 (2017): 471–74, https://doi.org/10.17310/ntj.2017.2.09 and Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 459, https://doi.org/10.1017/ajil.2019.22.

16 General Agreement on Tariffs and Trade 1994, art. III:2; General Agreement on Tariffs and Trade 1994, art. III:4, 1867 U.N.T.S. 190.

17 Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 460 (citing Joost Pauwelyn, "Carbon Leakage Measures and Border Tax Adjustments Under WTO Law," in *Research Handbook on Environment, Health and the WTO*, eds. Geert Van Calster and Denise Prévost (Edward Elgar Publishing, 2013): 489.

18 Joel P. Trachtman, "WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes," *National Tax Journal 70, no. 2 (2017): 474–75,* https://doi.org/10.17310/ntj.2017.2.09.

19 General Agreement on Tariffs and Trade 1994, art. I:1, 1867 U.N.T.S. 190.

20 Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 463, https://doi.org/10.1017/ajil.2019.22.

21 Panel Report, *Canada—Certain Measures Affecting the Automotive Industry*, para. 10.29, WT/DS139/R (WTO, Feb. 11, 2000), https://jusmundi.com/en/document/decision/en-canada-certain-measures-affecting-the-automotive-industry-report-of-the-panel-friday-11th-february-2000.

22 See, e.g., *Panel Report, Indonesia—Certain Measures Affecting the Automobile Industry*, para. 14.143, WT/DS54/R, WT/DS55/R, WT/DS59/R, WT/DS64/R (WTO, July 2, 1998), https://jusmundi.com/en/document/decision/en-indonesia-certain-measures-affecting-the-automobile-industry-report-of-the-panel-thursday-2nd-july-1998. ("The GATT case law is clear to the effect that any such advantage (here tax and customs duty benefits) cannot be made conditional on any criteria that is not related to the imported product itself.")

23 Notably, however, only two measures have been upheld under an Article XX exception as of 2022. Daniel Rangel, *WTO General Exceptions: Trade Law's Faulty Ivory Tower,* Public Citizen (February 4, 2022), https://www.citizen.org/article/wto-general-exceptions-trade-laws-faulty-ivory-tower/.

24 WTO, "WTO rules and environmental policies: GATT exceptions," accessed August 10, 2026, https://www.wto.org/english/tratop_e/envir_e/envt_rules_exceptions_e.htm; Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 465–66.

25 Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 467, https://doi.org/10.1017/ajil.2019.22.

26 Joel P. Trachtman, "WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes," *National Tax Journal 70, no. 2* (2017): 479, https://doi.org/10.17310/ntj.2017.2.09 (citing Panel Report, *United States—Standards for Reformulated and Conventional Gasoline*, para. 6.37, WT/DS2/R (WTO, adopted May 20, 1996), as modified by Appellate Body Report, WT/DS2/AB/R). Despite this finding, WTO adjudicators have not settled on a uniform definition of "exhaustible natural resources" under Article XX(g). See also Manjiao Chi, "'Exhaustible Natural Resource' in WTO Law: GATT Article XX (g) Disputes and Their Implications," *Journal of World Trade 48, no. 5* (2014): 941, https://doi.org/10.54648/trad2014032.

27 Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 467, https://doi.org/10.1017/ajil.2019.22. However, the BCAs of LICs/LMICs in the graduated price scenario may not meet this requirement because of disparities between their BCAs and domestic measures.

28 WTO, "WTO rules and environmental policies: GATT exceptions," accessed August 4, 2026, (https://www.wto.org/english/tratop_e/envir_e/envt_rules_exceptions_e.htm; General Agreement on Tariffs and Trade 1994, art. XX, 1867 U.N.T.S. 190.

29 Appellate Body Report, *United States–Import Prohibition of Certain Shrimp and Shrimp Products,* para. 180–81, WT/DS58/AB/RW (WTO, adopted Nov. 6, 1998), https://jusmundi.com/en/document/decision/en-united-states-import-prohibition-of-certain-shrimp-and-shrimp-products-ab-1998-4-report-of-the-appellate-body-monday-12th-october-1998#decision_6289.

30 Panel Report, *United States—Import Prohibition of Certain Shrimp and Shrimp Products (Recourse to Article 21.5 by Malaysia)*, para. 5.67, WT/DS58/RW (WTO, adopted Nov. 21, 2001), https://jusmundi.com/en/document/decision/en-united-states-import-prohibition-of-certain-shrimp-and-shrimp-products-report-of-the-panel-friday-15th-may-1998#decision_6287; see also Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 468–69.

31 Michael A. Mehling et al., "Designing Border Carbon Adjustments for Enhanced Climate Action," *The American Journal of International Law 113, no. 3* (2019): 468–69.

32 Appellate Body Report, *United States–Import Prohibition of Certain Shrimp and Shrimp Products (Recourse to Article 21.5 by Malaysia)*, paras. 144, 149, WT/DS58/AB/RW (WTO, adopted Nov. 21, 2001), https://jusmundi.com/en/document/decision/en-united-states-import-prohibition-of-certain-shrimp-and-shrimp-products-recourse-to-article-21-5-of-the-dsu-by-malaysia-ab-2001-4-report-of-the-appellate-body-monday-22nd-october-2001#decision_6291. This holding, however, concerned import bans, rather than import charges. See also Joel P. Trachtman, "WTO Law Constraints on Border Tax Adjustment and Tax Credit Mechanisms to Reduce the Competitive Effects of Carbon Taxes," *National Tax Journal 70, no. 2 (2017): 481–82*, https://doi.org/10.17310/ntj.2017.2.09.

4. A Common Framework for Assessing Carbon Pricing Effort

This section presents a common framework for assessing carbon pricing effort within a climate coalition. The framework provides a structured basis for determining whether different carbon pricing approaches deliver sufficiently comparable levels of effort to support cooperation and eligibility for coalition benefits. It is also designed to promote interoperability across different carbon pricing systems while preserving national flexibility through a common methodology, transparent assessment, and peer review.

4.1 FOUNDATIONS OF THE FRAMEWORK

Achieving interoperability across compliance carbon markets will require pragmatic approaches that accommodate differences in policy design, legal frameworks, institutional capacity, and national circumstances. By offering a practical pathway toward interoperability that does not require countries to adopt common carbon pricing instruments or directly link their emissions trading systems, a shared framework for assessing carbon pricing effort preserves national policy autonomy, encourages broad participation in the coalition, reduces trade frictions, and provides greater certainty for firms.

Importantly, this framework can also serve as a stepping stone toward deeper integration, where countries choose to pursue it, by helping them build trust, develop robust national compliance markets, and gain experience cooperating. Over time, countries or regional groupings with greater policy convergence may choose to pursue deeper forms of integration, including market linkage, while still participating in the shared framework for assessing effort across a wider set of jurisdictions.

Guiding principles for the framework are summarized below. They aim to balance credibility, inclusiveness, and practicality while accommodating diverse national carbon pricing systems.

Policy neutrality

The framework is a tool for assessing the level of carbon pricing effort; it is not intended to prescribe particular policy instruments. Participating jurisdictions should remain free to price carbon with taxes or emissions trading systems, and to design those systems as their circumstances warrant. They should be equally free to choose complementary fiscal measures and related policies suited to their national circumstances.

Competitiveness

A central objective is to preserve a level playing field by ensuring that firms face broadly comparable carbon costs regardless of where they operate. The framework should therefore assess the *effective carbon cost* imposed by each country's carbon policies as a package, rather than focusing solely on the headline price. (Section 4.2.1 discusses policy design features that affect the effective carbon cost.) Understanding the effective carbon cost creates a common basis for addressing competitiveness concerns while supporting cooperation across diverse policy architectures.

Equity

Countries differ substantially in income and development levels, institutional capacity, the scale and emissions profile of their industrial sectors, and the structural costs of industrial decarbonization, among other factors. Comparability should be assessed based on the *level of carbon pricing effort a country exerts relative to its economic and structural circumstances*, not on whether countries use the same policy instrument or achieve the same explicit carbon price. The framework should therefore accommodate differentiated expectations while preserving incentives for progressively stronger climate action. Modeling in the 2025 GCPP report and Section 3 shows that a coalition can accommodate such differentiation without incurring significant carbon leakage. In practice, the framework could incorporate differentiation in several ways. One option is to negotiate carbon price floors linked to income. Another is to set country-specific expected carbon price benchmarks that reflect each country's economic and structural circumstances, as discussed in Section 4.2.2.

Legitimacy

The framework should operate through transparent, rules-based processes that are collectively governed by participating jurisdictions. Assessment methodologies, decision-making procedures, and criteria for recognition should be clearly defined and consistently applied. A credible, facilitative process through which countries can assess alignment is also important for building confidence in one another's systems.

Accountability

Transparency and peer review rather than centralized enforcement should provide the basis for accountability, as explained in Section 4.2.3. Countries should report comparable information using shared methodologies, supported by expert technical review and peer dialogue. Public benchmarking, together with access to coalition benefits such as climate finance, technology transfer, capacity development, reduced border adjustment exposure, or enhanced cooperation, will create incentives for continued alignment.

Parsimony

Existing international reporting and review mechanisms should be leveraged, where possible, to avoid establishing new administrative structures. Building on existing reporting under the Paris Agreement, UNFCCC transparency framework, WTO Trade Policy Review, and national inventories can reduce transaction costs, improve consistency, and accelerate implementation.[1]

Empiricism

Comparability should rest on transparent, observable, and replicable metrics rather than subjective judgments. Effective carbon costs should be estimated using observable features of domestic policy, with explicit carbon prices as the primary input. The framework could also establish transparent criteria for determining when complementary fiscal measures that directly affect carbon compliance costs should be recognized.

Environmental effectiveness

While the framework assesses carbon pricing effort rather than emissions outcomes, it should ultimately support meaningful emission reductions. Periodic review of observed outcomes, including industry-level emissions intensity and emissions trajectories, can help identify implementation gaps, inform future refinements to the framework, and strengthen confidence that recognized systems are contributing to their intended environmental objectives.

4.2 CORE ELEMENTS

A common framework for assessing carbon pricing effort requires three core elements. First, it needs a methodology for measuring the effective carbon costs imposed by different domestic carbon pricing systems. Second, it requires a transparent basis for determining the level of carbon pricing effort that can reasonably be expected from participating jurisdictions given their economic and structural circumstances. Third, it needs a review process through which participating jurisdictions can assess comparability, build confidence in one another's systems, and periodically refine the framework over time. Together, these elements provide a structured basis for comparing diverse carbon pricing approaches while preserving flexibility over domestic policy design.

4.2.1 Measuring Effective Carbon Costs

The first element of the framework establishes a common metric for measuring the carbon costs imposed by different domestic policy packages. Because jurisdictions rely on different policy instruments—including carbon taxes, emissions trading systems, tradable performance standards, and hybrid approaches—headline carbon prices alone do not provide a consistent measure of the carbon costs borne by regulated facilities. Differences in coverage, free allocation, output-based benchmarks, offsets, and other policy features can substantially affect the costs firms actually face. A framework aimed at preserving a level playing field by ensuring that firms face broadly comparable carbon costs regardless of where they operate therefore requires a metric that translates these heterogeneous policy packages into a comparable measure of carbon pricing effort.

> *Unlike the headline carbon price, [the effective carbon cost] accounts for policy design features that determine the actual compliance costs faced by firms.*

This report proposes **effective carbon cost (ECC)** as that common metric. The ECC is a measure of the average carbon cost borne by regulated facilities, expressed as the average carbon cost per metric ton of CO_2e emitted within a given country and industry. Unlike the headline carbon price, it accounts for policy design features that determine the actual compliance costs faced by firms. These actual compliance costs are often different from the headline carbon price.

Depending on policy design, firms may face different incentives to emit less carbon while keeping output fixed versus making small changes to output at the same emissions intensity, or making larger output changes, including shutting down completely. We focus on the average costs borne by facilities after accounting for free allocation, output-based benchmarks, and exemptions or other forms of compensation based on fuel, process, or other criteria. Actual cost to facilities reflects the overall stringency of the policy and is most relevant to the trade and competitiveness concerns that motivate the framework.

The literature contains several metrics to compare carbon pricing systems, each designed for a different analytical purpose. Measures used by the Organization for Economic Co-operation and Development (OECD) are primarily diagnostic in that they are designed to assess the strength and coverage of carbon pricing and identify opportunities for policy reform. Other measures seek to characterize overall carbon-pricing effort across economies or facilitate comparisons across a broader set of climate policies. The OECD's Effective Carbon Rate is intended to measure the strength of the marginal incentive to reduce emissions, while its Effective Average Carbon Rate (EACR) accounts for free allowance allocation to estimate firms' average carbon costs and

incentives for longer-term decarbonization investment.[2] The EACR is the closest existing analogue to the metric proposed here, but it represents free allocation only to broad sectors.

The World Bank's Total Carbon Price (TCP) serves a different purpose: it is intended to provide a comprehensive picture of the extent to which economies price the social cost of greenhouse gas emissions across countries, sectors, and fuels, including for discussions of carbon-pricing comparability and minimum carbon-price commitments. In addition to direct carbon taxes and emissions trading systems, the TCP incorporates indirect carbon-pricing signals from fuel excise taxes, producer- and consumer-side fuel subsidies, and deviations from standard VAT rates. As implemented, however, the TCP does not adjust for free allowances, output-based rebates, or benchmarks.[3] The Carbon Barometer, a tool developed by the investment firm Kepos Capital, is designed to compare the implied carbon prices created by countries' market-based climate-policy incentives. It applies a broader definition of carbon pricing, converting seven policies into marginal incentives per metric ton of CO_2.[4]

The ECC proposed here is not intended to measure the economy-wide carbon price signal. Rather, it measures the average carbon compliance costs borne by firms in specific industries after accounting for policy design features—free allocation, output-based benchmarks, exemptions, and other forms of carbon cost relief—that determine firms' actual costs. This industry-specific focus is essential for assessing competitiveness and ensuring a level playing field among trade-exposed industries. Existing metrics either report economy-wide or broad sectoral averages, or they do not systematically account for policy provisions that reduce firms' average compliance costs. This makes them unsuitable for comparing the carbon costs faced by the industries covered by a BCA.

Carbon costs can also be expressed per unit of output. That measure is useful for assessing the cost embodied in particular goods, but it combines policy stringency with differences in emissions intensity, production processes, and industrial structure.[5] Two jurisdictions applying the same carbon pricing policy may report different costs per metric ton of output because they rely on different mixes of production technologies.[6] By expressing net compliance costs per metric ton of emissions, the ECC more clearly summarizes differences arising from carbon pricing policy while capturing the average burden imposed on regulated facilities.

Calculating the ECC requires first examining applicable carbon pricing legislation and related regulations to identify the headline carbon price, policy coverage, and any provisions that reduce compliance costs, including free allocation, output-based benchmarks, and other forms of carbon cost relief. Facility-level emissions and, where necessary, production data can then be used to estimate carbon costs for individual facilities. These costs are subsequently aggregated to the country–industry level by dividing total carbon costs by total covered emissions, yielding a single ECC for each country and industry. Box 3 provides more detail on the methodology.

Box 3: Components of the Effective Carbon Cost Calculations

Effective carbon costs are calculated using facility-level production and emissions data together with policy parameters obtained directly from primary legislative and regulatory sources. The effective carbon cost is then calculated as:

Effective Carbon Cost = Headline Price × Coverage × (1 − Carbon Cost Relief Share)

Each component in this equation, and the method used to calculate it, is described below:

- **Step 1 — Headline price.** The headline price is the prevailing market price applied to a metric ton of CO_2 emitted by a regulated facility. It is set or implied by the jurisdiction's carbon pricing legislation and may take the form of a carbon tax rate, an emissions trading system allowance price, or the credit price under a tradable performance standard.

- **Step 2 — Coverage.** Coverage is the share of an industry's CO_2 emissions that is subject to the carbon price. It varies by country depending on the scope of the policy being implemented, including which industries and facilities are covered, what emissions thresholds apply for installations to be included, and any fuel, process, or specific exemptions that exclude emissions from pricing. For example, in China, a cement clinker producer is covered by the national ETS if its annual direct emissions reach 26,000 metric tons of CO_2e. A producer below this threshold is not included in the list of key emitting entities for the national ETS.[7] Such installations are required to meet annual emissions targets instead of surrendering allowances and receive no free allocation. In sum, coverage measures the reach of the carbon-pricing framework.[8]

- **Step 3 — Carbon cost relief share.** The carbon cost relief share is the proportion of carbon costs compensated through free allocation of allowances or credits. It is determined using the allocation rules established in the enabling legislation for each country's carbon pricing policy. In output-based systems, such as tradable performance standards, facility-level production data are used to calculate the quantity of free allowances available to each producer. For example, for steel, aluminum, and cement facilities under China's 2025 allocation rules, the allowance surplus or deficit is capped at 3% of verified emissions. This means that a covered steel plant with verified annual emissions of 1 Mt CO_2e would be eligible for a final free allocation of at least 970,000 allowances. At a minimum, the carbon cost relief share is 97%, and the plant operator must purchase allowances for only the remaining 30,000 metric tons. All 1 Mt CO_2e are covered by the ETS, but nearly all of these emissions (97%) are shielded from the immediate requirement to purchase allowances. Even though some facilities receive more allowances than they need to cover their emissions, our methodology caps the carbon cost relief share at 1.

This analysis reports costs per metric ton of CO_2e emissions, including non-CO_2 greenhouse gases, even though some jurisdictions' pricing policies cover only CO_2. The Online Effective Carbon Cost Appendix provides more detail on ECC calculations and data.

Appendix E summarizes **complementary fiscal measures** that reduce the carbon costs borne by regulated facilities, such as rebates, tax credits, compensation mechanisms, subsidies, or revenue recycling. This report documents these measures qualitatively to provide context when interpreting results from the modeling analysis.

Similarly, some countries allow regulated facilities to use carbon offsets to satisfy a portion of their compliance obligations, thereby reducing effective carbon costs. However, offsets are not incorporated into the analysis because comparable data on facility-level offset use and offset prices are not available.

Several methodological choices influence the calculation. The framework proposed in this report focuses on nationally administered carbon pricing systems.[9] It therefore excludes subnational policies unless these policies are incorporated into the national system. Were a coalition to recognize subnational systems, the risk is that doing so might incentivize countries to ring-fence facilities involved in international trade within specific jurisdictions that have more ambitious carbon pricing regimes than the country as a whole. This would reduce the coalition's emissions impact.

Similarly, the analysis does not account for two further sources of cross-country variation: complementary fiscal measures and the use of offsets. Incorporating either would warrant additional data collection but would also require resolving high-level policy questions. Complementary fiscal measures may raise or lower firms' direct carbon compliance costs or reduce the future cost of decarbonization. Appendix E catalogues many of these measures for the countries included in this analysis. Conceptually, complementary fiscal measures that amount to additional costs could be added and complementary measures that amount to subsidies could be subtracted from the carbon costs used to calculate the ECC, perhaps subject to a de minimis threshold. Where measures amount to subsidies, it may be useful to distinguish between subsidies that support technology research and development (R&D) and subsidies that support technology deployment. Benefits from R&D can extend beyond the subsidizing country as the resulting knowledge diffuses. By contrast, deployment subsidies advantage production in the subsidizing country and could distort trade.

Many complementary fiscal measures, however, cannot be translated into transparent and comparable per-ton adjustments to the carbon price. Further, coalition members would need to determine the relevant perimeter of complementary fiscal measures, otherwise attempts to recognize these measures could easily become intractable. Future studies could build on this analysis by developing clear methodologies, including defined perimeters, for incorporating relevant additional measures into the ECC calculation.

A second important source of cross-country variation is the use of offsets. Several of the countries in this analysis allow offset use to a limited degree (Appendix E). Incorporating offsets in the ECC calculation would require data on facility-level use of offsets and offset prices. Countries may also agree that reliance on offsets below a de minimis share of emissions warrants no adjustment.

The ECC is intended to characterize the overall carbon pricing environment within a jurisdiction rather than the competitiveness of individual facilities. Plant-level investment and relocation decisions depend on facility-specific characteristics—including emissions intensity, production technology, and benchmark allocation—that cannot be fully captured by a country–industry average. The ECC should therefore be interpreted as a jurisdiction-level measure of carbon pricing effort rather than a predictor of firm-level competitiveness.

This approach to calculating the ECC shares much, but not all, of the underlying logic of the EU CBAM, which similarly adjusts headline carbon prices for free allocation and other policy features when determining the carbon price effectively levied on imported products.[10] The principal difference lies in the level of aggregation. Whereas the EU CBAM calculates installation-specific carbon costs for individual shipments, the framework proposed here aggregates facility-level costs into a single country–industry benchmark suitable for comparing domestic carbon pricing systems across jurisdictions. Under EU rules, country- and product-specific CBAM default values can serve as a fallback where verified installation-level data are unavailable. These values reflect estimated embedded emissions for individual products rather than average effective carbon costs across a country and industry. By targeting individual facilities, the EU CBAM could invite a form of regulatory reshuffling where installations with higher emissions, because they will be credited at the highest effective rate, are incentivized to export to the European Union.[11]

Table 3 illustrates the methodology by applying it across four industries and the power sector in eleven jurisdictions. Consistent with the 2025 GCPP report, we focus on steel, aluminum, cement, and fertilizers because they are among the most emissions-intensive and trade-exposed industries and together account for more than 20% of global CO_2 emissions. They also correspond to the initial scope of the EU CBAM and are already covered by existing or planned carbon pricing policies in the jurisdictions that account for the largest share of global production. We additionally include the power sector because electricity is a key input to industrial production and because carbon pricing systems typically begin by covering power generation as well as industrial emissions.[12] The jurisdictions in Table 3 reflect major signatories to the November 2025 Open Coalition Declaration that have existing carbon pricing policies. While the calculations reflect current policy parameters, future studies could incorporate the expected carbon pricing path for different jurisdictions to project future ECC trajectories.

Table 3: 2025 effective carbon cost by country and industry ($/t)

Country	Headline Price	Carbon Pricing System	Steel	Aluminum	Cement	Ammonia[13]	Power
Canada[14]	67.95 for price-based provinces, equivalent effort for provinces covered by ETS	Federal output-based pricing system; provincial ETSs and carbon taxes	8.03	1.24	1.56	6.02	8.58
Chile[15]	5.00	Carbon tax	5.00	No primary production	5.00	No primary production	4.59
China[16]	8.67	National ETS	0.06	0.03	0.01	Not covered	0.08
European Union[17]	82.97	EU ETS	36.56	25.28	12.76	38.54	82.97
France[18]	82.97	EU ETS; carbon tax	26.97	18.04	6.95	42.12	82.97
Germany[19]	82.97	EU ETS; national ETS	44.21	28.50	4.94	36.27	82.97
Mexico[20]	3.5	National ETS pilot; carbon tax	0.87	No primary production	0.26	0.00	0.28
New Zealand	32.00	National ETS	3.72	0.00	0.00	0.00	32.00
Norway[21]	82.97	EU ETS; national carbon tax	2.57	23.19	10.51	2.26	82.97
Singapore	19.12	Carbon tax	19.12	No primary production	No clinker production	No primary production	19.12
United Kingdom[22]	62.36	National ETS; carbon price support in Great Britain	11.85	31.32	13.26	No primary production	86.01

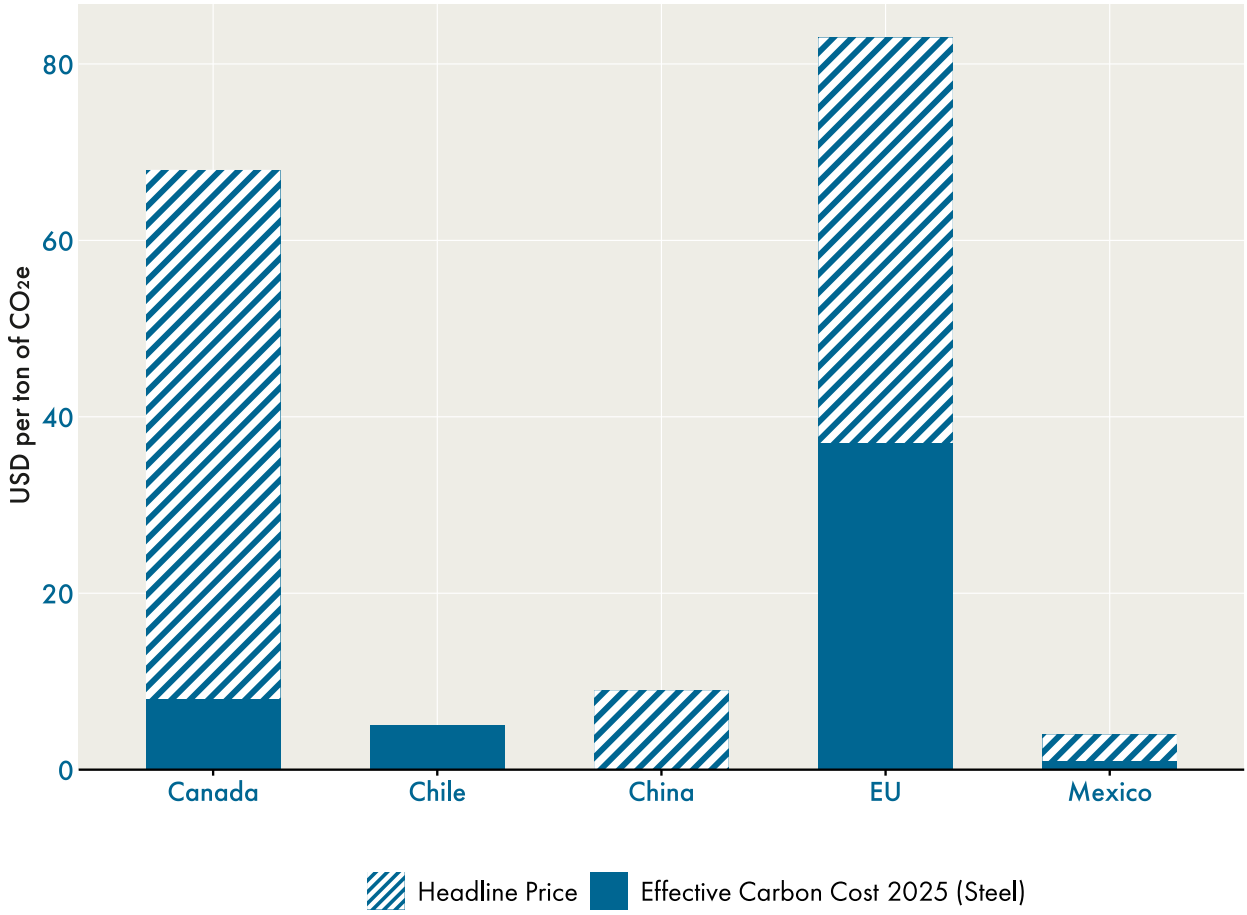
Notes: The table summarizes results using the calculation methodology described in Box 3. Country-specific details are in Appendix E and detailed assumptions can be found in the Online Effective Carbon Cost Appendix. Effective carbon costs for steel, aluminum, cement, and ammonia are constructed from the bottom up using plant-level data (reported emissions, installed technology). Results for the power sector are based on public data about grid architecture and generating plants, together with information about the specific allocations, exemptions, and carbon cost relief provided under each jurisdiction's carbon pricing instrument. Where plant-specific parameters could not be obtained (e.g., clinker ratios, fuel mixes, process-versus-combustion splits), we applied assumptions calibrated to country benchmarks or, failing that, to industry averages. The World Bank's average 2025 currency exchange rates were used throughout. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Several conclusions emerge from this illustrative application:

- **Headline prices can substantially exceed the ECCs that firms face.** Coverage, free allocation, and output-based benchmarks can materially reduce the carbon costs firms actually bear (Figure 7). For example, firms in Canada face a headline price of approximately $68/t in 2025, but output-based allocation shields emissions up to specified benchmarks and compliance credits may trade below the headline price. As a result, Canada's ECC falls to approximately $8/t for steel production.

- **Differences in effective carbon cost, which reflect differences in overall policy stringency and are most relevant to managing trade and competitiveness risks, may be narrower than headline prices imply.** For example, nominal carbon prices of approximately $10/t in China and $85/t in the European Union suggest a price gap of roughly $75/t. After accounting for policy design, however, these ECCs may be closer to $0.05/t and $15–$40/t, respectively, which reduces the difference to roughly $15–$40/t.

Figure 7: Headline prices can substantially exceed the ECCs that firms face



Notes: Select countries represented. Total bar height reflects the headline carbon price, while the darker segment shows the effective carbon cost. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

- **Effective carbon costs can vary substantially across sectors and industries within the same jurisdiction.** Even where a single headline carbon price applies, other policy provisions can produce markedly different ECCs for different industries. For example, under the EU ETS, the same headline carbon price applies across all covered sectors, but estimated ECCs range from approximately $13/t for cement to $39/t for ammonia, while the power sector faces the full headline price of approximately $83/t. This variation reinforces the importance of assessing carbon pricing effort at the country–industry level rather than relying on a single national price.

- **A framework for calculating and comparing effective carbon cost requires robust data and transparent reporting.** Specifically, detailed information is needed about policy coverage, free allocation, benchmarks, credit prices, offsets, and other forms of compensation, together with facility-level emissions and production data. Because much of this information must be assembled from primary legislative and regulatory sources and linked to installation-level datasets, credible assessments will require consistent reporting methodologies and strong institutional capacity. While policymakers may be concerned about disclosing sensitive information, facility-level emissions and production data for this report was generally obtained from publicly available sources for a fee. The presence of multinational companies in heavy industries in many LICs and

LMICs suggests a similar approach may be applicable beyond the UMICs and HICs surveyed here. Coalition countries may want to identify an established procedure for collecting data that draws on methods used by existing energy analytics firms and international organizations such as the International Energy Agency.[23] At the same time, coalition members should consider providing technical assistance to lower-income members to strengthen data capacity.

4.2.2 Assessing Expected Carbon Pricing Effort

To balance competitiveness and equity concerns, the framework could assess comparability against differentiated benchmarks that reflect countries' economic and structural circumstances, while preserving incentives for progressively stronger climate action.

The common framework could accommodate these differences in one of two ways:

Income-based differentiation. One approach would be to establish carbon price floors with differentiated commitments by income group. This could take the form of a tiered graduated price, as proposed by the IMF and the 2025 GCPP report, or a continuous graduated price that rises with per capita income.[24] Alternatively, coalition members could agree on a uniform minimum effective carbon price—for example, $25/t—while allowing low- and middle-income countries a longer transition period before the minimum price takes effect.

Broader country-specific benchmarks. While income provides an important indicator of a country's capacity to undertake industrial decarbonization, it may not fully capture differences in the feasibility and cost of carbon pricing. Countries with similar income levels can face markedly different structural conditions. For example, Brazil's extensive hydropower resources provide comparatively favorable conditions for decarbonizing energy-intensive industries, whereas Indonesia's greater reliance on coal-fired electricity implies higher transition costs. A more refined approach would therefore develop *country-specific benchmarks based on a broader set of structural fundamentals.*

Conceptually, this approach is analogous to the IMF's External Balance Assessment, which evaluates policy settings against country-specific structural fundamentals rather than a single global benchmark.[25] Similarly, differentiated carbon pricing benchmarks would provide a transparent, empirically grounded reference point against which ECCs could be assessed while accounting for country-level differences.

Such a methodology could capture three broad dimensions of expected carbon pricing effort—economic capacity, industrial significance, and structural decarbonization costs—using the metrics described below.

Economic capacity

- **Income per capita.** Higher-income countries generally have greater economic capacity to absorb carbon pricing costs, finance industrial decarbonization, and compensate affected firms and workers.

- **Institutional capacity.** Jurisdictions with stronger regulatory and administrative institutions are better able to implement, monitor, and enforce carbon pricing systems, including MRV requirements.

Industrial significance

- **Heavy-industry emissions per capita.** Higher emissions from covered industries indicate greater scope for carbon pricing to reduce emissions and would merit a higher carbon price. To preserve incentives for decarbonization, the indicator could be calculated as a weighted average over the previous five years, with greater weight given to more recent years so that improvements in emissions performance are reflected over time.[26]

- **Global industrial importance.** Jurisdictions that account for a large share of global production in steel, aluminum, cement, and fertilizers have greater capacity to shape international technology deployment, supply chains, and learning effects. As a result, they can reasonably be expected to undertake greater carbon pricing effort than countries with otherwise similar income levels but much smaller industrial footprints.

Structural decarbonization costs

- **Marginal abatement costs.** Countries that face structurally higher costs for reducing emissions in covered industries may reasonably be expected to sustain lower carbon prices for an equivalent level of effort.
    - *Carbon-intensive production structure*—A higher share of production that uses emissions-intensive technologies (e.g., blast-furnace steelmaking or high-clinker cement production) increases transition costs and may justify a lower expected benchmark carbon price during the transition period.
    - *Access to low-carbon industrial inputs*—Greater availability of low-carbon electricity, hydrogen, scrap steel, supplementary cementitious materials, and other key inputs lowers the cost of decarbonization and supports a higher expected carbon price.

- **Heavy industry as a share of GDP.** Where covered industries constitute a larger share of economic activity, carbon pricing imposes greater economy-wide adjustment costs, warranting a more gradual expected pricing trajectory.

Ultimately, coalition members will need to agree on both the categories and metrics used to quantify differences in expected carbon pricing effort. For example, income could be measured in terms of GDP per capita, adjusted for purchasing power parity. Measures of institutional capacity could use tax revenue as a share of GDP, Government Effectiveness ratings from the World Bank's World Governance Indicators, or the World Bank's Country Policy and Institutional Assessment. The objective is to ensure that whatever factors are used, they provide a transparent and empirically grounded basis for estimating the level of effort that can reasonably be expected across heterogeneous jurisdictions.

The methodology should also preserve incentives for structural transformation. Variables should capture genuine structural characteristics rather than consequences of past policy choices. For example, jurisdictions should not receive permanently lower benchmarks because they have maintained more carbon-intensive production processes or delayed investment in low-carbon technologies. Furthermore, the methodology should calibrate institutional capacity in a manner that preserves incentives for continued institutional strengthening and improved implementation over time. Where differences in expected carbon prices reflect structural transition costs, resulting price disparities should be limited, transparent, and—as appropriate—diminish over time. In other words, the

framework should allow for distinctions between structural fundamentals that affect the feasibility of carbon pricing and the policy choices that the framework is intended to evaluate.

4.2.3 Review Process for Assessing Comparability

The third element of the framework compares actual carbon pricing effort to expected pricing effort (elements one and two, respectively) to determine whether pricing effort across different jurisdictions is sufficiently comparable to support mutual recognition.

Jurisdictions whose ECCs are broadly consistent with their expected pricing benchmark could be recognized as providing comparable carbon pricing effort, even where they rely on different policy instruments or face different structural conditions. Coalition members would ultimately need to determine the degree of deviation that can be deemed consistent with any agreed framework and whether that threshold should shift over time as carbon pricing systems mature. Importantly, this approach evaluates **carbon pricing effort**, not climate ambition more broadly. Jurisdictions may pursue different emissions targets, complementary policies, or decarbonization pathways while nevertheless providing comparable levels of carbon pricing effort under the framework.

This section lays out a transparent process through which participating jurisdictions assess comparability, build confidence in one another's systems, and periodically refine the methodology for assessing pricing effort over time. Rather than relying on centralized enforcement, this process could combine standardized reporting, independent technical review, peer dialogue, and transparency to encourage continued alignment while preserving national control over domestic carbon pricing policies.

Institutional arrangements

The coalition could draw on the experience of the IMF's Article IV consultation process and the WTO's Trade Policy Review Mechanism (TPRM).[27] Because the coalition would assess a narrower and more objective set of policies and outcomes—principally carbon pricing systems and industry-level emissions—it could employ a considerably leaner review process than either institution, while leveraging their processes where possible (e.g., overviews of fiscal measures in IMF Article IV surveillance).

A permanent, independent secretariat could bring credibility and competence to the coalition's accountability regime and support implementation by coordinating reporting, conducting technical assessments, and facilitating peer review.[28]

Reporting

Participating jurisdictions could submit standardized self-assessments at regular intervals using common reporting templates and accounting methodologies. Reports would include information on carbon pricing legislation, policy design, effective carbon costs, industry-level emissions, and any other variables required to assess comparability under the framework.

Review frequency could be calibrated to risk, following the approach of the WTO's TPRM. Jurisdictions that account for a larger share of global industrial emissions or trade could undergo more frequent reviews. Ad hoc reviews could be initiated following significant changes to domestic carbon pricing systems, where questions arise regarding implementation, or in the case of economic crises (e.g., significant depreciation of a currency that could warrant a temporary adjustment to the expected carbon price).

Although reporting requirements may present challenges for some countries, coalition members already have strong incentives to monitor carbon pricing systems as a source of fiscal revenue and to ensure effective climate policy implementation. The secretariat could further support members through technical assistance, capacity development, and knowledge sharing while maintaining common reporting standards across jurisdictions.

Independent technical review

The coalition secretariat would conduct an independent assessment of each country's submission to verify reported information and evaluate carbon pricing effort using the agreed methodology. This assessment could include engagement with relevant national authorities—including environmental regulators and tax and customs agencies—as well as consultations with industry, labor, and civil society organizations where appropriate.[29]

Following each review, the secretariat would prepare an independent report summarizing its findings, documenting the effective carbon cost calculation, assessing carbon pricing effort relative to the agreed benchmark, and identifying any issues that require clarification or further analysis. Repeated engagement through successive review cycles also allows the secretariat to build technical expertise and strengthen confidence in the consistency of assessments across jurisdictions.

Peer review

The coalition secretariat's report would form the basis for discussion among coalition members. Peer review provides an opportunity to scrutinize methodologies, exchange implementation experience, identify emerging challenges, and build confidence that assessments are being conducted consistently across jurisdictions. It also creates opportunities for mutual learning and continuous refinement of the framework as carbon pricing systems evolve.[30] A dedicated forum for peer engagement could provide additional scrutiny and pressure on coalition members to deliver on their commitments, complementing the transparency provided through self-assessments and the independent secretariat report.[31]

Transparency

Transparency is central to the integrity of the framework. It provides a way to detect noncompliance and support reputational consequences, reduces uncertainty about the credibility of member countries' commitments, and incentivizes countries to meet their coalition obligations.[32] Self-assessments, secretariat reports, and outcomes from peer review could be made publicly available, increasing the visibility of members' carbon pricing systems and making departures from agreed methodologies easier to identify. Public reporting would also reduce uncertainty for firms by providing a consistent basis for comparing carbon pricing effort across jurisdictions. As companies increasingly incorporate expected carbon costs into investment decisions, greater transparency may lower policy uncertainty and improve the investment climate for jurisdictions that demonstrate stable and credible carbon pricing systems.[33]

Incentives and consequences

Implementation of a common framework for assessing carbon pricing effort would rely primarily on transparency, peer accountability, and access to coalition benefits rather than punitive enforcement. Continued participation could provide benefits such as technical assistance, capacity development, climate finance, technology cooperation, and recognition under coalition arrangements.

Where jurisdictions persistently fail to satisfy reporting requirements or maintain comparable carbon pricing effort, the coalition could introduce graduated responses. These could include enhanced monitoring, targeted technical assistance, temporary suspension of coalition benefits, or, in exceptional circumstances, suspension of

membership (which would entail exposure to border carbon adjustments). For lower-income countries, continued access to financial and technical support could be linked to participation in the review process and compliance with agreed reporting requirements.[34] By combining transparency with tangible incentives, the framework would encourage continued alignment while maintaining flexibility for jurisdictions to pursue carbon pricing through different domestic policy approaches.

Section 4 Endnotes

1 The WTO Trade Policy Review Mechanism (TPRM) provides a regular peer review of WTO members' trade policies and practices to improve transparency, strengthen understanding of national trade measures, and support adherence to WTO rules.

Marrakesh Agreement Establishing the World Trade Organization: Annex 3, "Trade Policy Review Mechanism," 1867 UNTS 3 (April 15, 1994), https://www.wto.org/english/tratop_e/tpr_e/annex3_e.htm.

The Enhanced Transparency Framework (ETF), established under Article 13 of the Paris Agreement, provides a common system for countries to regularly report greenhouse gas emissions, progress toward nationally determined contributions (NDCs), adaptation actions, and climate finance, with information subject to technical expert review and multilateral consideration to promote transparency, consistency, and accountability.

Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement, 18/CMA.1, Conference of the Parties Serving as the Meeting of the Parties to the Paris Agreement (19 March 2019), https://unfccc.int/documents/184700.

2 OECD, *Effective Carbon Rates 2025: Recent Trends in Taxes on Energy Use and Carbon Pricing*, OECD Series on Carbon Pricing and Energy Taxation, (OECD Publishing, 2025), https://doi.org/10.1787/a5a5d71f-en.

3 Paolo Agnolucci, Carolyn Fischer, Dirk Heine, Mariza Montes De Oca Leon, Joseph Pryor, Kathleen Patroni, Stephane Hallegatte, "Measuring Total Carbon Pricing," *Policy Research Working Papers, 10486* (World Bank, 2023), http://hdl.handle.net/10986/39976.

4 Mark Carhart, Bob Litterman, Clayton Munnings, and Olivia Vitali, "Measuring Comprehensive Carbon Prices of National Climate Policies," *Climate Policy 22, no. 2* (2022): 198–207, https://doi.org/10.1080/14693062.2021.2014298. This methodology provides the research foundation for the Kepos Carbon Barometer. *See* "Tracking Global Carbon Pricing Policies," Carbon Barometer (Kepos Capital, 2022), https://www.carbonbarometer.com/.

5 Jane Ellis, Daniel Nachtigall, and Frank Venmans, "Carbon Pricing and Competitiveness: Are They at Odds?", *OECD Environment Working Papers No. 152* (Paris: OECD Publishing, 2019), 11–12, especially Table 1, https://doi.org/10.1080/14693062.2020.1805291.

6 Meredith Fowlie, Mar Reguant, and Stephen P. Ryan, "Market-Based Emissions Regulation and Industry Dynamics," *Journal of Political Economy 124, no. 1* (2016): 249–302, especially sec. 4.1, eq. (7), and sec. 6.1, https://doi.org/10.1086/684484.

7 Ministry of Ecology and Environment of the People's Republic of China, "Notice on Carrying Out Relevant Work for the National Carbon Emissions Trading Market in 2025" (April 15, 2025), Annex 1: "Requirements for Preparing the 2024–2026 Lists of Key Emitting Entities," https://www.mee.gov.cn/xxgk2018/xxgk/xxgk06/202504/t20250415_1114934.html.

8 Coverage is computed on direct (Scope 1) emissions only: an industry's covered share is the fraction of its own direct emissions subject to the carbon price; emissions from purchased electricity are excluded from an industry's covered emissions, since these are priced at the generator level. This exclusion does not mean industries bear no carbon cost on their Scope 2 emissions. Where electricity markets allow generators to pass compliance costs through to wholesale prices, the carbon price on generation is embedded in the electricity price industrial users pay.

9 The eligibility of subnational carbon pricing systems under the EU CBAM remains unclear. The European Commission's May 2026 draft implementing regulation on carbon prices (Ares(2026)4841230) provides that a reduction in CBAM certificates only applies where a carbon pricing instrument is "binding in nature and imposes compliance obligations on all operators active in the relevant sectors covered by that mechanism without discrimination."

Commission Draft Implementing Regulation laying down rules for the application of Regulation (EU) 2023/956 as regards the conversion of the carbon price paid in a third country into a corresponding reduction in the number of CBAM certificates, European Commission (13/05/2026), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM:Ares(2026)4841230.

10 The EU uses the term 'carbon price effectively paid in a third country' to refer to the verified carbon price an operator has paid under a qualifying third-country mechanism, which determines eligibility for a reduction in CBAM certificates to be surrendered.

Commission Draft Implementing Regulation laying down rules for the application of Regulation (EU) 2023/956 as regards the conversion of the carbon price paid in a third country into a corresponding reduction in the number of CBAM certificates, European Commission, (13/05/2026), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=PI_COM:Ares(2026)4841230.

11 In an intensity-based system, cleaner facilities typically generate surplus credits that they can sell to higher-emitting facilities. As a result, these facilities effectively face a negative carbon price, since they receive revenue from credit sales rather than incurring net compliance costs. Compared to dirtier plants, cleaner facilities may have a smaller incentive to export to the European Union under an installation-level CBAM since they would receive no credit for a carbon cost they did not bear. By contrast, dirtier plants will have paid a higher carbon price.

12 International Carbon Trading Partnership, *Emissions Trading Worldwide: ICAP Status Report 2026* (2026), https://icapcarbonaction.com/en/publications/emissions-trading-worldwide-icap-status-report-2026.

13 We use ammonia production as a proxy for fertilizer production, since it accounts for the vast majority of emissions associated with nitrogenous fertilizers. Our focus on nitrogenous fertilizers follows the EU CBAM, which includes only nitrogen-based fertilizers, and reflects the higher emissions intensity of manufacturing nitrogenous fertilizers relative to potassium- or phosphorus-based fertilizers.

14 Facilities' costs depend on the corresponding provincial system.

15 The Chilean carbon tax is a flat levy.

16 These costs reflect the fact that free allocations are set 3% above or below a facility's actual emissions depending on its performance relative to a benchmark.

17 These costs reflect free allocation based on product benchmarks.

18 These costs reflect the EU ETS price along with France's low-carbon power mix and national carbon tax, which is not added on top of EU ETS costs for the same emissions.

19 These costs reflect the EU ETS price along with Germany's national ETS, which is not added on top of EU ETS costs for the same emissions.

20 State carbon taxes are not included in these costs.

21 These costs reflect Norway's participation in the EU ETS alongside a national carbon tax.

22 These costs reflect free allocation for the 2021–2025 period and a Great Britain-specific Carbon Price Support tax on fossil fuel use for power generation.

23 See, e.g., International Energy Agency, *Greenhouse Gas Emissions from Energy: Database Documentation, July 2026 Edition* (Paris: IEA, 2026), pp. 69–70, 96; *see also* International Energy Agency, "Greenhouse Gas Emissions from Energy," data product, available at https://www.iea.org/data-and-statistics/data-product/greenhouse-gas-emissions-from-energy.

24 Ian W.H. Parry, Simon Black, and James Roaf, *Proposal for an International Carbon Price Floor Among Large Emitters*, International Monetary Fund Staff Climate Notes (2021), https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468.

25 Camila Casas Cian Allen, Giovanni Ganelli, Luciana Juvenal, Daniel Leigh, Pau Rabanal, Cyril Rebillard, Jair Rodriguez, and João Tovar Jalles, "2022 Update of the External Balance Assessment Methodology," *IMF Working Papers*, 047 (2023), https://doi.org/10.5089/9798400234934.001.

26 This approach is analogous to the World Bank International Bank for Reconstruction and Development Dynamic Formula for shareholding, which places greater weight on recent International Development Association replenishments to encourage continued donor contributions to support the poorest countries. See World Bank Group, *2020 Shareholding Review: Report to Governors at the Annual Meetings*, Development Committee DC2020-0009 (October 16, 2020), https://www.devcommittee.org/content/dam/sites/devcommittee/doc/documents/mgr/Final%20DC2020-0009%20Shareholding.pdf.

27 IMF, "Selected Decisions and Selected Documents of the International Monetary Fund, 44th Issue," Attachment I of SM/12/156 Supplement (2024): 9–11, https://www.imf.org/-/media/files/selecteddecisions/current/9798229008426-web.pdf.

28 Joseph Aldy, "The Crucial Role of Policy Surveillance in International Climate Policy," *Climatic Change* 126, no. 3-4 (2014): 282, https://doi.org/10.1007/s10584-014-1238-5.

29 IMF, "Guidance Note for Surveillance Under Article IV Consultations," *IMF Policy Papers* (2022), https://doi.org/10.5089/9798400211522.007.

30 Armin Schäfer, "A New Form of Governance? Comparing the Open Method of Co-ordination to Multilateral Surveillance by the IMF and the OECD," *Journal of European Public Policy* 13, no. 1 (2006): 81, https://doi.org/10.1080/13501760500380742.

31 Joseph Aldy, "Policy Surveillance: Its Role in Monitoring, Reporting, Evaluating and Learning," *Governing Climate Change: Polycentricity in Action?*, eds. Harro van Asselt, Johanna Forster, David Huitema, and Andy Jordan (Cambridge University Press, 2018): 218.

32 Joseph Aldy, "The Crucial Role of Policy Surveillance in International Climate Policy," *Climatic Change* 126, no. 3-4 (2014): 280–81, https://doi.org/10.1007/s10584-014-1238-5.

33 Joseph Aldy, "Policy Surveillance: Its Role in Monitoring, Reporting, Evaluating and Learning," *Governing Climate Change: Polycentricity in Action?*, eds. Harro van Asselt, Johanna Forster, David Huitema, and Andy Jordan (Cambridge University Press, 2018).

34 The Montreal Protocol on Ozone Depleting Substances (ODS), for instance, linked financing for projects to reduce ODS consumption to countries submitting adequate ODS data reports. *See* Joseph Aldy, "The Crucial Role of Policy Surveillance in International Climate Policy."

5. Conclusion

The case for a multilateral climate coalition has strengthened over the past year. As Section 2 documents, the EU CBAM entered its compliance phase in January 2026, the United Kingdom and Norway will follow in 2027 (Norway adopting the EU mechanism directly), and nine other jurisdictions are exploring border carbon adjustments. At the same time, MDBs and bilateral arrangements such as the EU–India Free Trade Agreement are responding to the need for financial and technical support for industrial decarbonization in low- and middle-income countries—helping establish the foundation for more ambitious, coordinated, and durable climate action. The analysis in Section 3, which models impacts in those countries that endorsed the declaration on the Open Coalition as a demonstration case, quantifies the payoff from formalizing cooperation: coalition scenarios cut emissions from four heavy industries by an order of magnitude more than current policies, generate close to USD 150 billion per year in total revenue for member countries at every income level, and do so with only moderate effects on industrial output and commodity prices.

An important element of this momentum is the spread of carbon pricing itself, driven in part by the border measures documented in Section 2.[1] As a broader set of countries pursues carbon pricing, their emerging systems reflect a greater diversity of domestic constraints, institutional histories, and national priorities. The border measures that countries adopt in tandem with domestic carbon pricing mean that these systems now interact, shaping the flow of goods, investment decisions, and ultimately greenhouse gas emissions. The need for a common technical foundation to assess and compare carbon pricing systems has become correspondingly more pressing.

This report provides proof of concept for developing such a foundation across several countries, focusing on four heavy industries and elucidating the data needs and analytical decisions that underlie this type of work. Three lessons stand out. First, headline carbon prices can substantially overstate differences in carbon pricing effort. For example, firms in Canada face a headline price near $70/t, but output-based allocation and discounted compliance credits bring the effective carbon cost for steel down to roughly $8/t, while Chile's $5/t tax applies essentially in full. As a result, many jurisdictions are closer in pricing effort than headline prices would suggest: an apparent gap of $75/t between the European Union and China shrinks to roughly $35/t for steel and $25/t for aluminum once policy design is taken into account. Last, data are essential to building credibility. ECCs should be calculated using primary legislation and facility-level emissions and production data, so it will be important to build an infrastructure that supports consistent reporting methodologies and analytical work, together with needed institutional capacity across countries.

More fundamentally, this report provides a framework for cooperation on carbon pricing. It shows that, rather than requiring countries to harmonize policy instruments or directly link emissions trading systems, jurisdictions can assess the comparability of carbon pricing effort through three integrated elements: a common methodology for measuring ECCs, differentiated benchmarks for expected carbon pricing effort that reflect economic and structural circumstances, and a transparent review process that compares the two to determine whether carbon pricing effort across jurisdictions is sufficiently comparable. In combination, these elements offer a pragmatic pathway toward interoperability for carbon pricing systems that preserves national policy autonomy while balancing competitiveness and equity concerns. By setting forth this common framework for assessing carbon pricing effort, the report provides a practical foundation for interoperability that emerging climate coalitions can consider.

Appendix A provides a roadmap for taking this agenda forward. It identifies the technical and analytical work that can help coalitions evaluate pathways toward interoperability among carbon pricing systems, with particular attention to environmental effectiveness, equity, competitiveness, and implementation feasibility. We offer it as a resource to help inform the work programs of the Open Coalition and for the broader community of policymakers and practitioners seeking to advance carbon market cooperation.

Many of the questions ahead sit at the intersection of technical analysis and policy choice. Carbon accounting, MRV, and approaches to comparing carbon prices can provide a foundation for cooperation, but decisions about governance, market access, equity, and the distribution of benefits and obligations will ultimately shape what forms of interoperability are both feasible and durable. Progress will depend in part on sequencing these issues well—identifying where technical work can proceed now, where political agreement is needed, and where early cooperation can lay the groundwork for deeper alignment. Appendix A sets out these questions and the workstreams through which governments and coalitions can begin to address them.

The choices governments make over the next few years will determine whether these efforts converge toward an interoperable system of carbon pricing programs or fragment into a patchwork of conflicting national rules.

The choices governments make over the next few years will determine whether these efforts converge toward an interoperable system of carbon pricing programs or fragment into a patchwork of conflicting national rules. The measurement methods and criteria being developed to assess comparability of carbon pricing effort, together with the institutional arrangements that are now taking shape, will govern trade in industrial goods for decades. We encourage members of emerging coalitions and their partners to engage with this roadmap, tailoring it to improve its usefulness, and we invite the broader community of policymakers, researchers, and practitioners to join the effort.

Section 5 Endnotes

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A. Roadmap of Technical Work to Inform Options for Interoperability among Carbon Pricing Systems

As countries pursue increasingly diverse approaches to carbon pricing, industrial decarbonization, and trade-related carbon measures, the need for a common technical foundation for interoperability has become more pressing. As this report has discussed, interoperability across compliance carbon markets can reduce trade frictions, address competitiveness and leakage concerns, and provide investment certainty, supporting industrial decarbonization and helping to mobilize transition finance.

The goal of this roadmap is to identify the technical and analytical work needed to enable emerging climate coalitions to evaluate pathways for interoperability among carbon pricing systems, with particular attention to environmental effectiveness, equity, competitiveness, and implementation feasibility. It is intended as a resource that emerging coalitions may draw on in informing their work while also supporting a broader community of policymakers and practitioners working on carbon market cooperation.

Although the roadmap has been informed by consultations with the Global Climate Policy Project Working Group on Climate Coalitions, it is not intended to reflect the views or potential contributions of any single institution or initiative. Rather, it is designed as a shared resource to coordinate and catalyze analytical and policy work across governments, international organizations and forums, academia, civil society, and industry. Appendix B provides a non-exhaustive stocktake of organizations and initiatives whose ongoing work aligns with, and can help advance, the technical and analytical workstreams identified in this roadmap.

The issues identified in this roadmap span both technical and political dimensions. Some workstreams focus primarily on developing a common analytical foundation—for example, methodologies for embedded carbon accounting, MRV, and carbon price comparability. Others involve a greater degree of policy judgment and political negotiation, including decisions about equity, mutual recognition, governance, market access, and the distribution of benefits and obligations. Even ostensibly technical issues often have important policy implications and may require coordination across multiple domestic institutions, including environment, finance, trade, industry, customs, and foreign affairs ministries. Progress toward interoperability is therefore likely to depend not only on developing robust technical foundations, but also on sequencing political deliberation and building domestic institutional capacity for implementation.

Phase 1: Prework and Scoping

1. Establish a shared understanding of interoperability.

Develop a working definition of what coalition members mean by interoperability in the context of compliance carbon markets and carbon pricing. Identify members' objectives and the key principles that should guide the development of interoperability. This common foundation would help clarify which interoperability pathways merit further exploration, identify the most relevant analytical workstreams, and inform their sequencing.

2. Define priority sectors and scope of emissions coverage.

Identify sectors where interoperability is most relevant because of trade exposure, emissions intensity, and existing or emerging carbon pricing coverage. Establish which emissions should be tracked for different interoperability options.

Key questions:

- Which sectors are most exposed to carbon leakage?
- Which sectors already face carbon pricing or border measures?
- Which sectors have feasible accounting methods for embedded carbon?
- Which criteria should guide the selection for early pilots, and which sectors are best suited for these pilots?
- For each sector, what is the appropriate scope boundary for emissions, balancing emissions significance, data quality, and implementation feasibility?

3. Map existing systems.

Drawing on existing efforts (see Appendix B), create a comparative stocktake of participating jurisdictions' carbon pricing systems, including plan and timeline for implementation (where relevant).

Assess the following for each system and identify systemic trends:

- Carbon price level and border carbon adjustment (if appropriate)
- Coverage by industry and gas
- Free allocation, exemptions (e.g., baselines), or other carbon cost relief
- Abatement potential by industry and country
- Use of offsets
- MRV rules
- Product-level emissions data availability
- Enforcement and compliance strength
- Treatment of exports and imports
- Revenue recycling and support for industrial decarbonization
- Legal authority for linking or recognition

Phase 2: Analytical Foundation: Embedded Carbon Accounting and Carbon Measures

Advancing convergence in emissions accounting, reporting, and verification rules so that embedded carbon can be compared across markets can help ease frictions arising from existing carbon measures, including border carbon adjustments, and establish a necessary analytical foundation for assessing interoperability across carbon pricing systems. Common accounting methodologies for embedded carbon are a prerequisite for evaluating whether different carbon measures can operate consistently and recognize one another.

Key questions:

- Can embedded emissions be measured consistently across jurisdictions?
- What data should be required at the facility and firm levels?
- How should default values be used where firm-level data are unavailable?
- How should electricity emissions be assigned?
- How should recycled inputs and complex supply chains be treated?
- What verification standards are credible but not overly burdensome?
- Which types of carbon measures (e.g., border carbon adjustments, product carbon standards, procurement requirements) depend on common embedded-carbon accounting methodologies?
- Which elements of carbon measures require common accounting methodologies, and where can jurisdictions retain methodological flexibility?

Technical work required:

1. More coherence in and mutual understanding of accounting methodologies for embedded carbon. Develop more consistent rules for boundaries, emissions factors, product classification, facility attribution, electricity treatment, treatment of offsets, and verification.
2. MRV equivalence. Assess whether different national MRV systems produce sufficiently comparable data.
3. Product carbon data infrastructure. Explore registry architecture; third-party verification; data exchange between customs, regulators, and firms; and other innovations.
4. Sector pilots. Test methodology in selected sectors, likely steel, cement, aluminum, and fertilizers.

Deliberation questions:

- Is harmonized accounting enough to reduce trade friction?
- What is the optimal balance between rigor and inclusivity? Do the benefits of increasingly sophisticated accounting and compliance systems justify their administrative and technical costs, taking into account the potential burden on lower income countries?
- Can the accounting approach support CBAM-style systems without requiring full policy convergence?
- How much flexibility should jurisdictions retain?

Phase 3: Interoperability Options: Analytical Workstreams

Option 1: Soft Linkage—Common Framework for Assessing Carbon Pricing Effort

Jurisdictions recognize when each other's carbon pricing systems reflect a comparable effort, even if prices, coverage, exemptions, and instruments differ, as this report proposes. This could support eligibility for coalition benefits, like market access, reduced border charges or exemptions, and climate finance or technical assistance. This option could be implemented in one of two ways:

- **Membership-only recognition.** Domestic carbon prices, adjusted for equity, would determine eligibility for coalition membership. However, trade among coalition members would still be subject to border carbon adjustments, with exporters required to align with the importing country's domestic carbon price.
- **Full mutual recognition.** Domestic carbon prices, adjusted for equity, would determine both coalition membership and trade treatment within the coalition. In this case, no border carbon adjustments would apply to trade among coalition members.

Technical work required:

1. Comparable carbon pricing metric. Develop a way to compare carbon pricing effort across systems for traded goods. Possible components: headline carbon price, emissions coverage (including sectoral scope, installation thresholds, and emissions exemptions), free allocation, intensity standards, exemptions, offset limits (share and type of offset), regulatory stringency, revenue use and other carbon cost relief mechanisms, compliance and enforcement.
2. Equity-adjusted carbon price floors or equity adjustment framework. Assess what constitutes "appropriate effort" for countries that differ across income and development levels, institutional capacities, scale and emissions profile of their industrial sectors, and structural costs of decarbonization.

   Possible factors include per capita income, institutional capacity, current per capita heavy industry emissions and recent trends, global industrial importance, abatement costs, economic importance of heavy industry, and currency and purchasing-power differences.

   Key questions:

   - What is the magnitude of carbon leakage in graduated carbon pricing scenarios?
   - What price credibly signals greater coordination on carbon pricing (to deter leakage) and commitment to long-term carbon pricing (to incentivize innovation and investment in hard-to-abate sectors)?
   - How do marginal abatement cost opportunities differ by country?
   - Should recognition be based on nominal price, effective price, or effort relative to capacity?
   - How should exchange rates be handled?

3. Recognition process and tiers. Develop process and possible categories of recognition.
4. Governance. Explore institutional options such as agreement establishing framework for assessing comparability of carbon pricing, coordinating secretariat, dispute-resolution mechanism, technical standards body, and treatment of countries outside the coalition.
5. Pilot linkage design and sequencing. Identify whether soft linkage should begin with two jurisdictions, certain sectors or other formats.

Option 2: Hard Multilateral Linkage of Carbon Pricing Systems

Jurisdictions formally link carbon pricing systems so compliance units, allowances, or credits are mutually usable across systems. This is the most integrated and technically demanding option.

Technical work required:

1. Legal compatibility assessment. Assess whether jurisdictions can legally accept foreign compliance units, transfer allowances internationally, recognize external registries, harmonize enforcement, prevent double counting, and adjust caps or accounting rules.
2. Market design compatibility. Compare systems across features such as cap-setting, price floors/ceilings, free allocation, offsets use, compliance periods, registry systems, and enforcement penalties.
3. Environmental integrity safeguards. Develop rules for aggregate emissions, cap adjustment, offset quality, market stability reserves, and suspension or delinking procedures.
4. Governance. Explore institutional options such as treaty-based linkage, club agreement, coordinating secretariat, dispute-resolution mechanism, and technical standards body.
5. Pilot linkage design and sequencing. Identify whether hard linkage should begin with two jurisdictions, sectoral linkage, price corridor arrangement, or other formats.

Deliberation questions:

- How much harmonization is required before linking?
- What happens if one system weakens its cap?
- Who governs shared market rules?
- How are revenues, risks, and price impacts distributed?
- What is the extent of expected trade in emission allowances under hard linking?
- What are lessons learned from past examples (California–Quebec and EU with non-EU members like Norway, Iceland, Lichtenstein, and Switzerland)?

Phase 4: Cross-Cutting Analysis to Inform Coalition Deliberations and Infrastructure for Implementation

Undertake cross-cutting analysis to inform coalition deliberations of the various options.

1. Competitiveness and leakage. Assess how each option affects carbon leakage, export competitiveness, import competition, industrial relocation and investment flows, supply-chain costs, and developing-country market access.
2. Equity and development. Evaluate impact on developing countries, especially low-income countries; whether recognition rules allow differentiated responsibilities; whether revenues or finance can support transition; whether technical assistance is needed for MRV capacity and/or carbon pricing mechanism implementation; and whether market access commitments can provide credible incentives for participation.
3. WTO and trade-law risk. Assess non-discrimination, treatment of developing countries, use of default values, compatibility with border measures, risk of disguised protectionism.
4. Governance and institutional feasibility. As agreed, design infrastructure for implementation, including coalition benefits like support for industrial decarbonization, trade facilitation for small and medium-sized enterprises (SMEs), and other programs.

B. Stocktake of Related Efforts Supporting Carbon Pricing Cooperation

Over the past three decades, governments, international organizations, MDBs, research institutions, and civil society organizations have launched a growing number of initiatives to advance carbon pricing, industrial decarbonization, and international climate cooperation. These efforts have generated significant technical expertise, strengthened implementation capacity, and expanded opportunities for international policy dialogue. Increasingly, they address complementary aspects of carbon pricing cooperation, including emissions accounting, MRV, policy comparability, market design, implementation support, and the interaction between climate and trade policy.

The emergence of this broad ecosystem reflects the increasingly multifaceted nature of carbon pricing cooperation. Different initiatives have developed distinct mandates, memberships, and areas of comparative expertise, allowing important progress to be made across a wide range of technical and policy issues. As countries begin exploring greater interoperability among carbon pricing systems, there is increasing value in understanding how these initiatives relate to one another and how their respective strengths can contribute to a coherent pathway toward deeper cooperation.

This stocktake identifies initiatives that make particularly significant contributions to the workstreams outlined in the interoperability roadmap in Appendix A. It is not an exhaustive catalogue but aims to highlight where expertise is already well developed, where institutions offer complementary capabilities, and where additional analytical or policy work could further support international cooperation. In doing so, it illustrates how an emerging multilateral initiative, such as the Open Coalition, could build on existing efforts by helping connect technical workstreams, encouraging collaboration across institutions, and informing future priorities for carbon pricing cooperation.

We catalogue initiatives into four broad categories following the roadmap in Appendix A (Mapping Carbon Pricing Systems and Assessing Comparability; Embedded Carbon Accounting and MRV, Cooperation and Interoperability; and Political Dialogue, Implementation, and Capacity Development), recognizing that some organizations cover multiple categories.

Mapping Carbon Pricing Systems and Assessing Comparability

Significant analytical capacity already exists to document and compare carbon pricing systems. These initiatives provide an important foundation to understand existing policy landscapes and identify opportunities for cooperation.

Carbon Barometer

The Carbon Barometer™, by Kepos Capital, provides an analysis of implied carbon prices by converting seven policies into marginal incentives per metric ton of CO_2 for over 25 countries from 2008 to 2022.[1] The methodology

used to account for non-price policies such as renewable portfolio standards and fossil fuel subsidies and taxes could help inform the coalition's work on evaluating carbon price comparability.

International Carbon Action Partnership (ICAP)

ICAP is an international forum of governments operating or developing ETSs at the subnational, national, and supranational levels. Since 2007, ICAP has facilitated technical exchanges and capacity building on ETS implementation and developed an updated global inventory of ETSs worldwide with comprehensive details on key design features. ICAP's explicit goals are to "facilitate the future linking of carbon markets" and "build and strengthen partnerships between governments." Its detailed analysis comparing features such as sectoral coverage can help inform the coalition's work in developing comparable carbon pricing metrics.[2]

Joint Task Force on Climate Action, Carbon Pricing, and Policy Spillovers

Convened by the WTO and joined by the IMF, OECD, United Nations Trade and Development (UNCTAD), and the World Bank, the Joint Task Force's 2024 report developed a shared framing for carbon pricing metrics and their role in competitiveness and cross-border spillovers.[3] This work could provide high-level support for coalition efforts to develop comparable carbon pricing indicators and inform analyses of how different interoperability options impact leakage and trade.

World Bank State and Trends of Carbon Pricing

The World Bank's flagship annual analytical report analyzes key developments in global emissions trading systems, carbon taxes, and carbon crediting mechanisms, while the Carbon Pricing Dashboard is the interactive data platform that operationalizes and extends much of the report's underlying dataset. In 2026, the Dashboard provides information on implemented and emerging carbon pricing initiatives in 58 national and 42 subnational jurisdictions. In mapping existing systems, coalitions can look to the Dashboard as a credible baseline input for evaluating the implementation status and design of members' carbon pricing instruments.[4]

Embedded Carbon Accounting and MRV

Substantive work is already underway to develop common frameworks for measuring carbon intensity and embedded emissions, particularly in key industrial sectors. These initiatives offer a valuable foundation to support consistent accounting rules across jurisdictions.

Climate Club

Launched formally in December 2023 with 36 countries, the Climate Club is a high-level forum, now comprising 50 countries, that aims to accelerate industrial decarbonization, develop common approaches to measuring carbon intensity, and engage in dialogue on carbon leakage and mitigation policies, including price- and non-price instruments. The Club's published guidelines on producing internationally comparable carbon intensity metrics in the steel and cement sectors could help a coalition develop consistent guidelines for product classification.[5]

Inclusive Forum on Carbon Mitigation Approaches (IFCMA, OECD)

IFCMA is the OECD's flagship platform for assessing the impact of carbon mitigation approaches, including carbon pricing, with a focus on improving the comparability of methods and data used in trade-relevant carbon metrics. It functions as an inclusive multilateral forum rather than a standard-setting body. IFCMA's work on product-level carbon intensity metrics could inform a coalition's technical decisions on embedded-carbon methodology.[6]

Partnership for Carbon Transparency (PACT)

PACT, an initiative of the World Business Council for Sustainable Development (WBCSD), has developed a standardized methodology for calculating and exchanging product carbon footprints (PCFs) across supply chains.[7] PACT's technical work on consistent PCF calculation could inform a coalition's work on embedded-carbon accounting, while its data exchange specifications and data protection protocols could be used to support a coalition's broader work on product carbon data infrastructure.

Partnership on Transparency in the Paris Agreement (PATPA)

PATPA is a global North–South partnership that supports countries in implementing the Paris Agreement's Enhanced Transparency Framework through regional workshops and targeted technical assistance.[8] Their work helping countries prepare Biennial Transparency Reports (BTRs) and strengthen long-term reporting processes could help inform coalition work on assessing MRV capacity and practical approaches to data quality assurance and review.

Cooperation and Interoperability

Dedicated initiatives exist to advance practical cooperation on carbon pricing, including direct experience with market linkage, cross-border credit frameworks, and the development of internationally consistent market infrastructure.

Carbon Pricing of the Americas (CPA)

CPA is a regional platform created by subnational and national governments in North and South America to cooperate on carbon pricing, share technical experience, and "identify opportunities to increase the alignment and linking of carbon pricing instruments and carbon markets."[9] CPA's established convening and training track record with linked and non-linked markets could inform a coalition's considerations on hard and soft linkage.

Coalition to Grow Carbon Markets (CGCM)

CGCM is a government-led coalition (including France, Kenya, New Zealand, Peru, Singapore, and others) that aims to "mobilise high-integrity, voluntary use of carbon credits by corporates" and to align policies and incentives for a robust cross-border carbon credit market.[10] CGCM's work on developing internationally consistent guidance on supporting transparent and interoperable infrastructure can inform a climate coalition's treatment of offset eligibility and limits.

International Emissions Trading Association (IETA)

IETA is a global association of more than 300 member companies and business organizations focused on carbon and greenhouse gas markets.[11] IETA's analysis of international reactions to the EU CBAM, through its annual greenhouse gas market sentiment survey and a series of economy-specific reports, could inform a coalition's work on the interoperability of carbon pricing measures across borders, in addition to work on questions of competitiveness and leakage.[12]

Political Dialogue, Implementation, and Capacity Development

A broad range of initiatives supports the political engagement and practical implementation capacity required to advance carbon pricing cooperation, with particular relevance for developing countries and the intersection of climate and trade policy.

World Bank Partnership for Market Implementation (PMI)

PMI is a 10-year World Bank facility (successor to the Partnership for Market Readiness) that helps client countries design, pilot and implement carbon pricing instruments and the systems needed to participate in international carbon markets. In recent years, PMI has focused on addressing obstacles in scaling carbon market infrastructure through the Carbon Market Infrastructure Working Group, and its analysis could support a coalition's work determining where technical assistance is needed for MRV capacity and carbon pricing mechanism implementation.[13]

Coalition of Finance Ministers for Climate Action

The Coalition includes over 100 countries that focus on using climate tools, including carbon taxes and emissions trading systems, within macro-fiscal frameworks. It holds Ministerial Meetings alongside IMF and World Bank Spring and Annual Meetings.[14] The Coalition provides a venue to discuss strategies for building support for carbon pricing and addressing distributional concerns. Its 2026–2028 Strategic Plan explicitly prioritizes carbon pricing and BCAs as one of five thematic priority.[15]

African Development Bank Africa Carbon Support Facility (ACSF)

ACSF is a flagship initiative designed to catalyze high-integrity carbon markets across Africa by providing financial, policy, and technical support, with the aim of unlocking billions in climate finance while aligning with the African Union's Carbon Market Strategy.[16] As of 2026, ACSF is primarily focused on voluntary carbon markets as opposed to supporting the development of carbon taxes or ETSs within Africa.

Asian Development Bank's (ADB) Law and Policy Reform Program

ADB's Legal Blueprint for Developing and Regulating Carbon Markets examines key legal, regulatory, and governance features that are relevant for participating in compliance and voluntary carbon markets.[17]

Integrated Forum on Climate Change and Trade (IFCCT)

Launched at COP30 in Belém (November 2025) under Brazil's presidency, the IFCCT is an independent forum for addressing the growing intersection of climate policy and international trade outside the UNFCCC negotiation process. IFCCT's Solutions Focused Dialogue at COP31 and three-year workplan could provide a complementary platform for discussing how principles of interoperability interact with broader global trade policy.[18]

Initiative for Climate Action Transparency (ICAT)

ICAT is a multi-stakeholder partnership that has worked with over 80 developing countries to build climate transparency infrastructure through regional hubs and direct country engagement, with a focus on supporting countries' transparency and reporting obligations under the Paris Agreement.[19] ICAT's work strengthening emissions data and institutional capacity could support coalition efforts to identify where technical assistance is most needed for MRV readiness in LMICs and LICs.

Energy Policy Institute at the University of Chicago (EPIC) and J-PAL Emissions Market Accelerator (EMA)
EMA is a partnership initiative to help regulators and industries in developing countries design, build, and implement pollution markets.[20] EMA's approach to setting monitoring standards and supporting compliance through continuous emissions monitoring could support coalition work on capacity development.

Appendix B Endnotes

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C. EU Carbon Border Adjustment Mechanism: Early Implementation and Emerging Lessons

Implementation of the EU Carbon Border Adjustment Mechanism (CBAM) provides the first practical experience with many of the technical and institutional issues that arise when carbon pricing systems interact through international trade. As governments look to design their own approaches to carbon leakage and competitiveness, the EU experience with CBAM implementation is beginning to set important precedents for emissions accounting, recognition of foreign carbon prices, verification, and compliance. This appendix summarizes important developments (up to early August 2026) that are relevant to the common framework for assessing carbon pricing effort proposed in this report.

Compliance Phase Begins

The compliance phase of the EU CBAM commenced on January 1, 2026, following a two-year transitional period that began in October 2023. In this phase, firms that import 50 metric tons or more of covered goods into the European Union per year are required to report the embedded emissions of these goods and surrender CBAM certificates equivalent to their associated carbon liability. Certificate prices are linked to the weighted average auction price of allowances in the EU Emissions Trading System (ETS). Weighted average allowance prices are being calculated quarterly in 2026 and will be calculated weekly from 2027 onward, with the official price published on the CBAM Registry as pricing information becomes available.

The current CBAM compliance phase introduces a gradual phase-in of carbon cost exposure for importers that runs in parallel with the phaseout of free ETS allowances for covered sectors. The total allocation of free allowances is scheduled to fall by 2.5% annually in 2026 and 2027 and decline sharply thereafter. The free allocation adjustment, which allows importers to discount their CBAM certificate obligation to reflect free allowances received by comparable EU producers, likewise declines with this schedule. In July 2026, however, the European Commission proposed slowing the phaseout of free allocation from 2028 onward and extending it through 2037, with full phaseout beginning in 2038 (see below).

Sectoral Coverage and Indirect Emissions

As of July 2026, the CBAM applies to direct and indirect emissions from imported cement, fertilizers, and iron ore, while coverage for imported aluminum, hydrogen, steel, and iron is limited to direct emissions only. This reflects the EU's intent to avoid duplicating carbon leakage protection for industries already eligible for state compensation of ETS-related electricity costs.[1] Including indirect emissions for certain industries would otherwise create an asymmetric competitive advantage in favor of EU producers who receive subsidized electricity, since an overseas

producer would bear the carbon costs of electricity inputs through the CBAM while a comparable EU producer is compensated for those same costs. Senior European Commission officials have indicated they will consider a proposal to extend indirect emissions coverage to the remaining CBAM-covered sectors in 2027.[2]

Adopted Implementing Regulations

The core legal framework for CBAM implementation was established through eight implementing and delegated acts published on December 17, 2025. Three additional acts are expected before the end of 2026.

The act on emissions reporting requires third-country operators to monitor and calculate onsite and upstream emissions at the facility level using system boundaries and monitoring rules consistent with the EU ETS. For complex goods, operators may combine actual emissions data with default values for one or more inputs.[3] Verification rules require independent verifiers to hold accreditation from an EU Member State national accreditation body, conduct a physical site visit in the first verification year, and repeat site visits at least once every two years thereafter.[4]

Default emission values are set at the product and country level and are scheduled to increase over time. Specifically, default values will increase from 10% in 2026 to 30% from 2028 onward for most sectors, with a flat 1% default value for fertilizers. The European Commission is required to review both values and mark-ups by 2027.[5] The free allocation adjustment reduces the CBAM certificate obligation to reflect the free allocation that an equivalent EU producer would receive.[6] Additional acts cover the CBAM Registry, customs communication, and authorized declarant procedures.

The European Commission has launched public consultations on draft implementing regulations covering the carbon price paid in third countries, the sale and repurchase of certificates, and CBAM declarations, with final regulations expected later in 2026. Of particular relevance for this report is the May 2026 draft regulation on carbon prices, which specifies what counts as a "carbon price" (amount paid under a third country's carbon pricing system, whether through a carbon tax, levy, fee, or ETS) and how the effective carbon price must be calculated net of rebates and compensation. In terms of international credits, the draft implementing regulation would allow only Paris Agreement Article 6.2 and 6.4 units to count toward recognized carbon prices, subject to a limit of 10% of covered emissions. By contrast, the act does not impose additional limits on domestic offsets and recognizes countries' own standards for credits used to meet obligations under their carbon pricing systems.

Proposed Legislative Amendments

The European Commission proposed two legislative measures in December 2025 under the Steel and Metals Action Plan, all of which are designed to strengthen the competitiveness of EU producers as free ETS allocation is formally phased out.

The first measure would extend the CBAM to 180 additional aluminum- and steel-intensive downstream products beginning January 1, 2028. The goal is to close the gap whereby EU manufacturers face higher input costs while finished-goods imports remain outside the CBAM. The second measure introduces anti-circumvention measures that target the misclassification of product characteristics, the routing of carbon leakage through uncovered

downstream goods, and gaps in accounting for pre-consumer scrap, while also tightening traceability and proof-of-origin requirements. The third measure establishes a Temporary Decarbonization Fund, financed by 25% of CBAM revenues in 2028 and 2029, to address export-related carbon leakage.

EU ETS Review and Implications for CBAM

In July 2026, the European Commission published a review of the EU ETS that establishes the legal framework for 2031–2040 ETS implementation and ensures its alignment with the EU's 2040 emission reduction targets. The assessment addresses the integration of carbon dioxide removal technologies, expansion of the trading system's current scope, carbon leakage risk in sectors not covered by the CBAM, reform of the market stability reserve, use of EU ETS revenues, and use of international carbon credits.[7] On CBAM implementation specifically, the proposal would reintroduce 15% of phased-out free allocation for CBAM-covered sectors from 2028, which slows the CBAM phase-in and extends the free allocation phaseout from 2034 to 2038. Continued free allocation after 2031 will become conditional on operators submitting verified decarbonization plans. The proposal also introduces an "ETS as a service" mechanism to help non-EU countries price emissions not covered by the EU ETS.[8]

Appendix C Endnotes

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D. Coalition Outcomes Under Lower Carbon Price Floors

The main analysis finds that a coordinated climate coalition can achieve substantial emissions reductions while generating significant fiscal revenues and limiting impacts on industrial competitiveness. We also model lower carbon price floors of $10/$20/$30 per ton, calibrated around the effective carbon price faced by EU producers, as an indication of the price levels that could help facilitate near-term coordination. The carbon price applied under the *Current Policy Baseline* is also reduced from $75/t to $30/t, roughly aligned with the effective carbon costs in Table 3.

A coordinated climate coalition continues to deliver emissions reductions well beyond those achieved under the *Current Policy Baseline* while generating substantial revenues for participating countries and producing only moderate changes in domestic commodity prices and industrial output. Although the magnitude of the estimated impacts is smaller than under the $25/$50/$75 levels modeled in the main analysis, with emissions reductions and carbon pricing revenues approximately 55%–60% lower, our central findings remain unchanged. The smaller effects largely reflect the lower price floors, which provide weaker incentives for emissions abatement and generate less carbon pricing revenue. However, reaching agreement in the near-term could set the foundation for raising ambition over time, with more significant climate and economic impacts.

Key finding #1: A climate coalition leads to significantly greater emission reductions than the Current Policy Baseline

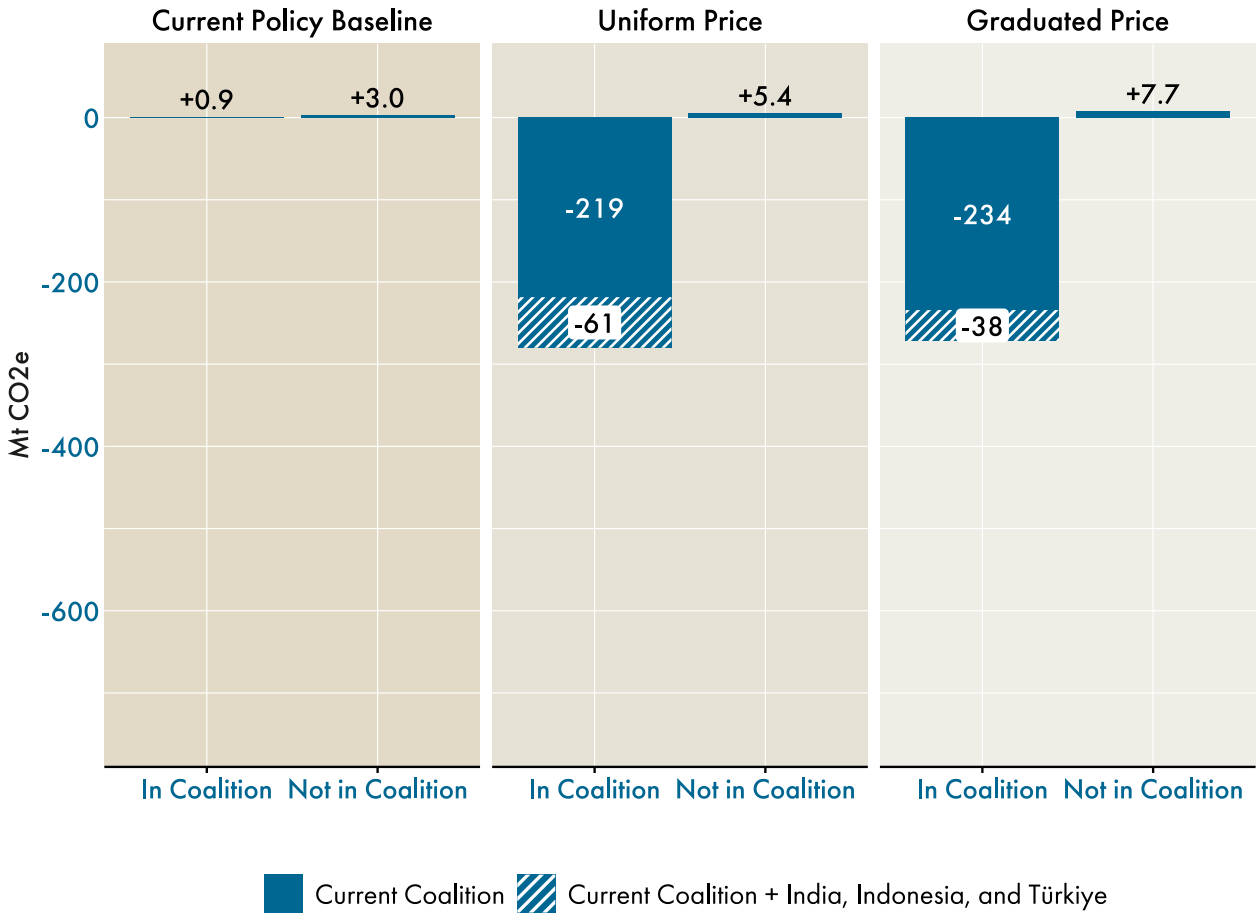
Modeling at lower carbon price floors continues to show that a coordinated climate coalition substantially outperforms the *Current Policy Baseline* in reducing emissions from target industries. As under the $25/$50/$75 price levels modeled in the main analysis, both the *Uniform Price* and *Graduated Price* scenarios produce meaningful emissions reductions, although the magnitude of these reductions is smaller at the lower $10/$20/$30 price floors.

Annual emission reductions under the *Uniform Price* and *Graduated Price* scenarios reach approximately 217–230 million metric tons of CO_2 equivalent (Mt CO_2e) (Figure D1). These reductions correspond to approximately 0.4% of global annual greenhouse gas emissions (0.6% of global carbon dioxide emissions). The small increase within the coalition under the *Current Policy Baseline,* where the main analysis showed a reduction, reflects the lower carbon price applied to some EU, UK, and EFTA producers relative to the effective carbon costs they face.

As in the main analysis, the steel sector accounts for the largest share of emission reductions, contributing 56% of the total across both coalition scenarios. Cement and aluminum account for a further 21% and 19%, respectively, while fertilizer production accounts for the remaining 4% (Figure D2).

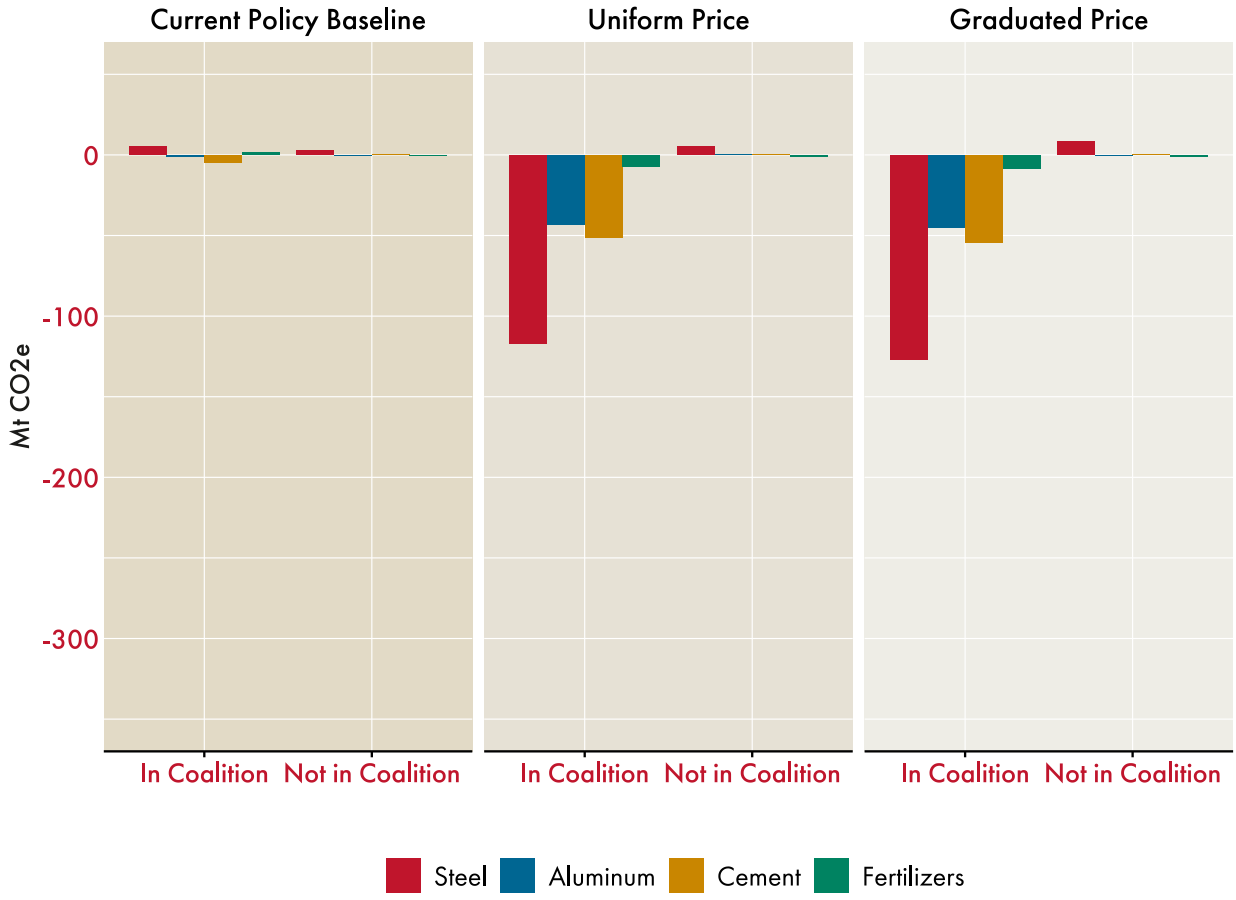
The results also continue to highlight the potential gains from expanding coalition membership. Including India, Indonesia, and Türkiye increases annual emissions reductions by 61.5 Mt CO_2e under the *Uniform Price* scenario and 37.6 Mt CO_2e under the *Graduated Price* scenario, equivalent to approximately 0.2% and 0.1% of global greenhouse gas emissions, respectively.

Figure D1: A climate coalition leads to significantly greater emissions reductions than the *Current Policy Baseline*



Notes: Bars show simulated annual changes in greenhouse gas emissions (CO_2e) from steel, aluminum, cement, and fertilizer production, using 2025 as the reference year. Negative values indicate emissions reductions and positive values indicate emissions increases. Positive values among non-coalition countries reflect emissions leakage as production shifts outside the coalition. Solid bars show results for the current coalition; striped portions show the additional effect of adding India, Indonesia, and Türkiye. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Figure D2: Steel accounts for more than half of the emissions reductions generated by a climate coalition



Notes: Bars show simulated annual changes in greenhouse gas emissions (CO_2e) by industry, using 2025 as the reference year. Negative values indicate emissions reductions, and positive values indicate emissions increases. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

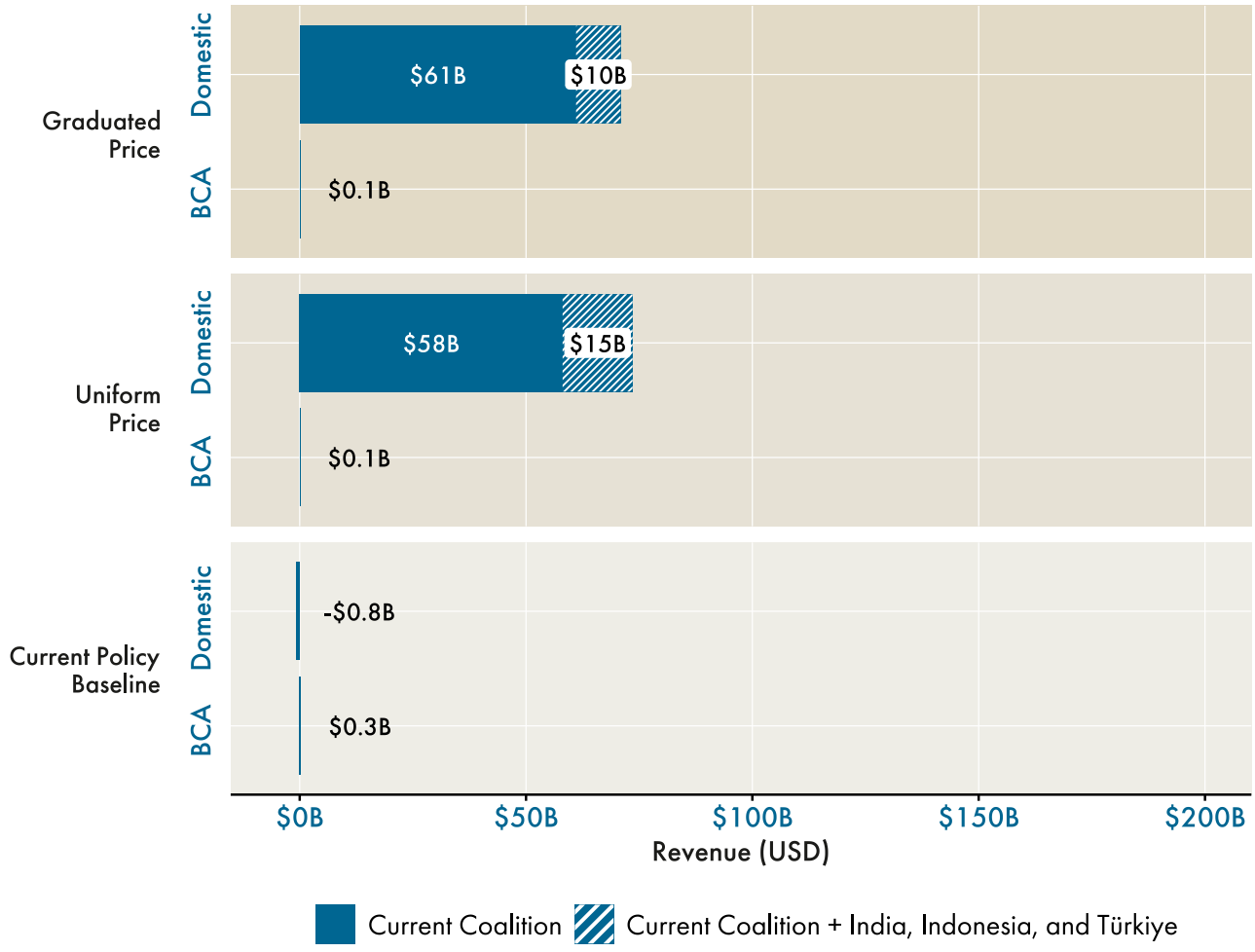
Key finding #2: A climate coalition generates substantial revenues for a broad set of countries

At the lower carbon price floors, the *Uniform Price* and *Graduated Price* scenarios continue to generate substantial revenues for participating countries. The coalition scenarios generate approximately USD 60 billion annually in carbon pricing revenues (Figure D3). As in the main analysis, the overwhelming majority of these revenues are generated domestically rather than through BCAs.

These revenues are broadly distributed across coalition members and can represent a meaningful share of general government revenue in some countries (Figure D4). Although revenues are lower in absolute terms than under the price levels modeled in the main analysis, the broader distributional pattern remains similar. Under a uniform carbon price, low-income countries such as Zambia could generate annual revenue equivalent to 0.6% of total government revenue—approximately USD 46 million. Larger upper-middle-income economies such as Brazil could generate approximately USD 2.0 billion in annual revenue—around 0.2% of total government revenue—under either pricing approach.

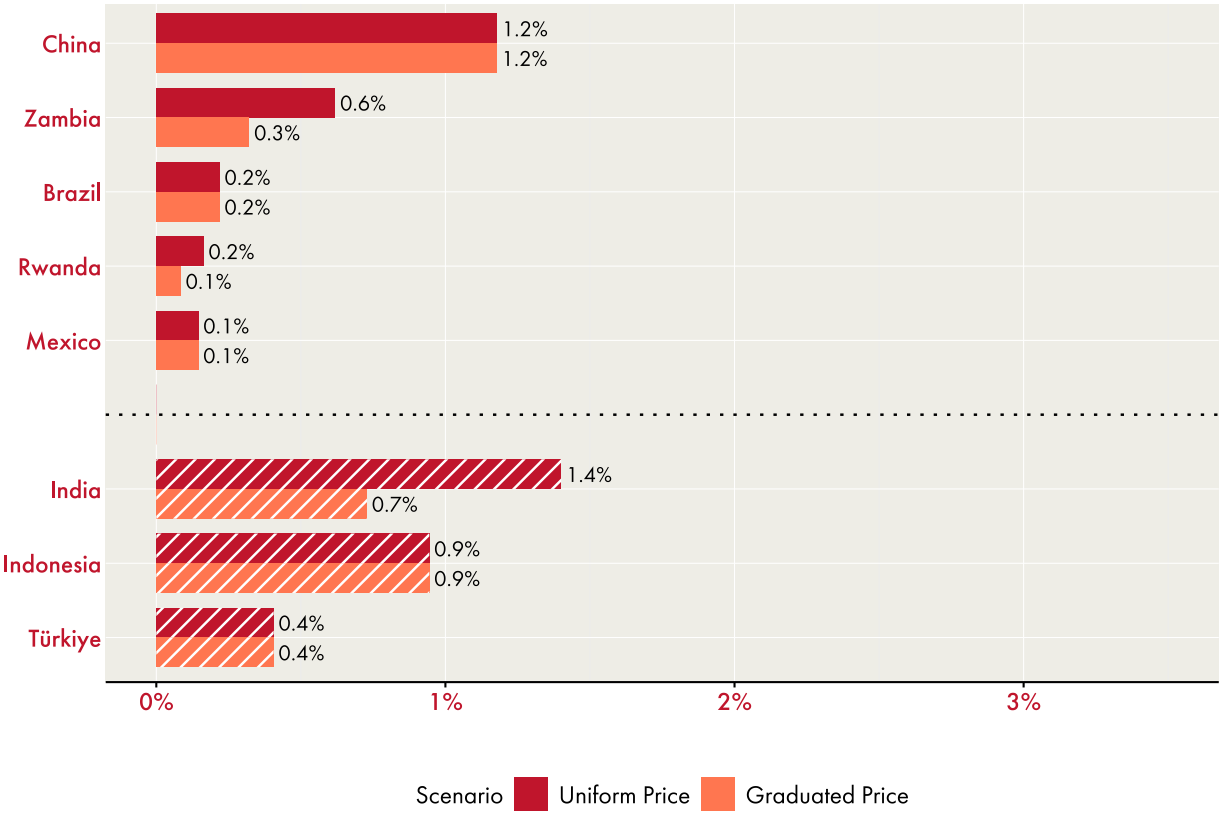
The results also continue to highlight the fiscal gains from expanding coalition membership. Including India, Indonesia, and Türkiye generates an additional USD 15.5 billion in annual government revenue under the *Uniform Price* scenario and USD 9.8 billion under the *Graduated Price* scenario.

Figure D3: A climate coalition generates substantial revenue primarily through domestic carbon pricing



Notes: The figure shows simulated annual effects with 2025 as the reference year. Domestic revenue reflects the revenue generated by domestic carbon price floors, measured net of the carbon pricing revenue coalition members already collect under existing policies. BCA revenue refers to fees paid by importers to coalition countries under the border carbon adjustment. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Figure D4: Both coalition scenarios generate meaningful revenue as a share of general government revenue



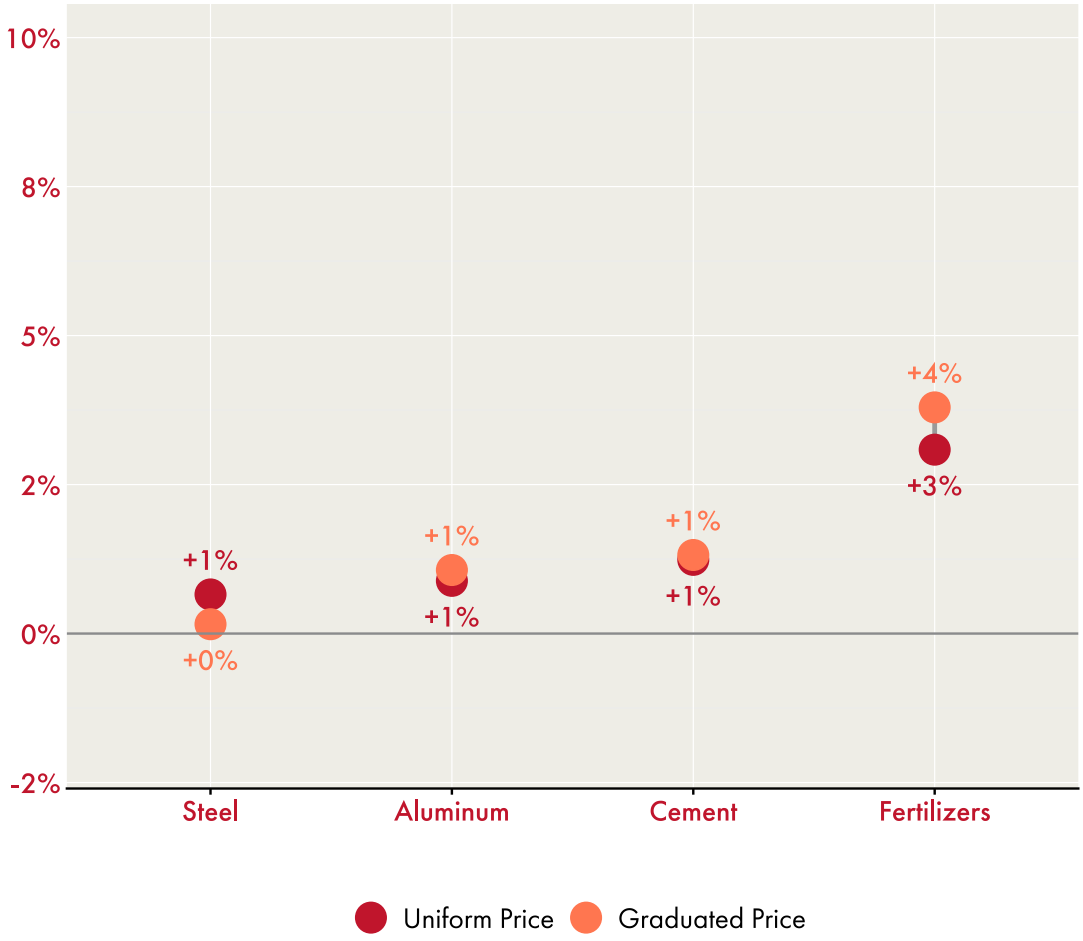
Notes: Bars show simulated annual domestic carbon pricing revenue as a share of 2025 general government revenue for selected coalition members. General government revenue is drawn from the IMF *World Economic Outlook* database, with exchange rates from the World Bank *World Development Indicators*. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

Key finding #3: Coalition members experience a moderate increase in prices

At the lower carbon price floors, coordinated carbon pricing continues to produce only moderate increases in commodity prices relative to the *Current Policy Baseline*.

In coalition member countries, steel prices increase 0.2%–0.7%, aluminum prices increase 0.9%–1.1%, cement prices increase 1.2%–1.3%, and fertilizer prices increase 3.1%–3.8%, all relative to the *Current Policy Baseline* (Figure D5).

Figure D5: Coalition members experience moderate changes in prices relative to the *Current Policy Baseline*



Notes: Points show simulated percentage changes in average commodity prices in coalition countries relative to the *Current Policy Baseline*, using 2025 as the reference year. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

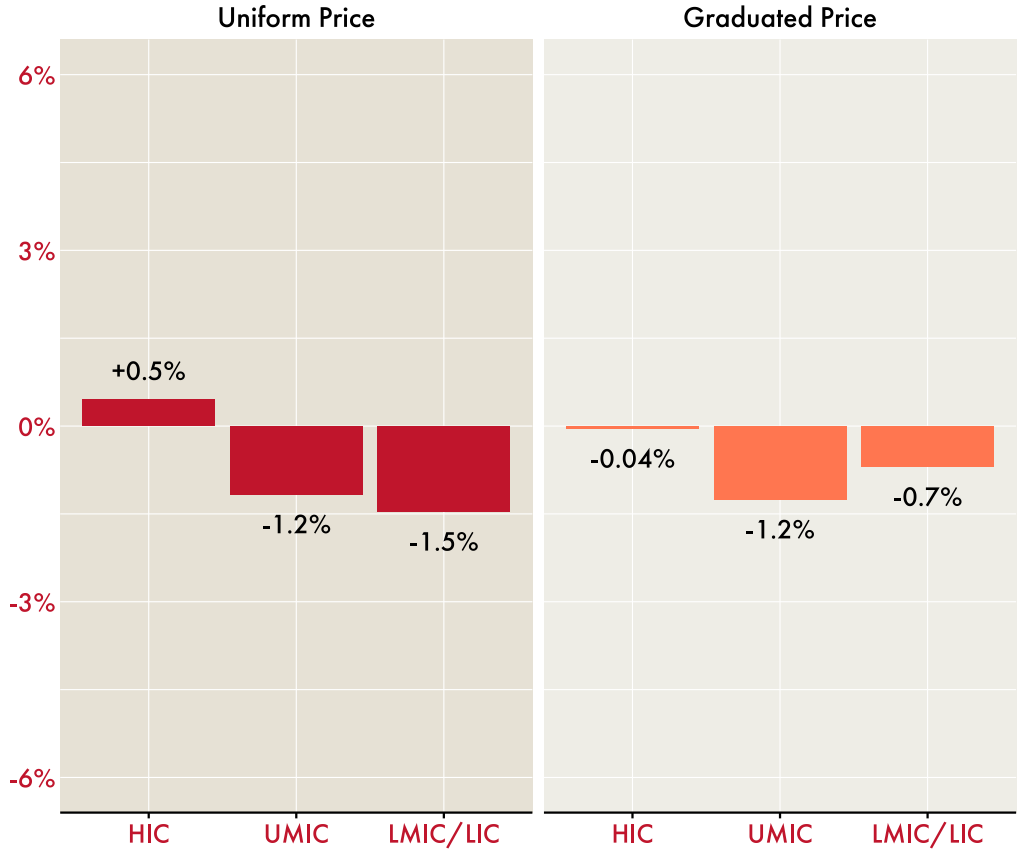
Key finding #4: Industrial producers in coalition countries do not substantially reduce output, suggesting emissions leakage will be minimal

The analysis at lower carbon price floors also reinforces the conclusion that coordinated carbon pricing can achieve substantial emissions reductions without materially reducing industrial production.

Across the four target industries, output in coalition member countries declines by approximately 0.9%–1.1% relative to the *Current Policy Baseline*, with the smaller decline under the *Uniform Price* scenario and the larger decline under the *Graduated Price* scenario for every industry. By industry, output falls 0.9%–1.1% for steel, 0.7%–0.8% for aluminum, 1.0%–1.1% for cement, and 0.4%–0.7% for fertilizer, depending on the policy scenario.

Under the *Graduated Price* scenario, lower-income countries experience smaller output reductions than under the *Uniform Price* scenario (Figure D6), consistent with the pattern in the main analysis. This continues to suggest that differentiated carbon price floors can better balance climate ambition with economic development objectives while preserving most of the coalition's climate benefits.

Figure D6: Differentiated carbon price floors mitigate output losses for lower-income countries, better supporting their economic growth



Notes: Bars show simulated percentage changes in coalition output by World Bank income group relative to the *Current Policy Baseline*, using 2025 as the reference year. Production and emissions data for the analysis are from Climate TRACE and CRU Group.

E. Carbon Pricing Country Profiles: Implications for Effective Carbon Costs in Heavy Industry

CARBON PRICING PROFILE: CANADA
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Canada's hybrid "pan-Canadian approach" is governed by the Greenhouse Gas Pollution Pricing Act (GGPPA).[1] Provinces may run their own systems if they meet a federal minimum-stringency benchmark; the federal Output-Based Pricing System (OBPS) applies as a backstop in Manitoba, Prince Edward Island, Yukon, and Nunavut. Equivalent provincial systems include British Columbia's OBPS (B.C. OBPS); Alberta's Technology Innovation and Emissions Reduction Regulation (TIER) OBPS; Ontario's Emissions Performance Standards (EPS); Québec's Système de plafonnement et d'échange de droits d'émission (SPEDE), which has been described as Canada's only ETS with an absolute cap and which has been linked to California since 2014; New Brunswick's OBPS; Nova Scotia's OBPS; Newfoundland and Labrador's Performance Standard System plus compliance fund; and the Northwest Territories' carbon tax, which was removed for all consumers except large emitters on April 1, 2025. Saskatchewan's OBPS was paused in April 2025 but facilities in Saskatchewan have continued reporting despite the pause.[2] *Coverage* Canada's federal OBPS covers 3% of the country's total emissions (2026).[3] It applies to 41 facilities that emit 50,000 metric tons of CO_2e or more per year in the electricity and heat, industry, and mining and extractives sectors.[4] Alberta's TIER has the highest covered emissions of any provincial system: 164.7 Mt CO_2e in 2023 or 63% of Alberta's emissions, with Alberta accounting for roughly 60% of total national industrial emissions.[5] The different provincial systems cover broadly similar activities; TIER additionally reaches mining and extractives and fuel use in agriculture and forestry.[6]

Field	Current Treatment
Price formation	The headline price is set to rise from CAD 95 (USD 68) in 2026 to CAD 140 (USD 102) by 2040.[7] Traded compliance instruments sit well below the headline level: In 2025 TIER Emission Performance Credits and offsets traded between CAD 18 (USD 13) and 30 (USD 22) per ton; federal surplus credits at USD 27; and Québec allowances at CAD 36–42 (USD 26–30), with an auction floor for 2025 effectively set by California's USD 26 reserve price.[8] The effective carbon cost falls by around half if credits are valued at traded prices. Alberta is working to implement a minimum compliance-price trajectory of CAD 110 (USD 79) by 2040, with a targeted effective TIER credit price of CAD 140 (USD 93) by 2040.[9] *Free allocation* Free allocation under the federal OBPS is provided through output-based standards set by a facility-specific allocation. Most benchmarks are set at approximately 80% of the national production-weighted average emissions intensity for each activity, while free allocation for more trade-exposed sectors is based on less stringent benchmarks: 90% for metal tubes, copper smelting, and ammonium phosphate and 95% for white cement, dolomitic and specialty lime, and electric arc furnace steel. Beginning in 2023, the stringency of most benchmarks increases by 2% annually.[10]
Compliance and administration	Covered facilities submit annual emissions and production reports under the federal Greenhouse Gas Reporting Program (GHGRP) and equivalent provincial systems, with third-party verification. Environment and Climate Change Canada (ECCC) may set a facility's emissions limit or estimate facility emissions where a report is missing, unverifiable, or contains a calculation error of 2% or more.[11] *Offsets* The federal Greenhouse Gas Offset Credit System operates alongside provincial offset programs. Under the federal OBPS, covered facilities may use eligible federal offset credits for up to 75% of their annual compensation obligation.[12] TIER allows the use of Alberta-based offset credits and Emission Performance Credits, which are granted to entities that emit less than the emissions intensity benchmark, to satisfy up to 90% of their compliance obligation from 2026 onward.[13] Quebec's SPEDE accepts eligible Western Climate Initiative offset credits and British Columbia's OBPS allows offsets generated within three years of the compliance year (its Emissions Performance Standard, however, does not allow offsets). Saskatchewan's OBPS has no offset credit program.[14]

Industry-Specific Treatment

Industry	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	1.4%	Emissions from integrated basic oxygen furnace and electric arc furnace (EAF) production methods are covered. Distinct federal benchmarks apply to emissions from coke, iron from smelted ore, cast steel, and rolled steel.	Output-based standards include a higher 95% benchmark to protect against competitiveness risks to EAF steel.
Aluminum	0.8%	Coverage includes direct CO_2 and perfluorocarbon emissions from aluminum production. Separate benchmarks apply to alumina production, baked anodes, and calcined coke.	The sector is protected from approximately 90% of carbon costs through an output-based allocation. Québec's cap-and-trade system and British Columbia's Industrial Emissions Reduction Program provide substantial free allocation based on performance benchmarks.
Ammonia	1.0%	Coverage focuses on emissions from production via steam methane reforming. Separate benchmarks apply to the production of ammonia, nitric acid, and granular urea.	The sector is classified as emissions-intensive and trade-exposed and therefore benefits from benchmark stringency set at 90% of the sectoral average.
Cement	1.0%	Coverage includes both fuel-combustion emissions and process emissions from clinker production and calcination. Separate benchmarks apply to clinker and grey cement, while white cement is generally assessed using facility-specific benchmarks.	As an emissions-intensive and trade-exposed sector, cement production is protected through output-based allocation.
Power	6.8%	Fossil-fuel generation is included under all major Canadian regulatory systems that cover large emitters. Electricity is regulated through dedicated output-based standards; under the federal OBPS, generation technologies are assigned fuel-specific emissions-intensity standards.	Around 84% of Canada's electricity production is already provided by non-emitting sources. Electricity-sector benchmarks are designed to limit the pass-through of carbon costs to industrial and household electricity prices, and the sector's Scope 2 emissions are excluded from direct carbon costs. Canada's Clean Electricity Regulations require covered generating units to meet an emissions-intensity limit of 0.065 metric tons of CO_2 per megawatt-hour from 2035 onward.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Canada has revenue recycling programs that return proceeds from the emissions pricing the jurisdiction of origin. The majority of provincial systems also dedicate a portion of their revenue to funding industrial abatement projects, including R&D and deployment of innovative solutions. The federal OBPS Proceeds Fund has operated through two streams: the Decarbonization Incentive Program, which provided merit-based project grants but closed to new applications in October 2023, and the Future Electricity Fund, which provides contribution agreements with provincial governments.[15] These initiatives do not impact the per-ton ECC as they are project specific and discretionary.

The Investment Tax Credit covers enhanced oil recovery at half the standard rate in three provinces, which reduces abatement costs but also does not impact the ECC.[16]

Endnotes

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CARBON PRICING PROFILE: CHILE
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Chile operates a national carbon tax under Article 8 of Law No 20.780. It is also developing plans for a pilot ETS in the energy sector, as authorized under the 2022 Framework Law on Climate Change.[1] *Coverage* The tax covers 22% of total national emissions (2026).[2] It applies to 105 stationary combustion installations, emitting 100 or more tons of particulate matter or 25,000 metric tons of CO_2, from the electricity and heat, industry, mining and extractives, agriculture, forestry and fishing, and fuel use sectors.[3] Emissions from biomass combustion are exempt. Separately, the tax regime also includes a one-time tax on new light- and medium-duty motor vehicles.[4]
Price formation	Chile's tax code sets a fixed rate of USD 5 per metric ton of CO_2. The price for local air pollutants is calculated by a formula and varies by region.[5] *Free allocation* There is no free allocation, benchmarking, or allowance-based relief.
Compliance and administration	Chile's Ministry of Finance administers the carbon tax while the Superintendency of the Environment (SMA) monitors emissions and identifies which facilities are covered by the tax.[6] These facilities are required to report verified annual emissions for tax assessment purposes.[7] Chile's 2026–2030 Energy Roadmap develops a 2030 target for the ETS.[8] Chile's 2035 Decarbonization Plan calls for an increase in the tax rate beginning in 2027, however this target has not yet been enacted into law.[9] *Offsets* Covered entities may reduce their carbon-tax liability through certified emission-reduction projects approved under the Emission Compensation System (SCE) established by Decree No. 4/2023.[10] Emission Reduction Certificates generated by eligible projects may be purchased or transferred and used to offset taxable emissions.

Industry-Specific Treatment

Industry	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	0.1%	Scrap-based electric arc furnace producers.	The ECC equals the statutory rate on whatever CO_2 crosses the threshold. It is reducible only through certificates from the emission compensation system (SCE).
Aluminum	0.0%	No primary production.	Not applicable.
Ammonia	0.0%	No primary production.	Not applicable.
Cement	0.7%	Fuel-combustion emissions only.	Process CO_2 is not covered by the carbon tax.
Power	16.3%	Fossil electricity generation. For combined heat and power plants, electricity is treated separately from eligible heat.	Emissions from marginal-cost dispatch are uniquely excluded from the tax. Instead, these plants are dispatched as if untaxed and a government compensation mechanism redistributes the burden among generators. As a result, the tax changes neither dispatch nor the spot price: it is recovered from load through a charge on withdrawals and affects contract prices rather than the marginal price signal.[11]

Complementary Fiscal Measures Affecting Carbon Compliance Costs

The Chilean government has advanced a National Reconstruction and Economic and Social Development bill with incentives such as accelerated depreciation, corporate rate cuts, and integration and investment incentives to reduce the net after-tax cost of capital expenditures to reduce carbon emissions—effectively making abatement cheaper.[12]

The Ministry of Finance also uses Chile's Fuel Prices Stabilization Mechanism (MEPCO) to adjust the specific fuel tax (IEC) downward when international prices rise and upward when they fall.[13] The practical effect is to create an inverse relationship between the implicit carbon price embedded in gasoline and diesel prices and international oil prices.

Endnotes

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CARBON PRICING PROFILE: CHINA
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	China's National Carbon Market is governed by its Interim Regulations on the Administration of Carbon Emission Trading. In addition, several regional pilot systems cover sectors not included in the national program.[1] *Coverage* The ETS covers 52% of national carbon dioxide emissions (2026).[2] It applies to approximately 3,378 facilities with annual emissions above 26,000 metric tons of CO_2e in the electricity and heat and industry sectors.[3]
Price formation	In 2025, the China Emissions Allowance (CEA) price averaged approximately CNY 62.36 (USD 8.67). For steel, cement, and aluminum plants, surplus or deficit allowances are currently capped at 3% of verified emissions.[4] *Free allocation* Allowances are freely allocated using output-based benchmarking in the power sector and intensity-based benchmarks in the steel, cement, and aluminum industries.[5]
Compliance and administration	China's Ministry of Ecology and Environment (MEE) is the lead authority responsible for setting rules and administering the ETS; provincial subsidiaries oversee implementation. The MEE roadmap targets coverage of all major industrial sectors by 2027 and a transition to a cap-based market with a combination of free and paid allowances and market-adjustment mechanisms by 2030.[6] *Offsets* China Certified Emission Reduction (CCER) credits are issued under a separate national voluntary market.[7] Eligible CCERs can cover up to 5% of verified emissions.

ndustry-Specific Treatment

Industry	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	11.2%	Full production boundary for both the basic oxygen furnace production route, including coke, sinter, iron, furnace, and the electric arc furnace route.	The ECC is low, as allowances are within 3% of verified emissions.
Aluminum	2.5%	Scope 1 emissions from smelting process; Scope 2 emissions from purchased power are not covered.	The ECC is low, as allowances are within 3% of verified emissions. Emissions from captive power may be separately covered as power.
Ammonia	0.7%	Not covered.	Not applicable.
Cement	3.8%	Fuel and clinker-process emissions.	The ECC is low as the allowances are within 3 % of the verified emissions and vary primarily with fuel efficiency and the clinker-to-cement ratio.
Power	42.4%	Coal- and gas-fired power generation, including combined heat and power and qualifying captive power plants, with output-based benchmarks.	The ECC for coal generation ranges from near zero to approximately 20% of the CEA for the least efficient plants at the maximum allowable deficit. For gas generation, the ECC has a maximum of zero, as the surrender obligation is capped at the allocation received.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Domestically extracted coal is subject to a province-specific ad valorem resource tax within a statutory 2%–10% range.[8] Certain mining-related reductions may apply, including for depleted mines. China does not operate a general national coal tax or CO_2-based tax on coal combustion. Resource-tax charges or relief accrue primarily to coal producers and are reflected, if at all, in market coal prices.

China provides low-carbon transition support through central-budget investment grants, government-backed funds, and concessional green finance. The Central Budget Investment Special for Energy Conservation and Carbon Reduction may fund up to 20% of eligible industrial decarbonization projects, or up to 30% for listed advanced-technology demonstrations, generally subject to an RMB 100 million project cap.[9] China's 2026 Carbon-Peaking Action Plan also calls for establishing a National Low-Carbon Transition Fund, although

detailed operating rules have not yet been published.[10] These measures reduce investment and financing costs but are excluded from the direct ECC unless a plant-specific, quantifiable benefit directly offsets the carbon-compliance expenditure.

Endnotes

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CARBON PRICING PROFILE: EUROPEAN UNION
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	The European Union Emissions Trading System (EU ETS) is a cap-and-trade system established under EU Directive 2003/87/EC.[1] The EU Carbon Border Adjustment Mechanism (EU CBAM) entered its compliance regime in 2026 and is coordinated with the phase-out of free allowance allocation to industrial sources.[2] *Coverage* The EU ETS covers 36% of EU emissions (2026).[3] It applies to approximately 10,000 installations across the electricity and heat, industry, mining and extractives, maritime transport, and aviation sectors.[4] Stationary combustion units above 20 megawatts of total rated thermal output are included; other sectors have production- or activity-specific thresholds.[5] A second, separate EU emissions trading system, EU ETS 2, will price emissions from fuel use upstream of covered EU ETS installations and expand to cover other sectors, including road transport, in 2028.[6]
Price formation	In 2025, the average secondary European Union Allowance (EUA) price was approximately EUR 74 (USD 82.97) per metric ton of CO_2e. There is no EU-wide price floor, however, the EU's Market Stability Reserve (MSR) adjusts future auction volumes according to the surplus of allowances in circulation, withdrawing allowances when the surplus is high and releasing allowances when market supply is low.[7] *Free allocation* Eligible installations receive benchmark-based free allowances adjusted for production, carbon leakage status, and the phased reduction of free allocation for CBAM-covered products from 2028.[8]
Compliance and administration	The EU ETS is overseen by the European Commission, primarily through the Directorate-General for Climate Action (DG CLIMA); EU Member States are responsible for implementing the system through their designated competent authorities.[9] Operators use approved monitoring plans and obtain accredited verification from the applicable national authority.[10] Allowances sufficient to cover each installation's compliance obligation must be surrendered annually.[11] The Market Stability Reserve (MSR) manages allowance supply.[12] The EU emissions cap will decline by 4.3% per year over the period 2024–2027 and by 4.4% per year from 2028 on.[13] *Offsets* Currently, no international or voluntary credits may be used in lieu of EUAs.[14]

Industry-Specific Treatment

Industry	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	4.3%	Integrated basic oxygen furnace and electric arc furnace (EAF) production; coke, sinter, agglomerated iron ore, EAF carbon, high alloy steel, iron casting, and hot metal are subject to distinct benchmarks. Finished steel processing after casting is not benchmarked as a separate product.	ECC reflects the allowance price applied to the portion of a plant's verified emissions that is not covered by final free allocation. The main drivers of variation in ECC across installations are differences in plant emissions intensity and the level of free allocation.
Aluminum	0.1%	Direct carbon dioxide and perfluorocarbon emissions are covered; purchased electricity is considered outside the plant Scope 1 boundary.	ECC reflects the net allowance cost after free allocation for Scope 1 emissions. While it can be low, indirect electricity exposure is large given the Scope 1 boundary. Indirect-cost compensation is reported separately from ECC.
Ammonia	0.6%	Steam methane reforming, coal-based production, "blue" production with carbon capture and storage, and "green" production via electrolysis using renewable electricity sources.	ECC reflects the net allowance cost for Scope 1 emissions after free allocation. ECC can be higher for fossil-based production routes because direct emissions often exceed free allocation. Green ammonia can have low direct emissions but high electricity use, which is reported separately.
Cement	2.5%	Fuel-combustion and calcination emissions at clinker production lines. Grinding-only sites may fall outside the clinker benchmark.	ECC reflects the net allowance cost for fuel combustion and calcination emissions after free allocation and is mainly driven by calcination. Final free allocation is primarily determined by the clinker benchmark and output, and the clinker ratio is used only to assess product-level exposure.
Power	18.8%	Fossil electricity generation. For combined heat and power plants, electricity is treated separately from eligible heat.	For fossil generation, ECC exposure is approximately the EUA price since electricity output generally receives no free allocation. Fossil generators may pass allowance costs into wholesale prices; pass-through varies with the marginal generator, market structure and contracts.[15]

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Electricity compensation, tax and network relief, fuel-tax support, and investment aid are separate policy instruments from the EU ETS compliance obligation, although they may indirectly affect carbon costs. EU Member States may provide indirect EU ETS cost compensation to eligible electricity-intensive products for carbon costs embedded in power prices. Under 2026 State-aid guidelines, maximum aid is generally 80% of the calculated eligible indirect ETS electricity costs for existing highly exposed sectors and 75% of the same for newly eligible sectors; national schemes are optional and based on efficiency benchmarks.[16] This compensation is most relevant to aluminum, basic chemicals/ammonia and eligible steel products, while cement is not automatically eligible. Gross indirect cost, aid and residual burden are reported separately. Member States may also provide electricity-tax reductions, network-charge relief, or temporary price aid. These measures are not harmonized across the EU. They are reflected in the ECC calculation.

EU rules permit national reductions in energy-tax rates or exemptions for specified businesses, as well as dual-use and mineralogical uses. These provisions can affect process fuels in steel, cement and ammonia, but treatment is specific to individual Member States. Support for fossil-fuel use was estimated at EUR 111 billion in 2023, much of it in the form of household, transport, or crisis support rather than plant-specific aid.[17]

EU ETS revenues finance the Innovation Fund, which provides grants and competitive-bidding support for industrial electrification, renewable hydrogen, carbon capture, utilization, and storage, and other innovative low-carbon processes.[18] The Modernization Fund finances energy-transition and industrial-efficiency investments through grants, premiums, guarantees, loans and other instruments, but is available only in 13 beneficiary Member States.[19] Member States also use national ETS revenues for industrial decarbonization and may compensate eligible electricity-intensive industries for indirect carbon costs.[20]

Endnotes

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CARBON PRICING PROFILE: FRANCE[1]
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	France introduced a climate-energy contribution (contribution climat-énergie or CCE) tax as part of its 2014 finance law. Taxes were adopted under the Code of Taxes on Goods and Services (CIBS), with the carbon component incorporated under unified energy tax rates established by the CIBS.[2] Large emitting installations also participate in the EU Emissions Trading System (EU ETS) under Directive 2003/87/EC and the French Environmental Code.[3] *Coverage* The CCE covers 41% of national emissions (2026).[4] It applies to fossil fuel consumption primarily in the buildings and transport sectors, as well as to smaller industrial installations that fall below the EU ETS threshold. Operators covered by the EU ETS are generally excluded from the CCE and pay only the base-rate carbon component tax.[5]
Price formation	The level of the CCE tax is set by the government and has been frozen at approximately EUR 45 (USD 52) per metric ton of CO_2 since 2018.[6] *Free allocation* The CCE does not provide free allocation.
Compliance and administration	The Law on Energy Transition for Green Growth set a target trajectory for increasing the CCE to EUR 100 per metric ton of CO_2 by 2030.[7] However, the tax has been held at the same level since 2018. *Offsets* Companies cannot use offsets to reduce their CCE tax obligation.[8]

Industry-Specific Treatment

Industry[9]	Share of National Emissions[10]	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	3.7%	Coke, coal and gas used for chemical reduction and qualifying metallurgical processes generally receive preferential excise tax treatment. Auxiliary boilers and site heating are treated separately.	ECC reflects the excise tax paid on taxable auxiliary fuel use.
Aluminum	0.2%	Fossil fuels used in qualifying metallurgical processes may receive preferential treatment. Carbon-anode process emissions are not subject to fossil-energy excise tax.	ECC reflects the excise tax paid on taxable fossil-fuel use. Excise tax on electricity and related relief are reported separately from Scope 1 ECC.
Ammonia	0.4%	Natural gas or other fuels combusted to produce process heat or steam; natural gas used as a chemical feedstock is not subject to the excise tax.	ECC reflects the excise tax paid on natural gas or other fuels combusted to produce process heat or steam.
Cement	2.0%	Fuel used in qualifying mineralogical processes, including clinker production, generally receives preferential excise tax treatment. Auxiliary boilers and other site fuel use are separated.	ECC reflects the excise tax paid on taxable fuel use outside the qualifying mineralogical process.
Power	5.6%	Gas, coal, and oil used to generate electricity are generally exempt from fossil-energy excise. For combined heat and power plants, fuel attributable to heat production and auxiliary use are separated.	ECC reflects the excise tax paid on taxable heat-related or auxiliary fuel use.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

France provides exemptions, reduced rates, or refunds for certain industrial energy-tax obligations including dual-use processes, non-fuel or combustible uses, and mineralogical processes.[11] These provisions may reduce the effective tax burden for eligible industrial entities, including in sectors with significant energy consumption, but eligibility depends on the energy product, use case, and applicable legal conditions. Broader fuel-tax expenditures, temporary energy-price measures, and investment support mechanisms are treated separately

from the ECC calculation.

In 2026, the government announced nearly EUR 150 million in compensation for indirect carbon costs to the chemical industry, including fertilizer-related facilities.[12] This measure provides compensation for carbon costs embedded in electricity consumption and is therefore not deducted from the direct ECC calculation.

France supports industrial decarbonization primarily through the France 2030 investment plan.[13] Under this framework, the Appel d'Offres Grands Projets Industriels de Décarbonation (AO GPID) program provides competitively awarded, performance-based support for up to 15 years to large EU ETS industrial projects. Annual payments are tied to verified emission reductions and decline as a predetermined reference carbon price rises. The published payment mechanism sets a payment floor at zero and does not ordinarily require repayments when the carbon price exceeds the project's bid price. France also provides capital grants for industrial decarbonization projects through the DECARB IND program.[14] Both instruments are project-specific and reduce transition investment costs or residual operating costs, so they are not treated as adjustments to the direct ECC calculation.

Endnotes

1 This appendix focuses on elements of France's carbon pricing framework that are not covered in the EU ETS appendix.

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CARBON PRICING PROFILE: GERMANY[1]
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Germany's national emissions trading system (nEHS) was adopted under the Fuel Emissions Trading Act (BEHG).[2] Large installations participate in the EU Emissions Trading System (EU ETS) under Directive 2003/87/EC.[3] The nEHS is transitioning from fixed-price allowance sales to auction-based allowance sales in 2026.[4] *Coverage* The nEHS covers 42% of national emissions (2026).[5] It regulates upstream fuel suppliers who must purchase certificates for the emissions associated with covered fuels sold for use in Germany, and the carbon cost is generally passed through to fuel users. The system prices fuel use that is not already subject to the EU ETS. This includes emissions from sectors largely outside the EU ETS, such as buildings and road transport, as well as fuel use by smaller industrial installations that fall below EU ETS coverage thresholds. Where fuel is used in an installation already covered by the EU ETS, mechanisms are provided to avoid double carbon pricing. In 2024, approximately 2,070 entities were regulated under the nEHS.[6]
Price formation	2026 nEHS certificates are auctioned within a price corridor of EUR 55–65 per metric ton of CO_2 (USD 62.15 – 73.45).[7] If the cap is exceeded, additional allowances can be purchased for EUR 68 (USD 76.84) after the auction period closes.[8] *Free allocation* There is no free allocation of emissions certificates under the nEHS.
Compliance and administration	The German Emissions Trading Authority (DEHSt) administers EU ETS installations, the nEHS and related compensation schemes.[9] Germany is aligning fuel pricing with the second EU ETS (ETS2) while preserving the EU ETS installation boundary.[10] The nEHS remains operative through 2027 and will phase out as German firms enter the EU ETS2 regulatory phase planned for 2028.[11] *Offsets* No offsets are eligible for nEHS compliance.[12]

Industry-Specific Treatment

Industry[13]	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	5.6%	Not covered under nEHS.	Not applicable.
Aluminum	0.1%	Not covered under nEHS.	Not applicable.
Ammonia	0.6%	Not covered under nEHS.	Not applicable.
Cement	2.1%	Not covered under nEHS.	Not applicable.
Power	25.6%	Smaller combustion facilities that are not covered by EU ETS	ECC exposure is approximately the nEHS price because there is no free allocation and all nEHS certificates must be purchased.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Germany provides electricity-price nEHS carbon-leakage aid to compensate for fuel costs through the National Ordinance on Measures to Avoid Carbon Leakage in the National Fuel Emissions Trading System (BECV).[14] This aid does not alter the carbon price or allowance obligation.

Germany's Climate and Transformation Fund (KTF) finances industrial decarbonization projects, hydrogen projects, and measures to reduce electricity costs.[15] Under the KTF-funded Climate Protection Contracts program, competitively selected industrial projects may receive 15-year, two-way Carbon Contracts for Differences to cover the incremental investment and operating costs of low-carbon production relative to a conventional reference case.[16] The payment level depends on energy prices and the EU ETS carbon price and can switch direction: when the low-carbon process becomes more economical than the conventional alternative, the beneficiary must repay the difference to the government. Support is granted on a project-specific basis rather than as a sector-wide instrument, sharing transition-cost risk between the government and the beneficiary while limiting the potential for overcompensation.

Endnotes

1 This appendix focuses on elements of Germany's carbon pricing framework that are not covered in the EU ETS appendix.

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6 Ibid.

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CARBON PRICING PROFILE: MEXICO
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Mexico applies a carbon tax under a federal law (*Ley del Impuesto Especial sobre Producción y Servicios* or LIEPS) that establishes excise taxes on certain products and services. Separately, implementation of a national emissions trading system (ETS) under Mexico's General Law on Climate Change is in a transition phase.[1] Several states have adopted explicit carbon-tax regimes, notably Guanajuato, Yucatán, Querétaro, Zacatecas, and Durango. These state-level policies vary in terms of scope, tax base, and interaction with federal policy.[2] *Coverage* The Mexico ETS covers 36% of national emissions (2026).[3] It applies to approximately 300 facilities with annual emissions of 100,000 metric tons of CO_2 or more in the electricity and heat, industrial, and mining and extractives sectors.[4] The federal carbon tax applies to the sale and import of fossil fuels based on their CO_2 emissions relative to a natural-gas benchmark; natural gas is fully exempt.[5]
Price formation	In 2025, the headline carbon price, based on the federal carbon tax, was MXN 68 (USD 4).[6] State-level carbon-tax rates range from approximately MXN 58 (USD 3.2) per metric ton of CO_2 to MXN 692(USD 38.5) per metric ton of CO_2. In several states, the state-level carbon tax is indexed to inflation.[7] Price data from the Mexico ETS is not yet available because the trading system has not yet entered its operational phase. *Free allocation* ETS allocation is 100% free on historical verified emissions during the start of the planned operational phase, with three additional reserves above the cap for auctions, new entrants, and general ex-post adjustment where allocation falls short of verified emissions.[8] The Ministry of Environment and Natural Resources (SEMARNAT) is designing an auction mechanism. Free allocation is expected to decrease following the first year of the operational phase.[9]
Compliance and administration	SEMARNAT, which administers the ETS and the National Emissions Registry (RENE), requires facilities that emit more than 25,000 metric tons of CO_2e annually to report emissions. The Consultative Committee of the Emissions Trading System (COCOSCE) is the formal advisory forum on issues such as allowance allocation during the operational phase, electricity-sector obligations and offsets. Neither Mexico's carbon tax nor its ETS has a published price trajectory. *Offsets* In its pilot phase, the Mexico ETS allows domestic offset and early-action credits for up to 10% of obligations for non- CO_2 gases.[10] The LIEPS carbon tax liability can be met using UNFCCC-endorsed carbon credits for domestic projects with no quantitative cap.[11] Some states accept offset certificates against state tax liability.[12]

Industry-Specific Treatment

Industry	Share of National Emissions	Coverage[13]	Key Considerations for the Effective Carbon Cost (ECC)
Steel	2.3%	Integrated basic oxygen furnace and electric arc furnace production routes.	Most emissions come from combustion; fuels other than natural gas are covered by the tax.
Aluminum	0.0%	No primary smelting (secondary/ recycling only).	Not applicable.
Ammonia	0.1%	Major ammonia facilities primarily use steam methane reforming with natural gas feedstock.	Installations covered by the ETS receive free allocations, while both natural-gas feedstock and fuel use are exempt under the relevant federal instruments. Consequently, the ETS and fuel-tax mechanisms result in no ECC for ammonia production.
Cement	2.3%	The federal tax covers only fuel combustion emissions.	Some state taxes also cover process emissions from clinker production and calcination, although those do not impact the ECC.
Power	23.5%	The ETS pilot covers state- and privately-owned generation facilities above the emissions threshold. LIEPS taxes fuel-oil and coal plants, while natural gas (majority of thermal output) is fully exempt.	With 100% free allocation and no auctions, the ETS pilot imposes no cost. The gas exemption removes most electricity-sector fuel use from the carbon tax as well.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Carbon-tax obligations can be satisfied using eligible Mexican carbon credits.[14] The ECC is reduced when credits are available below the headline carbon-tax rate. In addition, the Ministry of Finance can adjust the carbon tax through a fiscal stimulus mechanism and may partially reduce the tax burden during periods of elevated fuel prices, which reduces the carbon price signal and ECC for affected fuels.[15] In addition, Plan México, President Sheinbaum's six-year national economic strategy, includes measures such as accelerated depreciation for capital investments, tax incentives in strategic development corridors, support for industrial investments, and significant public investment in energy infrastructure, along with domestic-content targets and new tariffs covering steel and aluminum.[16] The Plan also earmarks nearly 6% of GDP for investment in the state-owned petroleum company PEMEX and more than 1% of GDP for electricity generation, transmission and distribution.[17] These measures can reduce the net cost of decarbonization.

Endnotes

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CARBON PRICING PROFILE: NEW ZEALAND
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	The New Zealand Emissions Trading Scheme (NZ ETS) was adopted under the country's Climate Change Response Act 2002.[1] A separate levy applies to imported synthetic greenhouse gases.[2] *Coverage* The NZ ETS covers 6,050 registered participants and 44% of gross national emissions (2026).[3] However, only 178 participants are subject to mandatory reporting and compliance obligations. These include entities in the electricity and heat, industry, mining and extractives, transport, aviation, buildings, agriculture, forestry and fishing, and waste sectors.[4]
Price formation	In 2025, the average price of a New Zealand Unit (NZU) on the secondary market was NZD 55.04 (USD 32). The auction reserve price was NZD 68 (USD 40).[5] *Free allocation* Free allocation is available for emissions-intensive, trade-exposed industrial activities. In 2025, the assistance rate was 85% for highly emissions-intensive activities. From 85%, it is being phased out at a rate of one percentage point annually until 2030, when the rate of phase-out increases to three percentage points annually to 2050.[6]
Compliance and administration	New Zealand's Environmental Protection Authority (EPA) administers the NZ ETS while the NZ Customs Service administers the synthetic greenhouse gas levy.[7] Third-party verification is only required for entities that are applying to use a facility-specific emissions factor; it is generally not required for emissions reporting.[8] The NZ ETS cap and auction settings are updated annually on a rolling five-year basis. Over the period 2026–2030, the cap declines from 16.3 Mt CO_2e to 9.6 Mt CO_2e, the base auction volume declines from 5.2 million units to 1.7 million units, and the auction floor rises from NZD 71 (USD 41.27) to NZD 87 (USD 50.57).[9] *Offsets* No external offset credits may be used in place of NZUs. However, the EPA can issue NZUs to eligible forestry participants for verified carbon sequestration under the NZ ETS.[10]

Industry-Specific Treatment

Industry	Share of National Emissions	Coverage[11]	Key Considerations for the Effective Carbon Cost (ECC)
Steel	2.2%	One integrated producer manufactures iron and steel from ironsand. Electric-arc furnace production is expected to enter operation in 2026.	Free allocations are granted under the emissions-intensive, trade-exposed industrial allocation regime.
Aluminum	0.7%	One national smelter; coverage extends to process CO_2 and perfluorocarbons.	Allocative baseline exceeds emissions. The allocation is treated as a shield capped at one implying an ECC of zero.[12]
Ammonia	0.4%	One fertilizer producer uses a steam-methane-reforming route. The eligible activity is the production of carbamide (urea).	The basis of allocation is urea.
Cement	0.4%	The eligible activity is the production of cementitious products.	The regulated baseline is measured as per metric ton of cementitious product.
Power	4.0%	Fossil-fuel generation is fully covered: full NZU surrender with no free allocation. This means generators face the full market cost of NZUs.	The cost of NZUs is passed through in wholesale electricity prices, particularly when thermal generation is marginal. Eligible industries are protected from this pass-through through the allocation of free NZUs based on an electricity factor for their Scope 1 emissions.[13]

Complementary Fiscal Measures Affecting Carbon Compliance Costs

From early 2021 to late 2023, commercial and industrial businesses could apply to the Government Investment in Decarbonising Industry Fund for co-funding to support decarbonization projects.[14] This support primarily reduced the cost of ETS compliance for participating businesses and did not impact the ECC. New Zealand also provides fuel excise duty refunds and regional fuel tax rebates for off-road commercial use of petrol, but this has no impact on the ECC for priority industries.[15]

Endnotes

1 *Climate Change Response Act 2002*, version as of 1 January 2026, New Zealand legislation, https://www.legislation.govt.nz/act/public/2002/40/en/latest/#DLM158584.

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3 "Carbon Pricing Dashboard," World Bank, accessed 16 August 2026, https://carbonpricingdashboard.worldbank.org/dashboard. World Bank estimates of emissions coverage reflect the scope of carbon pricing instruments implemented in 2026, applied to greenhouse gas (GHG) emissions from the EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (2025 release), which covers the period 1970–2024.

4 Information on total participants from "Participants in the ETS," Environmental Protection Authority, New Zealand Government, accessed 16 August 2026, https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/ets-reports/participants/. Information on mandatory participants from "New Zealand Emissions Trading Scheme," International Carbon Action Partnership, accessed 16 August 2026, https://icapcarbonaction.com/en/ets/new-zealand-emissions-trading-scheme. Sector coverage from "Carbon Pricing Dashboard," World Bank, accessed 16 August 2026, https://carbonpricingdashboard.worldbank.org/dashboard.

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8 *Climate Change Response (Emissions Trading Reform) Amendment Bill*, Government Bill 186—3, reported from the committee of the whole House on 3 June 2020, New Zealand legislation, https://www.legislation.govt.nz/bill/government/2019/186/en/latest/#LMS143384.

9 *Climate Change Response Act 2002*, version as at 1 January 2026, New Zealand legislation, https://www.legislation.govt.nz/act/public/2002/40/en/latest/#DLM158584, and supporting regulations.

10 Ibid., s 4(1), s 64.

11 "Emissions Trading Scheme (ETS)," Environmental Protection Authority, accessed 16 August 2026, https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/; "Industries in the Emissions Trading Scheme," Environmental Protection Authority, accessed 16 August 2026, https://www.epa.govt.nz/industry-areas/emissions-trading-scheme/industries-in-the-emissions-trading-scheme/.

12 Ministry for the Environment, BRF-6769, "Final allocative baselines for industrial allocation in 2025," Appendix 1, available at https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/updates-to-2025-final-allocative-baselines/. The 4.0818 construction (2.042 direct plus an electricity-contract factor of 0.137 applied to about 14.89 MWh/t) follows the NZAS-specific treatment described in the March 2025 Cabinet material on allocative baselines.

13 "Updates to 2025 Final Allocative Baselines," Ministry for Cities, Environment, Regions & Transport, published 12 February 2026, https://environment.govt.nz/what-government-is-doing/cabinet-papers-and-regulatory-impact-statements/updates-to-2025-final-allocative-baselines/. Standard EAF 0.516 tCO2e/MWh per Electricity Authority modeling. See "Determination of the 2025 Electricity Allocation Factor," news item (Electricity Authority, 8 August 2025), https://www.ea.govt.nz/news/general-news/determination-of-the-2025-electricity-allocation-factor/.

14 "Government Investment in Decarbonising Industry Fund," Energy Efficiency & Conservation Authority, last updated 20 October 2025, https://www.eeca.govt.nz/co-funding-and-support/previously-funded-projects/approved-gidi-projects/.

15 "Fuel excise duty refunds," NZ Transport Agency, accessed 16 August 2026, https://www.nzta.govt.nz/vehicles/fuel-excise-duty-refunds.

CARBON PRICING PROFILE: NORWAY[1]
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Norway prices carbon primarily through a carbon tax on mineral products, supplemented by separate carbon taxes on offshore petroleum activities, waste incineration, and fluorinated greenhouse gases. These taxes were established under the Excise Duties Act and associated regulations.[2] Covered installations also participate in the EU Emissions Trading System (EU ETS) under the Greenhouse Gas Emissions Trading Act, which implements the EU ETS Directive through the European Economic Area (EEA) Agreement.[3] Starting in 2026, Norway restructured its carbon tax to better align with EU ETS coverage, exempting some ETS-covered emissions from the tax while applying reduced rates where emissions are covered by both the EU ETS and the Effort Sharing Regulation.[4] *Coverage* Carbon taxes cover 65% of national emissions (2026).[5] The tax on mineral products is levied upstream on producers and importers and generally applies to CO_2 emissions from the combustion of liquid and gaseous fossil fuels. It does not apply to most industrial process emissions or to fugitive emissions of CO_2 or methane. Waste incineration is subject to a separate carbon tax based on the fossil share of waste combusted. Offshore petroleum combustion is taxed separately and stacks on top of ETS liability.[6]
Price formation	Carbon tax rates are set annually by the Norwegian Parliament and expressed per physical unit of fuel or product. Rates are calibrated to deliver an implied carbon price of NOK 1,405 (USD 135.15) per metric ton of CO_2 in 2025 and NOK 1,639 (USD 157.66) per metric ton of CO_2 in 2026.[7] *Free allocation* There is no free allocation, benchmarking or allowance-based relief.
Compliance and administration	National excise taxes are administered by the Norwegian Tax Administration. Carbon taxes are applied upstream to fuel suppliers rather than facilities and do not require installation-level MRV or emissions registries. Administration of the carbon tax on offshore petroleum transfers from the Ministry of Energy and the Offshore Directorate to the Ministry of Finance and Skatteetaten; this transfer is planned for January 1, 2027.[8] The government has announced a target of increasing carbon tax rates to around NOK 2,000 (USD 192.38) per metric ton of CO_2 by 2030.[9] *Offsets* The tax on mineral products does not allow for offsets.

Industry-Specific Treatment

Sector	Share of National Emissions	Coverage[10]	Key Considerations for the Effective Carbon Cost (ECC)
Steel	0.2%	From 2026, Norway's sole electric arc furnace steel producer will be exempt from the CO_2 tax.	Process emissions from carbon electrodes and carbon injection are not subject to the CO_2 tax.
Aluminum	4.4%	All smelters participate in the EU ETS; synthetic greenhouse gas emissions are excluded from the CO_2 tax.	Fossil fuels used in ETS-covered installations are exempt from the CO_2 tax where the relevant exemption applies.
Ammonia	1.8%	Facilities are covered by the EU ETS.	Scope 1 emissions are covered by the EU ETS; only net emissions are included.
Cement	0.9%	Calcination CO_2 is not covered by the CO_2 tax on mineral products.	A clinker-to-cement ratio is used as production data for this industry is reported in cement.
Power	2.2%	Grid generation is more than 90% renewable; only smaller non-ETS generators are covered by the CO_2 tax.	The ECC excludes indirect electricity cost compensation.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Norway operates a carbon compensation scheme, approved by the European Free Trade Association (EFTA) Surveillance Authority, that reimburses power-intensive industries for 75% of the ETS-driven indirect cost embedded in electricity prices.[11] Under a 2024 agreement between the government and industry, the scheme carries an annual ceiling of NOK 7 billion (USD 675 million) and requires recipients to invest a share of the aid in emissions reduction and energy efficiency; payments are made retrospectively. This agreement runs through 2030. No compensated Scope 2 cost is added to the direct ECC, since the compensation offsets a real cost that never appears in the plant's own emissions.

Beginning March 2026, land-based ETS installations outside the Effort Sharing Regulation are exempt from the domestic carbon tax on the same emissions.[12] This exemption is not factored into present ECC calculations that are based on 2025 data but would affect ECC for 2026 onward. Norway also provides capital support for abatement investments. The Longship programme funds the Brevik carbon capture plant and the Northern Lights transport and storage chain, with the state carrying most of the capital and early operating cost of these projects. Enova provides grants for broader industrial decarbonization efforts, and the Innovation Fund is available to Norwegian installations on the same terms as EU installations.[13]

Endnotes

1 This annex focuses on elements of Norway's carbon pricing framework that are not covered in the EU ETS annex

2 *Lov om kvoteplikt og handel med kvoter for utslipp av klimagasser (klimakvoteloven)* [Act on quota obligations and trading in quotas for greenhouse gas emissions (Climate Quota Act)], last modified 09.02.2024, https://lovdata.no/dokument/NL/lov/2004-12-17-99. The mineral products tax is levied under the *Lov om særavgifter* [Act on Excise Duties], Act of 19 May 1933, No. 11 and the Excise Duties Regulation (FOR-2001-12-11-1451); the offshore tax is levied under a standalone statute (Act of 21 December 1990 No. 72).

3 *Klimakvoteloven* [Greenhouse Gas Emission Trading Act], Government of Norway: Ministry of Climate and Environment, law date 17/12/2004, https://www.regjeringen.no/en/documents/greenhouse-gas-emission-trading-act/id172242/.

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7 "Rate for mineral product tax," Norwegian Tax Administration, accessed 16 August 2026, https://www.skatteetaten.no/en/rates/mineral-product-tax/?year=2025 - rateShowYear; *Stortingsvedtak om CO2-avgift på mineralske produkter for 2025* [Storting resolution on CO2 tax on mineral products for 2025], https://lovdata.no/dokument/LTI/forskrift/2024-12-13-3219; *Stortingsvedtak om CO2-avgift på mineralske produkter for 2026* [Storting resolution on CO2 tax on mineral products for 2026], https://lovdata.no/dokument/STV/forskrift/2025-12-18-2763.

8 "Endringer i særavgiftsloven og særavgiftsforskriften som følge av overføring av forvaltningsansvaret for CO2-avgiften i petroleumsvirksomheten på kontinentalsokkelen [Amendments to the Excise Duty Act and the Excise Duty Regulations as a result of the transfer of administrative responsibility for the CO2 tax in petroleum activities on the continental shelf]," Norwegian Tax Administration, published 23 June 2026, https://www.skatteetaten.no/rettskilder/type/horinger/endringer-i-saravgiftsloven-og-saravgiftsforskriften-som-folge-av-overforing-av-forvaltningsansvaret-for-co2-avgiften-i-petroleumsvirksomheten-pa-kontinentalsokkelen.

9 *Meld. St. 13 (2020–2021)* [Climate Action Plan 2021–2030], recommendation of 8 January 2021 from the Ministry of Climate and Environment, approved in the Council of State the same day, https://www.regjeringen.no/no/dokumenter/meld.-st.-13-20202021/id2827405/.

10 *Lov om kvoteplikt og handel med kvoter for utslipp av klimagasser (klimakvoteloven)* [Act on quota obligations and trading in quotas for greenhouse gas emissions (Climate Quota Act)], last modified 09.02.2024, https://lovdata.no/dokument/NL/lov/2004-12-17-99; "Rate for mineral product tax", Norwegian Tax Administration, accessed 16 August 2026, https://www.skatteetaten.no/en/rates/mineral-product-tax/?year=2025#rateShowYear; *Stortingsvedtak om CO2-avgift på mineralske produkter for 2025* [Storting resolution on CO2 tax on mineral products for 2025], https://lovdata.no/dokument/LTI/forskrift/2024-12-13-3219; *Stortingsvedtak om CO2-avgift på mineralske produkter for 2026* [Storting resolution on CO2 tax on mineral products for 2026], https://lovdata.no/dokument/STV/forskrift/2025-12-18-2763; information on EU ETS from "Carbon Pricing Dashboard," World Bank, accessed 16 August 2026, https://carbonpricingdashboard.worldbank.org.

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12 *Prop. 1 LS (2025–2026)*, Government of Norway, Ministry of Finance, accessed 16 August 2026, https://www.regjeringen.no/en/documents/prop.-1-ls-20252026/id3125412/?ch=1.

13 "Longship goes into operation – A Global Breakthrough for Carbon Capture and Storage," Government of Norway, press release, 17.06.2026, https://www.regjeringen.no/en/whats-new/longship-goes-into-operation-a-global-breakthrough-for-carbon-capture-and-storage/id3109272/.

CARBON PRICING PROFILE: SINGAPORE
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Singapore prices carbon through a single, economy-wide carbon tax governed by the Carbon Pricing Act of 2018.[1] *Coverage* The carbon tax covers 70% of national greenhouse gas emissions (2026).[2] It applies to approximately 50 facilities in the electricity and heat, industrial, mining and extractives, and waste sectors.[3] A uniform statutory rate applies to the Scope 1 greenhouse gas emissions of every taxable facility.
Price formation	The statutory rate for the 2025 emissions year was SGD 25 (USD 19.13) per metric ton of CO_2e.[4] The price was scheduled to increase to SGD 45 (USD 34.44) in 2026.[5] *Free allocation* The government provides transitory allowances to eligible emissions-intensive, trade-exposed facilities under the carbon tax framework. These allowances reduce the volume of emissions subject to the carbon tax. Support in the form of free transitory allowances is based on internationally recognized efficiency benchmarks where available, or otherwise on facility-specific decarbonization plans, and applies only to a portion of a facility's emissions.[6]
Compliance and administration	Singapore's National Environment Agency (NEA) administers and enforces the Carbon Pricing Act, including facility registration, emissions reporting, compliance, and tax collection.[7] Facilities register with the NEA through the Emissions Data Monitoring and Analysis (EDMA) system: the first threshold of 2,000 metric tons of CO_2e makes a facility reportable, the second of 25,000 metric tons of CO_2e makes it taxable. Emissions reports from taxable facilities must be verified by an accredited external auditor. The price trajectory is scheduled to increase to SGD 50–80 (USD 38.27–61.23) by 2030.[8] *Offsets* A taxable facility may surrender eligible International Carbon Credits (ICC) to meet up to 5% of its compliance obligation for taxable emissions. ICCs are authorized under Article 6 of the Paris Agreement and are sourced through 11 implementation agreements between Singapore and partner countries.[9] Given the current lack of eligible ICCs, Singapore will allow any unutilized 2025 offset quota to be carried forward to 2026.[10]

Industry-Specific Treatment

Sector	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	0.2%	One plant utilizing a scrap-based electric arc furnace production route.[11]	The covered plant was a taxable facility in 2025.
Aluminum	0.0%	No primary production.	Not applicable.
Ammonia	0.0%	No merchant production.	Not applicable.
Cement	0.0%	No clinker production. Singapore operates grinding and blending terminals on imported clinker.	Combustion and electricity use for grinding terminals in Singapore fall below the 25,000 metric ton CO_2e threshold.[12]
Power	29.5%	Producers are taxed on Scope 1 combustion emissions at the full statutory rate. Natural gas supplied 93% of the generation fuel mix in 2025.	For 2025, the marginal carbon cost is SGD 25 (USD 19.13) per ton of Scope 1 emissions, after accounting for free allocation.[13]

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Singapore provides several decarbonization grants that recycle revenue from the carbon tax into support for industrial decarbonization and energy efficiency programs. These measures are not included in the ECC calculations. Additionally, Singapore's transitory carbon tax allowances cushion the impact of a rising carbon tax rate and lower the ECC for the affected years.[14]

Endnotes

1 *Carbon Pricing Act 2018 (Act 23 of 2018), as amended by the Carbon Pricing (Amendment) Act 2022 (Act 37 of 2022)* with effect from 1 Jan 2024, https://sso.agc.gov.sg/Act/CPA2018; Carbon Pricing (Registration and General Matters) Regulations 2018, reg. 3 (prescribed industry sectors), https://sso.agc.gov.sg/SL/CPA2018-RG5?DocDate=20241218.

2 "Carbon Pricing Dashboard," World Bank, accessed 16 August 2026, https://carbonpricingdashboard.worldbank.org/dashboard. World Bank estimates of emissions coverage reflect the scope of carbon pricing instruments implemented in 2026, applied to greenhouse gas (GHG) emissions from the EDGAR (Emissions Database for Global Atmospheric Research) Community GHG Database (2025 release), which covers 1970–2024.

3 Ibid.

4 *Carbon Pricing Act 2018 (Act 23 of 2018), as amended by the Carbon Pricing (Amendment) Act 2022 (Act 37 of 2022)* with effect from 1 Jan 2024, https://sso.agc.gov.sg/Act/CPA2018.

5 "Carbon Tax," National Environment Agency, accessed 16 August 2026, https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax.

6 *Carbon Pricing Act 2018 (Act 23 of 2018), as amended by the Carbon Pricing (Amendment) Act 2022 (Act 37 of 2022)* with effect from 1 Jan 2024, Part 5 Division 1A (ss. 20A–20G), in particular s. 20C (reduction of reckonable GHG emissions chargeable to tax) and s. 2(1) (Minister for Trade and Industry responsible for Division 1A), https://sso.agc.gov.sg/Act/CPA2018; "Oral reply to PQ on the transition framework for carbon tax," Ministry of Trade and Industry, Singapore, 3 Apr 2024, https://www.mti.gov.sg/newsroom/oral-reply-to-pq-on-transition-framework-for-carbon-tax/.

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8 Ibid., Third Schedule (for rate). For path: "Carbon Tax," National Environment Agency, accessed 16 August 2026, https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax.

9 Singapore has implementation agreements with Bhutan, Chile, Ghana, Mongolia, Papua New Guinea, Paraguay, Peru, the Philippines, Rwanda, Thailand and Vietnam.

10 "Media Release on the Roll Over of Unutilised International Carbon Credit (ICC) Offset Quota for Emissions Year 2025," Ministry of Sustainability and the Environment, Singapore, press release, 11 May 2026, www.mse.gov.sg/latest-news/media-release-on-the-roll-over-of-unutilised-international-carbon-credit--icc--offset-quota-for-emissions-year-2025/.

11 For context on the stoppage, see: Brian Taylor, "Singapore EAF melt shop idled," *Recycling Today*, published April 8, 2025, updated April 15, 2025, https://www.recyclingtoday.com/news/singapore-natsteel-recycling-melt-shop-idled-2025/.

12 Grinding terminals where taxable, have no process component according to Singapore's First Biennial Transparency Report 2024 under the UNFCCC. See: *Singapore's First Biennial Transparency Report*, National Climate Change Secretariat Singapore, 11 Nov 2024, https://www.nccs.gov.sg/singapore-s-first-biennial-transparency-report/.

13 Producers also have indirect exposure to carbon pricing through the grid emission factor, which the Energy Market Authority reports at 0.402 $kgCO_2/kWh$ for 2024. No factor was published for 2025. See, "Frequently Asked Questions," National Climate Change Secretariat, questions 1, 4 and 5 and "New Emission Standards for Power Generation Units," Energy Market Authority, press release, 26 Oct 2023, https://www.ema.gov.sg/news-events/news/media-releases/2023/new-emission-standards-for-power-generation-units. The October 2023 emission standard applies a Tier 1 intensity limit of 0.355 metric ton CO_2e per MWh to new and repowered units and requires them to be at least 30% hydrogen-ready.

14 "Written Reply to Parliamentary Question on International Carbon Credits Limit," Ministry of Sustainability and the Environment, Singapore, 26 February 2026, https://www.mse.gov.sg/latest-news/written-reply-to-parliamentary-question-on-international-carbon-credits-limit/.

CARBON PRICING PROFILE: UNITED KINGDOM
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	The United Kingdom Emissions Trading Scheme (UK ETS) operates under the Greenhouse Gas Emissions Trading Scheme Order 2020.[1] A Carbon Price Support (CPS) applies to eligible British fossil-fuel power producers through the Climate Change Levy. The UK Carbon Border Adjustment Mechanism (UK CBAM) begins in 2027 and is coordinated with industrial free allocation.[2] *Coverage* The UK ETS covers 25% of total territorial emissions (2026).[3] It applies to approximately 688 entities and installations in the power and industrial sectors with thermal input exceeding 20 MW, as well as 370 aircraft operators.[4] In 2026, the UK ETS was expanded to cover 15% of UK-related maritime shipping emissions.[5] Electricity generators in Northern Ireland continue to participate in the EU Emissions Trading System (EU ETS) while the EU and UK pursue a framework for linking their respective schemes.[6]
Price formation	The 2025 average United Kingdom Allowance (UKA) price was approximately GBP 47.36 (USD 62.36) per metric ton of CO_2. Eligible British fossil power generators also face a CPS of GBP 18 (USD 23.70) per metric ton of CO_2.[7] *Free allocation* The electric power sector generally receives no free allocation while other industrial producers receive benchmark-based allowances. The first allocation period for stationary sources ends in 2026 and the second runs from 2027 to 2030.[8] Coordination of the UK CBAM and the UK's free allowance allocation starts in 2027.[9]
Compliance and administration	The UK ETS Authority is responsible for implementing the ETS while the UK Environment Agency manages the Emissions Trading Registry.[10] Operators use approved monitoring plans and accredited verification. Surplus allowances may be banked for use in future compliance periods. The UK also sets an auction reserve price of GBP 28 (USD 31.64) from April 2026 and has developed a cost containment mechanism (CCM) to respond to sustained extreme prices. Phase II of the UK ETS (2031–2040) will set a new cap trajectory aligned with the UK's net-zero targets.[11] *Offsets* No offsets may be surrendered for UK ETS compliance.

Industry-Specific Treatment

Industry[12]	Share of National Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	0.7%	Integrated basic oxygen furnace and electric arc furnace operation, coke, sinter, hot metal and rolling.	ECC reflects the allowance price applied to the portion of a plant's verified emissions that is not covered by final free allocation.
Aluminum	0.0%	Scope 1 CO_2 and PFC emissions; Scope 2 emissions from purchased electricity.	Direct plant ECC may be modest as indirect electricity cost can dominate.
Ammonia	Not applicable.	Natural-gas steam methane reforming using "blue" (natural gas) and "green" (renewables) energy inputs, and fertilizer integration.	ECC is dependent on the route as indirect power exposure may be large for green production.
Cement	0.8%	Clinker fuel and calcination emissions; grinding-only sites separated.	Final allocation is primarily determined by the clinker benchmark and output, and the clinker ratio is used only to assess product-level exposure.
Power	11.6%	British fossil power producers are under the UK ETS plus CPS; Northern Ireland power producers are under the EU ETS.	British fossil generators face an indicative marginal carbon cost equal to the UKA price plus the CPS rate. Electricity generation receives no free allocation. Eligible combined heat and power can reduce average site ECC.

Fiscal Measures Affecting Carbon Costs

The UK compensates eligible manufacturers for indirect costs from the UK ETS/CPS if they produce a listed product and meet a 5% gross value added (GVA) eligibility threshold. For 2026–2027, compensation covers either 75% of eligible indirect costs or the amount needed to keep residual costs at 1.5% of GVA, whichever is greater. Eligible products include basic iron and steel, aluminum, fertilizers/nitrogen compounds and basic chemicals. Cement producers and producers in Northern Ireland are excluded.

The British Industry Supercharger provides additional relief from electricity-related policy costs for eligible energy-intensive industries. It provides exemptions from the indirect costs of Contracts for Difference, the Renewables Obligation, Feed-in Tariffs, and Capacity Market charges. The Network Charging Compensation Scheme provides additional compensation for electricity network charges, with the compensation rate increasing from 60% to 90% for eligible costs incurred from April 1, 2026.[13] The UK Industrial Technology Transformation Fund has also supported energy efficiency projects, but the fund is closed to new applicants.[14] These programs and policies can reduce indirect exposure to carbon costs but do not reduce the direct ECC.

Endnotes

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CARBON PRICING PROFILE: BRAZIL
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Brazil is establishing a national greenhouse gas emissions trading system, Sistema Brasileiro de Comércio de Emissões or SBCE, under Law No. 15.042.[1] *Coverage* As of August 2026, the scope and coverage of the SBCE have not yet been defined. The law authorizing the SBCE stipulates that it will apply to operators of installations and sources emitting above 25,000 metric tons of CO_2e annually.[2] Draft regulations for MRV sectoral coverage propose to include pulp and paper, iron and steel production in integrated mills, cement, primary aluminum, oil and natural gas exploration and production, oil refining, and air transport in the first stage, which is expected to begin in 2027.[3]
Price formation	As of 2026, Brazil does not yet have an operational national carbon-pricing system with an observed allowance price. Under the SBCE, Brazil would implement an absolute emissions cap using Brazilian Emissions Allowances (CBEs). *Free allocation* Current law calls for the development of a National Allocation Plan to determine the allocation of CBEs under the SBCE.[4] Allocation is to be determined with reference to factors including technological development, marginal abatement costs and historical efficiency gains. While output-based benchmarks may be adopted, the choice of allocation methodology is left to the regulator.
Compliance and administration	The Interministerial Committee on Climate Change (CIM) sets the overall policy direction for the SBCE and approves the National Allocation Plan. The Extraordinary Secretariat for the Carbon Market (SEMC), within the Ministry of Finance, serves as the temporary administering authority until the permanent regulator is established.[5] Implementation of the SBCE law is to proceed in five phases: one year to define regulations, one year for operators to stand up reporting instruments, two years of report-only obligations, and an undefined period to implement the SBCE asset market with free allocation of CBEs. Full implementation and the first compliance period will follow the final phase and therefore are not scheduled to begin before 2030–2031. *Offsets* The use of Verified Emission Reduction or Removal Certificates (CRVEs) to meet SBCE compliance obligations would be allowed under current law.

Industry-Specific Treatment

Industry	National Share of Emissions	Coverage	Key Considerations for the Effective Carbon Cost (ECC)
Steel	4.6%	Integrated mills in Stage 1 (2027); semi-integrated mills in Stage 2 (2029).	Not applicable.
Aluminum	0.2%	Primary aluminum in Stage 1 (2027); recycled aluminum in Stage 2 (2029).	The SBCE covers all six GHGs, so PFCs from anode effects will fall within its scope.
Ammonia	0.1%	Ammonia and urea are considered chemical industries, which are included in Stage 2 (by 2029).	Natural gas used as ammonia feedstock carries no carbon levy of any kind.
Cement	2.5%	Included in Stage 1 (2027).	Calcination process CO_2 falls inside SBCE scope because the instrument is an emissions cap.
Power	4.0%	Included in Stage 2 (by 2029).	Not applicable.

Complementary Fiscal Measures Affecting Carbon Compliance Costs

The Climate Fund provides grants through the Ministry of Environment and Climate Change (MMA) and loans through the Brazilian Development Bank (BNDES), which operates a dedicated credit facility that provides below-market interest rates for investments in greenhouse gas mitigation and climate adaptation.[6] The Climate Fund reduces the cost of capital for investments in greenhouse gas abatement in sectors covered by the SBCE without modifying the carbon price. Similarly, a separate climate fund launched in 2026 by BNDES and the Green Climate Fund (GCF) may lower the cost of abatement.[7]

Several coal generation plants, primarily in southern Brazil, receive reimbursement for eligible fuel costs through the Energy Development Account (CDE).[8] This subsidy will not impact the carbon price faced by coal-fired generators under the SBCE but reduces overall operating costs for these generators.

Endnotes

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CARBON PRICING PROFILE: TÜRKIYE
Implications for Effective Carbon Costs in Heavy Industry

Carbon Pricing Policy Architecture

Field	Current Treatment
System overview	Türkiye's Climate Law No. 7552 entered into force in July 2025.[1] It authorizes a national ETS and Carbon Market Board, requires emissions permits for covered installations, and provides for allowance allocation, auctioning, and offsets. It also allows for the possible future introduction of a carbon border adjustment mechanism. *Coverage* As of 2026, the scope and coverage of the ETS have not yet been defined. Türkiye does, however, have an established MRV framework. The Climate Change Directorate assigned verification of 2025 emissions reports for 758 facilities, providing a strong foundation for implementation of the ETS.[2]
Price formation	As of August 2026, Türkiye does not yet have an operational national carbon-pricing system with an observed allowance price. *Free allocation* The Draft Regulation on Türkiye's ETS proposes benchmark-based 100% free allocation during the 2026–2027 pilot period.[3]
Compliance and administration	The Directorate of Climate Change (İklim Değişikliği Başkanlığı), under Türkiye's Ministry of Environment, Urbanization and Climate Change, is the lead authority responsible for establishing and administering the ETS. The Directorate will serve as the secretariat for the Carbon Market Board.[4] *Offsets* The Draft Regulation on Carbon Credits and Offsetting proposes a Türkiye Carbon Offsetting System and indicates that domestic offsets may be eligible for ETS obligations. Quantitative limits and detailed eligibility rules have not yet been finalized.[5]

Complementary Fiscal Measures Affecting Carbon Compliance Costs

Climate Law No. 7552 earmarks auction and other ETS revenues for green transformation investments and authorizes grants, guarantees and financing-cost support, with priority potentially given to ETS-covered sectors.[6] Separately, the Green Transformation Program offers tax, customs, VAT, and financing incentives for low-carbon manufacturing investments.[7] The Türkiye Industrial Decarbonization Investment Platform seeks to mobilize concessional and commercial financing for steel, aluminum, cement, and fertilizer decarbonization projects.[8]

Endnotes

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