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Carbon pricing and taxation

A review of approaches and development implications

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Abstract: Nowadays, all policy makers must engage with direct and indirect carbon pricing issues. However, the implications of different types of tools and methods to price carbon and support decarbonization deserve further attention in view of their development implications. Two aspects—revenue recycling and complementary policies—are critical when it comes to ensuring that carbon pricing and taxation measures are supportive of broader sustainable structural economic transformation and help to avoid a 'green squeeze'. As countries begin to develop their own national systems of carbon taxation, it is critical to embed within these the potential for revenue recycling to address distributional issues, and to provide funding for complementary policies to support green transition and sustainable development endeavours. The major challenge at present is that mechanisms for effective redistribution are nascent or non-existent including across the case studies reviewed in this scoping study, i.e. South Africa, Mozambique, Ghana, and selected Latin American countries. Moreover, there are uncertainties regarding effective redistribution systems at an international level, with a continued failure to agree common approaches to pricing and reporting and verifying embedded carbon.

Key words: carbon pricing, carbon taxation, revenue recycling, redistribution

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1 Introduction

The ambition of the Paris Agreement is shared globally, and all signatories are preparing more ambitious Nationally Determined Contributions (NDCs) for submission by 2025. However, well-known issues remain in terms of how trade and investment policies are integrated within NDCs as well as adaptation plans,[1] and vice versa.[2] There is also much uncertainty about how a mutually agreed approach to carbon pricing can support the ambition of the Paris Agreement and the global green transition.

Policy makers who consider introducing (or scaling up) carbon pricing face technical choices between different methods, such as carbon taxes and emissions trading systems (ETS). Both are key mechanisms to derive a carbon price, but there are important differences in relation to how they operate, their economic effects, and political economy considerations (Parry et al. 2022).

More than two-thirds of NDCs submitted to date refer to the use of carbon pricing mechanisms (World Bank 2022). Global interest in the use of carbon taxes and ETS has grown tremendously given the need to counter new carbon border adjustment measures (CBAM) applied to imports into the European Union (EU) for selected product lines from 2026. Because a carbon tax means a carbon price has been paid, it is one way to reduce the transfer of resources to the EU and support green competitiveness for heavy industry targeted by the CBAM.

The use of unilateral measures like the EU CBAM, and other countries' replication, will ensure that the issues regarding carbon pricing remain high on the international agenda for the foreseeable future. However, the implications of pricing carbon and the different types of tools deployed, including carbon taxes, deserve further attention, especially in view of their development implications.

This scoping paper explores these aspects with a focus on the distributional issues. It is organized as follows. Section 2 introduces the economic and political case for different types of carbon pricing schemes as part of broader green industrial policy (GIP) and discusses the current international context. Section 3 introduces country examples of the application of different types of carbon pricing, both explicit ones such as carbon taxes and/or ETS and more implicit means like excise duties. Section 4 explores the development implications with a particular focus on distributional issues. Finally, this scoping paper concludes with a set of recommendations for consideration by policy makers as they weigh up different options and consider how carbon taxation can support both their climate and sustainable development objectives.

2 The economic case and politics: domestic and international

Although many economists consider carbon taxes as first-best instruments to price and incentivize emissions reductions (Akerlof et al. 2019; Nordhaus 1974), the ETS emerged in the EU in view of the compromises needed given its political constraints: the EU has no fiscal union and tax measures require unanimity, whereas regulations like the ETS required qualified majority voting

[1] And as reflected in recent joint initiatives between the World Trade Organization (WTO), the World Economic Forum, and the World Bank on Action on Climate and Trade (WTO 2023).

[2] For example, how environmental and climate considerations could be embedded within the African Continental Free Trade Area, see ODI (2021).

(LIFE ETX 2021). There are, however, individual cases of member states applying carbon taxes. For example, the long-running carbon taxes in Sweden are credited with significant reductions in carbon emissions.[3] Switzerland, while not an EU member, has secured an equivalence agreement that links its ETS to the EU's, thus providing greater flexibility. It also applies a carbon tax in support of its emissions reductions.

There are several important differences that drive the choice of one method to price carbon, compared to another. One difference between carbon taxes and an ETS—and a compliance carbon market[4]—is that the latter may target specific producers and sectors, i.e. those that are major emitters. This more limited application, compared to, say, an across the board carbon tax, provides some advantages, especially in view of political economy considerations. In addition a carbon tax sets a price, whereas under a cap and trade scheme, the limit on emissions permitted (the cap) drives the price and provides the incentive to emit less. There can also be other arrangements to sell unused rights.[5]

In the USA, because of strong political opposition to a carbon tax, unprecedented government support and subsidies underpin the Inflation Reduction Act and decarbonization efforts. However, the USA must also respond to EU policy and is considering different types of tools, including carbon tariffs. There are also other important global developments regarding carbon taxation to consider, discussed next. This all means that the issues regarding carbon pricing are only likely to grow in the foreseeable future.

2.1 Market-based mechanisms

Carbon taxes are very much in line with the conventional neoclassical economics response to climate change: 'raising the price of carbon is a necessary and sufficient step for tackling global warming. The rest is largely fluff' (Nordhaus 2007: 29). However, there are also other important efficiency and cost-effectiveness considerations (Baranzini et al. 2016).

As a market mechanism, carbon taxes provide incentives for firms to improve resource efficiency in their production processes and supply chains. Other types of incentives include carbon permits and tradable rights (e.g. ETS) and regulations such as feed-in-tariffs.

Measures often form part of broader GIP, which is defined by Anzolin and Lebdioui (2021) across three dimensions (based on an assessment of different approaches to mitigate climate change). These are: (i) the consumption-centred dimension; (ii) the firm-level sustainability dimension; and (iii) the productionist innovation-driven dimension.

These tools seek to adjust the relative prices of products that rely on carbon-intensive production processes to reflect the wider social costs of carbon emissions (externalities), thus creating incentives (and disincentives) to entrepreneurs and consumers to make low-carbon choices and switch production to lower-carbon alternatives. Carbon taxes (prices) are also cost efficient as they equalize the marginal cost of abatement across all firms.

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[3] However, extensions were voted down in the case of Switzerland more recently, which illustrates the challenges with carbon taxes (as they are perceived to affect all voters in a very visible way) (see Wyplosz 2024).

[4] The differences between voluntary and compliance carbon markets are discussed in detail by Ashraf and Karaki (2024).

[5] The European market is discussed by Wyplosz (2024).

There is some consensus that the EU's ETS has been able to affect business-as-usual emissions (Haites 2018), and there is some evidence that carbon taxes within the EU have supported cumulative emissions reductions (Metcalf and Stock 2023). There are nonetheless concerns that carbon pricing is necessary but not sufficient to drive emission reductions, because prices can be an ineffective signal for the take-up of unfamiliar technologies, and given imperfect information (Lewney 2020).

These issues can become amplified within a developing country context, particularly where institutions may be weak. Other concerns have been raised by Jacobs (2024), who points out the profound weakness in solely relying on market-based mechanisms and argues that far greater attention is needed on the role of institutions and the superior achievements to date of regulations: energy efficiency standards, product prohibitions, and other measures to support the achievement of specific targets.[6]

While there has been progress on carbon pricing across several countries (Box 1), the coverage of global emissions is still only partial.[7] Moreover, effective carbon prices have been too low to internalize all externalities (and therefore do not correspond to the social cost of carbon, with these estimations also varying considerably).[8]

At the multilateral level, the Director General of the WTO has tried to make progress, including through a technical contribution and presentation of a carbon pricing framework to inform policy design. The framework developed includes a set of economy-level criteria which determine variation in carbon prices between economies. These are historical emissions, the current level of economic development, and the economic costs of climate change (see Bekkers and Cariolia 2024)

However, many WTO members have pushed back strongly, referring to both past emissions (e.g. reflecting common but differentiated responsibility) and revenue recycling (Aarup 2023). Subsequently, various taskforces have been established both at the international level (comprising the major international organizations) and at the national level (in the case of the USA) (Jao and Khan 2024). As part of its move towards green diplomacy, the EU has introduced a carbon market diplomacy taskforce (Dimitrova 2024). Indeed, there are many different types of carbon pricing schemes, both implicit and explicit, as well as different drivers, e.g., financial sector, maritime sector, etc. (see Table 1).

Table 1: Carbon pricing design and country priorities

Design	Priorities
Implicit	
Implicit carbon pricing (e.g. fuel and commodity taxes/subsidies)	Revenue: taxes, auctioned ETS permits
Shadow carbon pricing: private entities accounting for social costs, and stress testing	Industrial policy: feebates, performance standards
Explicit	
Carbon taxes	Capabilities: use of existing systems
ETS	Political: carbon taxes can be politically difficult compared to ETS

Source: adapted from Heine (2022).

[6] It is worth noting that the mission-orientated approach to governance turns complex challenges like climate change into pathways for new forms of collaboration and new market opportunities.
[7] E.g. Anzolin and Lebdioui (2021) and Parry et al. (2021).
[8] See also Semieniuk and Yakovenko (2020), Smith and Braathen (2015), and Stern (2018).

The financial sector increasingly requires shadow carbon pricing and for private entities to account for social costs. This is a methodology that helps to quantify the risks and opportunities for new investments, assigning a monetary value on the impact of a change in carbon emissions within economic analysis (KPMG 2024). In addition shadow prices can be used as part of policy appraisal and evaluation.[9] The International Maritime Organization is on the cusp of agreeing an international carbon tax on maritime emissions to finance the energy transition of international maritime transport by 2025.[10] At the international level there is momentum within the United Nations (UN) for a global tax convention (Travers 2024). Overall there is growing momentum for carbon taxes and the use of ETS (Box 1). The EU is also supporting greater sensitization as part of its new green diplomacy drive (Simon 2024).

Box 1: Stocktake of carbon pricing

There are now 75 carbon pricing instruments in operation worldwide, covering around 24% of global emissions. It is estimated, based on the number of carbon taxes and ETS currently being considered worldwide, that this share of global emissions could rise to 30%. However, strong political commitment is needed. In addition price levels continue to fall short of the ambition needed to achieve the Paris Agreement goals. While carbon tax rates have shown slight increases, price changes within ETS are mixed, with ten systems experiencing price decreases over the past 12 months, including longstanding ETS in the EU, New Zealand, and the Republic of Korea.

Source: World Bank (2024).

Despite this massive growth in interest, there remains a lack of coordination amongst the big players, especially the EU and the USA (Box 2). This divergence reflects domestic political economy concerns and, arguably, respective positions within the green technology race. These differences in approaches (and in the absence of an agreed multilateral framework for carbon pricing) have major implications for other developing countries in view of interconnected economic, trade, and investment relationships.

Box 2: The differing EU and US approaches

The EU CBAM was introduced in 2023 and is expected to be fully effective from 2026. It aims to ensure that the carbon price of imports of certain products[11] is equivalent to that of production in the EU under the EU ETS for selected products, services, and varying scope of emissions, direct (Scope 1, e.g. emissions that occur at source, owned by a company) and in-direct (Scope 2, e.g. the generation of purchased energy from a utility provider). Importers into the EU will have to submit carbon credits related to the carbon embodied in selected products from 1 January 2026 and for selected industries including aluminium, cement, electricity, fertilizers, hydrogen, and iron and steel.[12]

If a carbon price has been applied at source, the EU proposes to recognize this. However, the process for this remains unclear and new systems of compliance, certification systems, and so on will be needed (see

[9] Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy (2021).

[10] It should be noted that from January 2024 the EU ETS covers CO_2 emissions from large ships.

[11] The initial design covers iron/steel, cement, fertilizers, aluminium, hydrogen, and electricity.

[12] The calculation of carbon includes both direct emissions (scope 1) and indirect emissions from electricity (scope 2). However, certain sectors—aluminium, as well as iron and steel, where scrap metal processing is electricity-intensive—receive compensation in the EU for their indirect emissions, so only their scope 1 emissions will be covered until that compensation is phased out.

Keane et al. 2024) All countries that export to the EU products targeted by CBAM will need to respond and there will be ripple effects across supply chains. These developments have the potential to raise the costs of exporting to the EU. Estimates of the economic impact of the CBAM on exporters to the EU vary according to carbon price and other assumptions. The EU's Green Deal accompanies emissions trading through several other regulations and is arguably the most advanced. Its actions are spurring response measures in other countries, notably the USA.

Potential US responses

As explored in some detail by Mehling et al. (2024) several bills have been introduced in the USA to reduce carbon-intensive imports, prevent carbon leakages, reduce greenhouse gas (GHG) emissions, and spur domestic decarbonization in manufacturing sectors. Two of these are summarised below to highlight some of the key differences related to exemptions and revenue recycling: the Foreign Pollution Fee Act (FPFA) and the Clean Competition Act (CCA) (see Mehling et al. (2024) for more information and comparisons, including with the FAIR Transition and Competition Act (2021)).

- The **FPFA** aims to reduce the importation of embodied GHG emissions by imposing a fee on selected imports The fee will be imposed if the difference in pollution emitted by the foreign-made food and mean intensity of GHGs in a domestic competitive alternative is more than 10% (Elkerbout et al. 2023). However, the FPFA does not issue credits in the case of pre-payment of a domestic carbon price in the foreign country, and this could lead to double payments by foreign producers (Cosbey 2023). Unlike other global carbon measures, especially the EU CBAM, the FPFA allows domestic manufacturers to petition the government to add new product categories where they face dirty international competition (Reinsch and Denamiel 2023). Moreover, the emissions difference from US baselines can go up from 10% to 50% if the foreign country has a free trade agreement (FTA) with the USA , while the fee can be waived if the foreign producer is deemed essential to national security (Reinsch and Denamiel 2023). As summarised by Mehling et al. (2024), there are concessions available for lower- and middle-income countries, but no specific use of revenues (e.g. revenue recycling) specified.
- The **CCA** is closer to the EU CBAM as it aims to reduce the carbon intensities of existing facilities and lower GHG emissions through both imports and domestic production of high-polluting sectors (EDF 2023). This will be achieved through a carbon price on domestic and foreign producers if they exceed US baseline industrial averages (McCabe 2023). This carbon price can therefore be used by US producers as credits towards the purchase of carbon certificates under the EU CBAM, thus increasing the interoperability of the two measures (GCF 2022). The CCA also has provisions for the creation of Carbon Clubs consisting of countries that have imposed explicit costs on GHGs, including the EU (Gangotra et al. 2023). Interestingly, the CCA would exempt least-developed countries (LDCs) and have a larger coverage of products than the EU CBAM, extending to fossil fuels, petrochemicals, glass, paper, and ethanol (GCF 2022; Reinsch and Duncan 2022). As discussed by Mehling et al. (2024), there is also a use of revenues: a competitive grant to support reductions in carbon intensity and a State Department Economic Support Fund.

Source: authors.

2.2 Choosing between tools

Carbon taxes are generally considered much simpler to administer for developing countries than ETS and, in principle, can be designed to have the same carbon price equivalent effect (Parry et al. 2022). However, politically, carbon taxes are more challenging to implement than ETS, which can be more politically acceptable (as the burden may be perceived to fall less on voters). However, as the current international situation is highlighting, this then raises global coordination challenges: carbon taxes are the most natural instrument for an international carbon price floor (Table 2).

Table 2: IMF comparison between carbon tax and ETS

Design issue	Instrument	
	Carbon tax	ETS
Administration	Simpler as fuel taxes can be extended	Challenging for capacity-constrained countries
Price	Price certainty can promote innovation	Price volatility can be challenging
Uncertainty	Emissions uncertain but tax rate can be adjusted	Certainty over emission levels
Revenue distribution	Revenues can be recycled for more progressive policy	Free allowance may limit desirable distributional outcomes
Global coordination	Most natural instrument for a global carbon price floor	Possible to comply with global price floor

Source: adapted from Parry et al. (2022).

Given these issues, CBAMs have attracted considerable criticism. There is concern that they may provide a loophole for foreign manufacturers to engage in 'resource shuffling', which would reorganize production to reduce the carbon intensity of exported products but continue to produce highly carbon-intensive products for domestic use (Keohane and Ye 2024; Yi et al. 2024). Even if permissible under the WTO, they could stifle multilateral climate efforts through the United Nations Framework Convention on Climate Change (UNFCCC) (Keohane and Ye 2024).

As other countries develop counter measures to the EU CBAM, there are other areas where greater detail is needed. As discussed by Keane (2023), there are issues regarding the transfer of resources to the EU which could occur due to the lack of fully functional domestic systems capable of providing desired 'equivalence'. This may result in a transfer of resources that could have otherwise been utilized to support decarbonization efforts in producing countries.

For the equivalent measures to be recognized, independent certification will be required. Common metrics and monitoring, reporting, and verification systems are also needed. Even if countries are less carbon intensive than the EU, and therefore not liable for transfer carbon credits (because the embedded carbon content is lower than EU producers), they will still need to certify to this effect.

Importers will need to declare the embedded carbon content of products covered and ensure that the carbon price has been paid. Given the issues regarding 'common but differentiated responsibility' the distributional issues associated with different levels of carbon pricing deserve much greater attention. The EU has one of the highest carbon prices in the world (World Bank 2024). But the Paris Agreement provides for developing countries to defer or delay their emissions peak, with no expectation that the cost of decarbonization should match that of the EU (Keane et al. 2024).

2.3 International outlook

All countries are dealing with carbon pricing issues, either directly or indirectly. At the international level there is widespread recognition of the need for greater coordination of policies to maximize positive and limit negative cross-border spillovers (IMF et al. 2024). Recent submissions to the WTO Committee on Trade and Environment indicate an increasing appetite amongst some

members to make progress on common measuring, reporting, and verification (MRV) systems for embedded carbon.[13]

Despite this increasing appetite for greater coordination, the issues associated with the EU CBAM are likely to grow over the coming years as other countries emulate the approach (e.g. the UK is expected to introduce its own CBAM in 2027). Trade tensions may further rise depending on the approach pursued by the USA.

Carbon taxation issues have remained high on the agenda of the G20 under the current chairmanship of Brazil, and this is likely to continue as South Africa took over from 1 December 2024. The 2023 African Leaders Nairobi Declaration on Climate Change (African Union 2023) makes clear that new financing mechanisms, including a global carbon taxation regime, are needed to avert the climate emergency. However, despite the ambition, the international outlook for agreement continues to be somewhat uncertain.

3 Case studies: national and regional

This section summarizes the experiences of different countries in their use of carbon pricing systems. The countries are South Africa, Mozambique, Ghana, and various countries within Latin America. This brief review draws out some of the major issues regarding political feasibility, socioeconomic impacts, distributional issues, and broader sustainable development implications. The focus on African countries and those in Latin America is related to the movement of the G20 Presidency to South Africa from Brazil. Both countries have been extremely vocal in their concerns about the EU CBAM and how it is effectively shaping their own climate change mitigation policy.

3.1 South Africa

As Africa's largest GHG emitter, South Africa has committed to an ambitious green transition as a key part of the country's National Development Plan 2030. South Africa's NDC (updated 2021) aims to reduce GHG emissions to 350–420 $MtCO_2e$ by 2030 and achieve carbon neutrality by 2050. South Africa is (to date) the only African nation to have introduced a carbon tax and a carbon credit system, and therefore a carbon pricing system. A new climate change law was passed in June 2024 which sets caps for large emitters and requires every town and city to publish an adaptation plan (Peyton 2024).

The carbon tax came into effect in 2019 and places a carbon price on emissions from large businesses in the industry, power, and transport sectors via a midstream tax on fuels.[14] It covers around 82% of the country's emissions. The price in 2023 was R190 (equivalent to approximately US$10) and raised US$127 million in the same year (equivalent to approximately 0.03% of gross domestic product (GDP)). However, as discussed by Qu et al., (2023) the effective tax rate is lower, estimated at just R7 in 2021–22, with the overall carbon price estimated at around EUR20;

[13] For example, during recent October 2024 meetings of the WTO Committee on Trade and Environment, Japan introduced a new proposal on trade-related climate measures focusing on methodologies for measuring embedded carbon emissions. China called for dedicated multilateral discussions on border carbon adjustment measures in November 2023.

[14] Currently covering coal, diesel, gasoline, kerosene, jet fuel, other oil products, LPG, natural gas, waste as fuel and non-fuel emissions.

although this is broadly in line with other G20 countries, significantly higher rates of US$120/tCo$_2$ are needed by 2030 to reach net zero by 2050 (*Ibid.*).

There is considerable debate about how best to achieve this. In addition to the specific measures in place to price carbon, South Africa also applies fuel levies, which similarly influence carbon prices. These measures are considered to influence the overall carbon price. A provision is included in the Carbon Tax Act to deduct emissions from combustion of petrol and diesel from the carbon tax calculation to avoid double taxation.[15] But the two tax bases differ: the fuel levy is a tax per unit of consumption/sales of petrol and diesel (11 cents per litre for petrol and 14 cents per litre for diesel), which affects all retail consumers; the carbon tax is imposed on emitters operating at a capacity above a defined threshold and then applies a rate per tonne of CO_2e. It currently covers the energy, manufacturing, and transport sectors. There was a plan to remove the fuel levy completely in 2022, but the process stalled, with one reason for this being concern over the loss of possible revenue (Libera 2024).

In contrast to countries like Ghana and Ethiopia (see Advani et al. 2021), increasing the carbon price in South Africa is considered to have a regressive effect on households (Qu et al. 2023). The higher price is expected to pass through to energy prices and lead to higher output prices. While the overall impact on growth is expected to be minimal, it may be spread unevenly across sectors, with energy-intensive sectors (e.g. transport minerals and mining) most affected. The implied reallocation of employment from high-carbon to low-carbon and green sectors will need to be managed carefully and be supported with training and other measures.

At the household level, higher transport, food, and electricity prices represent a marginally greater share of expenditure among the poorest households. Adjusting and expanding established social assistance programmes in South Africa to support the groups most affected by the tax, as well as broader climate change impacts, could help mitigate these differential impacts. While revenues from the tax are not earmarked in principle, 'recycling' of revenues, which under the current policy trajectory are expected to reach 2% of GDP by 2030, could have a positive impact on economic growth. For example, it is estimated that the use of revenues for public investment, social assistance, and income tax cuts could boost growth by 1.4% by 2030 (Qu et al. 2023.).

The Government of South Africa has raised concerns, however, regarding the influence of the CBAM on its own climate change mitigation policy. Some studies identify South Africa as one of the most affected countries across exporters to the EU (Baker et al. 2022; UNCTAD 2021). Other indicators suggest that the EU CBAM affects just 0.2% of South Africa's exports, particularly in the iron and steel sector (World Bank 2023). Xiaobei et al. (2022) estimate that the EU CBAM will reduce South Africa's exports to the EU by 4% in 2030 (leading to a 0.02% reduction in GDP), mostly caused by a decline of over 30% in cement and iron and steel exports. While relatively modest now, these impacts are likely to increase as the CBAM rules expand to more products and other trading partners introduce similar schemes, particularly as South Africa's carbon intensity remains high and the national effective carbon price is comparatively low.

3.2 Mozambique

As a relatively low carbon-emitting nation, Mozambique's approach to climate change is concerned more with adaptation and resilience to the impacts of climate change. Nonetheless, Mozambique has committed to emissions reductions of approximately 40 million tCO_2eq from 2020 to 2025 in the updated NDC (Republic of Mozambique 2021). The NDC actions do not include any

[15] See SARS FAQs, point 25 (SARS n.d.).

commitment to introduce carbon pricing. However, there is an intention to use voluntary cooperation under Article 6 of the Paris Agreement and the use of the carbon market or new market mechanisms.[16] At the country level, given Mozambique's participation in voluntary carbon markets and its desire to strengthen engagement under Article 6, efforts are underway to support national monitoring, reporting, and verification systems (UNEP 2023). It is recognized that institutional capabilities must be strengthened.

Mozambique is identified as one of the countries that are most negatively affected by the EU CBAM (Luke 2023). Haddad et al. (2024) note that almost 20% of Mozambique's exports may be affected by the EU CBAM,[17] with around 20% of its total exports covered by the EU CBAM. Mozambique has been identified as the most exposed country in Africa to the EU CBAM (Luke 2023). However, the degree of exposure also depends on the carbon intensity of production. Mozambique produces a lot of primary (as opposed to recycled) aluminium. Therefore, based on scope 1 emissions (direct GHGs), Mozambique is the most highly exposed exporter in both absolute and relative terms (because aluminium produced in the EU is largely recycled). However, if scope 2 emissions (indirect emissions) are included in the future, Mozambique's exposure drops and, in fact, the CBAM could increase its relative competitiveness.[18]

There is an added complication, however, in the case of Mozambique, which is seeking to massively increase the share of renewables in its energy consumption (driven by hydro). This is because the energy supply for aluminium production comes from the South African grid. To overcome the challenges of CBAM, an obvious solution is to ensure that production is powered by Mozambique's own grid, reducing embedded carbon and enhancing green competitiveness.[19] As discussed by Keane et al. (2024), this provides an obvious entry point for aid for trade and climate finance.

3.3 Ghana

Ghana's priorities in relation to climate change focus mainly on adaptation and financing rather than on mitigation, given its relatively small share of emissions. Nonetheless Ghana's NDC (published in 2015 and updated in 2021) (Republic of Ghana 2021) sets out 19 policy actions for adaptation and mitigation. It aims to reduce emissions by 64 $MtCO_2e$ by 2030, prevent premature deaths, and create jobs and wider benefits. In parallel Ghana also has multiple developmental needs and objectives which are focused on economic growth and local industrial diversification, expanding employment, and providing public services. In recent years the government has been grappling with rising public debt, expanding fiscal deficits, and increasing debt servicing costs. leaving very little fiscal space for developmental spending (Karimu 2024).

Environmental taxes such as a carbon tax could therefore be a valuable source of revenue as part of a broader fiscal consolidation effort and could contribute to NDC targets. While Ghana does not currently have a carbon tax or ETS, a level of carbon pricing is imposed indirectly through duties on fuels used for transport and electricity generation. Complementary measures also include

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[16] More specifically it states: 'Mozambique supports carbon market efforts, makes actions economically viable within the specific contexts of LDCs, developing countries; and the further development of accounting rules within the United Nations Framework Convention on Climate Change (UNFCCC) to ensure the environmental integrity of market mechanisms and avoid double counting' (Republic of Mozambique 2021: 71).

[17] See Haddad et al. (2024).

[18] See Maliszewska et al. (2023).

[19] Fox (2024) reports the former EU Trade Commissioner and former Director General of the WTO as also noting that the EU should help Mozambique pay for this.

tax on imported vehicles, fees for vehicle registration and reforms in 2005 and 2015, removed subsidies on petroleum products, and the administrative fuel price-setting system. There is scope to raise the levy on diesel and fuel oil, which were assumed to be below the estimated efficient rates. Nonetheless, due to increases in the cost of living, the current political context is highly sensitive and not conducive to introducing new tax burdens on households (Advani et al. 2021).

The case for a carbon tax in Ghana has been considered by external research studies, one of which estimated that the tax base of a carbon tax (measured by the carbon dioxide equivalent (CO_2e) embedded in fossil fuels in 2018) to be almost 14.7 million tonnes, potentially raising approximately 0.7% of GDP (Advani et al. 2021). Another study modelled the effect of a 'moderate carbon charge' (US$25 per tCO_2 in 2021, rising to US$50 by 2030) on emissions reduction in Ghana to be approximately 4% by 2030 with a revenue impact of an estimated US$0.6 billion (World Bank 2021). Local household survey data in Ghana suggests that taxes on fuels for transport and electricity would, however, be broadly progressive: households in the top income decile spend 4% of household expenditure on electricity compared to 2.5% in the bottom decile (Advani et al. 2021), with the top quintile spending over 2% of household expenditure on transport compared to 0.5% in the bottom quintile (ODI 2022).

A new emissions levy became effective from February 2024. It imposes a levy on CO_2e emissions from specified sectors and combustion emissions from vehicles (EY 2024). There does not appear to be any revenue recycling mechanism. Looking ahead, Ghana will need to continue to strive to increase investments in renewable energy alternatives as part of a broader strategy of green economic transformation. In terms of supporting green export competitiveness, Ghana is reported to be struggling to access the latest 'green' technologies or devise a strategy for powering its bauxite-to-aluminium industry because of uncertainties in the 'green' taxonomies of core economies in the Global North. This is because tentative plans to feed Ghana's aluminium industry with relatively 'green' hydropower (also Ghana's cheapest electricity source) are provoking push-back because of the trade-offs involved, while other contestations are emerging around expanding bauxite mining into forest reserves (Acheampong and Tyce 2024).

3.4 Latin America

The approach adopted by Latin America in relation to carbon pricing is diverse, reflecting a significant degree of heterogeneity amongst its countries. Only four countries (Argentina, Chile, Colombia, and Mexico) have established some form of carbon pricing mechanism (Table 3). Mexico is the only country that has established (in 2014) a carbon emission trading system that operates simultaneously with a carbon tax.

Table 3: Carbon taxes in operation in Latin America

	Year of introduction	Average price on emissions covered by a carbon tax, weighted by the share of the country's CO_2 emissions ($ per tonne of CO_2)	Share of CO_2 emissions covered by a carbon price (%)
Argentina	2018	1.84	35.5
Chile	2017	2.62	52.4
Colombia	2017	0.61	11.3
Mexico	2014	1.54	55.6
Uruguay	2022	167	4

Source: own elaboration based on Ritchie et al. (n.d.).

Despite upper-middle-income status, there is a lack of major specific commitments in relation to mitigation measures. For example, in its NDCs, Argentina sets a maximum unconditional emission of 349 $MtCO_2$ by 2030, which represents a reduction of 4% with respect to the emissions in 2016 and a 19% reduction with respect to the peak in emissions in 2007 (MAyDS 2020).

Colombia makes a much stronger commitment and contribution by setting a maximum of 169 $MtCO_2$ in 2030, a 51% reduction with respect to the projected emissions. Mexico, on the other hand, makes a commitment to a maximum of 644 $MtCO_2$ in 2030, a reduction of 51% with respect to the projected emissions. Uruguay has set a target of 9.3 $MtCO_2$ for the year 2030 (Republic of Uruguay 2022).

Chile makes a commitment to a maximum level of emissions of 95 $MtCO_2$ by 2030, a reduction of 30%. However, Chile and Uruguay make an additional commitment to achieve carbon emission neutrality by 2050. The adoption of carbon taxes or trading schemes is at the core of their strategy to comply with these commitments. For example, Chile has had a carbon tax in place since 2017.

These levels of carbon price appear to be substantially lower than the carbon price adopted by the EU CBAM (which is currently around 71 euros/tCO_2)[20]. And in some cases, the level of the carbon price appears lower than what is needed to achieve the NDC target in 2030. For example, in the case of Argentina, Mardones and Andour (2024) suggest a tax rate of US\$20/tCO_2 on all emissions to achieve this objective. Only Uruguay appears to have set a level of carbon tax that yields a price that exceeds the EU implicit CBAM price.

The low levels of carbon price appear to be incompatible with the levels of ambition in relation to mitigation—except in the case of Uruguay. However, the level of the carbon price should be considered within the context of other actions to achieve emissions reductions. All countries apply some type of implicit carbon tax, including the pricing of emissions from road transport in the case of Brazil (OECD 2016).

In general terms the CBAM is expected to have a limited impact on Latin America. Based on the World Bank's Relative CBAM Exposure Index, only Venezuela would appear exposed by virtue of the importance of the EU in its exports of iron and steel. For the rest of the Latin American countries, the exposure is small. Nonetheless, Brazil has been extremely vocal about the rise of unilateral measures like CBAM, including as part of its presidency of the G20.

4 Development issues

At both the national and international levels, there is a need to ensure that carbon taxes support the broader process of greener structural economic transformation. There are other important dimensions to consider in terms of equity, given the major differences in the carbon price of the EU compared to developing countries, valid concerns regarding the transfer of financial resources to the EU, and the need for investments in compliance infrastructure to support compliance with CBAM and boost green competitiveness. While the political and legal implications of this continue to be the focus of international and increasingly bilateral discussions, carbon taxes are a critical component of the broader GIP toolkit needed to support developing countries' own just green

[20] The price of the CBAM certificates will be linked to the weekly average carbon price in the EU ETS.

transition. However, new types of technical assistance and capacity building will be needed to support this process.

4.1 Threats to and opportunities for development

Some of the threats to development relate to the increasing costs, complexity, and competitiveness challenges arising from uncoordinated approaches to pricing and taxing carbon at an international level. These are clear from the concerns arising from unilateral measures like CBAM. Keane et al. (2024) highlighted the risks of a 'green squeeze' arising due to the burden of compliance and in the absence of dedicated support measures. But they also highlighted the opportunities to boost low-carbon competitiveness, particularly for countries that already rely on renewable energy sources.[21] To realize these opportunities, dedicated finance and new forms of international cooperation and support are needed. Developing countries should request impact assessments to guide the design of support measures.

All countries need to respond to the new global trade landscape: global business and supply chains are adapting to the different ways in which carbon is being priced, both implicitly and explicitly. Many lower-income countries already impose a degree of indirect carbon pricing through existing national tax policy, particularly through levies and duties on fuels used for energy generation and transport, but also measures such as taxes targeting fuel use (Granger et al. 2021). Other measures are also influencing production and trade, including new measures to tax emissions associated with international maritime and aviation trade. The combined effects of these measures on competitiveness, including new supply chain initiatives that also cover transportation (known as scope 3), must be fully assessed.

Table 4: Threats and opportunities

Threats	Opportunities
Mitigation policy: CBAM is argued to be shaping country mitigation policy, contrary to the UNFCCC principle of 'common but differentiated responsibility'	Revenue: potential to support domestic green transition efforts, boost productive capacity, ensure mutual recognition, avoid resource transfers
Competition: competitiveness challenges through increasing costs, e.g. aviation/maritime transportation inclusion within the EU ETS, etc.	Nature based markets: 2/3 of NDCs refer to carbon markets; Article 6 UNFCCC and interoperable international carbon markets
Transition: costs of adjustment, upgrading production; skills, training, other labour market implications, need for technology transfer to reduce carbon intensity	Technological: knowledge and technology spillovers, other benefits from decentralized decarbonized energy systems

Source: authors.

There are concerns that indirect carbon pricing systems are not adequately considered by measures like the EU CBAM. This is because of a narrow focus on more direct approaches to pricing carbon (Boute 2024). As a result, there are concerns that countries with more limited institutional capacity to implement more sophisticated pricing systems may be unfairly penalized. This concern is in addition to the overriding criticism that the CBAM is contrary to the UNFCCC's principle of 'common but differentiated responsibility'.[22]

[21] See Keane et al. (2024) for further discussion of Mozambique.

[22] Notably, major concerns that it undermines the principle of 'common but differentiated responsibilities and respective capabilities in light of different national circumstances', as enshrined in Article 4(3) of the Paris Agreement.

4.1.1 Supporting sustainable structural economic transformation

To respond to new competitiveness challenges, boost green credentials, and support countries' own NDCs, consideration of the various dimensions of political economy, and sequencing, are all needed as part of ex ante carbon pricing policy design. In the case of carbon taxation there is a need to consider the interaction with other indirect measures and the broader regulatory framework.

Some handbooks have begun to be developed and the UNFCCC provides some material in view of the preparation of countries' NDCs. In addition international businesses[23] and international organizations such as the IMF have developed approaches (Parry et al. 2012). However, two aspects—revenue recycling and complementary policies—are critical when it comes to ensuring that such measures are supportive of broader sustainable structural economic transformation.

It is vital that revenue recycling systems boost public investments in low-carbon energy supply, production, and related technologies, and provide for broader redistributive measures. This therefore raises important issues related to governance, accountability, and transparency.

4.1.2 Revenue recycling

International organizations (PMR 2019) have begun to provide further guidance in this area. If the US CCA comes to fruition, it will exempt imports originating in LDCs from a carbon border tax and, in addition, will invest 25% of revenue generated from other carbon-intensive imports to the USA in LDC decarbonization efforts (retaining 75% of revenue generated to fund decarbonization in US manufacturers of the goods covered). In comparison to this the original EU CBAM proposal sought to ensure that the revenues generated from LDC exports are redistributed in support of LDC decarbonization efforts that did not make it through the trialogue process.

Instead, member states retain 25% of the CBAM revenues. The remaining 75% are made available to the EU budget by member states once per year (European Commission 2023). The agreement text requires the EU to provide technical assistance to developing countries and LDCs for complying with the CBAM and states that financial support for decarbonization in those countries should come from the EU budget.

This absence of revenue recycling remains highly controversial, with increasing calls for the EU to reconsider or establish a dedicated adjustment mechanism, possibly at the multilateral level, as part of broader aid for trade support. In addition the EU is committed to conducting a complete review of the CBAM in 2027, focusing in part on its impact on the exports of LDCs (European Parliament 2022).

As countries begin to develop their own national carbon taxation systems, it is critical to embed within these the potential for revenue recycling to address distributional issues and to fund complementary policies to support their green transition.

4.1.3 Distributional issues

Although national tax policy on carbon taxes varies globally, most of the existing schemes have been introduced in higher-income countries. Coverage in developing countries is low, reflecting their relatively small share of global emissions and their lower tax administrative capacity, among

[23] ICC Global Environment and Energy Commission, ICC Global Taxation Commission (2022).

other constraints (especially political). Nonetheless, the economic case for carbon pricing applies globally, even if consideration of responsibility and developmental challenges can be reflected in different levels of pricing for different types of country.

Given the high levels of public debt and increased related servicing costs, the revenue raising potential of carbon taxes is of particular interest (even if only in the relatively short to medium term during low carbon transition). The revenue received can support public investment in renewable energy, related technology, and infrastructure, and can build resilience to climate change impacts and finance social safety nets.

However, even though a strong economic case can be made for carbon taxation at the country level, a key consideration is where the burden of taxation falls. In higher-income countries such as the UK, carbon taxation would likely be regressive (Adam et al. 2021). In comparison, the picture across lower-income countries is quite different. This is because household expenditure surveys suggest that fossil fuels and electricity, for example, tend to be consumed relatively more by richer households. These income groups are therefore more likely to bear the greater burden of higher carbon prices and so carbon taxes are found to be broadly progressive (Advani et al. 2021).

Even if broadly progressive, however, carbon taxes can lead to strong public opposition. Effective compensation schemes, such as unconditional or targeted cash transfers using a share of tax revenue raised, can in some cases offset these effects and help to build public support. Modelling of the net impact on households of four carbon tax schemes in the USA, China, Argentina, and Turkey indicates that by 2030 the costs of the tax on the four lowest income deciles could be completely offset by recycling 25% to 30% of the revenues (Parry et al. 2022).

Of the existing carbon tax and ETS schemes, revenues are partly used to fund direct transfers in Switzerland and Ireland. However, mechanisms for effective redistribution systems are nascent or non-existent in many lower-income countries. In addition there are further risks in lower-income countries, such as the potential for households to switch from more highly taxed fossil fuels to informal, untaxed fuels such as wood and charcoal.

These dynamics must be considered within the broader context of the developmental impact of higher energy costs during the transition, in the absence of cheaper alternatives. In 2022, for example, only just over half the population of sub-Saharan Africa had access to electricity,[24] with the push to expand electricity networks, still mostly powered by fossil fuels, often subsidized to facilitate wider access.

4.1.4 Complementary measures needed

In addition to the price signals provided by carbon pricing, complementary measures such as fiscal incentives and regulatory mechanisms can support investment in renewable energy and low-carbon technologies, creating new jobs to help replace (or expand) those lost from carbon-intensive sectors in support of structural economic transformation.

Investment in skills, training, and retraining, coordination between energy sector stakeholders and educational institutions, as well as social safety nets to support workers during the transition (e.g. temporary income support or unemployment support) will be needed to support movement away from fossil fuel-based production systems.

[24] IEA, IRENA, UNSD, World Bank, WHO (2023).

In the context of renewable energy investment incentives, if lower-income countries want to consider them as part of a wider package of measures, designing and managing them in the most cost-effective and targeted ways will be important. This could include shifting to expenditure-based incentives rather than general income tax holidays and indirect tax reliefs (e.g. Abramovsky et al. 2018), as well as undertaking analysis of the factors specific to those sectors that are likely to be influential in promoting investment.

In addition to revenue recycling for direct subsidies and public investment in renewables, many countries offer private investment mechanisms such as tax and financial incentives, auctions, and feed-in tariffs. However, smaller and poorer economies including LDCs and Small Island Developing States typically lag behind other developed and emerging markets in integrating such mechanisms into their renewable energy policies, both in terms of the quantity and cost-effectiveness of mechanisms offered. This may be related to scale and the challenges of limited domestic markets.

Finally, there is a need for new skillsets related to counting carbon, capacity building, and institutional development to secure monitoring, reporting, and verification systems, accreditation, and so on. Depending on the existing capacity of administrative and governance systems, revenue recycling systems will need to be created. New partnerships could be sought to facilitate technology transfer, including the transfers of knowledge, skills, and know-how.

5 Conclusions

This scoping paper explored some of the major issues regarding the choice of carbon pricing instruments and their development implications. It focused on two specific areas—revenue recycling and complementary policies—which seek to minimize the risks of a 'green squeeze' arising, whereby the costs of transition fall hardest on producers least able to adapt. As this review has sought to emphasise, getting the right frameworks in place can potentially boost green competitiveness. However, the country examples have also illustrated the challenges associated with pricing carbon, the weakness in current approaches and institutional frameworks, and, more generally, an absence of focus on these two areas.

There are several issues to resolve at the international level. As this review has shown, many countries already have indirect carbon pricing systems including fuel taxes in place. However, there is a risk that these types of schemes may not be recognized or adequately captured by new unilateral approaches (e.g. the concerns raised regarding the EU CBAM). This reinforces the need for greater sensitisation, as well as greater advocacy to support efforts to secure global agreement on global carbon pricing systems and related support for institutional capacity building.

This scoping paper focused on the need for revenue recycling and support for complementary policies in the design and operationalization of national initiatives, including by big players.

These aspects are missing from the country case studies reviewed: South Africa, Mozambique, Ghana, and selected Latin American countries. This absence reinforces the need for greater consideration of appropriate international support mechanisms that cut across the climate–trade–finance nexus.

In South Africa, which has a carbon tax and carbon credit system, increases in carbon pricing are needed but are likely to have a regressive effect on households. Mozambique does not have any carbon pricing system in place but is the most affected by the EU CBAM in Africa. However, with

the right investments made, green competitiveness could be enhanced. In Ghana, which lacks a carbon tax or ETS, a level of carbon pricing is imposed indirectly through duties on fuels used for transport and electricity generation as well as a new emissions duty, but no provisions are made for revenue recycling. Finally, in Latin America, the low levels of carbon pricing appear to be incompatible with the levels of ambition in relation to mitigation.

The more flexible the structure of production, the easier it will be to replace fossil fuel energy-intensive production methods. However, investment in skills, training, and retraining, coordination between energy sector stakeholders and educational institutions, as well as social safety nets to support workers during the transition (e.g. temporary income support or unemployment support) will be needed. There is a need for new skillsets related to counting carbon, developing monitoring, reporting and verification systems, accreditation, and so on.

Depending on the existing capacity of administrative and governance systems, new revenue recycling systems will need to be created. New types of technical assistance and capacity building will be needed to support this process to ensure that the revenues raised really do support countries' own green transition plans. And this applies both at the national and international levels: revenue recycling and complementary policies will be critical to support sustainable structural economic transformation.

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