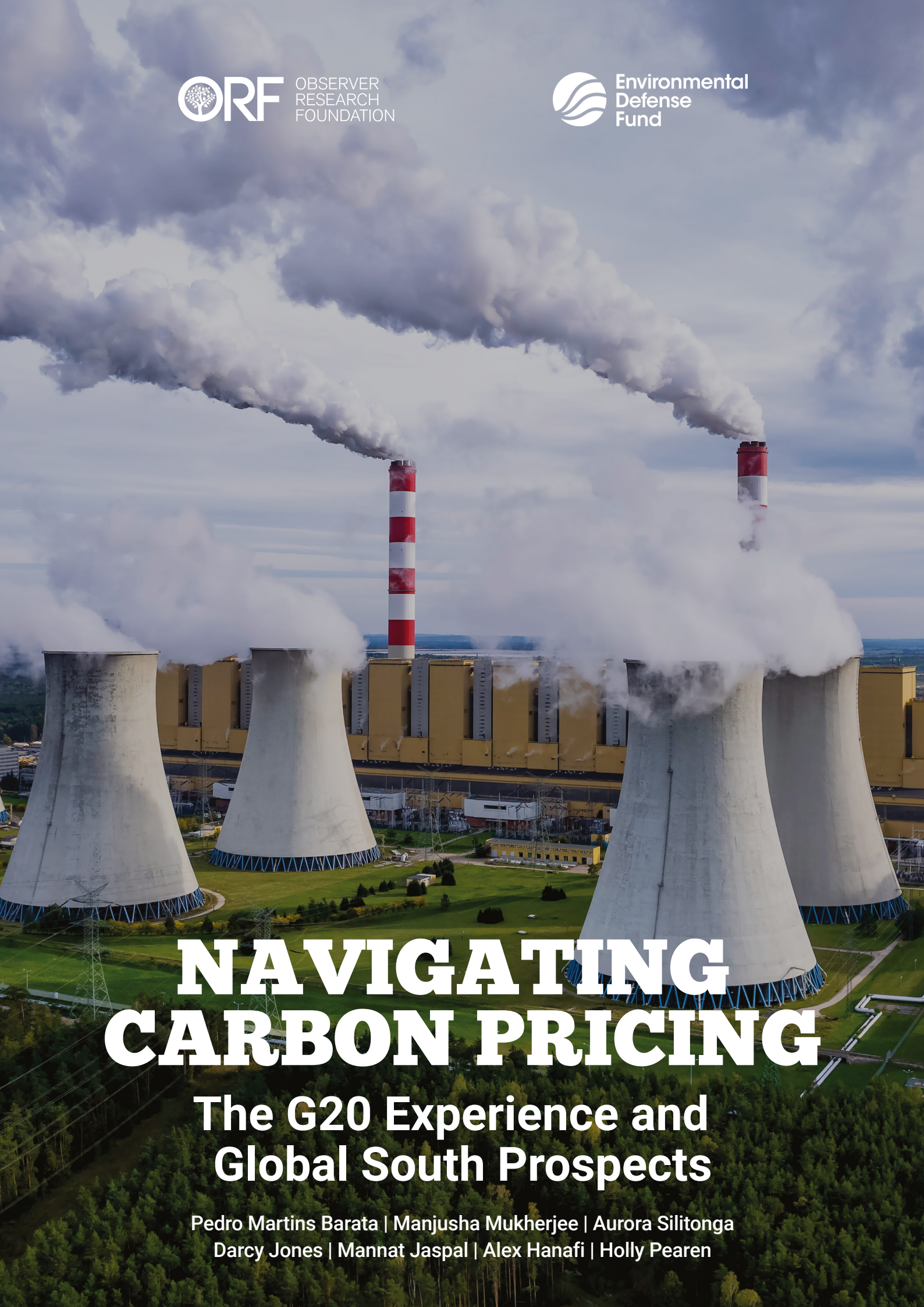

NAVIGATING CARBON PRICING

The G20 Experience and Global South Prospects

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Abstract

CARBON PRICING HAS evolved in the last 20 years, from its early adoption within European climate policy, to its wider use within developing and emerging economies. This growth in the instrument mirrors the increasing commitment from emerging economies, particularly in developing mitigation instruments that can be supportive of domestic mitigation. Despite the potential benefits being clear, at least in theory, the development of carbon pricing tools in emerging economies continues to face challenges.

In the context of India's 2023 G20 Presidency, this report provides an overview of the experience of carbon pricing across the world. It focuses on the benefits of these instruments, the challenges that impede wider adoption, and the plausible solutions that can lead to the faster uptake of these tools by emerging economies. In particular, two sets of issues can slow down the implementation of carbon taxes or emissions trading systems: lack of capacity to design and implement the instruments,

and the social impacts of their adoption. The report utilises a review of the current literature, which indicates that the social impacts of existing carbon pricing regimes have largely been overstated and that, where such impacts are evident, there are design elements that can mitigate and reverse any negative social and income effects of the proposed carbon pricing instruments.

The report also looks at existing capacity-building efforts and initiatives and argues for more coordination across initiatives and a focus on sharing lessons across the Global South. This is particularly important given the growing experiences in Latin America, Africa, and Asia on carbon taxes, emissions trading, and crediting.

Acronyms

ADBI	Asian Development Bank Institute
BCA	Border Carbon Adjustment
CBAM	Carbon Border Adjustment Mechanism
CBDR	Common But Differentiated Responsibilities
CBIT	Capacity Building Initiative on Transparency
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
CPLC	Carbon Pricing Leadership Coalition
ETS	Emissions Trading System
EU	European Union
FDI	Foreign Direct Investment
G20	Group of Twenty
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIZ	Gesellschaft für Internationales Zusammenarbeit
ICAP	International Carbon Action Partnership
ICP	Internal carbon pricing
IMF	International Monetary Fund
JI	Joint Implementation
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
NGO	Non-governmental organisation
PMI	Partnership for Market Implementation
PMR	Partnership for Market Readiness
RGGI	Regional Greenhouse Gas Initiative
UNFCCC	United Nations Framework Convention on Climate Change

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I.

The Context for Carbon Pricing in the G20: Benefits and Challenges

Why Put a Price on Carbon?

Potential Benefits of Carbon Pricing

Carbon Pricing in Action

Context for Carbon Markets in the G20 Countries

Why Put a Price on Carbon?

CLIMATE CHANGE IS widely recognised as a consequence of both market[1] and policy failures.[2] The failure to account for the costs of greenhouse gas (GHG) emissions in the prices of goods and services can be described as a fundamental market failure which has effectively allowed economic actors to exploit the atmosphere as a free resource, encouraging a continued link between fossil fuel consumption and economic growth.[3] Another significant factor driving climate change is policy failure in the form of fossil fuel subsidies and a distortionary tax system that incentivises emissions over environment protection.[4]

Carbon pricing is a well-established economic instrument which can internalise the cost of carbon dioxide emissions in goods and services and, by effect, optimally drive down the costs associated with reducing emissions.[5] Carbon pricing is a cost imposed on units of carbon emitted, or a

proxy for such emissions—in theory, it incentivises polluters to decrease the volume of carbon that they release into the atmosphere. Through this approach, carbon pricing aims to redirect both the production and consumption patterns towards activities with lower carbon intensity and stimulate advancements in technology. Carbon pricing can take various forms, typically, carbon taxes or carbon trading markets.

The concept of internalising externalities, first introduced by economist Arthur Pigou in *The Economics of Welfare* (1920), is underpinned by the argument that individuals and firms tend to disregard the costs imposed on others unless those costs are reflected in their own actions. In this context, a Pigouvian tax on carbon serves as a mechanism to ensure that the costs of emitting GHGs are included in the prices of goods and services.[6] This approach was later popularised by Yale economist William Nordhaus in the 1970s, who argued for assigning a monetary value to the environmental damage caused by GHG emissions, including carbon.[7] Today, it is generally recognised that carbon pricing is important and potentially useful but not a silver bullet and should be complemented with other fiscal policy and mitigation instruments to address market deficiencies and foster innovation while facilitating the adoption of low-carbon technologies.[8]

Potential Benefits of Carbon Pricing

Carbon pricing serves multiple purposes, each contributing to its importance as a policy tool.

The first aim is to correct market failures. By placing a price on carbon, businesses and individuals are incentivised to reduce their emissions, thereby enhancing economic efficiency. This incentive is based on an opportunity cost and is maintained throughout the operation of the carbon pricing system, whether a particular entity reduces its emissions to comply with a cap or decides to purchase allowances or credits to meet its obligation.

Additionally, carbon pricing mechanisms can play a vital role in stimulating investments in low-carbon technologies, renewable energy sources, and energy-efficient practices. Especially when carbon pricing mechanisms are designed to provide medium-term price signals, carbon pricing can promote investment stability and investor confidence, allowing finance to flow towards emission-saving technologies or solutions and encouraging the development of new emission-reducing practices. This not only contributes to a more sustainable future but also fosters innovation, promotes job creation, and spurs economic growth in green sectors.[9] Studies suggest that

investments in sustainable industries have the potential to generate three times as many jobs compared to government spending in the fossil fuel sector.[10] In the context of developing economies, such investments take on greater significance as they support vulnerable sectors and communities in adapting to climate change and achieving just transitions.

Furthermore, carbon pricing can generate substantial revenue for governments, which can be allocated to support climate-related initiatives and regional and social transitions or be redistributed to citizens through dividends or tax cuts, thereby fostering public support for emission reduction efforts.[11] The World Bank's *State and Trends of Carbon Pricing 2023* report highlighted that the heightened ambition and broader application of carbon pricing mechanisms have led to a fivefold increase in government revenues over the past decade.[12] Notably, this revenue surge has seen 40 percent of the funds being allocated to environment-friendly expenditures, while an additional 10 percent has been directed to compensating households and businesses.[13] The European Union emissions trading system (EU ETS) has helped generate over 152 billion euros for the government while reducing emissions by 35 percent since 2005.[14] Initially, revenue from the EU ETS was not allocated to specific ends, with only a general indication at the European level that member states should prioritise expenditure in social transition and innovation. Over time, this policy has changed, with increasing shares of revenues being committed at the EU level for innovation and social cohesion. At the national level, member states have equally tended to earmark revenue to specific policies, such as adaptation infrastructure, technological innovation, and socially just transitions.

Carbon Pricing in Action

Mandatory carbon pricing has been put into practice primarily through two mechanisms. The first is a carbon tax, in which the government imposes a tax on carbon emissions or a proxy thereof, such as the carbon content of fossil fuels.[15] Scandinavian nations were among the pioneers in implementing these carbon levies. In 1990, Finland became the first country to introduce a carbon tax, followed by Denmark, the Netherlands, Norway, and Sweden. In the last 30 years, several countries, including Argentina, Chile, Colombia, France, Germany, Japan, Mexico, Poland, Portugal, Singapore, South Africa, and Uruguay, have initiated carbon taxation policies in one or more economic sectors. Additionally, numerous regional entities, such as the Canadian provinces of Alberta, British Columbia, and Quebec, have implemented their own carbon taxation measures.[16]

The second approach is through an emissions trading system (ETS), or carbon market, which imposes emission limits on economic agents and allows such entities to trade emissions allowances, thereby creating a market-based price for carbon.[17] Trading allows entities within the ETS to decide whether to reduce

emissions or to purchase emission allowances from other entities which may have a surplus or an overall lower cost to emission abatement. In this way, the overall cost of abatement is efficiently minimised across the participating economic actors, and emissions stay within the overall mandated limits. In 2005, the EU initiated the world's inaugural carbon emissions trading system, building on previous experience in the US in the control of criteria pollutants, in particular sulphur dioxide. This EU ETS market is characterised by annual emission caps and pricing determined by the interplay of supply and demand for allowances. Comparable emissions trading mechanisms have since been adopted in Canada, China, South Korea, the United Kingdom, and several states of the United States (US).[18]

According to the World Bank, the percentage of global emissions subject to carbon taxes and emissions trading systems increased from 7 percent in 2005 to some 23 percent in 2023. The same report states that there are 73 carbon pricing instruments currently in operation covering 23 percent of global emissions.[19]

In parallel with developments in these compliance instruments, the world has also seen the emergence of a global voluntary carbon market, wherein companies seeking to decarbonise in line with the objectives of the UN Paris Agreement commit to long-term reduction pathways and purchase carbon credits generated by emission reduction projects and activities.

Finally, companies have also increased their use of implicit (or shadow) carbon pricing in their decision-making. This implies incorporating a carbon price (usually related to the social cost of carbon or to a metric similar to the longer-term carbon price in the prevailing sector in which the company operates) into investment calculations. By doing so, a company can best align its internal investment and operational decisions with the goals of the Paris Agreement.

These carbon pricing instruments are further explored in Chapter 2.

Context for Carbon Markets in the G20 Countries

The concept of carbon pricing offers a spectrum of benefits, with three core advantages. First, it promotes sustainable growth by incentivising cleaner and more energy-efficient practices, thereby fostering an environmentally responsible economy. Second, it serves as a magnet for investments, attracting capital for renewable energy projects and technology innovations that drive environmental progress. Third, carbon pricing contributes to substantial emission reductions, steering societies toward a lower-carbon future.[20]

However, alongside these benefits come a series of challenges that must be carefully addressed. For one, equity concerns are paramount throughout emissions mitigation policies. To avoid

inequity, carbon pricing mechanisms need to be designed in ways that do not disproportionately burden vulnerable or marginalised populations.[a] Ensuring industrial competitiveness is another challenge, as businesses need to remain competitive in a global market while undergoing the transition to cleaner practices. Additionally, the effective design and implementation of carbon pricing policies is crucial to maximise their potential benefits and minimise unintended consequences. Balancing these benefits and challenges is essential for achieving a successful and equitable carbon pricing strategy.[21]

Despite these challenges, the benefits of carbon pricing make a compelling case for carbon pricing mechanisms, particularly within the G20 countries, since they account for over 80 percent of global GHG emissions.[22] Mitigation instruments such as carbon pricing will prove to be a useful addition to the fiscal policy toolkit to reduce emissions as well as augment revenues.[23] There is growing recognition among the G20 countries of the imperative to transition towards net-zero GHG emissions to mitigate the existential dangers associated with climate change. Many nations have taken proactive steps by setting ambitious targets for reducing emissions. The implementation of carbon pricing measures can serve as a highly effective means to accelerate progress and attain the renewable-energy and energy-efficiency interim goals set for 2030.

Box 1: About the G20

The Group of Twenty (G20) is the premier forum for international economic cooperation. It plays an important role in shaping and strengthening global architecture and governance on all major international economic issues. The G20 comprises 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom, and United States) and two regional bodies (the European Union and the African Union). The G20 members account for 85 percent of global GDP, over 75 percent of global trade, and two-thirds of the world population.[24]

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[a] Note: 'Vulnerable population' refers to groups of people particularly susceptible to adverse impacts or risks associated with carbon pricing policies, such as low-income households, rural communities, Indigenous people, elderly and children, populations dependent on carbon-intensive industries, and those lacking access to alternative energy sources or located in areas prone to climate-related hazards. 'Marginalised population' refers to groups of people who are systematically disadvantaged due to social, economic, or political factors. Marginalised populations can overlap with vulnerable populations in the context of carbon pricing but also include groups facing discrimination based on race, ethnicity, gender, disability, sexual orientation, or socioeconomic status.

The G20 nations encompass a wide range of economies, from highly industrialised to emerging markets. While these nations exhibit diverse economic structures, they share common values and objectives in addressing climate change and emissions reductions. Carbon markets, due to their flexibility and market-oriented mechanisms, offer an avenue for these economies to tailor carbon pricing policies that suit their specific contexts. Tailored policies can assist in achieving ambitious emission-reduction targets while promoting economic diversity, equity, and innovation. Furthermore, carbon markets can facilitate international collaboration by allowing emissions trading, enabling countries to work together in achieving these emission reduction targets. Looking ahead, 122 of the 195 Parties to the Paris Agreement[25] have indicated in their updated Nationally Determined Contributions (NDCs) that they are planning or considering the use of carbon pricing to meet their NDCs.

Experts from international organisations such as the International Monetary Fund (IMF)[26] have therefore called for a minimum agreement on levels of carbon pricing,[27] while the European Commission[28] addressed its counterparts in the G20, encouraging them to join in carbon pricing regimes. As per the World Bank's High-Level Commission on Carbon Prices,[29] in order to adequately limit global warming, countries would need to establish a carbon price ranging from US$50 to US$100 per tonne by 2030. The IMF further proposed a three-tier price floor featuring a progressive schedule of minimum carbon prices, which starts with a price of US$25 per tonne for low-income countries, followed by US$50 per tonne for middle-income countries, and US$75 per tonne for high-income countries. In tandem with other mitigation policies, it is believed to hold the potential to achieve a 23-percent reduction in global emissions below baseline by 2030.[30] However, the median global carbon tax currently stands at US$26 per tonne, while the median cost of allowances within carbon-trading systems is US$20 per tonne. Meanwhile, the EU ETS price has fluctuated between 60 and 100 euros since 2018. This median price, resulting from both taxation and trading, exhibits substantial variations based on the level of development in individual countries.[31]

It is thus safe to say that carbon pricing levels in existing regimes are not currently commensurate to the task of aligning our trajectories with the 1.5°C limit. Why then should G20 countries consider carbon pricing as a policy tool? First, G20 countries should use carbon pricing strategically for the service of more rapid decarbonisation of their economies as they build competitive economies geared for the global market. Carbon pricing policies can enhance the local and global competitiveness of manufacturing and industry. This will be particularly relevant as more consumers and countries move away from higher-

carbon-intensive products to lower-carbon alternatives. Already, this energy transition is being felt and is upending global patterns in many sectors, such as automotives manufacturing.

Second, strategic fiscal policies that utilise the revenue generated from carbon pricing can help alleviate the initial economic costs associated with the adoption of carbon pricing schemes. Nonetheless, the path towards increased adoption by G20 countries must be country-owned and sensitive to the particular challenges of carbon pricing adoption in fast-growing economies, including the need for robust institutional frameworks, capacity building, and addressing potential competitiveness and equity concerns. These challenges can and should be addressed in the design of domestic carbon pricing approaches if carbon pricing policies are to be effective, efficient, and equitable. As more countries across the Global South consider and implement carbon pricing mechanisms and participate in carbon markets, South-South policy diffusion and the sharing of experience and lessons learned may be particularly valuable in tailoring solutions to these challenges.

II.

Existing Carbon Pricing Instruments in the G20: Industrialised vs. Emerging Countries and the Learnings So Far

Types of Carbon Pricing

AS MENTIONED IN the previous section, most compliance applications of carbon pricing fall into two categories: carbon taxes and emissions trading systems. This section details their current level of application across jurisdictions within the G20, and draws some common learnings from their implementation.

Types of Carbon Pricing

i. Carbon Tax

A carbon tax directly sets a price on carbon by defining an explicit tax rate on GHG emissions.[32]

Carbon tax is one form of compliance-based carbon pricing policy. The tax is levied either on the carbon emissions of an activity or the carbon content of the fossil fuel used for that activity.[33] With this approach, governments can take a more tailored strategy by differently taxing industries and entities based on their emissions and taking

into account their competitiveness, such as by levying higher taxes on higher-emission industries. By establishing a specific price on emissions, a carbon tax gives the market high certainty to inform investment decisions and manage risks resulting from mitigation activities.

In comparison with other carbon pricing instruments, carbon taxes are fairly straightforward and easy to administer. New carbon taxes can be integrated quickly through legal, administrative, and technological infrastructure that likely already exists.[34] On the legislative front, governments must enact clear and encompassing laws that define the scope, rates, and applicable industries subject to the carbon tax. Administrative mechanisms involve the appointment of the responsible agencies or divisions within the Ministry of Finance tasked with tax collection, monitoring, and enforcement, staffed by experts in environmental economics and taxation.

Carbon taxes can be applied at a variety of points along supply chains, depending on the existing infrastructure, industry characteristics and size, and political conditions and priorities. For instance, a carbon tax could be levied on fossil fuel industries at points of extractions or applied to car users' emissions to reduce transport-based emissions. Typically, the carbon tax should be applied at the point nearest to the decision-maker that is most responsible for the emission and can therefore act more in response.

Because of its ease of administration, a carbon tax is often encouraged as an entry point for more sophisticated carbon pricing policies. Carbon taxes also provide a revenue source for government budgets. Countries that currently implement carbon taxes collect revenues accounting for as much as 0.04-1.2 percent of GDP annually[35] (See Table 1 for carbon tax prices and revenues in G20 countries).

However, because of the ease of administration, it is important that carbon taxes are not easily altered on an unpredictable basis. Experience has shown that some forward clarity about tax levels is necessary if the tax is to help guide business decisions.

One limitation of a carbon tax is that it does not directly limit actual emissions. Although the tax rate can be calculated to deliver a certain amount of expected reductions, the actual emissions reductions depend on myriad other factors in the market, such as each firm's efficiency and size, and other climate policies. For example, if renewable alternatives are more expensive than fossil fuels and if a carbon tax is not sufficiently high, companies might be inclined to pay the tax without transitioning to renewables. Getting the carbon tax rate correct is important for its climate effectiveness.

To avoid protracted situations of ineffectively low levels of carbon taxation, countries have experimented with carbon tax "escalators", i.e., scheduled and announced increases in the carbon taxation level. This sort of progressive increase can also help companies or other regulated entities to adopt and not oppose carbon taxation. However, such escalators run the risk of a too-gradual

increase, which opens the door for political pressure to delay the successive steps.

Integral to any carbon pricing infrastructure is the implementation of a robust measurement, reporting, and verification (MRV) system. This involves deploying technologies or other systems for emission tracking such as satellite imagery, sensor networks, and emissions tracking software to track taxable entities. Just like ordinary taxes, there should also be auditing or third-party verification procedures put in place, which are crucial to ensure transparency and accountability. To address these environmental integrity concerns, some commentators have proposed adding quantity-based provisions to price-based carbon tax policies. These environmental integrity mechanisms (EIMs) would help ensure that an expected or predicted emission reduction pathway is actually achieved.[36] EIMs can range from strong regulatory backstops to far less certain forms of policy review.

ii. Emissions Trading System

Another common form of carbon pricing is an emissions trading system (ETS), in which a government decides the level of emissions reduced and lets the market decide the price of carbon, and emitters can trade emission units to meet their emission targets.[37,38] Also known as cap-and-trade, the system is managed by a governing body that sets a limit on carbon emissions and/or other greenhouse gases. Liable entities in the sectors covered by the system receive unitised emissions allowances, giving them the right to emit a tonne of carbon, and must ensure that their operations stay below their allowance level. They can buy more allowances from other entities or sell unused ones. This system establishes a market price for emissions by creating supply and demand for allowances. Industries with lower emissions can trade surplus allowances with larger emitters, incentivising them to reduce their emission to avoid buying more in the future. Furthermore, the cap ensures that the country overall can remain below its pledged emissions.

To establish an ETS, governments will require more sophisticated infrastructures to set up the market and circumvent its possible inefficiencies. The foundation of an ETS includes a well-defined legislative framework outlining emission reduction targets, allowance allocation, and compliance mechanisms.[39] Administrative bodies are essential for overseeing allowance issuance, emissions monitoring, MRV, and data reporting. Accurate measurement methods like continuous monitoring can help ensure market transparency. There should also be regular cap adjustments so that the regulated emissions levels are kept in line with the ETS jurisdiction's climate commitments across time horizons. Public engagement, stakeholder collaboration, and international coordination enhance political support and efficiency.

These ETS instruments almost always built from scratch are typically housed in the Ministry of Environment (or its equivalent), with close cooperation with other ministries. Additionally, unlike a carbon tax, an ETS usually operates at the midstream or downstream junctures of the industry. At these points, the ETS can include the major players that are in charge of the larger chunks of emissions and exclude smaller actors, and this policy is usually an advanced extension of a pre-existing carbon pricing scheme.[40]

Regardless of these more complex implementation steps and requirements, an ETS is still a powerful carbon management tool. It is one of the cheapest ways to accomplish emissions reduction.[41] Within this system, conducting trades within the specified cap minimises costs for households and businesses while effectively enforcing necessary emission reductions. Imposing strict mandates or regulated pricing might not reliably achieve desired reductions. Emissions trading also establishes thorough monitoring and verification of emissions, thereby maintaining the credibility of policies. This strategy is more responsive to economic fluctuations compared to centrally administered taxes, as demonstrated in Europe, where prices decline during economic downturns. Emissions trading stimulates ingenuity, identifying economical strategies for businesses to improve sustainability, such as investing in energy efficiency. This is in contrast to inflexible technology mandates that can lead to higher compliance expenses.

Box 2: ETS Success Stories[42]

A classic success story for ETS is the EU ETS, established almost two decades ago, in 2005. The EU ETS is a pivotal element of the EU's climate change strategy, covering approximately 38 percent of the bloc's emissions through 10,000 stationary installations in sectors including energy, industry, and EU-based aviation. Governed by Directive 2003/87/EC and entering its fourth trading phase in 2021 (2021-2030), the EU ETS witnessed revisions in 2018 for Phase 4, with further reforms introduced in 2021 to align with the European Green Deal and the updated target of achieving at least 55 percent net emission reductions by 2030 compared to 1990 levels. Cumulative revenue amounted to 139.5 billion euro (US$158.4 billion) since inception, with 38.8 billion euro (US$40.8 billion) generated in 2022, exemplifying the EU's ongoing commitment to effective emission regulation and adaptive climate action. The cap for 2022 stood at 1,529 MtCO2e for stationary installations and 28.4 MtCO2e for aviation, yielding an average auction price of 78.91 euro (US$83.10) and a secondary market price of 80.82 euro (US$85.11). This cap is allocated to industry

players through auctioning and free allocation based on benchmarking, and the use of carbon offset credits was allowed only up to 2021. While the EU ETS is now considered a successful instrument, it was plagued in its early years by an over-supply of allowances and a surplus of carbon credits that, in the presence of weak demand in the years corresponding to the European financial crises of 2008-2009 and 2011-13, led to a depressed price. The introduction of a Market Stability Reserve and other quantity management tools led to a sustained increase in the price level for allowances, which held steady even in the face of the recent upheaval in energy prices in Europe. The ability of the EU ETS to learn and adapt was crucial for its longer-term success.

Much like the EU ETS, many other carbon markets have revised and strengthened their coverage, cap stringency and/or other key design elements over time. Globally, there are also observable trends of policy diffusion enabling the avoidance of past first-of-kind ETS teething problems and challenges, which have contributed to the improvement over time of ETS standards. A 2023 study of the efficacy of California's cap-and-trade system in reducing toxic air pollution disparities between disadvantaged and other communities found that disproportionate exposure to air pollution was successfully reduced, but not eliminated. The study recommended facility-specific emissions caps to lock in benefits for disadvantaged communities. Other US states, including New York and Washington, are building on California's experience and integrating environmental equity concerns into their carbon-pricing rules from the start. Another 2023 study of California's ETS similarly concluded that more stringent emissions caps can also reduce local air pollution but that carbon pricing alone should not be considered a primary policy tool to address local air quality issues. Instead, policies that specifically address environmental and social equity concerns should be considered in tandem with market-based policies. For more on the social challenges of carbon pricing policies, see Chapter 3.

Table 1: ETS and Carbon Tax Price and Revenues in G20 Countries

	ETS		Carbon Tax	
Countries	**Coverage of Jurisdiction's Emissions**	**Price and Revenue (2023)**	**Coverage of Jurisdiction's Emissions**	**Price and Revenue (2023)**
Argentina	-	-	20%	$3/tonne $167 million
Australia	N/A	$11/tonne		
Brazil	-	TBC	-	-
Canada	1%	$48/tonne $86 million	30% (fuel tax)	$48/tonne $5.45 billion
China	31%	$8/tonne N/A	-	-
France	w/ EU	w/ EU	35%	$49/tonne N/A
Germany	40%	$33/tonne $6.96 billion	-	-
India	-	-	-	-
Indonesia	26%	~$4.5/tonne N/A	WIP	TBC
Italy	-	-	-	-
Japan	TBC	N/A	75%	$2/tonne $1.65 billion
Mexico	40%	N/A	44%	$4/tonne $239 million
Russia	-	-	-	-
Saudi Arabia	-	-	-	-
South Africa	-	-	80%	$9/tonne $95 million
South Korea	74%	$11/tonne $243 million	-	-
Türkiye	TBC	N/A	-	-
UK	28%	$88/tonne $7.6 billion	24%	$22/tonne $873 million
African Union	-	-	-	-
USA	Regional	-	-	-
EU	38%	$96/tonne $42.2 billion	-	-

Notes:

- *All currency is expressed as US dollars (US$). Prices are presented in US$ per tCO_2e.*
- *Prices are not necessarily comparable between carbon pricing initiatives because of differences in the number of sectors covered and allocation methods applied, specific exemptions, and different compensation methods.*
- *Data was last updated on 31 March 2023.*

Carbon taxes and ETS are becoming increasingly common, with many jurisdictions implementing both, along with other non-market-based carbon policies. A 2018 comparative study of the effectiveness of carbon taxes and ETS found that both instruments reduce emissions but ETSs "have performed better than carbon taxes on the principal criteria of environmental effectiveness and cost-effectiveness."[44]

iii. Crediting Systems

A crediting mechanism designates the GHG emission reductions from project- or program-based activities, which can be sold either domestically or in other countries. Crediting mechanisms issue carbon credits according to an accounting protocol and have their own registry. These credits can be used to meet compliance under an international agreement, domestic policies, or corporate citizenship objectives related to GHG mitigation.[45]

Often used in conjunction with other carbon pricing policies and ETSs, carbon credits are emission units issued by a carbon crediting program that represent an emission reduction or removal of GHGs generated by an approved activity, project, or program, usually calculated from a baseline or projection scenario. When purchased, carbon credits enable individuals or groups to financially support projects that combat climate change. These credits may be traded domestically or abroad to help buyers achieve compliance towards domestic or international climate commitments, or towards corporate voluntary climate commitments.[46]

Carbon credits offer an innovative mechanism to incentivise emissions reduction or removals by enabling individuals and companies to invest in sustainable projects that offset their own carbon footprint or help them comply with domestic climate obligations.[47] By financially supporting initiatives such as reforestation, renewable energy projects, and energy efficiency improvements in developing countries, carbon credits not only contribute to global emissions reduction but also foster sustainable development and economic growth in vulnerable regions. This approach can encourage environmentally responsible behaviour; it could also have a positive impact on local communities and ecosystems if designed properly and prudently.

So far, several jurisdictions have incorporated a form of crediting system into their overall carbon pricing policies, such as the EU (until 2020), South Korea, and China.[48] In the early implementation of the EU ETS, Joint Implementation (JI) and Clean Development Mechanism (CDM) credits were used for up to 10 percent of the compliance obligation of each covered entity. In 2009, however, concerns by the EU about the cumulative surplus of carbon credits, as well as perceived issues with the environmental integrity of such credits led to the EU's decision to not allow any more carbon credits into the system, except from a

very small number of jurisdictions. This move was aimed at stopping carbon pricing from lowering further, but credits in the early days were necessary to encourage engagement and integration towards the ETS. Similarly, in Korea's ETS, domestic offsets are allowed to fulfil up to 10 percent of total allowance. Beginning in 2018, international offsets also became eligible to assist compliance as long as it is converted to Korean Carbon Units (KCU). Some countries with a carbon tax, such as South Africa and Colombia, allow emitters to meet their carbon tax obligation by using carbon credits generated from domestic projects.[49]

Despite these benefits, carbon credits are still plagued with accountability and verification issues. If carbon credits lack quality, their use could undermine climate action.

It is crucial to consider the associated challenges and expenses of carbon credits. A key concern is whether corporations and nations view carbon credits as a means to evade the responsibility of reducing their own carbon emissions, resembling a strategy to escape the consequences of their actions. Another concern is the complexity of confirming the ecological advantages of carbon credits.[50] Numerous analyses of carbon credit markets have discovered instances of "over-crediting", wherein credits are generated with calculations of greater emissions reductions than they genuinely deliver.[51]

Producing carbon credits involves challenges in proving emission reductions and accurately measuring GHG reduction or removal, requiring well-documented standards, protocols, and reliable verification processes to ensure effective reduction of atmospheric GHG levels. New and emerging large-scale programs, including jurisdictional-scale carbon crediting programs, may help elevate the quality of emission reduction credits by addressing some of these key environmental integrity challenges.[52]

iv. Internal Carbon Pricing

Internal carbon pricing is a tool an organisation uses to guide its decision-making process in relation to climate change impacts, risks, and opportunities.[53] While externally imposed carbon pricing falls under the purview of policymakers, companies can also voluntarily assess the financial cost associated with GHG emissions through internal carbon pricing (ICP).

Most companies are adopting this policy to support their climate commitments around energy efficiency, future climate, and GHG regulations, as well as to branch into low-carbon opportunities and investments. By assigning a monetary value to carbon emissions, companies can effectively identify and manage climate-related pain points and internalise carbon reduction into their overall strategies. With an ICP that reflects each company's unique operations and characteristics, management can gain insights into the company's emissions

sources, the right incentives to achieve reduction targets, and how to efficiently allocate finances into both cost- and emission-efficient projects and strategies.

In 2020, the median ICP price was US$25/tCO2e. As of 2020, over 5,900 companies globally have adopted an ICP or had plans to do so, including nearly half of the world's 500 biggest companies by market capitalisation. This represents an 80-percent increase since 2015.[54] Some 6,000 companies worldwide reported their ICP plans and data in 2020.[55] Among these, around 24 percent—or almost 1,000 companies—are based in G20 countries,[b] with 600 of those companies based in the EU. The US and Japan followed, with 264 and 252 companies adopting an ICP, respectively.

An ICP is being adopted by many other types of institutions, such as governments and financial institutions, as a key factor in their decision-making process. This is especially essential during infrastructure and project appraisals—internalising future social and abatement cost into their investment evaluation as another form of prudent risk management.[56]

v. Other Forms of Carbon Pricing

The Paris Agreement and Article 6

The Paris Agreement sets the framework for international climate action, including several key features such as the continuous ratcheting up of ambition through the cyclical submission of Nationally Determined Contributions (NDCs) by all Parties to the Agreement. These NDCs are reviewed and enhanced every five years, and countries are meant to increase their ambition in line with the overall requirement of achieving carbon neutrality globally in the second half of this century.

As part of the Agreement, Article 6 provides for three separate ways for countries to cooperate in the implementation of their goals. Two of these three Article 6 instruments can adequately be called carbon-market-based frameworks. Under Article 6.2, two or more countries can notify the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat of their intent to pursue a "cooperative approach". A number of principles apply, under which countries can then trade with each other on the basis of "internationally transferred mitigation outcomes". This broad term implies that the units that could be traded under Article 6.2 could come from a variety of instruments, such as carbon credits from domestic or international crediting systems or emission allowances from linked emissions trading systems (such that a unit used for compliance under country A's ETS can be used in country B's own system). Switzerland and Ghana have already notified the UNFCCC of their intent to cooperate under such system.

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[b] Non-regional members only.

Article 6.4 of the Paris Agreement provides for a carbon crediting system modelled in large part on the Kyoto Protocol's Clean Development Mechanism (CDM). Under this Article, project developers will be able to submit their project in accordance with pre-approved methodologies and protocols to a centrally nominated Supervisory Board that responds to the Conference of the Parties of the Paris Agreement. There is ongoing work in establishing the basic elements of the framework for methodology submission, as well as the accreditation of validation and verification bodies and other infrastructure. It can be anticipated that Article 6.4 will start issuing credits in the next two years if sufficient progress is made on the setting up of the infrastructure.

Carbon Border Adjustment Mechanism (CBAM)

A carbon border adjustment mechanism (CBAM) is a policy tool designed to address carbon leakage and promote climate goals by imposing carbon tariffs on imported goods or other trade measures on certain products based on their carbon content to ensure they meet the same emissions standards as domestically produced goods. A CBAM is intended to prevent the relocation of carbon-intensive industries to regions with less stringent climate policies, thus protecting the effectiveness of domestic carbon pricing and emissions reduction efforts. The EU has been the first to legislate a CBAM, which is phasing into implementation during 2024-26. Its impacts have been analysed but are yet to be evidenced. In response, there has been an increasing worldwide recognition of CBAMs as a potential carbon pricing tool to address carbon leakage and also to promote emissions mitigation through a signal to other trading regions to adopt their own equivalent domestic carbon prices or ETS. Canada, Japan, the United States, and the United Kingdom are now also considering similar border carbon adjustment (BCA) mechanisms.

Implementing CBAMs can be complex, however, requiring accurate measurement, verification of the carbon content of imported products, and negotiation and agreements with trading partners. This is part of the reason for the EU's phase-in approach. There is also concern that CBAMs can potentially shift the burden from industrialised to emerging economies and come across as a discriminatory policy measure in international trade.[57] If introduced in high-income economies with more ambitious climate mitigation targets, CBAMs' trade impacts might adversely concentrate in low-income economies going at odds with the common but differentiated responsibilities (CBDR) principle of the Paris Agreement.[58]


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III.

Understanding and Mitigating the Social Challenges of Carbon Pricing

Assessing Social Challenges and Inequality Impacts

Tools to Address Distributional Issues in Carbon Pricing Development

Evidence from Fossil Fuel Subsidy (FFS) Removal

Conclusion on Social Impacts and Policies

DESIGNED TO INTERNALISE the external costs of carbon emissions, carbon pricing holds immense promise as an emission reduction tool to incentivise low-carbon transition and presents a complex tapestry of social challenges. Distributional implications for the public and impacted economic sectors are important considerations in evaluating carbon pricing policies. Existing literature reveals that actual results depend on a variety of circumstantial factors such as income, energy consumption patterns, and geographical variations as well as carbon pricing design and methodological approaches. To address specific distributional impacts and anticipated political considerations, financial resources and institutional capacity can be deployed in concert with carbon pricing. Therefore, it is crucial for governments to evaluate their national circumstances for the choice of carbon pricing.[59]

This chapter is organised as follows: The first section provides the distributional implications

of carbon pricing policies that can be reasonably anticipated as social challenges in various economies along with their theoretical and empirical evidence. The second section describes the potential financial and policy solutions that may be used to address anticipated distributional and political challenges associated with carbon pricing policies and the existing literature that assesses the experiences of nations that have implemented such policies.

Assessing Social Challenges and Inequality Impacts

As the environmental benefits of carbon pricing policies are increasingly being documented, lessons learned from implementing jurisdictions indicate that the social and economic impacts must be assessed and addressed to achieve optimal outcomes. Social and equity impacts are highly dependent on the unique features of a given jurisdiction, including economic development status, household average incomes, regional disparities, and re-investment policies. Understanding who pays and who receives dividends from carbon pricing policies, and the associated impacts on vertical equity (across different income groups), horizontal equity (within income groups), sector competitiveness, and social factors can help policymakers anticipate political repercussions, consider mitigating policies, and design appropriate backstops.

Current literature mostly draws consensus on a qualitative pattern that carbon pricing significantly reduces GHG emissions, but these reductions are also associated with output and employment losses if not complemented and compensated with appropriate policies. Indeed, a prediction-based impact assessment of carbon pricing schemes in developing countries shows a systematic trade-off between emissions reduction and economic activity. Revenue recycling, however, can mitigate the impact on production and employment. Tax discounts or exemptions to vulnerable sectors can be introduced by the government under a carbon tax to mitigate its economic impacts.[60]

Several policy experiment studies—such as removing subsidies, together with introducing carbon tax without revenue recycling, revenue redistribution through lump-sum transfers to producers and consumers, recycling carbon tax revenues towards endogenous corporate or production tax, and lump-sum transfers as opposed to proportional tax reductions—have found that revenue redistribution can significantly limit the negative impact of carbon taxes on the GDP.[61,62,63] However, these are mostly predictive studies, and the empirical evidence is limited for the impacts of carbon taxes on different economies, populations, and geographies. This report delves deeper into some of those empirical impacts, evaluated at a disintegrated level from the perspectives of both industrialised and emerging economies.

The impacts of implementing an ETS or cap-and-trade system can vary widely depending on the design, stringency,

and implementation of the ETS, as well as the socioeconomic context of the country. ETS implementation could, for example, lead to economic adjustments in industrialised countries, changing the workforce composition from carbon-intensive sectors to cleaner and sustainable sectors. Increased energy, transportation, and goods and services cost will remain constant across economies. Emerging economies can particularly face challenges in economic development. They have limited capacity to transition rapidly to cleaner technologies and have limited choice, if at all, to react to the increased cost burden. This can impact their access to essential services and energy security, interfering with their poverty-alleviation goals.

Developing countries will require access to international climate finance mechanisms to support clean development projects, capacity-building assistance to implement and manage ETS effectively, and cleaner technology and knowledge transfer to foster economic growth. Irrespective of the economies, the social impacts of ETS underscore the importance of a comprehensive and balanced approach to carbon pricing that considers the specific environmental and economic circumstances and equity dimensions.

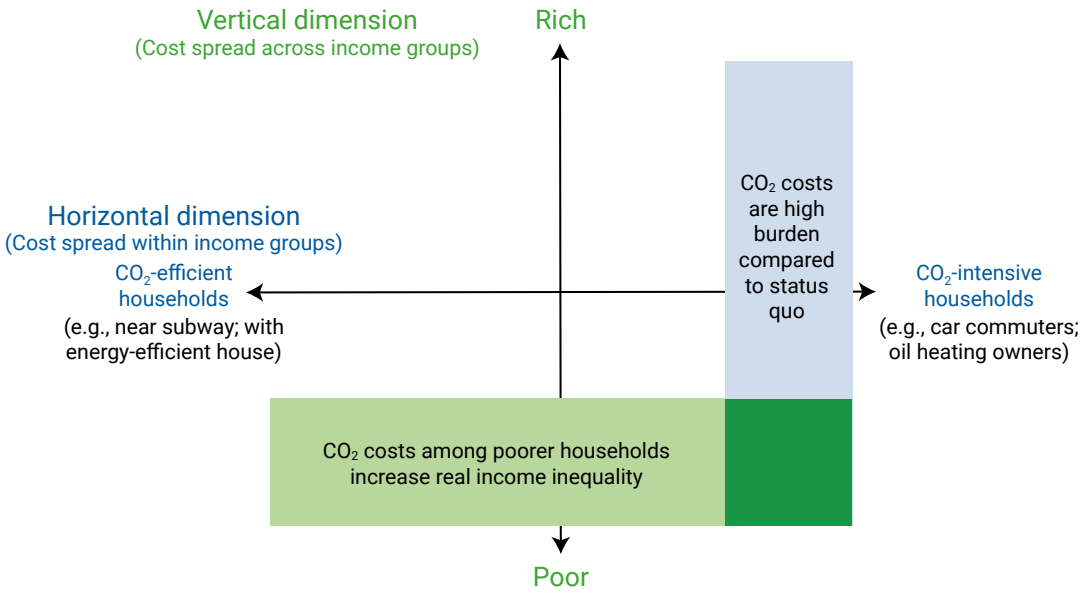
i. Vertical Equity: Impact on Households

Carbon pricing mechanisms like carbon taxes or cap-and-trade systems increase the price of carbon, but the relative impacts on households will depend on income distribution, stage of development, and countermeasures, among other factors. In general, carbon pricing policies may be regressive in developed countries and progressive in developing countries.[64,65] One of the main and politically crucial stakeholder groups to be impacted by carbon pricing's distributional dimension are households. Household carbon footprints vary based on direct consumption of fossil fuels and indirect consumption of goods and services that use fossil fuels in their production or distribution, and ability to access low-carbon alternatives. In theory, households at the high- and middle- income range tend to have larger carbon footprints and will therefore pay more under carbon pricing schemes in absolute terms. However, relative to their household income and expenditures, upper-income consumers generally pay less than lower-income households. In this way, carbon pricing policies may be regressive—i.e., they place a proportionally higher burden on lower-income individuals and communities. This regressive nature can lead to increased income inequality.

Lower-income households can be particularly impacted by carbon pricing in several ways. First, increased expenditures, including higher energy cost, higher cost from goods and services from GHG-emitting sectors, increased transportation, and heating and cooling costs disproportionately affect low-income households as they often spend a larger share of their income on these although they consume less.

Second, loss of employment and income in households working in GHG-emitting sectors, particularly as lower-income workers, may lack additional labour skills or the means to achieve them. The third factor is the exacerbating energy poverty and its consequences.[66]

Figure 1. Vertical and Horizontal Dimensions of Equity[67]



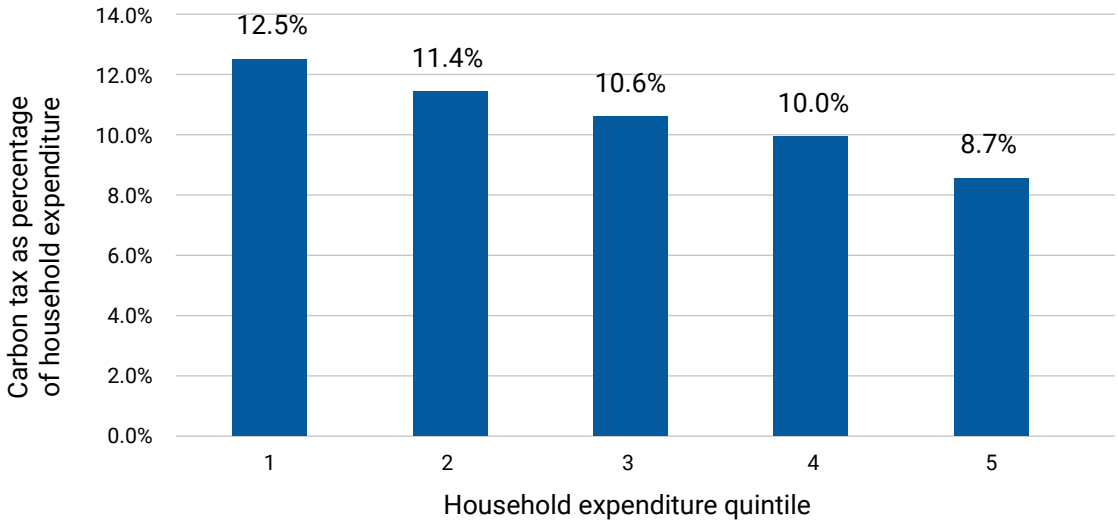
A UN report on Carbon Pricing defines 'household impacts' by using two components: a) 'use-side impacts' or the policy impact on the relative prices of goods and services purchased by households and, consequently, on household expenditure; and b) 'source-side impacts' or the policy impact on nominal wages, capital, and transfers and, consequently, on household income. Carbon pricing is generally found to be regressive on the use side as lower-income households spend a larger share of their income for goods of primary necessity which are mostly carbon-intensive.[68] Source-side impacts are, however, progressive, reflecting the capital-intensive nature of carbon-intensive industries. Thus, the burden of a carbon tax may fall more on capital than on labour, resulting in less returns in capital than in labour. Since capital income represents a larger share of richer households' total income, the impacts from reduced capital are progressive. If implemented with appropriate revenue recycling policies, source-side impacts may dominate the

use-side impacts, leading to an income-progressive outcome.

Socially unbalanced impacts of carbon pricing on the households are also represented as the 'vertical' and 'horizonal' dimensions of inequality. Vertically, or across different income levels, carbon pricing puts a larger burden on low-income households in most high-income countries. If there are no compensatory measures, the pricing tends to increase, as does the societal inequality in real incomes across income groups. On the other hand, carbon pricing puts a larger burden on CO_2-intensive households, independent of their income distribution positions. The variations in CO_2 intensity, even when income is controlled, is the horizontal dimension of inequality. Increasing the horizontal inequality of carbon pricing may not necessarily increase the overall inequality in real incomes, but it remains politically and economically significant for the individual loss aversion which eventually leads to public resistance (Figure 1).[69]

An evaluation of the distributional incidence of a carbon tax of US$200 per tonne CO_2 in the United States shows that the tax will consume the most (12 percent) for a household's expenditure in the lowest quintile and the least (9 percent) for a household in the top quintile, demonstrating the vertical inequality (Figure 2).[70,71]

Figure 2: Incidence of US$200/t$CO_2$ Tax in the US[72]



Box 3: Household Impact Assessment in Developing and Industrialised Countries

A distributional impact assessment of carbon pricing was conducted in eight developing countries in Asia (Bangladesh, India, Indonesia, Pakistan, Philippines, Thailand, Türkiye, and Vietnam), comparing four carbon pricing design options, including a globally harmonised carbon price; a national carbon price; and sectoral carbon prices in the power and transport sectors on both across vertical and within horizontal income groups. The results follow.[73]

1) Vulnerable population groups might be highly country-specific and most likely tied to specific energy and fuel use—for example, the choice of heating and cooking fuels, whether and how households use electricity, and whether households own a motorised vehicle. How those consumption patterns can be used to devise targeted compensation schemes (or additional policies that ease the transition to clean energies) could be studied.
2) In India, food and consumption goods are carbon-intensive sectors. Since poorer household spend most of their income on these, carbon pricing in India has a regressive impact.
3) In Bangladesh and Pakistan, the rural poor would be least affected by a national carbon price and the urban rich the most. It could be due to their energy poverty that a large part of the poor population does not report expenditure for energy services. Poorest households rely on traditional fuel (biomass) and subsistence farming, and have low or no access to energy infrastructures. An increase in energy prices can thereby trap the poorest households in poverty, incentivise biomass use with adverse health consequences, and shift women out of the labour force as they dedicate a larger share of their time to firewood collection.
4) Türkiye and Thailand, the richest countries in the sample, have shown a higher impact on poorer households that spend a higher income share on energy-intensive goods and services—a consistent pattern found in industrialised countries. The food sector is also high-carbon intensive in these countries, resulting in a regressive impact.
5) Pakistan has a carbon-intensive service sector, mostly consumed by richer households, which also have a larger share of energy expenditures, resulting in a progressive outcome.
6) In all the countries, transport expenditures are greater among households with higher incomes. Thus, transport shows a progressive outcome.
7) Progressive outcomes would still affect households in absolute terms, and thus, climate policy instruments should be designed in ways that are socially

just. Compensation schemes must be tailored to their specific context, which requires a close understanding of the factors that determine which households are most severely affected.

The regressive nature of carbon pricing instruments was assessed in several studies. In one of the first distributional impact assessments of a carbon tax in seven European countries (France, Germany, Italy, Netherlands, Spain, the UK, and Ireland),[74] it was found that the impact of carbon tax is regressive in general. Though the rich would pay higher tax, the burden of the tax in relation to household spending is higher for the poor. Another earlier study for Australia,[75] assuming no technological substitution against a carbon tax, found it to be regressive with increase in inequality. If used for transfer of payments, the regressivity impact was found to be lowered without decreasing the total revenue.

Many distributional impact studies for developing countries like Indonesia and China have shown the progressive impact of carbon tax.[76] A study in China found that the progressive impact is primarily for differences between urban and rural expenditure patterns. An equal per-capita basis recycling of carbon revenues ('sky trust') will enhance this progressivity, as low-income (mainly rural) households would receive more dividends than they pay in carbon charges, and high-income (mainly urban) households would pay more than they receive in dividends. Thus, it would contribute to both lower fossil fuel consumption and higher income equality.[77]

Evidence from carbon pricing policies implemented in 39 countries indicates a significantly increased likelihood of progressive distributional outcomes in lower-income countries and for policies that impact the transportation sector. This tendency could be explained by low carbon intensities of the consumption baskets of poor households in lower-income countries, resulting from a higher share of subsistence consumption, low access to modern energy services, or the lack of affordable energy.

ii. Impacts Across Sectors

Political acceptance of carbon pricing policies is often influenced by the sectors covered. Certain industries that are particularly impacted due to their heavy reliance on carbon-intensive processes and products, limited capacity to reduce emissions, or competition from low-emission industries may experience economic disruption as a result of carbon pricing policies, resulting in political mobilisation and advocacy from sector stakeholders. For example, in the EU, each member state is dominated by different economic sectors, with resulting political and equity impact considerations.

However, rather than specific sector impacts, by far the most contentious aspects of the ETS has been the coverage of transport and heating fuels, in part because those sectors touch day-to-day household activities.

Policy design affects the extent of disruption in each sector, but an increase in the price of carbon will have broad effects on economic behaviour in ways described in the following points.[79]

- *Increased Production Costs:* Industries that rely heavily on fossil fuels or energy-intensive processes may experience a significant increase in production costs. Carbon pricing mechanisms effectively put a price on carbon emissions, which can lead to higher costs for energy, raw materials, and transportation.
- *Market Shifting:* Carbon pricing can cause shifts in consumer preferences and demand patterns. If carbon prices are transferred directly to consumers, cost-conscious consumers may shift buying patterns towards products and services with lower carbon footprints, causing a decline in demand for carbon-intensive goods.
- *Job Displacement:* Carbon-intensive sectors may experience job displacement as they face economic challenges. Labour-intensive industries, in particular, may need to downsize or restructure their workforce to remain viable.
- *Resource-Based Economies:* Extractive industries, such as coal mining or oil and gas production and refining, may experience economic disruptions.
- *Supply Chain Impacts:* Affected industries can face supply chain disruptions if their suppliers or partners also experience the impacts of carbon pricing. This can lead to delays, increased costs, and production bottlenecks.
- *Technological Shifts:* To remain competitive in a carbon-constrained world, impacted industries will need to invest in cleaner and more efficient technologies. While this can lead to long-term benefits, the upfront costs and transition period can be disruptive.
- *Reduced Competitiveness:* Affected industries in regions with strict carbon pricing policies may become less competitive compared to counterparts in regions with lax carbon pricing, if at all. This can result in a loss of market share to competitors with lower production costs.
- *Trade Implications:* International trade dynamics can be affected, especially if trading partners have differing carbon pricing policies. Vulnerable industries may face trade barriers or disruptions in global supply chains.

Box 4: Impacts of Carbon Pricing on the Brazilian Industry[80]

The implementation of market instruments, including an ETS and a carbon tax, to effectively meet the GHG reduction commitment cost is still being discussed in Brazil.[81] In a quantitative assessment of the economic and sectoral impacts of carbon pricing instruments on Brazil's industry sector this study: characterised Brazil's industries for their share in exports of manufacturing products, share in the world value added of manufactured goods, and productivity in the context of climate policy and carbon pricing and for their sectoral emission; compared international benchmarks for GHG emission intensity; analysed the impacts of different carbon values through three indicators, namely, the impacts of carbon pricing in terms of value added (VA), emissions intensity, and international trade exposure. Sector value added considered expenditures of the production factors, including capital and labour. Results indicate that, considering a price of carbon of US$10/tCO2, the cost of reducing emissions from 35 percent to 45 percent (the same range as the Brazilian NDC) could represent an impact of 0.3 percent to 3.7 percent on sectorial VA. However, results for emissions intensity and international trade reveal medium to high carbon leakage risks for all analysed industrial sectors.

iii. Horizontal Equity: Impacts Across Geographies

The social impacts of carbon pricing can vary significantly by region and country. Increased energy, transportation, and goods and services cost will be a constant across economies and geographies.[82] Emerging economies or poorer regions can particularly face challenges in economic development. Limited capacity to transition rapidly to cleaner technologies results in fewer options to react to the increased cost burden. This can impact access to essential services and energy security, interfering with their poverty-alleviation goals. Less developed regions and countries will need access to international climate finance mechanisms to support clean development projects, capacity-building assistance to implement and manage policy deployment effectively, and cleaner technology and knowledge transfer to foster economic growth.

The following characteristics may influence the extent to which carbon pricing policies can create inequitable outcomes between regions and economies of varying development status:

- *Rural vs. Urban:* Carbon pricing can affect rural and urban areas differently. Urban areas often have better access to public transportation and energy-efficient infrastructure,

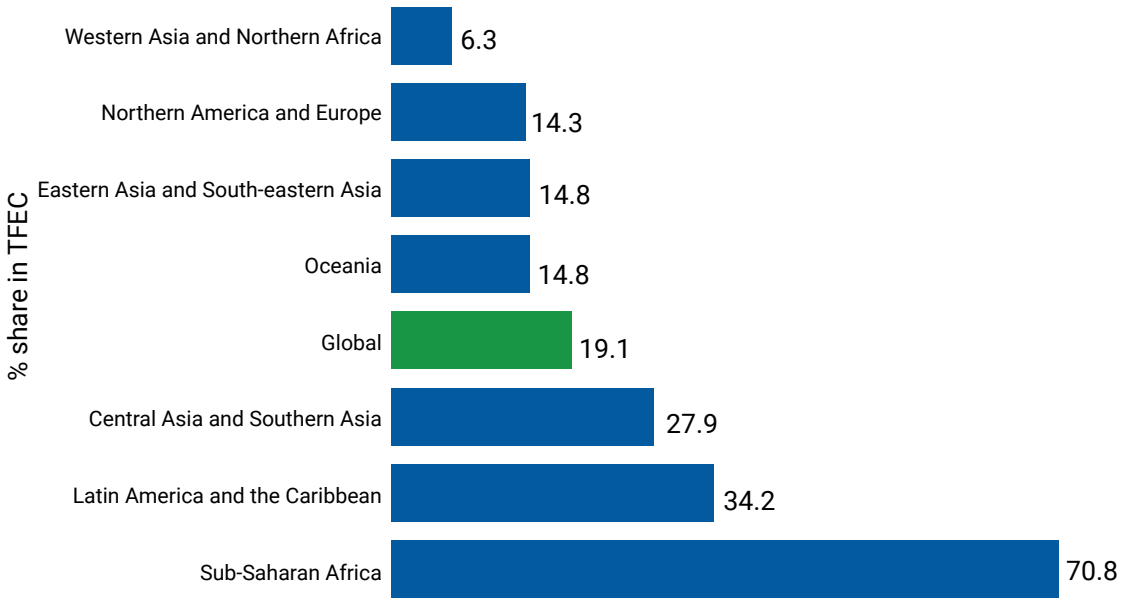
making it easier for residents to adapt to changes in energy costs.

- *Energy Mix:* Regions with a high dependence on fossil fuels for electricity generation may see more significant increases in electricity prices due to carbon pricing. In contrast, regions with a cleaner energy mix, like those heavily invested in renewables, may experience smaller price increases.
- *Economic Profile:* As with economy-wide impacts, the economic profile of a given region may influence whether carbon pricing has regressive or progressive effects. For instance, residents in relatively wealthy regions tend to consume more fuel, energy, and high-GHG footprint foods.
- *Resource-Rich Regions:* Regions with substantial natural resources like forests or wetlands can benefit from carbon pricing through carbon-offset programs. These regions can generate revenue by selling carbon credits or participating in carbon sequestration projects. Regional impacts will also differ between regions depending on the allocation of clean energy resources such as solar and wind. Regions that are heavily dependent on carbon-intensive industries, such as coal mining or oil extraction, may experience significant economic disruptions. These regions may face job losses, declining property values, and reduced government revenues.
- *Agricultural Impacts:* Different agro-climatic zones may need to adapt to changes in input costs for fertilisers, irrigation, storage, and processing needs, particularly when farming is already affected by the changing climate conditions. Carbon pricing can influence farming practices and crop choices.
- *Cross-Border Effects:* Disparities can arise in regions located near national or state borders if neighbouring jurisdictions have different carbon-pricing policies. This can lead to businesses or individuals shifting their activities to areas with lower carbon prices.

Box 5: Examples of Geographical Distributional Impacts

Different renewable energy shares of different regions, countries, and states or provinces within the countries can significantly contribute to differentiated impacts for different carbon pricing mechanisms. Figure 3 shows the RE shares of the different global regions, which vary significantly. Likewise, a country with variable RE installed capacities, varied agro-climatic zones, distinct state industrial profiles, or discrete geo-climatic regions can have different degrees and complexities of the impacts. For example, India has 15 agro-climatic zones, from the Himalayan regions, Gangetic plains, and plateaus and hill regions, to coastal plains, dry regions, and islands, which have different irrigation,[83] household cooling and heating requirements, and potential for solar or wind energy.

Figure 3: Renewable Energy Share in Total Final Energy Consumption (%), Global and Regional[84]



iv. Social Factors and Environmental Justice

Environmental justice concerns related to carbon pricing policies revolve around the equitable distribution of the costs and benefits of these policies, especially for vulnerable and marginalised communities.

These concerns highlight the potential for carbon pricing to disproportionately affect disadvantaged communities and exacerbate existing environmental and social inequalities. Any transition to a low-carbon economy must prioritise these communities. Some key environmental justice concerns associated with carbon pricing include the following:[85]

- *Impacts on Poverty*: Owing to the disproportionate economic burden arising from the increased cost of fossil fuels and energy potentially leading to energy poverty and financial strain. Poverty-stricken households are different to low-income households and have lower capacity to adjust their expenditures or incomes, even with small changes in the price of basic needs, such as shelter, energy, food, and transport. For households already struggling to make ends meet, any increase in essential expenses like energy costs can push them further into poverty or deepen existing poverty traps, exacerbating social inequalities and hindering economic mobility.
- *Energy Inequity*: Higher energy costs, forcing low-income households to have a trade-off between energy bills and other necessities like food and healthcare. Additionally, the upfront costs of transitioning to cleaner energy sources may be more challenging for low-income households.
- *Disadvantaged Communities:* Communities dependent on carbon-intensive industries may experience concentrated and systemic job losses, which can have cascading effects on local economies and social well-being. Increased fuel prices for transport may discourage trade and the development of comparative advantages for poor countries currently in relatively carbon-intensive activities, such as metallurgical manufacturing processes and fishing.[86]
- *Lack of Representation:* Marginalised communities may have less influence and participation in decision-making processes related to carbon pricing policies, potentially leading to policies that do not adequately address their unique needs and concerns. The reasons may include factors such as socioeconomic disparities, educational inequalities, language barriers, and geographic isolation.
- *Disproportionate Health Outcomes:* Climate pricing policies may lead to broad public health benefits attributable to behavioural shifts away from high-GHG footprint foods, towards walking or public transit use and the reduction of co-pollutants.[87] Climate pricing policies that reduce fossil fuel use can potentially mitigate air pollution and associated health impacts,[88]

especially if deployed in concert with additional environmental and health regulations.[89] Thus, carbon pricing, if designed well, can reduce both emissions and local air pollutants simultaneously and thus be in a country's national interest.[90,91] Carbon pricing policies that allow emissions trading may also exacerbate health outcomes in communities located near polluting facilities. Co-benefits for a differentiated climate policy have not been fully explored, can vary across countries, and might require more than just pricing carbon.[92] Two 2023 studies concluded that California's ETS reduced local air pollution disparities, but carbon pricing alone should not be considered a primary policy tool to address local air quality issues.[93,94] Similarly, a study investigating the impact of nationally uniform and sub-nationally differentiated carbon pricing policies on fine particulate matter (PM2.5) concentrations in China observed a substantial reduction in regional disparity in PM2.5 pollution and a consequent improvement in environmental equity by the subnational policies.[95] Nevertheless, flexibility in carbon pricing policy enabling a polluting farm's ability to avoid reducing emissions, such as trading allowances or paying a carbon fee, could be perceived as being unfair to communities that are heavily impacted by local pollution from industries like thermal power plants, refineries, and major highways.

Box 6: Exacerbating Energy Poverty

In developing or low-income countries, energy poverty is related to both access and affordability, compared to industrialised nations, where it is mostly affordability. Regressivity of carbon pricing is less established in low-income countries. Many energy-poor households in these countries do not use gasoline or diesel but often rely on traditional biofuels such as foraged wood, which is typically not covered and is difficult to cover by any carbon pricing policy. Biomass energy also has its own environmental, social, and health challenges. Kerosene is another important fuel for poor people in many countries. This can potentially lead to conflicts in developing countries between carbon pricing policies and poverty alleviation amongst the world's poorest by forcing up the prices of and restricting access to energy.[96]

A look at the global energy access (Figures 4 and 5) reveals that more than 8 percent (675 million) of the global population live without access to electricity and 29 percent live without access to clean cooking to this date. These proportions increase by a huge margin in most of the Global South, particularly in rural areas. For example, 95 percent of Sub-Saharan Africa, 93 percent of Oceania, 51 percent of Central and Southern Asia, and about half of the global rural populace do not have access to clean cooking.[97]

Figure 4: Population without Access to Electricity, in Millions, Globally and by Region[98]

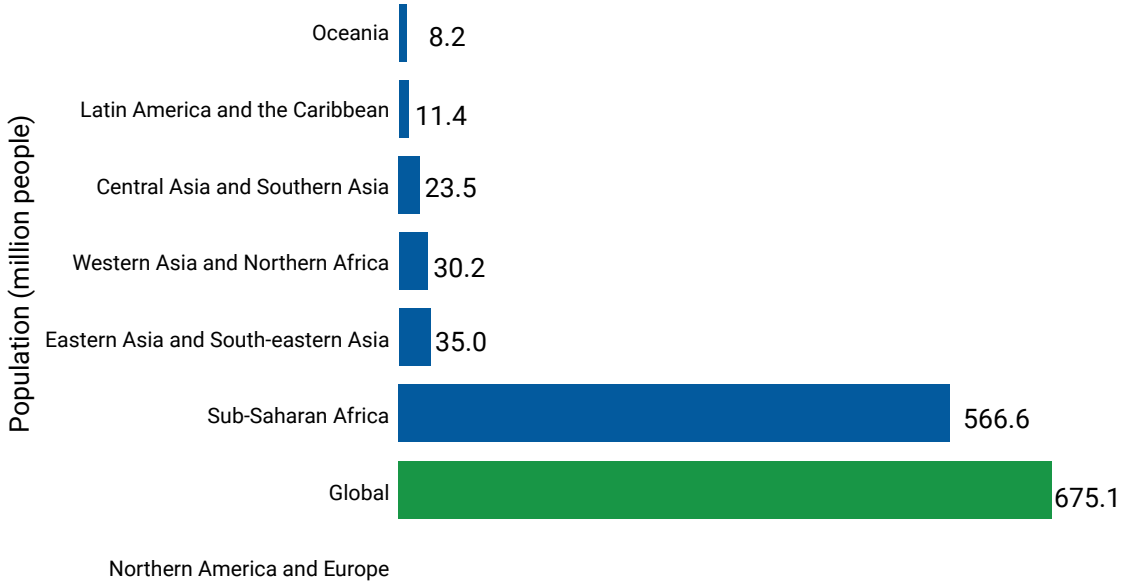
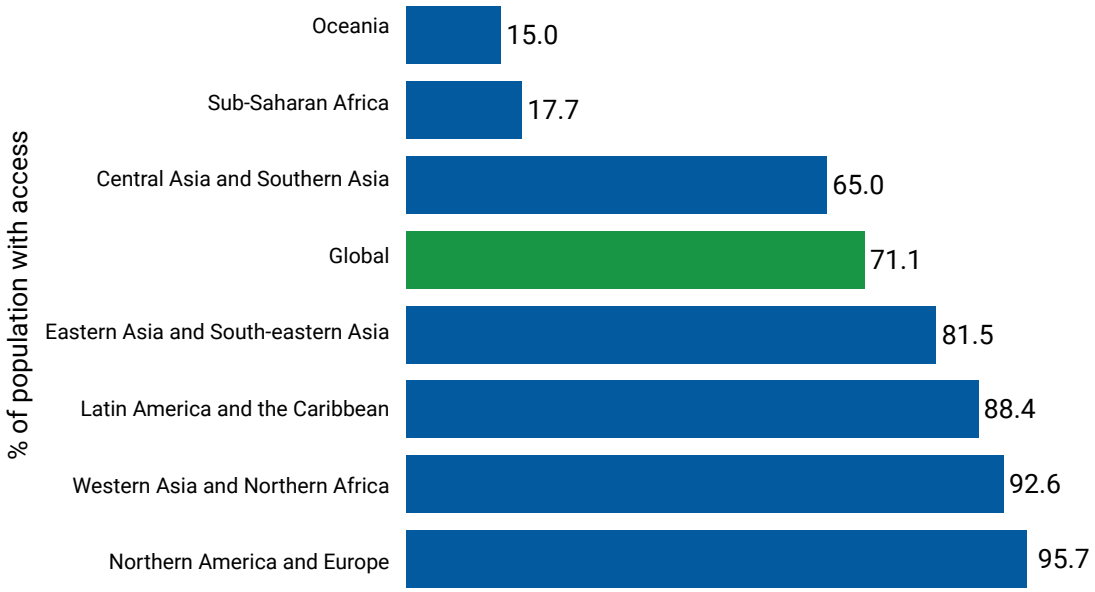


Figure 5: Access to Clean Cooking, Global and Regional[99]



v. Carbon Leakage

In a globalised economy, unilateral implementation of carbon pricing tools in one jurisdiction can lead to the risk of carbon leakage, where businesses move their operations to regions with less stringent or no carbon pricing policies to avoid costs. This can result in emissions being shifted to other jurisdictions rather than reduced, resulting in the concern of carbon leakage. That carbon pricing is not enforced worldwide threatens corporates in countries and sectors where it is applicable with a competitive disadvantage.[100]

Discussions of carbon leakage emerged central to climate policies when the industries under the EU ETS system were considered to be at significant risk to competitiveness within and outside. Following an impact assessment and stakeholder consultation, the European Commission came up with lists of energy-intensive industrial sectors and sub-sectors that were deemed to be at a higher risk of exposure to carbon leakage and thereby received a greater share of free allowances under the ETS system. Sectors with the highest risk significance received 100 percent free allowances, with performances benchmarked against the most efficient installations. The allocations reduced gradually for non-listed sectors.[101]

Environmental, Economic, and Social Impacts

Both environmental and socioeconomic impacts are considered. Environmental impacts result from emission migration which can even reverse the environmental outcomes sought through carbon pricing. Economic impacts can include investment avoidance, investment relocation, and shifting of production (including impacts on the value chain) outside the jurisdiction imposing carbon constraints. The social impacts are linked to the economic impacts owing to job losses, resulting in livelihoods and community-level consequences.[102]

Channels for Carbon Leakage

Carbon leakage can also be examined through the channels that it happens, including production leakage, which has an impact on short-term competitiveness owing to differences in cost structure between GHG activities in different jurisdictions, which might lead to the loss of market share at an international stage between the same sectors; investment leakage, which is a long-term impact, resulting out of the loss of competitiveness caused by climate policies, that is high enough to shift the investment to jurisdictions with less restrictive policies; and leakage through indirect climate policies, such as changes in global fossil-fuel prices.[103]

Addressing Carbon Leakage

The following three measures are predominantly used to avoid carbon leakage:

i) Exemptions and free allowances, like in the EU ETS. However, they severely weaken incentives for efficient domestic production;

ii) Border carbon adjustments (BCA) or CBAM seeking to level the carbon price paid between goods produced domestically and abroad;
iii) Carbon footprint consumption charge. However, this can violate WTO law and create domestic political resistance.[104,105]

Evidence of Carbon Leakage

Carbon leakage has been found and estimated in ex-ante Computable General Equilibrium (CGE) modelling studies for hypothetical policy scenarios. A meta-analysis of 25 such CGE literatures estimated a typical range of carbon leakage to be between 5-25 percent (mean 14 percent).[106] Another estimate averages the leakage rate between 10 and 30 percent.[107] With carbon border adjustment measures in place, the leakage estimates are reduced to 5-15 percent (mean 6 percent). However, there is no literature on the empirical evidence of carbon leakage. Recent studies of carbon leakage from the EU ETS on different sectors, such as cement and steel, have found no evidence. This might be the case for the free allowance allocation covering risk-exposed industries from competitions and the low-price signals during most of the EU ETS' history. Additionally, the empirical evidence is limited by certain sectors, regions, time periods, and linear approximations and lacks external validity.[108]

vi. Political Resistance

Public perception, understanding, acceptance, and trust are important for the success of carbon pricing policies. Lack of awareness or resistance from high emitting industry regions can lead to political opposition, resulting in a delay in implementing effective carbon pricing policies. A study of the attitudes toward fuel taxes covering a national sample of population, including members of protesting groups, found that education level, domicile (rural versus urban), political orientation, and trust in government correlate with opinions on carbon taxes; household income did not appear to matter.[109] Fierce political resistance in Australia towards the Carbon Pricing Mechanism (CPM) introduced in 2012, led to the eventual repeal of the carbon pricing schemes in 2014.[110]

vii. Behavioural Impacts

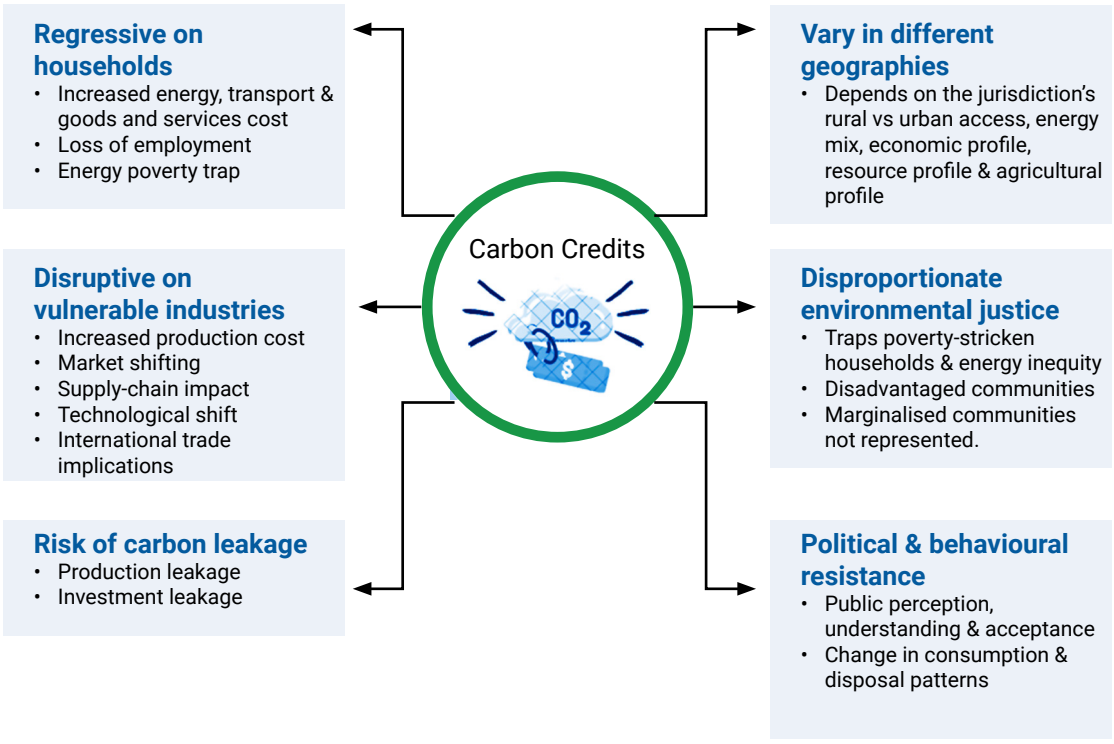
Carbon pricing is predicated on changing individual and consumer behaviour, but it may have both positive and negative social consequences. It is important to recognise that some groups are already making less energy-intensive choices out of necessity rather than choice, such as rural communities in developing countries, low-income households, and elderly populations dependent on fixed incomes.

- *Encouraging energy conservation in households with high energy consumption:* Higher prices incentivise households to move away from carbon-intensive consumption, such as by reducing energy consumption, transitioning to clean energy option, and retrofitting energy-efficient technologies. However, it

also depends on consumers' access to low-carbon alternative options to react to the carbon price by switching.

- *Shift to public transport:* Higher fuel costs due to carbon pricing can encourage individuals to use public transportation or carpooling, increase their use of electric or hybrid vehicles, or opt for active transportation (such as cycling or walking).
- *Resistance to change* can also be a response behavioural pattern leading to political instability.
- *Consumption choices:* Consumers may become more mindful of the carbon footprint of products they purchase. They may choose products with lower carbon footprints or opt for locally sourced goods.
- *Waste reduction:* Carbon pricing can promote waste reduction and recycling as individuals seek to minimise the carbon emissions associated with the production and disposal of goods.

Figure 6: Social Impacts of Carbon Pricing



Source: Authors' own

Tools to Address Distributional Issues in Carbon Pricing Development

Addressing distributional issues in carbon pricing development is crucial to ensure that the burden of climate action is shared fairly and vulnerable populations are not disproportionately affected. Research indicates that the most influential factor in determining the impacts of carbon pricing across various socioeconomic groups and regions is the use of the revenue generated by payments of the carbon price.[111,112] The suitability of a particular solution will depend on the specific inequities identified, stage of economic development, and carbon pricing mechanism deployed. Several tools and policy measures that can be employed to mitigate distributional concerns associated with carbon pricing are explored below.

i. Revenue Recycling

- *Double dividend through progressive tax cuts:* Recycling of revenue from carbon pricing is directly associated with the 'double dividend' hypothesis. It refers to the dual benefits that can be achieved through redistributing the revenue generated from a carbon tax or carbon pricing mechanism to reduce pre-existing direct taxes, like payroll or sales taxes, thus not only reducing emissions but also gaining positive economic impacts.[113] This approach ensures that lower-income households benefit from the revenue generated.
- *Direct rebate or lump-sum transfers:* Direct cash rebates or dividends to support low- and middle-income households are also an effective policy measure to offset the increased costs of carbon pricing. It is a straightforward approach to compensate price hike resulting from carbon price, which returns the revenue to households on a per-capita basis, also known as 'cap-and-dividend', 'tax-and-dividend', or 'sky trust'. It is a progressive approach, as poorer households receive more in light of their increased expenditure.[114] People with limited resources may not favour being taxed only to be later compensated. This reflects a deeper concern about trusting the government and the perception that they are being treated differently.
- *Subsidies and other transfers:* Subsidising household consumption for goods impacted by carbon price, such as food subsidies, energy efficiency support, or public transportation can also bring a progressive result for the overall carbon pricing mechanism. It is important to design these subsidies specific to a jurisdiction's needs for effective results. A study in Mexico found progressive effects for revenue recycling as food subsidy but regressive effects when used as a manufacturing tax cut.[115] Subsidies can also interfere with price signals; for example, direct return of revenues as a subsidy to an electricity bill can be perceived as less expensive electricity, thereby changing the carbon price signal and potentially leading to increased consumption and emissions.[116] Similarly, subsidies to petroleum-based fuel can interfere with carbon pricing signals.

Box 7: Revenue Recycling to Households in the Asia Pacific

A study in the Asia Pacific region to evaluate the distributional impacts of carbon tax on households through an analysis of country-specific policies that could potentially compensate households, reduce inequality, and build support for adoption found the following results:[117]

- A carbon tax would have different implications across the region.
- Loss in household welfare: A carbon tax of US$50 per tonne would lead to 10 percent loss of initial consumption in Mongolia, 7 percent in Indonesia, slightly above 3 percent in China and India, 2.1 percent in the Philippines, and less than 2 percent in Kiribati and Myanmar.
- Distributional impact: The carbon tax would be regressive in China, Indonesia, and Mongolia, but it would be progressive in India, Kiribati, the Philippines, and Myanmar. Across the region, small groups of households employed by the energy sector would be heavily exposed to labour income losses.
- Compensating vulnerable households: A cash transfer targeted at the poorest 40 percent of the households would cost an average of 16 percent of the revenues raised by a carbon tax to ensure household welfare for the tax reform. This tax revenue share amount would be 8 percent for India, 11 percent for Kiribati, 15 percent for China and Myanmar, 17 percent for the Philippines, 23 percent for Indonesia, and 24 percent for Mongolia to protect the poorest 40 percent of the household from the reform.
- Compensating measures: The list of compensating measures considered in the study through direct cash transfers are: i) universal basic income, ii) child grant to all children younger than 14, iii) non-contributory old age pension to everyone older than 65, iv) subsidy to urban community households, v) subsidy to rural community households, vi) lump sum to beneficiaries of existing social protection schemes, vi) subsidy to households biomass or coal for cooking fuel, and vii) targeted transfer to the poorest 40 percent households.

Carbon pricing revenue can also be utilised in several different ways as a general source of financing to developmental objectives focusing on resolving inequality—for example, healthcare, education, infrastructure, access to water, sanitation, and clean energy—or issues of high public concern, which can enhance the ability to pay carbon prices in developing countries. Some examples of the spending of revenues from carbon pricing from different countries are presented in Box 8.

Box 8: Examples of Revenue Distribution in Different Countries[118,119,120]

- Argentina: Investments in social security system, national housing fund, and transport infrastructures.
- California: Revenues from the cap-and-trade program under AB32 is legislated to support low-income households and vulnerable communities. The revenues go into a Greenhouse Gas Reduction Fund (GGRF) and a combination of strategies to protect low-income households while preserving the price signal. These include policy measures like climate credit or dividend and subsidies for energy efficient programs. Climate credit is a direct share of auction revenue to households twice a year on their electricity bills. This credit amount depends on the amount of allowances sold by that utility and the number of independent clients and is not related to the electricity use which ensures no interference with carbon price signal.
- Colombia: The Sustainable Colombia Fund supports conservation and sustainability projects by women, Indigenous peoples, and minority communities.
- France: The EU ETS revenues are used to fund the National Agency for Housing, which supports energy efficiency investments.
- New Zealand: From 2022, NZ ETS auction proceeds will be used to support emissions reductions programs through a Climate Emergency Response Fund.
- Republic of Korea: Auction revenues are to be reinvested to support small- and medium-sized companies and also utilised as a Climate Response Fund, which supports mitigation equipment, low-carbon innovation, technology development, etc.
- PRC Regional ETS, Hubei, Shanghai, Shenzhen: Revenues deposited into provincial, state, and city treasury, respectively. The Shenzhen treasury specifies a provision to set up a market stability fund to support companies' mitigation activities, capacity building, ETS management, promoting market service institutes, etc.
- Singapore: Carbon tax revenue is recycled back to the economy by supporting: green economy transition and decarbonisation efforts; energy-intensive companies to implement energy efficiency measures; households to mitigate the impact in the form of additional rebates through introducing the Climate Friendly Households Programme in 2020, where eligible households can redeem vouchers to offset the cost of purchasing energy efficient appliances; introduction of a transition framework to give existing emissions-intensive trade exposed (EITE) companies more time to adjust to a low-carbon economy and transitory allowances for part of their emissions to mitigate the risk of carbon leakage.
- Switzerland: Revenue is redistributed equally to all residents using a dividend approach through the national health insurance system. The amount granted to each household is settled against their health insurance premium.

ii. Infrastructure Investments, Including Public Transportation

Investments in affordable and accessible public transportation systems, cycling lanes, and pedestrian-friendly infrastructure to reduce the transportation costs for individuals with limited mobility options, or even subsidies in public transportation that increases the availability of low-carbon options, can also preserve the carbon price signal.

Box 9: Potential Revenue Recycling for Clean Transport in Indonesia

An evaluation of potential revenue recycling measures for Indonesia's breakthrough carbon tax measures recommends[121] subsidising the prices of green alternatives, particularly to promote non-gasoline powered cars. Indonesia aims to phase out gasoline cars as part of their 2060 net zero emissions target and to reduce the chronic pollution in the large cities. However, sales of electric vehicles have not taken off for their twice as high costs as opposed to their gasoline counterparts and due to the lack of charging stations, despite incentives such as tax breaks and an exemption from Jakarta's odd-even traffic policy. The difference in sale price between a gasoline-powered car and its green version is IDR 200 million. To ensure a comparable cost, the government would need to churn out a massive sum of money which could be the revenue from the country's carbon tax.

iii. Clean Electricity Sector and Energy Efficiency Programs[122]

- *Clean electricity:* Carbon pricing does not hit the electricity expenditures if the electricity supply is relatively clean, i.e., a higher share of clean energy will have an indifferent distributional incidence towards either progressivity or regressivity. Hence, investing in the decarbonisation of the electricity sector can be a very impactful tool to reduce impact on both households and power-intensive industries.
- *Implementing energy efficiency programs* that target low-income households, such as subsidies for energy-efficient appliances or home insulation and increased availability of affordable low-carbon substitutes, could help them reduce their energy consumption and costs. Subsidies for energy efficiency are also considered to be effective to address energy poverty over the long term.
- *Exempting clean fuels* from carbon pricing that are mostly used as a substitution to traditional biomass for cooking or subsidising clean

alternatives, such as fostering the uptake of clean stoves, can address both the economic and social costs. It is to be noted that petroleum-based fuel subsidies incentivise increased fuel consumption and emission and interfere with the pricing signal.

- *Performance standards moratoria* or subsidies in the electricity sector might face lower public resistance.

iv. Sector-Specific Support

Provide targeted assistance to industries or sectors that are particularly vulnerable to carbon pricing, including those with high energy intensity and trade-exposed sectors.

- The electricity sector could be made carbon-pricing-revenue-neutral through support for reducing emissions or increasing the clean energy share, subsidies, or tax rebates to poorer households to cover increased electricity costs.
- The most exposed industries could be supported through free emission allocation under an ETS system or through introducing tax discounts or exemptions or cost compensation measures under a carbon tax.[124]

Carbon Border Adjustments are also a tool to address carbon leakage which is protecting domestic industries from competitiveness. The revenue of CBAs could be utilised to help transition vulnerable industry sectors.

Box 10: The Case of India's MSME (Micro, Small and Medium Enterprises) Sector

India's MSME sector represents 63.4 million unincorporated non-agricultural enterprises, who contributing to 28 percent of its GDP and 40 percent of the exports. The sector is characterised by 31 percent manufacturing and 36 percent trade enterprises employing 111 million people in total—the second largest employment sector in India.[125] Apart from its significant economic contribution, this is an emission-intensive sector for its heavy fossil fuel reliance and informal nature to be regulated effectively. MSMEs consume about 25 percent of the total industry sector energy consumption in India, of which 15 percent is electricity and 85 percent is thermal energy consumption. Hence, a low-carbon transition for the MSMEs is critical to achieve the country's NDCs. Often found disproportionately vulnerable to climate risks, the sector widely uses outdated technologies and processes and is hardly covered under risk management instruments and insurance. Only 16 percent of MSMEs in India are financed through formal banking systems, with an estimated credit gap of US$240 billion, which impedes the sector's transition. Diverting carbon pricing revenue towards promoting blended finance tools, intensified R&D, demonstration; piloting climate tech projects; digitising the ecosystem; and scaling up capacity building could be approached to risk proof the sector.[126]

v. Subsidy Reform

Subsidy reform measures are policies aimed at phasing out or redirecting government subsidies that support fossil fuels or other carbon-intensive activities. When designed as a distributional tool alongside carbon pricing policies, subsidy reforms can help address environmental justice concerns and ensure that the burdens and benefits of carbon pricing are distributed fairly. A 2020 meta-analysis of carbon pricing policies in 39 countries found that subsidy reforms are not inherently more progressive than other carbon pricing instruments but their effect depends on other economic and social factors, as well as policy design and enforcement.[127] Some of these reform initiatives include the following:

- *Targeted subsidy reductions or reallocation:* Identify and gradually reduce subsidies that disproportionately benefit carbon-intensive industries, such as fossil fuel, mining or fossil fuel extraction, or high-emission agriculture. Reallocate these subsidy funds to support clean energy, energy efficiency, or other low-carbon initiatives. It is also important to ensure that subsidy reforms do not disproportionately impact low-income households by simultaneously implementing measures to maintain or enhance energy access and affordability for these communities.
- *Phasing and gradual reduction:* Implement subsidy reforms gradually to allow affected industries and communities time to adapt. Phasing out subsidies over several years can help minimise the disruptive effects.
- *Investment in green technologies:* Direct savings from subsidy reforms into research, development, and deployment of green technologies, which can create new economic opportunities and jobs in clean energy sectors.
- *International cooperation:* Work with international partners to reform subsidies on a global scale, addressing cross-border issues and ensuring that carbon-intensive industries do not simply relocate to regions with less stringent subsidy policies.

vi. Spending on Policy Considerations

Revenues can also be recycled in support of ancillary policies:

- *Climate policies:* Coordinate carbon pricing efforts with other climate policies, such as renewable energy incentives and renewables share requirement; investments and subsidies for low-carbon R&D, promoting both the supply and demand of renewables; and increase public spending on low-carbon infrastructure or services to create a comprehensive and equitable approach to addressing climate change.
- *Risk-proofing of financing:* Provisions of finance and financial guarantees

by governments can reduce the perceived investment risk in low-carbon production and climate-tech innovations and help overcome other challenges in financing low-carbon investment. Public economic stimulus through fiscal policies like tax cut, direct financial assistance, lowered interest rates and asset purchases by central banks for climate tech or low-carbon energy system; demand-side policies like increased government spending or consumer incentives; and public intervention in land planning, such as ensuring low-carbon transportation and infrastructures in cities, can be helpful in promoting investments in the low-carbon energy or technology research and implementation network.[128,129]

- *Just transition policies:* Develop policies that support workers and communities affected by the transition away from fossil fuels, such as job training programs, employment placement services, and economic diversification initiatives.

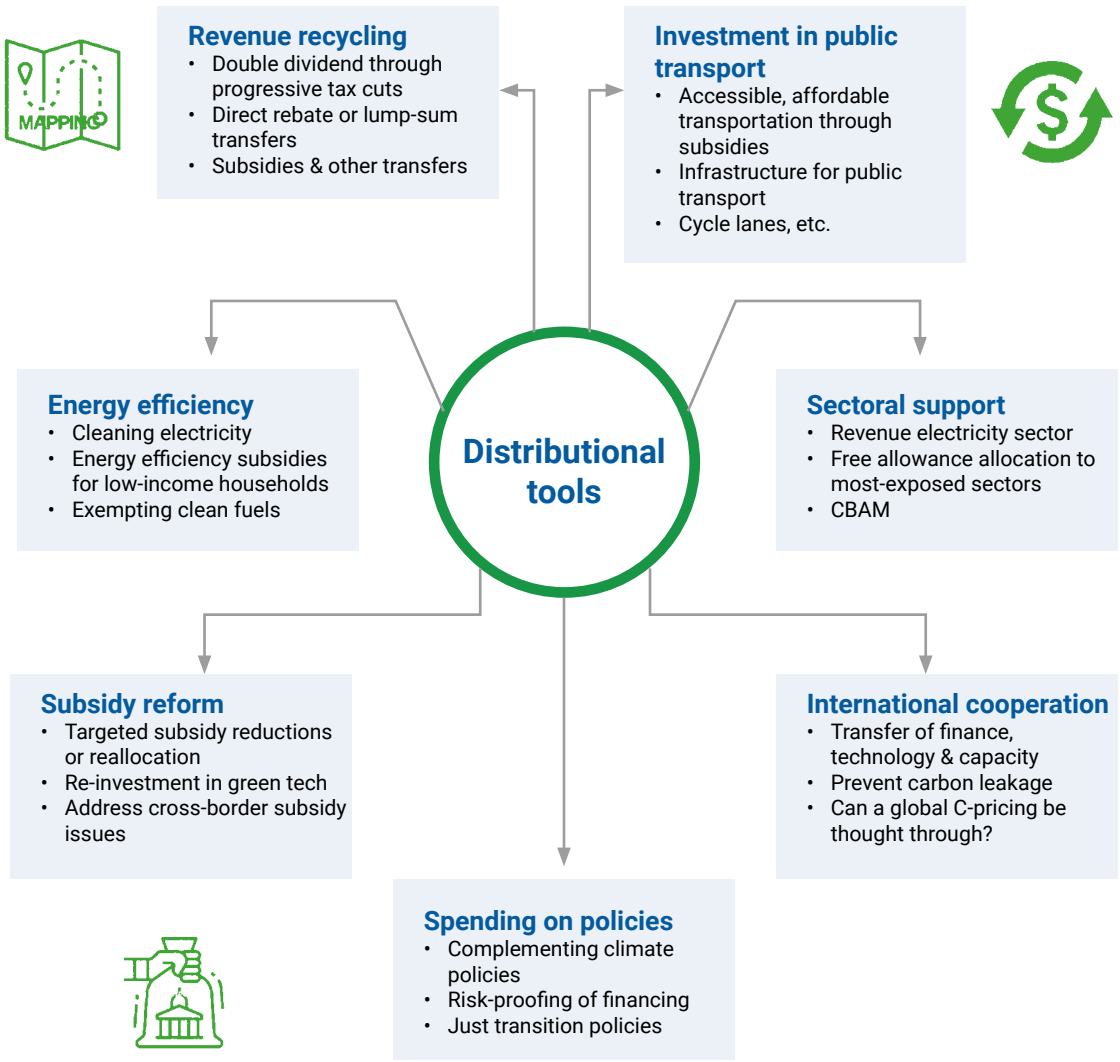
Box 11: Promotion of Clean Energy to Accelerate Low-Carbon Transition of Indian Economy by Allocating Annual Government Budget in India[130,131]

The Government of India in its Union Budget 2023 announced over US$10 billion for several new initiatives and steps aimed at promoting clean energy and green growth. These include:

- Green Hydrogen Mission to facilitate low-carbon transition of the economy, reduce import dependence for fossil fuel, and assume technological and market leadership in the sector with an annual production target of 5 MMT by 2030.
- Allocation for priority capital investments towards energy transition and net zero objectives, and energy security.
- Viability Gap Funding Scheme for 4,000 MWh battery energy storage systems and formulation of a detailed framework for pump storage projects.
- Investment for strengthening interstate transmission system for the evacuation and grid integration of renewable energy.
- Notification of Green Credit Programme under the Environment (Protection) Act for encouraging behavioural change.
- "PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth" to promote alternative fertilisers and balanced use of chemical fertilisers.

- Establishment of new waste to biogas plants under a central scheme.
- Facilitation of 10 million farmers over the next three years for adopting natural farming over the next three years through creation of a national level distributed micro-fertiliser and pesticide manufacturing network.
- “Mangrove Initiative for Shoreline Habitats & Tangible Incomes” (MISHTI) for mangrove plantation along the coastline and on salt pan lands, wherever feasible, through convergence between existing systems like the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) and the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) and other sources.
- Promotion of coastal shipping as an energy efficient and lower cost mode of transport both for passenger and freight through PPP mode with viability gap funding.
- Allocation of adequate funds to scrap old vehicles of the Central Government and support to states in replacing old vehicles and ambulances.
- Permitting Foreign Direct Investment (FDI) up to 100 percent under the automatic route for renewable energy projects.
- Waiver of Inter State Transmission System (ISTS) charges for inter-state sale of solar and wind power.
- Setting up of Ultra Mega Renewable Energy Parks to provide land and transmission to RE developers on a plug and play basis.
- Laying new transmission lines and creating new sub-station capacity under the Green Energy Corridor Scheme for evacuation of renewable power
- Setting up the Project Development Cell for attracting and facilitating investments
- Notification of Promoting Renewable Energy through Green Energy Open Access Rules 2022
- Launch of Green Term Ahead Market to facilitate sale of renewable energy power through exchanges

Figure 7: Potential Distributional Tools to Address the Social Impacts of Carbon Pricing



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Evidence from Fossil Fuel Subsidy (FFS) Removal

While fossil fuel subsidy removal can be seen as an implicit form of carbon pricing, it is a complementary policy measure to carbon pricing, aiming at both emissions reduction and promoting sustainable energy practices. There are alarming numbers of fossil fuel subsidies around the world, and their removal can have potential environmental and economic benefits. However, it can also pose significant social challenges. Evidence of social challenges associated with the removal of fossil fuel subsidies in the context of carbon pricing are discussed below.

- Energy price increases for consumers: When subsidies on fossil fuels are removed, it often leads to an increase in energy prices, including gasoline, diesel, and electricity. This can have a direct and immediate impact on consumers, particularly those with lower incomes.

Evidence: Studies in countries like Indonesia and Ireland have shown that the removal of fossil fuel subsidies can lead to significant price hikes for essential energy sources. In these cases, low-income households spend a larger share of their income on energy, making them more vulnerable to price increases. This impact can be mitigated through household energy allowances or exclusion of such allowances from removal.[132,133,134]

- Impact on household welfare cost: Higher energy prices resulting from subsidy removal can strain household budgets for essentials like cooking fuel or leading to reduced spending on other necessities like food, healthcare, and education, challenging the welfare cost of households, particularly in developing countries.

Evidence: Research in countries like Ghana and Nigeria has demonstrated that the removal of fuel subsidies can result in reduced household income available for other essential expenses.[135,136]

- Social unrest and protests: Subsidy removals can trigger social unrest and protests, especially in regions where subsidies have been in place for an extended period. Demonstrations and public outcry may occur due to the sudden economic hardship caused by price increases.

Evidence: Protests and social unrest following subsidy removals have been documented in countries such as Ecuador, Morocco, and Mexico. These events underscore the social sensitivity of such policy changes.[137,138,139]

- Transportation challenges: Higher fuel prices can make transportation less affordable, affecting not only individual commuters but also businesses reliant on transportation for the movement of goods.

Evidence: In several countries, the removal of fuel subsidies has been associated with disruptions in transportation services, leading to logistical challenges and increased costs for businesses.

- Uneven regional impacts: The effects of subsidy removal can vary regionally, with rural areas often facing more significant challenges due to limited access to alternative transportation and energy sources.

Evidence: Studies in countries like Indonesia have highlighted how subsidy removal impacts rural communities differently, with urban areas having greater access to alternative transportation options.[140]

- Need for social safety nets: To mitigate the social challenges of subsidy removal, governments often need to implement social safety nets or targeted assistance programs to support vulnerable populations.

Evidence: Successful cases of subsidy reform, such as Indonesia and Malaysia, have incorporated well-designed cash transfer programs to shield low-income households from the adverse effects of higher energy prices.[141,142]

- Public perception and acceptance: The success of subsidy removal hinges on public perception and acceptance. Effective communication and outreach strategies are critical to garner support for reform efforts. A cross-national analysis observes that the public acceptance of removing fossil fuel subsidies for private consumption is lower than the public acceptance of removing fossil fuel subsidies for industrial use.

Evidence: Examples from countries like Morocco demonstrate the importance of clear communication and public engagement to build understanding and acceptance of subsidy removal policies.[144]

It is important to note that the impact of fossil fuel subsidy removal varies depending on the specific context, including the level of subsidies, the design of accompanying policies, and the broader economic and social conditions of a country. Policymakers need to carefully consider these factors when implementing subsidy reform in conjunction with carbon pricing to minimise social challenges and ensure just transition.

Conclusion on Social Impacts and Policies

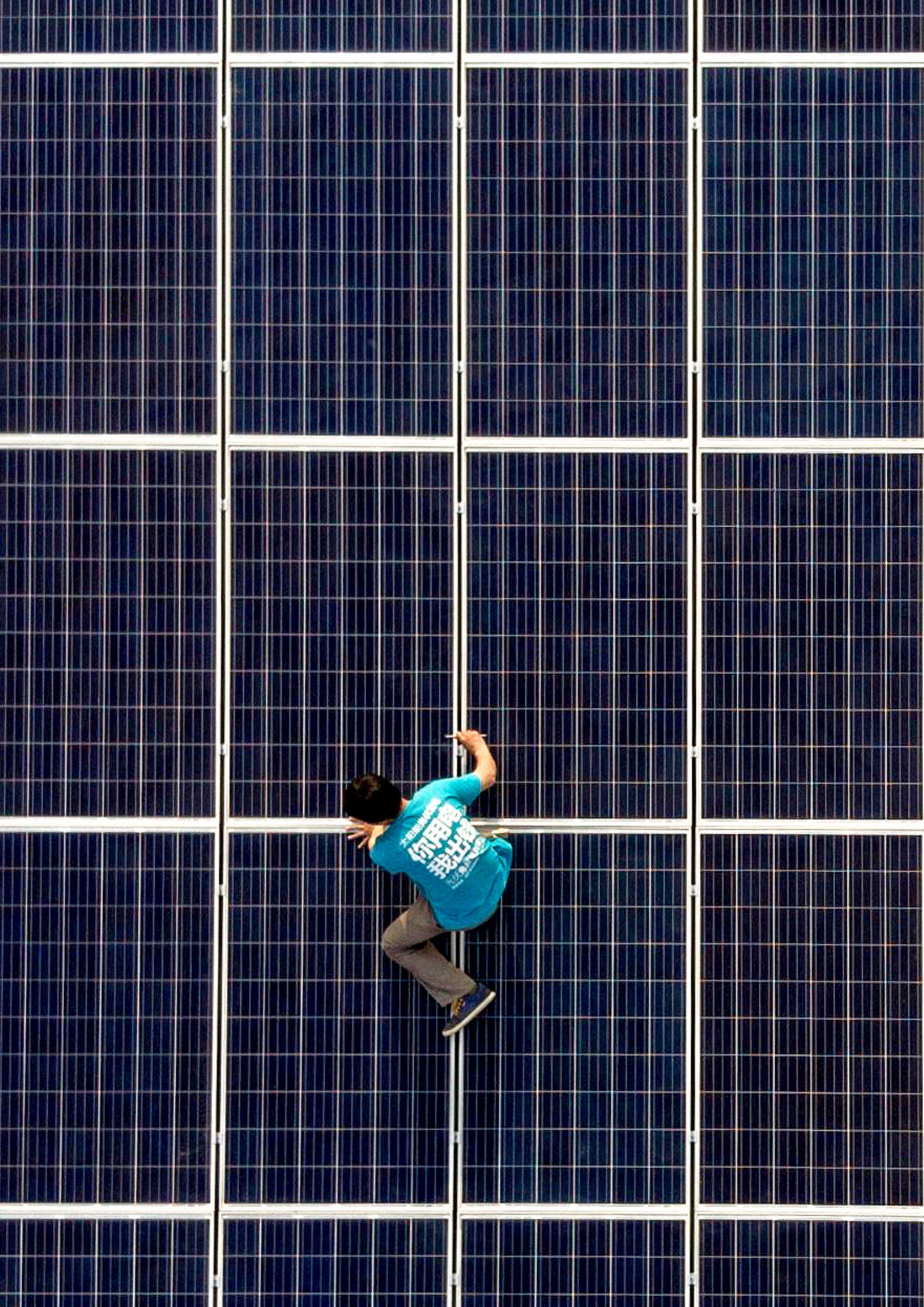
Carbon pricing has clear social and economic impacts beyond the desired impact on emissions. As this section highlights, social and economic impacts are complex, and a thorough analysis of these impacts must be considered by policymakers while designing and implementing carbon pricing instruments.

It is generally assumed that carbon pricing will have a negative impact on income distributions. Nevertheless, as discussed in this section, the picture is more complex. While carbon pricing increases—and rightfully so—the price of carbon-intensive products, which tend to be consumed by lower-income households as a proportion of their income, have countervailing factors.

The first factor is that it is not always the case that lower-income households are the ones consuming higher-carbon options. In developing and emerging economies, many lower-income households tend to have less exposure to more high-carbon, modern lifestyles.

The second is that carbon pricing can also impact the allocation of capital in an economy. By impacting those with larger stakes in the capital of high-carbon technology, carbon pricing can also have, through that transmission channel, a positive impact on income inequality overall. In short, the social impacts of carbon pricing will always be dependent on the social, cultural, and political contexts.

Where such impacts need to be mitigated, revenue recycling from either a tax or auction income in an ETS can go a long way in addressing such impacts, whether it be through sector support, subsidy reform, support for low-carbon social infrastructure, or direct income support through either dividends or income tax reform. There is now abundant experience with the use of such earmarked revenues across different jurisdictions to provide confidence of their effectiveness.



IV.

Overview of Prominent Capacity-Building Initiatives

Capacity-Building Needs

Has Capacity Building Been Effective in the Field of Carbon Markets?

Gaps in Capacity-Building Initiatives

Recommendations

OPPORTUNITIES TO EMPLOY market-based instruments to meet sustainable development and climate goals should be matched with the means to design, implement, and review such capacity building for carbon pricing, which can help both in accelerating the pace and broadening the scale of carbon pricing's contributions to climate action. The success of carbon pricing policies will rely in part on participating countries' capacities to embed carbon pricing approaches within existing domestic policy, legal, regulatory, and finance frameworks.

While some infrastructure capacity needs are likely to be identical across countries implementing a particular policy (e.g., establishing registries for ETS), capacity building needs will vary across countries and may include a range of issues within each country, for example, economic analysis and emissions modelling; public and stakeholder engagement; market-based policy design and carbon finance; legal frameworks and institutional arrangements. For instance, stakeholder meetings

with local governments, industry, local communities, and implementing entities proved helpful in the EU's effort to identify capacity building needs as it prepared for the launch of its ETS. Topic-by-topic meetings that focused on key elements of carbon pricing systems were used to target specific capacity-building interventions to key stakeholders. Industry operators, project developers, think tanks, and other private sector and civil society actors should be considered both as potential targets of capacity building and as potential sources of capacity building assistance, depending on the local context. Including individuals who are less inclined to support or potentially adversely affected by such programs is equally crucial; by gathering them, addressing their concerns, dispelling misconceptions, and illustrating their role in ETS design, opposition can be effectively mitigated, facilitating tailored programs for accelerated implementation and efficacy.

Some work has already been undertaken to understand carbon pricing capacity building needs, and it is therefore important to have a comprehensive understanding of the landscape of current capacity building efforts. Few, if any, comprehensive assessments of the efficacy of carbon pricing capacity building efforts exist. A collective review and assessment of capacity building efforts across various initiatives and systems would assist in identifying lessons learned and in tailoring efforts to local circumstances. Landscape assessments can help optimise across initiatives by catalysing efforts to coordinate resources, identify gaps, and avoid duplication. Effective coordination and the sharing of experience among initiatives could assist in achieving efficacy, pace, and scale in the delivery of capacity building support, helping to maximise the impact of current and planned efforts.

Capacity-Building Needs

Insufficient national administrative capacity is cited as the primary challenge for the implementation of carbon markets, particularly under the Paris Agreement, argue Steinebach and Limberg.[145] This argument posits that nations with limited administrative capacities will struggle to establish the required institutional frameworks for effective participation in carbon markets. Therefore, substantial international support in the form of bureaucratic capacity building is critical for enabling low-capacity countries to navigate and benefit from these mechanisms successfully. Drawing on experiences from the Kyoto Protocol's market mechanisms as an empirical example, the paper demonstrates that countries with higher bureaucratic capacity were quicker to establish and implement domestic environmental institutions and attracting CDM projects. The centrality of international support, capacity building, and technical assistance programs is therefore crucial for developing and emerging economies to build robust institutional frameworks conducive for the success of carbon markets globally. This calls for the imperative of investments

in international cooperation and bureaucratic support programs for the comprehensive implementation of market mechanisms.[146] Simultaneously, capacity-building efforts should encompass developed countries to identify and rectify ineffective programs, fostering a dynamic environment conducive to mutual learning among nations utilising carbon pricing to facilitate emission reduction.

However, it is important to note that capacity-building needs vary across countries and include a range of issues within each country that will have to be tackled differently. Therefore, it becomes essential that local partners are involved from the planning stage, right through the execution and impact assessment so that the training programs incorporate existing background knowledge and are well adapted to the local context. A holistic package comprising targeted, continuous support that is aligned with a country's individualised needs is more likely to generate results than ad-hoc efforts on isolated topics. For example, an IMF/OECD report identified several possible considerations for G20 Finance Ministers regarding carbon taxation policies, including improved measurement of countries' principal greenhouse gas mitigation policy responses; sharing metrics and indicators for measuring countries' carbon footprints; analysis of energy price changes on households, industries, and employment in vulnerable sectors and regions, and of measures designed to alleviate adverse consequences; and analysis of the potential impacts of rising disparities in carbon prices on carbon leakage and on countries' imports, exports, output, and employment.[147]

The agreement at the Conference of the Parties (COP26) in Glasgow marked a significant milestone in finalising the rulebook for the Paris Agreement. This included a long-awaited decision on Article 6, which further strengthened the role of carbon pricing and markets as a crucial mitigation strategy. Presently, 69 out of 195 countries have expressed their intent to utilise carbon pricing to fulfill their NDCs, which signals a promising trend. Numerous capacity-building programs in the realm of carbon markets exist to support these countries. This section highlights notable carbon-market capacity-building programs distinguished by their significant scope, ambitious goals, extensive administrative experience, and/or broad geographical coverage. These programs aim to enhance stakeholder understanding of the key components of a successful carbon pricing mechanism, bolster willingness to develop such mechanisms, and facilitate the rapid adoption of effective carbon pricing strategies.

i. Partnership for Market Readiness (PMR)

The Partnership for Market Readiness (PMR) is a collaborative initiative led by the World Bank with the objective of harnessing market-based mechanisms to enhance climate change mitigation efforts, with a particular focus on middle-income countries. Throughout its

run from 2011 to 2021, it offered grants to countries to develop their market readiness, experimented with new market instruments, facilitated the exchange of experiences and knowledge on market readiness, and disseminated knowledge on market instruments for country-specific applications. The PMR also assisted countries in preparing for carbon policy choices and implementation by addressing readiness components, such as monitoring, reporting, and verification systems; greenhouse gas emissions inventories; legal and institutional frameworks; and first pilot activities.[148] The program has since evolved into the Partnership for Market Implementation (PMI), which was launched in 2021.

The PMR's evolution led to the development of two additional work programs: Technical Work and Policy Work. The Technical Work program generates knowledge products and fosters exchanges on technical aspects related to carbon pricing, establishing common standards and approaches for greenhouse gas mitigation. On the other hand, the Policy Work program provides comprehensive support to countries in modelling the costs and benefits of policy options, analysing policy interactions, and integrating this analysis into low-carbon development plans and strategies.[149]

The PMR supplied financial support and technical aid to 23 countries, primarily middle-income countries, representing approximately 46 percent of the world's greenhouse gas emissions.[150] These countries include Argentina, Brazil, Chile, China, Colombia, Costa Rica, India, Indonesia, Jordan, Mexico, Morocco, Peru, South Africa, Sri Lanka, Thailand, Tunisia, Türkiye, Ukraine, and Vietnam.[151] As of November 2020, the total pledges to the Fund amounted to approximately US$130 million contributed by countries such as Australia, Denmark, the European Commission, Finland, Germany, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States, with their contributions being considered as Official Development Assistance (ODA).[152]

The PMR has demonstrated adaptability and inclusivity in its approach to address climate change mitigation. It maintains a non-prescriptive and non-political stance, allowing countries to determine their activities independently. Originally focusing on "market readiness" for carbon pricing, the PMR evolved to encompass a broader range of initiatives, including supporting NDCs following the Paris Agreement. Moreover, it embraced a true partnership model involving a diverse set of stakeholders to ensure inclusivity and relevance.[153] However, the most striking challenge in the selection, design, and execution of carbon pricing mechanisms was the fact that it is heavily influenced by local contexts. Factors like a nation's policy and institutional framework, the technical proficiency of relevant stakeholders, and political commitment played vital roles in carbon pricing adoptions and proved to be significant bottlenecks.[154]

ii. Partnership for Market Implementation Facility (PMIF)

The Partnership for Market Implementation Facility (PMIF), launched in 2021 and managed by the World Bank, is a comprehensive trust fund aimed at accelerating global decarbonisation initiatives. With an initial funding of approximately US$125 million, this 10-year program is currently backed by 11 global donors, including Australia, Canada, the European Commission, Finland, Germany, Japan, Norway, Spain, Sweden, Switzerland, and the United Kingdom. It serves two primary objectives: supporting countries in designing and implementing explicit carbon pricing contextualised to domestic contexts and their respective sustainable development strategies; and facilitating the development of countries' participation in international carbon markets.[155]

Functioning as an umbrella organisation, the PMIF integrates various World Bank initiatives related to carbon pricing and climate finance. It encompasses a core program, the PMI, along with Compact with Africa–Green Business Fund (established in 2021), Climate Warehouse program, Carbon Pricing Leadership Coalition, Innovate4Climate global conference, and the Regional Climate Weeks. Together, these components form a cohesive framework for advancing global efforts in carbon pricing, climate finance, and market implementation.[156]

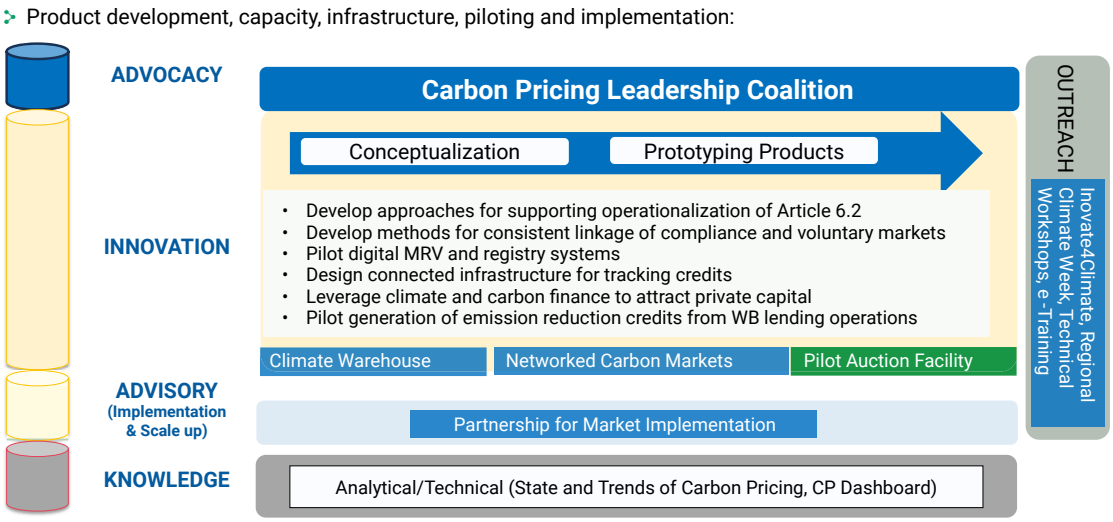
Figure 8: The PMIF Program

The PMIF program is implemented in collaboration with World Bank Group regions, country management units, and global practices to leverage and support operations. Its activities are structured around four thematic pillars.

ADVISORY	INNOVATION	ADVOCACY	KNOWLEDGE AND OUTREACH
Help countries build their capacity to design and implement carbon pricing policies. Use country-specific approaches to create an enabling environment for private investment in climate-smart initiatives.	Conceptualise, develop, test, and pilot new ideas and prototypes. Develop new tools and assessment frameworks, explore the use of new technologies, develop innovative financial approaches, and help create an enabling environment.	Convene, deliver, and exchange consultative dialogues with key stakeholders on carbon pricing policies and market development. Facilitate leadership dialogue to catalyse action on carbon pricing in the public and private sectors.	Support the development of technical knowledge products, tools, and assessment frameworks. Develop carbon pricing guidebooks and organise global/ regional conferences and workshops.
Partnership for Market Implementation Compact with Africa	Networked Carbon Markets Climate Warehouse	Carbon Pricing Leadership Coalition	Innovate4Climate Regional Climate Weeks

Source: PMIF Annual Report 2021/2022[157]

Figure 9: The PMIF and Capacity Building



Source: Hughes[158]

The PMI followed the decade-long PMR as the World Bank's anchor fund. With a 10-year capitalisation target of US$250 million,[159] it aims to help countries develop and implement carbon pricing policies and programs in at least 30 countries by 2025. The primary objective of the PMI is to aid countries in creating, testing, and executing pricing mechanisms in order to support programs and policies that introduce a strong price signal for carbon emissions across various regions and sectors. Furthermore, it envisages facilitating countries' engagement in the implementation of Article 6 of the Paris Agreement.[160]

There are two avenues for country assistance within the PMI: the implementation window, designed to aid countries that have concluded their readiness activities and are committed to progressing with implementation, and the readiness window, which supports newly participating countries in developing policies, enhancing capacity, and establishing necessary infrastructure. Assistance is also extended to facilitate their engagement in international carbon markets through Article 6 and other mechanisms. In its inaugural year, the PMI chose 17 countries from the 33 that expressed interest.

Figure 10: Countries Selected Under PMI, Inaugural Year

READINESS WINDOW		
COUNTRY	**FOCUS AREA**	**PROPOSAL STATUS**
Bangladesh	Assess feasibility and develop roadmap of carbon pricing options Readiness for participation in international carbon markets	Under preparation
Botswana	Readiness support for carbon tax	Completed
Guinea	Assess feasibility of domestic carbon pricing options	Under preparation
Malaysia	Pilot carbon tax in selected sectors	Submitted
Montenegro	Assess feasibility of carbon pricing options Draft legislative framework for bylaws in compliance with EU legislation	Submitted
Pakistan	Assess and prepare roadmap for ETS pilot program Readiness for participation in international carbon markets	Under preparation
Panama	Develop domestic carbon pricing infrastructure Pilot domestic voluntary carbon market	Submitted
Senegal	Analyze carbon pricing options Develop roadmap for design and implementation of carbon tax Readiness for participation in international carbon markets	Submitted

IMPLEMENTATION WINDOW		
COUNTRY	**FOCUS AREA**	**PROPOSAL STATUS**
Chile	Roll out carbon offset mechanism Review energy sector cap-and-trade program and fuel tax National strategy on Article 6	Submitted
China	Broaden and deepen ETS	Under preparation
Colombia	Implement ETS	Submitted
Indonesia	Support implementation of cap-and-trade program in power sector Support development of domestic crediting scheme Deepen and broaden carbon pricing instrument mix (carbon tax/ETS) in other sectors	Under preparation
Kazakhstan	Strengthen and expand ETS	Submitted
Mexico	Operationalize ETS	Submitted
Turkey	Implement ETS	Under preparation
Ukraine	Design and roll out plan for ETS	Completed
Vietnam	Implement a pilot national crediting program Implement a pilot ETS in select sectors	Submitted

The table indicates the status of proposal submissions as of 30 June 2022.

Source: PMIF Annual Report 2021/2022[161]

iii. International Carbon Action Partnership (ICAP)

In 2007, the European Council and the Government of the State of California established the ICAP, bringing together national and subnational governments that were in the process of either designing or implementing ETSs. Under this initiative, Members and Observers, comprising national and regional governments, actively engage in the exchange of insights and deliberations related to the design and execution of emissions trading systems. As of May 2023, ICAP boasted 34 full Members from subnational, national, and supranational governments and seven Observers, underlining its global relevance and reach in the realm of emissions trading systems. The Members include Arizona, Australia, Austria, British Columbia, California, Denmark, the European Commission, France, Germany, Greece, Ireland, Italy, Maine, Manitoba, Maryland, Massachusetts, the Netherlands, New Jersey, New Mexico, New York, New Zealand, Norway, Nova Scotia, Ontario, Oregon, Portugal, Québec, Spain, Sweden, Switzerland, the Tokyo Metropolitan Government, Vermont, the United Kingdom, and the State of Washington; and the seven Observers countries include Canada, Japan, Kazakhstan, Republic of Korea, Mexico, Singapore, and Ukraine.[162]

Instigated by the policy planning department of the German Foreign Office in 2007 to foster international cooperation and unify global policies to fight climate change, the idea was soon signed in Lisbon the same year. In its early days, ICAP's main aim was to expedite the possibility of a global carbon market in the wake of the Kyoto Protocol. Thus, ICAP's focus was directed towards every technical aspect of the compulsory carbon market related to linkages, such as MRV, allocation method, scope, and coverage.[163]

Underscoring emissions trading as a crucial policy mechanism in the fight against climate change, ICAP is dedicated to supporting the worldwide development, implementation, and improvement of ETSs. By actively engaging with governments, it aims to cultivate and strengthen partnerships that facilitate the exchange of best practices and lessons learned.

The three core tenets of ICAP's model include:

- Technical dialogue through its platform for Members and Observers to exchange insights and deliberate on the design and execution of ETSs.
- Knowledge sharing: Positioned as the primary knowledge hub, ICAP caters to those seeking comprehensive insights into emissions trading and provides information on the latest ETS advancements worldwide. The organisation now hosts a readily accessible information repository which is available on their website and serves as a valuable resource on the subject of carbon pricing.
- ICAP plays a pivotal role in enhancing capabilities related to

the formulation, execution, and functioning of ETSs globally. The program extends its support to policymakers and private-sector representatives by offering comprehensive training courses. These courses cover a wide spectrum of topics encompassing all aspects of emissions trading, fostering a deeper understanding of this vital tool in the fight against climate change. It has delivered courses to over 700 participants from more than 60 countries, building capacity on emissions trading as a key policy instrument to tackle climate change globally.[164]

ICAP's flagship training activity is its two-week Summer School on Emissions Trading, targeted at participants from emerging economies and developing countries. The Ecologic Institute, a Berlin-based think tank, along with its collaborative partners, initiated a training and capacity-building program focused on emissions trading in 2007, supported by the European Commission and under the aegis of the International Carbon Action Partnership. With over 20 summer schools and training courses held since 2009,[165] a large number of officials and stakeholders are currently working on carbon market policies in emerging economies and developing countries. Alumni of the courses have developed a strong network and share information across their regional jurisdictions.

iv. Japan's Paris Agreement Article 6 Implementation Partnership (A6IP)

To ensure the effective and robust implementation of Article 6 of the Paris Agreement, there are certain prerequisites for participation and reporting. Japan's Paris Agreement Article 6 Implementation Partnership (A6IP), initiated during the COP27, seeks to strengthen these efforts and acknowledge the imperative for capacity building, especially in developing nations, to implement Article 6. Managed by the Institute for Global Environmental Strategies (IGES), A6IP also works with the World Bank and the UNFCCC to flesh out its governing structure and concrete capacity-building plans in collaboration with research institutions and private companies.[166]

Currently, there are 69 countries and 34 organisations, including multiple international organisations as well as regional and multilateral banks, that are active partners of the A6IP.[167]

The A6IP is aimed at enhancing the understanding of Article 6 regulations and their alignment with NDCs. This involves providing countries with the knowledge and insight required to grasp the intricacies of Article 6 and how it interfaces with their climate action plans. Additionally, it recognises that sharing best practices in institutional arrangements is of paramount importance. By exchanging proven methods and

approaches through various channels like workshops and training modules, countries can optimise their authorisation and recording processes. Furthermore, the initiative involves organising workshops and training sessions to facilitate mutual learning and enhance capabilities related to Article 6 reporting and review processes. This ensures that countries and stakeholders are well-prepared to navigate the complexities of compliance with Article 6. Another critical aspect is supporting the development of baseline methodologies. This includes the creation of tools and resources to establish a standardised framework for assessing emissions reductions, thereby promoting consistency and reliability. Lastly, a central focus is on designing carbon markets that are robust and characterised by their reliability and environmental integrity. These markets play a crucial role in ensuring that the emission reductions shared under Article 6 adhere to high standards. Through these comprehensive efforts, the implementation of Article 6 is enhanced, contributing to more effective global climate action.[168]

v. GIZ's Global Carbon Market Program

Since 2008, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), commissioned by the German Ministry of Environment, Conservation and Nuclear Safety (BMU), has been supporting partner countries in using market mechanisms for reducing GHG emissions through its Global Carbon Market project. The Global Carbon Market project aims to promote national and international carbon market instruments among public and private decision-makers to support them in their climate change mitigation efforts.[169]

The Global Carbon Market project advises government agencies and private-sector actors on the opportunities provided by market-based instruments. Through rigorous analytical studies and knowledge exchange at conferences and workshops, the project strengthens the ability of public decision-makers in partner countries—Uganda, Chile, Tunisia, India, and, since 2022, the Caribbean—to make use of new and existing carbon market instruments. Furthermore, the initiative enhances the involvement of partner nations in global negotiations and facilitates the exchange of knowledge between countries in the Global South.[170]

Box 12: Case Study: Tunisia—A Sectoral Approach

Tunisia experienced a nearly 44 percent increase in GHG emissions from 1994 to 2012. As part of its commitment to the Paris Agreement, Tunisia aims to reduce CO2 intensity by 41 percent by 2030 compared to 2010 levels. The cement sector, responsible for 14 percent of the country's emissions, is a crucial focus for achieving climate targets. The Global Carbon Market project in Tunisia operates on a dual approach: building capacities and removing regulatory barriers in the cement sector for enhanced climate action and promoting Tunisia's international positioning to participate in Article 6 and other market mechanisms.

The project supports low-clinker cement, which holds the potential of up to 50 percent reduction in sectoral emissions. Additionally, it advances co-processing in cement production by leveraging waste-management strategies and enhancing energy-efficient practices, and establishing a centralised Measurement Reporting and Verification (MRV) system. Strategic collaboration with pivotal stakeholders, including the Ministry of Environment, the Ministry of Industry, and the cement industry, proved to be essential in fostering a favourable regulatory environment and bolstering the engagement and commitment of all parties involved. Furthermore, it focuses on enhancing Tunisia's Article 6 readiness and international positioning, collaborating with partners to build capacity, foster dialogue, and develop project pipelines. The project actively supports Tunisia in international negotiations, provides technical insights, and strengthens institutional capacities.

Consequently, the Global Carbon Market project claims to have bolstered private and public stakeholders' capacities in Tunisia, promoted low-carbon technology options, improved carbon emissions monitoring, and raised awareness of Article 6 among decision-makers and civil society. Article 6 has become a key priority for public decision-makers in Tunisia, with the project significantly contributing to capacity-building and training negotiators on Article 6.

Box 13: Case Study: Sino-German Cooperation—Establishing Emissions Trading and Reducing Nitrous Oxide Emissions

China has established ambitious targets of peaking CO2 emissions before 2030 and achieving carbon neutrality by 2060, with the national ETS positioned as a key instrument in reaching these objectives. In 2021, the Chinese ETS initiated its inaugural compliance phase, overseeing the regulation of CO2 emissions from approximately 2,200 companies within the power generation sector. Aligned with directives from the 14th Five-Year Plan and the 2035 long-term outline, China is dedicated to intensifying control over non-CO2 greenhouse gases (GHG), including potent GHGs like N2O and HFCs.

GIZ has been actively involved in supporting the development of the ETS in China since 2012 and continues to provide further support to refine its ETS. Post the national ETS launch, the project continued to provide assistance in refining the system, with a focus on enhancing the monitoring, reporting, and verification (MRV) framework. Emphasis is also placed on fortifying the political and technical dialogue between China and Germany concerning carbon market topics. Since 2020, the project has extended its support to include the reduction of industry-related N2O emissions through initiatives such as capacity building, studies, workshops, and various exchange formats. In an effort to encourage the proliferation of carbon markets in Asia, the program also assists China in sharing its ETS experience with other Asian countries, strengthening South-South cooperation. In terms of industry-related N2O mitigation, the project supports the implementation of measures to sustainably reduce N2O emissions, shares German expertise in industrial N2O abatement, and provides capacity building and policy recommendations.

The achievements include supporting the establishment of ETS pilots in China, training over 5,000 individuals from environmental administration and companies on the national ETS, and organising extensive exchanges on the technical design of the national ETS in collaboration with entities like the German Emissions Trading Authority (DEHSt), the European Energy Exchange (EEX), and the International Carbon Action Partnership (ICAP).

vi. Other Related Initiatives: Forging Coalitions on Carbon Pricing

Eastern Africa Alliance (EEA) on Carbon Markets and Climate Finance

The Eastern Africa Alliance on Carbon Markets and Climate Finance is a collaborative initiative established in June 2019, comprising seven member nations (Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda, and Sudan) with the objective to promote a shared vision for carbon markets and climate finance across the Eastern Africa region. It was set up to influence and enhance regional readiness concerning the new generation of market mechanisms as defined in Article 6 of the Paris Agreement, encompassing capacity-building activities for both the public and private sectors. It was also conceptualised to ensure that regions interests and priorities are duly considered in the finalisation and implementation of Article 6. The primary goal of the Alliance is to enhance the capacities of its member countries and create a platform for sharing experiences and pushing forth a unified regional approach regarding carbon markets, enhancing coordination on international carbon mechanism of Article 6, and plough in climate finance to the region.
The interim secretariat for the Alliance is housed at the UNFCCC Regional Collaboration Center Kampala, with support from GIZ Uganda, alongside the Alliance Coordinator responsible for overseeing all Alliance-related activities.

West African Alliance (WAA) on Carbon Markets and Climate Finance

The West African Alliance for Carbon Markets and Climate Finance was initiated by West African negotiators during COP22 in Marrakech in 2016 with the overarching goal of strengthening the position of West African states in participating in international carbon markets. The Alliance has set up a permanent regional structure, with ENDA Energy serving at the Secretariat located in Dakar. Its primary objective is to bolster the engagement of West African countries in global carbon markets, promote technology transfer, and enhance access to result-based climate finance for the implementation of their NDCs.[171]

First, it strives to actively involve West African delegates in UNFCCC negotiations. This engagement particularly hones in on critical aspects such as market mechanisms, transparency, and climate finance. The objective is to ensure that West African countries are well-represented and influential in shaping international climate policies. Additionally, the Alliance is committed to facilitating access to carbon market mechanisms and opportunities for climate finance at both the national and subregional levels. By doing so, it seeks to empower these nations in their climate endeavours, providing them with the resources and support needed for effective implementation. The

Alliance also spearheads the transition of capacities and activities associated with Clean Development Mechanism (CDM) into the framework of the Paris Agreement. This transition ensures that established expertise and practices align with the latest global climate initiatives. Furthermore, the Alliance extends its support to pilot initiatives under Article 6 within the subregion. In doing so, it not only aids in the implementation of these initiatives but also actively shares the knowledge and insights gained during the process with the broader international community. This two-way exchange of information contributes to the collective progress in global climate negotiations.[172]

The Alliance's membership predominantly consists of countries from the West African region, particularly from within the Economic Community of West African States, including Benin, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Niger, Nigeria, Liberia, Burkina Faso, Sierra Leone, Senegal, and Togo, as well as Mauritania. The initiative is firmly anchored in the subregion, meticulously attuned to the distinct requirements and priorities of its member states. It is an initiative that has been crafted both by and for West African nations, ardently focused on addressing the unique requirements and priorities of its member states.

Table 2: A Comparison of Capacity-Building Initiatives

Initiative	Issuing Organisation	Duration and Status	Members	Achievements
Partnership for Market Readiness (PMR)	World Bank	2011-2021, evolved into Partnership for Market Implementation (PMI)	23 countries	Financial support and technical aid to 23 countries, primarily middle-income countries, representing 46 percent of global emissions
Partnership For Market Implementation Facility (Core programs - PMI, Compact with Africa)	World Bank	Launched in 2021, 10-year program	17 countries	Initial funding of US$125 million, 11 global donors. The PMI has a 10-year capitalisation target of US$250 million and aims to help develop and implement carbon pricing policies and programs in at least 30 countries by 2025.
International Carbon Action Partnership (ICAP)	European Council, Government of California, German Foreign Office	Established in 2007	34 full Members, 7 Observers	Engage governments globally, host Summer School on Emissions Trading, deliver courses to over 700 participants from 60+ countries

Japan's Paris Agreement Article 6 Implementation Partnership (A6IP)	Japan Ministry of Environment, managed by the Institute for Global Environmental Strategies (IGES)	Launched in 2022 during COP27	69 countries and 34 organisations (as active partners)	Capacity building, mutual learning, supporting developing nations in navigating Article 6 complexities. Contributions include carbon pricing database and Emissions Trading Summer School
Global Carbon Market	GIZ, commissioned by the German Ministry of Environment	Since 2008	Uganda, Chile, Tunisia, India, Caribbean since 2022	Strengthen the ability of decision-makers in partner countries, promoted low-carbon technology options, improved emissions monitoring, raised awareness of Article 6
Eastern Africa Alliance on Carbon Markets and Climate Finance	Eastern Africa Alliance; UNFCCC Regional Collaboration Center Kampala and GIZ Uganda (Secretariat)	Since 2019	Burundi, Ethiopia, Kenya, Rwanda, Tanzania, Uganda, and Sudan	Support regional coordination and build strong networks among member countries
West African Alliance on Carbon Markets and Climate Finance	Western African Alliance; ENDA Energy (Secretariat in Dakar)	Since 2016	16 Member states	Support regional coordination and build strong networks among member countries

Given the inconsistent and limited availability of data on the effectiveness of capacity-building initiatives, there is a lack of concrete metrics for comparing these programs through outputs such as the number of training sessions conducted, number of stakeholders reached, amount of funding expended on capacity-building activities, volume of educational materials distributed, quantity of policy briefs or reports produced, hours of technical assistance provided to stakeholders, number of workshops or seminars organised, or policy briefs developed. This also includes outcomes such as the increased willingness of stakeholders to adopt carbon pricing mechanisms, evidenced by the percentage of stakeholders implementing or expressing intent to implement such mechanisms, the program's influence on policy changes, quantifiable reductions in GHG emissions, economic benefits from carbon pricing, enhanced stakeholder engagement, alignment with international best practices, additional environmental co-benefits, sustainability of implemented mechanisms, and stakeholder satisfaction levels regarding program effectiveness.

Has Capacity Building Been Effective in the Field of Carbon Markets?

Building capacity in the development and implementation of carbon pricing

and carbon markets in particular is key to the further expansion of carbon markets beyond its current coverage of 23 percent of global emissions. As countries and companies consider carbon pricing, they must understand the requirements of each individual system and its demands on existing infra- and superstructures. As an example, a country that has an undeveloped taxation system may struggle to develop a carbon tax, especially if the taxable entity is prone to under-report its emissions. Capacities and resources are required to ensure not only proper development but also the implementation and enforcement of the carbon pricing tool.

The experience of international carbon pricing capacity building does not restrict itself to the initiatives mentioned in this chapter. During the Kyoto Protocol years, roughly between 2003 and 2013, many different agencies at the multilateral and bilateral levels took on the initiative to set up capacity-building programs. These largely followed the traditional flows of bilateral development assistance as these efforts piggybacked on existing relationships between administrations and grantees. As the efforts started growing, it became clear that many countries were not receiving the expected level of technical assistance. In order to coordinate efforts across different funders, the Secretariat of the UNFCCC convened the Nairobi Framework, which was intended to ensure the widest possible coverage by capacity-building efforts to take part in the Kyoto Protocol mechanisms. It soon became apparent that there had been significant duplication of initiatives within countries. The result of such lack of coordination and concentration of efforts in some key countries was the continuing lack of diversity in the development of clean development projects. Eventually, this issue impacted the relations between developed and developing countries at the Conference of the Parties.

Gaps in Capacity-Building Initiatives

- Weak coordination between carbon markets' capacity-building initiatives and organisations: There is a plethora of programs delivering capacity building on carbon markets in developing countries; however, there is often little to no coordination among them, resulting in duplications of efforts, inconsistent quality standards, inefficient resource allocation, and a fragmented approach with limited impact. Hence, the exchange of knowledge through practical experience can leverage synergies, and efficient outcomes can result from well-coordinated and consolidated endeavours. For instance, tools and informational materials created during one pilot initiative can be foundational for subsequent pilot activities, demonstrating the potential for cumulative learning and improvement across various projects.[174]
- Lack of sustainability of capacity: The mere development of capacity within governmental entities does

not guarantee its retention within the country or its sustained continuity. Initiatives to institutionalise capacity within organisations, such as through manuals and train-the-trainer programs, can mitigate the dependence on individual staff members. The challenge is further exacerbated by the limited size of teams dedicated to carbon market development matters within government structures.[175]

- Lack of efficient stakeholder engagement mechanisms: In many countries, institutional capacities for effective coordination across ministries and sectors at various levels of disaggregation are notably weak. This often leads to inter-ministerial conflicts and fatigue within the administrative structure. Furthermore, the inadequacy extends to the realm of stakeholder engagement, where efficient mechanisms are lacking. The dearth of streamlined coordination mechanisms at the institutional level exacerbates the challenges faced in fostering collaboration between different stakeholders and can impede the seamless implementation of initiatives and policies.

  Moreover, it is frequently observed that training sessions conducted for high-level officials fail to disseminate essential knowledge and skills to the local stakeholders who bear the responsibility for actual implementation. This lack of cascading information hampers the effective execution of strategies and initiatives at the grassroots level, highlighting the need for targeted efforts to bridge this gap in knowledge transfer. Sustained endeavours are essential to guarantee fair access to tailored capacity building, preventing the accumulation of support in specific regions, as observed during the Kyoto mechanisms, exhibiting favourable "preconditions" for capacity building.[176]
- Inadequate engagement of the private sector: The private sector holds a pivotal position in furnishing financial backing for project execution and galvanising support for pioneering research and development initiatives. Hence, there is a need for initiatives to enhance the capabilities of the private sector concurrently with those of the public sector.

Recommendations

As a new generation of carbon market mechanisms takes place with the development of Article 6 of the Paris Agreement, countries will want to take advantage of the flexibility of Article 6 in the development of their bespoke national arrangements and mechanisms. It would be useful at this juncture to reflect on the effectiveness of capacity-building efforts so as to avoid repeating the same mistakes. Certain lessons can be derived from the experience of the PMR for the success of new programs:

- **Learn by doing:** Most countries involved in capacity building have

learned as they implemented and face the same issues as others. Tuition or knowledge transfer in the absence of the immediate usability of such knowledge can be wasteful and disheartening. In addition, if the knowledge itself is not immediately usable in a given context, this may result in dissatisfaction with the program. Piloting can be an effective means for learning by doing. For instance, Ghana has established a comprehensive array of institutional frameworks for Article 6 and associated documentation, providing a valuable blueprint that can be utilised by other countries.[177] Peer-to-peer learning should be based on insights gained from "learning by doing" exercises. Knowledge products that reflect on these lessons, as exemplified by GGGI in 2021, can play a crucial role in disseminating this knowledge beyond the scope of peer-to-peer exchanges. Regional initiatives like the EEA and WAA are actively promoting regional networks to facilitate peer-to-peer support.

- **Championing:** Effective capacity-building efforts require a champion entity within each country that is tasked with the development of a carbon pricing instrument. Without such an individual or institutional champion, the process of diffusion of knowledge within the country's administrative structures and wider stakeholders will be jeopardised.
- **Mentoring:** Most successful capacity building programs within climate policy and carbon markets have relied on extensive mentoring and handholding through the process of putting into action the knowledge transferred in capacity building, for example through the co-development of carbon crediting projects in countries with little experience of the CDM. In the more ambitious context of the Paris Agreement, countries will need to assess much more thoroughly the costs and benefits of participating in the global carbon market. Robust modelling capacities should be developed in this regard. Countries will also be further incentivised by the Paris Agreement framework to consider carbon pricing mechanisms for their own use in reducing their emissions and not just as potential sellers of carbon credits (as was the case in the Clean Development Mechanism).

Capacity development should also prioritise the development of tools encompassing not only registries but also vital instruments like abatement cost calculators, auction platforms, emission tracking systems, compliance mechanisms, and MRV frameworks. These tools are indispensable for facilitating the successful implementation and management of carbon pricing initiatives, enabling countries and companies to optimise their emission reduction efforts and achieve their climate objectives effectively.

- **Impact assessments:** The evaluation of capacity-building initiatives within carbon markets has been perceived

to be insufficient so far. There is a pressing need to enhance these assessments to ensure increased effectiveness and introduce a dynamic approach to the process. Moreover, fostering improved dialogue among capacity-building providers and incorporating peer reviews of the programs by the providers can significantly enhance their overall quality and impact.

Figure 11: A 10-Step Framework for Capacity-Building Programs

Source: Authors' own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V.

The Next Wave of Carbon Markets

The Challenges

The Opportunities

South-South Cooperation in Carbon Markets: Opportunity Areas

AS OUTLINED IN THE previous chapters, carbon pricing instruments, and carbon markets in particular, can be seen as making a return to prominence in the climate policy toolkit. Much of the impetus comes from the new context of the Paris Agreement, including the development of the NDCs and the slow but steady development of the modalities for putting into operation Article 6 of the Paris Agreement.

Carbon markets started out in the Global North. They were first promoted by developed countries, and the United States in particular, as a way to provide flexibility in complying with developed country targets under the Kyoto Protocol. The first wave of carbon markets (the European Union Emissions Trading Scheme, New Zealand, the Regional Greenhouse Gas Initiative of the North-eastern United States, and California) all needed to start with a clean slate and relatively little international experience.

As more countries are experimenting with carbon pricing and carbon markets, programs like the Partnership for Market Readiness or GIZ's cooperation programs on markets sought to establish the infrastructure for carbon markets in different emerging economies and developing countries overall. While mostly successful, in some cases, these efforts failed to materialise in the development of actual carbon market instruments. This can be partly explained by the very different context of the group of countries. In many cases, emerging economies have a development imperative in which the fight of climate change must be contrasted and embedded into a number of often contradicting policy objectives. While lessons from the North regarding the social and economic dimensions of carbon pricing are valuable and initiatives like the PMR or ICAP will continue to prove invaluable in building a cadre of experts over the long term who are well-versed in the basics of carbon pricing tools, the prospect of South-South engagement in mutual learning and sharing of experience is a tantalising one.

The Challenges

Governments in the South need to contend with different challenges than those of the United States, Europe, or Japan:

- **Resources available in administrations:** To put this issue into perspective, one of the authors witnessed a session at a recent ICAP Summer Course in which participants from emerging economies learned, from the head of one European Member State, about the size of the office in charge of the administration of the ETS within his country. It was noted that the size of that particular administration was larger than many of the course participants' staffs for entire ministries. This speaks to the dearth of expertise in administrations in some countries, especially as environmental administrations have to contend with traditionally much larger bureaucracies in their industry or power counterparties.
- **Data poverty:** Establishing a proper carbon pricing system, be it a carbon tax or an emission trade, requires, at the outset, the mining of data and the establishment of proper data management systems, as high-quality data is required on emissions and their proxies in order to set baseline scenarios and policy scenarios, monitor performance, and establish compliance penalties if required.
- **Incipient electricity and overall energy market liberalisation:** In the EU and the US, emissions trading has been implemented in the context of an already liberalised energy market, in which price competition in generation went alongside independent regulation of grid services. This liberalisation of energy markets greatly facilitates the transmission mechanism of carbon prices through the power sector.

Under more vertically integrated, centrally regulated power systems, the use of carbon pricing regimes cannot count on the transmission of the price signal, unless explicit recognition of the carbon cost is embedded into the tariff regime by the electricity regulator. Yet, even in such cases, and prior to a full transition to a liberalised electricity market, carbon pricing can be a useful tool.

- **Lack of access to affordable capital:** Despite overall improvements in business environments across many countries in the Global South, access to capital towards low-carbon solutions can only come with a variety of risk premia, from policy and counterparty risk, to technology risks, with low-carbon technologies often finding it difficult to access affordable capital. Carbon markets can provide and leverage capital but cannot correct for wrong or outdated risk perceptions. This entails a focus for complementary policies to carbon markets that can address de-risking investments in low carbon solutions.
- **Focus on energy access and energy poverty:** In developed economies, near universal access to electricity and basic energy services has been achieved. While energy poverty is also an issue due to growing income inequality in some countries, the challenge of servicing a growing population with reliable and modern energy services for an increasingly connected society is much more challenging. G20 countries must in many cases still prioritise universal access, ensuring equality of access across regions, especially for the disadvantaged socioeconomic strata of society.

The Opportunities

In certain respects, emerging economies have some advantages:

- **Emerging young leaders**
  Due to the efforts over the years of initiatives such as the ICAP Summer Courses, there is already a community of younger, trained technical staff ready to assume roles of thought leadership in the establishment of new carbon policies, including carbon pricing.
- **Avoidance of lock-in of newly built infrastructure**
  Given the expectation of faster economic growth and the need to build infrastructure across transport, housing, and energy grids, countries are best placed to avoid the locking-in of technology that may soon be outdated and out of line with decarbonisation imperatives. Countries such as India are already investing in upgrading their energy infrastructure and building out renewables. In this context, carbon pricing can work to both ensure the longer-term sustainability of the infrastructure rollout as well as accelerate the winding down and phasedown of existing, higher-carbon technology, as has been the case

with the accelerated phasedown of coal-fired power generation in Europe.

- **Access to, and development of, new 'leapfrogging' technology**
  As is already happening with China and India in the case of solar PV technologies, there is immense scope for the early deployment of more advanced technologies.

South-South Cooperation in Carbon Markets: Opportunity Areas

The carbon market is in an integrity crisis, motivated by accusations and evidence of severe misrepresentation of core features of carbon credits in the international market, be it through projects that have issued too many credits in relation to estimated removals or reductions in GHGs, or through misrepresenting the benefits of the work to local communities and Indigenous peoples. Resolving this set of issues requires concerted effort from a number of actors. In a South-South context, it will also include the stepping up of action by governments looking to exercise their public duty. This role for sovereign governments in a voluntary carbon market must be tailored to the needs of the market, but it includes a measure of oversight over the activities of carbon project developers, carbon crediting standards, and provision of guidance as to where governments would see activities best developed and in what way, including an endorsement of the proper use and claim of carbon assets generated in the market.

Potential areas for South-South cooperation in carbon market development include the following:

Generic capacity-building across linguistic geographies

Many international communities share a common language. Capacity building within such linguistic communities, as in the case of the Institut de la Francophonie pour le Developpement Durable, can break down an important barrier of access to information.

Possible development of common market architecture across regions of the world

As many initiatives have already highlighted, much of the infrastructure supportive of different carbon market designs in the world has already been developed. In other words, there is advantage in copying, adopting, and adapting others' experiences. A few cases in point:

- **Data exchange standards**
  Data exchange standards (DES) are the "common language" that a carbon market registry must follow. The first set of DES were developed for the United National registry system under the Kyoto Protocol, and that system has been adapted to many of the existing systems, including the EU ETS. This common adoption holds out the hope that this same "language" can facilitate the linking of carbon market systems in the long run. Even without such

a lofty ideal, the adoption of the UN DES makes practical sense.

- **Registries**
  Going one step further, registry software, i.e., the actual implementation of the DES, is available for free from the European Commission. Any constituency that considers establishing a registry might want to understand how to leverage such offers rather than spend valuable capital and other resources tailoring a bespoke solution out of nothing.
- **Common approaches to offsets, potentially mutual recognition, or adoption of common standards**
  Paraphrasing Gertrude Stein, "a carbon credit is a carbon credit is a carbon credit", i.e., carbon credits the world over should follow essential tenets of carbon credit quality to ensure wider acceptability internationally. As the world moves away from the Kyoto Protocol and its reliance on a single set of crediting protocols, i.e., the Clean Development Mechanism methodologies, it is important to ensure comparability in quality. This can be achieved by the endorsement of initiatives such as the Integrity Council on the Voluntary Carbon Market and its outcomes or by establishing mutual recognition of crediting protocols at the regional level. Encouraging South-South cooperation can also lead to crediting protocols that speak more to Global South priorities.
- **Developing common thinking on issues such as the legal context of allowances and credits**
  Issues such as the legal nature of carbon credits, with its implications on cross-border trading, tax provisions, and accounting standards, have yet to be settled uniformly across jurisdictions. There are efforts underway, such as those under UNDROIT, to provide common guidance across jurisdictions. South-South cooperation could include aligning on such issues.
- **Exploration of linking between markets**
  Finally, while carbon market or pricing linking may seem like an ambitious goal in the near term, it can be considered a longer-term goal, as economies converge and as mutual confidence in systems evolves. Till date, such linking has mainly involved North-North linking, such as EU-Switzerland or California-Quebec. However, in the longer run, linking may very well proceed along more regional connections within the Global South. As with existing experience, linking will most likely be preceded by years of independent experience in the design and implementation of nationally appropriate systems that can engage with each other.

These are just some of the areas in which opportunities might emerge. It is important to keep an open mind about the value of this cooperation, based on the mutual understanding of national circumstances and the value of sharing experiences and co-designing systems.

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