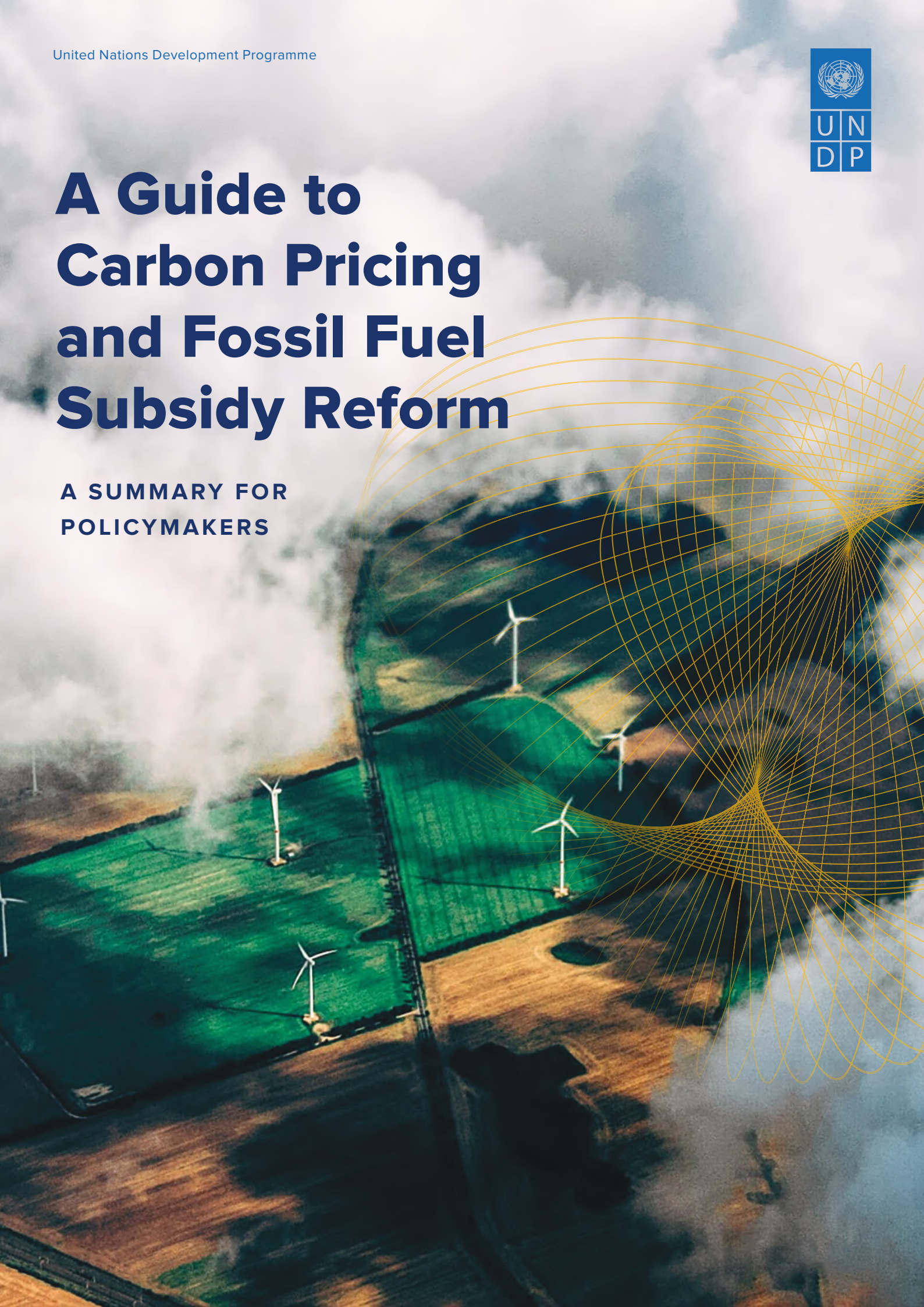
United Nations Development Programme

A Guide to Carbon Pricing and Fossil Fuel Subsidy Reform

A SUMMARY FOR POLICYMAKERS



A Guide to Carbon Pricing and Fossil Fuel Subsidy Reform:

A SUMMARY FOR POLICYMAKERS

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The price of solar power has decreased dramatically in the last decade, and is now becoming a competitive alternative to fossil fuels—especially coal.

FOREWORD

The science is clear: climate change is already here. It is taking place in every corner of the globe. It is happening faster than ever and now intensifying. Our changing climate, which poses an existential threat, is primarily caused by our continued use of fossil fuels. Yet, the fossil fuel industry benefits from subsidies of $11 million every minute which is fueling our climate crisis. Indeed, exposure to air pollution is estimated to cause seven million premature deaths every year.

At the same time, our path out of this crisis is equally clear. To limit the global temperature rise to 1.5 degrees Celsius, emissions need to fall by 7.6 per cent every year between now and 2030. This translates to an annual six per cent decrease in energy production from fossil fuels. An intrinsic part of this process is for Governments to directly address the current mispricing of fossil fuel-based energy that entire economies are built on. That starts with phasing out fossil fuel subsidies and putting a price on carbon.

Global shifts in carbon pricing and fossil fuel subsidy reform are gathering pace. Countries, including Morocco and India, have taken steps to reform these subsidies while major-emitter countries in the G7 and G20 have made commitments to phase out fossil fuel subsidies. More than 60 carbon pricing initiatives have been implemented across the world. Indeed, 96 of the 146 Nationally Determined Contributions refer to carbon pricing as a "policy option".

Yet such is the extent of our climate crisis, Governments need to rapidly accelerate their decarbonisation and drive forward a clean energy transition. Drawing on existing literature and case studies, *A Guide to Carbon Pricing and Fossil Fuel Subsidy Reform: A Summary for Policymakers* aims to provide decisionmakers with new insights and guidance on how to implement successful energy pricing reform in three steps: 1) phasing out fossil fuel subsidies; 2) putting a price on carbon; and 3) reallocating these resources towards the achievement of the Sustainable Development Goals (SDGs).

The report highlights the pros and cons of existing tools in relation to specific economic and social contexts—drawing lessons from emissions trading pilot schemes in China, for instance. Using a macroeconomic lens, the report also demonstrates how multilateralism will be pivotal to bolster global, collective action towards fair and effective carbon pricing mechanisms. Indeed, the report complements the ambitious objectives set out in the new Global Roadmap on clean energy that stemmed from the 2021 High-Level Dialogue on Energy. For instance, it calls for a shifting of fossil fuel subsidies to renewable energy investments, while creating new green, decent and healthy jobs to secure a just and inclusive transition.

As some countries start to build forward better from the COVID-19 pandemic, we cannot go back to business-as-usual as our continued dependence on fossil fuels is precipitating the decline of both people and planet.

The United Nations Development Programme (UNDP) will continue to offer support to countries and policymakers as they design and implement the energy pricing reforms that will lay the foundations of the green economies of the future. Complementing these efforts, UNDP has made an ambitious commitment to work with our partners to provide 500 million additional people with access to clean and affordable energy by 2025.

With the SDGs serving as our collective North Star, the entire UN family and our partners will be on hand to help countries and communities to plot a course out of this crisis -- towards that greener, more inclusive, and more sustainable future.

Achim Steiner
Administrator, United Nations Development Programme (UNDP)
Co-Chair, UN-Energy

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KEY MESSAGES

- **Carbon pricing is key to reducing emissions and delivering the nationally determined contributions (NDCs) cost-effectively, and could mobilize hundreds of billions, even trillions, of dollars in additional revenues annually.** This report provides a comprehensive analysis of existing carbon pricing tools, and aims to help policymakers decide which carbon pricing policies will be the most adapted to their national contexts. It shows that the effectiveness of carbon pricing mechanisms is optimal when combined with fossil fuel subsidy reform.

- **Policy options for imposing an explicit carbon price include a tax, an emissions trading system (ETS) or measures combining features of both.** Taxes can be levied on energy production, consumption or trade, for example. Alternatively, policy makers can control the volume of emissions under an ETS. Finally, so-called "hybrid" measures combine facets of both these policies by setting a cap on emissions but, for example, limiting the range within which prices can fluctuate.

- **Carbon pricing measures aim to increase the cost of polluting fuels and technologies. But if misplanned or misdesigned, carbon taxes can lead to civil unrest.** This was the case in France, where the introduction of a carbon component into the fuel tax in 2014 led to a price rise in 2018 which triggered the mass protest movement of the Gilets Jaunes (Yellow Vests), partly because the price rise incurred by the tax was going to disproportionately affect lower middle class and working class households who are heavily reliant on cars.

- **Carbon pricing measures are not only effective in terms of greenhouse gas emissions reductions. They also present unique revenue raising opportunities.** Unlike other policy instruments to reduce greenhouse gas emissions, such as, energy efficiency regulations or subsidies for low carbon technologies, carbon pricing has the potential to mobilize hundreds of billions, even trillions, of USD in additional fiscal revenues annually which could help support the Sustainable Development Goals (SDGs). Positive carbon pricing also presents substantial revenue opportunities. Overall, these could address often chronic funding issues faced by many developing country governments.

- **International momentum on carbon pricing is gathering pace.** Globally, more than 60 carbon pricing initiatives have been implemented. 96 of 146 Nationally Determined Contributions (NDCs) currently refer to carbon pricing as a policy option. However, current policies require extending, reinforcing and coordinating to achieve current and future emissions reduction goals.

INTRODUCTION

Carbon pricing initiatives are emerging at an unprecedented rate at the regional, national and subnational levels, but their scale and ambition will need to increase substantially to achieve the world's climate targets. Globally, more than 60 carbon pricing initiatives have been implemented (WBG, 2021). Broadly speaking, these are evenly divided between carbon taxes and cap-and-trade systems. Business and investor support is also growing, with more than 2,000 companies that have priced or plan to price carbon by 2022. While the use of carbon pricing mechanisms is increasing, it is still far from enough, with generally low price levels, despite recent upward movements in key markets, and limited geographic and sectoral coverage. Indeed, current coverage based on the existing mechanisms only accounts for 20% of global greenhouse gas (GHG) emissions, and the majority of emissions (85%) are priced at less than US$10 per ton of CO_2, far below the price that economic models suggest is needed to meet the climate stabilization goals recommended by scientists. Estimates by economists such as Nick Stern and Joseph Stiglitz suggest that prices will have to be more broadly applied and raised to between $50 and $100 per metric ton of CO_2eq by 2030 to meet the goals of the Paris Agreement.

Furthermore, the effectiveness of carbon pricing mechanisms becomes optimal when these are combined with fossil fuel subsidy reform. While carbon pricing aids the transition to a low-carbon economy, fossil fuel subsidies can cancel out and even reverse the impacts of carbon pricing. According to the latest figures from the IMF, fossil fuel subsidies were estimated at $4.7 trillion (6.3% of world GDP) in 2015 and $5.2 trillion (6.5% of GDP) in 2017 (IMF, 2019; Coady et al., 2019). Emerging/Developing Asia accounts for nearly 40% of global energy subsidies, followed by Advanced Economies (27%); the Commonwealth of Independent States (15%); Middle East, North Africa, Afghanistan, and Pakistan (9%); Latin America/Caribbean (5%); Emerging/Developing Europe (3%); and Sub-Saharan Africa (2%). Fossil fuel subsidies as defined by the IMF include both underpricing the supply cost of fossil fuel and undercharging for environmental externalities such as global warming, air pollution, traffic congestion and accidents. Carbon pricing is thus one component in efficient fossil fuel subsidy reform, and it is critical for policymakers to take an integrated approach to achieving net GHG emissions reductions.

SCOPE OF THE REPORT

There is a growing body of literature comparing the various options for carbon pricing (taxes versus cap-and-trade) and discussing the detailed design of such mechanisms, their effectiveness and efficiency, the required pricing level, the distributional impact and political acceptability. However, the available literature is fragmented and often very academic. The majority of these studies focus on a specific country or one of the subtopics mentioned above and do not provide a holistic view of possible policy frameworks or the quantification and pricing of net positive impacts.

Although there is extensive research on fossil fuel subsidies and the need for reform, resources that take a coherent approach to both carbon pricing and fossil fuel subsidies are limited, if not non-existent. These two policy implications need to be assessed concurrently to avoid policy incoherencies and contradictions. In addition, most of the experience has been in developed economies, meaning that developing countries are yet to design effective carbon pricing and fossil fuel subsidy reform programmes.

Against this backdrop, this report will take the shape of a policy guideline targeting policymakers in developing countries to inform them of the best practices, lessons learned, comparative advantages and distributional impacts of carbon pricing and fossil fuel subsidy reform. In addition to carbon pricing, the paper will explore other policy instruments used by policymakers to regulate emissions and will provide a summary of the pros and cons of such instruments. In particular, it will analyse the impact of carbon policies on vulnerable groups and the political acceptability of past reforms and will recommend solutions to increase the effectiveness of the policies studied. It intends to provide policymakers with a "beginner's guide" to implementing carbon pricing and fossil fuel subsidy reform policies. It will do this by sharing best practices and lessons learned from countries that have reduced or phased out fossil fuel subsidies and successfully introduced carbon taxes, using an accessible format that is easy for non-specialists to understand.

Climate change is an unprecedented challenge to sustainable development. Rising concentrations of GHGs are likely to expose hundreds of millions of people to food and water shortages, as well as coastal flooding (IPCC, 2018). The world's poorest countries, communities and households will be disproportionately affected, due to their greater economic dependency on exposed sectors and more limited capacity to adapt to physical climate changes.

Decarbonizing the energy sector is central to tackling climate change. Reducing fossil fuel dependency in the energy sector—which accounts for around 65% of total GHG emissions—is essential to implementing the Paris Agreement objective of limiting climate change to well below 2°C (IPCC, 2018).

The energy transition offers sizeable local development benefits, including:

Improved local environmental conditions. Poor air quality is a critical development issue in many countries: air pollution linked to energy use is associated with an estimated 4.2 million premature deaths globally each year, 90% of which are in developing countries (Campbell-Lendrum and Prüss-Ustün, 2019; WHO, 2018).

Sustainable growth and employment. Public policies to incentivize large-scale technology adoption have the potential to stimulate innovation, productivity growth and employment.[1] By one estimate, ambitious climate action could generate more than 65 million new jobs in 2030 (New Climate Economy, 2018), although there will likely also be job losses and declining investment elsewhere in the economy, for example in coal mining (Anbumozhi et al., 2019).

Strengthened public finances. Energy pricing could mobilize hundreds of billions, even trillions, of US dollars in additional fiscal revenues annually. Energy subsidies to consumers alone cost around $425 billion per year in 2018 to maintain (IEA, 2018).[2] A $70t/$CO_2$ tax could raise revenues of 1%–3% of GDP in most countries in 2030 (IMF, 2019). These revenues could provide essential support for various fiscal and development policy objectives such as the delivery of the Sustainable Development Goals (SDGs), including strengthening energy and other infrastructure services, as well as targeted support to offset some of the adverse impacts of higher energy costs on key impacted households.[3]

Overall, most countries would be better off from implementing mitigation policies consistent with achieving the Paris Agreement, considering the broader economic benefits associated with action to reduce GHG emissions (IMF, 2019).

There is a growing consensus that carbon pricing measures will be essential to achieving mitigation outcomes and will therefore play an important part in any mit-

1 See, for example, Acemoglu et al. (2012), Jaffe and Stavins (1995), Popp (2010) and Popp et al. (2010).
2 A further $70–$100 billion a year in subsidies are allocated to fossil fuel producers globally.
3 Many developing countries face a range of public financing issues, including narrow tax bases (for example, owing to informality and the limited numbers of direct taxpayers), declining tariff revenues, downward pressures on corporate income tax rates, as well as expensive and often illiquid sovereign debt markets.

igation policy package that governments implement. The report will explain the critical role of carbon pricing, give an overview of energy pricing reforms worldwide and will then present the various types of carbon pricing, how to design these and how to determine which one to choose. Following a discussion of key carbon pricing reform priorities, the report concludes with recommendations on how to ensure socially equitable reform outcomes and how to strengthen international policy coordination.

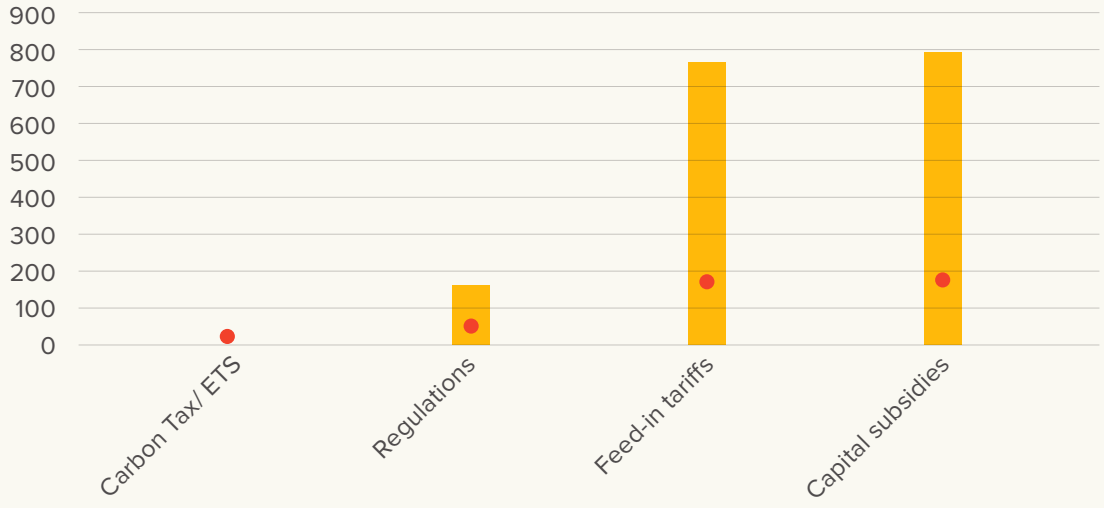
In the village of Hore Mondji in Mauritania, a women's cooperative uses solar energy to operate the borehole that supplies water to the market garden. Photo: Raphael Pouget/Climate Visuals Countdown

THE CRITICAL ROLE OF CARBON PRICING

Carbon pricing is key to reducing emissions cost-effectively (Stiglitz and Stern, 2017). By increasing the cost of polluting fuels and technologies, policies such as Emission Trading Schemes (ETS) and carbon taxes encourage households and firms to use energy more efficiently and to switch to less-polluting alternatives. Such measures could reduce emissions in the electricity sector, for example, at less than one-fifth of the cost of alternative policies such as feed-in tariffs or capital subsidies, on average (OECD, 2013) (figure 1).[4]

Figure 1: Mitigation costs in the electricity sector by policy instrument

EU€2010/tCO_2 abated



Source: OECD (2013).

Eliminating remaining fossil fuel subsidies is an important first step towards implementing carbon pricing in many developing countries. By lowering the final price of energy, such subsidies can be viewed as negative carbon pricing. Energy subsidies can be defined in multiple ways (see box 1 for details). Current subsidy practices are a major contributing factor to climate change: in a study of 26 developing countries, subsidy reversal was found to potentially reduce emissions by an average of 6.4% by 2025 compared to business as usual (GSI, 2019). Eliminating energy subsidies—which is no insignificant undertaking—before introducing a positive charge on carbon emissions is thus at the core of effective carbon pricing strategies in many developing countries.

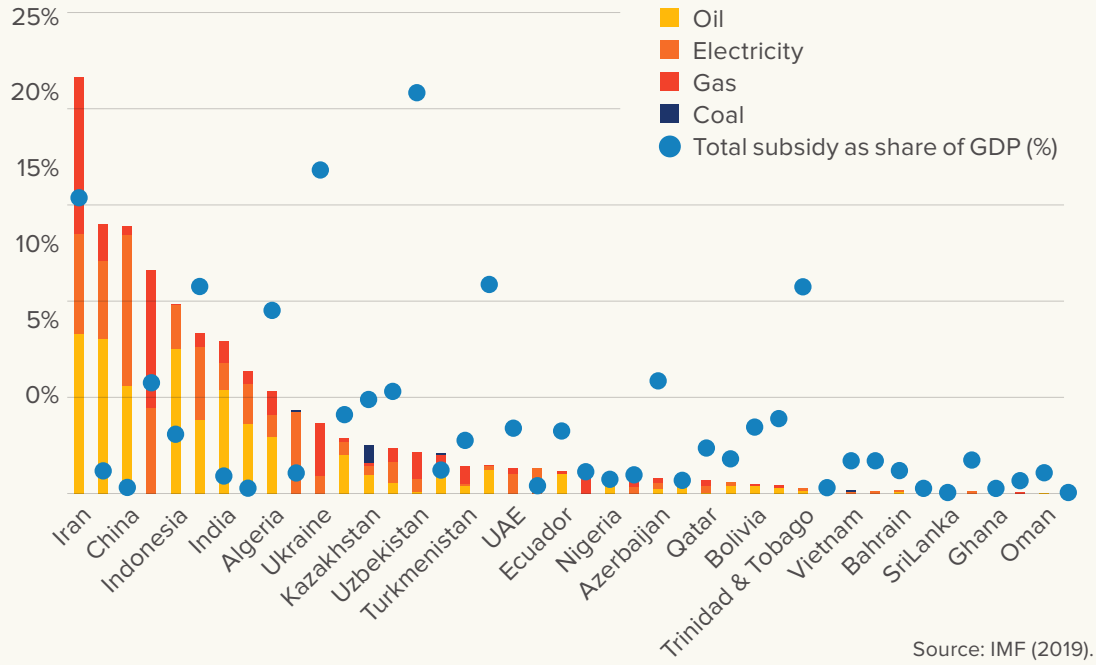
4 Such inefficiencies apply in other sectors also: biofuels support in the United States (US), Canada and the European Union (EU), for example, amounted to $11 billion in 2006 and reduced emissions at a cost of 50-90 times the then prevailing EU ETS price (Jones and Keen, 2011, OECD, 2008).

Box 1. Defining energy subsidies

Energy subsidies take various forms, but it is common to distinguish between those targeting producers, which affect input costs, and those affecting prices paid by consumers. There are different definitions of consumer subsidies: one rather narrow interpretation is one in which the sale price is below the average unit cost of production. A second approach advocated by the OECD defines a subsidy as when the final sale price is below the market price for a given fuel product. A third and broader concept of a subsidy proposed by the IMF is when energy prices are below the market price of energy gross of appropriate indirect taxation, including, for example, standard rates of VAT or excise and environmental duties.

Carbon pricing reform presents unique revenue-raising opportunities. Unlike other policy instruments to reduce GHG emissions, such as energy efficiency regulations or subsidies for low-carbon technologies, carbon pricing has the potential to raise hundreds of billions, even trillions, of US dollars in additional fiscal revenues annually, which could help support the SDGs. Energy subsidies to consumers alone cost around $425 billion per year in 2018 to maintain.[5] Positive carbon pricing also presents substantial revenue opportunities (figure 2). Overall, these could address the often chronic funding issues faced by many developing country governments.

Figure 2. Fiscal revenues from energy subsidy reform in 2018 in millions of US$ and % GDP, selected countries



Source: IMF (2019).

Note: Figure 2 shows potential fiscal revenues from energy subsidy reform in 2018 in $millions of USD (bar, right scale) and as a % of GDP (dot, left scale). Total energy subsidies exceed $10 billion for 11 countries in the sample, including Iran, Saudi Arabia, China and Russia. Total expenditures exceed 10% of GDP for six countries in the sample, including Uzbekistan, Iran, Ukraine and Libya. Overall, these outlays are principally concentrated in oil and power, but some countries also have large expenditures on gas (e.g. Ukraine and Uzbekistan).

Source: IMF (2019).

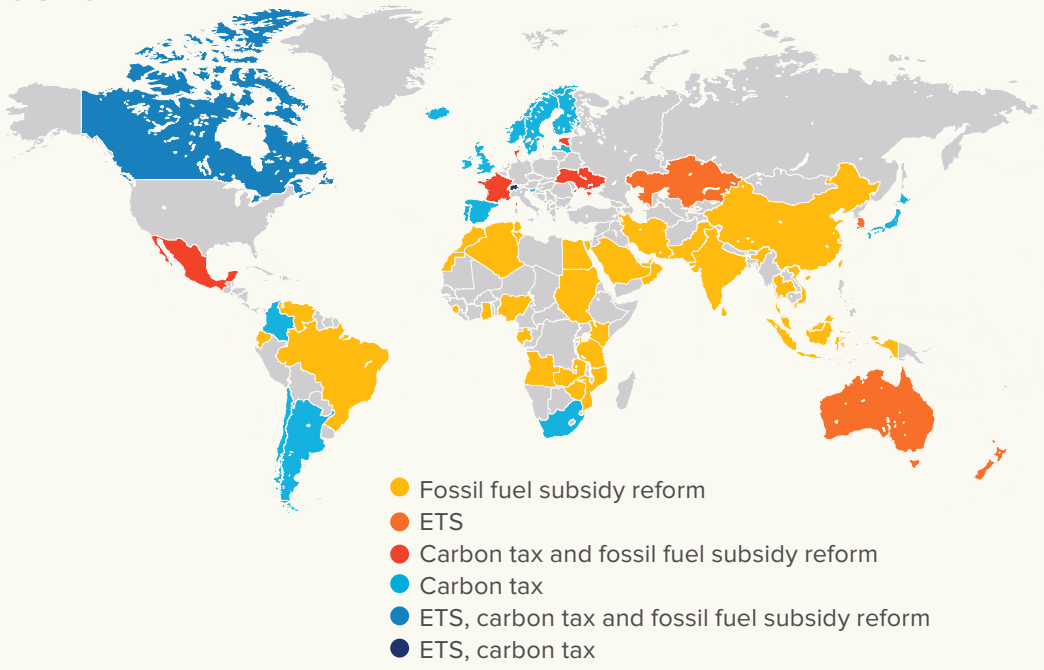
5 A further $70-$100 billion a year in subsidies are allocated to fossil fuel producers globally.

OVERVIEW OF RECENT ENERGY PRICING REFORMS

International momentum on carbon pricing is gathering pace. Over 40 countries undertook some form of subsidy reform as of 2020, while 61 national and subnational governments have implemented positive carbon pricing policies (figure 3) (WBG, 2020a; Zinecker et al., 2018). Furthermore, 96 of the 146 Nationally Determined Contributions (NDCs) currently refer to carbon pricing as a policy option.

However, current policies need to be extended, reinforced and coordinated to achieve current and future emissions reduction goals. The coverage of current carbon pricing (12 gigatonnes of global annual CO_2 equivalent emissions—$GtCO_2eq$) remains limited, accounting for around 22% of total global emissions. Likewise, prices are currently low: around $2/t of CO_2 when averaged across global emissions (IMF, 2019; WBG, 2020a). Current carbon pricing is thus providing insufficient support for delivering either current NDCs or the progressively more ambitious ones of the future (UNEP, 2018).

Figure 3. Overview of national emissions pricing (in 2019) and energy subsidy reforms, 2015–2017



Note: Figure 3 shows the countries that have implemented national energy pricing reforms, including carbon taxes and ETSs.[6] Notable recent reforms include the introduction of a carbon tax in South Africa, for example. It shows which countries implemented fossil fuel subsidy reforms between 2015 and 2017, namely Morocco, Ghana, India, Bangladesh, China, Ecuador, Brazil and Argentina.

Source: Zinecker et al. (2018) at the International Institute for Sustainable Development (IISD); WBG (2019b).

6 For simplicity, significant sub-national ETS (e.g. ETS in California and China) are not shown.

Improving current policies will require massive investment in enhancing relevant capacities, particularly in less developed countries. Carbon pricing poses technical, financial and institutional policy challenges. Moreover, ensuring carbon pricing is implemented in a way that is consistent with poverty alleviation goals requires a potentially complex mix of expenditure policies and sequenced reforms. The resulting capacity development needs may be large and sustained, particularly in less developed countries, given their often limited prior experience of implementing carbon pricing.

Carbon pricing present unique revenue-raising opportunities, which could be used to support the achievement of the Sustainable Development Goals, such as quality education for all. Photo: UNDP Democratic Republic of the Congo

CHOOSING A CARBON PRICING INSTRUMENT

A range of fiscal and regulatory policy options exist for putting a price on carbon. Carbon taxes and ETS or reductions in energy subsidies create explicit price incentives for households and firms to use energy more efficiently and to switch to less-polluting alternatives by raising the cost of fossil fuel use.[7] These approaches contrast with implicit pricing policies such as capital subsidies, for example, which drive the uptake of low emissions technologies by reducing upfront costs to households and firms; or energy efficiency standards, which shape technology choices including in buildings and household appliances. Table 1 summarizes the pros and cons of these various pricing instruments.

Table 1. Summary features of different mitigation policy instruments

Policy instrument	Pros	Cons
Carbon price/energy subsidy reformenergy subsidy reform	- Low-cost abatement - Revenue opportunities	- Increases energy costs to consumers - Potentially politically unpopular
"Feebate"[8]	- Avoids energy price increases - Creates incentives for mitigation by inefficient consumers or producers	- No fiscal revenue - Not fully efficient
Regulations, e.g. energy efficiency standards	- Overcome some market failures and barriers (e.g. hidden energy costs) - Create scale markets	- Technically challenging to set/measure performance standards - Risk of regulatory capture - No fiscal revenue
Feed-in tariffs	- Effective at stimulating investment - Can be directed at specific technologies	- High cost - Increase energy costs to consumers - Inflexible long-term payments - Negative impact on ETS prices - No fiscal revenue
Capital subsidies	- Effective at stimulating investment - Can be directed at specific technologies	- Fiscally expensive - Risk of free-riding - Negative impact on ETS prices

7 Use of "shadow carbon prices" can also shape public investment decisions in, for example, energy and transport infrastructure. Some multilateral agencies now include carbon price assumptions in their investment appraisal methodologies (European Bank for Reconstruction and Development, 2019, European Investment Bank, 2018, WBG, 2017).

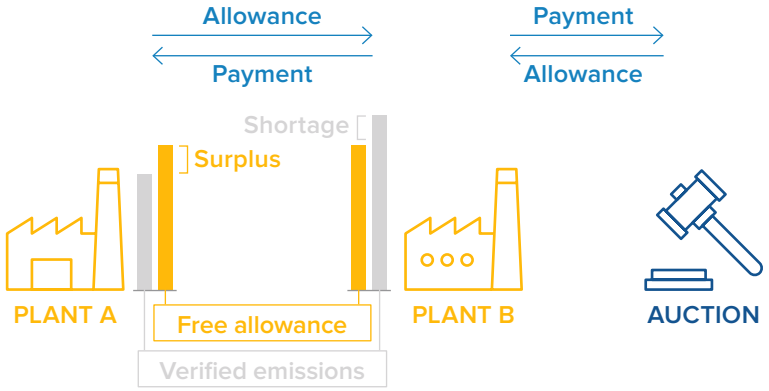
8 A "feebate" is a hybrid fiscal instrument which combines subsidies (taxes) on households or firms below (above) some emissions intensity threshold.

Explicit carbon pricing policies are particularly attractive given their low-cost nature and potential to support government financing. Carbon pricing yields the lowest-cost emissions reductions of all mitigation instruments and, if well designed, can also raise valuable fiscal revenues which could be used to support a range of public financing objectives, including delivery of the SDGs. By contrast, capital subsidies deplete government resources and are often inefficient (Callaway, Fowlie and McCormick, 2018; Ellerman, Marcantonini and Zaklan, 2014; Marcantonini and Valero, 2017; OECD, 2004).[9]

Policy options for imposing an explicit carbon price include a tax, an ETS or measures combining features of both. Taxes can be levied on energy production, consumption or trade, for example. Alternatively, policymakers can control the volume of emissions under an ETS (box 2 presents an overview of the basic operations of an ETS). Finally, so-called hybrid measures combine facets of both these policies by setting a cap on emissions but, for example, limiting the range within which prices can fluctuate.

Box 2. What is an ETS?

An ETS creates a market for reducing GHG emissions. The government places a limit on total emissions. The rights—or allowances—to pollute are either retained by the government or transferred to producers. Polluters have to hold—and retire—allowances sufficient to cover the emissions from their productive assets. Producers trade between each other, and potentially the regulator, to ensure that all firms comply with this policy constraint. Firms that have the most flexibility to reduce emissions at low cost are likely to be allowance sellers. The market price is thus driven by the effective stringency of the cap—also a function of economic and industrial activity, and the marginal cost of reducing emissions.



A set of clear criteria can help policymakers in instrument selection and design. Due consideration will need to be given to factors ranging from efficiency (the likely cost of reducing emissions), fairness (particularly relating to the distributional outcomes of carbon pricing on households), the stability and predictability of incentives (important for investors in low-carbon technologies), as well as, for example, the transparency and reliability of environmental goals and outcomes. Box 3 outlines some key guiding principles for carbon pricing policy design and implementation. Table 2 gauges the key features of the main policy options against these criteria.

9 Subsidies are susceptible to the usual problems of restricting eligibility and avoiding manipulation by vested interests: around 50% of energy efficiency subsidies in the US, for example, went to households and firms that would have invested regardless of incentives (Joskow and Marron, 1993).

Box 3. "FASTER" principles for carbon pricing policy choice and implementation

The OECD and World Bank have developed the "FASTER" principles to guide effective carbon pricing design and implementation. According to these, policies should prioritize:

- **F**airness: Ensure that those who pollute are saddled with the associated costs while avoiding disproportionate burdens on vulnerable groups.
- **A**lignment: Align carbon prices with national climate and wider development objectives.
- **S**tability and predictability: Encourage low-carbon investment through a stable and predictable carbon price that rises over time.
- **T**ransparency: Consult on and clearly communicate policy objectives and implementation choices, including the size of all related fiscal expenditures.
- **E**fficiency: Aim to achieve emissions reductions at the lowest cost.
- **R**eliability and environmental integrity: Allow for a measurable reduction in environmentally harmful behaviour.

Source: OECD and WBG (2015).

Table 2: Evaluating explicit carbon pricing policies by selected criteria

FASTER Criteria	Carbon Tax	ETS	Hybrid	Comments
Low administrative costs (E)	X			Carbon taxes can largely be implemented using existing excise or extractive tax frameworks.
Stable and predictable carbon prices (S)	X		X	ETS prices are uncertain and unstable, limiting incentives to invest in reducing GHG emissions.
Support government finances (A)	X	X	X	All these policies have revenue-raising potential. In practice, failure to auction allowances has particularly reduced revenues from ETS and hybrids.
Adjust to external shock (S)		X	X	Carbon prices under ETS and hybrids adjust to changes in the economic environment (e.g. they fall during an economic downturn).
Certainty of mitigation outcomes (R)		X		ETS fixes emissions over a short period (e.g. 5 years) but does not provide certainty over climate outcomes (which are determined by long-term global GHG concentrations).
Attract international finance (E, F)		X	X	ETS and hybrid schemes in different countries can be linked in order to promote cross-border investments in low-cost abatement opportunities. A tax also makes transnational investment in low-carbon technologies more attractive.
Political attractiveness (T, F)		X	X	Free allocation of valuable emissions rights to existing polluters has helped overcome political obstacles to implementing ETS and hybrid schemes. Carbon tax revenue recycling and, potentially, hypothecation can also help promote the political economy of reform.

There is growing momentum for bold climate action. Commissioned by UNDP, the People's Climate Vote—the world's largest opinion poll on climate—found that 64% of people over the 50 surveyed countries said that climate change was an emergency.

While policy preferences will differ across countries, the following issues are likely to be broadly relevant:

Carbon taxes are generally preferable to ETS from an efficiency perspective. Carbon taxes are likely to be more efficient, in the sense of achieving emissions reductions most cheaply, than pure ETS schemes because they allow firms more flexibility to take less action if pollution reduction ends up costing more than is expected (Hoel and Karp, 2001; Newell and Pizer, 2002; Pizer, 2002; Schmalensee and Stavins, 2017; Weitzman, 1974).

"Hybrid" policies are potentially attractive because they introduce cost controls and limit price volatility. Incorporating features of a tax into an ETS—through, for example, the establishment of a price floor and/or ceiling in the trading price range—potentially helps balance additional flexibility in the face of uncertain costs. This reduces price volatility, which can otherwise hinder incentives to invest in low-carbon technologies.

ETS or hybrid measures requiring a largely new policy and institutional architecture, including, for example, monitoring, verifying and reporting emissions (commonly at the installation level) as well as allocating emissions allowances. In contrast, carbon taxes can largely be integrated into existing indirect tax policy frameworks.[10]

The challenges associated with ETS implementation should not be underestimated, particularly for less developed countries (LDCs) and other countries with weaker institutional capacity and emissions data availability. These technical issues are discussed further in the next section (box 4 outlines recent experiences with ETS pilots in China).

10 One notable extension is the need for a system of rebates on non-combusted fuels (e.g. some inputs to petrochemicals production) or fuels supplied to downstream producers that are using sequestration technologies (e.g. carbon capture and storage [CCS]).

Box 4. Lessons from ETS pilots in China

From 2013 to 2016, eight Chinese provinces and municipalities (Guangdong, Hubei, Fujian, Shanghai, Chongqing, Tianjin, Beijing and Shenzhen) introduced ETS pilot schemes. These regional emissions markets have already surpassed $4 billion in value and are ranked the fourth largest globally (after EU, Korea, and California) (WBG, 2019a). Although their scope differs, each scheme covers direct and indirect CO_2 emissions from six major industrial sectors.

Carbon prices have fluctuated widely across and within these schemes, ranging from $0.60 to $12/t$CO_2$e). To encourage price stabilization, contingency measures are in place, including market suspension, additional allowance auctions and buy-back options (although there has been no report of active market stabilization to date). Firms are permitted to meet up to 10% of their compliance obligations through trade in Chinese Certified Emission Reductions (CCERs).

Several emerging lessons can be drawn from these pilots. The first concerns the potential challenges for ETS cap setting and allocation methodologies in countries where historical emissions data are less readily available and where improved data collection results in the recalculation of fuel consumption and emissions factors. China's cement emissions, for example, were overestimated by 32%–45%, while coal emissions were also subject to significant errors. A second lesson concerns the desirability of greater clarity regarding the nature of the cap: while there is some value to the flexibility associated with an intensity-based cap, overall emissions reduction goals may be better served by a mass-based cap, particularly among large and heavily polluting countries. A third lesson relates to the future use of offsets, specifically the fact that cost control may be better served if imported credits are also permitted, particularly for small countries.

Figure 4. Carbon prices and GHG coverage by Chinese province ETS, 2018

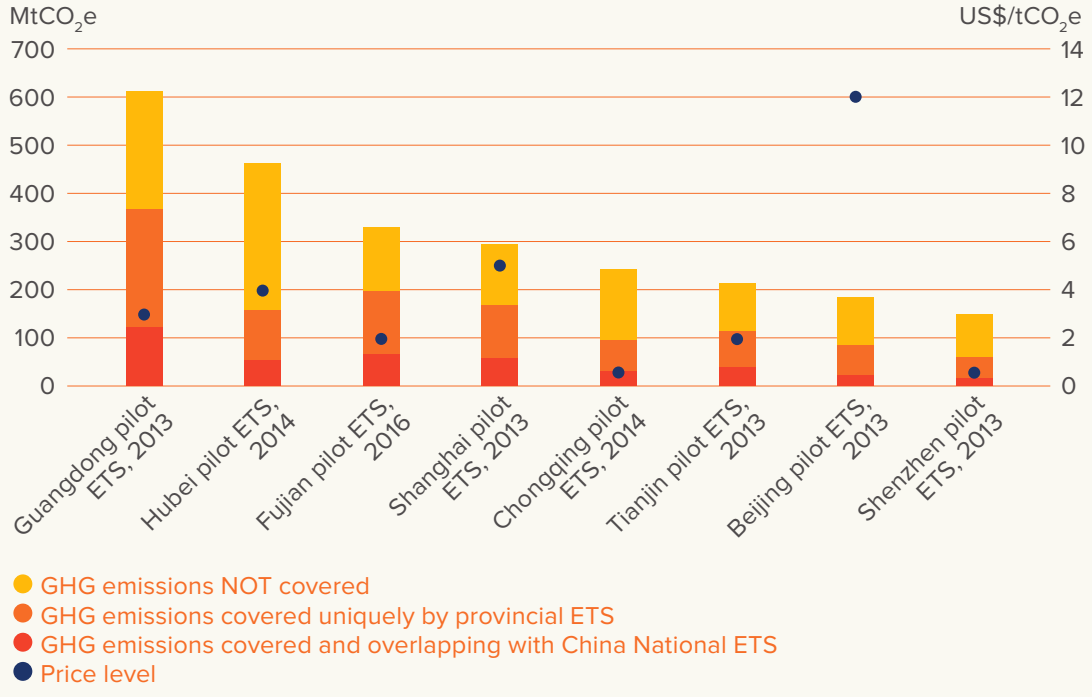


Figure 4 shows GHG emissions by Chinese province regulated under ETS (columns, left-hand scale), and the associated emissions prices (dots, right-hand scale). ETS coverage ranges from around 40%–60% with prices between $0.6 and $12/t$CO_2$. There is currently a significant overlap of coverage between national and regional schemes ranging from 14%–21% of total emissions.

Source: WBG (2019a) and Stoerk, Dudek and Yang (2019).

National-level circumstances potentially have a major bearing on policy choice and design decisions. Key considerations include the size and structure of the energy market, the degree of institutional development, the availability and need for technological transfer as well as macroeconomic stability. For example, carbon taxes are likely to be preferred in countries with weaker institutional capacity, while countries with highly volatile macroeconomic circumstances may be attracted to the more flexible pricing offered by ETS (table 3).

However, these issues and their implications for policy implementation and design in developing countries are only weakly understood. Experiences of carbon pricing reforms outside of the industrialized world remain relatively limited so far. There are thus considerable knowledge gaps concerning the most appropriate approaches to designing and implementing carbon pricing policies in a way that takes due account of national and local circumstances in developing countries. Doing so is likely to require much deeper focus than in advanced countries on the enabling environment to support investment in low-carbon technologies, given potential barriers and the scarcity of technical knowledge, skills finance and other key inputs.

A worker sands the edge of a wind turbine blade in a wind turbine factory in Ontario, Canada. Photo: Joan Sullivan/ Climate Visuals Countdown

Table 3: Country specific characteristics impacts carbon pricing choices

	Factor	Instrument choice	Policy design and implementation
Macro	Macro volatility	ETS prices adjust automatically to change economic conditions	Consider market stability measures if volatility is excessive
	Current account position		Greater carbon leakage risks/ need for international policy coordination in open economies
	FDI dependency	Both taxes and ETS can provide incentives for international investment in cleaner technologies	Consider linking domestic ETS to international carbon market to promote capital inflows Need for greater consultation with international investors on policy implementation and rules
	Cost of capital	High cost/ scarce capital may favor carbon tax given greater chance of spiraling medium and longer term mitigation costs	Consider possible investment promotion/ de-bottlenecking policies e.g. loan guarantees/ multilateral development support
Sector	Energy market size	Carbon tax preferred due to likelihood of less liquid ETS.	Linking and/or market stabilization rules potentially made more desirable in ETS.
	Energy market structure	Carbon taxes or "upstream" ETS more appropriate for countries with few major emissions point sources	Greater risk of regulatory capture. More need for independent support and investment in determining key policy variables
	Market share of state-owned industries	ETS relatively more exposed to risk of regulatory capture	Greater value of cross government approach to policy development
	Energy importer?	Carbon tax less vulnerable than ETS to market power by oligopolistic fuel exporters	
Technology	Domestic technology and support services sector?		Increased likelihood of stimulating productivity growth and innovation from early policy adoption Establish partnerships with international technology suppliers
	Inefficient domestic industrial sector		Importance of credible long term price to support investment and financing decisions. Need to consider possible credit constraints Carbon prices and compensation rules need to be carefully designed to support reform by weaker players
Policy	Efficiency of tax regime?		Large tax distortions in existing fiscal regime increase risk of negative "tax interaction" effects, warranting lower target carbon price
	Ad hoc v formula based price setting?	Easier to adjust regulated energy tariffs to a carbon tax due to greater price stability	Additional value to energy price liberalization
	Price v cost based price regulation?		Carbon price pass through more automatic with cost based approach. Need explicit adjustment in the case of price based formula
	Pre-existing large scale green subsidies?	ETS more susceptible to adverse policy interactions than carbon tax	Greater value to winding down subsidies in the case of ETS
Institutions	Institutional quality	Countries with lower institutional quality are likely to find carbon tax more practicable and less risky.	Where ETS adopted, apply upstream point of regulation
	Data quality	Carbon tax implementation less dependent on high quality emissions data	Ensure adequate household data quality Auction allowances where possible; use simple technology benchmarks for free allowances

CARBON PRICING DESIGN AND IMPLEMENTATION

A clear understanding of the implementation steps and decision factors associated with particular carbon pricing policies is critical. While there are several common issues across explicit pricing policies—including the need to define the scope of any measure across sectors and gases, make judgments on target carbon prices, and align policies towards the delivery of relevant national policy goals—practical implementation steps and decision factors differ substantially according to the instrument, awareness of which may in turn shape policy choices. Boxes 5 and 6 outline key steps and decision factors in establishing an ETS and carbon tax, respectively.

Box 5. Piloting an ETS: key policy steps and decision factors

Step 1. Decide market scope

Determine the sectors, emissions sources, regions and GHGs to be regulated. This should aim to balance the goal of a broad-based market (which is likely to result in lower, more stable carbon prices) with increased administrative challenges and costs associated with including smaller scale market players. Tw strategies that can help manage these trade-offs are using emission thresholds to initially target major polluters (most ETS pilots have focused on the industrial and power sector) and placing the “point of regulation” upstream on suppliers of fossil fuels.

Step 2. Set market cap

A cap on total emissions should be set, where possible in accordance with national climate change goals. For fast-growing economies or for those where national targets are established on similar terms, an intensity-based cap may be considered (e.g. emissions per unit of output), albeit at the cost of introducing uncertainty over total emissions. The cap should fall predictably over time (lower caps are generally associated with higher carbon prices), and this decline rate should be reviewed periodically. Establishing a baseline requires an assessment of historical emissions and a robust projection of future emissions based on the outlook for the economy, energy technologies, and wider policies bearing on regulated sectors and firms. This can be undertaken either “top-down” (based on aggregate emissions) or “bottom up” (based on a granular assessment of emissions as well as mitigation potential and costs for each sector, subsector, or participant). The latter approach requires extensive plant- or firm-level emissions data collection.

Step 3. Allocate emissions

The right to pollute must be allocated. Most governments have chosen to transfer the majority of allowances to firms free of charge in order to limit political opposition to policy implementation and limit perceived risks to the economic health of emissions-intensive, trade-exposed sectors (sometimes referred to as carbon leakage). There are a number of principles for allocating allowances in this way, including, for example, in relation to historical emissions ("grandfathering"), or sector/technology-specific benchmarks. In each case, they requires policymakers to access detailed firm-, plant- or technology-specific data to manage allocations. A far simpler alternative is for the government to sell permits, usually through an auction, and—if needs be—to find alternative mechansisms to address any economic or distributional concerns.

Step 4. Compliance and reporting

Technical, legal and administrative rules relating to monitoring, reporting and independent verification of emissions are critical to market effectiveness. Rules should seek to balance cost, precision and complexity: the use of default emissions factors for particular polluting activities for technologies, for example, can help limit monitoring costs among more predictable sectors and point ”sources”. A key design choice relates to the ”point of regulation”: enforcing compliance among upstream fossil fuel producers or midstream refiners and logistics centers, for example, substantially reduces the number of regulated enitites (and the associated data collection and monitoring requirements). Where relevant, policy makers should utilize and develop existing rules and systems to support implementation.

Step 5. Carbon credits and "linkages"

Policymakers may allow firms to comply with an emissions cap through the use of carbon credits, generated from low-carbon investment projects outside the scope of the ETS. These may help reduce costs where credits are available more cheaply. However, they reduce the environmental certainty from the cap (since projects earning carbon credits are not subject to a limit on total emissions). As such, eligibility conditions and limits on the number of credits which can be imported may be required. In the longer term, policymakers can also broaden the market by allowing regulated entities to use allowances issued under another ETS to comply with their domestic cap. Linking schemes in this way may reduce costs and limit volatility (through a more liquid market).

Step 6. Market stability

ETS prices can be volatile, which potentially hinders low carbon investment and exposes firms and households to the risk of high-cost scenarios. As such, price stabilization and other cost control rules are potentially warranted. Options include the establishment of a price floor and/or ceiling, allowance reserves, and arrangements to allow participants to “bank” (carry over) or borrow allowances across compliance periods.

These steps require extensive policy development and investment in enhanced institutional and technical capacity, supported by deep engagement with stakeholders to understand the practical implications of different policy choices. Policy rules are likely to need to be refined frequently, warranting regular reviews of ETS performance supported by rigorous, independent evaluations.

Source: PMR and ICAP (2016), EU (2018).

Box 6. Implementing a carbon tax: key policy design considerations

Step 1. Tax rate

Carbon tax rates should be specific (i.e. not a proportion of energy prices) and equal to a given fuel's CO_2 emissions factor (the resulting CO_2 per taxable unit) multiplied by the chosen CO_2 emissions price.

Step 2. Tax base

A carbon tax can be levied on production at the upstream asset or refinery or on transiting fuels at the relevant port or pipeline terminal. Alternatively, a carbon tax can be integrated into excise on refined fuels. In general, imposing the tax upstream reduces the number of tax payers and thus administration costs (though this logic may not apply consistently in some markets, such as thermal coal). The key is to find a place between extraction and consumption where it is simple to tax all (or almost all) of a given fuel. Taxing "fugitive" emissions that do not enter the formal production chain present particular implementation challenges. It may be appropriate to make adjustments to the tax rate to reflect emissions that are otherwise unaccounted for or impose additional fees on assets, firms or industrial sectors in proportion to estimated emissions. Given these challenges, it is likely that addressing fugitive emissions should generally follow on from initial carbon tax reforms on consumed energy.

Step 3. Revenue collection and use

Revenues from carbon taxes typically flow direct to the consolidated fund or other principal central funds account (and are collected by the revenue or customs authorities). As with other taxes, explicit hypothecation of carbon tax revenues should generally be avoided to limit creating budgetary inflexibilities and complexity. The appropriate use of the revenues is country-specific, with public investment and debt financing needs likely to feature high on the priorities of many developing countries. Some adjustments to expenditure programs to offset adversely impacted energy consumers and stimulate innovation in low-carbon technologies may be appropriate (and have been commonly deployed in practice as part of an overarching package of reforms), but these should generally be targeted well and limited to a small proportion of the overall revenues.

Step 4. Policy interactions and spillovers

Standard rates of VAT and sales taxes should generally be levied gross of excise taxes. Broader energy pricing regulations and practices may need adjusting to permit carbon costs to pass through to consumers. The carbon tax component of an excise should theoretically not be eligible for VAT rebate, but this is likely to be too complex to administer in practice.

While there are some technical issues to address in the implementation of carbon taxes, these steps are administratively and technically feasible for most countries. However, as with other carbon pricing policies, carbon tax implementation is likely to require careful groundwork to build consensus, understand and address the distributional consequences, and manage potential policy spillovers. For instance, most if not all countries that introduce a carbon tax have introduced other environmental tax benefits to avoid negative impacts on consumers.

Source: MfE (2019) PMR and ICAP (2016).

Box 7.

Summary of policy recommendations I

- Establish clear criteria, such as the FASTER principles, for evaluating the most desirable carbon pricing policy instrument, including relative weights.
- Prioritize the implementation of explicit carbon pricing policies, with a clear focus on the cost-effectiveness of emissions reductions.
- Target the most environmentally harmful measures and fuels on which the poorest households are least dependent for initial energy subsidy reform.
- Accompany this with a general tightening up of provisions under remaining subsidy programmes as a stepping-stone to full energy subsidy elimination.
- Target a broad-based explicit carbon pricing framework, capturing all major energy-related emissions.
- Maximize the revenue opportunities from carbon pricing by auctioning permits in an ETS and avoiding exemptions or rate reductions in a tax-based approach.
- Avoid introducing inflexibilities into the public finances associated with carbon pricing by limiting explicit hypothecation/revenue earmarks.
- Choose a point of compliance that limits the number of regulated entities to be administered, including, where appropriate, by levying carbon prices upstream.
- Wherever possible, seek to integrate carbon pricing policies into existing policy systems and processes (e.g. use excise regime or fiscal regime to levy a carbon tax on extractive industries).

Where an ETS is preferred:

- Adopt an upstream point of compliance to help simplify policy implementation, coupled with an allocation system based principally around auctioned permits.
- Carefully consider potential cost control measures, including through the potential eligibility of carbon credits or the introduction of trading price ranges and administrative factors.
- Limit the scope of the ETS and employ carbon taxes to ensure a comprehensive set of price incentives.

Where a carbon tax is preferred:

- Avoid exemptions from the fiscal base (i.e. full coverage across fuels and energy sectors).
- Choose a point of compliance that limits the number of tax-payers to be administered.
- Design and implement appropriate set rebates on non-combusted fuels for downstream energy users employing sequestration technologies to ensure coherent incentives throughout the value chain.
- Carefully map all policies that shape incentives for energy utilization and pricing and identify key overlaps and risks of adverse policy interactions for deeper scrutiny and evaluation of reform options.
- Identify key barriers to investment in low-carbon technologies and processes across all major energy sectors of the economy as part of a sustained focus on strengthening the enabling environment to support the effectiveness of carbon pricing.
- Draw on international experiences and best practices, supported by international agencies where appropriate, to obtain insights on policy design and implementation choices, and historical pitfalls, in a way that is adapted and relevant to national circumstances.

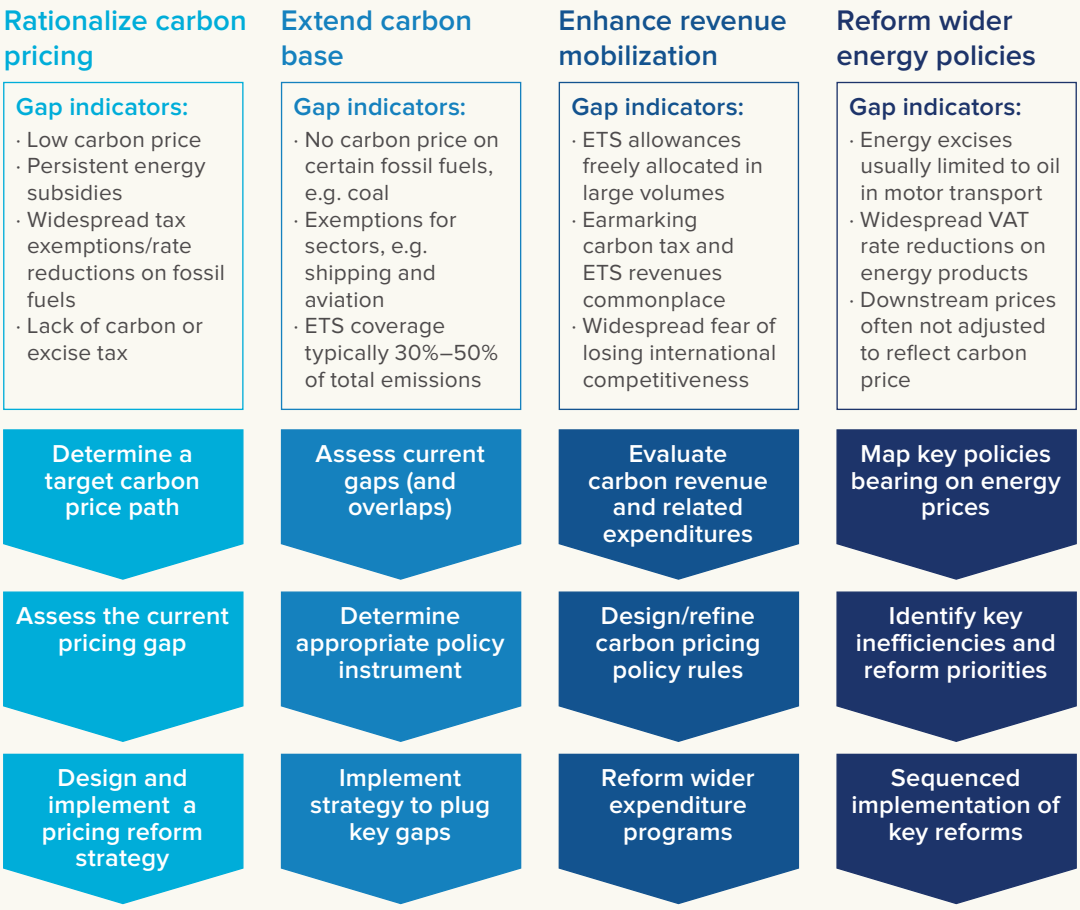
Source: Authors.

Engineers at Henrietta's solar power station in Mauritius. Photo: Stéphane Bellerose/UNDP Mauritius

KEY CARBON PRICING REFORM PRIORITIES

Considerable progress towards rationalizing energy prices and associated policies still needs to be made to support current and future NDCs. The major areas to be focused on are summarized in figure 5.

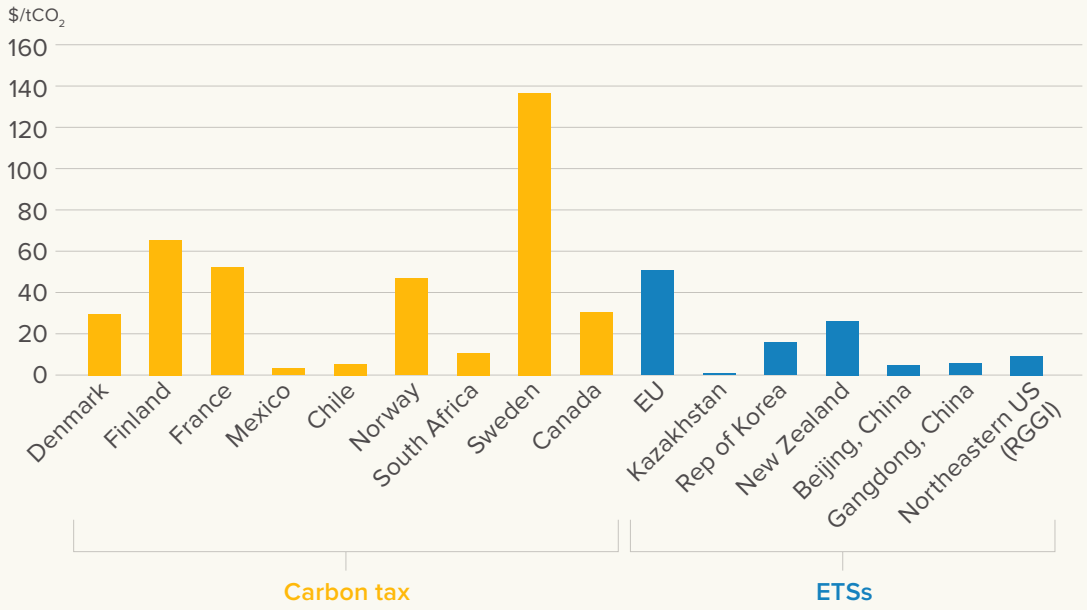
Figure 5. Summary of carbon pricing policy gaps and reform steps



Rationalization of energy pricing: Reversing energy subsidies is a key starting point in carbon pricing reform. This should initially target the most environmentally harmful measures and the fuels on which the poorest households are least dependent. Prevailing energy subsidies should be eliminated before the introduction of a positive—and rising—charge on carbon emissions in the range of at least \$40–\$80/tCO_2, rising to \$50–\$100/tCO_2 by 2030—roughly equivalent to \$0.35–\$0.70 per gallon of gasoline, or \$80–\$160 per ton of coal in 2020—as these are the targets required to implement the Paris Agreement (EPA, 2018;

IPCC, 2006; Nordhaus, 2017; Stiglitz and Stern, 2017).[11] However, despite a recent uplift in some markets such as the the EU, most existing carbon prices fall short of these target rates (figure 6). Steady price increases are thus warranted, such as through regular pre-announced reductions in the emissions caps—or rising price floors—in the case of ETS or hybrid policies, or the use of automatic escalators for carbon taxes.[12]

Figure 6. Carbon prices in 2021, selected countries



Note: Figure 6 presents carbon prices for selected countries in 2021, expressed in US$/tCO$_2$. It shows that, outside a subset of EU countries, nominal rates are generally too low compared to the $40–80/tCO$_2$ which available analysis suggests may be required to achieve the Paris Agreement.

Source: Authors' own calculations based on data from WBG (2021).

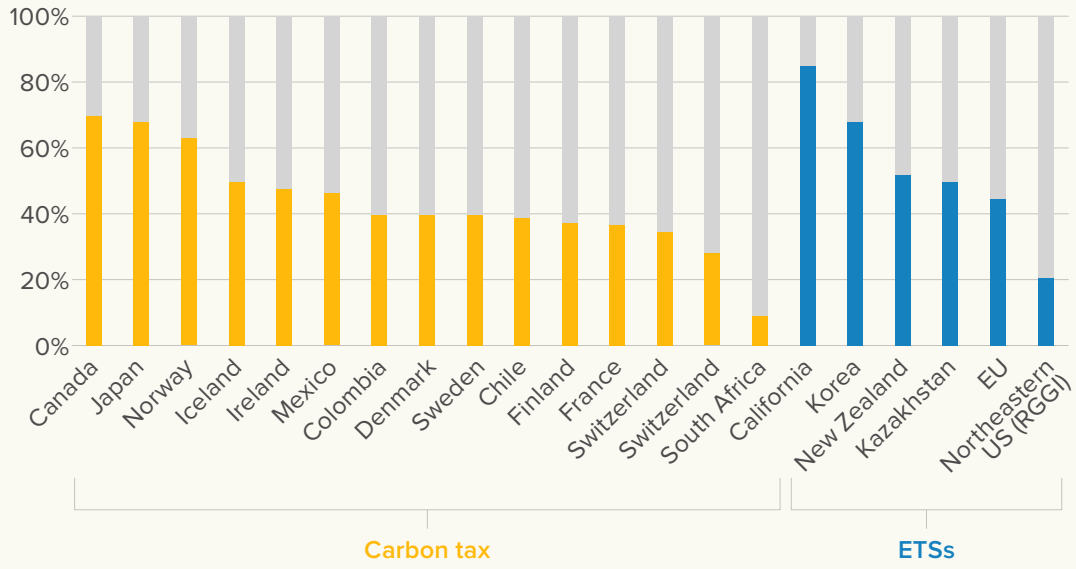
Broadening the carbon pricing base: Carbon prices should be levied as broadly as possible across the economy. However, existing carbon tax and ETS arrangements remain partial in scope (figure 7), which substantially undermines their effectiveness.[13] Figure 8 provides an overview of the percentage of emissions that are currently subject to an emissions charge of less than €30tCO$_2$ (equivalent to ~$(2018)35): international aviation, shipping fuels and most major energy sources—including coal, coke and natural gas—are either exempt or systematically undertaxed across regions, while the road transportation factor faces substantially higher carbon prices than other sectors (OECD, 2018a; OECD, 2018b). Concerted efforts to expand the coverage of existing policies across sectors and fuels is thus a key priority, requiring an understanding of gaps and policy overlaps, agreement on the most appropriate redressive policies and an associated implementation strategy.

11 In some instances, early investment in relatively high-cost technologies may be required to achieve deeper, systemic decarbonization involving long-lived capital stock (such as clean transport infrastructure) (Vogt-Schilb and Hallegatte, 2014; Vogt-Schilb, Hallegatte and de Gouvello, 2015).

12 Tax escalators were widely used in energy tax reforms in Europe during the 1990s and 2000s: in the UK, for example, fuel excises increased in real terms by 3%–6% annually between 1993 and 2000 and proved effective in reducing emissions (Skou Andersen et al., 2007; EU, 2019). Policy credibility is key to the success of such measures: South Africa, for example, planned escalators to a carbon tax on electricity that were often cancelled. Metcalf and Weisbach (2009) argue that carbon tax should be set by an independent authority.

13 ETSs, for example, are typically around 40%–70% as effective in reducing emissions as a universal carbon price, while taxes on road fuels or electricity production are commonly only around 5% or 10% as effective, respectively (IMF, 2019). However, in a few coal-intensive countries such as China, India, the Philippines and South Africa, taxing coal alone can be almost as effective as a universal carbon tax.

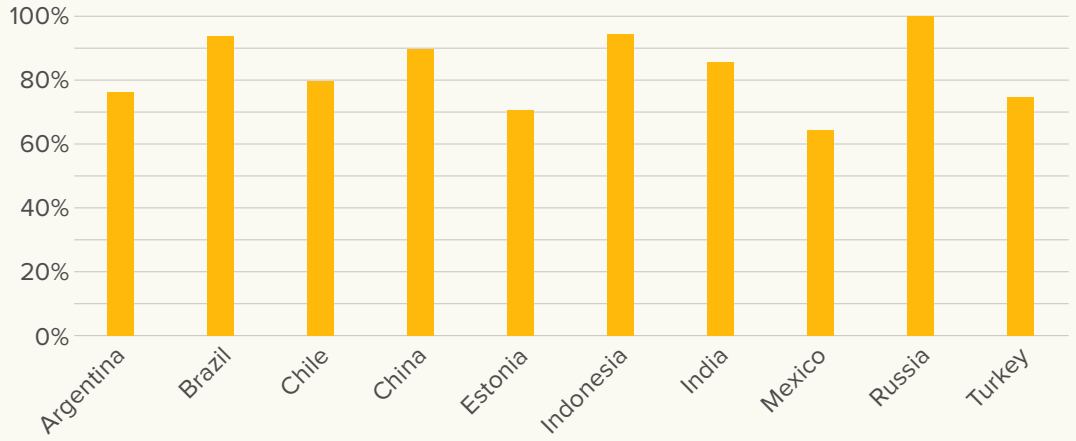
Figure 7. Scope of carbon pricing schemes in 2018, selected countries



Note: Figure 7 shows the coverage of carbon pricing regimes as a percentage of total national emissions in 2018. It highlights the partial nature of most policy frameworks, which commonly apply to only 30%-60% of total emissions. Transport and service sectors have frequently been omitted.

Source: IMF (2019).

Figure 8. Effective carbon pricing gap at €30tCO_2 (equivalent to $33t$CO_2$) in 2015, selected developing countries



Note: Figure 8 shows the percentage of energy-related emissions which are not subject to a carbon price of less than €30tCO_2. In the case of Mexico, for example, approximately two-thirds of total energy-related emissions are not subject to this price benchmark, rising to 100% in the case of Russia.

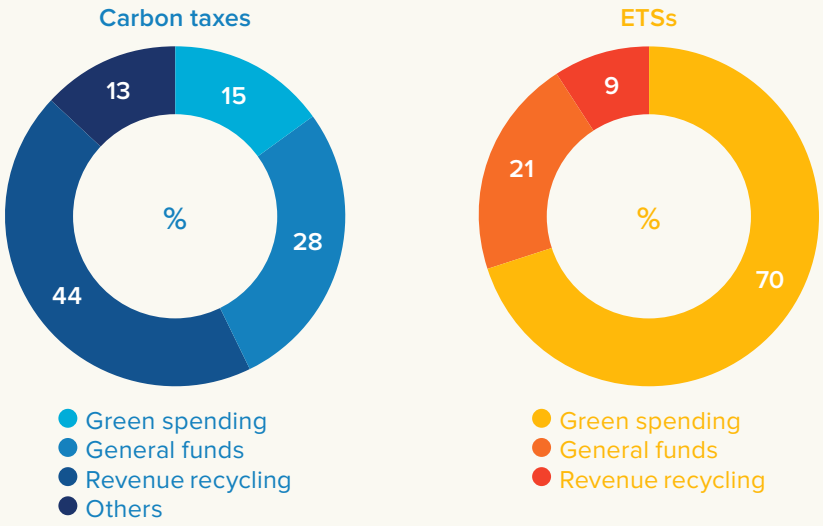
Source: OECD (2018a).

Strengthening revenue mobilization: Carbon pricing, including energy subsidy reform, presents massive new revenue opportunities to support various fiscal and development policy objectives, including the delivery of the SDGs. However, these have so far largely not been realized: energy subsidies to consumers continue to cost hundreds of billions of dollars annually, and current revenues from effective carbon prices amount to less than 1% of GDP on average across 40 OECD and G20 countries (OECD, 2018a; IEA, 2018). This is largely due to narrowly based policies and certain policy errors (Jones, Keen and Strand 2013).[14] In particular, ETS schemes, for example, have tended to distribute substantial proportions of allowances for free, rather than selling them, at a cost of hundreds of billions of dollars in the case of the initial phases of the EU scheme.[15] Carbon taxes, by contrast, have generally delivered somewhat better revenue performance (figure 9).

14 Marten and Dender (2019), for example, find that pricing all energy-related CO_2 emissions at least at €30/tCO_2 would on average more than double revenues.

15 Revenue mobilization is steadily improving with 57% of total allocations expected to be auctions during Phase IV (2021–2030), equivalent to around €260 billion at the current price of around €30/tCO_2. However, the majority of allowances continue to be transferred for free to most industrial producers.

Figure 9. Allocation of global revenues from carbon taxes and ETSs, by expenditure category



Note: Globally, an estimated 44% of carbon tax revenues (left-hand panel) have been used to lower other taxes, 28% for general funds, and 15% for environmental spending. This contrasts with the use of revenues from ETS auctions (right-hand panel), in which an estimated 70% of ETS revenues have been used for environmental spending, 21% for general funds, and 9% for lowering other taxes.

Source: IMF (2019) and Carl and Fedor (2016).

Addressing industrial competitiveness issues: Industrialization is a key pathway to higher living standards for many developing countries: industry and manufacturing, for example, contribute 44% of GDP on average in lower-middle-income countries, compared to 33% in low-income countries (WBG, 2019c). However, carbon pricing has the potential to undermine industrial competitiveness in energy-intensive, trade-exposed sectors, particularly where countries pursue unilateral reforms. A detailed understanding of the impacts of carbon pricing on key exposed sectors and firms is therefore required to limit both the potential for carbon leakage[16] and undue regulatory capture by better informed and often politically influential industrial stakeholders. By way of example, figure 10 shows the impacts that EU ETS prices have on steel industry profitability.[17] International cooperation to limit major differences in carbon pricing is likely to be a more effective means of limiting competitiveness risks than free allocations of emissions permits under ETS schemes, which are generally ineffective and fiscally expensive.

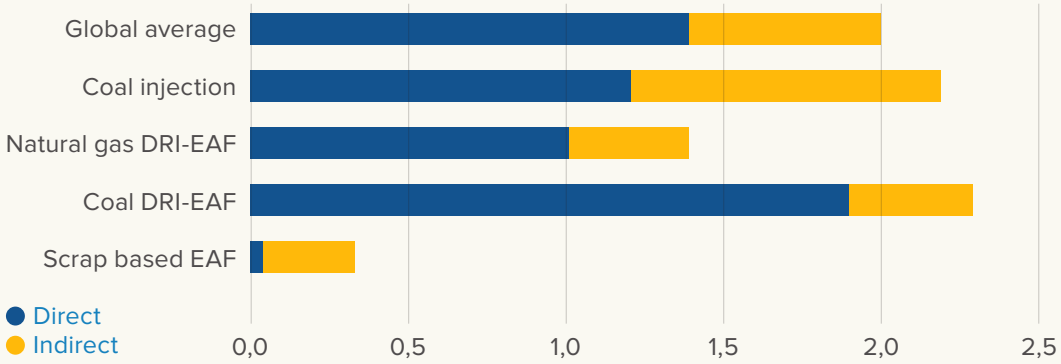
Where adopted, free allocations should be kept to an absolute minimum, perhaps up to 20% of emissions allowances, and directed at energy-intensive and trade-exposed industrial sectors, rather than utilities.[18]

16 Evidence of carbon leakage to date is somewhat limited. However, this may reflect the relatively low carbon price levels observed to date (including substantial protection for at-risk sectors (Stiglitz and Stern, 2017, WBG, 2019d). In addition, available analysis may be insufficiently granular to identify clear causal impacts on particular subsets of producers or product markets.

17 Many industrial stakeholders are politically influential and have better information on the potential impacts of energy policy reforms. This can present particular challenges for ETS implementation in the form of successfully lobbying for too generous a cap or excessive free allocations of allowances (as has been the case in the EU ETS for example).

18 Such levels are likely to be sufficient to compensate power generators and industrial producers for the imposition of carbon pricing policies (Bovenberg and Goulder, 2002; Smith, Ross and Montgomery, 2002). Free allocations may also distort incentives to investing in low-carbon technologies by discouraging downscaling and withdrawal of inefficient firms (Böhringer and Lange, 2005; Rosendahl, 2008).

Figure 10. CO_2 per tonne of steel manufacture by current production technology (tonnes of CO_2 per tonne of crude steel), 2018

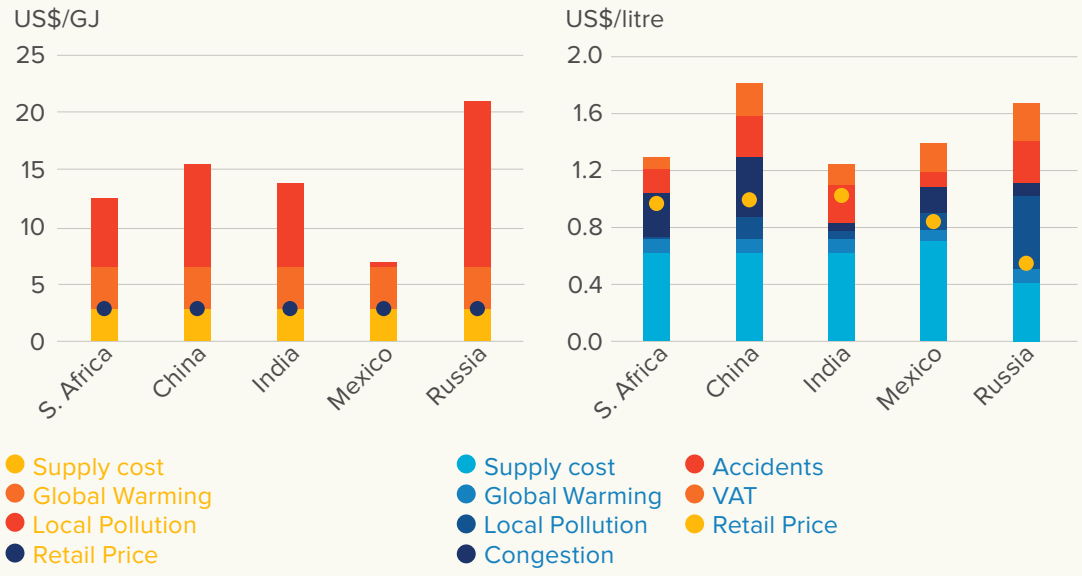


Note: Figure 10 shows CO_2 emissions intensities per tonne of crude steel by production technology. It highlights the substantial variation across producers and processing routes (with some exhibiting significantly higher carbon output than others). This implies that some producers, particularly those used coal based reductants, are particularly exposed to inflationary pressures from carbon pricing. Such policies thus have the potential to incentivize a shift towards steel production using electric arc furnace (EAF) technology, which is less carbon-intensive than the basic oxygen furnace (BOF) (although, in some cases, the impacts of such a shift on aggregate sector emissions is perhaps unclear given finite stock of scrap metal feeds).

Source: IEA (2020).

Reforming wider energy policies: The carbon pricing strategy should be complemented by a reform of wider policies affecting energy prices. Energy excise and user prices, for example, are commonly too low to support domestic policy objectives, exacerbating climate pressures: fuel taxes in the range of $0.5–$1.5 per litre, for example, may be appropriate (figure 11 for example).[19] In addition, energy products commonly receive preferential VAT or sales taxes treatment. These practices substantially compromise climate objectives and are poorly targeted on vulnerable groups (Jones, Keen and Strand 2013). Normalizing broader indirect tax treatment of energy products should thus be actively pursued in parallel with, and ideally in advance of, emissions pricing. Green subsidies and energy price regulations can also undermine the efficacy of carbon prices and resulting fiscal revenues. Ensuring that downstream energy pricing rules permit the pass-through of carbon costs is critical.

Figure 11. Optimal second-best tax rates on coal and gasoline in 2015, selected emerging economies



Note: Figure 11 shows estimates of the optimal prices of coal and gasoline for a sample of major emerging economies in 2015, considering fiscal requirements as well as local and global environmental costs. The left-hand panel shows that coal is priced at between one-third and one-seventh of the appropriate level. By contrast, as indicated in the right-hand panel, gasoline is discounted by between one-fifth and two-thirds compared to the social optimal.

Source: Coady et al. (2019).

19 Such optimal second-best energy tax rates depend on country-specific factors, including the elasticity of demand for energy (goods with more inelastic demand warrant higher tax rates), the statistical value of human life, the extent of congestion and local pollution issues, and revenues usage (Parry and Small, 2005).

Box 8.

Summary of policy recommendations II

- Establish whether any energy subsidies remain on fuel products by calculating the existence of a price gap against international prices.
- Rigorously assess the unit costs of power provision, including operating, maintenance and capital recovery costs and compare these with existing power tariffs.
- Gradually eliminate any remaining energy subsidies by progressively reducing any price gaps and recovering a steadily increasing share of power-related operating and capital costs.
- Implement a moderate carbon price that is high enough to encourage low-carbon investments in key sectors in the range of $40–$80 tCO2, covering all major energy sectors and associated GHG emissions.
- Target a steadily rising real terms rate increase of around 2%–4% annually, to be implemented either through a credible tax escalator or progressively tighter emissions cap, and clearly signal this intention to households and firms.
- Strengthen revenue generation and emissions reduction incentives by avoiding exemptions for particular sectors, such as industry, and fuels, such as coal, as well disproportionately high charges on road transport.
- Develop a detailed understanding of the impacts of carbon pricing for key exposed sectors and firms, considering the domestic and international market context.
- If an ETS or hybrid policy is adopted, strengthen revenue generation by avoiding free allocations of emissions to regulated firms.
- Where allowances are transferred for free, restrict these to no more than 20% of total emissions for firms within energy-intensive, trade-exposed sectors only.
- Complement carbon pricing with a rational system of energy-related charges, including excises of $0.5–$1.5 per litre on gasoline as a second-best instrument to control wider local environmental and social externalities.
- Apply standard rates of VAT and sales taxes to fuels wherever possible. Consider removing any anomalies in the general indirect tax treatment of energy prior to the implementation of a carbon tax or ETS/ hybrid.
- Ensure that in regulated energy markets, particularly for power, user tariffs and price regulations permit the full pass-through of carbon prices to consumers. Monitor the relationship between carbon and energy tariffs to further validate this.

Source: Authors.

ENSURING SOCIALLY EQUITABLE REFORM OUTCOMES

Recent social disturbances in several countries in response to energy price reforms highlight the sensitivity of carbon pricing reform as a development issue. Access to cheap energy is commonly viewed as key to reducing poverty and promoting industrial development — or, indeed, as a means of redistributing natural resource wealth — often leading to circumstances in which prices are tightly controlled. In addition, the industrial and consumer groups that are most affected by energy pricing decisions often exert significant political influence.

However, the mispricing of energy is fundamentally undermining development outcomes in many countries. The underpricing of energy is fuelling local environmental pressures, including, for example, urban air pollution and congestion, and eroding the fiscal resources available for a range of public financing goals, such as support for attaining SDG-related goals. This includes, but is by no means limited to, investment in expanding and upgrading energy supply infrastructure.

An overarching policy strategy is thus required to ensure equitable outcomes from carbon pricing reforms and overcome political obstacles to these. Some societal groups are likely to be disproportionately impacted by higher energy prices. These include households and firms with a high degree of economic dependency on fossil fuels, limited financial ability to cope with higher prices, and those benefiting from pre-existing subsidies, such as coal mining communities, for example.

Effective pricing reform strategies typically have common elements, including:

Understanding the distributional impacts: Understanding the impacts of energy pricing reform on key stakeholders is key for policy communication and public expenditure planning. This requires detailed data collection, analysis and policy impact evaluation. Household expenditure surveys are a vital tool for understanding the distributional implications of energy pricing reforms. These enable microsimulation and other analyses of the distribution of energy costs across social groups (see box 9 for methodological guidance). Empirical studies reveal wide heterogeneity in the distributional impacts of energy pricing reforms, absent associated expenditure adjustments.[20] Figure 12 illustrates how one such reform would affect a sample of Latin American and Caribbean (LAC) countries.

20 In China and the US, for example, carbon pricing is likely to impact electricity prices on which lower-income households are disproportionately dependent. By contrast, in India, poorer households often have limited access to power and vehicle ownership and are therefore less impacted by such reforms (IMF, 2019).

Box 9. Analysing the distributional impacts of energy pricing reforms using household expenditure data

To analyse distributional impacts of energy price increases on households, begin by segmenting households into relevant groups (for example, according to some ranking of total expenditure).[21] Second, calculate the respective expenditure share for each fuel as a proportion of the average total expenditure share for the respective societal group. Third, calculate the impact of policy on energy price increases as a proportionate change in total final energy prices. Finally, multiply expenditure shares by the percentage changes in energy prices for each fuel/group and sum over fuels for each group to produce a distribution of weighted average percentage increases in total expenditure from the policy change.[22] This calculation is set out below:

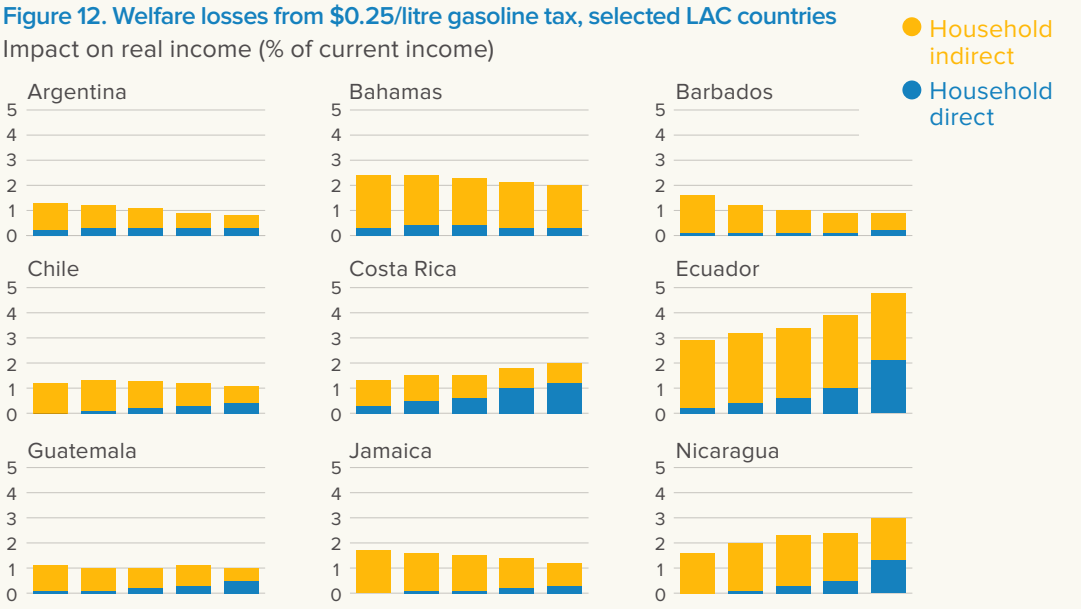
$$\text{Average expenditure increase \%} = \sum_i \left(\frac{\text{Average total expenditure on energy}_i}{\text{Average total expenditure}} \times \frac{\text{\% change in energy}_i \text{ price}}{\text{Total (prereform) energy price}_i} \right)$$

All results need to be interpreted carefully, given their sensitivity to sampling and data quality issues. Analysis of both the entire sample and those households reporting positive expenditures on a particular fuel is generally desirable (many fuel sources are purchased infrequently so demand may be "latent"). Such methodologies may also overestimate policy impacts since behavioural responses to price increases are omitted.

Source: Baker, Blundell and Micklewright (1989), Banks, Blundell and Lewbel (1997).

Figure 12. Welfare losses from $0.25/litre gasoline tax, selected LAC countries

Impact on real income (% of current income)



Note: Figure 12 shows the impact of a hypothetical energy price increase of $0.25/litre on gasoline and diesel on household expenditures (grouped by expenditure quintile) for a range of LAC countries. These are shown in terms of both direct expenditures on fuel but also the indirect effects on the costs of producing other goods and services, such as food and public transport. A pricing reform of this sort is shown to have a disproportionate impact on lower-income groups in Argentina, Bahamas, Barbados and Jamaica and on higher income groups in Costa Rica, Ecuador and Nicaragua, while being distributionally neutral in Chile and Guatemala.[23]

Source: Feng et al. (2018).

21 This is preferred to income, which may be highly variable and less representative of underlying prosperity.
22 This can be extended to the indirect impacts of energy price increases on goods and services (such as public or shared transportation), for example, using input-output tables (Symons, Proops and Gay, 1994).
23 Price reform is generally less progressive in many countries when considered only in terms of households that report direct expenditure on gasoline. International comparisons should be approached with caution, as a $0.25/litre increase in gasoline prices results in different proportional price increases across countries.

Targeted compensation of adversely impacted and vulnerable stakeholders: Employing some of the revenues generated by subsidy reform to alleviate the impacts of increased household energy costs on vulnerable groups can help ensure progressive outcomes while protecting the fiscal base.[24] Possible expenditure channels that avoid distorting underlying energy prices include increased investment in access to key energy and basic services, conditional or unconditional cash transfers, enhancements to social security programmes, and job creation and training programmes (table 4 summarizes the key features of these policy choices). Conditional cash transfer mechanisms, for example, have proved attractive for compensating former recipients of energy subsidy programmes in countries such as Indonesia, Ghana and Morocco, where social security systems cannot be used to transfer benefits to such vulnerable social groups (Fedelino et al., 2017; Zinecker et al., 2018) (box 10), and can be complemented by ramped-up investment in basic services and social provision.[25]

Table 4. Summary features of compensation options

Policy instrument	Pros	Cons
Improved basic services provision	- Strong potential development benefits	- Takes time to deliver - Rarely solely targeted at subsidy beneficiaries
Conditional cash transfers	- Highly targeted/linked to behaviour change - Outcomes readily measurable	- Challenging and burdensome to administrate
Unconditional cash transfers	- Cheaper/less burdensome to administrate (relative to conditional programmes) - Highly targeted	- Outcomes less readily measurable (relative to conditional programmes)
Enhanced social security payments	- Highly targeted - Moderate operational costs	- Not widely available for LDCs and middle-income countries - High upfront costs
Employment programmes	- Strong potential development benefits	- Take time to deliver - Rarely solely targeted at subsidy beneficiaries (particularly in the case of consumption subsidies) - Risk of mismatch in skills provision and market need

Box 10. Overview of the Tayssir Conditional Cash Transfer programme in Morocco

The Tayssir Conditional Cash Transfer programme targeting poor rural households expanded from 80,000 families in 2009 to 466,000 families in 2014 (around 5% of the population). The total programme cost grew to $70 million per year, equivalent to around 0.1% of GDP (energy subsidies previously cost around 1.7% of GDP). The households included in the programme received approximately $153 per year – a similar amount to pre-reform (net) household fossil fuel subsidies in the case of a family of four.

Source: Zinecker et al. (2018).

24 Flues and Dender (2017), for example, find that redistributing a third of the additional revenue from a carbon price increase to poor households increases energy affordability among these socioeconomic groups.

25 In Indonesia, for example, around $15 billion of the $17 billion in savings from energy subsidy reforms were reinvested, including $4.5 billion capital injection into state-owned enterprises with a focus on infrastructure and $2.5 billion increase in transfers to regions and villages (Zinecker et al., 2018).

A gradual and sequenced approach to price reform: Gradual price adjustments are desirable to enable households and firms to adjust to higher price charges.[26] Formula-based approaches to reform, whereby any gap between domestic regulated and "market" prices is gradually reduced each period until prices are effectively liberalized, are useful implementation tools (see box 11 for a discussion of pricing reform in Jordan).[27] High energy prices do not obviate the need for carbon pricing reforms or justify energy subsidies, but the commodity cycle may shape the timing of reforms, which are best planned and implemented during the downcycle in the case of energy importers. Limiting subsidies to fuels most heavily used by the poorest households and tightening up provisions under remaining programmes are useful initial steps towards subsidy elimination: countries such as Morocco and India, for example, have implemented more aggressive reforms on diesel and other fuels than liquefied petroleum gas (LPG), which is used for cooking by many poor households without networked energy supplies. However, experiences such as India's LPG subsidy reform highlight the complexity of such processes (box 12).

Box 11. Energy subsidy reform in Jordan: a staged approach

Jordan, a major energy importer, suffered a significant fiscal burden from energy subsidies: in 2005, for example, rising fuel prices pushed the cost of the country's fuel subsidies to almost 6% of GDP. A number of reforms to energy pricing, supported by a formula-based approach, led to initial increases in petroleum products. However, prices were kept below international prices, and price gaps widened with the commodity upcycle in 2011–2012. A monthly fuel price adjustment was re-established in early 2013, together with a series of increases to electricity tariffs to ensure operational cost recovery for the national electricity company.

Source: IMF (2017).

Box 12. Reforming LPG subsidies in India

The Government of India has sought to target LPG subsidies at the lowest-income groups, including through income-based exclusion criteria. These reforms were also accompanied by the Give It Up information campaign, which was designed to encourage households able to afford higher LPG prices not to claim the subsidy.

However, administrating these eligibility criteria has raised several issues. The income criteria excluded access to only 1% of households with active connections, while the administrative requirements to provide bank account details or an Aadhaar identification number for receipt of payments may have excluded around 5% of households from the subsidy, many of whom are likely to be among the most vulnerable.

Improved targeting of the subsidy requires stricter income criteria, lower administrative hurdles for eligibility for the poorest households, investment in distribution in the most remote regions and a further reduction in the unit value of the subsidy, coupled with a tighter limit on the number of LPG cylinders available for subsidy (which actually increased from 6 to 12 between 2012 and 2014).

Source: IMF (2017).

26 Large, one-off price adjustments–often enforced by a rapid deterioration in fiscal or balance of payments conditions and/or increases in market prices (for importers)–cause inflationary and other social pressures and can lead to an unwinding of reforms. Fuel price increases in Nigeria in 2012, for example, resulted in fierce social backlash and ultimately a reinstatement of the subsidy policy.

27 In the case of reforming subsidies to power, user tariff reforms can usefully target progressively more ambitious degrees of cost recovery by initially aiming, for example, at recovering basic operational and maintenance costs, before further adjustments are made to adequately recoup capital investment costs.

Well communicated and coordinated policy implementation: Strong communication with key stakeholders, emphasizing the underlying rationale for change, including the potential economic opportunities that green economic transition brings, is central to effective energy pricing reform. One major pillar for success is building consensus around the case for reform and possible approaches to this, working in close conjunction with experts and opinion formers. This process should be supported by appropriate economic and policy analysis, including through the formation of so-called green tax commissions (figure 13).[28] Managing and coordinating internal governmental stakeholders is critical for effective policy development and implementation:[29] the far-reaching nature of energy pricing reforms warrants coordinated implementation by an executive agency, such as the planning or finance ministry. One such example is the central coordination of ETS policy development in New Zealand, which is described in box 13.

Figure 13. Key policy steps and decision-making factors

Step 1. Determine objectives

The objectives of a communication strategy should be determined at the outset. These may range from satisfying statutory reporting requirements, developing expertise (within government, industry or civil society), building credibility and trust, particularly relating to longer term policy development, as well as fostering acceptance and support for policy objectives or implementation choices.

Step 2. Map stakeholders

There are a wide range of potential stakeholders to energy pricing reforms drawn from different branches government, industry, civil society and academia. Individual stakeholder groups should be profiled in terms of their role in, exposure to, and influence on reform outcomes, likely priorities and expectations and so on. Finally, it should be determined which of these profiles have the most critical bearing on policy development and outcomes, which should be used the basis for prioritizing engagement.

Step 3. Design engagement and communications strategy

Stakeholder engagement should be focused, timely, relevant, broad-based, open and accessible. This can take various forms, ranging from basic information-sharing to active partnership on key decisions (deeper engagement is more often the preserve of key decision makers and influencers). Government should communicate the objectives and benefits of reform, explain the implications of a defined alternative and address any potential misconceptions in a clear, coordinated, sustained fashion.

Step 4. Build capacity

Energy pricing reforms will likely require efforts to build capacity, particularly among regulators, as well as households and firms most impacted by policy changes. Potential capacity development needs range from designing and understanding technical rules on ETS markets to the operation of conditional cash transfer and other schemes designed to offset the impact of policy on vulnerable groups. Where these gaps are largest or most uncertain, pilot schemes may be warranted to evaluate proposed reforms and refine capacity-building and key policy choices before wider roll out.

28 Green tax commissions are dedicated independent bodies comprising representatives of government, industry, academia and civil society. They have proved influential catalysts for energy pricing reform across a range of OECD and non-OECD countries (OECD, 2001; Fedelino et al., 2017).

29 In this context, self and peer reviews–aimed at identifying, defining and measuring fossil fuel subsidies, as well as evaluating their impacts and determining next steps–have often proved successful in promoting closer interaction across government agencies and also serving as a basis for international exchanges of experiences (Gerasimchuk et al., 2017).

Box 13. New Zealand Emissions Trading Working Group

New Zealand established a cross-department Emissions Trading Group that would be accountable to a cabinet subcommittee to lead ETS policy design and implementation. These arrangements enabled the economy-wide ETS to be developed in just 18 months (following an extended gestation period) and for technical design and political decision-making to be aligned across the government.

Source: MfE (2019), PMR and ICAP (2016).

Box 14.

Summary of policy recommendations III

- Use available household expenditure survey data resources to develop a strong understanding of the distributional consequences of energy pricing reform.
- Carefully interpret the results of any distributional analysis undertaken on household survey (or other) data, considering issues such as sample representativity, latent demand and potential behavioural biases.
- Consider investment in strengthening available household survey data resources where data quality or coverage issues materially impede effective policy development.
- Carefully consider the desirable mix of measures to limit the adverse consequences of energy pricing reform on low-income households and the funding envelopes for these.
- Avoid universal payments and measures that distort the relative price of energy services in favour of more targeted policies, such as conditional cash transfer mechanisms.
- Adopt a gradualist approach to energy pricing reform, taking the commodity price cycle and the net import position for particular fuels into account.
- Begin by limiting subsidies to the fuels that are most heavily used by low-income households and those which are most harmful to the environment.
- Communicate the underlying rationale for energy pricing reform clearly to key stakeholders, including the consequences of inaction.
- Adopt a whole-of-government approach to policy design and implementation with an executive agency accountable for policy coordination.
- Actively engage with key stakeholders in industry, academia and civil society to develop policy options and strategies.
- Champion economic and social opportunities as part of a carefully coordinated communications and outreach strategy that also addresses potential risks.

Source: Authors.

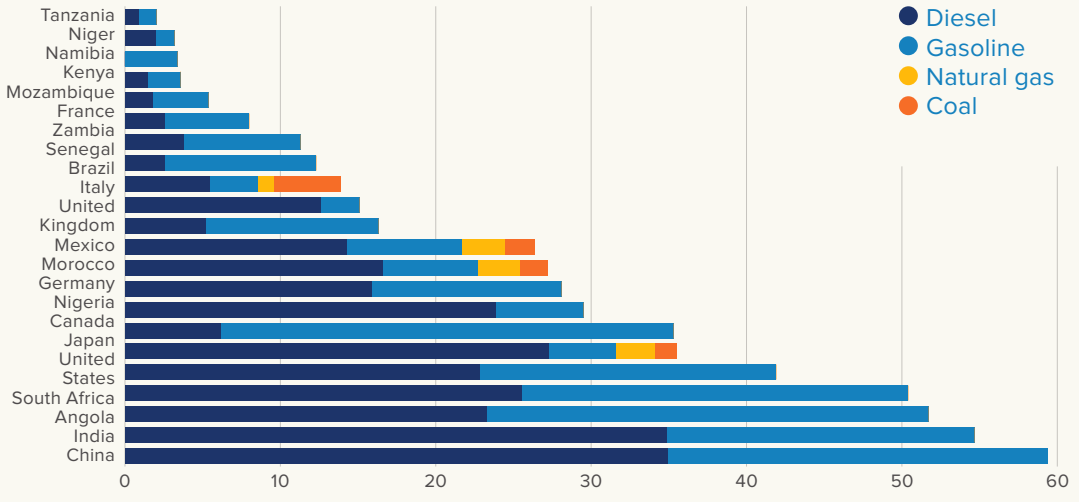
In the Peruvian Andes, a local community uses solar-powered water pumps to irrigate pasture with water from the nearby lake. This has enabled farmers to maintain crops amid changing weather patterns induced by the climate crisis. Photo: Monica Suárez Galindo/UNDP Peru

STRENGTHENING INTERNATIONAL POLICY COORDINATION

Strengthened international cooperation is required to help overcome barriers to the establishment of efficient pricing incentives. This should include:

Improved coordination of carbon prices across countries and regions: There is currently a wide divergence in carbon prices across countries. This increases the overall costs of action on climate change by failing to incentivize sufficient uptake of cost-effective mitigation in countries with low carbon prices. It also risks creating policy distortions, including carbon leakage and fuel smuggling. Cooperating around minimum carbon prices is one promising approach to policy coordination: it offers some protection and flexibility for countries wishing to set relatively high rates and has been adopted in Canada and the EU, in the case of energy excises. Efforts to improve the comparability of carbon prices across jurisdictions could support coordination. Examples of this include the measurement of effective carbon prices, taking into account base exemptions, rate reductions and wider indirect tax policy choices. Figure 14 shows the results of a comparative exercise of this sort, while box 15 summarizes the methodology. Deeper cooperation to tackle emissions from international aviation and shipping is a particular priority, with indirect taxes on cargo and passenger tickets being potential second-best alternatives in the absence of robust international policy coordination.[30]

Figure 14. Effective carbon prices in 2030, selected countries



Note: Figure 14 shows that carbon emissions are subject to significantly higher effective tax rates in Europe, compared to North America, Japan or major emerging markets (except Mexico). Overall, emissions in Africa are taxed most heavily due to the high motor fuel excises and limited emissions from the wider energy sector.

Source: IMF (2019).

30 Ticket or cargo taxes based on the value of service and the distance travelled may usefully proxy for carbon taxes given certain legal constraints on the use of fuel excises (Keen and Strand, 2007, Parry et al., 2018). In aviation, for example, the UK has reformed its Air Passenger Duty so the levy more closely reflects the distance flown and incentivizes higher passenger load factors (Faber and Huigen, 2018).

Box 15. Measuring and comparing effective emissions prices

Effective carbon prices can be measured by (i) expressing energy taxes on a CO_2-equivalent basis (i.e. dividing them by the relevant CO_2 emissions factor); and (ii) weighting the energy taxes and any direct carbon pricing by their relative effectiveness at reducing CO_2 emissions compared with an equivalently scaled comprehensive carbon price (see calculation below). Figure 14 provides a sample of results for a selection of countries.

$$\text{Effective carbon price} = \sum_i \frac{\textit{Tax rate on energy}_i}{\textit{Emissions per taxable unit of energy}_i} \times \text{behavioural impact of tax on demand for } \textit{energy}_i$$

Source: IMF (2019).

Harnessing international carbon markets: Low-carbon transition presents a massive financing challenge for developing countries: implementing the Paris Agreement, for example, will likely require $1.2–$2.9 trillion per year to decarbonize non-OECD economies (Rogelj et al., 2018), a scale of resource needs which cannot be met from public funds.[31] International carbon markets could promote low-carbon investment in developing countries and reduce overall mitigation costs, given the prevalence of less efficient technologies, lower-cost labour and easier integration into new investment projects (see figure 15 for an overview of potential options).[32] However, international project-based trading mechanisms under the Kyoto Protocol have lapsed and were subject to a number of structural failings (see box 16 for further details). While examples of new international carbon market cooperation initiatives have since emerged,[33] the scaling up of these arrangements is currently impeded by a lack of international agreement on the rules under article 6 of the Paris Agreement. Concluding this international architecture is critical to harnessing international financial flows from carbon taxation or ETS based policies to support the implementation of the Paris Agreement.

Figure 15. Options for driving international carbon financing flows

Fully integrated transnational ETS	Linked ETS schemes	ETS compliance with carbon credits	International transfers and cooperation
A fully integrated ETS in which a fully harmonized set of market rules are implemented across jurisdictions Pros • Fully efficient transnational investment allocation Cons • Technically and politically challenging to establish • Need to ensure highly coordinated policy implementation	Independent national or regional ETS that permit trade in emissions allowances across jurisdictions Pros • Greater flexibility in national or regional policy implementation Cons • Less efficient capital allocation provided if trading limits imposed	Firms purchase international carbon credits to meet ETS obligations or in lieu of carbon tax payments Pros • Households and firms in developing countries not exposed to higher prices Cons • Least cost-efficient mitigation • Can be challenging to scale up (project-based administration is often complex)	Revenues from carbon taxes or ETS auctions are transfered between governments to finance mitigation Pros • Opportunity to direct investment to strategically critical sectors Cons • Requires adjustments by the seller Risk of inefficient disbursements

31 The four major multilateral climate change funds by capitalization (the Green Climate Fund, the Clean Technology Fund, the Scaling-Up Renewable Energy Program for Low Income Countries, and the Global Environmental Facility) had around $23 billion in available capital in 2017 (Amerasinghe et al., 2017).

32 Carbon pricing is also associated with faster technological innovation, which serves to bring down the long-term costs of action of climate change (Goulder and Mathai, 2002; Calel and Dechezlepretre, 2016).

33 The Foundation for Climate Protection and Carbon Offset (KliK) has initiated a scheme to help meet Switzerland's domestic climate change commitments. Through the scheme, the government expects to purchase about 5 million tonnes of carbon credits per year, initially supplied from investments in clean cookstove technologies in Peru and financed by a CHF0.015/litre tax on imported diesel and gasoline (KliK, 2019).

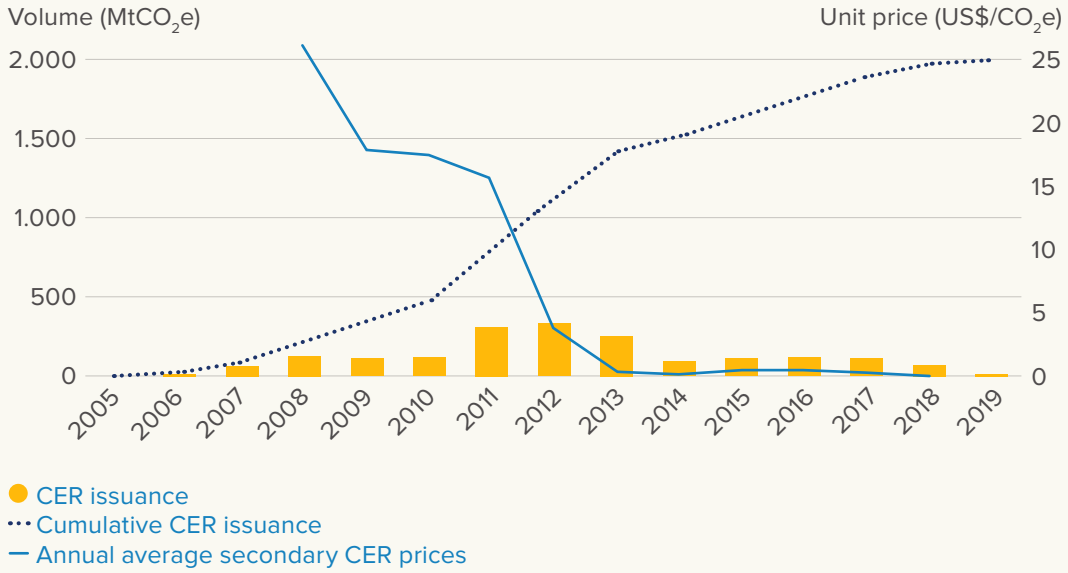
Box 16. Article 6, internationalizing carbon markets and lessons from the Clean Development Mechanism

Article 6, paragraph 4 of the Paris Agreement establishes a mechanism for contributing to the mitigation of GHG emissions and supporting sustainable development. Past experiences of international carbon crediting under the Kyoto Protocol may be relevant to the current international discussions aimed at finalizing the rules, modalities and procedures relating to this.

Specifically, the Clean Development Mechanism (CDM), which was established under the Kyoto Protocol, aimed to support emissions-reducing projects in developing countries. Eligible projects that reduce emissions below an agreed baseline earn Certified Emissions Reduction (CER) credits. These could be used to meet emissions reduction commitments made by Annex I countries to the Kyoto Protocol. So far, around 2 $GtCO_2e$ of CERs have been issued, valued at over $8 billion. Around 50% of the total ≈10,000 projects that have been certified are in hydro or wind power, accounting for around 550 $MtCO_2e$.

A key lesson from the CDM is that international cooperation should target technologies and measures which would otherwise remain inaccessible under host country governments' own actions. In the case of the CDM, buyers were discouraged from participating in the market due to concerns over poor environmental outcomes from carbon credits. This was due, for example, to weak technical benchmarks against which project investments were eligible for credits. This would generally support the argument for the careful transition of existing CDM projects or credits into any successor mechanism.

Figure 16. CDM credit supplies and prices, 2005–2019.



Note: The CDM provides the largest historical example of an international carbon crediting market. The volume of annual CER issuance peaked in 2012 at around 340 $MtCO_2e$, coinciding with the end of the Kyoto compliance period. Demand for CERs has since collapsed following policy decisions to limit CERs for compliance with international climate commitments. This has fuelled a rapid decline in the CER prices from around $15/$CO_2e$ in 2011 to nearly zero today, leading to a similar decline in the supply of projects.

Source: WBG (2019c).

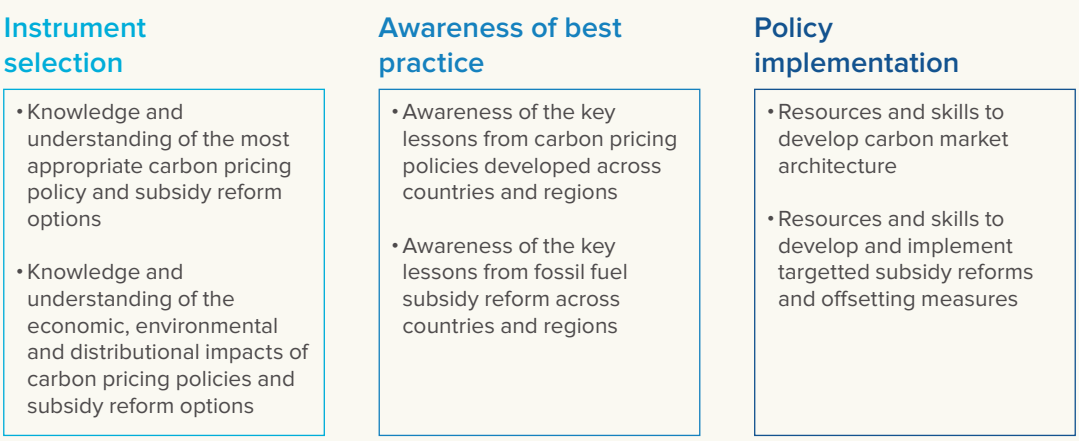
Strengthening institutional capacity for carbon pricing implementation: Implementation of carbon pricing is impeded by substantial capacity gaps in many developing countries, including in relation to instrument selection, awareness of international best practices and wider past policy "lessons", together with access to the skills and resources required to develop and implement chosen policies (figure 17). This reflects, in part, the relatively limited experience of carbon pricing reform in developing countries. There are a range of multilateral support programmes and forums to help overcome these barriers, including the technical assistance offered by the IMF[34], the World Bank Carbon Pricing Leadership Coalition, the Partnerships for Market Readiness (PMR) programmes (see box 17) and the Global Subsidies Initiative (GSI).

Box 17. Overview of the PMR

The PMR is tasked with building market "readiness" for mitigation action among developing countries. Programme support activities include tailored advice on country-specific mitigation policy choices; technical advice on best policy practices and the development of carbon pricing architecture, drawing on country experience, and specialist expertise and advice on emissions reduction targets and analysis on associated policy impacts. As of June 2020, the PMR has provided funding and technical guidance to 23 countries, including 19 implementing country participants and four technical partners. Independent evaluation of the PMR has found it to have been generally successful in informing partners regarding design, piloting and/or implementation of domestic carbon pricing instruments. The programme has been winding down as formal closure scheduled for June 2021 and is currently transitioning to the Partnership for Market Implementation program (PMI).

Source: PMR (2020).

Figure 17. Key capacity gaps impacting carbon pricing in developing countries



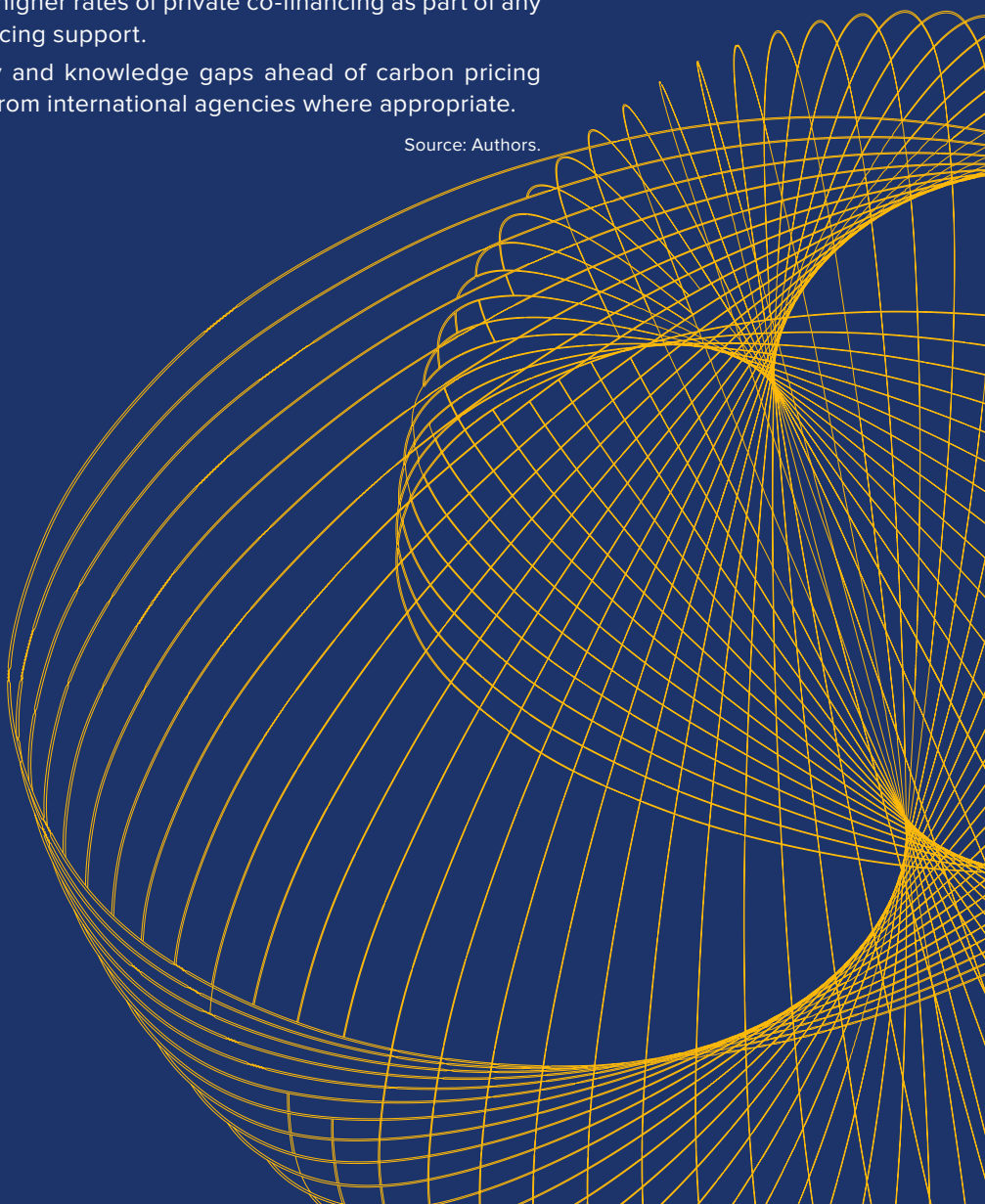
34 The IMF provides technical assistance for a range of indirect tax and energy subsidy reforms in developing countries. These have included support for carbon tax implementation in Mauritius (Parry, 2012).

Box 18.

Summary of policy recommendations IV

- Establish international forums, or integrate into existing multilateral dialogues (such as the G20), for discussion of practical steps towards improving carbon price coordination across countries.
- Prioritize international coordination around carbon prices, energy subsidies and broader energy policy where there is clear evidence of distortions, such as cross-border fuel smuggling and international bunker fuels.
- Agree on an appropriate common basis and methodological framework for comparing carbon pricing policies across countries, such as an effective carbon price.
- Target minimum prices as a basis for international carbon policy coordination and aim to steadily increase these lower-bound thresholds over time.
- Advance and conclude international negotiations on article 6 of the Paris Agreement to establish framework rules for international cooperation on carbon finance.
- Broaden and deepen international trade in carbon credits, subject to the high technical and environmental standards required to ensure long-term market and policy credibility.
- Undertake structured dialogue with other relevant ETS regulators to explore the potential for linking markets to improve liquidity, price stability and reduce compliance costs, including clearly identified barriers and risks.
- Actively measure and target higher rates of private co-financing as part of any publicly backed carbon financing support.
- Clearly identify key capacity and knowledge gaps ahead of carbon pricing reform efforts, with support from international agencies where appropriate.

Source: Authors.



THE ROLE OF INTERNATIONAL ORGANIZATIONS

International organizations, including UNDP, have deep expertise and experience partnering with client governments to develop and integrate climate change mitigation policies into wider sustainable development plans. There is a growing body of experience on undertaking carbon pricing successfully. Whether this is implemented through carbon taxes, ETSs or a combination of measures, international organizations have been instrumental in helping developing country governments better understand these reforms and build their capacity. By sharing knowledge and information they have been able to fill gaps in information and awareness. As indicated in this report, carbon pricing needs to start with the removal of any existing fossil fuel subsidies. These processes are inherently political and there are important political economy issues to consider. Evidence in the literature abounds to support the notion that these latter factors are crucial to sustainable outcomes. Because international organizations are not aligned with particular national interests, they can provide much-needed, independent advice to governments that request support in making these reforms and help build and strengthen institutional capacity. They can also share experiences from across the world that can inform these reforms.

Engineer at a solar power station in Mauritius. Photo: Stéphane Bellerose/ UNDP Mauritius

CONCLUSIONS

Curbing climate change is critical for sustainable development, given its potential to expose hundreds of millions of people to food and water shortages as well as coastal flooding as the world warms, disproportionately impacting the world's lowest-income countries, communities and households (IPCC, 2018).

Decarbonizing the energy sector will bring major local development opportunities, including improved local environmental conditions, new sources of green economic growth and, potentially, strengthened public finances.

Carbon pricing is key to reducing emissions and delivering the NDCs cost-effectively. It could mobilize hundreds of billions, even trillions, of dollars in additional fiscal revenues annually, which could help key public financing goals, including delivery of the SDGs.

Reinforcing and coordinating emerging carbon tax and ETS policies are important priorities, including expanding their coverage across countries and sectors, and reinforcing the price incentives to help catalyse low-carbon investment and deliver progressively more ambitious NDCs.

Initial carbon price levels in the range of at least \$40–\$80/tCO_2 by 2020 and \$50–\$100/tCO_2 by 2030 would be consistent with the implementation of the Paris Agreement if levied broadly across countries and sectors, in conjunction with a supportive enabling environment (Stiglitz and Stern, 2017; Nordhaus, 2017).

Eliminating remaining fossil fuel subsidies is an important first step towards effective carbon pricing in many developing countries. By lowering the final price of energy, energy subsidies can be viewed as a negative carbon price. Energy subsidies are a major contributing factor to climate change and are fiscally expensive to maintain. Their successful elimination is thus a major and urgent policy challenge.

The momentum surrounding carbon pricing reform is growing. Around 60 national and subnational governments have implemented positive carbon pricing policies (WBG, 2020). Furthermore, 96 of 146 NDCs currently refer to carbon pricing as a policy option.

Sustaining this will require substantial investment to develop capacity and overcome knowledge gaps relating to carbon price implementation in developing countries. There is relatively limited experience of carbon pricing reform in developing countries to date, implying a considerable need for capacity development and the enhancement and sharing of technical knowledge to support effective implementation in low- and middle-income countries.

An overarching policy strategy is required to ensure equitable outcomes from carbon pricing reforms and overcome political obstacles to these. This requires a clear understanding of the distributional consequences of reform, gradual and sequenced implementation accompanied by well-targeted compensation measures to support the most adversely affected groups, and deep engagement with all stakeholders, founded on a clearly communicated rationale for change.

There is a strong role for a range of international organizations, including international finance institutions and the UN system, in supporting mitigation policymaking capacity and providing seed finance for the energy transition in developing countries. The IMF, for example, has significant technical expertise in energy tax and subsidy reform, together with surveillance of related macrofiscal risks. The World Bank has also played a major role in supporting carbon market implementation across a range of countries, including as part of the PMR, and in financing low-carbon investment. UNDP has extensive experience brokering access to climate finance for developing countries and engaging in market-based climate mitigation mechanisms, like the CDM. Given its extensive in-country presence and cross-sectoral expertise, it can provide independent advice and support to governments interested in undertaking carbon pricing and fossil fuel subsidy reform.

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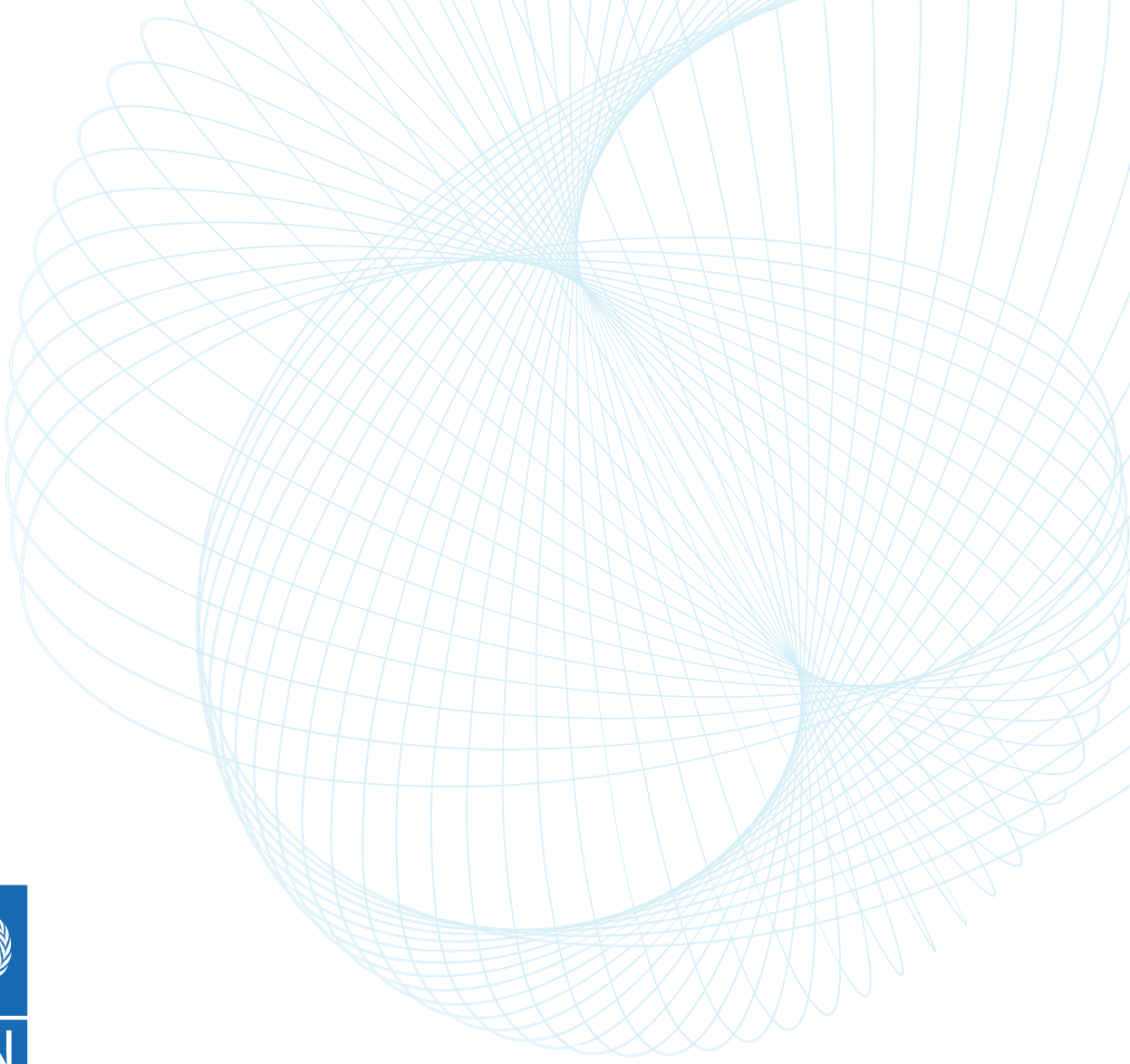
GLOSSARY OF KEY TERMS

Allowance	The right to pollute a unit (usually one ton) of carbon dioxide
Banking	Carrying over unused emissions allowances from one ETS period for compliance in a successive phase
Borrowing	Bringing forward emissions allowances from a future ETS period for compliance in a preceding phase
Carbon leakage	Displacement of economic activity or investment from one jurisdiction to another due to differences in the stringency of carbon pricing policies
Carbon price	A charge imposed on emissions of carbon dioxide either through a carbon tax, ETS or hybrid policy
Carbon tax	A specific excise or production tax imposed on energy in proportion to the emissions contained therein
Capital subsidy	A policy to reduce the cost of an upfront investment
Energy subsidy	A policy resulting in a fuel being sold below the relevant market price
Energy efficiency standard	A regulation mandating a certain level of technical energy efficiency (for example relating to a household appliance, vehicle or building)
Emissions Trading Scheme (ETS)	A policy in which a limit is placed on emissions and regulated entities are required to hold sufficient allowances to cover their emissions; these allowances are tradable between market players
Feed-in tariff	A payment (typically on a long-term basis) for renewable power supplied to the grid by a utility or retailer
Free-riding	A situation in which a household, firm or government benefits from a policy without incurring related costs
Hybrid ETS	An ETS policy with additional measures to stabilize market prices
Grandfathering	Allocating allowances according to historical levels of emissions
National Determined Contribution (NDC)	Any action that reduces emissions in developing countries and is prepared under the umbrella of a national government initiative
Mitigation	Reducing emissions (this term can also refer to reducing climate change–related risks)
Nationally Appropriate Mitigation Actions (NAMA)	Country-specific plan to reduce emissions pledged as part of the Paris Agreement
Paris Agreement	International agreement, reached in 2016 to limit climate change to well below 2°C
Point of regulation	The point in an energy production/consumption chain at which compliance with a policy is mandated

GLOSSARY OF ACRONYMS

BOF	Basic oxygen furnace
CCER	Chinese Certified Emission Reduction
CER	Certified Emissions Reduction
CCS	Carbon capture and storage
CDM	Clean Development Mechanism
EAF	Electric arc furnace
EBRD	European Bank for Reconstruction and Development
EPA	United States Environmental Protection Agency
ETS	Emissions trading system (or scheme)
EU/EC	European Union/European Commission
GDP	Gross domestic product
GHG	Greenhouse gas
GSI	Global Subsidies Initiative
ICAP	International Carbon Action Partnership
IEA	International Energy Agency
IISD	International Institute for Sustainable Development
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and the Caribbean
LDCs	Less developed countries
LPG	Liquefied petroleum gas
N_2O	Nitrous oxide
NDC	Nationally determined contribution
OECD	Organisation for Economic Co-operation and Development
PMR	Partnership for Market Readiness
R&D	Research and development
SDG	Sustainable Development Goals
tCO_2	Tonne of CO_2
tCO_2e	Tonne of CO_2 equivalent
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added tax
WBG	World Bank Group
WTO	World Trade Organization



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