K4D | Knowledge, evidence and learning for development

Lessons learned from carbon pricing in developing countries

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Question

What evidence is available on the lessons learned from implementing carbon taxes and other climate change mitigation strategies related to taxation and public finances (e.g. feebates) in developing countries?

Contents

1. Summary

Carbon pricing plays a central role in delivering broad-based and cost-efficient reduction in greenhouse gas emissions and achieving the climate targets of the Paris Agreement (ICAP, 2020). There are two main types of carbon pricing: emissions trading systems (ETS) and carbon taxes. Other complementary policies are also required for deep decarbonisation, such as performance standards, building codes, and innovation support. There are also more indirect ways of more accurately pricing carbon, such as through fuel taxes and the removal of fossil fuel subsidies; greenhouse gas emissions can also be priced through payments for emission reductions (ICAP, 2020). Due to its scope and time limitations, this review mainly focuses on carbon taxes and ETSs, also touching lightly on other policy approaches such as feebates. It presents some lower- and middle-income country case studies to further explore implementation of these mechanisms. Some lessons learned and recommendations on carbon pricing from the literature are also included. Many of the insights and lessons learned highlighted in this review come from experiences in developed and emerging economies. An important recent factor in the climate mitigation debate and pricing of carbon is the COVID-19 global pandemic – some insights drawn from recent opinion pieces and commentary are also included.

The literature on carbon pricing is vast and evolving. It has received much international attention due to the recognition that putting a price on carbon to internalise the societal costs of emissions is the most effective and cost-efficient way of mitigating climate change. However, implementing carbon pricing mechanisms successfully remains challenging and limited (especially in developing countries), given its complexity, huge vested interests against taxing carbon and the political buy-in needed for these to be successful. Equity considerations are also key. This rapid review has drawn on academic and grey literature from an array of international fora and organisations, many of which are specifically focused on exploring mitigation through carbon pricing (such as the International Carbon Action Partnership (ICAP) and the World Bank's Carbon Pricing Dashboard and Partnership for Market Readiness (PMR)). Key literature used in this review includes a recent Discussion Note of the Committee of Experts on International Cooperation in Tax Matters (2019) that includes a draft of the revised Chapter 3 (Design of the Carbon Tax) of the proposed United Nations Handbook on Carbon Taxation; the World Bank Group (2019) State and Trends of Carbon Pricing 2019 report; and a brief by ActionAid (2020) on carbon taxes.

Key findings:

- New carbon pricing initiatives are emerging mostly at the subnational level and in developed countries (World Bank Group, 2019: 47). Together the carbon pricing schemes in place cover about 20 percent of annual global greenhouse gas emissions (World Bank Group, 2019). However, despite arguments in favour of carbon pricing and over 50 carbon pricing schemes implemented or planned around the world (World Bank Group, 2019), implementation still remains limited, especially in developing countries.
- Carbon pricing still meets considerable public and political resistance and is vulnerable to public and political shifts (Maestre-Andrés et al., 2019). Political acceptability has been identified by some as the biggest challenge for the passage and preservation of ambitious carbon pricing schemes (Klenert et al., 2018).
- There are different ways of designing carbon pricing mechanisms and recycling revenue. Different countries may have different goals in mind with environmental tax reform; the most appropriate policy option will depend on a combination of factors such as a

country's emissions profile, energy and tax policy objectives, climate change risk profile, and capacity for tax administration (ActionAid, 2020).

- One reason why carbon taxes have proven difficult to implement is that they can aggravate poverty by (directly or indirectly) increasing prices of basic goods and services such as food, energy and travel (Vogt-Schilb et al., 2019). There is also a gender dimension, as some environmental taxes may have a greater impact on women, for example, taxes on energy products for domestic use will impact more on women as they tend to spend a higher proportion of their disposable income on household items and expenses (Cottrell & Falcão, 2018). Other marginalised groups, including people with disabilities, can be similarly negatively impacted. Well-targeted tools can be used to make an environmental tax more progressive (ActionAid, 2020).
- Important factors for implementation of carbon pricing mechanisms include: political buy-in; stakeholder consultation; comprehensive communications; measures to protect lower-income groups; analysis and assessment of country-specific situations and different instrument design; enabling environment; comprehensive reform plan; gradual and sequenced introduction; ensure positive environmental effects.
- It is difficult to assess how progressive ongoing carbon taxes are as most of these in developing/emerging economies have been in operation for less than ten years. Despite this, "success" stories have been touted in many of the Latin American country examples (e.g. Colombia) (ActionAid, 2020).
- It is not clear from the country examples included in this review what is driving the adoption of carbon pricing across these developing countries; influences may include compliance with international protocols, a desire to pursue environmental goals, and the impetus to raise revenues.

2. Carbon pricing

Background and benefits

Cost-effective tools are needed to deliver the UNFCCC Paris Agreement and achieve the Sustainable Development Goals in both developed and developing countries. Developing countries are facing huge challenges in relation to climate change impacts and meeting their climate targets. National taxation, specifically carbon taxation, have been advocated as one of the most efficient ways of reducing environmental damage (particularly reducing greenhouse gas emissions) and increasing revenues (ActionAid, 2020: 1).

Carbon pricing plays a central role in delivering broad-based and cost-efficient reduction in CO_2 and achieving climate targets (ICAP, 2020). **There are two main types of carbon pricing: emissions trading systems (ETS) and carbon taxes.** Both options can exist side by side in the same country. Deep decarbonisation also requires other well-designed complementary policies tackling various market and government failures (such as spill-over effects in research and development); instruments include performance standards, building codes, and innovation support, which carbon pricing can actively support (ICAP, 2020; High-Level Commission on Carbon Prices, 2017). **A combination of policies is likely to be more dynamically efficient and attractive than a single policy.** There are also more indirect ways of more accurately pricing carbon, such as through fuel taxes, the removal of fossil fuel subsidies, and regulations

that may incorporate a “social cost of carbon” (ICAP, 2020). Greenhouse gas emissions can also be priced through payments for emission reductions.

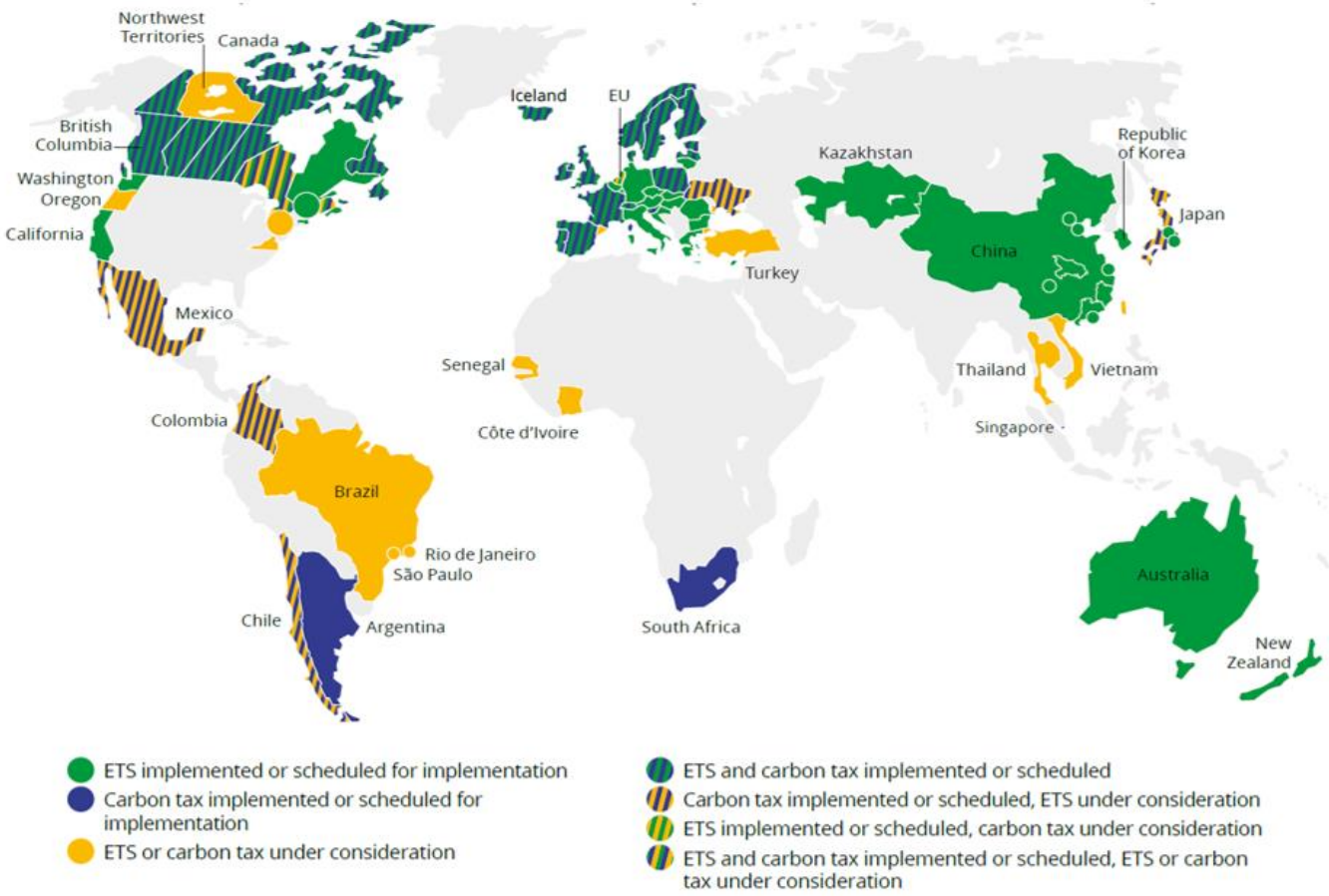
Currently, carbon prices vary widely across existing schemes (Klenert et al., 2018). The Report of the High-Level Commission on Carbon Prices (2017: 3) calculated “that the explicit carbon-price level is consistent with achieving the Paris [Agreement] temperature target [of well below 2^{o}C] is at least US$40–80/tCO2 by 2020 and US$50–100/tCO2 by 2030, provided a supportive policy environment is in place.” Furthermore, the implementation of carbon pricing would need to “take into account the non-climate benefits of carbon pricing (such as the use of revenues derived from it), the local context, and the political economy (including the policy environment, adjustment costs, distributional impacts, and political and social acceptability of the carbon price)” and the appropriate carbon-price levels would hence vary across countries (High-Level Commission on Carbon Prices, 2017: 3). **The report highlights a need for flexibility and transparency within carbon pricing**.

Carbon pricing instruments in low- and middle-income countries can often be seen as contentious – by raising concerns over industrial development, energy access and energy security, for instance (De Gouvello et al., 2020). However, **there is evidence that environmental taxes can bring about environmental improvement in developing countries**, such as emission reductions, cleaner energy generation, and improved recycling rates (Cottrell & Falcão, 2018). Furthermore, **carbon pricing is increasingly recognised as an important source of government revenue,** if used wisely (World Bank, 2019). Carbon revenues are expected to increase further in coming years, and this growth has the **potential to unlock fiscal opportunities, particularly in developing countries** where it has the potential to reduce state dependence on aid and debt financing, and to facilitate the mobilisation of domestic resources for public services (Cottrell & Falcão, 2018). It is becoming increasingly important for governments to consider how to use the revenues generated most effectively. Carbon revenues can either be allocated to general government revenue or be tied to specific purposes; they can be used for a number of purposes (see lessons learned section for information of key considerations on revenue use design) (World Bank, 2019). **This additional funding stream may also be attractive to developing countries post-COVID-19,** when countries will need revenue to re-start stalled or depressed economies or may be encouraged to continue inadvertent pollution and emissions reduction progress seen during COVID lockdowns (however, these points are solely speculative).

Figure 1 shows the current extent of **carbon pricing mechanisms** (i.e. carbon taxes and/or ETSs) around the World in 2019, distinguishing between existing, emerging and considered instruments. This figure is taken from the World Bank Group’s State and Trends of Carbon Pricing 2019 report and reflects the global state of play at the time of its publication in June 2019. As of then, 57 carbon pricing initiatives were being implemented or were scheduled for implementation, covering 46 countries and more than 20 cities, states and provinces. **Together the carbon pricing schemes in place cover about 20 percent of annual global greenhouse gas emissions** (World Bank Group, 2019: 12).

Generally, **successful and lasting carbon pricing and environmental tax reform have proven challenging to implement** (Vogt-Schilb et al., 2019; Coady et al., 2018). The case studies section below includes some country examples of where carbon pricing mechanisms have been implemented. However, inferring the “success” of these schemes is difficult, especially as many have not been in operation for long.

Figure 1: Locations of existing, emerging and considered carbon pricing instruments Worldwide



Source: World Bank Group, 2019: 13. Reproduced under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO).

NB: The large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions. The small circles represent carbon pricing initiatives in cities. The data used in this figure reflects the global state of play at the time of the report's writing in June 2019. Since then further countries are now considering carbon pricing schemes, including Indonesia (see https://carbonpricingdashboard.worldbank.org/map_data for most up-to-date information). Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources.

Emissions trading systems (ETSs)

An **ETS (or a cap-and-trade system)** caps the total level of greenhouse gas (GHG) emissions and allows those industries with low emissions to sell their extra allowances to larger emitters. By creating supply and demand for emissions allowances, an ETS establishes a market price for greenhouse gas emissions. The cap helps ensure that the required emission reductions will take place to keep the emitters (in aggregate) within their pre-allocated carbon budget.[1] ETSs can also act as an environmental "safety net", helping ensure a specific environmental outcome regardless of the performance of other policies. ETSs can play different roles in the policy mix, and the role of an ETS can differ across sectors (ICAP, 2020).

According to ICAP (2020: 26) estimates, as of January 2020, ETSs cover 9% of global GHG emissions. There are now 21 systems covering 29 jurisdictions with an ETS in force; 9 jurisdictions are putting in place their systems for operation in the next few years (including China and Colombia); and 15 jurisdictions are considering the role an ETS can play in their climate change policy mix (including Chile, Turkey, Pakistan and the Philippines). See Case Studies section for more information on these ETSs.

Carbon Tax

A **carbon tax** directly sets a price on carbon by defining a tax rate on greenhouse gas emissions (the Direct Emissions Approach) or on the carbon content of fossil fuels (the Fuel Approach). It is different from an ETS in that the emission reduction outcome of a carbon tax is not pre-defined but the carbon price is.[2] The primary purpose of a carbon tax is not to raise revenue but to change the behaviour of households and firms, as an effective carbon tax will incentivise the reduction of carbon emissions (Committee of Experts on International Cooperation in Tax Matters, 2019). Carbon taxes are generally easier to administer than a cap-and-trade system because they neither involve a market-based trading system nor require enforcing rules to prevent market manipulation. Furthermore, they can be built on existing taxes (High-Level Commission on Carbon Prices, 2017: 10).

Fuel Approach

In the **Fuel Approach** countries may choose to only tax certain fuels. For example, India and the Philippines only tax coal, while Mexico taxes coal and petroleum products (not natural gas) and Costa Rica levies tax on all fossil hydrocarbons. In Colombia, natural gas as motor fuel and coal are exempted from the carbon tax coverage. Zimbabwe only taxes certain fuels (petrol and diesel), although this was not specifically designed as a carbon tax (Committee of Experts on International Cooperation in Tax Matters, 2019: 22). Positives of the Fuel Approach include: i) Incentive is clear – Polluter Pays; ii) simple to administer, as can be added to an existing excise tax system; and iii) scope can include large part of CO_2 emissions, in small as well as big stationary facilities as well as transport. Negative aspects associated with this approach include: i) if incentive to choose higher quality fuels within the same tax group is desirable, system may be more complicated as more tax rates are needed: ii) other types of CO_2e emissions are outside

[1] Taken from https://www.worldbank.org/en/programs/pricing-carbon
[2] Taken from https://www.worldbank.org/en/programs/pricing-carbon

scope; and iii) does not develop measurement, reporting and verification systems (MRV) (Committee of Experts on International Cooperation in Tax Matters, 2019: 36-7).

Direct Emissions Approach

The **Direct Emissions Approach** has attracted increased attention in recent years, and relies on direct reporting of emissions from certain types of stationary installations/facilities. This is the case in Chile and most recently in Singapore and South Africa. A variation of this approach is to focus on certain processes and types of emissions (Committee of Experts on International Cooperation in Tax Matters, 2019: 29). Positives of the Direct Emissions Approach include: i) incentive is clear – Polluter Pays; ii) making use of existing MRV and incentive to further develop MRV; iii) possibility of developing other more complex instruments and of eventually converting to an emissions trading scheme; and vi) possible to include non-fuel combustion emission in scopes. Cons associated with this approach include: i) costly to measure; ii) cannot be applied to small facilities; iii) cannot be applied to transport fuels; and iv) its administratively complex (Committee of Experts on International Cooperation in Tax Matters, 2019: 37).

The reasons behind different approaches to implementing carbon taxes are often found in the national contexts, such as existing administration systems, the fact that the chosen fuels amount to the bulk part of carbon emissions or due to public policy concerns (Committee of Experts on International Cooperation in Tax Matters, 2019: 24). The approaches can be considered as complementary, since they have different advantages and disadvantages and achieve different goals in different sectors.

Other policy approaches and pricing mechanisms

The High-Level Commission on Carbon Prices (2017: 10) highlights that “Carbon pricing can also be implemented by embedding notional prices in, for example, financial instruments that reduce the capital costs of low-carbon programmes and projects (compared with other, more carbon-intensive programmes and projects).” Countries can use financial instruments such as **public guarantees and other risk-reducing instruments; feebate** programmes that tax new energy-inefficient equipment and subsidise new energy-efficient equipment**; and interest rate subsidies and tax breaks for low-carbon investments to reduce the upfront costs of mitigation actions** (Rozenberg et al., 2018). The High-Level Commission on Carbon Prices (2017: 10) elaborates that these “complementary policies can be defined based on an agreed carbon value (which can include both climate and non-climate considerations), which can help reduce the risk of arbitrariness and ensure economic efficiency.” However, these financial instruments can only be applied to new investments and thus do not affect *existing* assets. **The fact that these instruments do not affect existing assets makes them less effective than carbon pricing, but potentially more acceptable politically and socially** (as they do not result in premature retirement or stranded assets) (Rozenberg et al., 2018).

Different countries (or jurisdictions) may have different goals in mind with environmental tax reform. The most appropriate policy option will “depend on a combination of factors such as a jurisdiction’s emissions profile, energy and tax policy objectives, climate change risk profile, and capacity for tax administration” (ActionAid, 2020: 2). Although carbon taxes are the most popular approach to targeting and limiting carbon emissions, other (complementary) approaches have also been put forward and are gaining attention in the international climate change arena. There

are fewer (if none) case studies around these alternative approaches as many have only recently gained traction. These include (ActionAid, 2020: 2):

- **Carbon Added Tax (CAT):** Under a VAT-type system, a CAT is a tax on carbon emissions added at each stage of the production process. The application of a CAT will result in the final consumer paying for the full carbon footprint (the cumulative value of carbon emissions) incurred by the product throughout its entire production chain, whereas producers can claim credit for the CAT they paid which does not correspond to the emissions they were directly responsible for (ActionAid, 2020: 2).
- **Climate Damages Tax (CDT):** The CDT would represent a charge on the extraction of each tonne of coal, barrel of oil or cubic litre of gas, calculated at a consistent global rate based on how much CO_2 is embedded within the fossil fuel. The idea of the CDT is that fossil fuel companies, who already pay royalties (or similar) to the states where they operate, would pay an extra amount on the volume they extract. The CDT would need to be structured to prohibit companies from trickling this cost onto consumers, and to ensure that it is progressive (ActionAid, 2020: 2).
- **Border Carbon Adjustment (BCA):** A border carbon adjustment is a tax levied on imports at a price equivalent to the carbon tax (or price) being applied domestically. It is a measure aimed at protecting a country's domestic internal market against international competition, either by employing a carbon tax on imported products that have not previously been subject to one, or exempting domestically produced products from a carbon tax when the final product is destined for export. An import BCA is therefore commensurate to the carbon tax employed domestically by a given country (ActionAid, 2020: 2; Cottrell & Falcão, 2018).

Challenges with carbon pricing

One reason why carbon taxes have proven difficult to implement is that they **can aggravate poverty by (directly or indirectly) increasing prices of basic goods and services such as food, energy and travel** (Vogt-Schilb et al., 2019). Environmental taxes tend to be regressive, as "by imposing a uniform burden on all consumers – without consideration of income, purchasing power or gender – poorer people will pay a disproportionately higher amount of their available income on such taxes" (ActionAid, 2020: 2; Cottrell & Falcão, 2018). Cottrell and Falcão (2018: 10) find that "the greatest concern in developing countries in terms of equity impacts lies with indirect taxes on domestic fuel (electricity, cooking, heating), because substitutions are rarely available and poor households thus often have no alternative aside from paying the tax." **There is also a gender dimension, as some environmental taxes may have a greater impact on women**, for example, taxes on energy products for domestic use will impact more on women as they tend to spend a higher proportion of their disposable income on household items and expenses (Cottrell & Falcão, 2018).

Well-targeted tools can be used to make an environmental tax more progressive, such as differential rates for different sectors or groups (i.e. tax exemptions and reduced rates) or redistribution mechanisms to compensate lower income groups for increased costs. However, these tools require sound tax administration capacity as a result of a more complex system (ActionAid, 2020: 3).

On the other hand, other research has found that poverty and distributional effects of carbon pricing in low- and middle-income countries are more ambiguous then sometimes stated.

Dorband et al. (2018) assess the expected incidence of moderate carbon price increases for different income groups in 87 mostly low- and middle-income countries. They find evidence that distributional outcomes are primarily determined by differences among income groups in consumption patterns of energy, rather than of food, goods or services. They further find that for countries with per capita incomes of below US$ 15,000 per year (at PPP-adjusted 2011 US$) carbon pricing has, on average, progressive distributional effects (and regressive above this threshold). This turning point can be explained by an inverse U-shape of the energy expenditure to income relationship. Their findings suggest that mitigating climate change, raising domestic revenue and reducing economic inequality are not mutually exclusive, even in low- and middle-income countries (Dorband et al., 2018).

Acceptability of carbon pricing and redistribution

A number of recent papers explore the perceived fairness and public acceptability of carbon pricing.

Klenert et al. (2018) explore why carbon pricing in some countries is more successful than in others. They argue that lessons from behavioural and political science can help design carbon pricing schemes which are more acceptable to the public. They identify **political acceptability** as the biggest challenge for the passage and preservation of ambitious carbon pricing schemes. They draw two key relevant lessons from the political science literature. Firstly, that ambitious carbon pricing is often correlated with high political trust and low corruption levels. Secondly, they find that a policy reform is more likely to be successful if its costs are diffused and the benefits are concentrated. For a new carbon pricing scheme, they recommended making sure that the benefits are salient, avoiding solution-aversion[3] and ensuring transparency and clear communication are generally recommended. They conclude that **the ideal recycling of carbon pricing revenue strongly depends on the political context**. Generally, redistributing carbon pricing revenue as a regular carbon dividend addresses most of the political and behavioural barriers. Other ways of using the revenue can be appropriate in given circumstances, for example, when distributional concerns are the greatest obstacle to higher carbon prices, transfers directed to the poor can be key. Whereas, “when efficiency and competitiveness concerns are the greatest obstacle and trust in the government is high, reimbursing firms through transfers or tax cuts can be superior. Earmarking the revenue for green spending might be the option of choice if the main obstacle is that citizens are unconvinced of the environmental benefits of higher carbon prices” (Klenert et al., 2018: 675).

Vogt-Schilb et al. (2019) explore how governments could **mitigate negative social consequences of carbon taxes by expanding the beneficiary base or the amounts disbursed with existing cash transfer programmes** in 16 Latin American and Caribbean countries. Through their calculations they find that recycling revenues from a US$30 per tCO2e tax back to households in cash disbursements would have a progressive income effect, reducing inequality: households in poorer quintiles would see their real income increase by 5–9% on average, while households in richer quintiles would be net contributors. They find that 30% of carbon revenues could suffice to compensate poor and vulnerable households on average, leaving 70% to fund other political priorities. They acknowledge, that in addition to compensating

[3] “Solution-aversion” is the tendency for citizens to be more sceptical of environmental problems if the policy solution challenges or contradicts underlying ideological predispositions.

poor and vulnerable households, making sure that a majority of consumers benefit from the reform might be necessary to ensure political feasibility.

Maestre-Andrés et al. (2019) provide a comprehensive overview of public perceptions of the fairness of carbon pricing and how this affects policy acceptability. They reviewed empirical studies on how individuals judge personal, distributional and procedural aspects of carbon taxes and ETSs, and preferences for revenues use and redistribution mechanisms. Results are mostly from North American and European countries. Key policy insights gained include (Maestre-Andrés et al., 2019: 1186):

- If **people perceive carbon pricing instruments as fair, this increases policy acceptability and support.**
- **People's satisfaction with information** provided by the government about the policy instrument increases acceptability.
- While people express high concern over uneven distribution of the policy burden, they **often prefer using carbon pricing revenues for environmental projects** instead of compensation for inequitable outcomes.
- Recent studies find that **people's preferences shift to using revenues for making policy fairer if they better understand the functioning of carbon pricing**, notably that relatively high prices of CO_2-intensive goods and services reduce their consumption.
- Combining the redistribution of revenue to **support both vulnerable groups and environmental projects**, such as on renewable energy, seems to most increase policy acceptability.

They recommend the need for further research regarding public policy acceptability of carbon pricing policies in low- and middle-income countries. Further exploring public preferences for different types of environmental projects in which to invest revenues is also necessary (Maestre-Andrés et al., 2019: 1201).

Implications of COVID-19

There are differing opinions on the impact of COVID-19 on carbon pricing. These are mostly coming from opinion pieces in the form of blogs and articles, given the recent development of this global pandemic. Gauging the full impact of COVID-19 will take time.

In a commentary piece for the Grantham Research Institute, Burke and Taschini (2020) argue that **the impact of Covid-19 on the price of carbon illustrates how important it is to build flexibility into cap-and-trade systems**. Commodity prices (including carbon prices) have declined due to the turbulence of stock markets experienced as COVID-19 has spread. As it spread there has also been falling electricity demand in (European) countries; this means falling emissions but also significant reductions in demand for carbon permits. They argue that it is **inevitable that climate policy will be impacted by the repercussions of the global pandemic**. They specifically look at the European Union emissions trading system (EU ETS) and argue its efficacy is particularly vulnerable. It remains to be seen whether the effects of COVID-19 will be long-lasting or if recent market reforms to the EU ETS will be enough to tackle this unexpected supply–demand imbalance.

In another Grantham Research Institute commentary piece, Bhattacharya and Stern (2020) argue that the COVID-19 pandemic has underlined the fragility and dangers of the old growth

path. They highlight how “Many economic actors face severe financial difficulties of both *liquidity* and *solvency*; and, of special importance for many developing and emerging market countries, sharp declines in commodity prices, remittances and tourism, and reversals in capital flows” (Bhattacharya & Stern, 2020). **The recovery from COVID-19 has to be much more than green. They argue that the stimulus packages must be anchored in the target of net-zero emissions and greater resilience**, with supporting plans for sustainable infrastructure, pricing (including carbon pricing and elimination of fossil fuel subsidies, taking advantage of low fossil fuel prices) and smart regulations.

In a Special Series on Fiscal Policies to Respond to COVID-19 note, the IMF (2020: 1) call for “fiscal policymakers to “green” their response” to the COVID-19 crisis to prevent one crisis leading to another. They also highlight that “**public support for green policies may rise after the COVID-19 crisis**” (IMF, 2020: 2 – although others disagree with this assumption, see Trembath & Wang, 2020 opinion piece). With policymakers being able to make the case that, as with pandemics: (1) climate crises may look remote but can strike quickly (2) preparedness is essential and takes years and (3) the cost of preparing is dwarfed by the cost of not preparing. Policy measures recommended to green the recovery include pricing carbon right (IMF, 2020: 3):

- Low oil prices and the need to rebuild fiscal positions make raising carbon taxes (or closely related instruments, such as fuel taxes) and eliminating fossil fuel subsidies especially opportune. For many countries, a $75 per ton carbon tax would increase pump prices by less than the recent collapse in global oil prices.
- Carbon taxes can usefully be reinforced with measures like feebates to promote zero-emissions vehicles and improvements in energy efficiency, and should be supported with measures to assist low-income households and disproportionately affected workers and communities.
- Support to transport and other sectors most directly affected should not be provided in forms that undermine carbon pricing objectives, for example, by reducing fuel or trip-related expenses.

3. Lessons learned and future research

Lessons learned from carbon pricing and energy price reform

A number of papers offer lessons learned and insights from previous experiences of energy price reforms and carbon pricing mechanisms. These include Coady et al. (2018: 12), who draw on the six key lessons learned from Clements et al.’s (2013 cited in Coady et al., 2018) review of energy subsidy reform in 22 countries. These lessons enhance the likelihood of energy price reforms being successful and avoiding reform reversals. A recent brief by ActionAid (2020: 5; and also Cottrell & Falcão, 2018) puts forth recommendations for policy makers to take into account when implementing carbon taxes. De Gouvello et al. (2020: 196) in their practitioner guide put forward five steps to help reconcile carbon pricing with energy policies in developing countries, and ensure effective implementation. Insights on carbon pricing have also been drawn from the experience of the World Bank’s Partnership for Market Readiness (PMR) (High-Level Commission on Carbon Prices, 2017: 13). Here, the key common points from these papers have been integrated and include:

- **Political dialogue and buy-in:** Developing "readiness" for carbon pricing requires both **political leadership and technical/institutional readiness** to advance the carbon-pricing agenda at the domestic level (High-Level Commission on Carbon Prices, 2017: 13). There is hence the need for **political dialogue to ensure buy-in and help facilitate implementation** (De Gouvello et al., 2020: 196).
- **Stakeholder consultation:** Continuous engagement with stakeholder groups—to understand and address their respective concerns—is critical to avoiding policy misalignment (High-Level Commission on Carbon Prices, 2017: 13). Ample meaningful consultation with citizens and civil society organisations is also needed in order to take the needs of marginalised groups into account in the design of carbon taxes (ActionAid, 2020: 5).
- **Comprehensive communications strategy:** Lack of knowledge of the magnitude of subsidies and their shortcomings is often a key barrier to energy price reform. For example, this was viewed as being a major factor behind failed attempts at early energy subsidy reforms in Ghana, Indonesia, Mexico, Nigeria, the Philippines, Uganda, and Yemen (Coady et al., 2018: 14).
- **Implement targeted measures to protect lower-income groups:** Design **reconciliation options, and develop comprehensive, integrated policy packages** combining pricing and non-pricing instruments, and **ensuring progressivity of all carbon taxes** in their design (De Gouvello et al., 2020: 196; ActionAid, 2020: 5). The protection of lower-income households from the adverse impact of energy price increases is often seen as being essential to making a reform strategy politically acceptable (Sterner 2012 cited in Coady et al., 2018: 15).
- **Analysis and assessment of country-specific situation and different instrument design impacts:** Knowledge and careful consideration of the specific sector policies, government objectives and national (economic and social) circumstances are prerequisites for designing an appropriate policy package – particularly one that reconciles potential pressure points between energy policies and carbon pricing (De Gouvello et al., 2020: 196). Thorough analysis of the size and characteristics of the tax base prior to the tax implementation, to ensure the achievement of the desired effects (ActionAid, 2020: 5). In-depth impact assessments of proposed taxes must be carried out in order to identify potential (direct and indirect) impacts and trade-offs, especially on economic and gender inequalities (ActionAid, 2020: 5).
- **Enabling environment:** Carbon pricing is easier to implement if an **enabling environment and an appropriate regulatory framework exist** (High-Level Commission on Carbon Prices, 2017: 13).
- **Develop a comprehensive reform plan: Need to analyse interactions between carbon pricing and energy policy instruments**, which can lead to both synergies and conflicts (De Gouvello et al., 2020: 196). A comprehensive reform plan which embeds carbon/energy price reform within this is necessary: to help overcome barriers around the (often) lack of public confidence that the resulting fiscal gains will be used for the benefit of the broader population. This was seen as being an important factor in the unsuccessful fuel subsidy reforms in Indonesia (in the late 1990s and early 2000s) and Nigeria (in 2011) (Coady et al., 2018: 13).
- **Undertake a gradual and sequenced reform/introduction of taxes:** This is desirable when large price increases are needed as the public often reacts negatively to this, as in Indonesia in the late 1990s, Mauritania in 2008, and Nigeria in 2012 (Coady et al., 2018:

13). A gradual introduction will also help to increase juridical certainty in the tax system and gain political support (ActionAid, 2020: 5).

- **Ensure the carbon tax policy has a positive environmental effect** for the country, and does not function solely as a revenue raiser (ActionAid, 2020: 5).

Practical considerations in design

Carbon tax design

Key aspects for policymakers to consider for the basic design of a carbon tax as summarised by the Committee of Experts on International Cooperation in Tax Matters (2019: 9) include:[4]

- Consider **possible taxing power boundaries:** national or subnational tax? Cooperation essential among different national ministries.
- **Scope of the tax:** the decision of whether to measure and tax direct emissions or use a method of taxing fuels using average carbon content of fuels for tax rate calculation.
- **When is the tax to be paid:** at which point in the distributional chain, or point of regulation, of fuels or occurrence of emissions are legal entities to be made responsible for paying the tax?
- **Taxpayer:** connected to the point of regulation is the matter of which legal entity who will be responsible for paying the tax to the authorities.
- **Sectors, activities and kind of fuels to be covered by the tax:** the discussion of different approaches and their consequences.

Revenue use

Although country-specific circumstances will determine appropriate use of carbon revenues, country experiences from the World Bank's PMR can provide general insights for policymakers when assessing options for revenue use (World Bank, 2019: 49):

- **Using revenues for tax reform can improve efficiency, equity, and economic growth**, particularly in developing economies with large informal sectors. This option also requires limited administrative capacity. However, it may not adequately compensate those worst affected by the carbon price.
- Using revenues to **introduce policies that support climate mitigation** will help governments achieve climate targets including by lowering the cost of doing so, and have been shown to be popular with the public.
- Countries can also **channel spending toward development objectives such as health, human capital, and infrastructure**, which can help boost employment and growth.

[4] These points are taken from a draft of the revised Chapter 3 (Design of the Carbon Tax) of the proposed United Nations Handbook on Carbon Taxation prepared by the Subcommittee on Environmental Taxation, which is included in a Discussion Note of the Committee of Experts on International Cooperation in Tax Matters. The points in the list are further elaborated in the draft Chapter (Committee of Experts on International Cooperation in Tax Matters, 2019).

- Funds can be employed to **address competitiveness impacts and prevent carbon leakage**, often through forgoing revenue. While this option may address the negative impact on competitiveness, governments will need to ensure that these measures are temporary and do not undermine climate objectives.
- **Compensating individuals, households, and businesses through direct transfers can also reduce the negative impacts of carbon pricing** and has garnered public support.
- **Debt reduction is another option that can free up greater funds for future investment**, although it will not address a government's near-term objectives.

Future research areas

Coady et al. (2018: 18) conclude their discussion of energy price reform by highlighting a number of future research priorities:

- Develop refined (country level) estimates of the emissions price trajectories to meet Paris mitigation pledges and the other externalities to be reflected in fuel taxes (or more finely tuned pricing instruments), as well as estimates of the impacts of price reform on the energy system, emissions, fiscal balances, vulnerable groups, and the broader economy.
- Conduct quantitative assessments of the trade-offs between alternative policy options to help policymakers communicate the case for pricing measures.
- Conduct assessments of other components of the reform strategy, such as cuts in other taxes enabled by the new revenues and the form, and amount of, measures to provide relief to households, workers, and firms that are especially vulnerable to higher energy prices.
- Conduct further analysis of experience with existing reforms in different countries to help address the political challenges.

4. Case Studies

Quite a few countries employ carbon pricing mechanisms. Amongst them are many European countries, some provinces in Canada, and Japan. The following are country case studies where carbon taxes or ETSs have been implemented to mitigate climate change (i.e. lower greenhouse gas emissions). In most cases where an energy tax or carbon tax is implemented, the tax is implemented in combination with various forms of exemptions (ActionAid, 2020). It is difficult to assess how progressive carbon taxes are as most of those in developing/emerging economies (and elsewhere) have been in operation for less than ten years. Despite this, "success" stories have been touted in many of the Latin American country examples (e.g. Colombia). It is also not clear from these examples what is driving the use of carbon pricing across these countries; influences may run from international protocols, a desire to pursue environmental goals and achieve climate change commitments, to impetus to raise revenue.

ETSs in lower- and middle-income countries

The recent ICAP *Emissions Trading Worldwide: Status Report 2020* provides an update of the development of current ETSs over the course of the last year. They summarise updates of systems currently in force (i.e. those already operating) and those under development (i.e. jurisdictions in which a mandate for an ETS is in place, and where system rules are currently

being drafted), as well as other jurisdictions with major developments in 2019. Some of the developing countries (or emerging economies) summarised include (ICAP, 2020):

- **China:** China's approach to decarbonisation spans various levels of government: policies such as the national ETS and low-carbon development pilot programmes target CO_2 emissions nationally, and are coupled with regional carbon-intensity and energy-intensity targets enshrined in five-year plans (ICAP, 2020: 7). China continues to prepare for the full launch of its national ETS. In March 2019, the (newly established) Ministry of Ecology and Environment released draft interim regulations on the management of emissions trading, as well as a trial plan for allocating emissions allowances – two important steps towards adopting ETS implementing regulations. Simulation trading is expected to start in 2020 (ICAP, 2020: 9). The development of the ETS regulation is part of a first phase of the two-phased roadmap consisting of infrastructure development and simulated trading (World Bank Group, 2019: 35). **The long process to develop the national ETS reflects the challenges around designing a sound ETS with substantial differences in knowledge and capacity between the subnational regions and companies**. The consolidation of environmental responsibilities in one ministry could help the alignment of different environmental strategies and policies including the national ETS (World Bank Group, 2019: 35).
    - **Chinese Pilots:** Continue to operate with increasing levels of trading activity while preparations for the rollout of the China national ETS continue (ICAP, 2020).
- **Colombia:** Work on the design of a national ETS continues. Its 2018 Climate Change Law outlines provisions for the establishment of a 'National Program of Greenhouse Gas Tradable Emission Quotas' (Programa Nacional de Cupos Transables de Emisión de Gases de Efecto Invernadero [PNCTE]).The PNCTE will complement other mitigation instruments, such as the country's existing USD 5 carbon tax and its offsetting programme, both of which have been in place since 2017 (ICAP, 2020: 96). To avoid double taxation, the climate bill allows payments under the existing carbon tax to be recognised as an approach for emitters to meet their compliance obligations under a potential future ETS (World Bank Group, 2019: 37).
- **Mexico:** The Mexican ETS pilot started operating on 1 January 2020. The programme covers direct CO_2 emissions from energy and industry, representing 37% of national emissions. The full ETS is scheduled to be operational in 2023, with the pilot phase (2020-2021) and the transition phase (2022) constituting the system's test programme (ICAP, 2020: 9).
- **Republic of Korea:** East Asia's first national ETS. Held its first regular auction of allowances in 2019. Korea also released the first round of expected reforms for Phase Three from 2021–2025 to ratchet up ambition. Reforms include i) a yet-to-be-determined stricter emissions cap, ii) an increasing share of auctioning for non-EITE sectors, and iii) increased use of sector-specific benchmarking (ICAP, 2020: 9).
- **Philippines:** Currently discussing a bill that would establish a cap-and-trade system for the industrial and commercial sectors (ICAP, 2020: 9).
- **Taiwan (China):** Work on the design of an ETS continues. Climate Change Action Guideline calls for ETS implementation. 2018 proposal to establish ETS but no precise timeline given. Mandatory GHG reporting and offsets programme in place (ICAP, 2020: 142).

Other developing countries that are considering adopting ETSs but have not had significant developments over the last year include:

- **Brazil:** Considering the design of an ETS. RenovaBio (the National Policy for Biofuels) provides for trading in emission reductions. Voluntary ETS simulation for some companies (ICAP, 2020: 97).
- **Chile:** In the tax reform of 2014, a green tax for some fixed sources was introduced. In this context, stationary emission sources over 50MW of installed thermal capacity (MWt) are subject to a carbon tax (set at USD 5 per tCO_2) as well as to a tax on local pollutants (SO_2, NOx, and particulate matter). In 2019, reformed carbon tax to amend the threshold and allow offsets. Considering a market mechanism to trade certified emission reductions (ICAP, 2020: 98).
- **Indonesia:** Monitoring, Results and Verification (MRV) pilot system in operation for industry and power sectors. Regulations for a pilot ETS in drafting phase. Legal basis for national ETS by 2024 (ICAP, 2020: 143).
- **Pakistan:** Launched a national committee in 2019 tasked with assessing the opportunities for an ETS (ICAP, 2020: 145).
- **Thailand:** The '12th National Economic and Social Development Plan (2017-2021)' includes development of a domestic ETS. Currently operating voluntary ETS to test registry and trading platform. Also developing legal framework and roadmap for ETS (ICAP, 2020: 146).
- **Vietnam:** Its 'Green Growth Strategy' (2012) pursues the objective of a low-carbon economy and citing the use of market-based instruments as an avenue to achieve the strategy. Exploring potential for market-based instruments for the steel and waste sectors post 2020 (ICAP, 2020: 147).

Carbon taxes in lower- and middle-income countries

Argentina

The government of Argentina implemented a carbon tax on 1 January 2018 for most liquid fuels, replacing previous fuel taxes. The revenue is designated to multiple beneficiaries, including the National Housing Fund, the Transport Infrastructure Trust, and the social security system, among others (World Bank Group, 2019: 29). For fuel oil, mineral coal, and petroleum coke, the tax rate became operational from the beginning of 2019, at 10 percent of the full tax rate, and will increase annually by 10 percentage points to reach 100 percent in 2028. 100 percent of this revenue is distributed according to the Federal Revenue Distribution System. The carbon tax was estimated to cover about 20 percent of the country's GHG emissions and raise approximately ARS8.5 billion (US$300 million) in revenue in 2018. Tax exemptions apply to international aviation and shipping, export of covered fuels, the biofuel content of liquid fuels and the use of fossil fuels as raw materials in chemical processes (World Bank Group, 2019: 29).

Chile

Chile decided to use a downstream taxation mechanism so as to enhance the coherence between its mitigation policies for both global and local pollution (Committee of Experts on International Cooperation in Tax Matters, 2019: 35). The Chilean carbon tax can be viewed as a

Direct Emissions Approach carbon tax. Chile introduced a green tax reform in 2017, which included the introduction of two new green taxes, namely a carbon tax and a local pollution tax. Both taxes target emissions from facilities with stationary sources comprised of boilers or turbines, which individually or together have a thermal power of at least 50 MW. Even with this fairly high threshold, over 40 per cent of the national carbon dioxide emissions are covered by the carbon tax (Committee of Experts on International Cooperation in Tax Matters, 2019: 30). The Chilean carbon tax exempts stationary sources which use renewable, non-conventional means in which the primary energy source is biomass.

Costa Rica

Costa Rica has had a carbon tax since 1997. The Costa Rican tax base is fossil hydrocarbons (so the Fuel Approach). However, the carbon tax rate is not related to the fossil carbon content of the hydrocarbons nor based on the measurement of emissions, but rather by a percentage (currently 3.5) of the market price of the hydrocarbons (Committee of Experts on International Cooperation in Tax Matters, 2019: 24).

Mauritius

ActionAid (2020: 4) highlights Mauritius as an example of an unsuccessful environmental tax regime. Mauritius' introduction of the *Maurice Ile Durable* (MID) levy, a tax at the extraction point on fossil fuels, in combination with several other excise taxes, led to a negative environmental impact in the country. One of the primary objectives of environmentally-related taxation in Mauritius was revenue raising. For this reason, the tax rates employed on diesel, gasoline and coal were not commensurate with their carbon generation potential. As a result, whereas coal was only burdened by the MID, diesel and gasoline were subject to both the MID levy and excise duties, resulting in a move away from gasoline and diesel use to coal, a more carbon-intensive product. The overall outcome was a general increase in coal use in the country, leading to greater release of carbon emissions.

Senegal

According to the World Bank Group (2019: 41) "Senegal is exploring carbon pricing as part of the policy options to reach the objectives of its [Nationally Determined Contribution (NDC) to the Paris Agreement]. In 2018, the government organized consultations with stakeholders in the public and private sector to assess initial design options for the carbon pricing policy applicable to its economy. In 2018, a study on the opportunity to introduce carbon pricing at the domestic level was carried out. The government identified the need for additional analyses to explore the main elements to design a potential carbon tax in detail."

Singapore

According to the World Bank Group (2019: 41) on 1 January 2019, Singapore implemented its carbon tax. Singapore will review the carbon tax rate (of S$5/tCO2e (US$4/tCO2e)) by 2023, with plans to increase the rate to S$10–$15/tCO2e (US$8/tCO2e to US$11/tCO2e) by 2030. The carbon tax applies to all facilities with annual GHG emissions over 25 ktCO2e and is expected to raise revenue of nearly S$1 billion (US$760 million) in the first five years, which will help support initiatives to address climate change such as incentives for energy efficiency improvements in the industrial sector.

South Africa

South Africa's carbon tax came into force on 1 June 2019, it focuses on emissions from certain processes in the industrial, power, building and transport sectors. The South African carbon tax targets CO_2e emissions above a certain level from fuel combustion, electricity generation and industrial processes as well as estimated fugitive (irregular or unintended) emissions. Eighty percent of South African greenhouse gas emissions are covered. However, for many sectors, tax exemptions ranging between 60% and 95% apply, to protect national industry against international trade exposure, or allow the offset of emissions deriving from mitigation projects. The government also provides some exemptions from the carbon tax to mitigate the burden on households and individuals (ActionAid, 2020: 3). While in principle using a Direct Emissions Approach, the emissions taxed are calculated based on emissions factors pre-determined according to a methodology approved by the relevant authority. The tax law also lays downs standard values in case such a methodology does not exist for a specific activity (Committee of Experts on International Cooperation in Tax Matters, 2019: 31).

According to the World Bank Group (2019: 43) "This accomplishment was proceeded by a lengthy process that saw the implementation of the carbon tax delayed three times since its implementation was first proposed in 2013. Multiple rounds of consultations and discussions were needed to reach this stage due to its unpopularity with businesses and heavy reliance of the South African economy on coal. Since then, wind and solar power have increased in competitiveness and utilities have undergone restructuring. In addition, several changes were made compared to the initial bill following stakeholder input, including scaling down the growth of the carbon tax rate increase. The South Africa carbon tax is one of its key instruments to meet its NDC pledge." Due to its newness, it is not yet clear whether the South African experience is in fact efficient, effective, and fair, however it has inspired other African countries to assess the feasibility of introducing carbon taxes (ActionAid, 2020: 3).

Vietnam

Vietnam is analysing options for carbon pricing approaches applicable to the county and developing pilot crediting programmes for the steel and waste sectors, which could start after 2020 (World Bank Group, 2019: 45).

Vietnam's Environmental Protection Tax Law introduced a broad-based package of environmental taxes in 2012, covering a wide range of pollutants, and is considered to have led to positive behavioural change and reduced pollution and emissions (ActionAid, 2020: 4; Cottrell & Falcão, 2018: 14).

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Key websites

- International Carbon Action Partnership (ICAP): https://icapcarbonaction.com/en/
- World Bank – Carbon Pricing Dashboard: https://carbonpricingdashboard.worldbank.org/
- World Bank – Partnership for Market Readiness: https://www.thepmr.org/

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About this report

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