pmr | PARTNERSHIP FOR MARKET READINESS

TECHNICAL NOTE 16 | AUGUST 2019

Using Carbon Revenues

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT

WORLD BANK GROUP

TECHNICAL NOTE 16 | AUGUST 2019

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Acknowledgements

The Using Carbon Revenues report was prepared for the Partnership for Market Readiness (PMR) and the French Development Agency (AFD) by the Institute for Climate Economics (I4CE), whose team consisted of Sébastien Postic, Clément Métivier, Clément Bultheel and Emilie Alberola. The report was also supported by a team from Vivid Economics, including Stuart Evans, Rosetta Dollman and Josh Cowley. The World Bank Group team was led by Celine Ramstein and Daniel Besley and included Goran Dominioni who provided substantive input and support for the preparation of this report and its case studies. The AFD team was led by Oskar Lecuyer.

In addition, many experts shared their practical insights and knowledge on carbon revenues and we are very grateful for their time and contribution. These include Susanne Akerfeldt (Sweden), Juan Carlos Belausteguigoitia (Mexico), Alex Bowen (Grantham Research Institute), Mireille Chiroleu-Assouline (Paris School of Economics), Rachel Boti-Douayoua (Cote d'Ivoire), Matthew Botill (California), Neelam Chawla (Alberta), Joseph Curtin (Institute of International and European Affairs), Katie Eberle (Australia), Victor Escalona (Mexico), Dida Gardera (Indonesia), Anirban Ghosh (Mahindra), Jonathan Healy (Ireland), Sharlin Hemraj (South Africa), Kataria Hitesh (Mahindra), Ingrid Hoff (Norway), Michael Jakob (Mercator Research Institute on Global Commons and Climate Change), Anaïs Jalbert (Quebec), Emilio Lèbre La Rovere (Federal University of Rio de Janeiro), Marina Mattar (Abiquim), Axel Michaelowa (Perspectives GmbH), Carlos Muñoz (Mexico), Gareth Phillips (African Development Bank), Rodrigo Pizarro (Chile), Richard Purnell (British Columbia), Jan Raczka (Poland), Chantal Rainville (Quebec), Fernanda Rocha (Argentina), German Romero (Colombia), Javier Sabogal (Colombia), Ridhima Sud (India), Julien Viau (France), Augustin Vicard (France), Ruben Vermeeren (European Union), Nicolás Westenenk (Chile), Daniel Waluszewski (Sweden), Sophie Wenger (Switzerland) and Peter Wooders (International Institute for Sustainable Development).

Several colleagues from the World Bank Group also provided substantive input and feedback. These include Marcos Castro, Usayd Casewit, Sanaz Ettehad, Simon Fellermeyer, Harikumar Gadde, Errol Graham, Dirk Heine, Taisei Matsuki, Janet Minatelli, Alexandrina Platonova-Oquab, Rama Reddy, Marissa Santikarn and Manaf Touati.

Several colleagues from the French Development Agency also provided substantive input and feedback. These include Helene Ehrhart, Nicolas Meisel and Thomas Roulleau.

The report was edited by Anne Himmelfarb.

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Executive Summary

Carbon pricing is increasingly recognized as an important source of government revenue. If used wisely, carbon revenues can support further climate mitigation, industry competitiveness, and pursuit of further economic and development objectives. This report lays out a framework that can assist governments in using carbon revenues to pursue these objectives, drawing insights from a range of practical experiences.

Carbon revenues have grown in recent years. As of April 2019, there were 57 carbon prices either in place or scheduled for implementation. These initiatives cover around 11 gigatons of carbon dioxide equivalent ($GtCO_2e$), representing around 20 percent of global emissions per year, an increase from 13 percent of global emissions in 2016. As a result, the estimated revenues generated from carbon pricing have increased from US$ 22 billion in 2016 to US$ 44 billion in 2018 (World Bank 2019a).

Carbon revenues are expected to increase further in 2019 and the years following, and this growth has the potential to unlock fiscal opportunities, particularly in developing countries. These opportunities stem from both the possible expansion to new jurisdictions and increases in price. Most carbon prices are currently well below the US$ 40–80/tCO_2e 2020 level recommended by the Carbon Pricing Leadership Coalition's High-Level Commission on Carbon Prices (CPLC 2017). A recent International Monetary Fund (IMF) policy paper suggests that a US$ 70/tCO_2 carbon price would raise revenues equivalent to around 1–3 percent of gross domestic product (GDP) by 2030 in most countries considered (IMF 2019), and around 2–4 percent of GDP in major developing countries, including China, India, and South Africa.

Carbon pricing operates as part of a broader fiscal landscape that requires consideration of complex relationships and trade-offs. Government objectives in the fiscal context often include consideration of efficiency, equity, and long-run growth. Policy makers face trade-offs between objectives when choosing how to spend tax revenue. The circumstances are no different when exploring the different options for carbon revenue use. In addition, when balancing these trade-offs, policy makers must account for public opinion, as a lack of public acceptance for a policy can undermine its effectiveness and threaten its existence over time.

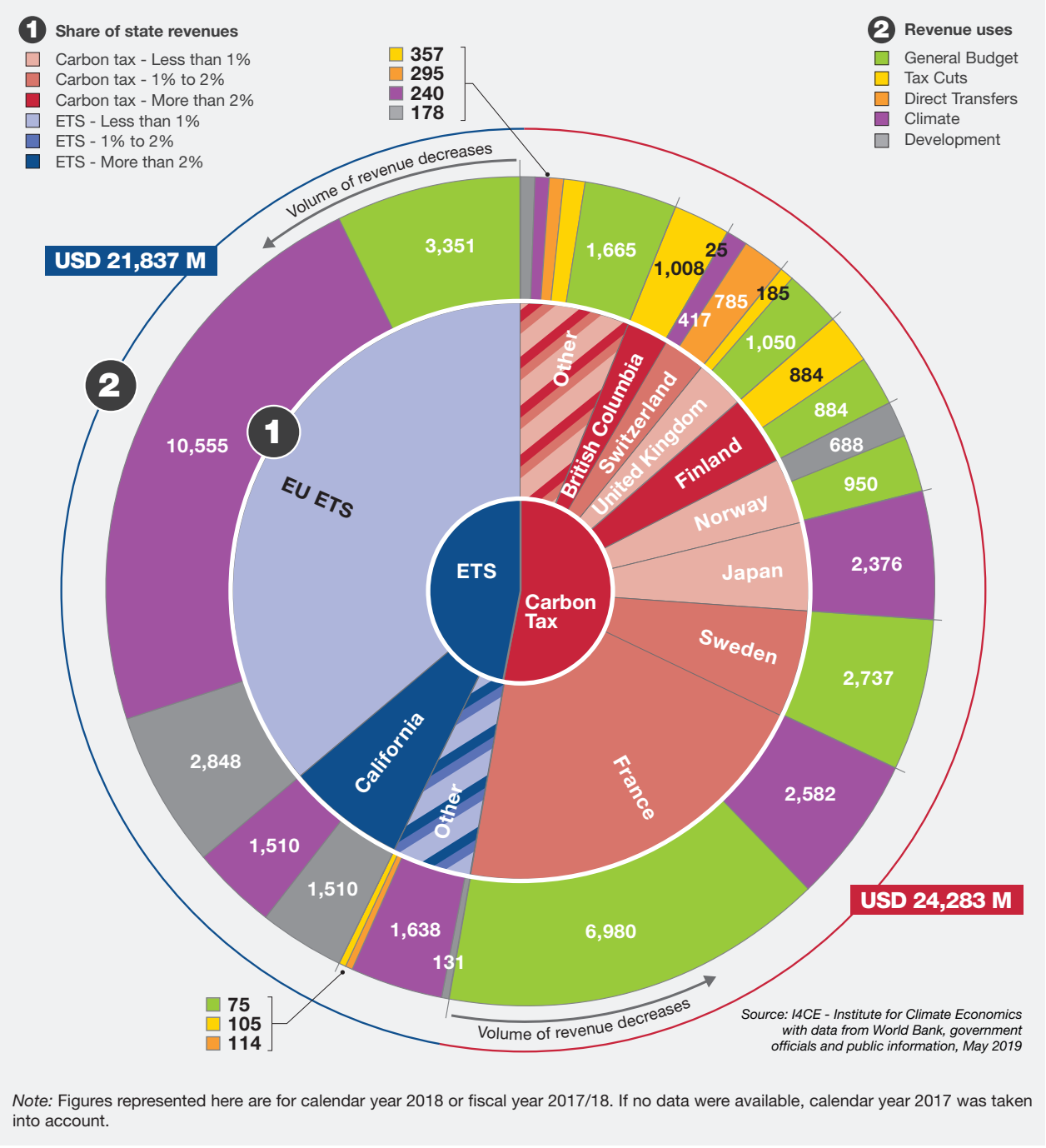
Many forms of revenue use will require only limited new governance arrangements as they take advantage of existing structures for revenue allocation. Many countries have existing tax and social security systems for example that can be used for revenue allocation, reducing the need for additional structures. In cases where revenue allocation structures are not in place—and there are many participants involved—there may be a case for a new cross-ministerial committee or an independent board to govern new programs. In addition, governments may need to prepare for practical challenges that can be associated with carbon revenue use, such as the potential for revenue volatility. Further, they should develop structures to ensure accountability, including processes for stakeholder engagement and for monitoring, reporting, and evaluation procedures.

Carbon revenues can either be allocated to general government revenue or be tied to specific purposes, through legal earmarking or hypothecation. Tying carbon revenues to a particular use provides greater visibility of the link between carbon pricing and public services, and greater certainty around funding. Nevertheless, there are benefits to directing revenues into the general fiscal pool, as this allows greater flexibility to alter revenue uses as circumstances and priorities change. Regardless of whether revenues are tied to a specific purpose, it is ultimately the specific use of revenues that is most important for outcomes.

Data for revenue uses are often incomplete, and categories can be inconsistent. Nonetheless, in 2017/18, we estimate that the majority of global revenues (excluding foregone revenues) have been allocated to

environmental projects (42 percent). Other revenue allocations include assigning revenues to the general budget (38 percent), development-related topics (12 percent), cuts to other taxes (6 percent), and direct transfers for households and businesses (3 percent). See **figure 1** for more details. This report assesses the use of carbon revenues to prevent carbon leakage and reduce national debt. The use of free allowances under emissions trading systems (ETS) or carbon tax exemptions is a common form of compensation to address carbon leakage**.** These allocations represent revenue forgone and therefore do not enter the calculations in **figure 1**. We also consider debt reduction as an option for revenue use; however, due to data limitations this is included in "general budget" in **figure 1**.

FIGURE 1. Carbon revenues by revenue use and jurisdiction, 2017/18



Note: Figures represented here are for calendar year 2018 or fiscal year 2017/18. If no data were available, calendar year 2017 was taken into account.

Source: I4CE (2019)

Jurisdictions' experience to date shows the wide range of spending options for carbon revenue. Our report focuses on six main options:

1. **Tax reform**, to target higher economic growth alongside lower pollution;

2. **Climate mitigation**, by encouraging investment in low-carbon technologies;

3. **Pursuit of other development objectives**, such as in education and health;

4. **Prevention of carbon leakage**, to achieve carbon pricing's environmental and economic objectives;

5. **Assistance for individuals, households, or businesses affected by carbon costs**, through transfers or programs;

6. **Debt reduction**, to lessen the debt burden on future generations.

Carbon revenues can finance tax reforms to support increased economic growth.

- When optimizing tax policy, there is a positive trade-off that can be made by replacing distortionary taxes, such as those placed on labor and business income, with externality-correcting taxes, such as those on greenhouse gas (GHG) emissions. By replacing distortionary taxes, carbon pricing can yield a "double dividend," simultaneously addressing negative environmental impacts while improving economic growth. Tax reform in the form of carbon pricing offers greater benefits in the presence of a large informal sector. This is because unlike conventional taxes (such as those on labor or profits), fuel taxes (such as those based on GHG content) apply in the informal sector, and a decrease in the gap between the taxes in the formal and informal sector incentivizes economic agents to join the formal economy (CPLC 2017). However, there are several challenges associated with employing tax revenues for tax reform. For example, tax cuts can be less visible to the public than funding for climate mitigation projects, and they tend to be less targeted than direct transfers. Therefore, tax reform may not (or may not be perceived to) adequately compensate those most impacted by carbon pricing.

Carbon revenues can finance additional policies or programs aimed at reducing emissions.

- There are different reasons why a government may want to fund these policies. Emissions may remain above target levels due to the presence of market failures distorting the price signal. In addition, policy makers may seek to reduce emissions in sectors not covered by the carbon price. In such cases, carbon revenues may be used for these purposes so as to further pursue the objective of emissions reductions, for instance through supporting the transition to renewable energy or the planting of carbon forests. Despite the advantages offered by these projects, ensuring the best use of funds for them can prove complex and may be associated with high administrative costs if existing programs are not in place.

Carbon revenues provide an important source of funds for developing countries seeking to finance development objectives.

- Developing economies face challenges in generating a sufficient tax base due to large informal sectors. Carbon pricing can offer a relatively efficient alternative for raising revenue, as it tends to be levied on relatively few large entities, can often be incorporated into existing processes, and is less easily evaded than other taxation. These additional revenues can provide a useful source of funds for spending on areas such as health, education, or infrastructure projects and therefore assist in the pursuit of the United Nations'

Sustainable Development Goals. Such spending can increase support for carbon pricing where funds are spent on issues of high public concern.

Carbon revenues can be used to address the potentially negative impacts of carbon pricing on competitiveness for domestic industry, reducing the risk of carbon leakage.

- The impact on competitiveness can be mitigated under an ETS by forgoing potential revenue and providing free allowances to emissions-intensive, trade-exposed (EITE) sectors. Similarly, these impacts can be addressed under a carbon tax by providing tax discounts or exemptions to vulnerable sectors. These provisions could be effective in limiting the negative impact of a carbon price on businesses in the short term and could reduce the risk that emissions increase in uncovered jurisdictions. However, identifying the sectors that require compensation can be difficult. Careful design is required to ensure the measures target the sectors most affected and do not offset the environmental aims of carbon pricing.

Carbon revenues can be used to help individuals, households, or businesses deal with the impacts of carbon pricing through direct transfers or other policies and programs.

- Where energy costs make up a larger share of income in low-income households than in high-income households, a carbon price is likely to be regressive. In such cases, governments may choose to use carbon revenues to compensate the low-income households through direct transfers. Evidence suggests that only a small share of revenues is needed to do so. Alternatively, if there is little evidence for a disproportionate impact on low-income households or individuals, governments may opt to compensate individual taxpayers via equal per capita transfers or tax credits. Revenues can also be employed to assist workers in sectors or regions that are highly affected by a carbon price. For instance, in managing the impact of phasing out coal production, the German government has implemented a variety of supportive policies, including early retirement support, retraining programs, and support for economic development in affected areas. While compensating those adversely affected by the carbon price can be perceived as a fair policy, transfers and other assistance may not lead to the same efficiency gains as tax cuts.

Carbon revenues can pay down the existing stock of debt, if not used for tax reforms or increased spending.

- Public debt represents a deadweight burden on the economy, as interest payments reduce the amount of revenue available for investment into public capital or tax reductions. By reducing the stock of public debt, countries can free up resources in future periods and also mitigate the risks associated with financial shocks. Diverting carbon revenue funds toward debt reduction is uncommon, potentially due to the lack of visibility around positive outcomes in the short term, which may be more of a focus for governments.

- **In practice, countries do not need to choose only one option for revenue use but can implement a package of spending initiatives.** For instance, a country could aim to use revenue for a mix of climate mitigation projects, tax reform, free allocations to support industry competitiveness, and pursuit of other development objectives. Jurisdictions including the European Union, Switzerland, and British Columbia have all taken a package approach, with revenues supporting multiple objectives. The appropriate package of policies and programs will differ based on country-specific factors, and the mix of these uses may also evolve over time.

Table 1 provides policy makers with a summary of the benefits and limitations of each revenue use option to assist with decision making.

TABLE 1. Benefits and limitations of different revenue use options

Revenue use	Benefits	Limitations
Tax reform	– Can improve efficiency of the tax system and have a positive impact on economic growth	– Can be less visible than alternative options, and tax cuts require targeting to compensate those affected by carbon price
Climate mitigation	– Can increase effectiveness of carbon price by addressing market failure – Can further reduce emissions in uncovered sectors – Can lead to greater public acceptance of carbon pricing	– Can have high administrative costs relative to alternative revenue use options if existing allocation mechanisms are not in place
Pursuit of other development objectives	– Offers a cost-effective revenue source for funding development goals given barriers to accessing finance – Can drive public support if spent on issues of high public concern	– Can have high administrative costs relative to alternative uses of revenue if existing allocation structures are not in place
Prevention of carbon leakage	– Reduces the risk of emissions increases in uncovered jurisdictions – Mitigates the negative impact on affected businesses in the short term – Has the potential to increase stakeholder support	– Requires identifying sectors for compensation, which can be difficult – Requires careful design to reduce the risk of undermining climate objectives
Assistance for individuals, households, or businesses	– Can compensate affected individuals, households, or workers – Can have low administrative costs, if allocation structures already exist	– Depending on design, can be less visible than alternative options if delivered through existing transfer systems, and therefore may have less public support
Debt reduction	– Frees up capital and reduces the economic burden of interest payments	– Lacks visibility – Does not address short-term objectives

Abbreviations

ARB	Air Resource Board
CO_2	Carbon dioxide
EITE	Emissions-intensive, trade-exposed
ETS	Emissions trading system
EU	European Union
EU ETS	European Union Emissions Trading System
GDP	Gross domestic product
GGRF	Greenhouse Gas Reduction Fund
GHG	Greenhouse gas
$GtCO_2e$	Gigaton of carbon dioxide equivalent
IEA	International Energy Agency
IMF	International Monetary Fund
LPG	Liquid petroleum gas
OECD	Organisation for Economic Co-operation and Development
PAHAL	Pratyaksh Hanstantrit Labh (India)
PINE	Policy Instruments for the Environment
PMR	Partnership for Market Readiness
R&D	Research & development
RGGI	Regional Greenhouse Gas Initiative
SDG	Sustainable Development Goal

Glossary of economic terminology

Automatic stabilizers	Policies that act to stimulate the economy when aggregate demand falls and to reduce growth when times are good. For example, progressive labor taxes collect a greater share of income when incomes are high and a lower share of income when incomes are lower, leading to less fluctuation in the real spending power of consumers and therefore in economic activity.
Carbon leakage	The loss of carbon-intensive production from jurisdictions covered by carbon pricing to those not covered by carbon pricing or facing a lower carbon price.
Distortionary tax	A tax that changes the incentives faced by economic agents. For example, taxes on labor reduce the incentive to work relative to leisure.
Double dividend	An improvement to both environmental and economic outcomes, such as by replacing distortionary taxes with carbon pricing.
Economic cycle	Fluctuations in an economy between periods of high growth (booms) and economic slowdowns or contractions.
Elasticity of demand	The responsiveness of demand to changes in a product's price.
Externality	A cost or benefit associated with the production or consumption of a good that affects parties not engaged in the production or consumption process. For example, CO_2 emissions contribute to climate change, a global externality.
Hypothecation	Where revenue is linked to expenditure though communication rather than an enforcing legal structure such as legislation.
Informal sector	The area of the economy that is not taxed or regulated by the government. It is not included in official statistics and can lead to an increased tax burden on the formal economy.
Legal earmarking	Where revenues are linked to expenditure initiatives through an enforceable legal structure such as legislation or executive decision.
Non-distortionary tax	A tax that doesn't change the incentives faced by economic agents. For example, a lump-sum taxation or transfer does not change the relative costs of different spending options available to a consumer.
Progressive	Characterizing a policy that consumes a greater share of income from high-income households than from low-income households.
Regressive	Characterizing a policy that consumes a greater share of income from low-income households than from high-income households.
Revenue neutral	Characterizing a fiscal policy action that leaves the total tax burden unchanged, for example by replacing income taxes with a tax on sales such that total revenue is unchanged.
Revenue volatility	Fluctuations in the quantity of revenues collected across different periods.
Tax incidence	The division between buyers and sellers in paying a tax. For example, if fuel taxes lead to a 100 percent increase in the price charged for fuels, the tax falls completely on buyers.
Transfers	Any payments made by a government to consumers or businesses, often to address equity or distributional concerns.

Introduction

1.1. Purpose of report

This report to the use of carbon revenues has three main objectives:

- Build understanding of the potential for revenue generation from carbon pricing instruments and outline how carbon pricing can fit into the broader fiscal policy strategy.
- Provide insights from the use of revenues generated by carbon pricing around the world.
- Provide practical guidance on how to determine the best use of revenues by helping policy makers understand the implications, opportunities, and challenges associated with different approaches to carbon revenue use.

The report is aimed at stakeholders interested or involved in the policy development process for carbon pricing systems and the approaches to using the revenues they generate. It explains the options for using carbon revenues and seeks to inform dialogue with fiscal policy specialists at finance ministries or equivalent. This report will also be of use to expert audiences such as technical experts, academics, multilateral development institutions, private companies, and nongovernmental organizations.

The focus of this report is on carbon pricing systems that generate revenues for governments. These systems are primarily either carbon taxes or emissions trading systems (ETSs). Because fossil fuel subsidy reforms and energy tax reforms are similar in nature to carbon pricing systems and have similar impacts on government revenue, and because there is extensive experience with these reforms in developing countries, this report also draws lessons from them. While many countries have experience with crediting systems, such as the Clean Development Mechanism (CDM), these typically do not raise revenue for governments and so are outside the scope of this report.

1.2. Report structure

The report is structured as follows:

- Chapter 2 outlines recent developments in carbon pricing and revenues.
- Chapter 3 discusses fiscal policy and carbon pricing, as well as objectives for design.
- Chapter 4 outlines the potential options for revenue use, including their advantages and disadvantages.
- Chapter 5 concludes with a discussion of the elements involved in an effective carbon revenue strategy.

Each chapter features a short summary of the main issues and findings. The country case studies showcased in this report are based on desk reviews, interviews, and peer reviews by government policy makers for most of the jurisdictions featured in the report. Additional or extended case studies are available in the annex. A complete bibliography is provided at the end of the report.

Developments in carbon pricing and revenues

BOX 1. Key findings: Developments in carbon pricing and revenues

- The adoption of carbon pricing systems and associated revenues is growing worldwide. While revenues are currently modest, they are expected to grow as prices and coverage increase in order to meet climate targets.
- The expansion of carbon pricing in the coming decades presents an opportunity for substantial flows of carbon revenues to support investment in the developing world.

Carbon pricing is a key tool available to policy makers to address climate change, as it allows jurisdictions to place a direct price on greenhouse gas (GHG) emissions. Carbon pricing encompasses a variety of approaches, with jurisdictions generally adopting either a carbon tax, which places a specified price on emissions, or an emissions trading system, which establishes a market to determine the price of emissions.

Carbon pricing is widely acknowledged as an efficient and cost-effective way of reducing emissions (CPLC 2017). By shifting the burden of emissions to those responsible, carbon pricing provides incentives to reduce emissions, typically through investment and innovation in low-carbon technologies and abatement options where cost-effective.

Well-developed carbon pricing systems have the potential to provide significant revenues. Carbon taxes generate revenue based on the size of the tax base and the price set by policy makers, while ETS revenues are raised through auctioning of emissions allowances. A recent International Monetary Fund (IMF) policy paper suggests that a carbon price of $\$70/tCO_2$ could generate revenues of 1–3 percent of gross domestic product (GDP) for most countries considered, and around 2–4 percent of GDP in major developing countries, including China, India, and South Africa (IMF 2019).

This chapter outlines the different types of carbon pricing instruments that have been adopted and the revenues they have been generated, and also considers the scale and characteristics of these revenues in the broader fiscal context.

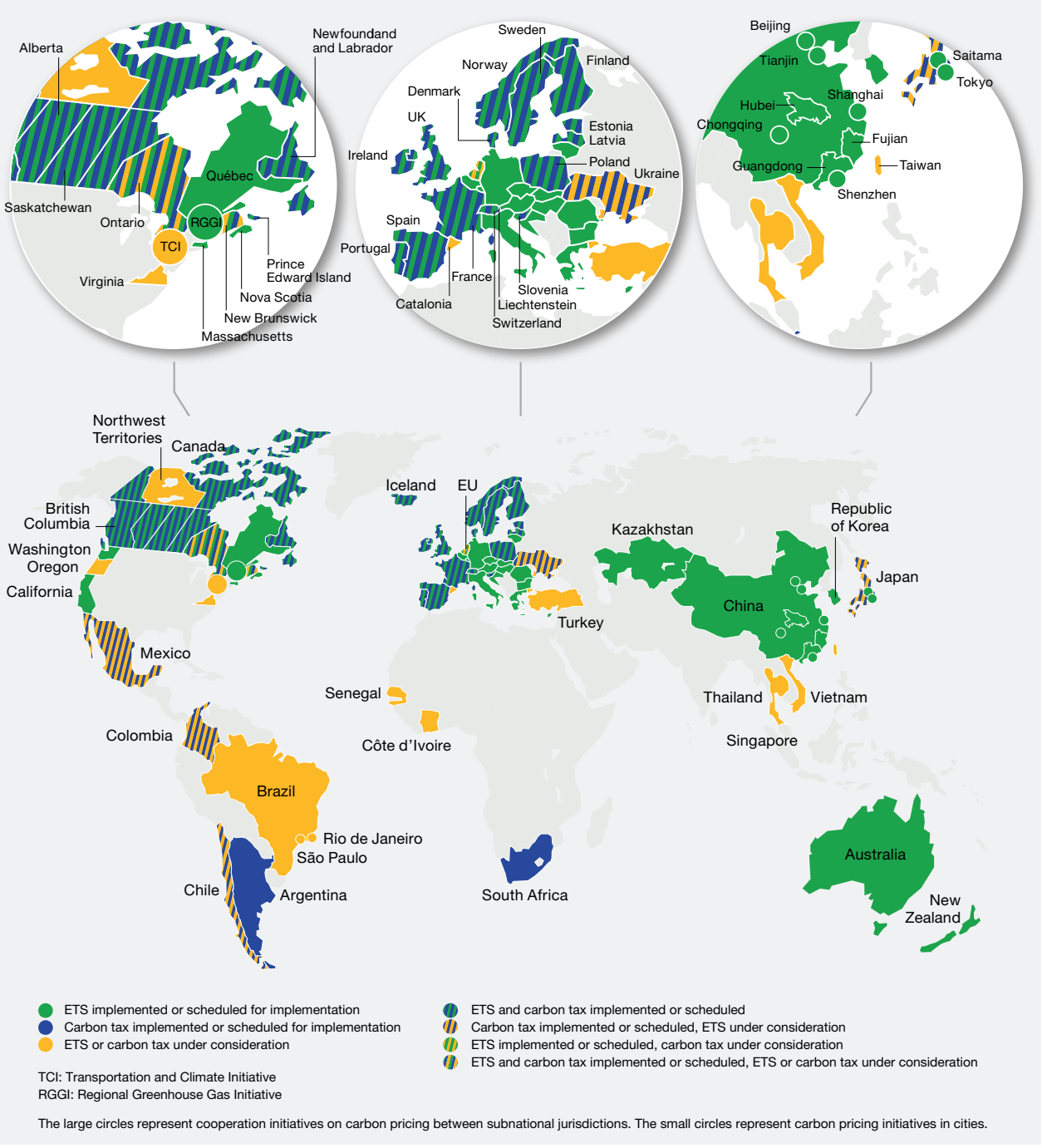
1.3. Overview of carbon pricing and revenues

To date, 57 carbon pricing initiatives have been implemented or scheduled for implementation (World Bank 2019a). Currently, 46 national and 28 subnational jurisdictions place a price on carbon emissions through a combination of ETSs and taxes, as shown in **figure 2**.

Implemented and scheduled initiatives cover 11 gigatons (11 billion tons) of carbon dioxide equivalent ($GtCO_2e$), representing 20 percent of yearly global emissions, up from 13 percent in 2016. This primarily reflects the expected coverage of the China national ETS. In addition, 2019 saw the introduction of carbon taxes in Argentina, South Africa, and Singapore.

The recent expansion of carbon pricing instruments into the developing world represents a maturation of the policies and the expanding importance of carbon pricing as a fiscal tool.

FIGURE 2. Global expansion of carbon pricing systems

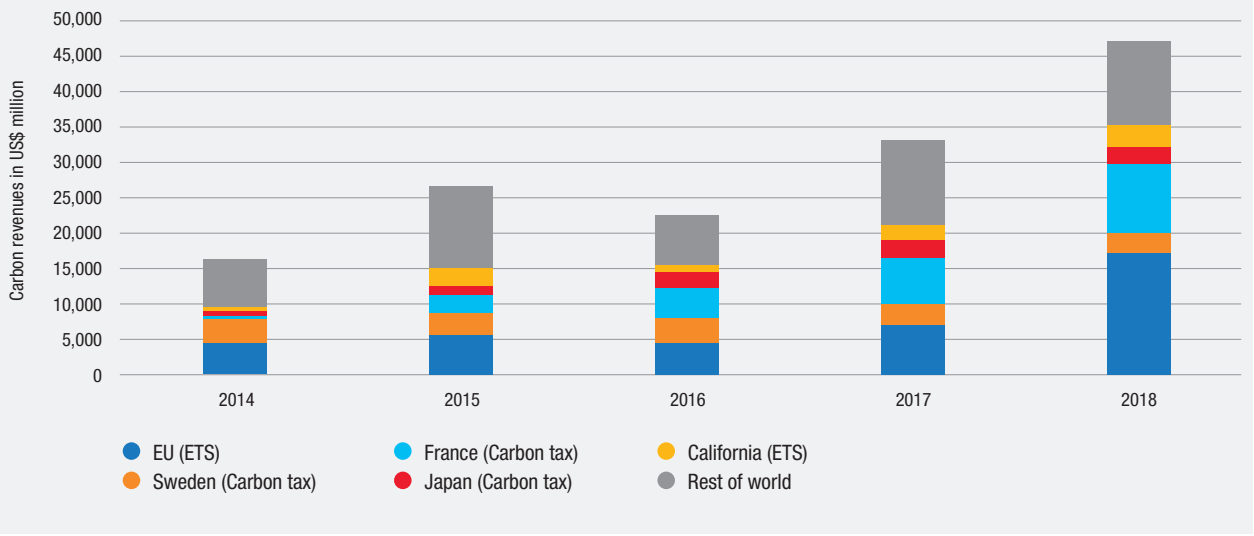


Source: World Bank 2019a.

Carbon price levels vary substantially, from less than US$ 1/tCO$_2$e to a maximum of US$ 127/tCO$_2$e. At present less than 5 percent of covered emissions are priced in accordance with the US$ 40–80/tCO$_2$ range recommended by the High-Level Commission on Carbon Prices as consistent with the Paris Agreement's goal to limit global warming to well below 2°C by 2020 (CPLC 2017). However, progress has been made in recent years, with half of emissions covered by carbon prices greater than US$ 10/tCO$_2$ in 2019, compared with around a quarter in 2017. This trend is likely to continue, as carbon prices are often launched at low levels, with the intention of scaling up over time.

As prices have increased, revenues from carbon pricing reached US$ 44 billion in 2018, a 30 percent increase from the US$ 33 billion raised in 2017 (figure 3). Revenues from existing initiatives increased, with the European Union Emissions Trading System (EU ETS) contributing most of the increase in revenues following an increase in the EU allowance price. There were also increases in revenue for the California ETS due to a larger share of allowances bought at auctions. The EU ETS remains the largest source of carbon pricing revenues due to its size, followed by the carbon tax in France, the California ETS, and carbon taxes in Sweden and Japan. Although smaller in absolute size, carbon prices often form an important part of other jurisdictions' revenue mixes.

FIGURE 3. Global carbon revenues, 2014–2018



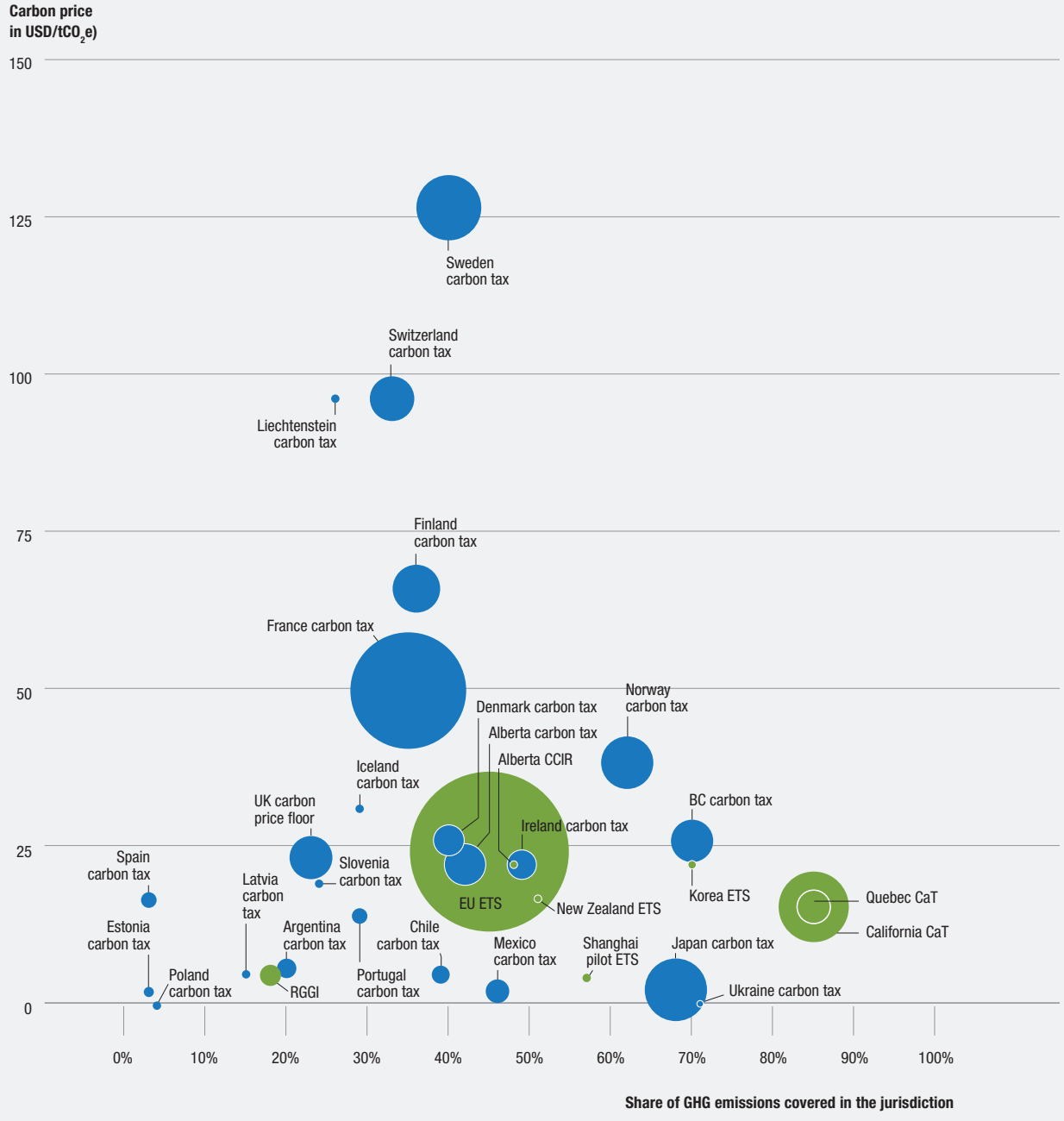
Sources: I4CE 2018; World Bank 2019a.

1.3.1. Determinants of carbon revenues

Carbon revenues are directly determined by the level of the carbon price and its sector coverage. Figure 4 from **State and Trends of Carbon Pricing (World Bank 2019a)** shows carbon revenues raised in 2018 by the carbon price level and the share of GHG emissions covered as of April 2019 for those carbon pricing systems that generated revenues in 2018. While the EU ETS already collects the largest carbon revenues due to the size of the covered market, its revenues could still grow substantially if prices were to increase to levels seen in Sweden's or even France's carbon tax, or if coverage increased to levels consistent with California or Quebec.

Carbon price variations can have a large impact on the size of revenues raised year to year. Variations tend to be greater under an ETS than under a carbon tax, where rates are set explicitly. ETS prices react to changes in market demand, which is driven by complex interactions between economic and firm-level factors. As a result, exogenous shocks tend to have a greater impact on ETS revenues compared to carbon taxes. For example, in the case of the EU ETS, prices fell from over € 20/tCO_2 in 2008 to under € 5/tCO_2 by 2013 as demand remained low following the European recession. Managing these price fluctuations can increase the effectiveness of carbon pricing systems while also increasing the stability of revenues (PMR and ICAP 2016).

FIGURE 4. Carbon revenues are primarily determined by carbon price level and coverage



Note: BC = British Columbia; CCIR = Carbon Competitiveness Incentive Regulation; RGGI = Regional Greenhouse Gas Initiative. The size of the circles is proportional to the amount of government revenues except for initiatives with government revenues below US$ 100 million in 2018; the circles of these initiatives have an equal size. For illustrative purposes only, the nominal prices on April 1, 2019, and the coverages in 2019 are shown. The carbon tax rate applied in Argentina, Finland, Mexico, and Norway varies with the fossil fuel type and use. The carbon tax rate applied in Denmark varies with the GHG type. The graph shows the average carbon tax rate weighted by the amount of emissions covered at the different tax rates in those jurisdictions. The middle point of each circle corresponds to the price and coverage of that initiative.

Source: World Bank 2019a.

In many jurisdictions there have been reforms to make carbon prices operate more effectively. Increasingly, jurisdictions are adopting market stability measures to provide greater predictability in ETS carbon prices and revenues, and to increase overall price levels. These measures include the EU Market Stability Reserve (MSR), and the auction reserve prices used in California and Quebec. Such measures have helped prices

increase recently. The EU allowance price has increased more than four times, from €6/tCO_2 (US$8) at the end of 2017 to over €21/tCO_2 (US$25) in December 2018. Similarly, in New Zealand a planned package of reforms has seen prices rapidly recover, from around $NZ10/$tCO_2$ (US$6) in early 2016 to $NZ25/$tCO_2$ (US$17) at the end of 2018. Further information on managing revenue volatility can be found in section 3.2.2.

Carbon revenues are also affected by the design of carbon pricing systems and the characteristics of markets covered by carbon pricing. The level of free allocations under an ETS and any tax exemptions permitted in a carbon tax directly affect the revenues raised. In ETS design, allowing offsets tends to reduce carbon prices and therefore revenues, while temporal flexibility measures such as permitting banking or borrowing of allowances can reduce price volatility, which is likely to reduce cyclicality in revenues. Revenues will also be affected by the underlying characteristics of covered markets, such as elasticity of demand. Inelastic markets will have relatively more stability in demand, and therefore more stable revenues. For example, petroleum products in particular can be highly demand-inelastic, giving governments a steady base of revenues that is relatively unchanged year-on-year (Li, Linn, and Muehlegger 2012).

1.4. The outlook for carbon revenues

Given climate objectives, carbon pricing revenues are likely to continue their rapid growth. The adoption of the Paris Agreement requires ratcheting ambition with the aim of limiting global warming to less than 2°C by 2020. Meeting this goal requires a suite of policy tools, with carbon pricing likely to play a major role. As of 2019, nearly 100 countries have explicitly mentioned carbon pricing in their nationally determined contributions (World Bank 2019a). Carbon pricing revenues already account for 3 percent of British Columbia's budget and 1–2 percent of Sweden's national government budget (Fay *et al.* 2015).

The potential for carbon pricing revenue to grow can be considered by looking at taxes that already place an implicit price on carbon, such as electricity and transport fuel taxes. These taxes are already an important source of revenue in many countries. Revenue associated with overall fuel and energy taxes for 2014 is estimated to be US$633 billion for the 60 economies covered by the PINE database,[1] or approximately 20 times more than explicit carbon revenues for 2017. These revenues are particularly important in some middle-income countries, suggesting there is a large opportunity for carbon prices or implicit carbon prices to raise significant amounts of revenue in lower-income countries. For example, Organisation for Economic Co-operation and Development (OECD) data suggest that energy tax revenue as a proportion of total tax revenue was around 8.5 percent in Turkey and 8.3 percent in Mexico in 2016, compared with an OECD average of 3.6 percent.

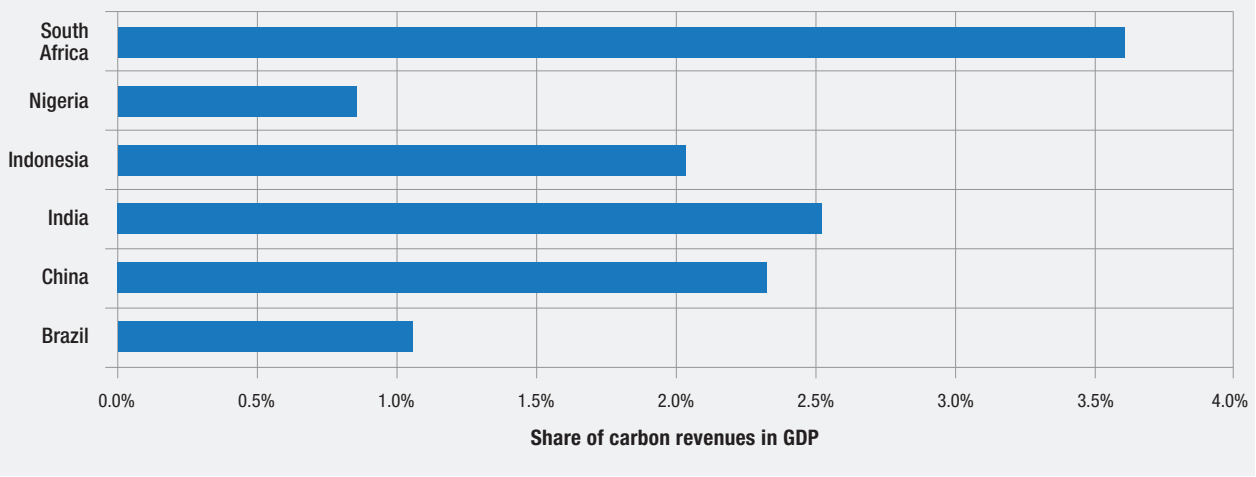
Fuel taxes also suggest that high carbon prices can be placed in some sectors, with the scale of carbon prices currently small relative to the implicit prices already applied. Due to the relatively inelastic demand for fuel, fuel taxes are often implemented to raise revenue. However, they are also designed to address other negative externalities associated with fossil fuel consumption, such as negative health effects and traffic congestion. While fuel and energy taxes are not typically aimed at reducing carbon emissions, they are complementary to carbon pricing policies. Fuel taxes in the road sector are greatest in the United Kingdom, equivalent to a carbon tax of €300/tCO_2 (US$330) in 2015 (OECD 2018). This is much larger than the highest explicit carbon tax applied to these fuels, which is Sweden's €111/ tCO_2 (US$130).

A recent IMF policy paper suggests that a US$70/$tCO_2$ carbon price would raise revenues equivalent to around 1–3 percent of GDP by 2030 in most countries considered (IMF 2019). For example, Indonesia could capture revenues equal to 2 percent of GDP, while Nigeria and South Africa would capture revenues

1 The Policy Instruments for the Environment (PINE) database is maintained by the Organisation for Economic Co-operation and Development (OECD). See the OECD website at https://www.oecd.org/environment/indicators-modelling-outlooks/policy-instrument-database/.

equal to 0.8 percent and 3.6 percent of GDP respectively. A subset of countries included in the IMF's analysis is presented in **figure 5**. Variations in revenues are primarily driven by cross-country differences in emissions intensity of GDP but are also affected by the price responsiveness of emissions. Under a carbon price of US$ 35/tCO$_2$, revenues would be around 60 percent of these values, as the lower price leads to additional emissions compared with the US$ 70/tCO$_2$ scenario.

FIGURE 5. Potential revenues raised from a US$ 70 carbon price in 2030



Source: IMF 2019.

An international carbon market could generate large flows of carbon revenues to developing countries with lower cost mitigation. International carbon markets channel funds to those jurisdictions with relatively low-cost emissions reductions, which are often in poorer regions. A modeling exercise undertaken as part of the World Bank's State and Trends of Carbon Pricing 2016 examined the potential for global revenue flows to 2050. If the full benefits of emissions trading are realized, by 2050 annual resource flows from carbon markets could reach US$ 1.86 trillion, with trade of 4,310 MtCO$_2$. Africa could be the largest net supplier, receiving financial inflows of around US$ 1 trillion a year, which equates to over 5 percent of its forecast GDP in 2050 (World Bank, Ecofys, and Vivid Economics 2016).

Carbon markets also enable the private sector to generate revenue. This can be through, for instance, payments for emission removals using negative emissions technologies or by investing in emissions reductions that enable them to sell credits or excess free allocations.

In cost-efficient decarbonization scenarios, revenues from carbon pricing remain significant for decades (CPLC 2017). While cutting emissions is the ultimate aim of carbon pricing, economic theory suggests that as the available carbon budget becomes increasingly scarce, prices should increase over time. This may keep revenues relatively stable over the next few decades, even as emissions decrease (Rausch and Reilly 2015).

As carbon revenue uptake and scale grow, it becomes increasingly important to align the use of carbon revenues with other government objectives within the broader fiscal policy framework. By adopting a principles-based approach, jurisdictions can design a package of carbon revenue uses that aligns climate policies with broader fiscal objectives. These principles are developed in the following chapter.

Fiscal policy context and governance considerations

BOX 2. Key findings: Fiscal policy context and governance considerations

Carbon pricing fits into a broader fiscal policy framework, including considerations regarding efficiency, equity, and long-run growth. As with any fiscal decision, governments will face trade-offs in pursuit of these aims.

Appropriate governance arrangements can help policy makers make best use of their carbon revenues. These arrangements can be enabled by establishing appropriate legal and administrative frameworks, processes for managing revenue flows, and effective stakeholder engagement and accountability measures. The last of these is particularly beneficial in building public acceptance of the policy.

Carbon pricing operates as part of a broader fiscal landscape that requires consideration of complex relationships and trade-offs. While the environmental objective of carbon pricing is principally to reduce greenhouse gas (GHG) emissions, it is also a potentially useful tool for raising government revenue, which can be used to pursue wider objectives related to efficiency, equity, and long-run growth. Given fiscal constraints, governments considering different options for carbon revenue use face trade-offs between these objectives. This doesn't mean that carbon pricing and its revenue use cannot lead to simultaneous improvements in environmental outcomes, efficiency, equity, and long-run growth, but rather that different revenue uses will lead to different impacts on these outcomes. The complexity of the trade-offs faced is discussed further in chapter 4.

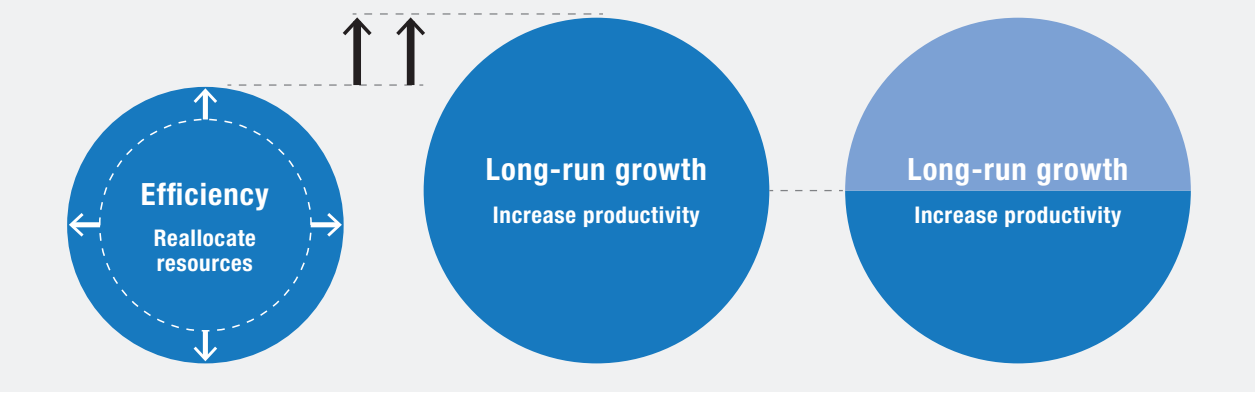
To make the most effective use of carbon revenues, governments should seek to develop appropriate governance arrangements. Clear legal and administrative frameworks can ensure carbon revenue use is well targeted and minimize administrative costs. Administrative arrangements can be fairly simple when existing structures for revenue allocation are already in place; but when they are not, there may be a case for creating new bodies to govern the revenue use for particular programs. In addition, early consideration of the potential volatility of carbon revenues can help in managing these flows and structuring programs and policies. Further, stakeholder engagement as well as monitoring and reporting procedures can build public acceptance of carbon pricing, which is crucial to its longevity. These issues are discussed further below.

1.5. Fiscal policy context for carbon revenue use

To ensure a coherent framework for revenue use, the objectives and impacts of carbon pricing must be well understood. For most jurisdictions, the principal aim of carbon prices is to reduce GHG emissions and thereby address climate change. Placing a price on carbon emissions causes firms, consumers, and investors to internalize the negative impact of these emissions into production, consumption, and investment practices. Carbon pricing also has other benefits (or co-benefits), such as improvements in other environmental outcomes and in health, mobility, and resilience. For some jurisdictions, realizing these other benefits may be the primary aim of placing a price on carbon. However, carbon pricing can also have some adverse impacts that should be considered by policy makers when allocating carbon revenues. The negative impacts of carbon pricing are typically concentrated in certain sectors or among certain consumers, which suggests a role for revenue use to offset these impacts.

Carbon pricing and its revenue use fit into a wider fiscal policy framework (outlined in box 3 and illustrated in figure 6), and it is important to understand these broader aims in order to determine the best options for revenue use. Government taxation and spending decisions aim for a number of outcomes, including (but not limited to) increasing efficiency, supporting long-run growth, and distributing resources more equitably (Henry *et al.* 2010; IMF 2015, 2018; Mirrlees *et al.* 2011). It is important to consider the aims governments may pursue through fiscal policy, as these can inform decisions regarding the use of carbon revenues. This analysis seeks to help prioritize carbon revenue options by identifying trade-offs. Potential uses of carbon revenue are discussed in detail in **chapter 4**.

FIGURE 6. Potential objectives of effective fiscal policy



Source: Vivid Economics.

When considering the options for revenue use, the government must also account for the level of public acceptance. A lack of public support can undermine the effectiveness of any policy and exacerbate the risk of policy reversal. The ways in which carbon revenues can build support for carbon pricing reform are discussed further in section 4.1.

BOX 3. Objectives of fiscal policy

Efficiency

One of the standard fiscal policy aims is to maximize efficiency, by better allocating public and private resources to their most efficient social use (Henry *et al.* 2010; Mirrlees *et al.* 2011). This aim can be achieved through policies that

- Internalize external benefits of certain activities (positive externalities) through public provision and subsidies to increase their provision to a socially more beneficial level, for instance through spending on health, education, infrastructure, or environmental preservation (GLA Economics 2006).
- Internalize external costs of certain activities (negative externalities) through the use of taxes or pricing mechanisms to reduce their scale to a socially more beneficial level, for instance through taxes on air or water pollution (Pigou 1920).
- Reduce distortions, by replacing taxes that change production decisions (such as income taxes) with taxes that internalize external costs (such as congestion charging) or those that are less distortionary and result in small relative changes in production decisions (such as taxes on "inelastic" goods like transport fuels or broad-based consumption taxes) (Pearce 1991).
- Reduce administrative costs, for instance by replacing more complex tax regimes, which may have larger costs associated with their collection, for simpler ones (Henry *et al.* 2010; Mirrlees *et al.* 2011).

Long-run growth

Fiscal policy can also assist in increasing economic possibilities through spending that seeks to manage the economy in a way that increases long-run growth (IMF 2015, 2018; Paudyal, Baral, and Keenan 2016). This may include policies to:

- Smooth the economic cycle, through using automatic stabilizers. These spending and taxation systems automatically cool the economy if it is growing too fast and can stimulate economic activity when growth slows. Discretionary fiscal policy can be used to smooth the economic cycle (IMF 2018).
- Increase innovation and productivity growth. This could include investments in new productive capital or support for technology innovation and diffusion, for instance through support for education or research, development, and deployment (IMF 2015).
- Ensure debt levels are sustainable, which reduces drag on future consumption and investment (IMF 2018).

Equity

Fiscal policy may be aligned with achieving social objectives to reduce inequality and expand access to economic opportunity (Henry *et al.* 2010; Mirrlees *et al.* 2011). This could include policies that aim to

- Reduce inequality by redistributing income from high-income groups to low-income groups (Henry *et al.* 2010). This could include replacing regressive taxes that disproportionately impact low-income earners (such as consumption taxes) with progressive taxes. This could also be achieved by transfers through the welfare system or grants to supplement the income of certain groups.
- Address disadvantage at a regional level or address the costs of economic transition, by compensating those who are severely negatively impacted by a given policy (Garnaut 2011).
- Support development and economic inclusion. This can relate to a wide range of development objectives in line with the Sustainable Development Goals, for instance enhancing opportunity through access to education and health care (UNDP n.d.).

1.6. Governance of carbon pricing arrangements

Many forms of revenue use will require only limited new governance arrangements as they take advantage of existing structures for revenue allocation. Governance in this context refers to the variety of institutions and systems that contribute to the design and administration of carbon revenues spending. Many countries have existing tax and social security systems for example that can be used for revenue allocation, reducing the need for additional structures. However, weak governance can be a limiting factor in implementing effective revenue-use frameworks, particularly in countries with limited regulatory capacity and structures in place for revenue allocation.

There are several issues to consider when setting out the governance arrangements for managing carbon pricing revenue:

- Legal and administrative factors;
- Governance of volatile revenue sources;
- The role of stakeholder engagement and accountability.

1.6.1. Legal and administrative factors

Jurisdictions have different legal and administrative structures that must be considered when setting the governance arrangements for carbon revenues. Most governments have well-established rules around their budget processes, timing of budget decisions, and means for approving the collection of taxes and spending of revenues. Carbon pricing and carbon revenues will provide just one of many sources of revenue and items of spending that will be considered by government, and they will thus need to operate within the established norms and legislation. For instance, while some countries may require executive or legislative approval for certain tax revenue uses, others may be more flexible in their decision making on spending.

Budgetary rules may have implications for governance frameworks when funds are legally earmarked for specific purposes. Legal earmarking creates barriers to redirecting spending outside the initial target area. For example, in some jurisdictions, taxes in certain sectors may require their revenues to be spent in those sectors. This requirement can have advantages from a governance perspective, as it makes the use of funds and their performance easier to track than they would be within more flexible revenue use frameworks. However, coordinating carbon revenue uses under legal earmarking can be complex, as it requires participation from lawmakers and dedicated institutions to govern the framework. The benefits and limitations associated with legal earmarking are discussed further in section 4.1.

Another factor determining the appropriate governance framework to employ is the extent of existing revenue allocation structures in place. For instance, if revenues are to be allocated toward direct cash transfers and there is an existing social security system in place to allocate transfers, then the additional administrative burden is likely to be minimal. Further, if revenues are to be allocated to public spending on projects that are easily scalable, there would probably be no need for additional institutions to govern these funds. However, if these systems are not in place, there will be a higher administrative burden, and new governance arrangements will likely be required.

Several jurisdictions have established special-purpose funds to channel spending of their carbon revenues. These funds can provide a transparent and highly visible vehicle for promoting the benefits stemming from programs and policies funded through carbon revenues. For instance, California set up a Greenhouse Gas Reduction Fund (GGRF) that funnels carbon revenues toward programs that both reduce emissions and assist disadvantaged communities (Rabin, Callahan, and Deshazo 2015). Further, Quebec employed an existing Green Fund to finance mitigation and adaptation projects using carbon revenues. Currently, over 20 programs are totally or partially funded in fields such as transport, energy efficiency, renewable energy, research and innovation, waste management, and agriculture (Alberola and Vaidyula 2015; CPLC 2016).

Setting up a dedicated fund for carbon revenues can be complex, given they tend to require involvement from the legislature, governing politicians, and (often) multiple government departments, ministries, and/or state agencies. In California, the legislature and the governor determine the provision of funds from the GGRF to selected programs. One such program, the Affordable Housing and Sustainable Communities Program, is then implemented by the Department of Housing and Community Development and the Department of Conservation. In Quebec, the Green Fund requires participation from the Ministry of Sustainable Development, Environment and Fight against Climate Change as well as a range of other entities across transport, energy efficiency, green energy, research and development, and the waste sector (Carl and Fedor 2016). The number of participants in such a process can create complications for decision making.

Given the complexity associated with cross-government involvement in the management of funds, cross-government committees are sometimes established to assist with coordination. Cross-government oversight of carbon revenues enables government departments, ministries, or agencies to collaborate on revenue allocation, while encouraging buy-in for the policy from a variety of stakeholders. For instance, the GGRF is administered by California's Strategic Growth Council, which includes members of civil society and representatives of the Transportation, Environmental Protection, and Natural Resources Agencies.

In addition to involving actors across government in carbon revenue management, several jurisdictions have set up independent management boards to ensure transparent processes. In California, the Air Resources Board is responsible for establishing and reviewing the methodology for quantifying the GHG reductions associated with each project funded by the GGRF (Rabin, Callahan, and Deshazo 2015). Quebec has recently set up a Green Fund Management Board to reform the governance of the Green Fund and assess its performance. In addition to independent members, the board includes members from the Ministry of Finance, the Ministry of Municipal Affairs and Housing, and the Ministry of Transport, Sustainable Mobility and Transportation Electrification; the goal is to foster collaboration between these bodies. Setting up such a management board is likely to ensure greater transparency for processes, although it's also possible that adding another layer of management makes the governance processes even more complex.

The collection and use of revenues also involve developing administrative arrangements, to ensure that policy is operationalized in the way intended. Different policies can differ in their administrative complexity, and a consideration of administrative costs is essential for the appropriate design of carbon pricing. One benefit of carbon pricing is that it can be a relatively low-cost method for collecting revenue. For example, carbon pricing applied at the upstream stages of production will tend to have relatively low collection and monitoring costs, because the tax is levied on a relatively small number of large entities and can often be incorporated into existing fuel-supply monitoring and reporting procedures (Aldy and Stavins, 2012 Bowen 2011; Weisbach and Metcalf 2009) issues relating to the rate (including the use of the revenues and rate changes over time. Policy options that can reduce administrative complexity may be appropriate for some jurisdictions. Some examples are discussed in **box 4**.

BOX 4. Simplicity in administrative design

Practical examples of carbon pricing have demonstrated that revenues can be raised at relatively low cost. For example, the design of the Colombian carbon tax, which was implemented in 2017, sought to reduce the administrative burden by applying the tax on the fossil fuel wholesalers at the upstream stage of production. Because the number of wholesalers is much lower than the number of consumers, this has resulted in lower transaction costs.

Smart design can also lessen administrative complexity in ETSs. New Zealand has the only ETS that covers forestry, a highly complex source of emissions mitigation and sequestration.However, authorities have implemented a simplified method to calculate liabilities and crediting —using default emission factors calculated based on forest type and geography—with a provision allowing entities to adopt more complex methodologies by choice (MPI 2017).

Administrative arrangements are somewhat simplified for carbon pricing as they are less easily evaded than other forms of taxes. Whereas conventional taxes such as those on labor and businesses cover only the formal economy, upstream carbon pricing can effectively cover the informal sector and hence reduce the relative benefits of informality and incentivize economic agents to shift toward the formal economy. This effect is particularly relevant for developing economies, which tend to have large informal sectors (Pigato, 2019).

Activities in informal sectors are outside the control of the state and therefore the bounds of labor and business tax collection. An international review of informal sectors finds that they can be driven by a relatively weak formal economy and a weak rule of law, among other factors (Schneider, Buehn, and Montenegro 2010). Carbon pricing systems can help shift part of the tax burden from the formal to the informal sector (CPLC 2017). Section 4.2.1 provides further discussion on the informal sectors of developing economies.

1.6.2. Management of revenue volatility

Additional policies may be required to address the impact of carbon revenue volatility on spending outcomes, particularly under an ETS. Government revenue volatility is not unique to carbon revenues, as taxes on commodities, labor, and businesses can also have volatile revenue streams. However, revenues can be particularly volatile under an ETS given the potential for fluctuations in auction prices (as discussed in section 1.3.1). Volatile and unpredictable revenues add complexity when designing a revenue use system, particularly when revenue is earmarked to a project over several years. Revenue volatility is far lower for carbon taxes than ETS, as taxes are not subject to volatility from price changes, although some volatility remains due to changing economic conditions and the cost of carbon abatement.

Policies can be designed to smooth the impacts of volatile revenue streams. Channeling revenues through a special-purpose fund such as California's GGRF can ensure the appropriate governance of funds in a stable institutional setting. This approach accounts for volatility by making trade-offs between programs, while also reducing uncertainty and the potential for political interference by successive governments. Other examples of revenue volatility management include Chile's Economic and Social Stabilization Fund, which is funded when there is a fiscal surplus and withdrawn from when there is a fiscal deficit. This is designed to smooth spending across the cycle when copper prices and production are low (World Bank 2018). Another example of revenue volatility management is provided by France's use of EU ETS revenues (see **box 5**).

While volatility management has been effective in France and Chile, it may not be feasible in other countries if there are legal and political constraints preventing the efficient use of surplus revenues or the ability to plug funding gaps when they occur.

BOX 5. France: Managing volatile carbon revenue to fund energy efficiency programs

France has implemented revenue volatility management in its use of EU ETS auctioning revenues to support the Habiter Mieux ("Live Better") program. This program is aimed at renovating the homes of low-income households to improve energy performance (Dubois 2015).

France arranged for auction revenues to be used to support this program up to a cap of €550 million annually. In 2013–2015, carbon revenues made up 39 percent of the program's total budget, with annual revenues averaging €249 million. However, following the sharp rise in the EU ETS price in 2017, this revenue cap was met, and the remaining €280 million was allocated to the government's general budget to be used for other purposes.

When auction revenues turn out to be smaller than those anticipated during the preparation of the finance law in the previous year, funding gaps can occur. In France, some of these funding gaps have been partly covered by other funds. For example, in 2017, the transition fund for energy renovation contributed €50 million (US$61 billion) to the National Housing Improvement Agency (Agence nationale de l'habitation) because of the low auctions of 2016.

1.6.3. Stakeholder engagement and accountability

Carbon pricing and the use of carbon revenues affect stakeholders through various channels. Understanding these impacts and transparently communicating how revenues are used is good practice and can also make policies more acceptable to stakeholders.

The use of carbon revenues should be informed by an understanding of the impact of carbon pricing on various stakeholders. Jurisdictions may benefit from conducting research into the various impacts of carbon pricing to identify the stakeholder groups that will gain or lose by the introduction of a carbon price. This evidence will help authorities gauge which stakeholder groups may oppose a carbon price and whether and how their concerns should be addressed. For example, quantifying the potentially negative impact on employment and economic activity in fossil fuel–consuming or -producing sectors will be important in designing policies to address this impact and maintain support.

Research into the various impacts of carbon pricing should be complemented by stakeholder engagement. Effective communication will be required to meet the different needs and perspectives of a variety of stakeholders (see **box 6** for types of public consultations that are part of the carbon revenues system in California). Governments need to communicate the following:

- The benefits of carbon pricing and carbon revenue use;
- The efforts that will be taken to mitigate the negative impact of carbon pricing;
- The system's ability to achieve its aims.

In addition, governments should consider how proactive they want to be in communicating carbon pricing, which will in turn influence the level of transparency and visibility. While most governments will aim to communicate the benefits of carbon pricing clearly and transparently, some jurisdictions may prefer to limit public outreach. Attracting attention to carbon pricing will increase the salience of the policy. Understanding public opinion on carbon pricing will help governments decide whether they should pursue an active or passive communications strategy. Further details regarding effective communication of carbon pricing are provided in **box 9** and the **Guide to Communicating Carbon Pricing** (PMR and CPLC 2018).

Monitoring and evaluating carbon revenue use can ensure that revenue is being used effectively, while transparent reporting can increase public acceptance. Governing institutions need to ensure that monitoring, reporting, and evaluation procedures are transparent and that they are overseen by independent bodies such as independent committees, state agencies, or international organizations. **Box 6** describes the tools used in California to achieve these aims.

BOX 6. Strategies to promote effective carbon revenue use in California

California has put in place mechanisms to enhance the transparency of auction revenue spending. It issues annual reports with technical assessments and holds public consultations that have a direct impact on the revision of investment plans.

Triennial investment plans and annual budget proposals in California are informed by the outcomes of public consultations and negotiations involving nongovernmental organizations, the private sector, local authorities, and interested citizens. Stakeholder engagement in the process of auction revenue spending takes several forms, including public Air Resource Board (ARB) hearings, workshops held by the ARB and state agencies, and the opportunity to provide inputs on various draft documents. In 2016, Californian agencies organized over 200 public meetings to discuss the use of cap-and-trade proceeds (California Climate Investments 2017).

Decision making on revenue use in California may also be informed through ex post assessments. The Department of Finance each year submits a report to the state legislature that details the outcomes and performance of projects funded under the Greenhouse Gas Reduction Fund, including the GHG emissions reductions expected from these projects. In 2016, in addition to the annual report, the ARB released an interactive map displaying all the programs implemented with GGRF funds, along with a comprehensive project list. Such tools are regularly updated and aim to provide greater transparency and support further evaluation of investments (California Climate Investments 2017).

To assess the effectiveness of projects funded with auction proceeds, the ARB evaluates the environmental and social impacts of projects in terms of greenhouse gas reductions, co-benefits, and benefits for disadvantaged communities, low-income communities, and low-income households.

Options for carbon revenue use

BOX 7. Key findings: Options for carbon revenue use

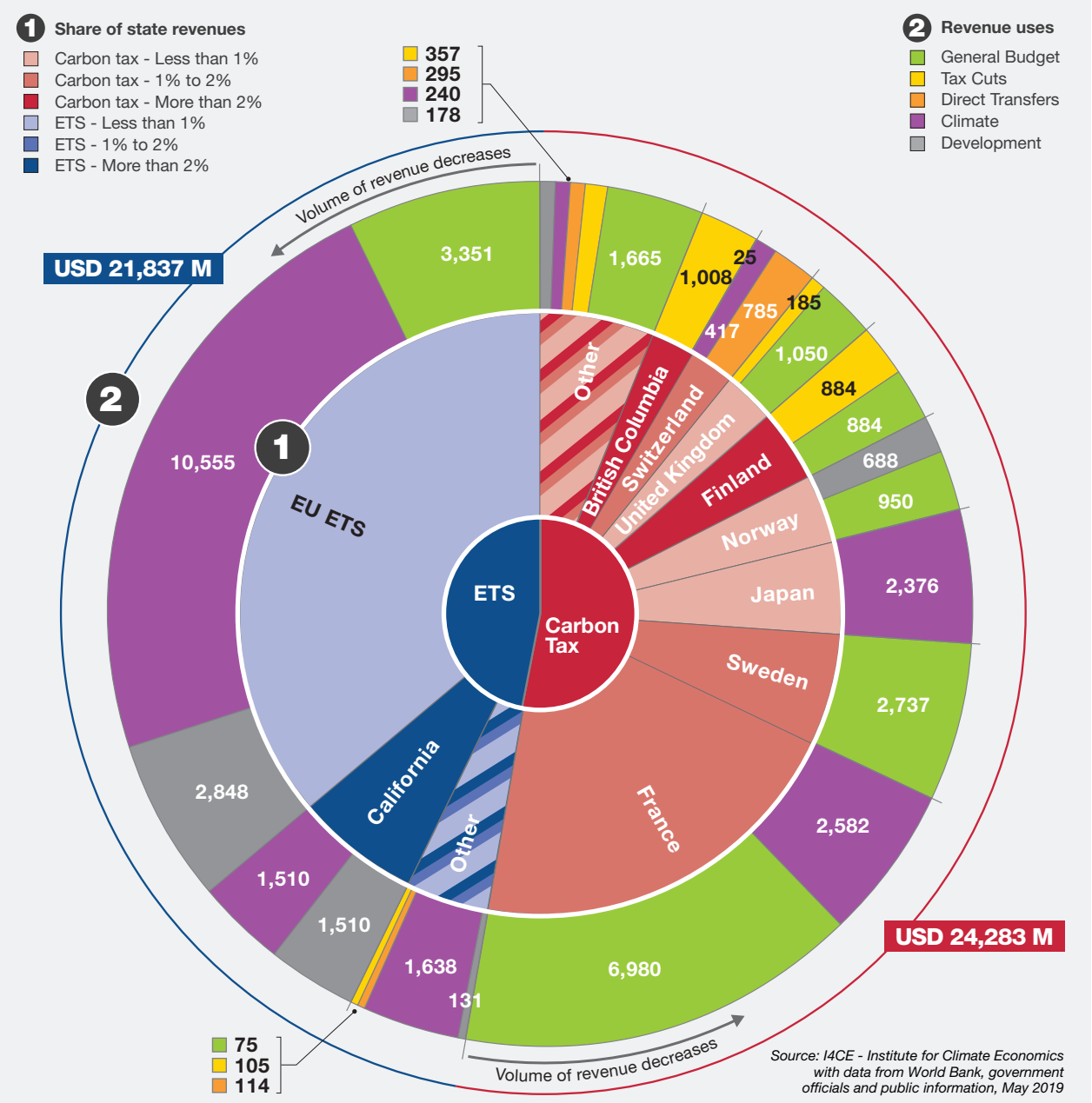
- The use of carbon revenues can be a powerful tool in building support for carbon pricing and for pursuing environmental, economic, and social objectives.
- Rather than being incorporated into the general budget, carbon revenues are often hypothecated to funding specific objectives. This approach can increase the acceptability of carbon pricing, as it demonstrates the range of desirable outcomes that can be enabled.
- Jurisdictions have used their carbon revenues to achieve various objectives, which generally fall into one of six categories.
  1. Tax reform, to target higher economic growth alongside lower pollution;
  2. Climate mitigation, such as investment in low-carbon technologies;
  3. Pursuit of other development objectives, such as in education and health;
  4. Prevention of carbon leakage, to achieve carbon pricing's environmental and economic objectives;
  5. Assistance for individuals, households, or businesses affected by higher carbon costs, through transfers or social programs;
  6. Debt reduction, to reduce the debt burden on future generations.
- Jurisdictions can combine these approaches into policy packages in order to achieve multiple objectives.

Carbon revenues provide a potentially substantial source of government income and can be used in various ways to deliver various policy objectives. Thus carbon pricing can have a dual impact, both reducing greenhouse gas (GHG) emissions and achieving other economic and social objectives through use of the income generated.

To date, carbon revenues have been used to address a variety of policy objectives, with most jurisdictions implementing a package of measures. As discussed in chapter 3, governments can best identify priorities for revenue use when they understand the impacts of carbon pricing through research, stakeholder engagement, and appropriate governance structures. **Figure 7** shows a breakdown of carbon revenues by jurisdiction and revenue use.

A large share of carbon revenues (38 percent) was allocated to the general budget in 2017/18, as shown in figure 7 below. This is a popular option, with 15 of the 33 jurisdictions that generated carbon revenues in 2018 allocating at least 50 percent of generated revenues to the general budget, and four more allocating at least 20 percent. When government revenues are allocated to the general budget, it is unclear where they have been used, and so this category may include spending on the other options specified (climate and development spending, etc.).

FIGURE 7. Carbon revenues by revenue use and jurisdiction, 2017/18



Note: Due to data limitations, the discussion of revenue use options in section 4.2 relies on categories that are somewhat different from those shown in this chart. Spending on climate and spending on other development objectives are discussed separately in sections 4.2.2 and 4.2.3 respectively. Revenues for debt reduction, discussed in section 4.2.6, have not been quantified. This is because this category tends to be allocated to the general budget (given debt reduction implies no additional spending or fiscal reform). In addition, prevention of carbon leakage tends to take place through free allocations in an emissions trading system or tax exemptions, which are not captured in revenue data. However, these can be a substantial use of forgone revenues, and they are therefore discussed in section 4.2.4.

Figures represented here are for calendar year 2018 or fiscal year 2017/2018. If no data were available, calendar year 2017 was taken into account.

Source: I4CE (2019)

The majority of carbon revenues (53 percent) were committed to either environmental or broader development projects in 2017/18. This figure is driven by EU ETS revenues, 80 percent of which were committed to these objectives. In addition, California assigns all revenues from its ETS for climate-oriented projects, funded through the Greenhouse Gas Reduction Fund.

Other popular revenue use options include tax cuts and direct transfers. These made up 6 percent and 3 percent of total carbon revenues respectively in 2017/18.

This rest of this chapter is structured as follows:

- Section 4.1 discusses the advantages and disadvantages of earmarking and hypothecating carbon revenues to specific objectives.
- Section 4.2 outlines potential revenue use options, as well as their benefits and limitations, alongside examples of international experience to date.
- Section 4.3 compares these potential revenue allocations—looking both at how well they achieve fiscal objectives and at how acceptable they are likely to be to stakeholders—and highlighting the trade-offs involved with each option.

1.7. Earmarking and hypothecation of carbon revenues

Carbon revenues can either be allocated to general government revenue or be used for defined purposes. Carbon revenues are distinct from most other sources of revenue in the frequency with which they are earmarked or hypothecated—for example, by being linked to spending programs or specific tax cuts. Revenues that aren't subject to these restrictions are allocated to the general government budget, which can be directed in line with other government priorities.

There are two methods for linking revenue to a particular purpose: legal earmarking, in which revenues are linked to expenditure initiatives through legislative or executive decision, and hypothecation, in which the links between revenue and expenditure are communicated without an enforcing legal structure. The EU ETS uses legal earmarking to provide greater surety of revenue uses, with a legislated recommendation for member states to use at least 50 percent of revenues for climate-related projects (European Parliament and Council 2009). Legal earmarking also occurs in California, where investments made with carbon revenues are required to further the main regulatory purposes of the cap and trade system (to reduce GHG emissions) and to support disadvantaged communities (Rabin, Callahan, and Deshazo 2015). By contrast, hypothecation is simply a communications strategy that links the generation of carbon revenues to preferred projects or programs. In some countries, like Chile and Mexico, no carbon revenues are earmarked or hypothecated; instead, all revenues are allocated to the general budget.

Earmarking and hypothecation can highlight the link between carbon pricing and beneficial fiscal services as well as provide certainty around funding allocations. By highlighting the impacts carbon revenues can have on specific policy areas, linking funds to a particular purpose can make carbon pricing more acceptable to concerned stakeholders. In addition, it can create greater certainty regarding funding allocations for long-term projects. See **box 8** for details on how the authorities in British Columbia used legal earmarking to create support among businesses and consumers for a carbon tax.

Further examples of effective communication associated with carbon revenues can be found in the World Bank's Fiscal Policies for Development and Climate Action (Pigato 2019, 47-50).

BOX 8. British Columbia: A carbon tax whose acceptability has grown over time

British Columbia's carbon tax provides an example of a carbon price whose support has grown among the general population. British Columbia followed a deliberate strategy of presenting the carbon price as a revenue-neutral tax reform. This helped to deflect criticism that the tax would spur the expansion of the state budget (Komanoff and Gordon 2015). Another crucial factor for acceptance was that the provincial government was able prove that the tax was not economically harmful, as demonstrated through numerous ex post studies (Clean Energy Canada 2015; Murray and Rivers 2015; Pederson and Elgie 2015).

Since its introduction in 2008, British Columbia's carbon tax has become an integral part of its broader fiscal mix, and a popular one. While controversial when first introduced, this tax is now supported by over 65 percent of the population (Metcalf 2015).

While earmarking and hypothecation can have several advantages, countries may also prefer to direct revenues into the general fiscal pool. Fiscal experts often argue that earmarking results in poor outcomes, and instead advocate transferring revenues to the general budget to allow the overall tax system to be optimized within the general tax and spending framework (Carattini, Carvalho, and Fankhauser 2018). If earmarking provides insufficient revenue, then the result is underinvestment. Alternatively, tying revenue to a specific area may lead to overinvestment, which can distort optimal spending outcomes and therefore reduce overall economic efficiency. While elegant in theory, there are economic, behavioral and political reasons to believe that government fiscal policy making is not always optimal, which means that earmarking or hypothecation can prove beneficial in supporting revenue use in priority areas.

Allocating carbon revenues to the general budget may be administratively simpler and more flexible than legal earmarking. Legal earmarking can create barriers to redirecting spending to other areas, meaning that there is less flexibility to alter revenue uses as circumstances and strategic priorities change. In addition, general budget allocation entails lower administrative costs than legal earmarking, as it does not require any additional assessment or creation of dedicated institutions (Sumner, Bird, and Smith 2009). Legal earmarking of funds for specific projects can create risks of funding gaps, as carbon revenues can be volatile. However, the risks from volatile revenues can largely be managed, as discussed in section 1.6.2. These issues apply less to hypothecation, which does not impose legal barriers to changed spending and need not introduce new institutional structures. For these reasons, many prefer hypothecation to earmarking as a form of committing funds to specific programs or areas for support.

In practice, allocating funds to the general government budget may not maximize efficiency, and can be less transparent than earmarking or hypothecation. Government spending can at times be inefficient and potentially subject to corrupt practices, which may mean general allocation does not lead to an efficient outcome as theorized. In addition, the benefits from carbon revenues will not be clear to the general public if funds are allocated to the general budget without explicitly communicating their links to associated tax cuts or spending increases.

Communicating a carbon pricing policy effectively is important for its acceptance and longevity. Earmarking and hypothecation can provide useful tools for communicating many of the advantages of carbon pricing. This includes the ability to spend revenue on issues of high concern to stakeholders and the public—issues that, in some jurisdictions and for some stakeholders, may resonate more than climate change.

Box 9 **discusses how the uses of carbon revenues can support the acceptance of carbon pricing policy, which is detailed in the Guide to Communicating Carbon Pricing** (PMR and CPLC 2018).

BOX 9. Carbon revenue use and public acceptance

Revenue use can be important in signaling the benefits of a carbon pricing policy. Carbon pricing can sometimes be associated with negative impacts, for instance increases in energy prices and competitiveness impacts on some industries. The use of carbon revenues offers a chance to address some of these concerns and to highlight the positive overall impacts of carbon pricing.

Earmarking or hypothecation can offer a clear link between carbon revenues and their use, which can make carbon pricing more acceptable to stakeholders. Studies suggest greater acceptance of carbon pricing when revenues are clearly linked to a specific purpose, as this allows the public to more clearly see what the revenues are funding (Klenert *et al.* 2018).

The public acceptance of carbon pricing can be increased by using carbon revenues to address issues of high public concern, including those aligned with policy objectives such as environmental goals. In doing so policy makers can demonstrate the benefits of carbon pricing and draw a clear line from the carbon price to environmental spending, tax breaks, rebates, and other public objectives. However, tax reforms or project spending can lack visibility if their impacts and links to carbon pricing are not well communicated by policy makers.

Several studies suggest that funding low-carbon initiatives with carbon revenues may be popular with people in high-income countries. Surveys conducted across Europe and the United States have found that people prefer spending revenue on low-carbon initiatives over alternatives such as reducing other taxes or expanding other social programs (Baranzini and Carattini 2017). This preference for spending on low-carbon initiatives comes from the alignment of revenue use with the environmental aims of carbon pricing (Kim 2017). It may also be driven by a tendency to underestimate the impacts of carbon pricing on environmental outcomes and therefore a preference for more direct policies (Carattini, Carvalho, and Fankhauser 2018).

While studies on carbon price acceptability are less common in low- to middle-income countries, evidence on other forms of taxation also suggests a preference for tax earmarking or hypothecation. For example, in 2000 the Government of Ghana sought to increase the value added tax rate from 10 percent to 12.5 percent but faced heavy public opposition. In order to secure public acceptance, the government committed 100 percent of the new revenues to a new Ghana Education Trust Fund, designed to fund scholarships and educational infrastructure, primarily at the tertiary level (Welham, Hedger, and Krause 2015).

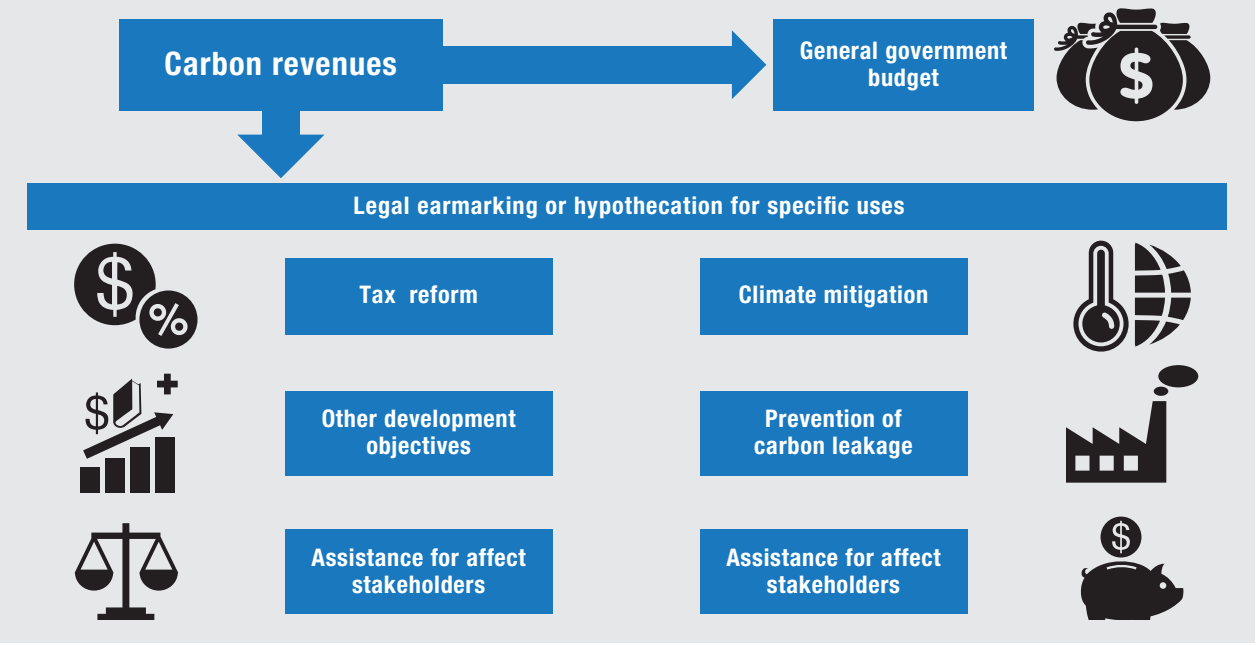
In some jurisdictions, it may be preferable not to focus revenue use on climate change. Aligning revenue use with the environmental goals of carbon pricing is likely to be successful in areas where concern around climate change is high. However, in jurisdictions where climate change is a less immediate concern, focusing on non-climate benefits may be preferred. For example, the proposed emissions levy in Costa Rica framed its core narrative around addressing air pollution, as this was of greater concern to the public than climate change (PMR and CPLC 2018).

Communicating the use of carbon revenues requires consideration of jurisdiction-specific factors and robust research. Carbon revenues can provide a valuable tool for increasing the acceptability, and ultimately the resilience, of carbon pricing. For this change to occur, however, it is essential that the policy rationale and communication strategy are jointly considered from the outset of policy design.

1.8. Potential revenue uses

There are several reasons to use revenues for specific purposes rather than for general budget allocation. First, as discussed in 4.1, research suggests earmarking and hypothecation are popular compared with general budget allocation. Further, evidence on the communication of carbon pricing suggests that spending aligned with the objectives of carbon pricing can make the policy more acceptable. Finally, earmarking and hypothecation allow the negative impacts of carbon pricing to be concentrated in certain industries and among certain groups of households, which revenues can be used to offset. **Figure 8** sets out the main potential uses of carbon revenue.

FIGURE 8. Potential uses of carbon pricing revenue



Source: Vivid Economics.

1.8.1. Tax reform

Revenues from carbon pricing can be used to deliver increased economic growth through efficiency-enhancing tax reform. The mechanism involves reducing the rate of tax levied on labor or business income (revenues or profits). Economic theory suggests that these taxes create distortions by discouraging labor market participation and investment. Therefore, taxing economic "bads" (in this case carbon emissions) and using the revenues to reduce distortionary taxes on economic "goods" (labor and capital) should increase the efficiency of the overall tax system.

The increase in efficiency from broader tax reform has the potential to provide a double dividend, both improving environmental outcomes and increasing overall economic activity. Without offsetting tax reform, carbon pricing can reduce real wages by increasing prices, in turn creating additional disincentives to work. However, by using carbon revenues to reduce taxes such as labor income tax, carbon pricing could have a net-positive effect on real wages, stimulating growth in GDP and employment. The Organisation for Economic Co-operation and Development (OECD) estimates that combining fiscal and structural reform with appropriate climate policy could achieve a net positive effect on GDP of 2–3 percent across G20 economies

by 2050 (OECD 2017). **Box 10** outlines how Sweden used carbon taxation as part of its fiscal reform, which involved successive cuts in income taxes as environmental revenues increased.

BOX 10. Sweden: Carbon tax as part of a broader fiscal reform

In Sweden, gradual increases in the carbon tax rates and in associated revenues have been combined with tax cuts in different ways in order to prevent an escalation of the overall level of taxation, encourage job growth, and address negative distributional effects (Åkerfeldt and Hammar 2015). In 2001, social security contributions from employers were decreased and income tax–free allowances were expanded, while the carbon tax was reformed and its rate increased (Carl and Fedor 2016). The 2001–2006 tax reforms, along with the surge in the general carbon tax and other environmental taxes, led to further cuts in income taxes, with measures specifically targeting low-income households (Åkerfeldt 2016; Raab 2017). Between 2007 and 2012, additional cuts in labor taxes decreased the state's budget by about €9 billion (US$10 billion), while increases in environmental taxes generated about €0.5 billion (US$0.6 billion) of public revenue (Hammar, Åkerfeldt, and Sterner 2013).

The carbon tax has played a significant role in emission mitigation in Sweden, while successive tax reforms have spurred additional economic growth. Sweden's greenhouse gas equivalent emissions decreased by 25 percent between 1990 and 2016, while GDP increased by 75 percent (Åkerfeldt, 2017; Raab, 2017).

Recent evidence is broadly supportive of the double dividend hypothesis. Pereira, Pereira, and Rodrigues (2016) examined the implementation of a carbon tax in Portugal using a dynamic CGE model and found strong evidence for a double dividend in the presence of tax cuts; Allan *et al.* (2014) got a similar result when examining this question for Scotland. Further, a recent review found that once structural employment is accounted for, a double dividend is more likely than previously believed (Pigato 2019). In general, the more inefficient the jurisdiction's taxation system before introducing a carbon price, the more likely that carbon revenues could deliver a double dividend. To the extent that taxation systems are more distorted in developing countries than developed countries, this result implies a double dividend may be more likely in developing countries. Older studies, including Takeda (2007) and Glomm, Kawaguchi, and Sepulveda (2008), found little evidence for the double dividend. This may be because in some cases, the reduction in real wages from carbon pricing outweighs the increase in real wages from tax cuts, leading to an overall reduction in labor supply. This effect suggests that tax reforms should be carefully designed to increase the likelihood that a double dividend can be achieved.

In countries with large informal sectors, tax reform can also boost economic activity by encouraging a shift toward the formal economy. As discussed in section 3.2.1, large informal sectors can arise when the tax burden on the formal economy is high. Evidence suggests that using carbon revenues to reduce conventional taxes in the presence of a large informal sector can boost economic growth. For example, carbon pricing simulations conducted on the Spanish economy, where the informal sector accounts for about 20 percent of GDP, had suggestive results: when revenues from a carbon tax of €34/tCO_2 were used to reduce labor taxes, the shift of activity from the informal to the formal sector reduced unemployment by 3 percent and increased official GDP by 7 percent (Markandya, Gonzalez-Eguino, and Escapa 2013).

Developing countries may have greater potential both to improve the efficiency of the tax system and to reduce the size of the informal sector (Pigato 2019). Developing countries tend to have narrower tax bases, and therefore more distortive and economically costly tax systems. In addition, developing markets tend to have larger informal sectors, with recent simulations suggesting that China, India, and Iran could increase GDP through environmental tax reform (Bento, Jacobsen, and Liu 2017; Carson, Jacobsen, and Liu 2014; Mirhosseini, Mahmoudi, and Valokolaie 2017).

When considering tax reform implementation, policy makers should consider the potential distributional impacts of tax cuts. Taxes on labor income tend to be progressive, as low-income earners are often exempted from paying these taxes. This means that a combination of lower taxes and higher energy prices, which may disproportionately affect low-income households (see section 4.2.5), can lead to an increase in inequality. Alternatively, cutting sales taxes (which tend to be regressive, as low-income consumers tend to spend a greater share of income) could offset these negative distributional impacts in many jurisdictions.

Tax cuts also tend to be less targeted than other policies and may not adequately compensate those most impacted by carbon pricing. For instance, tax cuts for businesses may not be highly effective at offsetting competitiveness impacts from carbon pricing, as they are targeted at all workers and industries, rather than the workers and industries most affected. Similarly, given that low-income earners pay little or no income tax, tax cuts may not tackle the distributional impacts of carbon pricing as effectively as targeted cash transfers.

That tax reform is often less visible than other policies may reduce public support for carbon pricing. The popularity of tax reform could be increased, however, by targeting salient taxes and effectively communicating the rationale for and benefits of the reforms. As discussed above, policies with clear, visible impacts are better at generating support for carbon pricing than those that cannot be linked clearly to carbon revenues. At the same time, some taxes, such as labor taxes, are more salient than others, and will likely lead to greater public support if reduced (Finkelstein 2009). In addition, evidence from British Columbia suggests that revenue neutrality, where the total tax burden across an economy is unchanged, can increase the attractiveness of tax reform to voters (see **box 8**). If tax reform is opted for as part of carbon revenue use, clear communications around re-balancing the taxation system are key to successful stakeholder engagement.

1.8.2. Climate mitigation

Perhaps the most common use of carbon revenues is to support additional policies aimed at achieving emissions reductions. According to the High-Level Commission on Carbon Pricing, policy packages that complement carbon pricing are likely to be required to achieve the targets under the Paris Agreement (CPLC 2017). This is partly because there are various market and government failures that prevent a carbon price from incentivizing the desired level of emissions. There may also be barriers to achieving economy-wide emissions reduction targets if some sectors not covered by the carbon price. In such cases, carbon revenues may be used to further pursue the objective of emissions reductions.

While a carbon price incentivizes emissions reductions, there are market failures that can prevent participants from reacting efficiently to price signals. A number of market failures can result from the private sector being unable or unwilling to invest sufficiently in low-carbon activities. In such a case, governments can provide funds for these investments. This step can be viewed as a public policy that complements carbon pricing in the pursuit of emissions reductions. Below, we examine a range of market failures and a means to address them through public investment.

Market failures can stem from financial barriers to investment, a lack of information, or systematic behavioral biases. There may be an inability to access finance from traditional lenders for low-carbon projects when the risk around these investments is perceived to be especially high. Policy makers can then set up a green investment bank to provide new investment vehicles for low-carbon projects. For instance, Australia's Clean Energy Finance Corporation aims to build the capacity of the finance sector to assess and invest in low-carbon projects. In other cases, individuals and firms may not pursue low-carbon investments due to a lack of information or systematic behavioral biases (Weber and Johnson 2012). For example, people often lack

clear information regarding energy efficiency in their homes and resist making energy efficiency improvements given their upfront costs. To address these issues, governments could invest in smart metering systems to assist consumers in monitoring their energy usage, or provide grants to incentivize individuals and firms to improve energy efficiency. In France, for example, revenues from the EU ETS were targeted at improving the energy efficiency in homes occupied by low-income households (Dubois 2015).

The presence of network effects may lead to private investment in low-carbon technologies below socially optimal levels. Technologies that rely on networks—such as electric vehicles, which rely on charging infrastructure—can be difficult to develop because of the high up-front costs in expanding the network (CPLC 2017). In such a case, there is an argument for government investment in public charging infrastructure to incentivize a shift toward electric vehicles. California's GGRF has supported the transition to zero- or low-emission cars, trucks, school buses, and transit vehicles by providing financial rebates for clean vehicle purchases and capital grants to expand intercity rail and transit services (Rabin *et al.* 2015). Public support for R&D and technology deployment can also unlock cost-effective abatement potential, bringing down the overall cost of climate mitigation options (Hood 2011).

Firms and innovators may underinvest in R&D or in deployment of low-carbon technologies because they are not accounting for social benefits from knowledge or innovation spillovers (CPLC 2017). Knowledge and innovation can be interpreted as public goods that generate positive externalities, as innovating firms that develop new technologies create benefits for other firms while also incurring the costs. The innovating firms lack the incentive to increase investment when the benefits go to others; thus without intervention, investment in low-carbon technologies will remain below socially optimal levels (Jaffe, Newell, and Stavins 2005). To address this underinvestment, governments can provide funding for R&D and subsidies for the development and deployment of low-carbon technologies (see **box 11** for similar policies implemented in Japan).

BOX 11. Japan: Dedicating carbon revenues to low-carbon projects and green R&D

Japan's carbon tax adds a carbon content component to the existing petroleum and coal tax. It was adopted in October 2012, as part of the major energy policy overhaul that followed the 2011 Fukushima nuclear disaster. It covers roughly 70 percent of greenhouse gas emissions in Japan, with a rate of US$ 3 per tCO2e in April 2016 (World Bank, Ecofys, and Vivid Economics 2017).

Estimated revenues climbed from ¥ 39 billion (US$ 500 million) in fiscal year 2011/12 to ¥ 262 billion (US$ 2.2 billion) in fiscal year 2015/16 (Kawakatsu, Lee, and Rudolph 2017).

Japan's carbon tax was explicitly passed to fund renewable energy and energy efficiency programs through green subsidies and R&D support, related (for example) to lithium-ion batteries, distributed energy generation, and carbon capture and storage. According to the Japanese government, carbon tax revenues are earmarked for green spending and measures aimed at reducing greenhouse gas emissions. Tracking revenue use is challenging, however, as revenues are lumped together with the broader petroleum and coal tax revenues (Carl and Fedor 2016; Kawakatsu *et al.* 2017).

In sectors not covered by carbon pricing, carbon revenues may be used to provide incentives for efficient levels of mitigation. Policies aimed at uncovered sectors, such as forestry in the United Kingdom, could include grants for tree planting to increase carbon sequestration. In fact the U.K. government currently provides grants for creating woodlands in order to reduce carbon, improve habitats for wildlife, and lessen flood risk (DEFRA 2018).

Investing carbon revenues in policies that support climate mitigation can deliver additional emissions reductions and can also increase the acceptance of carbon pricing. In many cases these policies (renewable energy mandates or direct investment, for example) may be needed to address market failure, to encourage further mitigation when prices are below those consistent with emissions targets, or to create sufficient incentives to invest in emissions reductions in uncovered sectors. At the same time, these policies may be a more salient way to identify policy impacts. This more direct line of causation between the policy and results is reflected in the relative popularity of these policies.

Despite the benefits, funding climate projects is not always the best use of carbon revenues. This could be the case where extensive research is required to ensure that the funds allocated address genuine barriers to emissions reductions, or where structures for public investment have not been established, and the administrative costs for identifying and managing expenditure are high relative to other options for revenue use (such as those discussed below). There is also a need to assess whether regulation (such as energy efficiency standards for equipment) would be preferable to government investment or subsidy (such as a subsidy to purchase energy efficient equipment).

1.8.3. Pursuit of other development objectives

The revenue earned from carbon pricing may provide an important source of funds for developing countries to finance their development objectives. These may include higher spending on health, education, or infrastructure projects such as roads. Such areas of development have already been targeted with savings from reduced fossil fuel subsidies in Indonesia. Investment in health, human capital, and infrastructure not only improves outcomes in the specific spending areas, it can also help boost employment and growth (World Bank 2019b). Funding projects in these areas can therefore be part of a policy package that supports sustainable economic development.

Accessing finance for development is often a challenge, in part because developing countries have great difficulty in raising tax revenue from households and businesses. Many developing countries are able to collect only relatively low levels of taxes, in the range of 10–20 percent of GDP, whereas high-income countries collect closer to 40 percent of GDP (Besley and Persson 2014). This difference reflects in part the much larger informal sectors (covering activities outside the bounds of regulation and broader state control) of low-income countries compared with high-income countries. According to Schneider, Buehn, and Montenegro (2010), informal activity was around 42 percent of GDP in a sample of 31 low-income countries, compared with around 22 percent of GDP in a sample of 32 higher-income countries. In some countries, then, raising taxes in the formal economy, such as those on labor and capital, can have limited effectiveness.

Given these barriers in accessing finance, carbon pricing offers a useful revenue source to pursue a country's development goals. As discussed previously, carbon pricing can raise a significant amount of revenue in a relatively efficient way. **Box 12** highlights how Colombia has used carbon revenues to pursue its development objectives.

Carbon taxes can provide a relatively steady base of revenue for pursuing development objectives. As discussed in section 1.3.1, carbon tax revenues can be less cyclical than other forms of revenue, such as labor income taxes. The consumption of petroleum products in particular is highly demand-inelastic, meaning taxes on these fuels provide governments with revenues that are relatively unchanged

year-on-year (Li, Linn, and Muehlegger 2012). This presents a more stable source of revenue than labor taxes, for example, which are highly cyclical with economic activity. Carbon taxes may therefore be helpful for funding long-term projects over several years.

Climate change has impacts on all aspects of the economy and society, and several broader development objectives are closely linked with climate mitigation targets. The United Nations' Sustainable Development Goals (SDGs) encourage developing countries to approach economic development in a sustainable way, as this can lead to broader environmental benefits. For instance, investing in SDGs –which support health, water, ecosystems, education, and infrastructure– is likely to increase the resilience of economies to climate change (International Council for Science 2017). Conversely, addressing rising temperatures will mitigate the threat to food and water security, ecosystems, and infrastructure. Thus using revenues for sustainable economic development policies can bolster climate change resilience at a regional and global level.

BOX 12. Colombia: Using carbon tax revenues to pursue environmental and development objectives

Colombia's carbon tax was enacted in 2016 as part of a larger tax reform aimed at boosting productivity and generating revenues for the country's new development agenda. Carbon tax revenues are now being used to support the national peace process by financing environmental projects for post-conflict zones through the Colombia in Peace (Colombia en Paz) fund.

Operational since May 2017, Colombia's carbon tax applies to large upstream companies that produce or import liquid fossil fuels, and the National Planning Secretary (Departamento Nacional de Planeación) estimates that it reduced directly around 1 percent of the country's emissions in 2017. With a rate of Col$ 15,000/tCO2e, the tax generated Col$ 476 billion (US$ 161 million) in its first year of operation. Revenues from this carbon tax are earmarked for the Colombia in Peace fund. Benefiting as it does from certain budgetary autonomy, the fund supports reconstruction and long-term development goals. It grants carbon tax revenues to environmental projects in post-conflict zones, in accordance with guidelines from the Ministry of Environment and Sustainable Development.

One novel feature of the Colombian system is to allow the use of offset credits as a flexibility mechanism to meet the tax obligation. Colombia's government thus trades part of its expected revenues against national investment in low-carbon development projects, aligned with national priorities. While such offsets are often seen associated with emissions trading systems, this is one of the few examples of this type of flexibility mechanism applied to a tax. International certificates were accepted in the first year of operation (2017), but only national certificates are likely to be accepted in the coming years. Around 4 million offset credits were used in 2017, equivalent to Col$ 60 billion (US$ 22 million) in redirected revenues.

As with policies that support climate objectives, assigning funds to development objectives can be a relatively complex option for revenue use. Effective development policy requires research into the area to which spending funds are allocated. This option may also be associated with greater administrative costs for identifying and managing expenditure than alternative revenue use options discussed above. This is particularly the case if spending is of a new type that requires new institutions or administrative arrangements. To the extent that existing arrangements can be used, administrative costs will be lower, leaving a greater residual fund to spend on development.

1.8.4. Prevention of carbon leakage

A common concern around the adoption of carbon pricing is the potential threat to the competitiveness of domestic industry. There is a risk that businesses paying a carbon price may experience reduced profits or market share to competitors in other jurisdictions, particularly as much of the global market remains uncovered by carbon pricing. This situation can result in "carbon leakage"—that is, the shifting of carbon-intensive industrial production, investment, and operations from markets with carbon pricing systems to markets with less stringent carbon regulation. In turn, GHG emissions shift jurisdictions, which undermines the effectiveness of the policy because it leads to a lesser reduction in global emissions.

Addressing competitiveness concerns is crucial, as carbon leakage has the potential to undermine the efficiency and environmental aims of carbon pricing policies. Particularly for emissions-intensive, tradeexposed (EITE) companies, an inability to reduce carbon intensity in the short-term can lead to a loss of profitability, causing production to shift elsewhere. This shift in production to uncovered jurisdictions can limit a carbon pricing policy's effectiveness, reducing both the impact on global emissions and the total revenues raised by a carbon price. Addressing these concerns is also key to winning support or reducing opposition from businesses.

Competitiveness concerns can be addressed through several channels, such as free allocation of allowances, partial tax exemptions, and "feebates." In an ETS, the free allocation of carbon allowances involves forgoing revenue and is usually tied to the historic level of absolute emissions or a historical or technology benchmark for the emissions intensity of production. Providing free allowances on this basis can reduce or eliminate the initial burden of the carbon price while maintaining marginal incentives to reduce emissions. Tax exemptions can similarly reduce the initial burden of a carbon tax and also involve forgoing revenue. A "feebate" system, where revenue is raised from the most emissions-intensive businesses and returned to more efficient businesses, also maintains incentives and overall industry profitability. These policies aim to mitigate the impact of the carbon price on competitiveness in the short term, enabling firms to adjust business models and reducing the chance that production moves to an uncovered market. There is evidence that benchmarking is a preferred approach to managing leakage concerns while maintaining incentives for mitigation (PMR 2015). One advantage of this approach is that it is more targeted than the broader tax cuts discussed above and allows support to be channeled to sectors most at risk of competitiveness impacts. Hence these policies tend to be popular with businesses.

The introduction of an ETS tends to be accompanied by a free allocation of allowances to compensate firms for the initial costs of the carbon price and prevent carbon leakage. Free allocation of emissions allowances affects revenue, as allowances not provided free of charge are normally auctioned. Therefore, the greater the number of units freely allocated, the lower the level of revenue raised. Many emissions trading systems give a large share of allowances away freely. For example, the EU ETS freely allocates allowances, particularly to firms in EITE sectors that are vulnerable to carbon leakage. In the current trading period (Phase 3, 2013–2020), up to 43 percent of allowances will be available for free allocation. The Republic of Korea's ETS is freely allocating 97 percent of allowances in Phase 2 (2018–2020); 100 percent were free in Phase 1 (2015–2017). California's ETS also provides free allocation of around half of its allowances.

The implementation of a carbon tax also tends to include concessions for industries at risk of carbon leakage. The U.K. Climate Change Levy offers energy-intensive businesses exemptions of between 65 percent and 90 percent if they have entered into a Climate Change Agreement, signaling they are taking actions to reduce energy use and CO_2 emissions (HM Government 2019). Similarly, South Africa's carbon tax includes tax-free thresholds of up to 95 percent for EITE sectors (KPMG 2019). These thresholds will eventually be

phased out to reinforce the pricing signal while providing companies with valuable time to transition to new, lower-carbon business models. **Box 13** details the tax-free allowances used to address competitiveness concerns in South Africa's carbon tax.

Despite the benefits of initiatives to prevent carbon leakage, careful design is required to ensure measures do not offset the environmental aims of carbon pricing or provide businesses with windfall profits. Allocations must be carefully targeted to ensure they do not reduce the incentive for decarbonization. Some policies aimed at addressing competitiveness concerns may have led to windfall profits at the expense of forgone revenues. For instance, a study of the EU ETS found that over the 2008–2015 period, free allocation may have generated up to € 24 billion (US$ 26 billion) in windfall profits for EITE businesses, while auctioning of allowances worth over € 137 billion was forgone (US$ 145 billion) (Carbon Market Watch 2016). The potential for windfall profits points to the need for transparent evaluation mechanisms to ensure the effective use of carbon revenues.

BOX 13. South Africa: Revenue use planning for South Africa's carbon tax

In early 2019, the South African carbon tax was passed into law. This process was the culmination of an extensive history of debates that saw the publication of various papers inviting public comment, including a carbon tax discussion paper (South Africa National Treasury 2010), a carbon tax policy paper (South Africa National Treasury 2013), and a paper on carbon offsets (South Africa National Treasury 2014). The legislation includes a tax of thre 120/tCO2e (US$ 10/tCO2e), which will increase at the rate of inflation plus 2 percent yearly until 2022, and applies to all combustion, process, and fugitive GHG emissions.

This design includes various tax-free allowances to do the following:

- Account for competitiveness concerns in the forms of a maximum 10 percent tax-free allowance for trade-exposed sectors, based on emissions intensity benchmarks
- Ease the transition with a 60 percent basic tax-free threshold and an additional 10 percent tax-free allowance for process and fugitive emissions
- Incentivize investment in mitigation technologies (companies would be allowed to claim an emissions intensity-based performance allowance up to a maximum of 5 percent, compared to an appropriate sectoral benchmark), with a 5 percent or 10 percent allowance for mitigation actions
- Foster broad-based participation with a tax-free allowance of 5 percent for complying with carbon budget information requirements (Government of South Africa 2017)

The legislation caps the use of offsets at 10 percent of the carbon tax liability of covered entities. The national treasury estimates the effective carbon tax rate to be R 6–48/tCO2e (US$ 0.5–4.0/tCO2e) with tax-free allowances of 60–95 percent of the total liability.

South Africa usually applies a strict rule whereby fiscal revenues are not earmarked. However, several soft revenue recycling options were discussed for the carbon tax, including an energy efficiency savings tax incentive (implemented since 2013 and due to be extended beyond 2020 to align with the first Phase of the carbon tax), support for the installation of solar water heaters, improved free basic energy for low-income households, improved public passenger transport, and support for shifting freight from road to rail (Government of South Africa 2015).

The legislation also includes credits for payment of the electricity generation levy and the renewable energy premium against a company's carbon tax liability to ensure a neutral impact on electricity tariffs during the first Phase of the carbon tax (until 2022).

Many jurisdictions have implemented processes to determine which sectors require support. EITE industries are most relevant for support, as they are most at risk of losing production through leakage to other jurisdictions. Generally, the use of emissions intensity and trade-exposure thresholds is accepted as a good proxy for cost pass-through ability and therefore leakage risk. These thresholds have been adopted in various forms in ETSs, including those in the EU, California, Quebec, and New Zealand. However, identifying the exact threshold at which leakage may occur is challenging, as this depends on idiosyncratic factors at a facility or sector level.

Support for prevention of carbon leakage should be transitional, with policies phased out as companies adjust to the effects of carbon pricing. Protecting against carbon leakage is important in a world with uneven carbon prices, but these policies can be phased out as other jurisdictions implement similar levels of carbon pricing (PMR 2015).

To date, evidence of carbon leakage has been limited (Pigato 2019). This evidence comes primarily from U.S. and European studies, as there is a small share of literature in developing countries. This does not mean that it will not prove a challenge in the future, and it remains important to consider the design, scale, and transition arrangements associated with policies to address carbon leakage.

Further discussion regarding policies to address carbon leakage risk is provided in the technical note on carbon leakage by the Partnership for Market Readiness (PMR 2015).

1.8.5. Assistance for individuals, households, or businesses

Carbon pricing can increase the costs of certain goods and have disproportionate impacts on particular income groups, sectors, or regions. Carbon revenues are often used to compensate those affected through direct cash transfers, subsidies, or support for retraining.

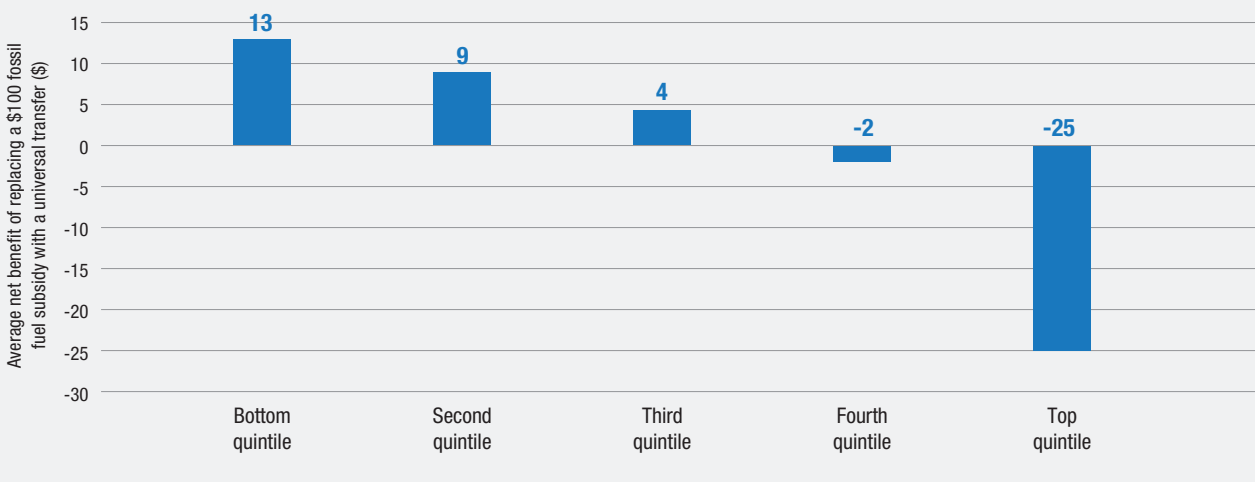
The impact of a carbon price can be regressive if energy costs make up a larger share of income in low-income households than in high-income households. If lower-income households spend a greater proportion of their incomes on energy services (including heating, lighting, transport, and refrigeration) than higher-income households, the increased costs of energy consumption and transport will have regressive impacts. A study of energy taxes in 21 OECD countries finds mixed evidence on regressive impacts (Flues and Thomas 2015). Taxes on heating fuels are slightly regressive, while electricity taxes are clearly regressive. However, taxes on transport fuels are not typically found to be regressive, as poorer households are less likely to use transport fuels.

Individual country demographics can affect the distributional impacts of carbon pricing. For example, a study found that the impact of a Can$ 30 (US$ 22) carbon price was roughly distribution neutral, a result corroborated by a recent IMF study (Ecofiscal Commission Canada 2016; IMF 2019). The IMF paper includes distributional analysis of a hypothetical carbon price across several countries, with regressive impacts in China and the United States driven by the impact of energy prices, due to a relatively more emissions-intensive energy sector than in Canada, for example. Conversely, in India, the level of car ownership and access to electricity is low among the lowest-income earners. Therefore, an increase in energy prices may have a progressive impact by absorbing a larger share of income from high-income households (Pigato 2019). Transport taxes can also have regionally unequal impacts, as households in rural areas typically spend a greater share of income on fuel (Titheridge *et al.* 2014).

Governments may choose to use carbon revenues to compensate low-income households if they have been adversely affected by a carbon price. This is often done through cash transfers to low-income earners, but it may also occur through other means like subsidies for low-carbon energy, public transport, or sustainable housing. For example, Regional Greenhouse Gas Initiative (RGGI) revenues have also been used to offer low-income customers assistance with electricity bills and to fund job-training programs (RGGI Inc. 2018). There can also be overlaps with other revenue use options. For example, investment in energy efficiency measures (as discussed in section 1.8.1 can reduce the impact of increased energy prices on energy bills for affected consumers. This policy has proved a popular revenue use in the RGGI, with almost US$ 2 billion invested in 2014 (Ceres 2016).

Research into fossil fuel subsidy reforms in developing countries shows that these policies can be progressive when combined with universal cash transfers. Fossil fuel subsidy reforms can provide valuable lessons for carbon pricing implementation. Subsidies effectively place a negative price on emissions, and their reduction is seen by some as an essential step toward carbon pricing (CPLC 2017; Vivid Economics and ODI n.d.). **Figure 9** shows that reducing fossil fuel subsidies by US$ 100 per capita combined with offering universal cash transfers could increase the average income of the bottom quintile by US$ 13.

FIGURE 9. Increase in equity as a result of replacing fossil fuel subsidies with cash transfers



Source: Arze del Granado, Coady, and Gillingham 2012.

Policy- and jurisdiction-specific factors need to be considered when seeking to redistribute revenues to those most negatively impacted by the carbon price. For example, only 6 percent of gasoline and diesel subsidies benefit the bottom income quintile, according to a survey of African and Asian countries conducted by the International Energy Agency (IEA) (Arze del Granado, Coady, and Gillingham 2012). **Box 14** outlines the experience of a large direct benefit policy undertaken in India following a reduction in fuel subsidies.

Further lessons from fossil fuel subsidy reforms can be found in the World Bank's note on Utilizing Social Safety Nets to Mitigate the Impact of Reform (Yemtsov and Moubarak 2018).

BOX 14. India: Implementing the world's largest direct benefit program for vulnerable households

In 2014, the Indian government moved to eliminate all diesel subsidies by fiscal year 2015/16 and implemented a tax on produced and imported coal of around Rs 400/t (US$ 3.29/t) (IEA 2015; Whitley and van der Burg 2015). LPG (liquid petroleum gas) and kerosene price supports were cut in January 2015. The total estimated oil and gas subsidies in India decreased 78 percent in three years, from Rs 1,578 billion (US$ 26 billion) in fiscal year 2013/14 to Rs 347 billion (US$ 5 billion) in 2016/17 (GSI-IISD 2017).

Savings from these reforms made it possible to implement the world's largest direct benefit transfers program for vulnerable households, namely the Pratyaksh Hanstantrit Labh (PAHAL). Initially implemented at reduced scale in 2013 and extended nationwide in January 2015, PAHAL has subsidized natural gas and LPG for cooking by directly transferring refunds to each consumer's bank account. To avoid diversion of the subsidies and double counting, biometric identity cards have been issued to link each consumer to their bank account (GSI-IISD 2017; IEA 2015).

Although the compensation program linked the receipt of the subsidy to fuel consumption, direct benefit transfers were considered preferable to direct cash transfers, as the latter would be less accessible to women, who are responsible for most LPG purchases in India. The initial version of the program also failed to target specific beneficiaries: in 2016, Prime Minister Modi called for high-income households to give up their subsidies, which resulted in 11 million Indians—around 7 percent of the total customer base—voluntarily relinquishing their subsidies. This step saved the exchequer over Rs 23 billion (US$ 350 million) per year. Moreover, 36 million illegal beneficiaries had their connections deactivated, which alone led to savings of nearly Rs 300 billion (US$ 4.6 billion) in cooking gas subsidies over the last three financial years (GSI-IISD 2018; Mittal, Mukherjee and Gelb 2017; Whitley and van der Burg 2015).

The Indian government estimates that, by mid-2017, the PAHAL program resulted in 199 million verified active domestic LPG connections. The PAHAL program was supplemented in 2016 by the Ujjwala program, which aims to provide 50 million free LPG connections to low-income households by 2019 and to ensure universal access to clean cooking by 2022. The country also recently announced ambitions to reduce its remaining excise duty exemptions on domestic LPG and kerosene, while extending the targeted direct benefit transfer to other fossil fuels (GSI-IISD 2018; Mittal *et al.* 2017; Whitley and van der Burg 2015).

Cash transfers have also been employed in developed economies. Box 15 outlines the redistributive policies introduced in Switzerland following the introduction of a carbon levy. These policies had a somewhat different focus from those employed in India, as revenue from the carbon price was funneled into lower social security payments for businesses and lower health insurance premiums for households. Compensation was thus universal rather than targeted at those most affected by carbon pricing.

BOX 15. Switzerland: Redistributing revenues to households and businesses through direct Transfers

Switzerland's CO_2 levy was introduced in 2008 and covers around 36 percent of the country's greenhouse gas emissions, mainly in the heating and power generation sectors (World Bank 2018).

The levy rate is linked to compliance with mitigation targets: if CO_2 emissions in a given year exceed the annual target, the levy rate is raised (Betz, Leu, and Schleiniger 2015). The Swiss Federal Office for the Environment (FOEN), which administers the CO2 levy, is expecting carbon levy revenues of some Sw F 1.2 billion (US$ 1.2 billion) in 2018.

One-third of revenues is earmarked for green spending and goes to reduce energy use in the building sector. The remaining two-thirds (except for a small funding for the national technology fund) is redistributed annually to households and businesses (FOEN 2018). The share of revenues that goes to businesses funds reductions in social security payments for the Old-Age Insurance System (PMR 2017b).

The remainder is redistributed uniformly to all Swiss residents via lower health insurance premiums, regardless of their income or consumption. Health insurers oversee this distribution (basic health insurance is compulsory in Switzerland). Given that this system is already in place, so that the amount each individual receives is merely settled against health insurance premiums, such a policy guarantees low additional administrative costs (CPLC 2016).

In 2018, each Swiss resident received Sw F 88.8 (US$ 89) via this yearly lump-sum rebate (FOEN 2018).

Studies conducted in developed countries suggest that targeted cash transfers using just a fraction of the revenues raised can be used to address adverse distributional impacts of carbon pricing and result in a progressive policy overall. Berry (2018) examined this question in France using a micro-simulation model. This work suggested that the French carbon tax could be made progressive if 17 percent of the revenues are distributed via cash transfers to low-income households. One study in the U.S found that redirecting 15 percent of revenues from a hypothetical carbon tax toward the poorest 20 percent of households would already make them no worse off (Morris and Mathur 2014). Note that carbon revenues can also be used to compensate households using tax cuts (as discussed in section 4.2.1), but this option may not benefit those earning below a jurisdiction's tax-free threshold.

Targeted transfers for the purposes of compensation have several benefits. First, they can address the impact on low-income households that can occur under a carbon price, while also advancing the government's equity objectives. Second, there is survey evidence to suggest these policies are popular with wider sections of society (Carattini *et al.* 2018). Finally, as transfers are often in cash form or incorporated into existing government systems, the administrative costs of transfers are relatively low, making this a relatively cost-effective policy.

However, targeted transfer programs can be difficult to design effectively. One challenge is that designing compensation programs to target those most affected by carbon pricing may depend on geographic criteria in addition to income criteria. The infrastructure for electronic cash transfers in developing countries provides an additional challenge, as it may be insufficient to allocate direct transfers at low cost. Experiences from Kenya highlight some of the difficulties, with problems around payment registration, timeliness and disparity across participants (Langat, 2019). However, examples of successful electronic cash transfer programs such as Brazil and Indonesia highlight good practice examples for implementing this option, with the use of mobile money a recent example of the supportive power of newer technologies (Dominioni & Heine, 2019). Increasing use of electronic cash transfers in developing countries and widespread uptake of mobile money accounts suggest that technology could make targeted transfer programs simpler and more efficient in future.

It may also be the case that direct transfers lead to greater distortions than tax cuts. Income tax cuts can provide a greater incentive to increase an individual's labor supply, while transfers can potentially provide a disincentive. If households have a greater disincentive to work, this could in turn reduce labor force participation and have a negative impact on economic growth. However, evidence for this effect is limited, as cash transfer programs without a specific employment focus show little or no negative effect on working-age employment in low- and middle-income countries (Baird, McKenzie, and Özler 2018).

Revenues can also be employed to assist with the transition of sectors or regions that are highly affected by a carbon price. Some regions will be better placed to deal with the impact of carbon pricing than others. For instance, more diversified regions with lower rates of unemployment and more substitutable skills will be better able to transition displaced workers to other types of employment. To alleviate the negative impact on sectors or regions that are less able to transition to a lower-carbon economy, there is a range of policies that can be used. Such policies can address the immediate income effects associated with business closure (both for the firms and for the employees) and can also offer support for skills development or job-seek programs to help with the transition.

One example of a supported transition comes from Germany's ongoing efforts to manage potential social impacts of the phasedown of its coal consumption. Germany is currently implementing a plan to Phase out coal production (Federal *Ministry* for the Environment, *Nature Conservation* and *Nuclear Safety* 2019). To manage the impact of this phasedown, Germany implemented a variety of supportive policies, including early retirement support, retraining programs, and support for economic development. The success of these policies indicates that early planning is important, that affected workers should be involved in the planning, and that structural support should be offered to affected regions and workers rather than companies to ensure transition toward more efficient and sustainable industries.

Support for affected businesses and communities can also improve the perceived fairness of carbon pricing. For instance, supporting coal miners affected by the implementation of a carbon pricing instrument was found to be popular in the United States, with a recent survey suggesting that over 70 percent of people support using carbon revenues to further the transition of the coal industry (Kotchen, Turk, and Leiserowitz 2017). It is important to manage the potentially large administrative burden that can be associated with these policies, and to target assistance to the training and skills needed to support worker transition to other forms of employment.

1.8.6. Debt reduction

In the absence of tax reforms or increased spending, revenues can be used to reduce budget deficits and pay down the existing stock of debt. Public debt represents a burden on the economy —interest payments reduce the amount of revenues available for investment in public capital or tax reductions—and it increases the negative impacts a shock such as a financial crisis would have (Ostry, Ghosh, and Espinoza 2015). By reducing the public debt, countries can free up resources in future periods.

Box 16 outlines the case of Ireland's carbon tax, which provided revenues as part of Ireland's bailout plan.

BOX 16. Ireland: A carbon tax designed to raise revenues for the general budget

Implemented in 2010, Ireland's carbon tax complements the EU ETS by targeting residential and commercial uses of oil, natural gas, and solid fossil fuels that the EU ETS does not cover. Since May 2014, the carbon tax has covered around 50 percent of greenhouse gas emissions with a rate of €20/tCO_2e (World Bank, Ecofys, and Vivid Economics 2017).

Ireland's carbon tax is an environmental tax that supports climate change policy; the revenues it raises help pay for the negative externalities caused by CO_2 emissions from transport and the heating of dwellings. But it has also played an important role in raising revenue.

Ireland's carbon tax revenues have risen steadily over time, along with the successive increases in the tax rate and the expansion of the tax base, from €223 million (US$ 274 million) in 2010 to €434 million (US$ 533 million) in 2016 (Central Statistics Office of Ireland 2017). Between 2010 and 2012, the Irish government received financial aid from the European Commission under the conditions of increased fiscal prudence and debt reduction policies (the Economic Adjustment Plan for Ireland). The carbon tax contributed 20–25 percent of the tax hikes required under this bailout plan, prevented an additional surge in labor taxes, and contributed to a 7 percent decrease in Ireland's greenhouse gas emissions in 2011 while the economy was slowly growing (Convery, Dunne, and Joyce 2013; PMR 2017a; South Africa National Treasury 2013).

However, debt reduction doesn't address short-term objectives of policy regarding equity, efficiency, and carbon leakage. Reducing the deficit acts as an intergenerational transfer by increasing the welfare of future generations, but it does not address equity concerns that may arise in the short term due to carbon pricing. In addition, it makes no immediate improvement to the economy's efficiency, as for example tax reform does.

In addition, debt reduction is less transparent than other options for revenue use and is less aligned with the environmental aims of carbon pricing. Like funds for general budget allocation, funds directed to debt reduction cannot be communicated as clearly as more tangible spending and tax decisions, and debt reduction's policy coherence with the broader aims of carbon pricing is limited. In light of these issues, debt reduction may be a less attractive option for voters than alternative revenue use options.

Examples of debt reduction in developing countries are limited, but experience with fossil fuel subsidy reform provides a useful analogy, as demonstrated by Indonesia's experience, outlined in box 17.

BOX 17. Indonesia: Reducing the deficit through fossil fuel subsidy reform

Indonesia's fossil fuel subsidies represented up to 10 percent of the country's expenditures between 2005 and 2014. The government implemented more than 10 energy price reforms in the period 1998–2015:

- In 2005, a major reform led to price increases of 149 percent for gasoline, 161 percent for diesel, and 186 percent for kerosene, bringing fuel prices within range of international levels and reducing the state deficit by Rp 43 trillion (US$ 4.5 billion) in 2005 and Rp 91 trillion (US$ 10 billion) in 2006.
- The 2013 diesel and gasoline subsidy reform generated fiscal savings of Rp 39 trillion (US$ 3.5 billion) in 2013 and Rp 86 trillion in 2014 (US$ 7.5 billion) in 2014.
- Starting in January 2015, Indonesia also removed all gasoline subsidies [a] and changed fixed diesel prices for a per liter subsidy. Combined with the fall of global oil prices, this measure saved Rp 211 trillion (US$ 15.6 billion), or 10.6 percent of annual public spending.

Assessing the impacts of this reallocation of public expenditures may take several years, yet the savings have already contributed to the government's budget and have improved its ability to fund social programs.

a. Except for distribution costs outside the Java-Madura-Bali area.

1.9. Overview of options

A jurisdiction's choice of how to use carbon revenues will reflect the government's objectives and local context, yet there are general considerations that are common across potential uses. As discussed in sections 1.6.1 and 1.7, legislative or other constraints may require jurisdictions to spend their revenues in certain ways and discourage the use of others. However, most jurisdictions have used their revenues to fund a package of spending priorities, and many have earmarked or more commonly hypothecated revenues to specific options.

Existing examples of revenue use also reveal the interactions between potential revenue uses, which enable jurisdictions to develop packages whose policies are mutually reinforcing. For instance, California's use of carbon revenues to finance energy efficiency investments is aimed at low-income earners, simultaneously targeting climate and equity objectives. Similarly, the EU's earmarking of revenues for its innovation fund seeks to support emissions reductions while increasing the competitiveness of energy-intensive industries.

In Australia, the *Garnaut* review recommended a combination of the above revenue options for Australia's carbon pricing system (Garnaut 2011): almost half of total carbon revenues were to be used for tax reform, a quarter to address carbon leakage, and the remainder split between compensation of low- and middle-income earners and support for low-carbon innovation. While the appropriate allocation across different use options is likely to differ substantially across different countries based on national objectives and characteristics, this exercise for Australia demonstrates how revenue use options can complement each other and help a government achieve multiple aims.

Table 2 **describes how each of the revenue use options identified in section 4 aligns with the fiscal policy objectives outlined in section 3 (we have added the important political dimension of acceptability). This is designed to assist policy makers in achieving specific goals.**

TABLE 2. Alignment of carbon revenue use options with fiscal objectives

Revenue use	Efficiency	Long-run growth
Tax reform	Tax reform can reduce the burden of distortionary taxes such as labor taxation, increasing economic efficiency and reducing the size of the informal sector.	Tax reform could encourage spending on investment and innovation, boosting long-run growth prospects.
Climate mitigation	Addressing non-market barriers can achieve the environmental objectives of carbon pricing more efficiently than carbon pricing alone, but some uses may have high administrative costs relative to alternative revenue use options.	Investing in environmental technologies encourages sustainable development and may make an economy more resilient to shocks.
Pursuit of other development objectives	Carbon pricing offers an efficient way to fund development goals, particularly for developing countries that may struggle to raise funds elsewhere. Broader development spending can boost efficiency by addressing market failures.	Development objectives can enhance education and health outcomes, which can boost the long-term productivity of an economy.
Prevention of carbon leakage	Preventing carbon leakage can avoid inefficient economic and climate outcomes, but careful design is required to avoid undermining carbon pricing's climate objectives, and identifying sectors at risk can be difficult.	Helping affected industries adapt to carbon pricing can encourage long-run investment in low-carbon technologies.
Assistance for individuals, households, or businesses	This assistance has low administrative costs if existing allocation structures are in place. There is also little evidence to suggest that it leads to a reduction in the labor supply.	Compensation for affected groups may enable them to invest in human capital or other productive capacity.
Debt reduction	Debt reduction can boost an economy's efficiency under financial crises.	Reducing debt increases future spending power.

Revenue use	Equity	Acceptability
Tax reform	While less targeted than direct transfers, cutting regressive taxes can have positive impacts on equity.	Tax cuts are less visible than some alternative policies but have proven popular in practice, especially those to salient taxes such as income or sales taxes, or if revenue neutral.
Climate mitigation	Equity is not directly affected by climate-related policies, but some environmental programs may deliver equity co-benefits.	By aligning with the environmental goals of carbon pricing, the benefits of funding climate-related policies can be easily communicated and particularly popular among populations where climate change is of high concern.
Pursuit of other development objectives	By targeting programs that benefit low-income households, development spending can reduce inequality.	Linking revenues to popular projects and desirable outcomes can increase the acceptability of carbon pricing, but there is limited policy coherence with the environmental aims of carbon pricing.
Prevention of carbon leakage	Targeting affected industries can protect jobs at risk, often in poor regions, but can be perceived as unfairly supporting certain industries.	While likely popular with affected sectors, if support is perceived to undermine climate goals it could be unpopular with some groups. Communication around carbon leakage is therefore of great importance.
Assistance for individuals, households, or businesses	Redistribution to low-income households or affected workers directly reduces inequality.	Reducing inequality is broadly a popular policy, though popularity varies across different jurisdictions.
Debt reduction	Debt reduction acts as a transfer to future generations.	Reducing debt may be relatively unpopular as it has limited immediate benefits for voters.

Conclusions

It is becoming increasingly important for governments to consider how to use the revenues generated from carbon pricing most effectively. The impact of carbon pricing is determined not only by the price itself but also by the use of its revenues, as these can support further climate mitigation, industry competitiveness, and pursuit of other economic and development objectives. It is therefore crucial that from the outset of developing their carbon pricing policies, governments incorporate carbon revenues into their fiscal policy framework. In cases where existing revenue structures are not in place, there may be a need for new governance arrangements, with revenues potentially overseen by a cross-ministerial committee or an independent board. Policy makers must then choose how to spend this revenue in order to achieve their broader objectives, including considerations around efficiency, equity, long-run growth, and public acceptance.

One key consideration relates to whether carbon revenues are allocated to the general budget or tied to specific policies. A large proportion of global revenues have been allocated to the general budget (37 percent in 2017/18), with countries (such as Chile and Mexico) channeling all their carbon revenues to the general budget. Channeling revenue into the general budget provides greater flexibility in its subsequent use, but the lack of visibility around the ultimate spending allocation can lead to a lower level of public acceptance than when the tie between revenue and a specific program is evident. Hence some other jurisdictions (such as the EU, Japan, and California) have chosen to earmark or hypothecate the majority (or all) of their revenues for specific purposes. Earmarking presents challenges of its own, such as the potential for funding gaps if revenues are lower than anticipated.

Country-specific circumstances will determine appropriate use of revenues, but there are general considerations for policy makers when assessing options for revenue use:

- 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 and can be less visible than spending options; hence this option may not be favored by the public.
- 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.
- 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 through overcompensation or dampening the incentive to reduce emissions.
- Compensating individuals, households, and businesses through direct transfers can also reduce the negative impacts of carbon pricing and has garnered public support. Transferring only a small proportion of the revenues to poorer groups can result in net gains for those groups and a progressive policy overall.
- 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.

Of reported revenue uses, funding for climate and development projects has been the most widely adopted. Analysis of the available revenue data for 2017 and 2018 showed that around 53 percent of revenue was allocated toward climate-related policies or development objectives. The next largest share went to tax cuts and direct transfers, which made up around 6 percent and 3 percent of revenues respectively. Funding for deficit reduction remained the least popular option, although this is difficult to identify. Finally, while efforts to address carbon leakage tend to reflect revenues forgone from free allocations or tax exemptions, they would make up a large proportion of revenue usage were they to be included.

In practice, individual countries tend to implement a package of spending initiatives. For instance, the revenues earned from the EU ETS have been split between support for climate projects, assistance to support industry competitiveness, and other uses often channeled through general revenues. In Switzerland, revenues from the ETS and carbon tax have been funneled toward direct transfers, climate and development projects, and support for competitiveness via free allowances. In British Columbia, revenues from the carbon tax are largely used to fund tax cuts, although a small portion also goes toward climate and development spending. The appropriate package of policies and programs will differ based on country-specific factors, and the mix of these uses may also evolve over time.

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