Tax Policy and Climate Change

IMF/OECD REPORT FOR THE G20 FINANCE MINISTERS AND CENTRAL BANK GOVERNORS

September 2021, Italy

Tax Policy and Climate Change

IMF/OECD Report for the G20 Finance Ministers and Central Bank Governors

September 2021, Italy

This work is jointly published under the responsibility of the Secretary-General of the OECD and the Managing Director of the International Monetary Fund (IMF). The opinions expressed and arguments employed herein do not necessarily reflect the official views of the OECD or the IMF or of the governments of their respective member countries.

Please cite this report as

IMF/OECD (2021), *Tax Policy and Climate Change: IMF/OECD Report for the G20 Finance Ministers and Central Bank Governors, September 2021, Italy*, www.oecd.org/tax/tax-policy/imf-oecd-g20-report-tax-policy-and-climate-change.htm

Photo credits: Cover © Shutterstock/Peshkova

Table of contents

FIGURES

TABLES

Overview

A progressive transition to net zero greenhouse gas emissions by around the middle of the century is essential for containing the risks of dangerous climate change. Limiting global warming to 1.5°-2°C, the central goal of the 2015 Paris Agreement, will require climate policy packages that drive transformative changes in production and consumption patterns.

Current emissions commitments and policies fall short of the ambitious policy action that is needed (see Annex A). Global carbon dioxide (CO_2) and other greenhouse gases must be cut by a quarter to a half below 2019 levels by 2030 to put the world on an emissions pathway consistent with climate stabilisation targets. Parties to the 2015 Paris Agreement are in the process of submitting revised mitigation commitments in their Nationally Determined Contributions (NDCs) ahead of COP26 in November 2021. Many are announcing emission neutrality targets by mid-century, though at present many intermediate emissions targets for 2030 are not aligned with these longer run neutrality goals. Much stronger policy action is needed—containing temperature rises to below 2°C will require a global explicit carbon price or measures resulting in an equivalent implicit carbon price, on top of existing policies, rising to around USD 75 per tonne of CO_2 or more by 2030 and increasing further beyond 2030.[1] In many cases, the policies announced or implemented by countries to date are only scratching the surface of what is needed to implement intermediate, and ultimately net zero, emissions targets.

While some policies apply an explicit price to carbon emissions, other policies have the effect of creating an implicit price, with policy mixes depending on countries' specific economic circumstances. Carbon taxes and emissions trading systems result in explicit carbon prices. Some taxes on energy use, regulations that discourage carbon emissions and subsidies for low or zero carbon technologies or behaviours result in implicit carbon prices. Most jurisdictions deploy a range of both implicit and explicit price instruments, with the policy mix depending on their specific circumstances such as the level of economic development or the availability of and access to clean technologies. A key challenge at the domestic level is to balance explicit carbon pricing and other reinforcing sectoral instruments, like feebates and regulations, which can be less efficient but likely have greater public acceptability due to their smaller or less direct impact on energy prices. Other supporting elements include public investment and technology policies; productive and equitable use of carbon pricing revenues; just transition assistance for vulnerable households, workers, and regions; measures to address industrial competitiveness; and pricing schemes or other mitigation policies for broader greenhouse gas emissions.

Explicit pricing of greenhouse gases, including carbon, is particularly conducive to cost-effective climate change mitigation, provided that it is inclusive and supports economic development. Pricing could be applied to all greenhouse gases in principle but in practice is being applied principally to

[1]See IMF (2019), *Fiscal Monitor: How to Mitigate Climate Change* and N. Stern and J. Stiglitz (2017), *Report of the High-Level Commission on Carbon Pricing*, Carbon Pricing Leadership Coalition, World Bank Group.

carbon emissions. While countries have multiple mitigation instruments available to them, explicit carbon pricing is the only instrument that automatically promotes all mitigation opportunities, and strikes a cost-effective balance across these responses. At present, many of the cheapest energy sources generate high carbon emissions, but the harm to the climate is not reflected in their price. Implicit carbon prices are less visible than explicit prices, but they tend to be higher per unit of emissions reduction and they do not raise government revenue and, in some cases, require additional government expenditure.

To achieve maximum cost-effectiveness, explicit pricing should comprehensively cover fossil fuel and process emissions across the power, industry, transport, and building sectors, and other sources where practical. Synergies between phasing out fossil fuel subsidies and explicit carbon pricing should be exploited. Among other strengths (see Box 1), a robust and rising carbon price helps to mobilise private finance for mitigation investment and drive innovation in low-carbon alternative energy sources and processes, while at the same time being a valuable source of revenue. Where practical, pricing could be extended to other emissions sources, for example, fugitive emissions from extractives, net emissions from land use change, and agriculture, as emissions monitoring capacity is developed or on a proxy basis (i.e., based on outputs and default emission rates).

Judicious use of explicit carbon pricing revenues can make climate policy more inclusive and effective while containing the costs of clean energy transitions to the economy. Increasing explicit carbon prices within a broader policy package that cushions adverse impacts by delivering immediate benefits to vulnerable households, workers, firms and regions, can increase the chances of successful implementation. Appropriate revenue use will depend on countries' specific circumstances, but where revenues are used to lower burdensome taxes on labour income, or boost productive investment, this provides a benefit to the economy that counteracts the harmful effects of higher energy prices.

Carbon prices – implicit or explicit – today are well below the levels that will be needed to drive decarbonisation and meet the objectives of the Paris Agreement. Recent analysis on explicit prices from carbon taxes and emissions trading systems and implicit prices from taxes on energy use, shows that around 60% of CO_2-emissions from energy use across OECD and G20 countries are not subject to a either a carbon tax, emissions trading system or fuel excise tax[2]. Rates are lowest in the industry and electricity sectors, and are further weakened by fossil fuel support and where free permit allocation rules provide an advantage to carbon-intensive technologies. While the level of increased policy action needed varies from country to country, depending upon their level of ambition, energy mixes, and different starting points, reaching the emissions abatement objectives defined in nationally determined contributions (NDCs) requires measures equivalent to explicit carbon price increases of around USD 75/tCO_2 or more by 2030 in the majority of G20 countries (see below).

At the international level, action to scale up explicit carbon pricing is hampered by concerns about competitiveness, "carbon leakage" and free-riding, which underscores the importance of international cooperation.[3] Existing measures to address competitiveness and leakage impacts of explicit carbon pricing (e.g., free allowance allocations) become less effective with deeper decarbonisation. Unilateral action to scale up carbon pricing and mitigation effort may also be deterred if countries are concerned that others may free ride and not enact sufficient mitigation measures. Pressure for border carbon adjustments (BCAs) to address competitiveness and leakage concerns is emerging with greater dispersion in explicit carbon prices across jurisdictions for carbon-intensive and trade-exposed sectors. BCAs are sometimes thought to create incentives to introduce explicit carbon prices in jurisdictions where

[2] OECD (2021), Effective Carbon Rates 2021: Pricing Carbon Emissions through Taxes and Emissions Trading. OECD Publishing, Paris, http://oe.cd/ECR2021.

[3] Carbon leakage, whereby foreign emissions increase because of the introduction of domestic climate policies, weakens the effectiveness of climate policies at reducing global emissions. It can also undermine political support for the implementation of climate policies.

they do not yet exist. However, their effectiveness at scaling up global mitigation is limited, as they price only the small fraction of emissions embodied in traded products. International coordination, for example over minimum carbon prices, is potentially effective, though coordination needs to be equitable (accounting for countries differentiated responsibilities and respective capabilities) and pragmatic (recognizing national circumstances), meaning also that it may need to take a broader view of mitigation efforts, by considering both explicit and implicit carbon prices.

There is a need for improved measurement of different mitigation policy instruments and approaches. At the G20 High Level Tax Symposium held in Venice on 9 July 2020, Ministers observed a relative dearth of comparable data on the stringency of greenhouse gas mitigation policies across countries where these take the form of implicit carbon prices. Explicit carbon prices are relatively well mapped and understood, but in order to achieve a more complete picture of the state of mitigation policies for the purposes of cross-country comparisons, a stocktake of mitigation policies other than through explicit pricing instruments is needed, and where possible their implicit carbon-price equivalent estimated.

With G20 countries accounting for around 80% of greenhouse gas emissions, the G20 Finance Track is well placed to take forward a structured and systematic dialogue on the role of implicit and explicit carbon pricing that can facilitate greater cooperation among G20 members. With their ability to consider jointly the incentive, fiscal, and international coordination aspects of the policy challenge, G20 Finance Ministers and Central Bank Governors (FMCBG) have the potential to promote the use of pricing and supporting measures and ensure a better alignment between mitigation policies and decarbonisation goals. Such action would support ongoing efforts by G20 Energy and Environment Ministers, along with G20 Sherpas, to spur fossil fuel subsidy reform.

The G20 is also well placed to ensure the coherence of mitigation policies differentiated across countries, taking into account that the ultimate collective goal of net-zero emissions can only be reached with patterns and speed of adjustment that align with country-specific circumstances. Developing and sharing metrics and indicators on policy approaches is a pre-requisite to paving the way for common approaches at the international level. Assessing the relative merits of different responses to negative international spillovers – ranging from “carbon border adjustment mechanisms” to “carbon pricing floor agreements” and broader “climate clubs” – will help to strengthen cooperation with a view towards reaching our common climate goals.

Box 1. Strengths of explicit carbon pricing

Explicit carbon pricing:

- **Provides across-the-board incentives for firms and households to reduce carbon-intensive energy use and shift to cleaner fuels:** This occurs as carbon pricing increases the price of carbon-intensive fuels, electricity, and consumer goods produced with such fuels and electricity.
- **Provides the essential price signal for mobilising private investment in clean technologies:** Pricing levels the playing field for emissions-saving technologies and helps to avoid lock-in of fossil fuel intensive investments (like coal generation plants), contributing to cost-effective abatement.
- **Is more flexible than regulatory approaches:** Unlike energy efficiency standards and other regulations, prices leave households and businesses a wide range of choices on how to cut

emissions. This greater flexibility reduces costs because the government is generally less well informed about the options available to emitters, particularly where different emitters would prefer different responses.

- **Provides ongoing mitigation incentives:** In the case of some policy tools, such as standards, the pressure to reduce emissions disappears once compliance with a standard is reached, whereas prices continue to induce mitigation effort as long as emissions are positive.
- **Reduces rebound effects:** Some instruments, such as energy efficiency standards, lead to increased energy usage. For example, improving the energy efficiency of an air-conditioning unit makes it cheaper to run and may therefore result in it being used more often, undoing some of the energy savings from the efficiency improvement, unless the price of energy use or of the emissions from energy use increase simultaneously.
- **Mobilises government revenue:** Unlike most other mitigation instruments, carbon pricing raises government revenues, and administrative costs of revenue collection can be lower than for many other fiscal instruments.
- **Generates domestic environmental co-benefits like reductions in local air pollution mortality:** Pricing carbon, like other mitigation instruments, results in cleaner air, which is a tangible and immediate benefit of reduced combustion of coal and motor fuels, especially in metropolitan areas.

The G20 Finance Ministers are well placed to advance a dialogue on various forms of pricing of greenhouse gases and broader climate mitigation policy mixes. To support an ongoing G20 dialogue on emissions pricing, Ministers may wish to request:

- improved measurement of countries' principal greenhouse gas mitigation policy responses through:
    - continued monitoring of explicit carbon pricing policies, including carbon taxes and emissions trading systems, and implicit carbon prices resulting from energy taxes and fossil fuel subsidies;
    - extending such monitoring by mapping and developing of new tools and indicators for the improved monitoring of economies' principal implicit carbon pricing policies (e.g., energy efficiency standards, emission regulations, feebates, clean energy subsidies, taxes on individual fuels, sectoral-based emissions pricing);
- sharing metrics and indicators for measuring countries carbon footprints;
- regular updates on implicit and explicit pricing measures consistent with countries' mitigation pledges and the impacts of pricing (e.g., on emissions, revenue, local air pollution mortality, economic welfare, energy prices);
- analysis of the incidence of energy price changes on households, industries, and employment in vulnerable sectors and regions, and of assistance measures designed to alleviate adverse consequences;
- dialogue on mechanisms to promote coordination, e.g. on minimum emissions pricing and on mitigation policy packages more broadly, among G20 members;
- exploring other areas of collaboration to elevate the role of emissions pricing in the transition to carbon neutrality, taking into account countries' different starting points and contexts, and avoiding

negative spill-overs on trade relations, including proposals for climate clubs or an Inclusive Framework;

- discussion of the role of border carbon adjustments (BCAs) including their pros and cons versus other compensation measures; and
- further analysis of the potential impacts of rising disparities in carbon prices on carbon leakage and on countries' imports, exports, output and employment.

The rest of this note provides: (i) a stocktake of the carbon prices from carbon taxes, emissions trading systems and fuel taxes today; (ii) an assessment of the extent to which explicit carbon pricing or equivalent mitigation policies are needed, and their environmental and broader economic impacts; (iii) a discussion of comprehensive mitigation strategies; and (iv) a discussion of BCAs, international price coordination, climate clubs, and an Inclusive Framework.

Stocktake: Effective carbon rates in OECD and G20 countries

Policymakers seeking to price carbon explicitly can use carbon taxes or emissions trading systems. In addition, fuel excise taxes *de facto* result in an implicit carbon price, even if the rationale for these taxes may not be principally climate-related and the tax rate often is not aligned with each fuel's carbon content. Furthermore, fossil fuel subsidies can effectively lower carbon prices.

Current carbon price signals are often too low and poorly aligned with fuels' carbon content. A stocktake of the effective carbon rates resulting from fuel excise taxes (an implicit carbon price), and explicit prices from carbon taxes and emissions trading systems, and including subsidies delivered through preferential excise or carbon tax rates, shows that carbon pricing is gaining momentum. However, current prices generally remain low and vary across sectors and fuels in ways that align poorly with carbon emissions or with pollution profiles more broadly (Box 2). Fossil fuel subsidies continue to distort price signals and weigh on public budgets (Box 3). The stocktake points to reform options and priorities, as from a climate point of view – net of domestic environmental benefits – effective carbon prices should ideally be the same per unit of carbon content of all fuels in all sectors to minimise the costs of reducing carbon emissions.

Box 2. Stocktake of carbon taxes, emissions trading systems and fuel excise taxes

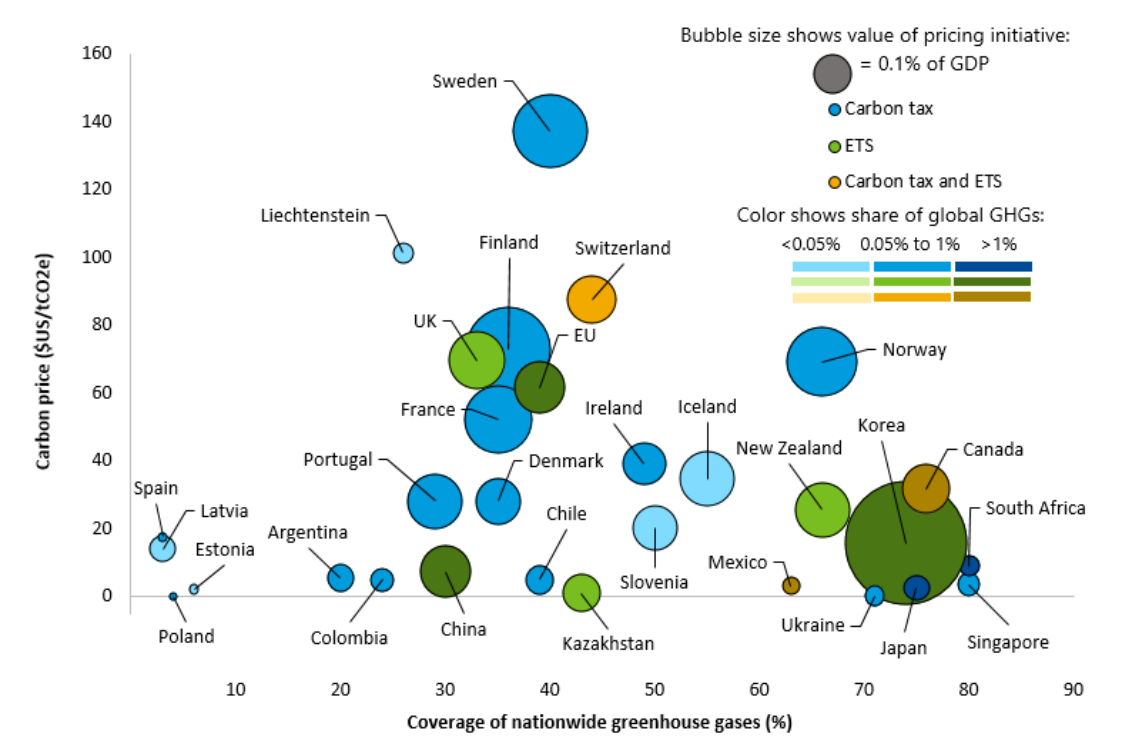
Carbon taxes: By imposing a charge on the carbon content of fossil fuel supply, carbon taxes are a straightforward carbon pricing instrument from an administrative perspective. They can be comprehensively applied, for example, at the point of processing or refining for coal, petroleum products, and natural gas. In addition, carbon taxes can provide certainty over the future trajectory of emissions prices, and revenues accrue directly to finance ministries.

Emissions trading systems: Under an emissions trading system (ETS), firms must acquire allowances to cover their emissions, the government fixes the supply of allowances, and allowance trading establishes the emissions price. Although trading systems to date have largely been applied to power generators and large industries, they could be extended midstream to include heating and transport fuels (the latter already being covered in a few systems). Mechanisms like price floors can reduce price uncertainty and allowance auctions can generate government revenues.

Fuel excise taxes: Fuel excise taxes create economic incentives similar to those of carbon taxes and emission permit prices, even if their primary objective may be to raise revenue. The strength of price-based incentives to reduce emissions depends on the rate and the base of the incentive, and on fuel price responsiveness, not on the stated policy intention. Fuel excise taxes can be seen as implicit carbon taxes.

Explicit carbon pricing is gaining momentum: For example, prices in the European Union's (EU) ETS have recently increased, Canada has announced it will increase its carbon prices to CAD 170 by 2030, Germany and China have introduced major pricing schemes this year, and Korea has a comprehensive pricing scheme. Figure 1 summarises explicit carbon pricing instruments (carbon taxes, emissions trading systems) at the national level as of 2021.

Figure 1. Selected explicit carbon pricing schemes, 2021



Note: Carbon prices are from 01 April 2021 from WBG. EU ETS price is from 19 July 2021 from EMBER. GHGs are from 2018. EU includes Norway, Iceland, Liechtenstein. Values less than 0.005% of GDP are of equal size for illustrative purposes. Canada's bubble reflects only the federal backstop, but the majority of their pricing uses provincial systems. The value of the UK's ETS is an estimation for 2021 based on a £50/tCO_2e price. Finland's transport fuels are priced at \$73/tCO_2e. Ireland's F-gases are priced at \$20/tCO_2e . Norway has a reduced rate on natural gas for EU ETS installations of \$4/tCO_2e. Norway and Mexico prices represent carbon price upper bounds. Lower bounds are \$3.9/tCO_2e and \$0.37/tCO_2e respectively. Switzerland's price is a weighted average between carbon price and ETS by emissions covered.
Source: World Bank, Climate Watch, Fund Staff Estimates, EMBER.

Carbon pricing discussions are often limited to carbon taxes and emissions trading systems, but it is useful for a stocktake of effective carbon prices to also consider fuel excise taxes, since these are effectively levied on the same base as carbon taxes. Effective carbon rates for a particular fuel or sector, the sum of any applicable explicit carbon prices from emission permit prices and carbon taxes, the implicit carbon prices resulting from fuel excise taxes, captures this broader view of abatement incentives resulting from price-based policies.[4] The OECD measures these effective carbon rates, going beyond explicit carbon prices, capturing part of but not the full implicit carbon price. This provides

[4] Effective carbon rates in this paper account for fossil fuel support in the form of energy excise rate reductions or exemptions. Other subsidies can also affect these rates and this will be considered in future work.

a starting point for mapping the full implicit prices from regulations and other non-price based mitigation policies.

Effective carbon rates measure the prevailing carbon price signal. They describe the policies to take into consideration, when seeking energy pricing reforms that strengthen carbon price signals or more broadly the environmental performance of taxes on energy use and emissions trading systems. The OECD's database on effective carbon rates covers 44 countries, including all OECD countries and G20 economies (except for Saudi Arabia), representing about 80% of global energy use and CO_2-emissions from energy use.

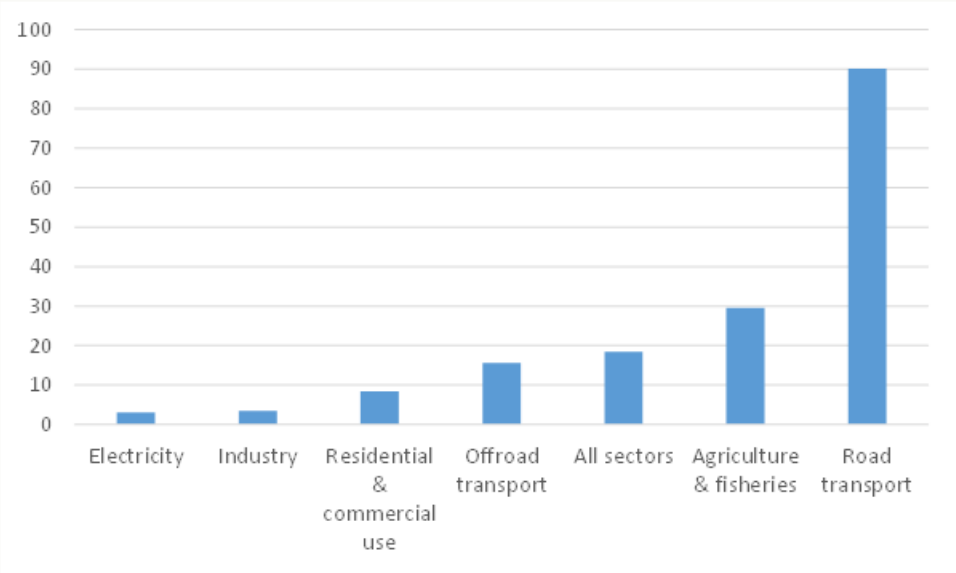
Effective carbon rates have been rising slowly overall and across sectors

More than half of all emissions from energy use remain unpriced as of 2018. The decline in the share of unpriced emissions over time has been slow and has mostly been attributable to rising coverage of carbon taxes and emissions trading systems.

Excise taxes cover a larger share of emissions than carbon taxes and emissions trading systems. In 2018, 6% of emissions were subject to a carbon tax, 12% of emissions were covered by an ETS, and 35% were subject to a fuel excise tax. With the exception of road transport, where coverage by excise is near complete at 95%, the three components of the carbon rate only cover a limited part of the base. Coverage by carbon taxes is highest in road transport (13%), followed by residential and commercial use (7%). Emissions trading systems cover more emissions in industry (14%) and electricity (18%) than in other sectors (less than 4%). These averages hide strong variation across countries.

Effective carbon rates are highest in road transport and lowest in the industry and electricity sectors

Figure 2. Average effective carbon rate by sector, 44 OECD and G20 countries, EUR/tCO_2, 2018



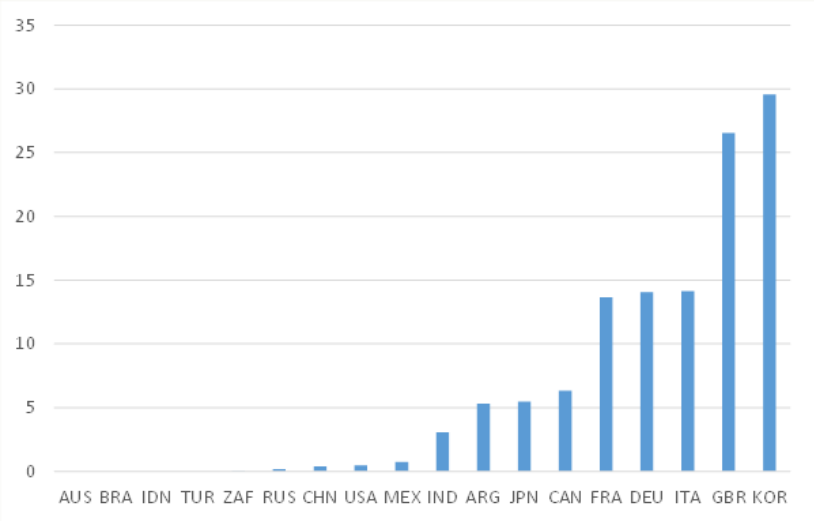
Note: The effective carbon rates pertain to fuel combustion in the sector, not all greenhouse gas emissions.
Source: OECD Effective Carbon Rates database.

Across all countries and fuels, the effective carbon rate in road transport is EUR 90/tCO_2. This is because of the broad coverage, and relatively high rates, of excise taxes in this sector. The share of road transport emissions priced at EUR 60/tCO_2 or more, is higher than 90% in the majority of G20 countries. Correspondingly (but not shown in the graph), effective carbon rates on road transport fuels are significantly higher than those on other fuels, with coal subject to the lowest rate on average. In other sectors rates are much lower on average, with the lowest averages in electricity and industry, where inter-country heterogeneity is large, as can be seen from Figure 3 and Figure 4.

In the electricity and industry sectors, emissions pricing often takes the form of emissions trading systems. Emission permits can be auctioned, but free allocation remains common in industry and to a lesser extent in electricity, and this reduces the average effective carbon rate (i.e., the marginal rate corrected for the share of free allocation). Across the countries shown in Figure 3 and Figure 4, the average rate measures 80% of the marginal rate in the electricity sector, and 70% in industry. Free permits may be contributing to their intended objective of limiting carbon leakage and competitiveness risks, but this potentially comes at a cost in terms of environmental effectiveness[5].

The effect of carbon pricing depends on price levels but also on the responsiveness of fuel use to greenhouse gas emissions pricing. This responsiveness differs between countries, sectors and fuels. In road transport, pre-existing taxes tend to be high, so that an increase in the carbon price has a small effect on the fuel price compared to other fuels and uses, e.g. coal. In addition, the carbon content of coal is relatively high, so that a carbon tax implies relatively large price increases. Combined with – so far – relatively limited substitution possibilities in road transport, this implies that higher prices can be expected to have a significantly smaller effect on road transport fuel demand than on the demand for coal or other fuels. Apart from fuel taxes, vehicle ownership and usage taxes also affect vehicle use and fuel efficiency. In several countries these are designed to reduce CO_2 and sometimes other pollutant emissions, with often strong impacts on purchase decisions and hence vehicle fleet characteristics.

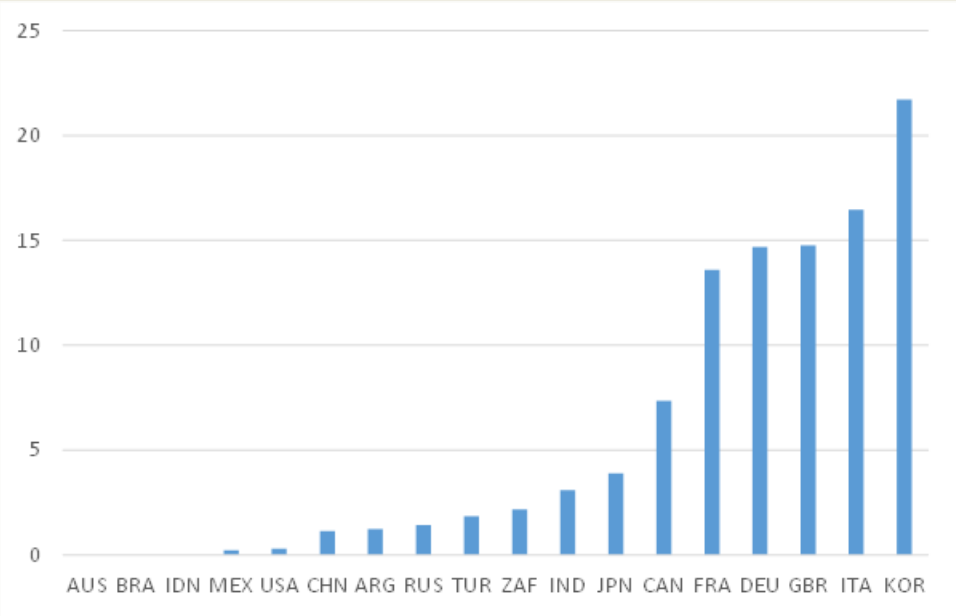
Figure 3. Effective carbon rate, electricity sector, EUR/tCO_2, 2018



Source: OECD Effective Carbon Rates Database.

[5] Flues, F. and K. van Dender (2017), "Permit allocation rules and investment incentives in emissions trading systems", *OECD Taxation Working Papers*, No. 33, OECD Publishing, Paris, https://doi.org/10.1787/c3acf05e-en.

Figure 4. Effective carbon rate, industry sector, EUR/tCO_2, 2018



Source: OECD Effective Carbon Rates Database.

Box 3. Greenhouse gas emissions pricing and fossil fuel subsidy reform[6]

At the 2009 Pittsburgh summit, G20 leaders committed to rationalising and phasing out "Inefficient Fossil Fuel Subsidies that encourage wasteful consumption" over the medium term, while ensuring targeted support for the poorest. This commitment was reiterated several times, including in the Riyadh Leaders' Declaration of 22 November 2020. Phasing out these subsidies proves to be difficult, however, as support levels essentially remain on par with 2010 levels, having increased substantially (to 2013) then receded in the interim as of 2019. The G20 peer review mechanism to support fossil fuel subsidy reform remains active, with Argentina and Canada reviews expected to be launched in 2021-22, and France and India have committed to follow suit. The Italian G20 Presidency has signalled intent to reinvigorate the G20 focus on subsidy reform in 2021, with several deliverables anticipated during its Presidency year.

The OECD estimates fossil fuel support through an inventory of now 1300 support measures, focussing on budgetary costs and revenue forgone.[7] It distinguishes between consumer support, producer support and general service support estimates. By this measure, total fossil fuel support across 50 countries covering all OECD, G20 countries (except for Saudi Arabia) and 6 Eastern European

[6] This section draws from the *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2021*, OECD Publishing, https://doi.org/10.1787/e670c620-en.

[7] There are various other notions of energy subsidies. For example, Coady and others, 2019, "Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates", IMF working paper 19-89, estimated global fossil fuel subsidies amounted to $5.2 trillion (6.5 percent of GDP) in 2017, as measured by undercharging for supply costs, environmental costs, and general consumption taxes.

partnership economies rose by 5% year-on-year to USD 178 billion in 2019, reversing a five-year downward trend also highlighted by previous editions of the *OECD Companion to the Inventory of Support Measures for Fossil Fuels*. The increase in support was driven by a 30% rise in direct and indirect support for the production of fossil fuels, notably oil and gas, primarily in OECD countries. The most significant increases in producer support were observed in Mexico, the United States, and the United Kingdom. However, in the European Union, support for coal production was scaled back. Consumer support is largest in the transport fuels sector, partly because large shares of support are delivered through preferential tax rates (see below).

In addition to the OECD's inventory-based support estimate, there is a combined OECD-IEA support estimate for 81 countries. It integrates IEA's consumer support estimates, which compare domestic prices to international reference prices. This estimate shows a decline of support from 2018 to 2019 by 18%, mainly as a consequence of the drop in crude oil prices as opposed to reform. Support had increased from 2016 through 2018, also mainly because of oil price fluctuations.

Fossil fuel support can influence effective carbon rates in several ways. For example, preferential excise tax rates are included in the inventory of support measures, and they also directly affect - and are accounted for in - the effective carbon rates. While in OECD countries, around 75% of support comes from preferential excise tax treatment, the situation is different outside the OECD area. In G20 non-OECD countries, for instance, transfers are more important, and these may or may not directly affect prices. Still, tax expenditures remain an important avenue for support, providing 43% of the total value of support. Increasing effective carbon rates, and reducing fossil fuel support, particularly in the OECD, is to a considerable degree a matter of removing preferential tax treatment, and putting in place better policies to achieve the goals of the tax preference.

The potential impacts of carbon pricing

(See Box 4)

Decisive policy action is required by G20 countries to reduce emissions over the next decade in line with intermediate emissions commitments, though the explicit carbon prices or implicit prices resulting from equivalent measures needed, differ substantially across countries. While countries have many policy instruments at their disposal, assessing the increase in carbon pricing needed to achieve climate objectives provides a useful benchmark—all policies combined must have the equivalent impact on emissions as this implicit carbon price is estimated to have, and their costs can be compared with that of carbon pricing. The carbon price increases that are estimated to be needed for G20 countries to achieve their NDC commitments through pricing alone vary from less than USD 25 per tonne of CO_2 in 2030 in five countries, to between USD 25 and USD 75 per tonne of CO_2 in four countries, and over USD 75 per tonne of CO_2 in ten other cases (Figure 5). To some degree, this variation reflects responsibilities that differ with the level of country development. Increased ambition for 2030, needed to attain Paris Agreement goals, would require stronger price increases or equivalent measures.

The potential revenue gains from explicit carbon pricing are significant. For example, a USD 50 per tonne of CO_2 carbon price in 2030 would generate revenue increases of around 1% of GDP for many G20 countries and substantially more than that in a few cases (Figure 6). OECD estimates[8] suggest similarly significant short run revenue potential from increasing prices to EUR 30/tCO_2 where they are currently lower.

Domestic environmental co-benefits can outweigh the economic efficiency costs of pricing. Carbon pricing is in many countries' own domestic interests before even counting the global climate benefits because, up to a point, the domestic environmental and health co-benefits can outweigh the economic efficiency costs—this is especially the case for countries with chronic mortality risk from local fossil fuel air pollution (Figure 7).

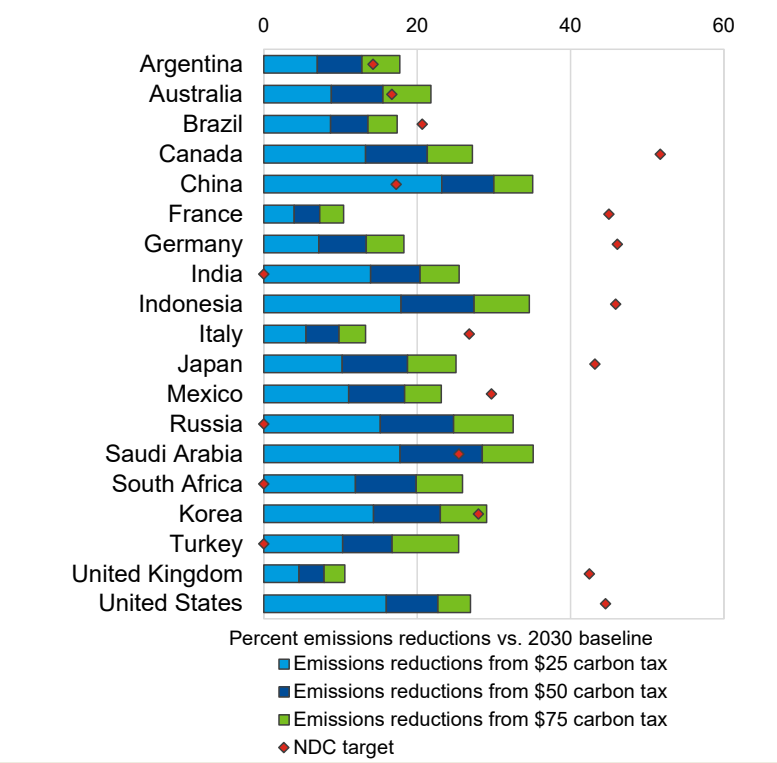
The impacts of carbon pricing on energy prices are of particular concern as, in turn, this affects the distributional burden on households and industries. Carbon pricing has a disproportionately large impact on the price of coal (given its high carbon intensity), but coal is largely an intermediate input. Carbon pricing has intermediate impacts on the price of natural gas, and more moderate impacts on pump prices for motor fuels. The impact on electricity prices will depend on the country's mix of power generation fuels. (See Table 2).

[8] Marten, M. and K. van Dender (2019), *The use of revenues from carbon pricing*, OECD Taxation Working Papers, No. 43, OECD Publishing, Paris, https://doi.org/10.1787/3cb265e4-en. OECD (2021), *Taxing Energy Use for Sustainable Development: Opportunities for energy tax and subsidy reform in selected developing and emerging economies*, OECD Publishing, Paris, http://oe.cd/TEU-SD.

Box 4. Explicit carbon prices needed to achieve mitigation pledges and the impact of pricing

Explicit carbon prices consistent with achieving countries' mitigation pledges for 2030 vary substantially across G20 countries for two reasons (Figure 5). First is because the stringency of pledges, as implied by the reductions in 2030 levels below baseline levels (with no change in current mitigation policies), differs substantially across countries. Second is because the price responsiveness of emissions differs across countries — for example, emissions are generally more responsive to pricing in countries that consume a lot of coal. Besides the price level, the fiscal impacts of carbon pricing (see Figure 6) depend on the baseline emissions intensity of GDP, adjusted for how much pricing causes emissions to fall and any erosion in pre-existing fuel tax bases.

Figure 5. NDC goals and CO_2 emissions reductions by pricing scenario



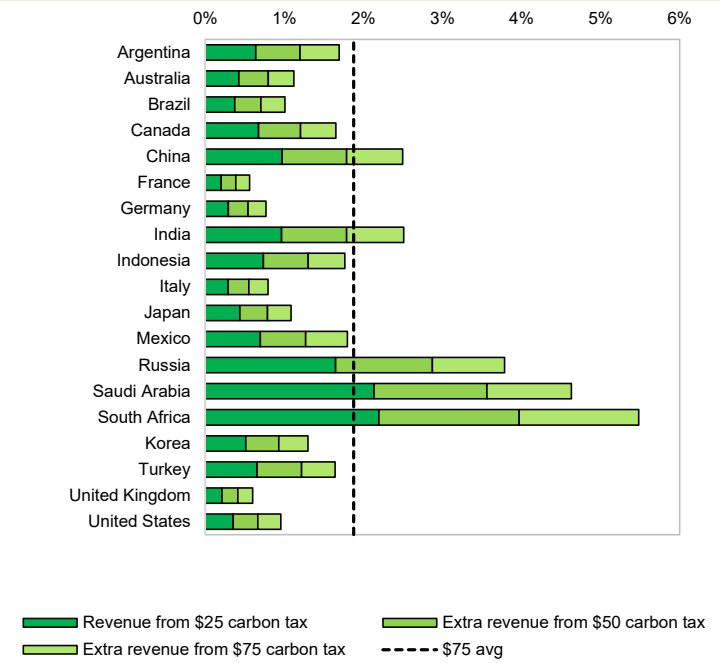
Note: NDCs targets are from first-round or (if applicable) second-round Paris pledge. Where country has a conditional NDC the target is defined as the average between the conditional and unconditional target. NDCs as of 23 July 2021.
Source: IMF staff calculations.

The economic efficiency costs of explicit carbon pricing (at least as measured by the value of foregone fossil fuel consumption less savings in supply costs) are manageable—typically around 0.5% of GDP for a carbon price of USD 50 per tonne of CO_2 in 2030 for emissions intensive countries, and much less than that in other cases. For most countries, however, the domestic environmental co-benefits of carbon pricing (primarily reductions in local air pollution deaths and reductions in traffic congestion/accident externalities) are about as large, or in a few cases are much larger, than the economic efficiency costs.

Box 5. Explicit carbon prices needed to achieve mitigation pledges and the impact of pricing *(contd.)*

In absolute terms, the energy price impacts of carbon pricing are broadly similar across countries for coal, natural gas, and gasoline (given similar emissions factors for these fuels), but the proportionate price increases differ considerably due to large differences in baseline prices. For electricity, the absolute price increases vary by country depending on the emissions intensity of generation. See Table 1.

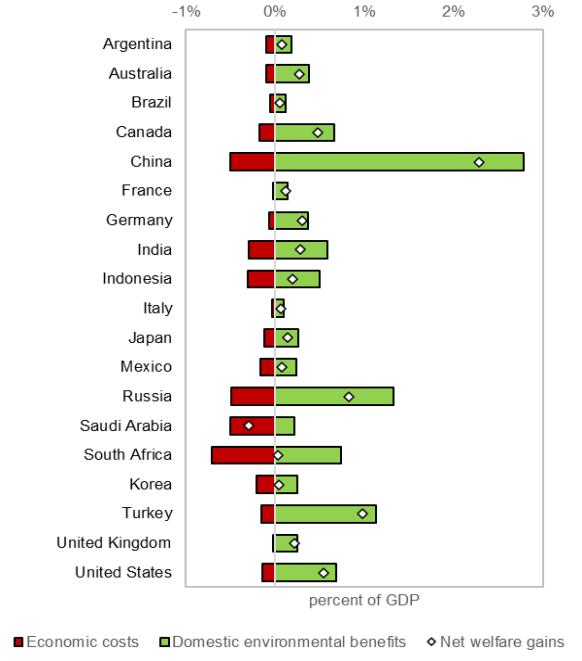
Figure 6. Fiscal revenues from alternative carbon pricing scenarios, 2030



Note: Estimates are relative to a baseline with any existing carbon pricing and fuel taxes fixed at 2020 levels – that is, carbon pricing is imposed on top of any existing pricing. Estimates take into account losses due to erosion of tax bases for pre-existing carbon pricing and fuel taxes.
Source: IMF staff.

Box 6. Explicit carbon prices needed to achieve mitigation pledges and the impact of pricing *(contd.)*

Figure 7. Efficiency costs and domestic environmental co-benefits for a $50 carbon price, 2030



Note: Costs are comparative static calculations of changes in consumer and producer surplus and government revenue, in fossil fuel markets, accounting for pre-existing fuel taxes. Domestic benefits include reductions in local air pollution morality and traffic congestion/accident externalities.
Source: IMF staff.

Table 1. Energy price impacts for a $50 explicit carbon price, 2030

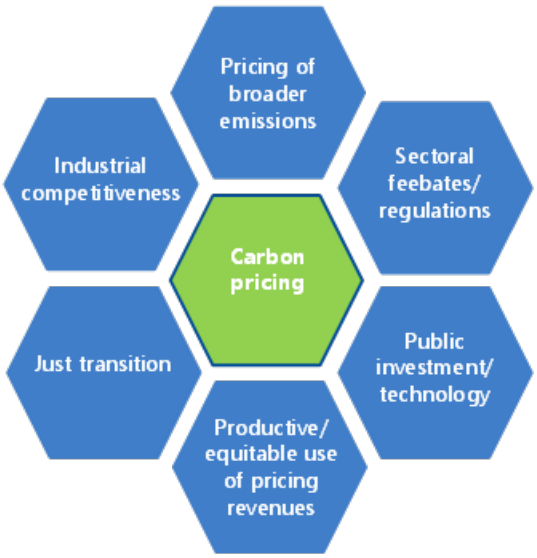
Country	Coal		Natural gas		Electricity		Gasoline	
	BAU price, $/GJ	% increase	BAU price, $/GJ	% increase	BAU price, $/kWh	% increase	BAU price, $/liter	% increase
Argentina	6.9	88	8.4	37	0.1	21	1.1	13
Australia	3.4	155	11.2	28	0.2	19	1.1	12
Brazil	4.3	121	6.9	45	0.2	3	1.2	9
Canada	2.6	204	4.0	77	0.1	7	1.1	12
China	4.7	107	12.7	22	0.1	22	1.2	11
France	5.8	84	21.5	16	0.1	2	1.8	8
Germany	6.4	83	22.5	4	0.2	7	1.7	8
India	5.7	89	4.5	64	0.1	16	1.3	10
Indonesia	2.7	192	5.2	65	0.1	56	0.7	20
Italy	6.6	78	20.2	13	0.2	7	1.9	8
Japan	4.8	101	15.4	8	0.2	17	1.4	10
Mexico	2.6	199	5.3	58	0.1	19	1.1	12
Russia	1.4	324	5.6	50	0.0	37	0.9	15
Saudi Arabia	0.0		1.6	184	0.0	69	0.5	23
South Africa	5.9	77	3.6	72	0.1	59	1.1	10
Korea	6.8	71	11.6	25	0.1	23	1.4	8
Turkey	2.9	165	12.6	23	0.1	24	1.2	11
United Kingdom	8.0	72	16.0	19	0.2	4	1.7	8
United States	2.3	281	5.9	44	0.1	11	0.9	14

Note: BAU is business as usual. Prices are retail prices, including pre-existing energy taxes, and adjusted for projected changes in international energy prices. Impacts of carbon taxes on electricity prices depend on the emission intensity of power generation. GJ = gigajoule; kWh = kilowatt-hour.
Source: IMF staff calculations.

Comprehensive climate change mitigation strategies

Although explicit carbon pricing is an effective instrument, a comprehensive package of measures is needed to enhance the overall effectiveness and acceptability of the mitigation strategy. Key elements potentially include a balance between explicit carbon pricing and reinforcing sectoral instruments like feebates and regulations; supporting public investment and technology policies; productive and equitable use of carbon pricing revenues; just transition assistance for vulnerable groups; measures to address industrial competitiveness; and pricing or regulation of broader greenhouse gases. The balance between different mitigation policy approaches will depend on countries' specific circumstances.

Figure 8. Key elements of a comprehensive mitigation strategy



Sectoral feebates or regulations: explicit carbon pricing may be subject to acceptability constraints, not least because of the burden of higher energy prices on households and energy-intensive firms. A balance is likely needed between pricing and sectoral measures that are less efficient because they do not promote the same demand responses but avoid large and highly visible increases in energy prices. Traditionally, reinforcing instruments have taken the form of regulations, for example energy efficiency or emission rate standards. Another option is feebates, which provide revenue-neutral sliding scales of fees on products or activities with above average emission rates and a sliding scale of rebate for products or activities with below average emissions rates. Feebates can cost-effectively promote all the behavioural responses for

reducing emission intensity within a sector and when designed well, they avoid a fiscal cost to the government, and they do not impose a new tax burden on the average household or firm.[9] Elements of feebates have been integrated into some vehicle tax systems though they could also be applied to industry and power generation, and to promote clean heating systems, efficient appliances, building retrofits (e.g., weatherisation and insulation), and forest carbon storage.

Public investment and support for technology: Mitigation instruments need to be supported by public investments that would not be provided by the market, even with a robust carbon price. An important example is network infrastructure for clean technologies (e.g., power grid upgrades to accommodate renewables, charging stations for electric vehicles). Market failures at various stages during the development and diffusion of new (clean) technologies can warrant policy interventions. For example, support for basic research, and prizes and other incentives for applied private sector research and development, to address knowledge spill-overs; and transitory incentives to promote deployments which might otherwise be hindered by scale economies and learning-by-doing spill-overs.

Productive and equitable use of carbon pricing revenues: Insofar as possible, the revenues from explicit carbon pricing should be used productively to benefit the economy to help offset the harmful effects of higher energy prices. Productive uses include, for example, cutting the labour tax wedge, funding clean infrastructure investment, or more general investments (e.g., for Sustainable Development Goals). Use of revenues can also be calibrated to enhance the overall fairness of the mitigation strategy to promote an even net burden relative to consumption over different income groups.

Just transition: Just transition measures refer to targeted protection for groups that are especially vulnerable to clean energy transitions. This includes low-income households for whom higher energy prices may be especially burdensome; displaced workers (e.g., from extractive industries, and energy-intensive firms competing in global markets); and vulnerable regions. Potential assistance measures might include stronger cash and in-kind social safety nets;, training, and re-employment services; and assistance for reclaiming abandoned mining and drilling sites and temporary local government budget support. In addition, in order to facilitate the transition out of fossil fuels, alternatives need to be made available. For instance, improved access to public transportation and cleaner cars (including charging facilities for electric vehicles) will strengthen households' ability to transition away from carbon-intensive transport.

Industrial competitiveness: The focus of the competitiveness debate has been on energy-intensive, trade-exposed (EITE) industries (e.g., metals, chemicals, cement) given that their costs are disproportionately increased by carbon pricing, demand for these products may shift significantly from domestic to foreign suppliers when their domestic prices rise, and these industries may also have political sensitivities, given the visibility of their employment effects. Existing assistance measures take the form, for example, of free allowance allocations (e.g. EU, Korea) and emission rate standards for industry in lieu of pricing (e.g., Canada). These measures, however, become less effective at preserving competitiveness for EITE industries with deeper decarbonisation, hence the current interest in BCAs (see below).

Pricing of broader emissions: Beyond pricing of fossil fuel CO_2 and industrial process emissions, there are various other sources of greenhouse gas emissions requiring pricing or related measures. For some G20 countries, fugitive (mainly methane) emissions from extraction, processing, and distribution of fossil fuels are a significant emissions source — these emissions might be priced using a default emissions rate pending more extensive development of metering technologies. Carbon storage in forests might be promoted through fees on landowners that reduce storage relative to a baseline year and corresponding rebates for landowners that increase carbon storage. Agricultural emissions are not directly measured, but

[9] Feebates are the fiscal analogue of emissions regulations with extensive credit trading provisions. In the former case however the implicit carbon price is fixed and the emission rate is determined endogenously and vice versa in the latter case.

some variant of emissions pricing might be viable based on farm level inputs or outputs and default emission rates.

BCAs and international coordination

Concerns about the leakage and competitiveness impacts of carbon pricing arise in the absence of effective international coordination on climate policies. The potential loss of competitiveness of domestic firms arises due to increased costs *vis-à-vis* foreign competitors in countries pursuing less ambitious environmental objectives. The additional compliance costs associated with domestic climate policies risk eroding support from industry and civil society. The two issues are intertwined: ambitious policies undertaken in a few countries may lead to production moving to countries that are given a perceived "unfair" competitive advantage by virtue of a less ambitious domestic carbon policy, potentially further exacerbating carbon leakage.

Dispersion in carbon pricing ambitions is prompting proposals for BCAs. Widely divergent mitigation pledges submitted for the Paris Agreement have led to concerns about achieving meaningful global greenhouse gas reductions and subsequently to some countries and regions pursuing stronger unilateral action. Many countries are considering which climate policies could be most effective at minimising adverse carbon leakage, while ensuring fairness by dampening any negative competitiveness effects. One of the policy options available to achieve these two goals is a border carbon adjustment (BCA). A BCA is a measure applied to traded products that seeks to make their prices in destination markets reflect the costs they would have incurred had their emissions been priced according to the regime in the destination market.[10] Discussion around BCAs to date has mainly centred on explicit carbon pricing, but implicit carbon prices can also affect leakage and competitiveness risks.

BCAs pose administrative and legal challenges. Policymakers will have to make several critical decisions, including which industries and sectors the BCA should cover (i.e., whether to focus on energy-intensive trade exposed industries, or to have a broader focus), whether to rebate exporters for domestic pricing, and whether to use country-specific or domestic industry benchmarks to assess embodied carbon in imported products, and what forms of explicit and implicit pricing to account for. These choices involve trade-offs between effectiveness at addressing competitiveness and leakage, administrative complexity, and potential legal risks from challenges at the World Trade Organization (WTO).[11] There are risks that BCAs could be perceived by some as a form of "green protectionism" which could lead to heightened geopolitical tensions.

---

[10] Cosbey, A. et al. (2012), *A Guide for the Concerned: Guidance on the elaboration and implementation of border carbon adjustment*, International Institute for Sustainable Development, www.iisd.org/library/guide-concerned-guidance-elaboration-and-implementation-border-carbon-adjustment.

[11] See I. Parry et al. (2021), *Carbon Pricing: What Role for Border Carbon Adjustments?*,, IMF Staff Climate Note, IMF, Washington, DC, forthcoming.

Alternatives to BCAs may become less appealing as ambition rises. Alternative policy approaches to BCAs could be implemented either instead of, or in parallel with BCAs. While some of these may avoid some of the administrative and legal pitfalls of BCAs, their use also involves trade-offs. Commonly implemented tools – such as free allocation of permits in emissions trading systems – may imply a lower level of domestic climate ambition and are often incompatible with ambitious long-term climate objectives. As decarbonisation ambitions rise, free permits become increasingly problematic to the extent that they do not offset the rising costs of progressively reducing emissions. Annex B includes two tables that summarise how design choices for BCAs affect policy objectives and how BCAs compare to alternative instruments, respectively.

BCAs should align with WTO rules. Any mechanism, a BCA or its alternatives, needs to be designed carefully and take into account country commitments under the multilateral, rules-based, trading system and its transparent and enforceable nature. This is especially important in today's highly interconnected world and given the already difficult environment for global governance.

Synergies between trade and climate policies should be strengthened. Making ambitious climate targets viable, in a globalised world, goes beyond the issues of carbon leakage and competitiveness. Governments should also consider other areas where trade and climate policies can be mutually supportive. For instance, existing trade-related policies that lead to increased carbon emissions (such as fossil fuel subsidies) should be reviewed. More coherence in the trade and environment policy space reduces the risk of exacerbating a sense of unjust global burden-sharing on the climate issue, notably between developed and developing countries. This can in turn increase countries' willingness to accept stronger commitments in climate negotiations. Ultimately, there is a need to restore trust in the multilateral systems (trade and climate) – especially in the wake of the COVID-19 crisis – so that they can both keep delivering substantial benefits.

An international carbon price floor (ICPF) is a potentially more effective mechanism for addressing free riding and scaling up global mitigation action. Even with measures to protect competitiveness, it can be very difficult for countries acting unilaterally to aggressively scale up mitigation action due to uncertainty about free riding—whether other countries will implement sufficient mitigation policies. An ICPF has the potential to address free riding and more effectively scale up global mitigation than a unilaterally imposed regime of BCAs as an ICPF would apply to all covered emissions in participating countries, rather than emissions embodied in trade flows. Participants may have strong incentives to join an ICPF, or a similar price coordination mechanism, if its success would limit risks of destabilizing the global climate system and thereby conferring benefits for all.[12]

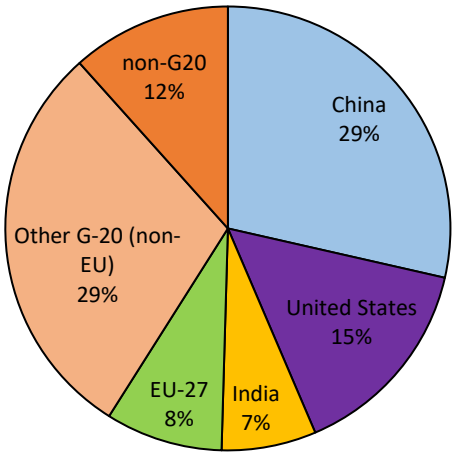
An ICPF has two key components; a focus on a small number of the largest emitting countries and a commitment to a minimum carbon price.[13] An ICPF would be focussed on a small number of key emitting countries that are responsible for the bulk of global emissions (see Figure 9) to facilitate negotiation over specific policy actions. In contrast, under the Paris framework there are many parties (195), negotiating over many pledges (one per party, with the exception of EU countries), which hampers reaching agreement on concrete policy actions that will deliver the needed reductions in global emissions.

[12] An alternative to the ICPF is a purer form of carbon pricing where each participant agrees to implement the same carbon price through a carbon tax or trading scheme. See W.D. Nordhaus, 2015. "Climate Clubs: Overcoming Free-riding in International Climate Policy." *American Economic Review* 105: 1339–70. Incentives to participate in either type of price coordination scheme might be strengthened through applying BCAs or general tariffs for non-participating countries, though this would complicate negotiations for setting up the agreement and may risk legal challenges.

[13] See I. Parry, S. Black, and J. Roaf (2021), *Proposal for an International Carbon Price Floor,* IMF Staff Climate Note, IMF, Washington, DC, www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468.

A key element of an ICPF is that it would focus on a single parameter, the minimum carbon price that each participant must implement. Simultaneous action to scale up carbon pricing among large emitting countries is a potentially effective way to address competitiveness and free rider concerns.

Figure 9. Country shares in projected global CO_2 emissions, 2030



Source: IMF staff calculations.

An ICPF could be designed pragmatically. The ICPF could complement and reinforce the Paris Agreement—the focus on minimum price requirements allows countries the flexibility to set higher prices if this is needed to meet their Paris mitigation commitments. The mechanisms could be designed equitably (to account for differentiated responsibilities) with stricter price floors for higher income countries and transparent mechanisms to transfer technical and financial assistance to lower income participants. And it could be designed flexibly to accommodate countries for whom carbon pricing is difficult politically so long as they achieve equivalent emissions outcomes through a combination of other policies.

Beyond explicit carbon pricing, countries could engage in dialogue on broad mitigation strategies, including policies resulting in implicit carbon prices. While some countries intend to increase the explicit price of carbon, policy approaches to mitigation continue to differ substantially, involving varying combinations of emissions pricing, clean energy subsidies, support for technological change and regulatory mechanisms. Given the differing policy mechanisms across jurisdictions and the rising awareness of the need to discuss and manage spillovers, there is an increasing need to develop new approaches to assess country-level mitigation policies and where possible measure the costs of these policies in the form of the carbon price equivalence of differing policy approaches (i.e., by calculating implicit carbon prices). This analysis would allow for meaningful and transparent comparison of the stringency of mitigation policy instruments across jurisdictions. Such an approach could in turn form the basis for a more rigorous assessment of the effectiveness and cost-efficiency of differing policy approaches and could ultimately help foster improved international coordination of mitigation policies. The work could also usefully support efforts to implement, and understand, Nationally Determined Contributions. It could also help facilitate discussion and cooperation toward avoiding the imposition of new trade measures such as border carbon adjustment mechanisms. Working methods like carbon clubs or an Inclusive Framework could be explored to this effect.

Support for continued dialogue on greenhouse gas emissions pricing and related climate policy instruments

Evidence on carbon prices shows they do not match policy ambitions. This report has shown that current fuel excise taxes, carbon taxes and emissions trading systems result in effective carbon rates that are often low and poorly aligned with fuels' carbon content. Evidence on non-pricing policies resulting in implicit prices is less comprehensive, but in general there is little indication that they make up for low prices. Consequently, more stringent carbon pricing policies or equivalent policies will be needed for countries to reach their nationally determined targets. This will be possible only if such policies do not compromise energy affordability or disproportionally affect lower income households, and if carbon leakage and competitiveness risks associated with differences in policy stringency in countries can be managed. Addressing these challenges requires a fiscal policy perspective and international dialogue.

The G20 Finance Ministers are well placed to strengthen the domestic and international greenhouse gas emissions pricing dynamic. They can consider jointly the incentive, revenue use and international coordination aspects of the policy challenge, which is needed to improve the use of carbon pricing or equivalent policies. Opportunities could be explored for broadening the coverage of pricing and aligning rates better with fuels' carbon content, and ensuring that it is embedded in policy packages that support growth and avoid adverse effects on households and businesses. In addition, the scope for alternative policies, resulting in implicit carbon prices, can be investigated, in line with countries' specific circumstances. Through this channel, carbon pricing and equivalent policies will be able to play their appropriate role in the overall policy response to the challenge of climate change.

To support an ongoing G20 dialogue on greenhouse gas emissions pricing, Ministers may wish to request the following:

- improved measurement of countries' principal greenhouse gas mitigation policy responses through:
    - continued monitoring of explicit carbon pricing policies, including carbon taxes and emissions trading systems, and implicit carbon prices resulting from energy taxes and fossil fuel subsidies;
    - extending such monitoring by mapping and developing of new tools and indicators for the improved monitoring of economies' principal implicit carbon pricing policies (e.g., energy

efficiency standards, emission regulations, feebates, clean energy subsidies, taxes on individual fuels, sectoral-based emissions pricing);

- sharing metrics and indicators for measuring countries carbon footprints;
- regular updates on implicit and explicit pricing measures consistent with countries' mitigation pledges and the impacts of pricing (e.g., on emissions, revenue, local air pollution mortality, economic welfare, energy prices);
- analysis of the incidence of energy price changes on households, industries, and employment in vulnerable sectors and regions, and of assistance measures designed to alleviate adverse consequences;
- dialogue on mechanisms to promote coordination, e.g. on minimum emissions pricing and on mitigation policy packages more broadly, among G20 members;
- exploring other areas of collaboration to elevate the role of emissions pricing in the transition to carbon neutrality, taking into account countries' different starting points and contexts, and avoiding negative spill-overs on trade relations, including proposals for climate clubs or an Inclusive Framework;
- discussion of the role of border carbon adjustments (BCAs) including their pros and cons versus other compensation measures; and
- further analysis of the potential impacts of rising disparities in carbon prices on carbon leakage and on countries' imports, exports, output and employment.

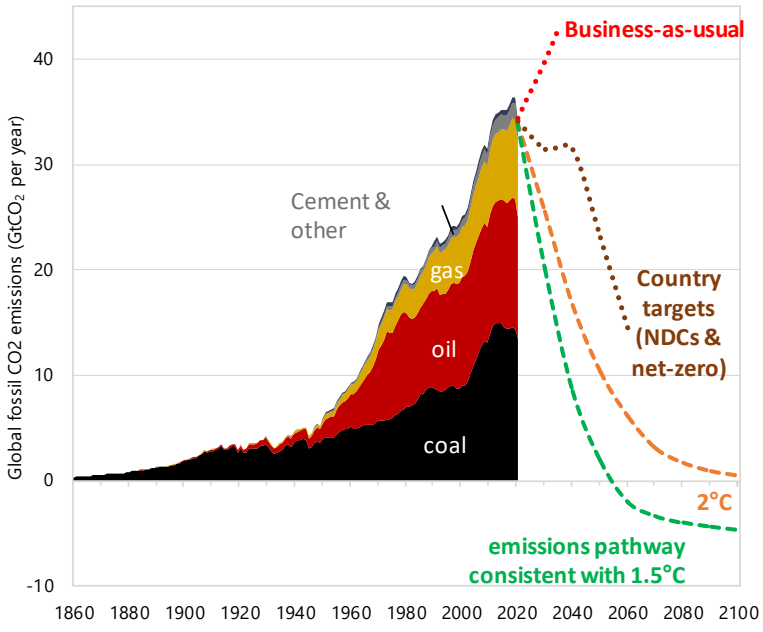
It is crucial for the success of monitoring and assessment efforts that they are systematically based on transparent and coherent methodologies. This work could potentially take the form of peer reviews. The IMF and the OECD have developed relevant capacities, on which they can build further to support the G20 FMCBG's initiatives on greenhouse gas emissions pricing, both implicit and explicit, and related climate policy instruments.

Annex A. Global and G20 emissions commitments

Under existing mitigation policies, post-COVID-19 projections suggest global CO_2 emissions will reach 37 billion tonnes in 2030 – illustrative pathways for containing warming to 1.5-2°C would require global CO_2 emissions in 2030 to be limited to around 16-26 billion tonnes or 25-50 percent below 2019 levels (see Figure A.A.1). Without these emissions reductions, the likelihood of meeting temperature stabilization goals will decline rapidly, as the remaining carbon budget consistent with warming targets is exhausted more quickly.

Mitigation pledges under the Paris Agreement are not legally binding, are partially dependent (for some developing countries) on external finance, and even if they were fully achieved would reduce global emissions in 2030 by only two-thirds of the emissions reductions that would be consistent even with a 2°C warming target. Countries are required to report progress on meeting their NDCs, and to submit revised NDCs every five years starting in 2021. Table A.A.1 summarises current mitigation contributions for G20 countries, which are mostly for 2030. Pledges differ in nominal stringency and baseline years against which targets apply.

Figure A A.1. Global CO_2 projections and pathways for warming targets



Note: Baseline and NDC projections for 170 countries (>95% of global emissions). Assumes linear path for countries with net-zero emission targets. Warming pathways assume CO_2 emissions are reduced in proportion to total GHG emissions.
Source: Global Carbon Budget (2021), IPCC (2018), IMF staff calculations.

Table A A.1. Paris mitigation contributions

Country	Submitted Revised NDC for COP26	Paris Mitigation Contributions	Year of Net-Zero Pledge
Argentina	Yes	Net emissions cap of 359 $MtCO_2$ in 2030	2050 (under discussion)
Australia	Yes	Reduce GHGs 26-28% below 2005 by 2030	N/A
Brazil	Yes	Reduce GHGs 37%-43% below 2005 by 2025 and 2030	N/A
Canada	Yes	Reduce emissions by 40-45% below 2005 levels by 2030	2050
China	No	Reduce CO_2/GDP 60-65% below 2005 by 2030	2060
France	Yes	Reduce GHGs 55%* below 1990 by 2030	2050
Germany	Yes	Reduce GHGs 55%* below 1990 by 2030	2050
India	No	Reduce GHG/GDP 33-35% below 2005 by 2030	N/A
Indonesia	Yes	Reduce GHGs 29%(41%) below BAU in 2030	N/A
Italy	Yes	Reduce GHGs 55%* below 1990 by 2030	2050 (under discussion)
Japan	Yes	Reduce GHGs 25.4%(28.5%) below 2005 by 2030	2050
Korea	Yes	Reduce GHGs 24.4% below 2017 by 2030	2050
Mexico	Yes	Reduce GHGs 22%(36%) below BAU in 2030	2050 (under discussion)
Russia	Yes	Reduce GHGs 70% below 1990 by 2030	N/A
Saudi Arabia	No	Reduce GHGs 130 million tonnes below BAU by 2030	N/A
South Africa	No	Reduce GHGs 398-614 million tonnes in 2025 and 2030	2050
Turkey	No	Reduce GHGs 21% below BAU in 2030	N/A
United Kingdom	Yes	Reduce GHGs 68% below 1990 by 2030	2050
United States	Yes	Reduce GHGs 50-52% below 2005 by 2030	2050
European Union	Yes	Reduce GHGs 55%* below 1990 by 2030	2050

Note: Some countries have specified both conditional and unconditional pledges, where the former are contingent on external finance and other support – in these cases the conditional pledges are in parentheses. Asterisks shows the European Union's regional commitment.
Source: UNFCCC, Energy & Climate Intelligence Unit. UNEP, 2020. Emissions Gap Report 2020. UN Environment Programme, Nairobi, Kenya.

Annex B. BCAs – Design choices and alternatives

Table A B.1. Design choices for BCAs and how they affect multiple objectives

Metric	Design Feature				
		Measuring embodied carbon			
	Sectoral coverage: EITE industries vs. broader	Domestic vs. country-specific benchmarks	Rebuttability	Rebates for domestic exporters	Adjusting BCA for carbon pricing abroad
Competitiveness of EITE industries	Same protection with both approaches	Domestic preserves competitiveness for all trading partners	Little relevance	Preserves competitveness of exports	Can preserve level playing field
Leakage	Broader addresses leakage more comprenshively but extra benefit may be modest	Country-specific addresses leakage more efficiently	Little relevance	Reduces leakage	May reduce leakage
Promoting carbon pricing/mitigation abroad	Broader increases incentives but only modestly	Country-specific provides stronger incentives on foreign producers and govts.	Incentive for foreign firm to reduce emissions	Little relevance	Promotes pricing but direct incentives may be modest
Mitigation for domestic EITE industries	Both approaches preserve incentives	Both approaches preserve incentives	Little relevance	Preserves incentives if appropriate design	Little relevance
Administrative	Broader may be very complex	Country-specific is more complex	Small if third parties provide verification	Modest additional burden	Increases burden
Legal	Leakage rationale more questionable for broader	Domestic might help by reducing tariff and showing like treatment	Should help with WTO	Could be challenged as a subsidy	May increase legal risks if not applied equally and equivalently across countries

Source: IMF staff.

Table A B.2. Ensuring the effectiveness and fairness of ambitious climate policies in a fragmented world: strengths and weaknesses of selected instruments

Instrument	Can be applied unilaterally	Maintains domestic abatement incentive	Avoids carbon leakage and asymmetric cost increases for domestic producers	Is WTO compatible	Administratively within reach	Generates revenues for domestic government	Incentivises foreign firms to invest in clean production	Incentivises foreign countries to price carbon emissions	Allows scaling to level of development of foreign countries
Preferential rates	Yes	Weak (depending on size of discount)	Moderate to strong (depending on size of discount)	Strong	Strong	Weak (foregone revenue, depending on size of discount)	No	No	No
Free permits	Yes	Weak to moderate (depending on extent and design of free allocation)	Moderate to strong (depending on share of free allocation)	Strong (has not been challenged)	Strong	No (foregone revenue)	No	No	No
Compensating for input-cost increases	Yes	Weak to moderate (depending on extent and design of cost compensation)	Moderate to strong (depending on size and breadth of compensation)	Strong (has not been challenged)	Strong	No (requires government spending)	No	No	No
Abatement payments	Yes	Strong in theory, moderate in practice	Strong	Strong (has not been challenged)	Strong	No (requires government spending)	No (but this may occur with the related instrument of carbon offsets)	No	No
Feebates	Yes	Moderate (encourages switch to cleaner product categories; but does not provide abatement incentives at the margin)	Strong (but does not address potential leakage by accompanying carbon price)	Strong	Strong	No (if revenue neutral design)	Moderate (strengthens export market for cleaner products)	Weak	No
Excise taxes on carbon-intensive products, such as steel, cement & bulk chemicals	Yes	Moderate (encourage switch to cleaner substitutes; but not the use of cleaner production	Strong (but does not address potential leakage by accompanying carbon price)	Strong	Strong	Strong	Moderate (strengthens export market for cleaner products)	Weak	No

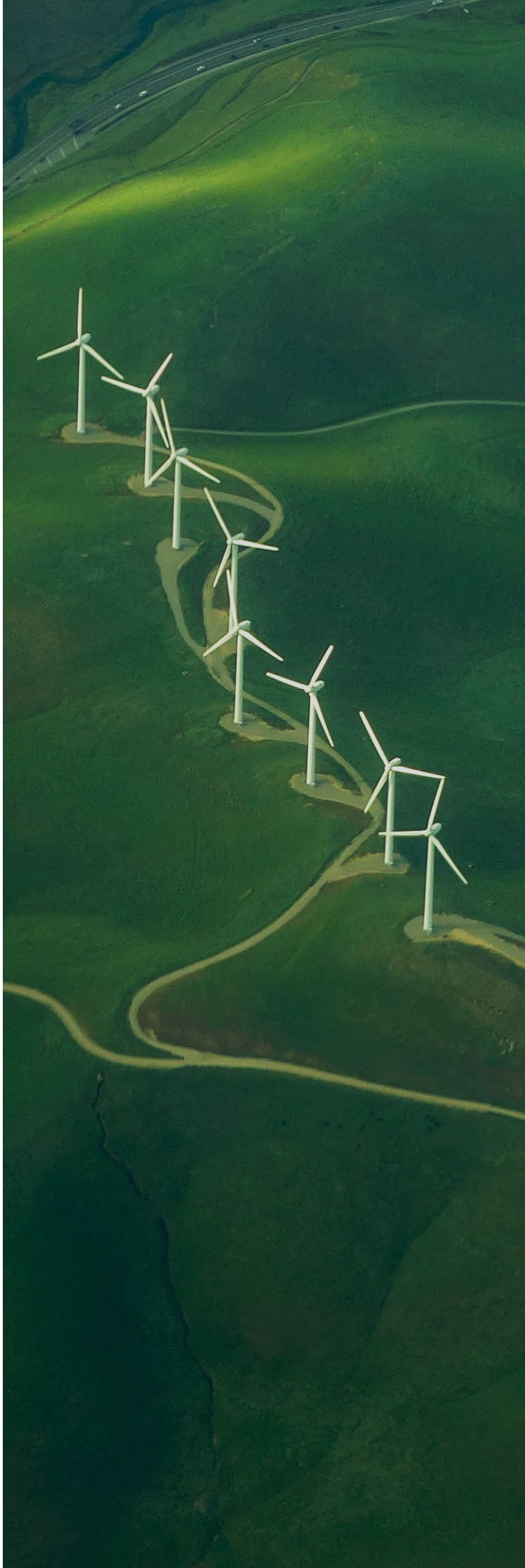
		processes for a given product)							
Narrow BCA (Mehling et al.)	Yes	Strong	Moderate	Moderate to strong (depends on design)	Strong	No	Moderate	Moderate	Strong
Broad BCA (Flannery et al.)	Yes	Strong	Strong	Moderate to strong (depends on design)	Weak	Strong	Strong	Strong	Moderate
International sectoral agreements	No	Strong in principle but weak in practice due to difficulty of reaching ambitious agreement	Strong	Strong	Moderate	Variable (depends on agreement)	Strong	Strong	Strong (existing agreements include such provisions)
Linking existing carbon markets	No	Variable (1)	Variable (2)	Strong	Weak	Variable (depends on market)	Strong	Strong	Strong

Note 1: Linking carbon markets generally maintain or strengthen domestic abatement incentives, however they may weaken these domestic incentives in certain circumstances depending on their design.
Note 2: Linking carbon markets aims to reduce carbon leakage effectively, however, this will depend on the overall scope and coverage of the schemes linked. This depends on the initial carbon markets that are being linked.
Source: OECD (2020), *Climate Policy Leadership in an Interconnected World: What Role for Border Carbon Adjustments?*, https://doi.org/10.1787/8008e7f4-en.

Tax Policy and Climate Change

IMF/OECD REPORT FOR THE G20 FINANCE MINISTERS AND CENTRAL BANK GOVERNORS, SEPTEMBER 2021, ITALY

This report, by the IMF and OECD, was drafted to inform the G20 Finance Ministers and Central Bank Governors on the role of greenhouse gas emissions pricing in climate change mitigation policy packages. It focuses on carbon pricing, taking stock of current pricing patterns, identifying reform needs, impacts and opportunities, and comprehensive approaches to address political economy concerns.



For more information:

ctp.contact@oecd.org

http://oe.cd/tax-environment

@OECDtax