Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized
Public Disclosure Authorized

WORLD BANK GROUP

State and Trends of Carbon Pricing 2019

Washington DC, June 2019

State and Trends of Carbon Pricing 2019

Washington DC, June 2019

The preparation of this report was led by the World Bank, with the support of Navigant and with contributions from the International Carbon Action Partnership.

The World Bank team responsible for drafting and reviewing this report was composed of Céline Ramstein, Goran Dominioni and Sanaz Ettehad.

The Navigant team included Long Lam, Maurice Quant, Jialiang Zhang, Louis Mark, Sam Nierop, Tom Berg, Paige Leuschner, Cara Merusi, Noémie Klein and Ian Trim.

The report benefited greatly from the valuable contributions and perspectives of our colleagues in the climate and carbon finance community, who have ensured the quality and clarity of this report: Johannes Ackva, William Acworth, Erik van Andel, Nicolette Bartlett, Daron Bedrosyan, Daniel Besley, Tanguy de Bienassis, Simon Black, Elliot Bourgeault, David Brock, Nigel Burns, Dallas Burtraw, Mercedita Garcia Cano, Marcos Castro Rodriguez, Chen Zhibin, Monica Crippa, Kurt Van Dender, Timila Dhakhwa, Ana Maria Dias, Chandni Dinakaran, Luisa Dressler, Assia Elgouacem, Dominik Englert, Thomas Erb, Víctor Escalona, Susana Escária, Eduardo Ferreira, Florens Flues, Moa Forstorp, Harikumar Gadde, Christophe de Gouvello, Stefany Gutu, Stephane Hallegatte, Dirk Heine, Dafei Huang, Marius Kaiser, Angela Churie Kallhauge, Junaed Khan, Seoyi Kim, Matt King, Lai Han, Liu Ying, Emídio Lopes, Vincent Marcus, Taisei Matsuki, Wataru Matsumura, Laura Merrill, Rachel Mok, Klaus Oppermann, Shibani Pandey, Ian Parry, Sébastien Postic, Neeraj Prasad, Venkata Putti, Barry Rabe, Jeanette Ramirez, Smita Rana, Suneira Rana, Stephanie Rogers, Germán Romero, Steven Rose, Isabel Saldarriaga Arango, Lourdes Sanchez, Marissa Santikarn, Chandra Shekhar Sinha, Jason James Smith, William Space, Sandhya Srinivasan, Kensuke Suda, Nuyi Tao, Erin Taylor, Jonas Teusch, Massamba Thioye, Michael Toman, John Ward, Peter Zapfel, Environment and Climate Change Canada, and Greenhouse Gas Inventory and Research Center of Korea.

We also acknowledge support from the Carbon Pricing Leadership Coalition, the Partnership for Market Readiness, CDP, and the Institute for Climate Economics for the preparation of this report.

WORLD BANK GROUP

NAVIGANT

icap International Carbon Action Partnership

© 2019 International Bank for Reconstruction and Development / The World Bank

1818 H Street NW, Washington DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

Some rights reserved
1 2 3 4 22 21 20 19

This work is a product of the staff of The World Bank with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of The World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries. Nothing herein shall constitute or be considered to be a limitation upon or waiver of the privileges and immunities of The World Bank, all of which are specifically reserved.

Rights and Permissions

This work is available under the Creative Commons Attribution 3.0 IGO license (CC BY 3.0 IGO) http://creativecommons.org/licenses/by/3.0/igo. Under the Creative Commons Attribution license, you are free to copy, distribute, transmit, and adapt this work, including for commercial purposes, under the following conditions:

Attribution—Please cite the work as follows:
"State and Trends of Carbon Pricing 2019" *State and Trends of Carbon Pricing* (June), World Bank, Washington, DC.
Doi: 10.1596/978-1-4648-1435-8.
License: Creative Commons Attribution CC BY 3.0 IGO

Translations—If you create a translation of this work, please add the following disclaimer along with the attribution: *This translation was not created by The World Bank and should not be considered an official World Bank translation. The World Bank shall not be liable for any content or error in this translation.*

Adaptations—If you create an adaptation of this work, please add the following disclaimer along with the attribution: *This is an adaptation of an original work by The World Bank. Responsibility for the views and opinions expressed in the adaptation rests solely with the author or authors of the adaptation and are not endorsed by The World Bank.*

Third-party content—The World Bank does not necessarily own each component of the content contained within the work. The World Bank therefore does not warrant that the use of any third-party-owned individual component or part contained in the work will not infringe on the rights of those third parties. The risk of claims resulting from such infringement rests solely with you. If you wish to re-use a component of the work, it is your responsibility to determine whether permission is needed for that re-use and to obtain permission from the copyright owner. Examples of components can include, but are not limited to, tables, figures, or images.

All queries on rights and licenses should be addressed to the Publishing and Knowledge Division, The World Bank, 1818 H Street NW, Washington, DC 20433, USA; fax: 202-522-2625; e-mail: pubrights@worldbank.org.

ISBN (electronic): 978-1-4648-1435-8
DOI: 10.1596/978-1-4648-1435-8

Picture credits:
page 18: © Daniel / Adobe Stock.
page 20: © kemalbas / istockphoto.com.
page 52: © kparis / istockphoto.com.
page 64: © Tiberius Gracchus / Adobe Stock.
page 68: © koto_feja / istockphoto.com.
Further permission required for reuse.

Cover and interior design:
Meike Naumann Visuelle Kommunikation

Foreword

Every year this report presents the latest developments in carbon pricing around the world. Every year the impacts of climate change feel more immediate and daunting, this year even more so than usual as extreme weather and numerous scientific reports have started screaming at us. Overall, while we see some encouraging trends, action on carbon pricing is nowhere near where it should be: it still covers only a small part of global emissions at prices too low to significantly reduce emissions.

First, this report reveals a mixed bag. A growing number of jurisdictions are implementing or planning to implement a carbon tax or an emission trading system—a total of 57 initiatives compared to 51 in 2018 and this number is set to grow, according to countries' climate pledges. Most of this action has taken place in the Americas, and particularly in Canada where the federal carbon pricing approach has prompted new initiatives at the provincial level. Important developments have also occurred in other parts of the world with new carbon taxes in Singapore and South Africa—the first carbon pricing instrument implemented in Africa—and new initiatives explored in Colombia, Mexico, the Netherlands, Senegal, Ukraine, and Vietnam.

But is it enough? Here again, the evidence is clear. Only 20 percent of global GHG emissions are covered by a carbon price and less than 5 percent of those are currently priced at levels consistent with reaching the temperature goals of the Paris Agreement. Swift action is needed: carbon pricing is the most effective way to reduce emissions and all jurisdictions must go further and faster in using carbon pricing policies as part of their climate policy packages.

Second, while the direction of travel seems clear, the implementation of carbon pricing mechanisms can sometimes be more difficult than anticipated. In the past year, we witnessed social unrest in part related to carbon pricing initiatives. These events highlight how critical—and often difficult—it is to gain and maintain public support for carbon pricing policies. Building on decades of experience in carbon pricing, we have come to learn the vital importance of taking a comprehensive approach. Carefully planning for the design and implementation of these policies entails, for example, including all stakeholders and having clear communication strategies in place early on that focus on local co-benefits, how the revenues will be used, and on measures that prevent adverse impacts falling on the poorest households. At the World Bank Group, we are supporting countries as they explore carbon pricing through our programs offering analytics, technical assistance, and fora to share their own experiences.

Third, this year's report goes beyond its traditional focus on explicit carbon pricing and, for the first time, also looks at implicit carbon pricing. Many countries are already implicitly pricing carbon through other policies, such as fuel taxes or fossil fuel subsidies reforms. Taking this wider view will allow us to obtain a more transparent view of the real price applied to carbon emissions, to utilize a wider portfolio of instruments to drive climate action, and to strengthen the ability to overcome implementation challenges. Going forward, we will continue to expand these analyses in order to provide a more comprehensive picture of, and advice on, countries' efforts on carbon pricing and getting incentives right to reduce emissions.

Finally, the Article 6 of the Paris Agreement offers a major opportunity to lower the costs of mitigation action and enable higher climate ambition. While the implementation Article 6 and its rules are not yet clarified, several pilot programs have started, some of which are being supported by the World Bank, that can enable us to test design options and identify challenges and innovative solutions.

Pricing carbon pollution is a crucial tool for driving investment and action in the right direction. Getting our prices right, and doing it now, is key to achieving climate and development goals.

John Roome,
Senior Director, Climate Change Group, World Bank

List of abbreviations and acronyms

A	**ADB**	Asian Development Bank
B	**BAU**	Business-as-usual
	BNDES	The Brazilian development bank
C	**°C**	Degrees Celsius
	CAR	Clean Air Rule
	CARB	California Air Resources Board
	CCIR	Carbon Competitive Incentive Regulation
	CDM	Clean Development Mechanism
	CER	Certified Emission Reduction
	CO_2	Carbon dioxide
	CO_2e	Carbon dioxide equivalent
	COP	Conference of the Parties
	CORSIA	Carbon Offset and Reduction Scheme for International Aviation
	CPLC	Carbon Pricing Leadership Coalition
D	**DRC**	Democratic Republic of Congo
E	**EBRD**	European Bank for Reconstruction and Development
	EC	European Commission
	ECR	Emissions Containment Reserve
	EIB	European Investment Bank
	ERF	Emissions Reduction Fund
	ERPA	Emissions reduction purchasing agreements
	ESRAF	Energy Subsidy Reform Assessment Framework
	ETS	Emissions Trading System
	EU	European Union
	EUA	European Union Allowance
	EU ETS	European Union Emissions Trading System
F	**FCPF**	Forest Carbon Partnership Facility
	FSB	Financial Stability Board
G	**GCF**	Green Climate Fund
	GDP	Gross Domestic Product
	GGPPA	Greenhouse Gas Pollution Pricing Act
	GHG	Greenhouse gas
	$GtCO_2e$	Gigaton of carbon dioxide equivalent
I	**ICAO**	International Civil Aviation Organization
	IEA	International Energy Agency
	IFC	International Finance Corporation
	IMO	International Maritime Organization
	INDC	Intended Nationally Determined Contribution
	IPCC	Intergovernmental Panel on Climate Change
	ITMO	Internationally Transferred Mitigation Outcome
J	**JCM**	Joint Crediting Mechanism
K	**$KtCO_2e$**	Kiloton of carbon dioxide equivalent

M	**MDB**	Multilateral development bank
	MEPC	Marine Environment Protection Committee
	MIGA	Multilateral Investment Guarantee Agency
	MRV	Monitoring, Reporting and Verification
	MSR	Market stability reserve
	MtCO_2e	Megaton of carbon dioxide equivalent
N	**NACAP**	Nitric Acid Climate Auctions Program
	NACAG	The Nitric Acid Climate Action Group
	NDC	Nationally Determined Contribution
	NZ ETS	New Zealand Emissions Trading System
O	**OBPS**	Output-Based Pricing System
	OECD	Organisation for Economic Co-operation and Development
P	**PMR**	Partnership for Market Readiness
	PSS	Performance Standards System
R	**RBCF**	Results-based Climate Finance
	REDD+	Reducing Emissions from Deforestation and Forest Degradation including sustainable forest management, conservation of forests, and enhancement of carbon sinks
	RGGI	Regional Greenhouse Gas Initiative
S	**SARPs**	Standards and Recommended Practices
	SGER	Specified Gas Emitters Regulation
T	**t**	Ton (note that, unless specified otherwise, ton in this report refers to a metric ton = 1,000 kg)
	TCAF	Transformative Carbon Asset Facility
	TCDF	Task Force on Climate-related Financial Disclosures
	TCI	Transportation and Climate Initiative
	tCO_2	Ton of carbon dioxide
	tCO_2e	Ton of carbon dioxide equivalent
U	**UK**	United Kingdom
	UNFCCC	United Nations Framework Convention on Climate Change
	US	United States
W	**WCI**	Western Climate Initiative

Table of contents

Figures

Tables

Boxes

Executive summary

In 2018 and 2019, the number of carbon pricing initiatives around the world increased and existing systems were strengthened as jurisdictions assessed their policies to better align with their climate objectives. But we are still very far from where we need to be to meet the Paris Agreement objectives. The coverage and price levels of carbon pricing initiatives is still insufficient. It is crucial that jurisdictions take action now to increase the breadth and the depth of carbon pricing. 2019 is also a critical year for clarifying the implementation of the international carbon pricing mechanisms stated in the Paris Agreement and unlock their potential for accelerating action and increasing ambition.

The challenge of reducing global greenhouse gas (GHG) emissions sufficiently to mitigate dangerous impacts of climate change remains daunting. According to the International Energy Agency (IEA),[1] increased energy demand contributed to a 1.7 percent rise in energy-related GHG emissions in 2017, the highest rate of growth in four years. In 2018, total GHG emissions reached historic heights, and the Intergovernmental Panel on Climate Change (IPCC) stressed that the window of opportunity to limit global warming and its dramatic consequences is closing fast.[2]

Carbon pricing is increasingly recognized as an essential instrument to cost-effectively deliver the transition to low-carbon societies.[3] In the past year, the IPCC, the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD) all reiterated the need for strengthening and accelerating carbon pricing, and the IMF recently pushed for establishing a voluntary carbon price floor among large emitters.[4] At the recent World Bank Group Spring Meetings, Finance Ministers from more than 20 countries endorsed the "Helsinki Principles," which promote national climate action mainly through fiscal policy and the use of public finance.[5]

Countries are committed to using carbon pricing to meet national climate targets. Of the 185 Parties that have submitted their Nationally Determined Contributions (NDCs) to the Paris Agreement, 96—representing 55 percent of global GHG emissions—have stated that they are planning or considering the use of carbon pricing as a tool to meet their commitments. That is an increase of eight Parties from last year.

Regional, national and subnational jurisdictions continue to adopt carbon pricing as a key policy to meet their climate targets, with 11 new initiatives

1 Source: IEA, *Global Energy & CO_2 Status Report 2018*, April 26, 2019.
2 Source: IPCC, *Global Warming of 1.5°C*, 2018.
3 Source: IPCC, *Global Warming of 1.5°C*, 2018.
4 Source: IMF, *Getting Real on Meeting Paris Climate Change Commitments*, May 3, 2019, https://blogs.imf.org/2019/05/03/getting-real-on-meeting-paris-climate-change-commitments/.
5 Source: WBG, *The Helsinki Principles*, April 2019. https://www.worldbank.org/en/news/press-release/2019/04/13/coalition-of-finance-ministers-for-climate-action

implemented in 2018 and 2019 so far. This increases the total carbon pricing initiatives implemented and scheduled for implementation to 57. This consists of 28 emission trading systems (ETSs) in regional, national and subnational jurisdictions, and 29 carbon taxes, primarily applied on a national level. In total, these carbon pricing initiatives cover 11 gigatons of carbon dioxide equivalent ($GtCO_2e$), or about 20 percent of global GHG emissions, similar as compared to last year.

New carbon pricing initiatives are emerging, mostly at a subnational level and in the Americas. Five new carbon pricing initiatives are in Canadian provinces and territories, driven by Canada's federal carbon pricing approach. 11 initiatives were implemented globally in 2018–2019 so far.

In 2018:

- An ETS in Massachusetts covering power plants, which will continue to be subject to the Regional Greenhouse Gas Initiative (RGGI);
- A carbon tax in Argentina covering most liquid fuels.[6]

In 2019:

- A backstop system at the federal level in Canada with two carbon pricing initiatives: an ETS that applies to power generation and industrial facilities, and a carbon tax-like fuel charge that covers a wide range of fossil fuels and combustible waste. The backstop system applies to provinces and territories that opt for it, or else have failed to establish their own carbon pricing initiative that meets federal benchmarks;
- An ETS in Nova Scotia, applying to the industry, electricity, building, and transport sectors;
- An ETS and a carbon tax in Newfoundland and Labrador, with the ETS applying to large industrial facilities and electricity generation, and a carbon tax covering fuels primarily used in transportation, heating of buildings and electricity generation;
- A carbon tax in Prince Edward Island similar to the fuel charge of the federal backstop system;
- An ETS in Saskatchewan covering large industrial facilities, which is complemented with the federal backstop system on all other emissions in the province as the ETS alone did not meet the federal benchmark;
- A carbon tax in Singapore that applies to all large emitters;
- An economy-wide carbon tax in South Africa—the first carbon tax in Africa.

Carbon pricing continues to expand with various initiatives under consideration. On the national level, this includes Colombia, Mexico, the Netherlands, Senegal, Ukraine and Vietnam. Within the subnational context, in Canada, Ontario and the Northwest Territories are working on new initiatives, while in the United States (US), New Jersey and Virginia are looking to join the RGGI and other states—such as Oregon and New Mexico—are considering developing their own carbon pricing initiatives.

Governments raised approximately US$44 billion in carbon pricing revenues in 2018, with more than half generated by carbon taxes. This is an increase of nearly US$11 billion compared to the previous year. Most of the revenue growth came from the higher European Union (EU) allowance price with other contributions from larger allowance sales in California and Québec, and an increase in revenues in Alberta, British Colombia and France due to higher carbon tax rates.

Many jurisdictions are broadening and deepening their carbon pricing instruments to better align with their climate goals, but prices remain too low to deliver on the objectives of the Paris Agreement. Governments are increasingly recognizing carbon pricing as a key policy instrument to meet climate mitigation targets. Strategies to strengthen carbon pricing action included both deepening, i.e. increasing prices or stringency, and broadening, i.e. increasing emission coverage. For example, Iceland increased its carbon tax rate by 10 percent in 2019 to bolster its effort to reach its NDC

6 For fuel oil, mineral coal, and petroleum coke, the tax is applied since the beginning of 2019.

targets, and Portugal is gradually reducing its carbon tax exemptions to transition away from coal. The EU and New Zealand have also significantly reformed and strengthened their respective ETSs to align with their NDCs, and Kazakhstan has relaunched its ETS after a two-year suspension. In the US, more states have opted to join the RGGI, and California is in the process of implementing significant reforms in its ETS.

However, these efforts are insufficient, as less than five percent of global emissions covered under carbon pricing initiatives are priced at a level consistent with achieving the goals of the Paris Agreement, i.e. US$40tCO$_2$ to US$80/tCO$_2$ by 2020 and US$50/tCO$_2$ to US$100/tCO$_2$ by 2030.[7] Due to the recent price increases, this represents some progress compared to last year when one percent of the covered emissions were in this range. It is still too low to meet the objectives of the Paris Agreement. Moreover, about half of the emissions covered by carbon pricing initiatives are still priced below US$10/tCO$_2$e. While this number remains unchanged from 2018, it is encouraging to see that the drop from three-quarters of the covered emissons that were priced below US$10/tCO$_2$e in 2017 has persisted.

The timid upward trends in adopting and strengthening carbon pricing initiatives are accompanied by increasing awareness that implementing carbon pricing can be challenging. In the past year, various initiatives have experienced pushback, such as the freeze of the carbon tax rate increase in France and the public rejection of a proposed carbon tax in the US state of Washington. This highlights the importance of obtaining and maintaining public support for carbon pricing. To help close the gap between current carbon prices and Paris-compatible levels and enable jurisdictions to adopt carbon pricing, learning from past examples and good practices will be key. This report contributes to supporting this effort by describing the latest developments and some of the lessons learned from jurisdictions around the world.

Considering policies that put an implicit price on carbon can also help action on carbon pricing. Various policies can be seen as putting an implicit price on carbon, such as fuel taxes and removal of fossil fuel subsidies.[8] Accounting for these policies in the debate on carbon pricing can play an important role in pushing forward the carbon pricing agenda. The ambition needed on carbon pricing depends on the overall policy environment, with stronger action required when other policies do not sufficiently support the transition to decarbonization.

Broadening the debate on explicit carbon pricing to carbon prices implicitly imposed via other policies can help policymakers and analysts obtain a more comprehensive and transparent view of the price applied to GHG emissions. This enables a better understanding of the price on GHG emissions in various jurisdictions across time and helps in aligning carbon pricing with overall ambitions. Discussing implicit carbon pricing can also help governments communicate about carbon pricing with relevant stakeholders, for instance, by highlighting the existence of—often large—co-benefits from policies that implicitly and explicitly price carbon. Importantly, some measures that implicitly price carbon face similar implementation challenges as those that price carbon explicitly. Policymakers can thus learn useful lessons from experience in implementing implicit carbon pricing policies to strengthen action on carbon taxes and ETSs.

7 Source: CPLC, Report of the High-Level Commission on Carbon Prices, May 29, 2017.
8 Work that goes in this direction has been conducted by OECD and IMF, see: OECD, *Effective Carbon Rates 2018 - Pricing Carbon Emissions Through Taxes and Emissions Trading*, September 18, 2018; IMF (2019), *Fiscal Policies For Paris Climate Strategies—From Principle To Practice*, IMF Policy Paper.

At the global level, there has been an increased interest in international cooperation. North America and Europe have taken steps towards creating linkages across several regions of the world. For example, the European Commission held its first policy dialogue with China's newly created Ministry of Ecology and Environment, reaffirming continued bilateral cooperation in developing China's national ETS. At the Global Climate Action Summit 2018, the EU and California agreed that officials from both jurisdictions would increase the frequency of exchanges, including on principles of alignment and the role of carbon pricing.

International cooperation through carbon pricing can play an important role in reducing the cost of implementing mitigation actions and increasing resource mobilization by crowding in public and private capital. Cooperation can lead to substantial cost savings in achieving the mitigation objectives of the NDCs. Article 6 of the Paris Agreement provides for voluntary cooperation among Parties to implement their NDCs, raise ambition, and promote sustainable development and environmental integrity. Article 6 can also provide a basis for establishing new linkages among different jurisdictions to reduce the current fragmentation of carbon markets. The linking of markets also offers greater depth and liquidity in markets and increased cost-efficiency and effectiveness in achieving emissions mitigation.

Guidelines for implementing Article 6 of the Paris Agreement are still being clarified, but pilots are already starting. At the 24th Conference of the Parties (COP 24) held in December 2018 in Katowice, Poland, an important milestone was met with the adoption of the Katowice Climate Package, which sets out the implementation guidelines for the Paris Agreement. The package includes operational guidance for governments in preparing their NDCs and rules for the functioning of the Transparency Framework. However, the negotiations did not agree on modalities and procedures for Article 6 mechanisms. Several outstanding issues remain to be discussed at COP 25 in Santiago, Chile. In this context, piloting activities initiated in several regions can play an important role in demonstrating opportunities and challenges based on practical experience, building capacity, and enhancing international cooperation.

The private sector is finding innovative ways to use carbon pricing to identify greater opportunities for GHG mitigation and reduce climate-related financial risks. Traditionally, companies use internal carbon pricing in their investment decisions to evaluate risks from mandatory carbon pricing initiatives.[9] However, businesses are exploring new ways of using internal carbon pricing to manage long-term climate risks and align their investments with climate objectives. For instance, major banking institutions are using carbon pricing approaches to review credit applications and assess their own portfolio footprint, while major indices are accounting for climate risks and climate policy including carbon pricing. Financial institutions are also increasingly applying internal carbon pricing in their investment decisions to manage climate-related risks and opportunities.

9 Source: CDP, *Putting a Price on Carbon- Integrating Climate Risk into Business Planning*, October 2017.

Box 1 / Carbon pricing in numbers

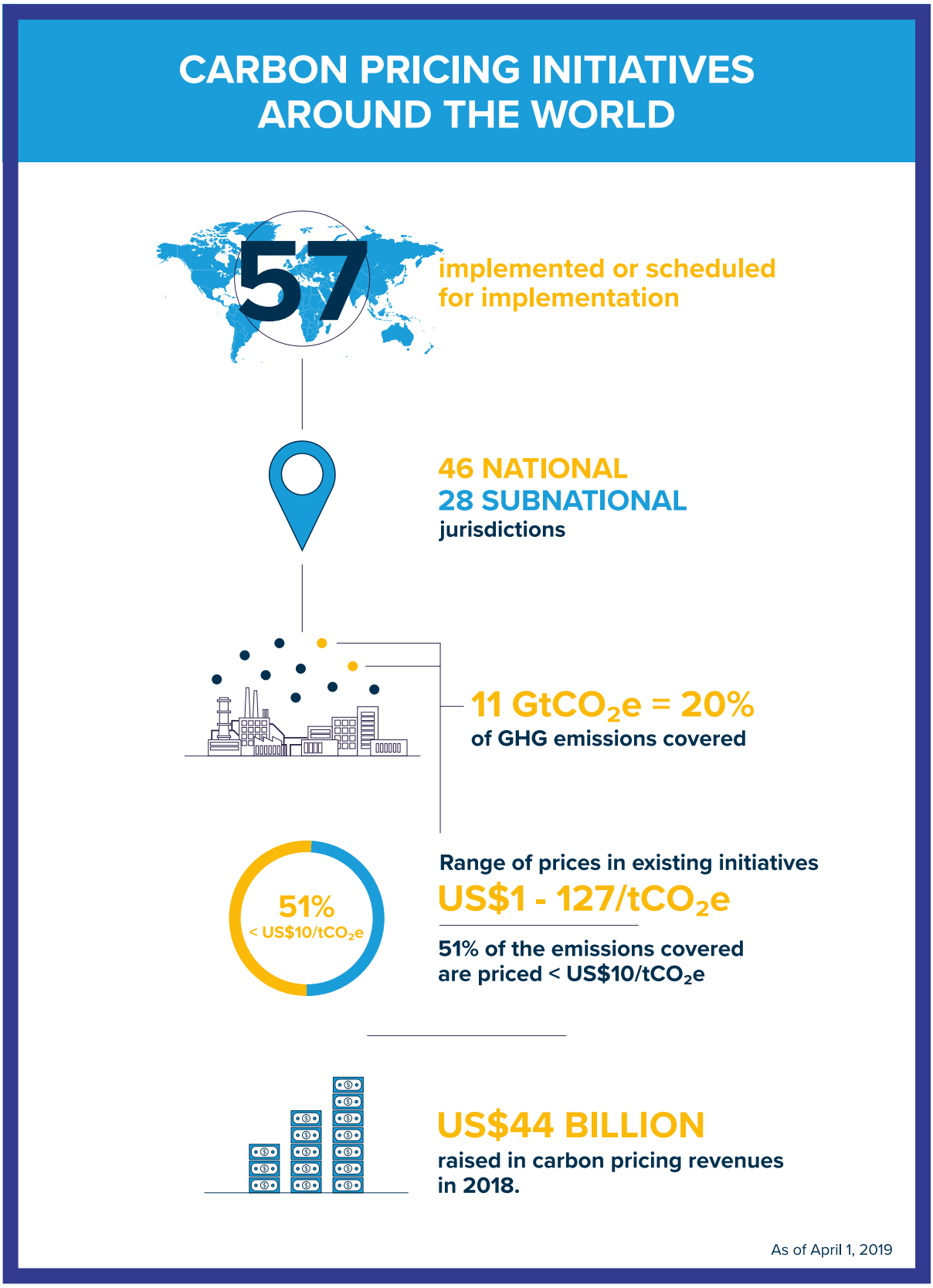
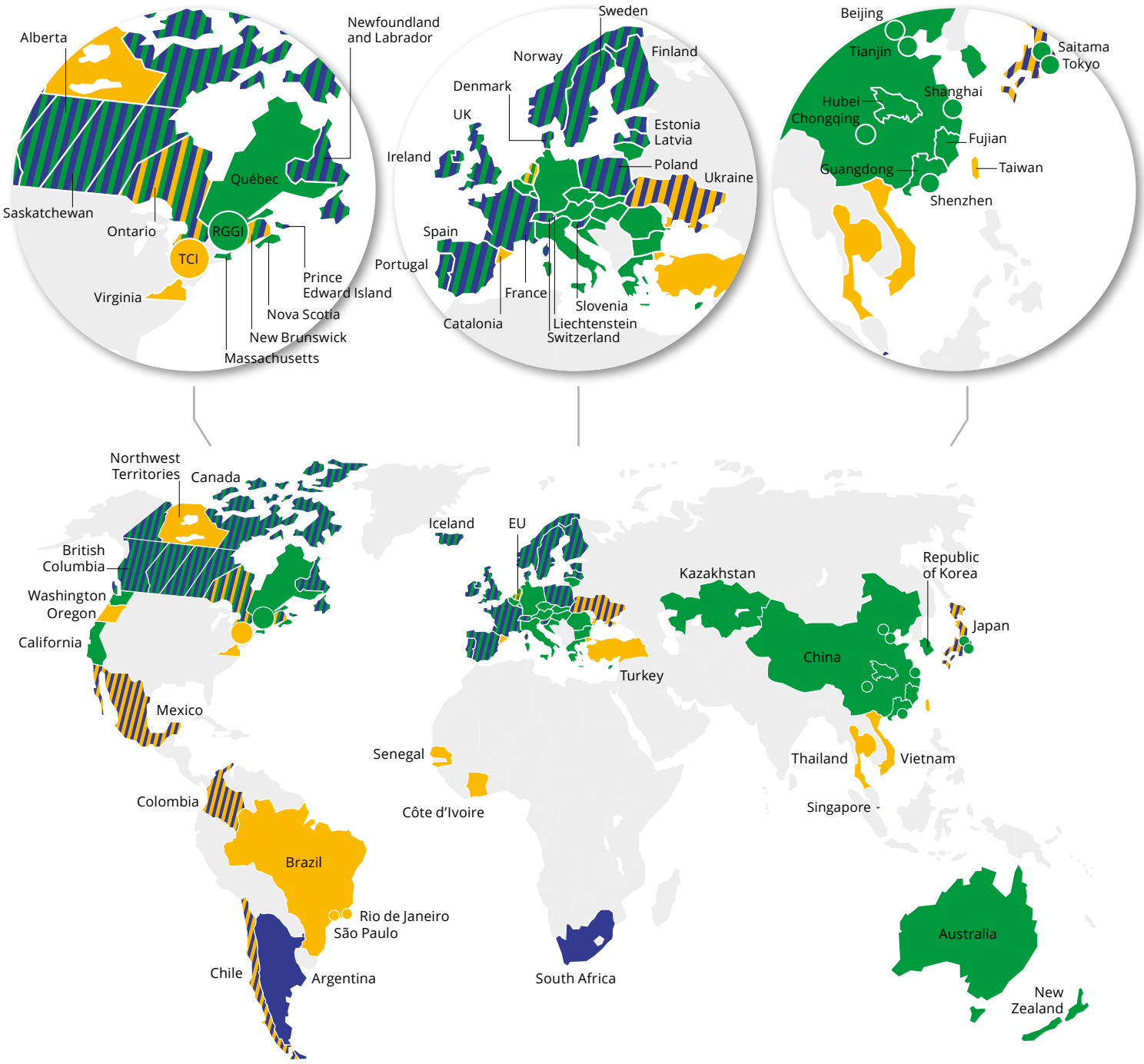
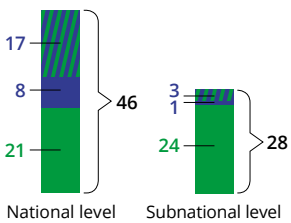


Figure 1 / Summary map of regional, national and subnational carbon pricing initiatives implemented, scheduled for implementation and under consideration (ETS and carbon tax)



Tally of carbon pricing initiatives implemented or scheduled for implementation

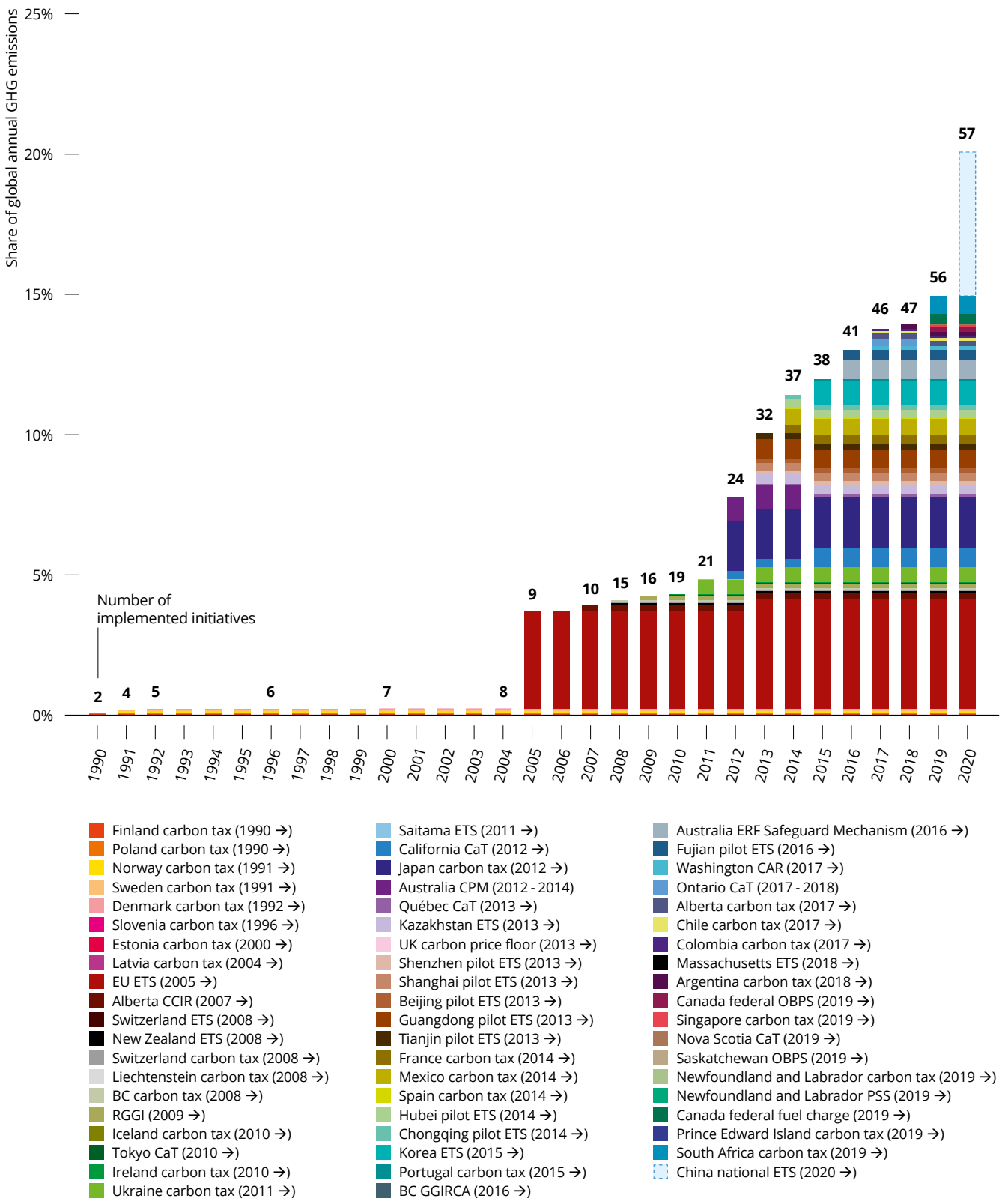


- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- Carbon tax implemented or scheduled, ETS under consideration
- ETS implemented or scheduled, carbon tax under consideration
- ETS and carbon tax implemented or scheduled, ETS or carbon tax under consideration

The large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions. The small circles represent carbon pricing initiatives in cities.

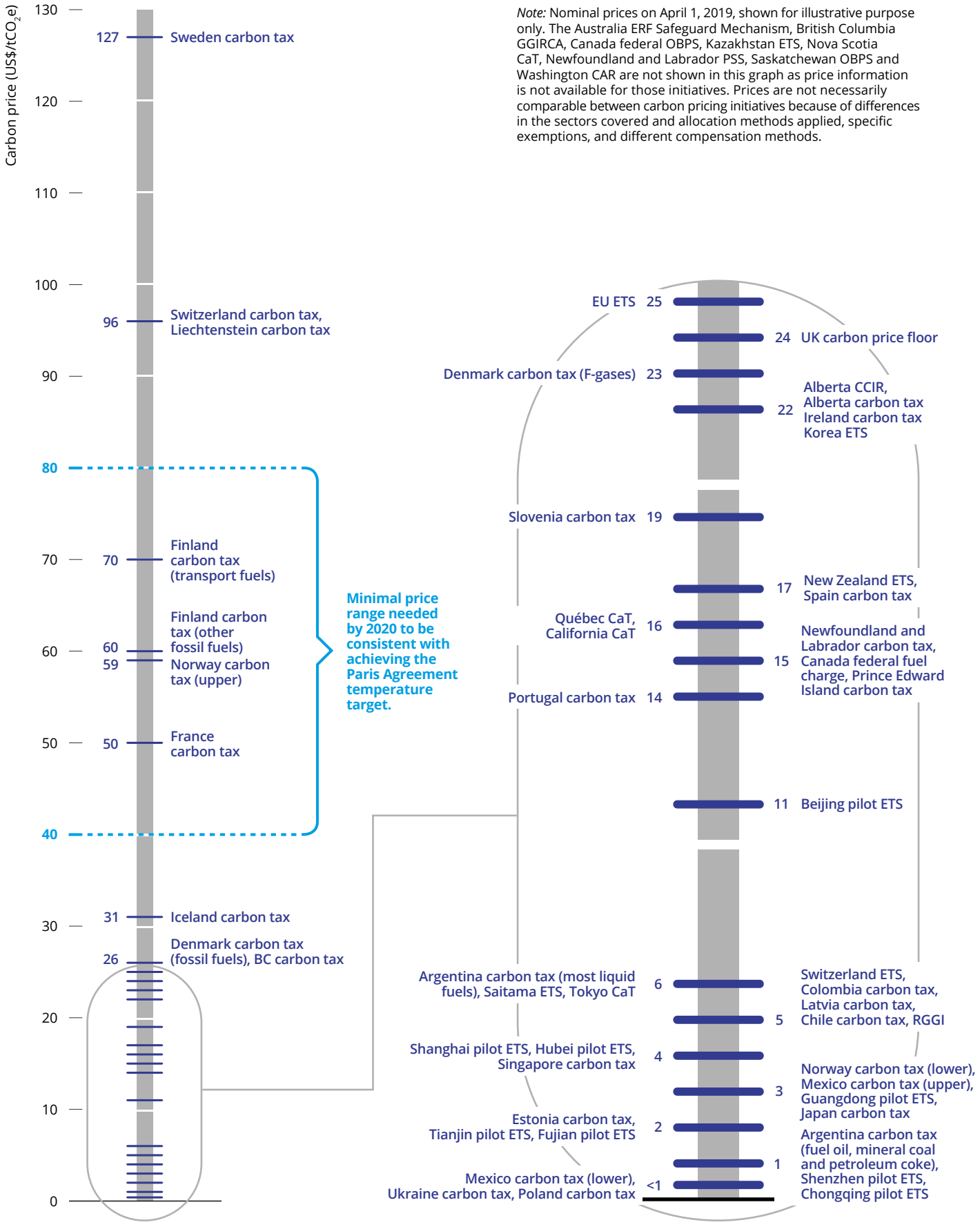
Note: Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible.

Figure 2 / Regional, national and subnational carbon pricing initiatives: share of global emissions covered



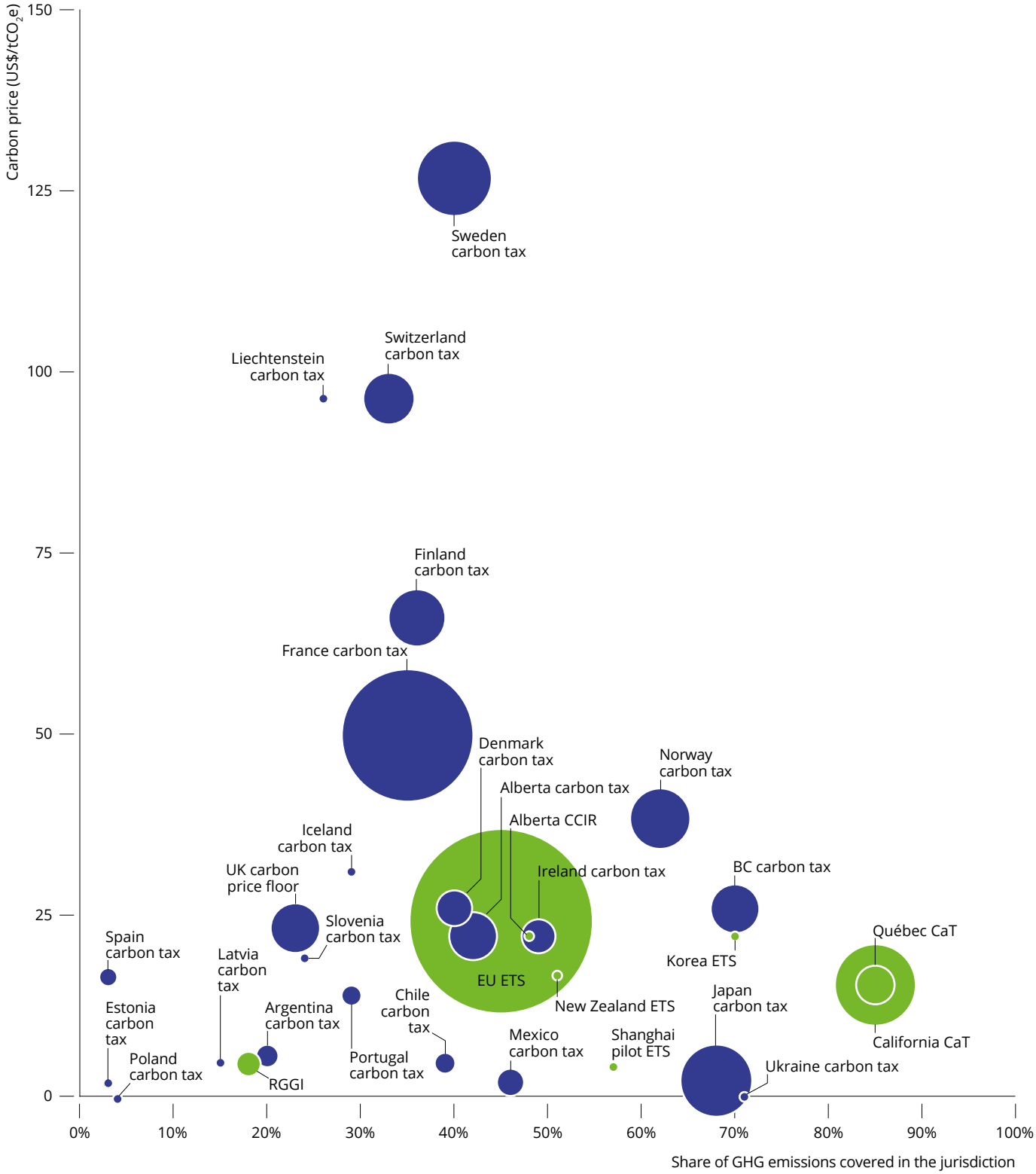
Note: Only the introduction or removal of an ETS or carbon tax is shown. Emissions are presented as a share of global GHG emissions in 2012 from (EDGAR) version 4.3.2 including biofuels emissions. Annual changes in GHG emissions are not shown in the graph. In 2018, the Alberta Carbon Competitiveness Incentive Regulation (CCIR) replaced the Alberta Specified Gas Emitters Regulation, which was launched in 2007. The information on the China national ETS represents early unofficial estimates based on the announcement of China's National Development and Reform Commission on the launch of the national ETS of December 2017.

Figure 3 / Prices in implemented carbon pricing initiatives



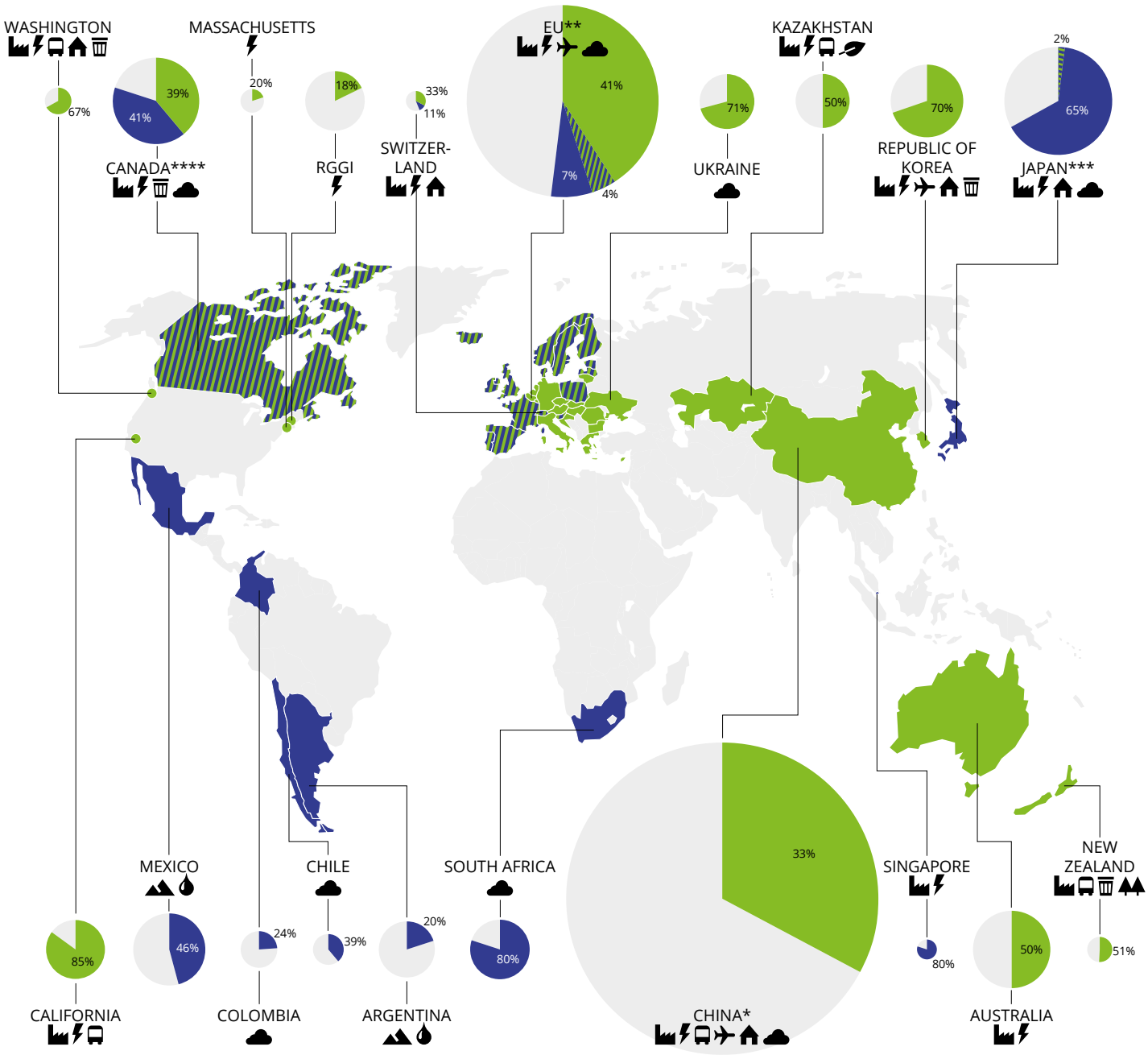
Note: Nominal prices on April 1, 2019, shown for illustrative purpose only. The Australia ERF Safeguard Mechanism, British Columbia GGIRCA, Canada federal OBPS, Kazakhstan ETS, Nova Scotia CaT, Newfoundland and Labrador PSS, Saskatchewan OBPS and Washington CAR are not shown in this graph as price information is not available for those initiatives. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the sectors covered and allocation methods applied, specific exemptions, and different compensation methods.

Figure 4 / Carbon price, share of emissions covered and carbon pricing revenues of implemented carbon pricing initiatives



Note: 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.

Figure 5 / Sectoral coverage and GHG emissions covered by carbon pricing initiatives implemented or scheduled for implementation, with sectoral coverage and GHG emissions covered



ETS implemented or scheduled for implementation
Carbon tax implemented or scheduled for implementation
ETS and carbon tax implemented or scheduled
40% Estimated coverage

Industry
Power
Transport
Aviation
Buildings
Waste
Forestry
Agriculture
All fossil fuels (tax only)
Solid fossil fuels
Liquid fossil fuels
Shipping

Note: The size of the circles reflects the volume of GHG emissions in each jurisdiction. Symbols show the sectors and/or fuels covered under the respective carbon pricing initiatives. The largest circle (China) is equivalent to 12.4 $GtCO_2e$ and the smallest circle (Switzerland) to 0.05 $GtCO_2e$. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS does not only refer to cap-and-trade systems, but also baseline-and-credit systems such as British Columbia and baseline-and-offset systems such as in Australia. Carbon pricing has evolved over the years and they do not necessarily follow the two categories in a strict sense. The authors recognize that other classifications are possible.

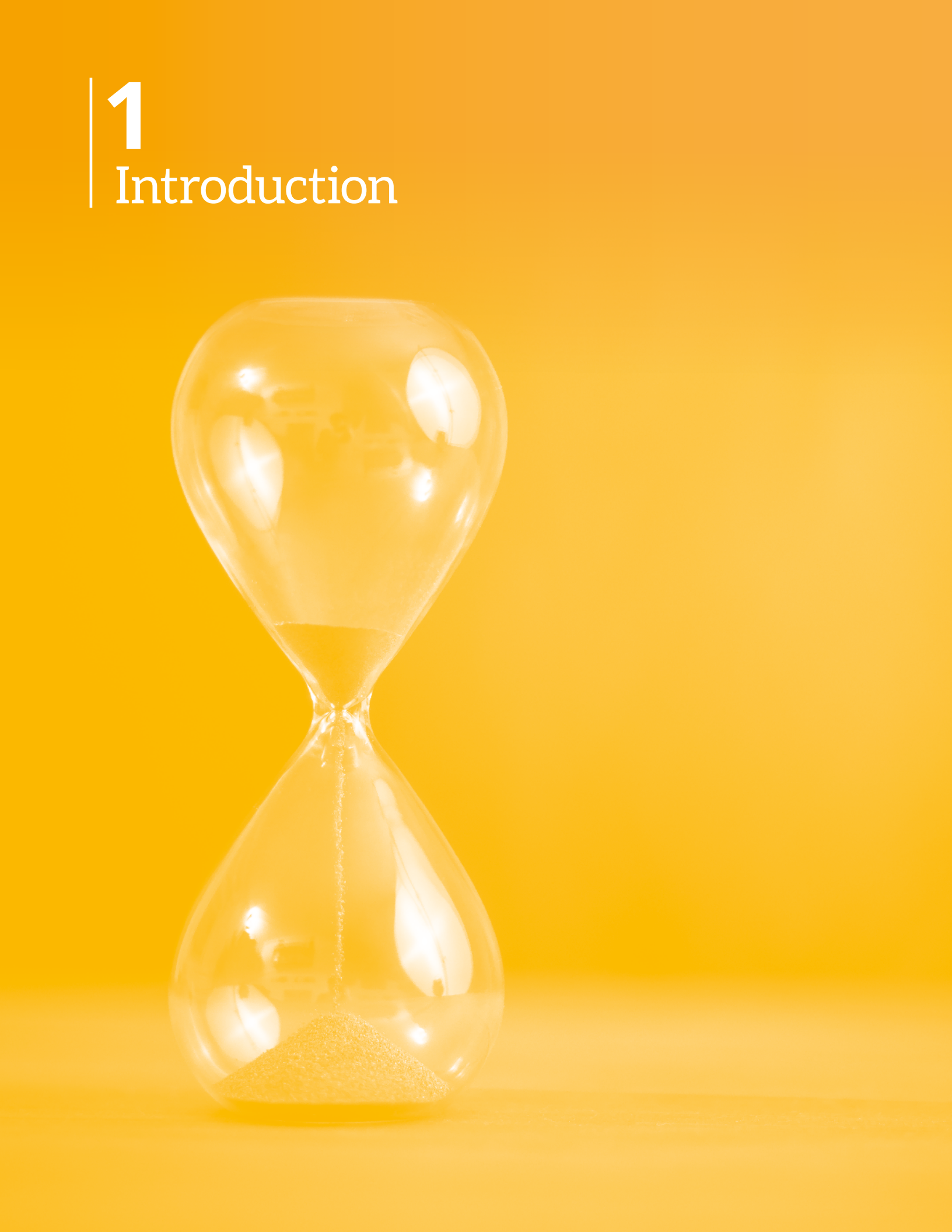
* The coverage includes the China national ETS and eight ETS pilots. The coverage represents early unofficial estimates based on the announcement of China's National Development and Reform Commission on the launch of the national ETS of December 2017 and takes into account the GHG emissions that will be covered under the national ETS and are already covered under the ETS pilots. The sector symbol refers to the covered sectors in the national ETS or (one of the) ETS pilots. The national ETS will initially cover the power sector only. The covered sectors vary per ETS pilot.

** Also includes Norway, Iceland and Liechtenstein. Carbon tax emissions are the emissions covered under various national carbon taxes; the scope varies per tax.

*** ETS emissions are the emissions covered under the Tokyo CaT and Saitama ETS.

**** The coverage includes both components of the Canada federal backstop system and the subnational carbon pricing initiatives.

1 Introduction



1 Introduction

The dangerous consequences of climate change are clearer than ever before. Yet, analyses indicate that countries' implemented policies and Nationally Determined Contribution (NDC) pledges fall far short of what is needed to keep the global temperature rise well below 2°C and pursue efforts to limit it to 1.5°C by 2100.[10] Carbon pricing can play a key role in the urgent efforts needed to accelerate the transition toward a low-carbon, climate-resilient future and increase the current level of ambition.[11]

> » There is a growing consensus that carbon pricing—charging for the carbon content of fossil fuels or their emissions—is the single most effective mitigation instrument. «
>
> *Christine Lagarde, Managing Director of the International Monetary Fund and Vitor Gaspar, Director of the International Monetary Fund's Fiscal Affairs Department*

This report takes stock of the latest developments in carbon pricing initiatives across the globe. It presents trends surrounding their development, the role they play in various economic sectors, and the policy choices involved. Tracking these developments helps identify gaps between current carbon pricing initiatives and those that would be needed to deliver on the objectives of the Paris Agreement. To this end, the report covers a variety of ways of putting a price on carbon emissions, which are here classified as carbon pricing, internal carbon pricing and implicit carbon pricing. For the purpose of this report, *carbon pricing* refers to initiatives that put an explicit price on greenhouse gas (GHG) emissions expressed in a monetary unit per tCO_2e. This includes carbon taxes, emissions trading systems (ETSs), offset mechanisms, and results-based climate finance (RBCF).[12] *Internal carbon pricing* refers to the practice of organizations assigning a monetary value to GHG emissions in their policy analyses and decision making. Where this report discusses *implicit carbon pricing*, it refers to other policies that implicitly price GHG emissions, such as the removal of fossil fuel subsidies and fuel taxation.

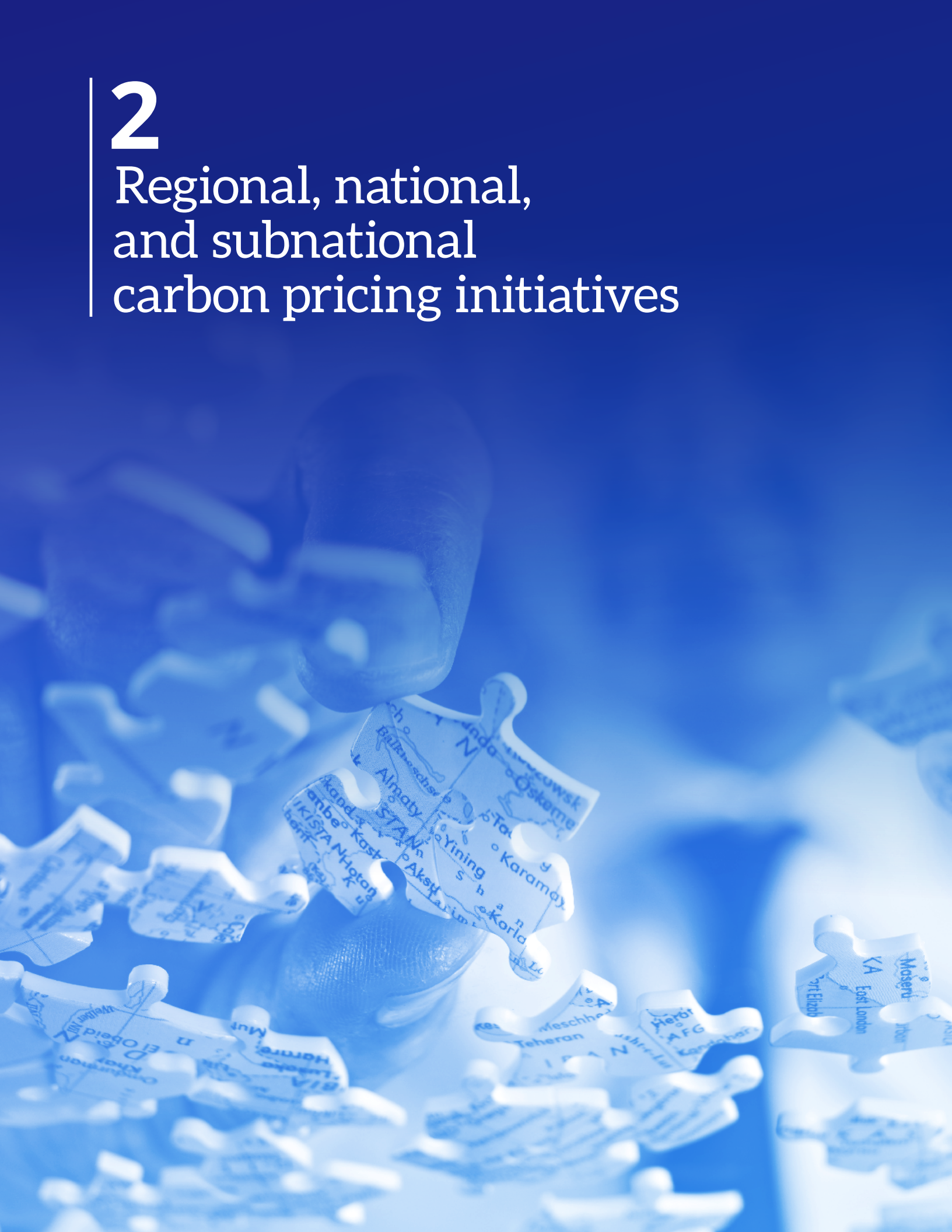
Chapter 2 of this report provides an overview of recent developments in carbon pricing initiatives at the regional, national, and subnational level and highlights trends occurring across these jurisdictions. Chapter 3 summarizes the latest international cooperation on carbon pricing, including the status of the implementation of the Paris Agreement and NDCs. This chapter also discusses voluntary carbon markets, RBCF, and carbon pricing in international aviation and international maritime transport. Chapter 4 reports on internal carbon pricing initiatives with a focus on their role in the private sector's effort to integrate climate-related financial risks and opportunities in their decision making with other instruments. For the first time in the State and Trends of Carbon Pricing report series, Chapter 5 has been added to discuss measures that put an implicit price on carbon, such as fossil fuel subsidy reforms and fuel taxes. This section goes beyond the traditional scope of the report to provide readers with a brief introduction of implicit carbon pricing in the context of, and relevance to, explicit carbon pricing.

10 Source: Climate Analytics, New Climate Institute, and Ecofys, a Navigant company, *Climate Action Tracker - Warming Projections Global Update*, December 11, 2018, https://climateactiontracker.org/documents/507/CAT_2018-12-11_Briefing_WarmingProjectionsGlobalUpdate_Dec2018.pdf.

11 The key role of carbon pricing in driving low carbon transition was recently recognized by IMF Managing Director Christine Lagarde and Fiscal Affairs Director Vitor Gaspar, https://blogs.imf.org/2019/05/03/getting-real-on-meeting-paris-climate-change-commitments/

12 RBCF has a carbon pricing component in that the amount of funding received per unit of GHG reduction target achieved creates the incentive for following through on the project.

2
Regional, national, and subnational carbon pricing initiatives



2 Regional, national, and subnational carbon pricing initiatives

2.1 Global overview of carbon pricing initiatives

As of April 1, 2019, 57 carbon pricing initiatives have been implemented, or are scheduled for implementation. This consists of 28 ETSs, spread across national and subnational jurisdictions, and 29 carbon taxes, primarily implemented on a national level. In total, as of 2019,[13] 46 national and 28 subnational jurisdictions[14] are putting a price on carbon, as shown in Figure 6.[15] Carbon pricing initiatives implemented and scheduled for implementation cover 11 gigatons of carbon dioxide equivalent ($GtCO_2e$) or about 20 percent of GHG emissions, as displayed in Figure 7.[16]

Details on the main developments that occurred in the past year in regional, national and subnational carbon pricing initiatives are presented below and overall trends analyzed over the past year are presented at the end of this section.

Carbon prices vary substantially, from less than US$1/tCO$_2$e to a maximum of US$127/tCO$_2$e, as shown in Figure 8. With some exceptions, carbon tax levels in 2019 remained unchanged while prices in many ETSs increased.[17] Most carbon taxes are linked to inflation only, which showed limited evolution in the past year. The carbon tax rate increases that occurred include i) the Portugal carbon tax rate that almost doubled from €6.85/tCO_2e (US$8.50/$tCO_2e$) to €12.74/$tCO_2e$ (US$14.31/$tCO_2e$) as it is linked to the European Union Allowance (EUA) price; and ii) the Iceland carbon tax rate, which increased by 10 percent to approximately ISK3850/tCO_2 (US$31/$tCO_2$). In France, the social protests resulted in the government shelving its planned carbon tax increase as described in more detail in Section 2.2. The increase of prices in many ETSs reflects strengthened trust and increased stringency. The EUA price continued to grow from €13/tCO_2e to €21/tCO_2e (US$16/$tCO_2e$ to US$25/$tCO_2e$) as more certainty developed on the future of the European Union Emissions Trading System (EU ETS) after 2020. California and New Zealand also saw price increases thanks to increased clarity on their post-2020 situation.

13 This report covers developments from January 1, 2018 until April 1, 2019.
14 Cities, states, and subnational regions.
15 The authors have kept the format of presenting this information consistent with the previous editions of the *State and Trends of Carbon Pricing* for comparison purposes.
16 The 2012 GHG emissions data of the Emissions Database for Global Atmospheric Research (EDGAR) version 4.3.2 including biofuels emissions has been used in this report. Source: EC JRC and PBL, *EDGAR's Global Greenhouse Gas Emissions from 1970 to 2012 (EDGARv4.3.2 Dataset)*, October 2017.
17 Price of April 1, 2018 compared with April 1, 2019.

Nonetheless, most jurisdictions still have carbon prices that are lower than those needed to cost-effectively deliver on the Paris Agreement. As discussed in Box 2 below, carbon prices of at least US$40–80/$tCO_2$ by 2020 and US$50–100/$tCO_2$ by 2030 are required to cost-effectively meet the temperature targets of the Paris Agreement. At present less than 5 percent of GHG emissions currently covered under a carbon price initiative is in line with required 2020 prices as shown in Figure 9. This is a slight increase from only one percent last year, but it is still very insufficient. Moreover, about half of the emissions covered by carbon pricing initiatives are still priced at less than US$10/$tCO_2$e. While this number remains unchanged from 2018, it is encouraging to see that the drop from three-quarters of the covered emissons that were priced below US$10/$tCO_2$e in 2017 has persisted.

Governments raised more than US$44 billion in carbon pricing revenues in 2018, consisting of revenues from carbon taxes, auctioned allowances, and direct payments to meet compliance obligations. This represents an increase of nearly US$11 billion compared to the US$33 billion raised in 2017. The EU ETS contributed most to the increase in revenues due to the increase in the EUA price, followed by California and Québec due to a larger share of allowances bought at auctions over the year.[18] The France carbon tax contributed to more than a third of global carbon tax revenue, followed by the carbon taxes of Canadian provinces Alberta and British Columbia where the carbon tax rates had also increased in 2018. An overview of the government revenues from carbon pricing is shown in Figure 10.

Box 2 / Carbon pricing trajectories to meet the objectives of the Paris Agreement

Identifying carbon price trajectories that can deliver on the Paris Agreement is crucial to guide climate action. In the past years, various price trajectories have been published that are needed to deliver on the Paris Agreement, each with important distinctions:

- The 1.5°C Intergovernmental Panel on Climate Change (IPCC) report, released in October 2018, provides price ranges of US$135–6,050/$tCO_2$e in 2030, US$245–14,300/tCO_2e in 2050, US$420–19,300/$tCO_2$e in 2070, and US$690–30,100/tCO_2e in 2100 (undiscounted values) under a pathway to keep peak temperatures below 1.5°C in the 21st century with 50–66 percent probability.[19] These price ranges are estimates of marginal abatement costs and comprise both prices from policies that put an explicit price on GHG emissions and costs on emissions from other policies.[20]

- The High-Level Commission on Carbon Prices indicates that carbon prices of policies that put an explicit price on GHG emissions need to be at least in the range of US$40–80/$tCO_2$ by 2020 and US$50–100/$tCO_2$ by 2030 to deliver on the Paris Agreement.[21] These prices are suggested under the condition that a sufficiently ambitious climate policy environment is in place.

18 Source: California Air Resources Board, *Archived Auction Information and Results*, accessed March 5, 2019, https://www.arb.ca.gov/cc/capandtrade/auction/auction_archive.htm.
19 Source: IPCC, *Global Warming of 1.5°C*, 2018.
20 IPCC price estimates are based on Global Integrated Assessment Models, which are tools to inform the implementation of carbon pricing trajectories. These models allow studying how the biophysical system and the economy interact and can provide insights on how to cost-effectively reach a temperature increase target. Marginal abatement costs are often used as an indication of the carbon price needed to yield mitigation because emitters prefer to abate carbon emissions if the cost of emitting an additional ton of carbon is higher than the cost of abating it.
21 Source: CPLC, *Report of the High-Level Commission on Carbon Prices*, May 29, 2017.

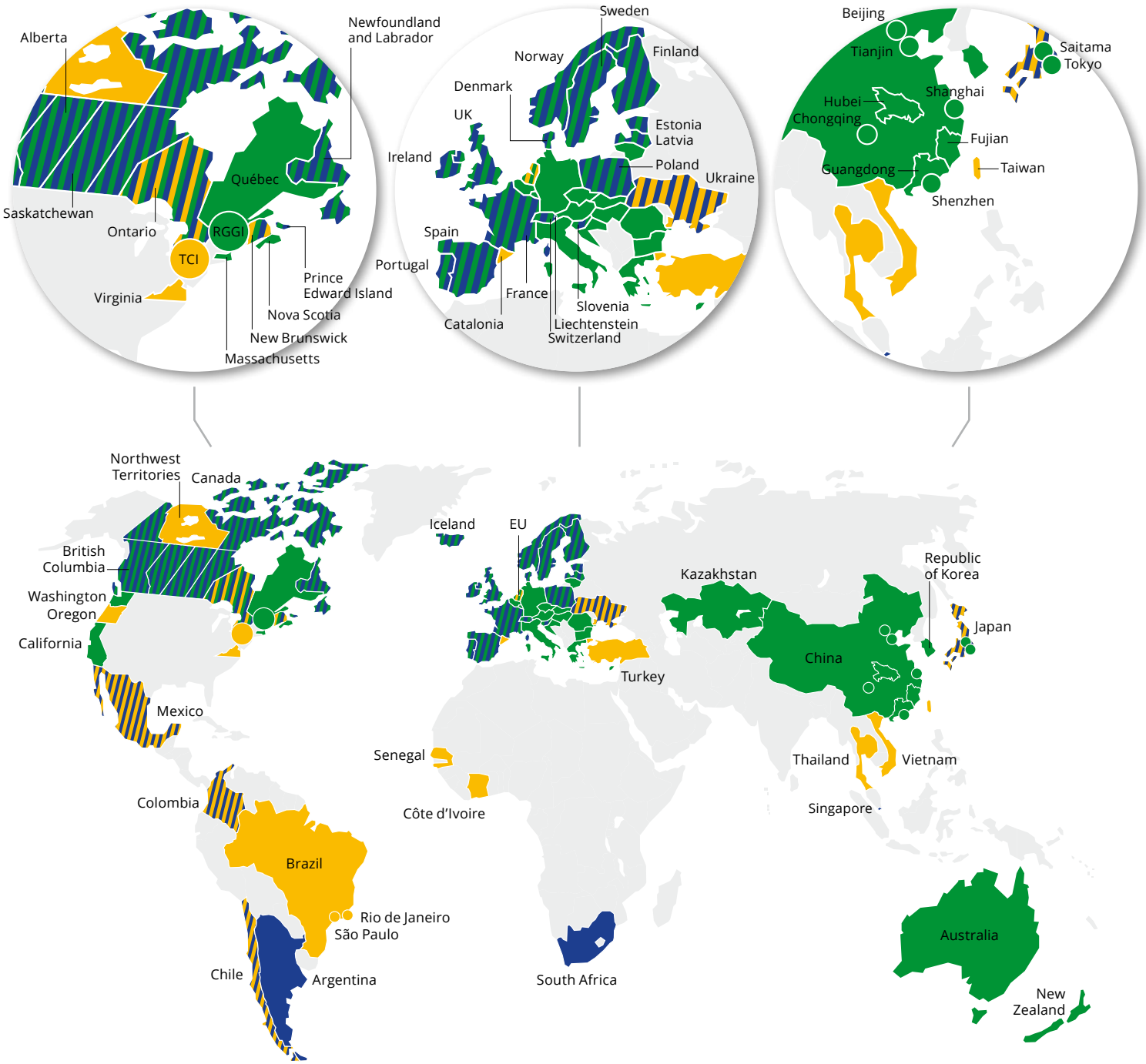
- The Carbon Pricing Corridors initiative provides sectorial estimates of carbon pricing trajectories compatible with the Paris Agreement.[22] For the chemical sector, prices of US$30–50/$tCO_2e$ in 2020—increasing to US$50–100/$tCO_2e$ by 2035—are needed. The power sector would need prices between US$24–35/$tCO_2e$ in 2020, rising to US$38–100/$tCO_2e$ by 2035.[23] These prices assume that carbon pricing is a part of a larger package of complementary policies that support infrastructure development, market design, low cost of financing for low-carbon projects, and low-carbon research and development.

The key difference between the different price trajectories is that the IPCC prices show the marginal cost of reducing GHG emissions, while the other sources provide carbon price ranges in the presence of ambitious complementary policies. The High-Level Commission report also estimates that explicit carbon prices would need to be higher if sufficient complementary climate policies are not implemented, or if explicit carbon prices are kept lower in the short term. This shows that the mitigation effectiveness of carbon pricing depends on the policy environment, and reiterates the importance of having a suite of complementary policies to reach the temperature targets set in the Paris Agreement as also highlighted in the 1.5°C IPCC report.[24] This will be discussed further in Chapter 5.

While these global estimates can serve as important tools to guide climate action, choosing the appropriate price level in each jurisdiction requires a careful analysis of the local context and attention towards ethical and distributional issues, as well as the imperative for global emissions curbs. This balancing is an inherent challenge to be overcome through international cooperation under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC). The High-Level Commission notes that when considering which price level is needed in a given jurisdiction, several factors must be taken into account, also to ensure the lasting acceptability and credibility of the policy, including: i) prevailing policy environment; ii) price elasticity of emissions; iii) distributional and ethical issues related to, for example, historical contributions to climate change, capacity levels, abatement costs; and iv) the need to address potentially competing policy goals, such as poverty reduction.[25] Nonetheless, global estimates remain essential for climate action, as they provide common guidelines to policymakers across the globe on the pathway towards deep decarbonization, thus enabling coordination between jurisdictions. International coordination and the alignment of prices over time is essential to effectively tackle climate change as it can create synergies in action, address potential negative consequences of carbon pricing, such as potential carbon leakage, and increase trust, enabling higher ambition overall.

22 Source: CDP, *Carbon Pricing Corridors - The Market View 2018*, May 2017.
23 Source: Ibid.
24 Source: IPCC, *Global Warming of 1.5°C*, 2018.
25 Source: CPLC, *Report of the High-Level Commission on Carbon Prices*, May 29, 2017.

Figure 6 / Summary map of regional, national and subnational carbon pricing initiatives implemented, scheduled for implementation and under consideration (ETS and carbon tax)



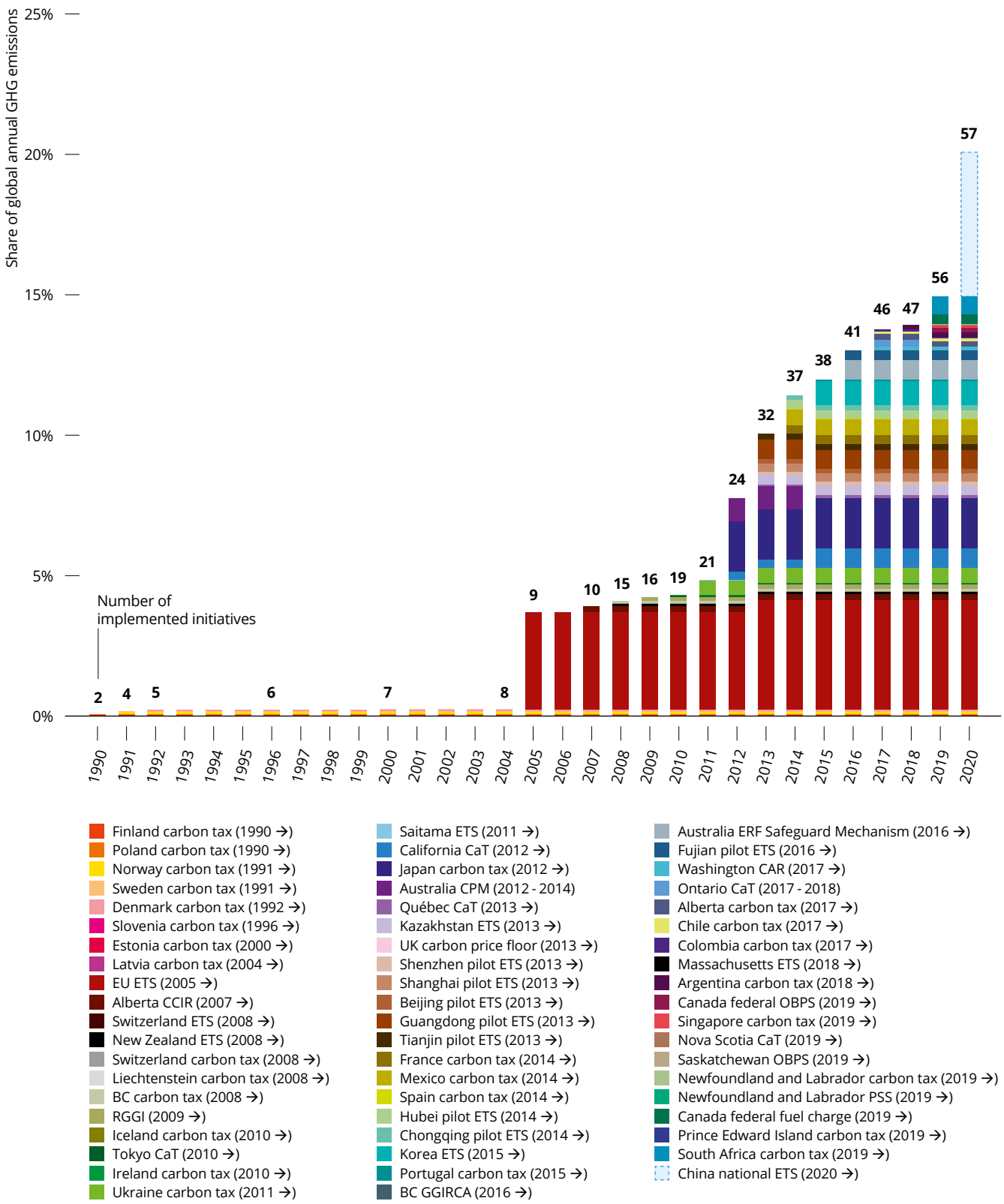
ETS implemented or scheduled for implementation
Carbon tax implemented or scheduled for implementation
ETS or carbon tax under consideration
ETS and carbon tax implemented or scheduled
Carbon tax implemented or scheduled, ETS under consideration
ETS implemented or scheduled, carbon tax under consideration
ETS and carbon tax implemented or scheduled, ETS or carbon tax under consideration

The large circles represent cooperation initiatives on carbon pricing between subnational jurisdictions.
The small circles represent carbon pricing initiatives in cities.

Note: RGGI = Regional Greenhouse Gas Initiative. TCI = Transportation and Climate Initiative. Carbon pricing initiatives are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date. Carbon pricing initiatives are considered "under consideration" if the government has announced its intention to work towards the implementation of a carbon pricing initiative and this has been formally confirmed by official government sources. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS not only refers to cap-and-trade systems, but also baseline-and-credit systems as seen in British Columbia and baseline-and-offset systems as seen in Australia. The authors recognize that other classifications are possible.

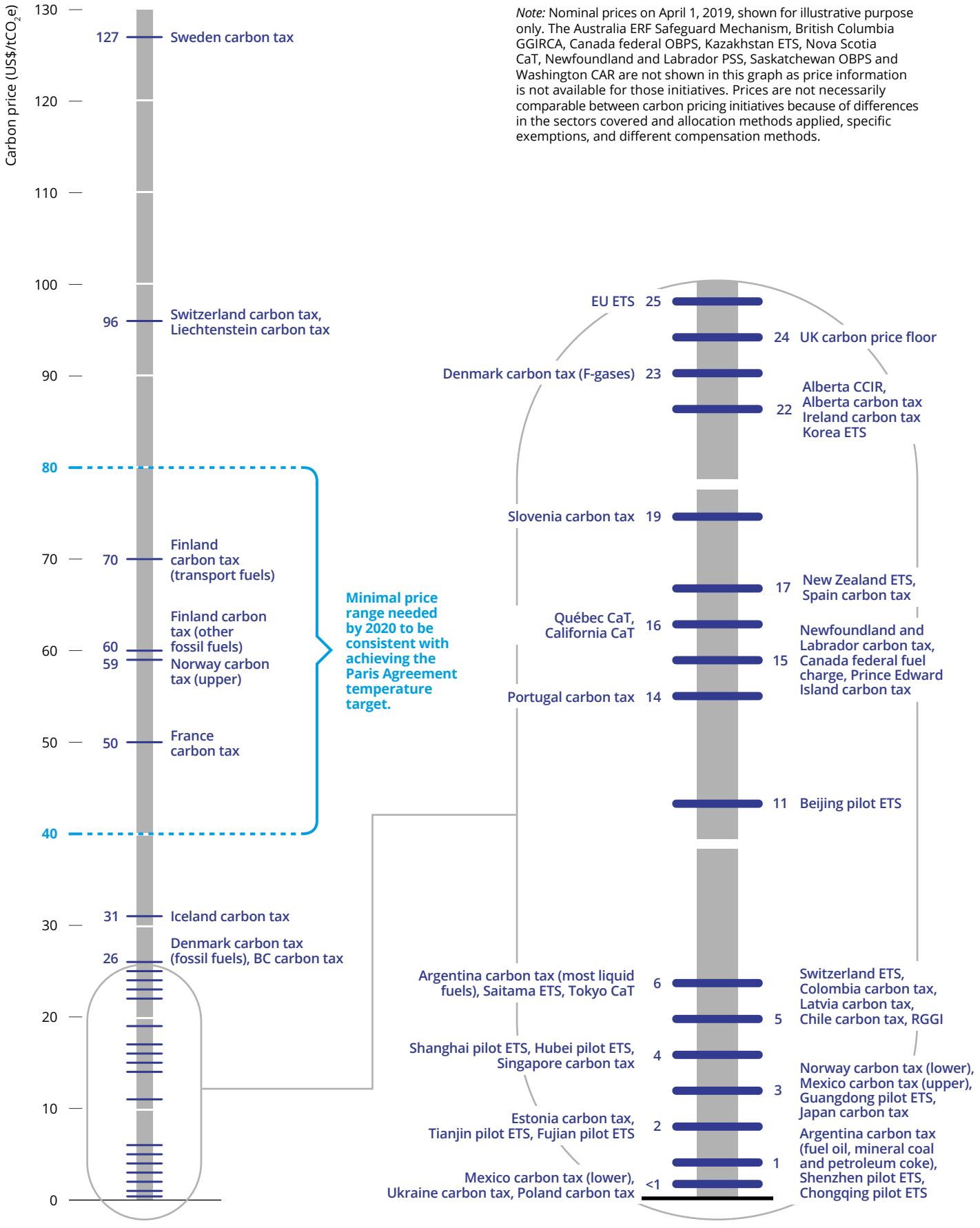
Initiatives implemented or scheduled for implementation: *National ETSs:* Australia, Austria, Belgium, Bulgaria, China, Croatia, Cyprus, Czech Republic, Germany, Greece, Hungary, Italy, Kazakhstan, Lithuania, Luxembourg, Malta, the Netherlands, New Zealand, the Republic of Korea, Romania, and Slovakia. *National carbon taxes:* Argentina, Chile, Colombia, Japan, Mexico, Singapore, South Africa, and Ukraine. *Both national ETSs and carbon taxes:* Canada, Denmark, Estonia, Finland, France, Iceland, Ireland, Latvia, Liechtenstein, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. *Subnational ETSs:* Beijing, California, Chongqing, Connecticut, Delaware, Fujian, Guangdong, Hubei, Maine, Maryland, Massachusetts, New Hampshire, New York, Nova Scotia, Québec, Rhode Island, Saitama, Saskatchewan, Shanghai, Shenzhen, Tianjin, Tokyo, Vermont, and Washington State. *Subnational carbon tax:* Prince Edward Island. *Both subnational ETSs and carbon taxes:* Alberta, British Columbia, Newfoundland and Labrador. **Initiatives under consideration:** *National ETS or carbon tax:* Brazil, Canada, Chile (ETS), Colombia (ETS), Côte d'Ivoire, Japan (ETS), Mexico (ETS), the Netherlands (carbon tax), Senegal, Thailand, Turkey, Ukraine (ETS), and Vietnam. *Subnational ETS or carbon tax:* Catalonia, New Brunswick, Northwest Territories, Ontario, Oregon, Rio de Janeiro, São Paolo, Taiwan, China, and Virginia.

Figure 7 / Regional, national and subnational carbon pricing initiatives: share of global emissions covered



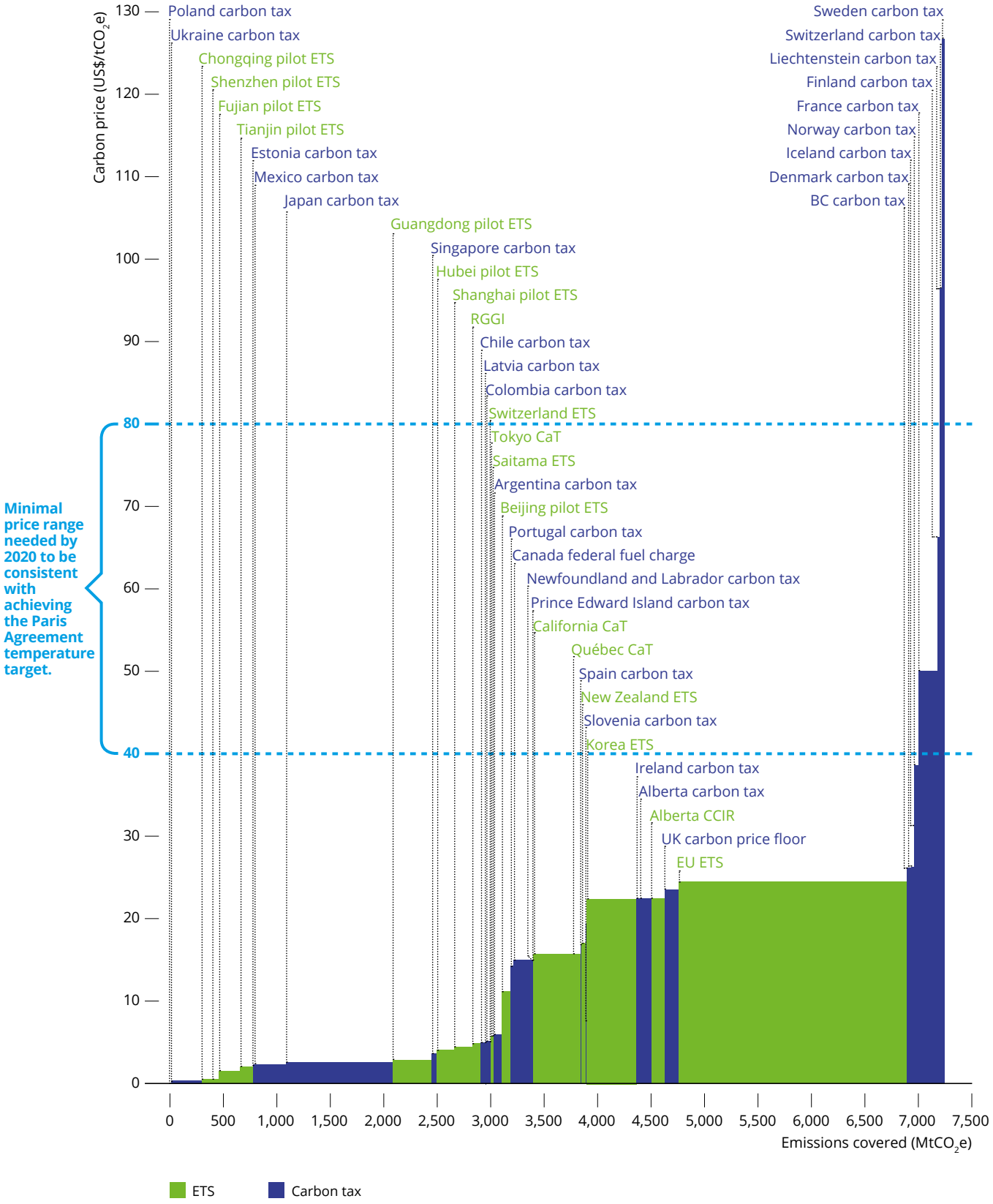
Note: Only the introduction or removal of an ETS or carbon tax is shown. Emissions are presented as a share of global GHG emissions in 2012 from (EDGAR) version 4.3.2 including biofuels emissions. Annual changes in GHG emissions are not shown in the graph. In 2018, the Alberta Carbon Competitiveness Incentive Regulation (CCIR) replaced the Alberta Specified Gas Emitters Regulation, which was launched in 2007. The information on the China national ETS represents early unofficial estimates based on the announcement of China's National Development and Reform Commission on the launch of the national ETS of December 2017.

Figure 8 / Prices in implemented carbon pricing initiatives



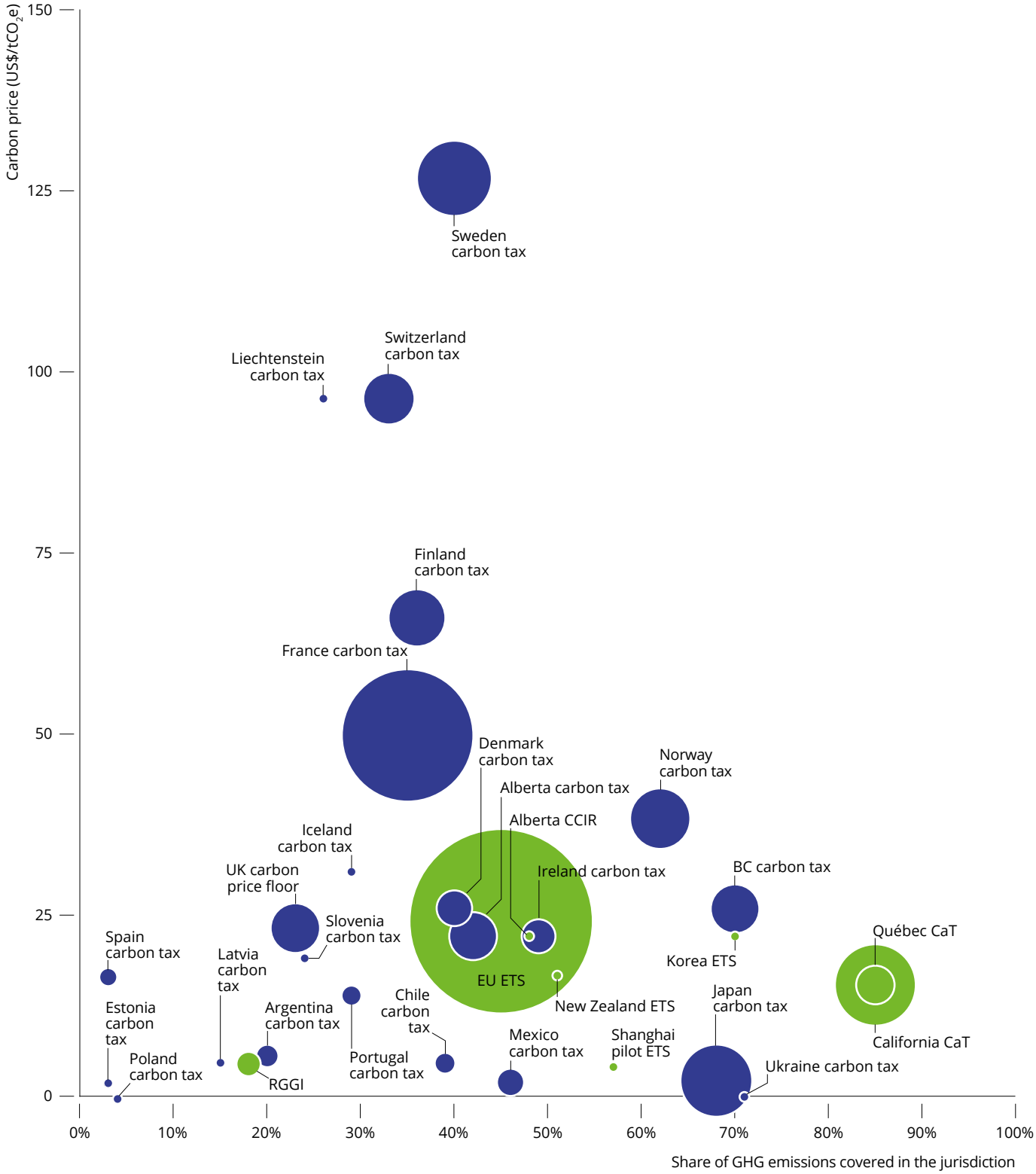
Note: Nominal prices on April 1, 2019, shown for illustrative purpose only. The Australia ERF Safeguard Mechanism, British Columbia GGIRCA, Canada federal OBPS, Kazakhstan ETS, Nova Scotia CaT, Newfoundland and Labrador PSS, Saskatchewan OBPS and Washington CAR are not shown in this graph as price information is not available for those initiatives. Prices are not necessarily comparable between carbon pricing initiatives because of differences in the sectors covered and allocation methods applied, specific exemptions, and different compensation methods.

Figure 9 / Carbon price and emissions coverage of implemented carbon pricing initiatives



Note: The Australia ERF Safeguard Mechanism, British Columbia GGIRCA, Canada federal OBPS, Kazakhstan ETS, Nova Scotia CaT, Newfoundland and Labrador PSS, Saskatchewan OBPS, and Washington CAR are not shown in this graph as price information is not available for those initiatives. 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.

Figure 10 / Carbon price, share of emissions covered and carbon pricing revenues of implemented carbon pricing initiatives



Note: 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.

2.2 Detailed overview of carbon pricing initiatives

This section provides a detailed overview of carbon pricing initiatives around the world. The information reported below focuses on key developments that occurred in the last year. For developments on GHG coverage and price levels across time, the reader is referred to the Carbon Pricing Dashboard and to Figure 2 of this report.[26]

Argentina

The government of Argentina implemented a carbon tax on January 1, 2018 for most liquid fuels, replacing previous fuel taxes.[27] The full rate of this tax was based on the local currency equivalent of US$10/tCO$_2$e on January 1, 2018 and varies quarterly according to the consumer price index. Due to the depreciation of the Argentine peso in 2018, the equivalent carbon tax rate is US$6/tCO$_2$e from April 1, 2019. The revenue is designated to multiple beneficiaries, including the National Housing Fund, the Transport Infrastructure Trust, and the social security system, among others. For fuel oil, mineral coal, and petroleum coke, the tax rate became operational from the beginning of 2019, at 10 percent of the full tax rate, and will increase annually by 10 percentage points to reach 100 percent in 2028. 100 percent of this revenue is distributed according to the Federal Revenue Distribution System.[28] The carbon tax was estimated to cover about 20 percent of the country's GHG emissions and raise approximately ARS8.5 billion (US$300 million) in revenue in 2018. Tax exemptions apply to international aviation and shipping, export of covered fuels, the biofuel content of liquid fuels and the use of fossil fuels as raw materials in chemical processes.[29]

Australia

On March 7, 2019, the Australian Government amended the Emissions Reduction Fund (ERF) Safeguard Mechanism.[30] Key changes to the Safeguard Mechanism include: bringing baselines up-to-date; simplifying baseline calculations to lower administrative costs by increasing options for using default emissions intensity values and prescribed production variables; and allowing baselines to be updated annually to reflect actual production. The changes would see baselines that are based more on emissions intensity of output than historical absolute emissions,[31] also known as grandparenting.

The ERF is a program that involves the government purchase of emissions reductions using a reverse auction to select projects. As of December 18, 2018, over 90 percent of the ERF—about A$2.3 billion (US$1.6 billion) out of the A$2.55 billion (US$1.8 billion) initially allocated—has been committed to 477 domestic emission reduction projects representing 193 MtCO$_2$e in abatement.[32, 33] On February 25, 2019, the government announced the Climate Solutions Package, a A$3.5 billion (US$2.44 billion) investment to deliver on Australia's NDC targets.[34] This package includes the Climate Solutions Fund, which provides an additional A$2 billion (US$1.4 billion) to the nearly-depleted ERF, expanding it to A$4.55 billion (US$3.2 billion) to support further domestic emission reductions projects.[35]

26 https://carbonpricingdashboard.worldbank.org/

27 The adopted carbon tax legislation differs from the initial Executive proposal of October 2017 as it is based on a lower rate than the initially proposed US$25/tCO$_2$e and exempts jet fuel, butane, propane and natural gas. Source: Argentinian Ministry of the Environment and Sustainable Development, *Argentina Participated in the Dialogue on Carbon Pricing Instruments in the Americas*, January 23, 2018, http://ambiente.gob.ar/noticias/argentina-participo-del-dialogo-sobre-instrumentos-de-precio-al-carbono-en-las-americas/.

28 According to Law no. 23548 Coparticipación Federal de Recursos Fiscales.

29 Source: Argentinian Ministry of Justice and Human Rights, *Tax on Liquid Combustibles and Natural Gas*, accessed March 5, 2018, http://servicios.infoleg.gob.ar/infolegInternet/anexos/0-4999/365/texact.htm.

30 Source: Australian government - Department of the Environment and Energy, *National Greenhouse and Energy Reporting (Safeguard Mechanism) Amendment Rule (No. 1) 2019*, March 4, 2019, https://www.legislation.gov.au/Details/F2019L00258.

31 Source: Australian government - Department of the Environment and Energy, *Explanatory Document*, April 2019, https://www.environment.gov.au/system/files/consultations/56b64cc6-6455-4aa1-9b72-d00b7e09bfb3/files/safeguard-mechanism-rule-amendment-explanatory-document.pdf.

32 Source: Australian government - Department of the Environment and Energy, *Emissions Reduction Fund Update*, December 18, 2018, http://www.environment.gov.au/climate-change/publications/emissions-reduction-fund-update.

33 Source: Australian government and Clean Energy Regulator, *Carbon Abatement Contract Register*, February 22, 2019, http://www.cleanenergyregulator.gov.au/ERF/project-and-contracts-registers/carbon-abatement-contract-register?Paged=TRUE&p_ID=164&p_manual_x0020_order=2%2e00000000000000&View=%7bB54F4D19-14DE-4AC8-8653-73984BC42391%7d&PageFirstRow=301.

34 Source: Australian government - Department of the Environment and Energy, *Climate Solutions Package*, March 5, 2019, https://www.environment.gov.au/climate-change/climate-solutions-package.

35 Source: Australian government - Department of the Environment and Energy, *Climate Solutions Fund - Emissions Reduction Fund*, accessed March 5, 2019, http://www.environment.gov.au/climate-change/government/emissions-reduction-fund.

Canada

As of 2019, carbon pricing applies throughout Canada. The Greenhouse Gas Pollution Pricing Act, adopted on June 21, 2018, established a federal carbon pricing initiative—also known as the federal backstop system. This follows from the Pan-Canadian Approach to Pricing Carbon Pollution announced by the Prime Minister of Canada in October 2016. The approach gave provinces and territories the flexibility to develop their own carbon pricing initiative and outlined the criteria that all initiatives must meet, thus establishing a federal benchmark for carbon pricing.[36] The federal government also committed to implementing a federal carbon pricing initiative in provinces and territories that requested it or did not have a carbon pricing initiative meeting the federal benchmark.[37]

The federal backstop system is made up of components similar to a carbon tax and a baseline-and-credit ETS component:[38]

- The tax-like component is a regulatory charge on fossil fuels with rates set at CAN$20/t$CO_2$e (US$15/tCO_2e) in 2019, rising by CAN$10/t$CO_2$e (US$8/tCO_2e) per year to CAN$50/t$CO_2$e (US$38/tCO_2e) in 2022. It covers a broad range of fossil fuels—including various liquid, solid, and gaseous fuels—and combustible waste. The federal fuel charge does not generally apply to fuels used at industrial facilities whose emissions are covered by the Output-Based Pricing System (OBPS).[39]
- The ETS component is called the OBPS, which sets an emissions-intensity standard for each sector under the system. The OBPS applies to power generation and emissions-intensive and trade-exposed industrial facilities emitting more than 50 kilotons of carbon dioxide equivalent (ktCO_2e) per year or any eligible facility that voluntarily chooses to participate.[40] Facilities with emissions above their standard must either pay a carbon price in line with the federal fuel charge, submit surplus credits purchased from facilities that performed better than their limit, or submit eligible offset credits.[41]

The revenues from the federal backstop system are returned to the provinces and territories where they were collected.[42] Provincial and territorial governments that have voluntarily adopted the backstop will receive these revenues directly and can decide how to use them. In other provinces, revenues from the federal fuel charge are returned to the province through direct payments to households via Climate Action Incentive payments that can be claimed when residents file their income tax and benefit return. Households in small and rural communities receive additional payments in recognition of their increased energy needs and reduced access to energy-efficient transportation options. It is proposed that the remainder be returned as financial support for sectors in the province particularly affected by the backstop system. The intent of the federal government is to invest the revenues from the federal OBPS in GHG reduction projects in the jurisdiction where the revenue is raised. Further details on OBPS revenues will be released later in 2019.

36 Source: Government of Canada, *Government of Canada Announces Pan-Canadian Pricing on Carbon Pollution*, October 3, 2016, https://www.canada.ca/en/environment-climate-change/news/2016/10/government-canada-announces-canadian-pricing-carbon-pollution.html.

37 Source: Government of Canada, *Next Steps in Pricing Carbon Pollution*, December 20, 2017, https://www.canada.ca/en/environment-climate-change/news/2017/12/carbon_pricing_backgrounderministerslettertoprovincesandterritor.html.

38 Source: Canadian Department of Finance, *Legislative and Regulatory Proposals Relating to the Greenhouse Gas Pollution Pricing Act and Explanatory Notes*, January 2018, https://www.fin.gc.ca/drleg-apl/2018/ggpp-tpcges-eng.asp.

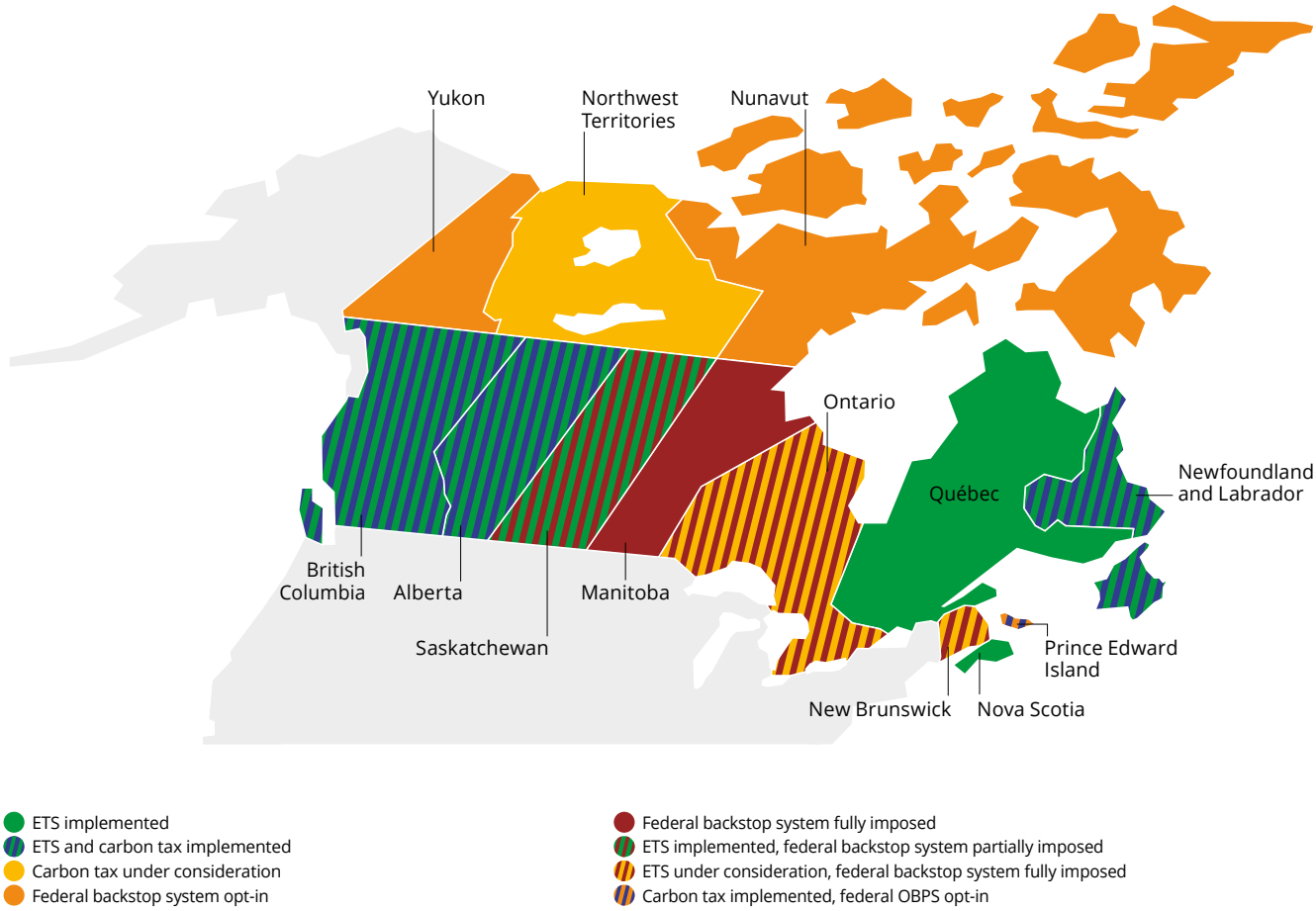
39 Source: Government of Canada, *Technical Paper: Federal Carbon Pricing Backstop*, January 5, 2018, https://www.canada.ca/en/services/environment/weather/climatechange/technical-paper-federal-carbon-pricing-backstop.html

40 Source: Government of Canada, *Technical Paper: Federal Carbon Pricing Backstop*, January 5, 2018, https://www.canada.ca/en/services/environment/weather/climatechange/technical-paper-federal-carbon-pricing-backstop.html; Government of Canada, *Policy Regarding Voluntary Participation in the Output-Based Pricing System*, March 2019.

41 Source: Government of Canada, *Pricing Carbon Pollution for Large Industry: Backgrounder*, December 20, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/large-industry-backgrounder.html; Government of Canada, *Notice of Intent to make regulations under Part 2 of the Greenhouse Gas Pollution Pricing Act*, December 20, 2018.

42 Source: Government of Canada, *How We're Putting a Price on Carbon Pollution*, November 20, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/putting-price-on-carbon-pollution.html.

Figure 11 / Summary map of key carbon pricing developments in the Canadian provinces and territories



Note: A carbon tax in Northwest Territories (NWT) is to be introduced by July 1, 2019 pending passage of Bill 42 "An Act to Amend the Petroleum Products Tax Act". As of April 1, 2019— the cut-off date of this report—Bill 42 has not been adopted yet. The NWT carbon tax will be changed from "Under consideration" to "Implemented or scheduled for implementation" once the bill has been formally adopted through legislation.

The federal government has introduced several measures to the federal backstop system such as exemptions on certain fuels to reduce the impact on farmers and remote communities that have little means for reducing their emissions.[43]

For the past two years, the federal government has worked with provinces and territories to ensure there is a price on carbon in across Canada. On October 23, 2018, following a systematic assessment of provincial and territorial carbon pricing approaches against the federal benchmark, the federal government announced the provinces and territories that met the federal benchmark and where the federal backstop system would apply as shown in Figure 11.[44] For the provinces and territories where the federal backstop system applies, the federal OBPS took effect on January 1, 2019 and the federal fuel charge on April 1, 2019.

43 Source: Canadian Department of Finance, *Backgrounder: Proposed Refinements to the Federal Carbon Pollution Pricing System*, accessed April 11, 2019, https://www.fin.gc.ca/n19/data/19-023_1-eng.asp?utm_source=CP+Daily&utm_campaign=8cfef9e47e-CPdaily19032019&utm_medium=email&utm_term=0_a9d8834f72-8cfef9e47e-110276633.

44 Source: Government of Canada, *Government of Canada Fighting Climate Change with Price on Pollution*, October 23, 2018.

- **Three provinces that meet the federal benchmark will continue to implement their existing carbon pricing initiatives:** Alberta, British Colombia and Québec.

- **Three provinces and one territory developed their own carbon pricing initiatives that meet the federal benchmark:** Newfoundland and Labrador, Northwest Territories, Nova Scotia, and Prince Edward Island (for large industrial facilities, the province opt for the federal OBPS).

- **Two territories and one province opted for the federal backstop system to apply:** Nunavut, Yukon, and Prince Edward Island. To take the unique circumstances of the territories into account, the federal backstop system will apply in Nunavut and Yukon starting July 1, 2019.[45] In Prince Edward Island, only the federal OBPS applies as the province has implemented its own carbon tax.

- **Four provinces did not meet the federal benchmark and the federal backstop system applies to these provinces:** Manitoba, New Brunswick, Ontario, and Saskatchewan (in part).[46] In Saskatchewan, the federal OBPS applies only to electricity generation and natural gas transmission pipelines, as the province's own OBPS for large industrial facilities meets the federal benchmark.[47] All four provinces are challenging the federal decision to impose the backstop system on them in court.

Key facts on the carbon pricing initiatives in place in these provinces and territories are listed in Table 1. A more detailed overview is provided in Annex II.

Table 1 / Summary of recent developments in key carbon pricing initiatives in the Canadian provinces and territories[48]

Jurisdiction	Type and status	Key developments
Alberta	ETS and carbon tax implemented Federal benchmark met	Following the Federal Court of Appeal's ruling against the Trans Mountain Pipeline expansion on August 30, 2018, the Alberta government announced its intention to pull out of the Canadian federal climate plan, which includes the pan-Canadian approach to carbon pricing.[49]
British Columbia	ETS and carbon tax implemented Federal benchmark met	The British Columbia carbon tax increased from CAN$30/t$CO_2$e to CAN$35/tCO_2e (US$23/t$CO_2$e to US$26/tCO_2e) on April 1, 2018 and will continue to increase annually by CAN$5/t$CO_2$e (US$4/tCO_2e) until the rate is CAN$50/t$CO_2$e (US$38/tCO_2e) in 2021.[50]

45 Source: Government of Canada, *Output-Based Pricing System*, December 21, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system.html.

46 Source: Government of Canada, *Pricing Carbon Pollution for Large Industry: Backgrounder*, December 20, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/large-industry-backgrounder.html.

47 Source: Government of Canada, *Saskatchewan and Pollution Pricing*, 21 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/saskatchewan.html.

48 For further details on each carbon pricing initiative, please refer to: World Bank, *Carbon Pricing Dashboard*, accessed March 14, 2019, https://carbonpricingdashboard.worldbank.org/.

49 Source: Government of Alberta, *Trans Mountain Pipeline: Premier Notley*, August 30, 2019, https://www.alberta.ca/release.cfm?xID=585428633B909-DEF9-2B91-6773792AA5DA51A9.

50 Source: Ministry of Finance (British Columbia), *Budget and Fiscal Plan 2018/19-2020/21*, February 20, 2018, https://bcbudget.gov.bc.ca/2018/bfp/2018_Budget_and_Fiscal_Plan.pdf.

Jurisdiction	Type and status	Key developments
Manitoba	Federal backstop system fully imposed	The government of Manitoba renounced its intention to implement a provincial carbon tax on October 3, 2018. This carbon tax did not meet the federal benchmark.[51] Manitoba is now challenging the imposition of the federal backstop system in court as it argues it already has a credible GHG reduction plan of its own.[52]
New Brunswick	ETS under consideration Federal backstop system fully imposed	New Brunswick's carbon pricing plan did not meet the federal benchmark. Therefore, on March 21, 2019, the provincial government made amendments to its Petroleum Products Pricing Act to allow the federal fuel charge to be incorporated into the province.[53] New Brunswick is challenging the imposition of the federal backstop system in court arguing that it unfairly targets its businesses and unduly burden rural households who do not have the option to use less fuel.[54] The provincial government is also developing an alternative OBPS for large industrial facilities.[55]
Newfoundland and Labrador	ETS and carbon tax implemented Federal benchmark met	The Newfoundland and Labrador carbon tax and provincial baseline-and-credit ETS were implemented as of January 1, 2019.[56] The ETS is called the Performance Standards System (PSS) and it applies to large industrial facilities and electricity generation. The carbon tax covers fuels primarily used in transportation, building heating, and electricity generation and starts at CAN$20/tCO$_2$e.[57] Both initiatives build on the province's Management of Greenhouse Gas Act, which was adopted in 2016 and already included provisions for a carbon tax and ETS. These provisions were, however, not in force yet. Therefore, the provincial government adopted required amendments in Fall 2018.
Northwest Territories	Carbon tax under consideration[58] Federal benchmark met	The Northwest Territories (NWT) carbon tax is planned to be introduced as part of the Petroleum Products Tax Act starting at CAN$20/tCO$_2$e (US$15/tCO$_2$e) on July 1, 2019, increasing annually in July by CAN$10 (US$8/tCO$_2$e) to reach CAN$50/tCO$_2$e (US$38/tCO$_2$e). The carbon tax will cover almost all fossil fuels as part of the territory's Made-in-the-North approach to incentivize investments in initiatives and programs that lead to greater use of renewable and cleaner fuels while minimizing impacts on the cost of living and doing business.
Nova Scotia	ETS implemented Federal benchmark met	Nova Scotia passed its final ETS regulations in November 2018 and its cap-and-trade ETS launched in January 2019. The ETS compliance period is 2019–2022. The program applies to the industry, electricity, building, and transport sectors and covers approximately 80 percent of GHG emissions in Nova Scotia.[59] The ETS legislation includes the ability to develop offsets. However, offsets will not be available to the ETS at the start date of January 1, 2019. The province intends to develop offset protocols or adapt them from existing protocols in other jurisdictions.[60] In May 2018, Nova Scotia became a member of the Western Climate Initiative (WCI), a collaboration of American and Canadian subnationals advancing emissions trading, though they are not linked for the purposes of trading allowances across jurisdictions.
Nunavut	Federal backstop system opt- in	Nunavut has been working with the federal government on a carbon pricing approach that considers its unique circumstances, including high costs of living and energy and challenges with food security. This resulted in several fuel exemptions additional to the federal ones and a delayed start of the federal backstop system to July 1, 2019.

51 Source: Government of Manitoba, *Manitoba Rejects Carbon Tax, Moves Ahead With Made-In-Manitoba Climate and Green Plan*, October 3, 2018, https://news.gov.mb.ca/news/index.html?item=44667&posted=2018-10-03.
52 Source: Government of Manitoba, *Manitoba to Challenge Ottawa's Carbon Tax in Court*, April 3, 2019, https://news.gov.mb.ca/news/index.html?item=45161&posted=2019-04-03.
53 Source: Government of New Brunswick, *Amendments Introduced to Allow for Carbon Tax*, March 20, 2019, https://www2.gnb.ca/content/gnb/en/news/news_release.2019.03.0182.html.
54 Source: Government of New Brunswick, *Commitment to Made-in-New Brunswick Approach to Climate Change*, December 5, 2018, https://www2.gnb.ca/content/gnb/en/news/news_release.2018.12.1311.html.
55 Source: Government of New Brunswick, *Get the Facts on the Federal Carbon Tax*, accessed April 11, 2019, https://www2.gnb.ca/content/gnb/en/corporate/promo/carbon_tax.html.
56 Source: Statutes of Newfoundland and Labrador 2018, *An Act to Amend the Management of Greenhouse Gas Act and the Revenue Administration Act*, December 5, 2018, https://www.assembly.nl.ca/Legislation/sr/Annualstatutes/2018/1840.chp.htm.
57 Source: CBC News, *Why the Lax Tax? Finance Minister Says Muskrat Burden Played Role in Carbon Pricing Social Sharing*, October 23, 2018, https://www.cbc.ca/news/canada/newfoundland-labrador/carbon-tax-newfoundland-labrador-1.4874616.
58 The NWT carbon tax is to be introduced by July 1, 2019 pending passage of Bill 42 "An Act to Amend the Petroleum Products Tax Act". As of April 1, 2019—the cut-off date of this report—Bill 42 has not been adopted yet. The NWT carbon tax will be considered "scheduled for implementation" once it has been formally adopted through legislation. Any upcoming developments regarding the status of the NWT carbon tax will be included in the next edition of the State and Trends of Carbon Pricing report and the Carbon Pricing Dashboard.
59 Source: Government of Nova Scotia, *Cap-and-Trade Program Regulations Made under Section 112Q of the Environment Act*, November 13, 2018, https://www.novascotia.ca/just/regulations/regs/envcapandtrade.htm.
60 Source: Government of Nova Scotia, *Nova Scotia's Cap and Trade Program - Regulatory Framework*, October 2018, https://climatechange.novascotia.ca/sites/default/files/Nova-Scotia-Cap-and-Trade-Regulatory-Framework.pdf.

Jurisdiction	Type and status	Key developments
Ontario	ETS under consideration Federal backstop system fully imposed	On October 31, 2018, the new Ontario government formally abolished the Ontario cap-and-trade program[61] following measures put in place in July 2018 to wind-down the program. Since then, the provincial government has been working to compensate industrial facilities for voided allowances they bought at earlier auctions. This process was completed by March 25, 2019 with compensation totaling to CAN$5 million (US$4 million).[62] On February 12, 2019, the provincial government announced its intention to develop a provincial baseline-and-credit ETS that shows similarities with the federal OBPS.[63] However, since the deadline to develop a carbon pricing approach that meets the federal benchmark has already passed, the federal backstop system was imposed. Ontario is challenging this in court, arguing that the backstop system exceeds the power of the federal government.[64]
Prince Edward Island	Carbon tax implemented Federal OBPS only opt-in	The Prince Edward Island carbon tax has been in force since April 1, 2019.[65] The carbon tax is part of the province's Climate Leadership Act and broadly similar to the federal fuel charge, starting at CAN$20/t$CO_2$e (US$15/tCO_2e) and increasing annually. Prince Edward Island has been working with the federal government to tailor the carbon tax to its own region. This resulted in additional exemptions for certain fuels and allowed the provincial government to partially offset the impact of the carbon tax on the overall tax burden by reducing the excise tax on gasoline.[66] At the request of the province, the federal OBPS for large power generation and industrial facilities was implemented as of January 1, 2019.[67]
Québec	ETS implemented Federal benchmark met	Since January 1, 2018, emitters from capped sectors in the Québec Cap-and-Trade System that reported emissions between 10,000 tCO_2e/year and 25,000 tCO_2e/year may voluntarily register to the initiative as a covered entity.
Saskatchewan	ETS implemented Federal backstop system partially imposed	As of January 1, 2019, Saskatchewan implemented its own baseline-and-credit ETS as part of its Prairie Resilience climate change strategy. The Saskatchewan OBPS covers industrial facilities that emit over 25 ktCO_2e, with a voluntary opt-in for facilities between 10–25 ktCO_2e.[68] Saskatchewan has also implemented non-pricing regulatory mechanisms that require emission reductions in the electricity sector and methane emissions from upstream oil and gas.[69, 70] These regulations cover 45 percent of GHG emissions, in addition to the 12 percent covered under the Saskatchewan OBPS. The Saskatchewan OBPS only partially meets the federal benchmark as it does not cover electricity generation and natural gas transmission pipelines facilities. Thus, the federal OBPS was imposed on those sectors. In addition, the federal fuel charge also applies.[71] Saskatchewan is challenging the imposition of the federal backstop system in court, questioning the federal government's constitutional right to do so.[72]
Yukon	Federal backstop system opt-in	Yukon has been working with the federal government on a carbon pricing approach that considers its unique circumstances to avoid putting the territory's competitiveness at a disadvantage and penalizing citizens who rely on fossil fuels, while rewarding businesses that invest in clean technology and operations.[73] This resulted in several fuel exemptions in addition to the federal ones and a delayed start of the federal backstop system to July 1, 2019.

61 Source: Government of Ontario, *Cap and Trade Cancellation Act*, 2018, September 14, 2018, https://www.ontario.ca/laws/statute/18c13.
62 Source: Government of Ontario, *Ontario Closes the Book on Cap and Trade Carbon Tax Era*, March 25, 2019, https://news.ontario.ca/ene/en/2019/03/ontario-closes-the-book-on-cap-and-trade-carbon-tax-era.html.
63 Source: Government of Ontario, *Making Polluters Accountable: Industrial Emission Performance Standards*, February 12, 2019, https://ero.ontario.ca/notice/013-4551.
64 Source: Government of Ontario, *Ontario Files Arguments to Challenge the Federal Government's Carbon Tax*, September 14, 2018, https://news.ontario.ca/ene/en/2018/09/ontario-files-arguments-to-challenge-the-federal-governments-carbon-tax.html/.
65 Source: Minister of Finance (Prince Edward Island), *Climate Leadership Act - Chapter 41*, December 5, 2018, http://www.assembly.pe.ca/bills/pdf_chapter/65/3/chapter-41.pdf.
66 Source: Government of Prince Edward Islands, *Carbon Levy*, February 22, 2019, https://www.princeedwardisland.ca/en/information/finance/carbon-levy.
67 Source: Government of Canada, *Prince Edward Island and Pollution Pricing*, November 23, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/prince-edward-island.html.
68 Source: Saskatchewan Gazette, *The Management and Reduction of Greenhouse Gases (Standards and Compliance) Regulations*, December 14, 2018, http://www.publications.gov.sk.ca/freelaw/documents/English/Regulations/Regulations/M2-01R3.pdf.
69 *The Management and Reduction of Greenhouse Gases (General and Electricity Producer) Regulations*, http://www.publications.gov.sk.ca/freelaw/documents/English/Regulations/Regulations/M2-01R1.pdf
70 *The Oil and Gas Emissions Management Regulations*, http://www.publications.gov.sk.ca/freelaw/documents/English/Regulations/Regulations/O2R7.pdf
71 Source: Government of Canada, *Pollution Pricing: Technical Briefing*, November 14, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/putting-price-on-carbon-pollution/technical-briefing.html.
72 Source: Government of Saskatchewan, *Province Challenging Federal Government's Ability to Impose a Carbon Tax*, April 25, 2018, https://www.saskatchewan.ca/government/news-and-media/2018/april/25/carbon-tax-case.
73 Source: Government of Yukon, *Proposed Framework for Government of Yukon Carbon Price Rebate Announced*, January 17, 2019, https://yukon.ca/en/news/proposed-framework-government-yukon-carbon-price-rebate-announced.

China

China continues to work on the implementation of its national ETS since its official launch in December 2017. On March 29, 2019, the Chinese government released the draft ETS regulation for public consultation. The draft ETS regulation sets the legal basis for the national ETS and contains the governance structure and ETS responsibilities of the national and local government bodies, covered facilities and verifiers. It also describes measures against market manipulation and enforcement mechanisms to ensure all parties involved meet their obligations in a timely manner against set standards. The development of the ETS regulation is part of a first phase of the two-phased roadmap consisting of infrastructure development and simulated trading that was published at the official ETS launch.[74] The roadmap also stated that the power sector will be the first sector to have compliance obligations under the ETS with the ETS gradually expanding to include another seven sectors, and that benchmarking will be the main approach for free allocation. Other design details of the national ETS such as cap-setting, allowance allocation, management of verification agencies, and trading rules still have to be clarified. The long process to develop the national ETS reflects the challenges around designing a sound ETS with substantial differences in knowledge and capacity between the subnational regions and companies.

The release of the draft ETS regulations follows the approval of the National People's Congress of China of the plan to restructure the State Council in March 2018, including the establishment of a new Ministry of Ecology and Environment to replace the Ministry of Environmental Protection. In addition to environmental governance, the new ministry absorbs the climate change responsibilities previously under the National Development and Reform Commission and takes charge of the development of the national ETS. The governance transition at the national level is reflected in the ETS pilot regions as well. In the past year, the ETS-related responsibilities in all pilots were moved from the provincial Development and Reform Commission to the Ecology and Environment Bureau. The consolidation of the environmental responsibilities in one ministry could help the alignment of different environmental strategies and policies including the national ETS. For example, the 2018-2020 Three-year Action Plan for Winning the Blue-Sky War aims to tackle air pollution, but also recognizes GHG emission reductions as a co-benefit.[75] The 13th Five Year Plan for Renewable Energy Development mentions a possible link between a renewable certificate market and carbon markets.[76]

In preparation for the launch of the national ETS, several ETS pilots have introduced measures to strengthen their ETS and align with known design details of the national ETS. Measures included decreasing free allocation shares in some pilots as well as transitioning free allocation methods from grandfathering to benchmarking. The Beijing pilot ETS is transitioning its free allocation approach for existing facilities in the power sector from using facility-specific historical emission intensities to sector-wide benchmarking. According to its 2017 allocation plan released in February 2018, the free allocation shares in the Beijing pilot ETS decreased by up to ten percentage points for existing facilities in various sectors including cement and petrochemicals.[77] In addition, an adjustment mechanism was created to avoid overallocation as a result of plant closures or reductions in production beyond a certain threshold. For the first time since its launch, the cap of the Chongqing pilot ETS for 2017 was lower than what entities reported that they expected they would need according to the allocation plan released in March 2018, which could indicate that some companies would face a shortage.[78] In the Guangdong 2018 allocation plan released in July 2018, five benchmark values used to determine free allocation to power generation were decreased.

74 Source: National Development and Reform Commission, *National Development and Reform Commission Issues National Carbon Emissions Trading Market Construction Plan*, December 18, 2017, http://www.ndrc.gov.cn/gzdt/201712/t20171220_871134.html.

75 Source: Library of Congress, *China: 2020 Air Pollution Action Plan Released*, August 16, 2018, http://www.loc.gov/law/foreign-news/article/china-2020-air-pollution-action-plan-released/.

76 Source: National Development and Reform Commission, *Notice on the 13th Five-Year Plan for Renewable Energy Development*, 2016, http://www.ndrc.gov.cn/zcfb/zcfbghwb/201612/t20161216_830269.html.

77 Source: Beijing Municipal Commission of Development and Reform, *Notice on the Approval of Key Quota Emission Units for 2017 Annual Quotas*, February 12, 2018, http://www.bjpc.gov.cn/zwxx/tztg/201802/t12508458.htm.

78 Source: Chongqing Development and Reform Commission, *About Grasping the 2017 Annual Carbon Emissions – Notice of Quota Payment*, November 4, 2018, https://www.cqggzy.com/tzgg/001006/20181108/43c41839-85c3-4d86-ac09-09bff4165d4c.html.

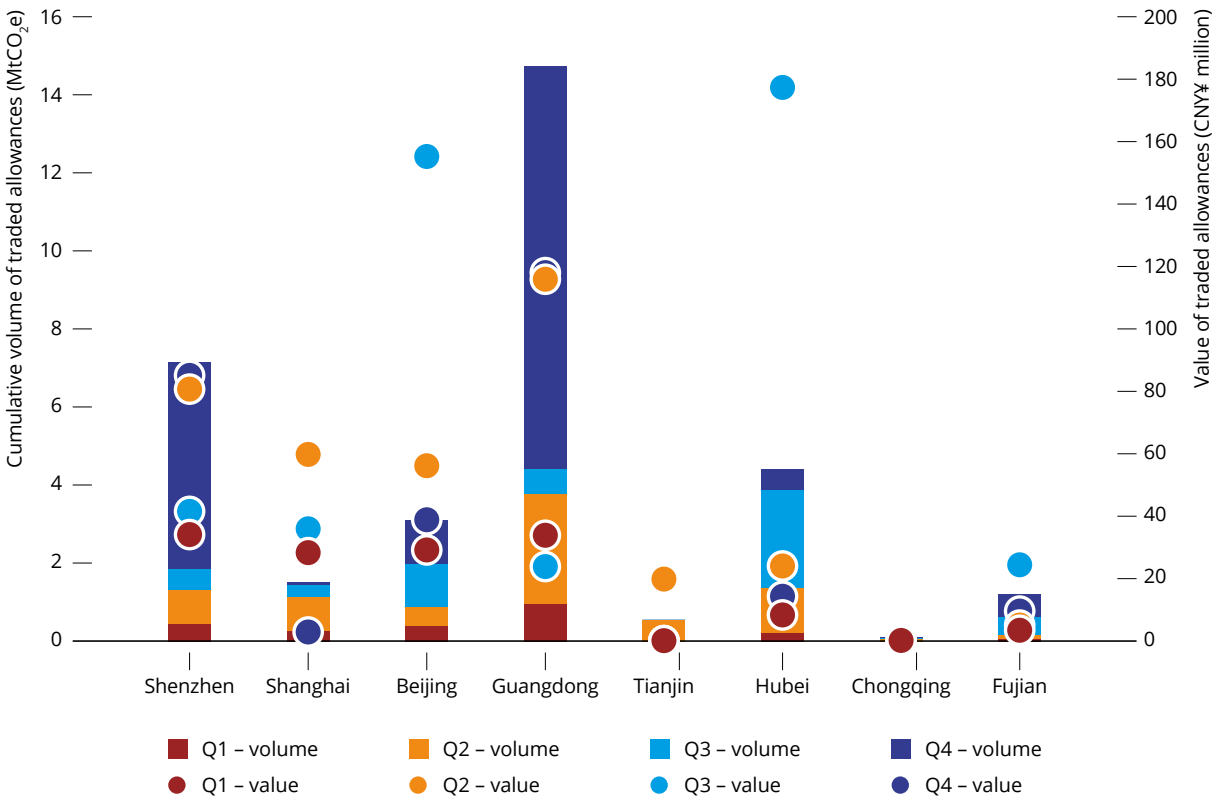
Box 3 / Chinese ETS pilot market highlights for 2018

The carbon markets in most ETS pilots continue to be active in 2018, with levels of activity varying across regions. Different price levels are the result of differences in cap stringency and market confidence. The government is still investigating how to tackle this issue on price differences if allowances from ETS pilots are permitted in the national ETS.

In most pilot regions, the majority of trading occurred in Q2 or Q3, which coincides with the compliance deadlines in those pilots as shown in Figure 12. For Beijing and Hubei, this was accompanied with a price increase also shown in Figure 12; in Hubei, Q3 accounted for 57 percent of the annual trade on the market and it reached the highest traded value of all pilots in any quarter of 2018 with CNY¥177 million (US$26 million). In Shenzhen and Guangdong, the traded volume spiked in Q4, where it grew to more than twice that of the other three quarters combined, with the underlying reason for this growth remaining unclear.

In contrast, prices and traded volume in Tianjin and Chongqing were relatively low. Overall, prices in most pilots have changed little in 2018 compared to previous years. Most pilots started with significantly higher prices when they were launched in 2013 and 2014. The initial high prices were affected by government guidance such as the auction floor price. This was followed by a decline in prices after the first compliance year when market participants gained better insight in the carbon market and the economy slowed down leading to lower-than-predicted carbon emissions. Prices in most pilots have been fluctuating around the same level ever since. Only Guangdong and Hubei have shown some structural price increases in the recent years due to measures to improve market confidence with more detailed compliance timelines, yearly allocation plans, and offset rules.

Figure 12 / Cumulative trading volume and value of the Chinese ETS pilots in 2018



Several ETS pilots have also been aligning free allocation to facilities with more recent activity levels. In Shanghai, the base years for determining free allocation has changed for the water supply sector from 2016–2017 and for the other sectors from 2014–2016 to 2015–2017 for the compliance year 2018.[79] Furthermore, the base years to determine the historical intensity for free allocation in 2018 changed from 2014–2016 to 2015–2017 in the Beijing pilot ETS.[80]

In March 2018, Taiwan, China, published the GHG Reduction Action Plan. The plan proposes to implement a cap-and-trade system, calculate baseline emissions, and set up regulations—albeit without a precise timeline. On this basis, the central industry authorities in charge of the six major sectors[81] developed GHG Emissions Control Action Programs to provide more detail on each sector's responsibilities to reduce their emissions. In addition, a series of subsidiary regulations has been formulated in preparation for the cap-and-trade system. This includes the 2018 Regulations Governing GHG Offset Program Management, which provides an opportunity for companies to acquire offsets credits.[82]

Colombia

On July 27, 2018, Colombia adopted its climate bill, which enables the government to establish an ETS.[83] The ETS needs to be compatible with Colombia's national GHG emission reduction targets and would provide more certainty in achieving these targets in addition to its existing carbon tax. The climate law also specifies that allowance distribution under an ETS should primarily take place through auctions with revenues directed towards the National Environment Fund. To avoid double taxation, the climate bill allows payments under the existing carbon tax to be recognized as an approach for emitters to meet their compliance obligations under a potential future ETS.

European Union

In February 2018, European lawmakers formally approved the EU ETS phase 4 (2021–2030) reforms. The process leading up to this moment reflect the challenges in adapting and strengthening a well-established ETS, which is also affected by the EU's diverse and layered decision-making process with three different legislative bodies representing the interests of 28 Member States. From the start of phase 3 (2013–2020) until 2018, prices remained consistently below €10/tCO_2e (US$11/$tCO_2e$) due to a large surplus of allowances resulting from the economic crisis and high import of international credits,[84] and a lack of mechanisms to address this surplus. Since 2014, EU lawmakers have been introducing measures to address this surplus—first through temporarily back-loading allowances, followed by a permanent market stability reserve (MSR)—but the carbon prices only started to markedly increase after the post-2020 reforms had been adopted. Over the course of 2018, EUA prices reached the level of €20–25/tCO_2e (US$22-28/$tCO_2e$) and have remained around that level ever since.[85] The reforms include increasing the linear annual cap reduction from 1.74 percent to 2.2 percent, increasing the impact of MSR on the surplus by withholding more allowances from the market and cancelling a portion of allowances in the MSR, and revising rules related to free allocation of allowances. Free allocation will be more aligned with recent activity levels, the benchmark levels will be updated every five years to take technological progress into account, and the free allowances for sectors not deemed at risk of carbon leakage will be phased out. These measures will increase the carbon price signal experienced by emitters. The EU is still working on several specific regulations related to free allocation including benchmarks and updating free allocation that will be completed in the course of 2020.

79 Source: Shanghai Municipal Development and Reform Commission, *Notice of the Shanghai Municipal Development and Reform Commission on Issuing and Distributing the Shanghai 2018 Carbon Emissions Quota Allocation Plan*, March 19, 2019, http://www.shdrc.gov.cn/gk/xxgkml/zcwj/zgjjl/35150.htm.

80 Source: Beijing Municipal Commission of Development and Reform, *Notice on the Approval of Key Quota Emission Units for 2017 Annual Quotas*, February 12, 2018, http://www.bjpc.gov.cn/zwxx/tztg/201802/t12508458.htm.

81 Energy, manufacturing, transportation, residential and commercial, agriculture, and environment.

82 Source: Taiwan, China, *Climate Change: Global Challenge Requiring Global Response*, November 2, 2018, https://www.roc-taiwan.org/fj_en/post/709.html.

83 Source: Congress of Colombia, *Guidelines for the Management of Climate Change*, July 27, 2018, http://es.presidencia.gov.co/normativa/normativa/LEY%20 1931%20DEL%2027%20DE%20JULIO%20DE%202018.pdf.

84 Source: European Commission, *Market Stability Reserve*, accessed April 11, 2019, https://ec.europa.eu/clima/policies/ets/reform_en. 9

85 Source: European Energy Exchange, *Market Data - Environmental Data*, accessed April 11, 2019, https://www.eex.com/en/market-data/environmental-markets/spot-market/european-emission-allowances#!/2019/04/01.

In addition to measures strengthening the carbon price signal, the reforms also introduced two low-carbon funding mechanisms to support for low-carbon investments: i) the Modernization Fund to support investments in energy efficiency and the modernization of the energy sector in lower-income Member States, and ii) the Innovation Fund to provide financial support for projects in the areas of renewable energy and carbon capture and storage/utilization.[86] This mix of policy instruments will help the EU meet its NDC targets that have been set in line with a 2 °C pathway.[87] This illustrates that further changes will be needed to align policies with climate targets and ultimately for the EU ETS to drive long term decarbonization in line with the ambition of the Paris Agreement for the global temperature to stay well below 2 °C.

The EU continues to seek out international cooperation. In April 2018, the European Commission held its first policy dialogue with China's newly-created Ministry of Ecology and Environment, reaffirming continued bilateral cooperation in developing the China national ETS.[88] At the Global Climate Action Summit held in September 2018, the EU and California agreed that officials from the EU and California would step up the frequency of exchanges, including on principles for alignment and the role of carbon pricing in sending near- and long-term investment signals for transformative technologies, addressing economic competitiveness, and maximizing public benefits for use of program revenues.[89]

Finland

From January 1, 2019, Finland changed the methodology to determine the CO_2 emission factor associated with heating fuels and fuels for work machines covered under the carbon tax component of its energy tax. The emission factor of the full lifecycle emissions of the fuels are now used instead of only combustion emissions, which effectively means that the carbon tax component per volume fuel consumed would increase.[90] To limit the additional tax burden due to this change, the carbon tax rate of these fuels was lowered from €62/tCO_2e (US$70/t$CO_2$e) to €53/t$CO_2$e (US$60/tCO_2e). The carbon tax for transport fuels remains at €62/tCO_2e (US$70/t$CO_2$e) as it already took the full lifecycle emissions into account. In addition, the partial carbon tax exemption for combined heat and power plants was turned into a partial energy tax exemption, resulting in a small increase of the tax burden on coal to support the transition away from coal use.[91]

These changes are reflective of the latest developments in the long history of balancing incentives to reduce GHG emissions with the cost of living and competitiveness of local businesses in the first country with a carbon tax. Following a series of reforms that saw the carbon tax rate increase in combination with lowering income taxes and social security contributions, Finland is currently greening its tax system to incentivize transitioning to a low-carbon economy and abandoning coal by 2030.[92] To this end, the government has been gradually strengthening the carbon tax component in the energy tax and shifting the tax burden to higher carbon fuels.

France

The France carbon tax was set last year on an increasing price trajectory towards €86.2/tCO_2 (US$97/t$CO_2$) in 2022, but this plan has been modified after social protests.[93] Since November 2018, large scale protests have been taking place, spurred by opposition to the carbon tax rate in a period when fuel prices are rising. Since its introduction in 2014, the carbon tax has increased six-fold from €7/tCO_2e (US$8/t$CO_2$e) to €44.6/t$CO_2$e (US$50/tCO_2e) within

86 Source: European Commission, *EU Emissions Trading System (EU ETS)*, accessed March 6, 2019, https://ec.europa.eu/clima/policies/ets_en.
87 Source: European Commission, *EU and the Paris Climate Agreement: Taking Stock of Progress at Katowice COP*, October 26, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2018:716:FIN.
88 Source: European Commission, *Emissions Trading: European Commission and China Hold First Policy Dialogue*, April 26, 2018, https://ec.europa.eu/clima/news/emissions-trading-european-commission-and-china-hold-first-policy-dialogue_en.
89 Source: European Commission, *EU and California to Step up Cooperation on Carbon Markets*, September 13, 2018, https://ec.europa.eu/clima/news/eu-and-california-step-cooperation-carbon-markets_en.
90 Source: Parliament of Finland, *Changes in Energy Taxation in 2019*, January 11, 2019, https://www.vero.fi/tietoa-verohallinnosta/verohallinnon_esittely/uutiset/uutiset/2019/energiaverotukseen-muutoksia-2019/.
91 Source: Parliament of Finland, *The Government's Bill to the Parliament with Proposals for Amending the Legislation on Energy Taxation*, 2018, https://www.eduskunta.fi/SV/vaski/HallituksenEsitys/Sidor/RP_191+2018.aspx.
92 Source: Parliament of Finland, *Government's Proposal to the Parliament to Amend Chapter 1, Section 2 of the Act on the Prohibition of Coal Energy and on Proceedings in the Market Court*, accessed April 11, 2019, https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Sivut/HE_200+2018.aspx.
93 Source: French Government, *Finances for 2019*, December 28, 2018, https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000037882341&dateTexte=&categorieLien=id.

four years. Agriculture, taxis and trucks are exempted from the carbon tax to protect their competitiveness. In addition, the government is using part of carbon tax revenues to cut labor and corporate taxes and provide financial assistance for low-income households on their energy bill.[94] Whilst in general France does not earmark revenues, the reform was accompanied by some support to the energy transition, including support for alternatively-source vehicles and tax credit to households improving energy efficiency of their residence. Originally, the French carbon tax would have increased by 23 percent in 2019 and as much as 19 percent by 2020. However, the tax rate in 2019 now remains at the 2018 rate of €44.6/tCO_2 (US$50/$tCO_2$), and following nation-wide consultations, it is not likely to increase in the near-term.

Iceland

The Iceland carbon tax rate increased by 10 percent to approximately ISK3850/tCO_2 (US$36/$tCO_2$) on January 1, 2019. The higher tax rate will generate ISK550 million (US$39 million) in additional carbon tax revenue including additional revenues related to the value added tax (VAT).[95] The carbon tax rate will grow with a further 10 percent on January 1, 2020,[96] increasing the carbon tax to about 15 percent of the total excise tax rate on transport fuels.[97] These increases are part of the Climate Action Plan 2018–2030 to bolster Iceland's efforts in reaching its NDC and to help meet their goal of carbon neutrality by 2040.[98] The focus of the carbon tax increases is to phase out fossil fuels in the transport sector. Iceland has already been making headway in greening its transportation with the electric vehicle purchases having more than tripled in 2018 compared to 2016. The abolishment of excise taxes and VAT for electric vehicles played a significant role in this surge. The Climate Action Plan will be subject to public consultation with an updated strategy published in 2019.

Kazakhstan

Kazakhstan relaunched its ETS on January 1, 2018 after it suspended it on April 8, 2016. The suspension was due to the impact of a drop in global oil prices on Kazakhstan's economy and accompanying industry protests.[99] During the suspension period, Kazakhstan—in response to the economic downturn—made several amendments to the ETS demonstrating redesign of the original ETS by introducing more flexibility measures. Changes include allowing installations to choose between two approaches for receiving free allowances; about a third of the covered installations chose free allocation based on historical emissions and two-thirds chose product-based benchmarks with the possibility of updating their free allocation with capacity changes.[100] In addition, the cap is set to reduce by 5 percent by 2020 compared to 1990. These developments in Kazakhstan underline the importance of including flexibility mechanisms in the design of a carbon pricing initiative in case of unexpected circumstances.

Korea, Republic of

The Korea ETS has entered its second phase as of January 1, 2018, which will be in effect until 2020.[101] Key changes in the new phase include the introduction of auctioning up to three percent of the required allowances in certain sectors, new banking rules, and allowing the restricted use of international credits. In addition, benchmarking will be more widely applied for the distribution of free allowances and allocated based on facility efficiency. Thus, the power, waste, and industry sectors will be added to the group of sectors were already receiving free allocation via benchmarks such as the oil refining, cement, and aviation industry.[102] These changes are the result of consultations with associated government bodies

94 Source: Ibid.
95 Source: Icelandic government, *Budget Bill 2019*, 2018, https://www.stjornarradid.is/lisalib/getfile.aspx?itemid=d5ab9587-b5df-11e8-942c-005056bc4d74.
96 Source: Icelandic Parliament, *Act on Amendments to Various Laws Relating to the Budget for 2019*, December 21, 2018, https://www.althingi.is/altext/stjt/2018.138.html.
97 Authors' calculations based on Source: OECD, *Taxing Energy Use 2018 - Iceland*, 2018, https://www.oecd-ilibrary.org/taxation/taxing-energy-use-2018_9789264289635-en.
98 Source: Government of Iceland, *Iceland Launches New Climate Strategy, Boosting Efforts to Reach Paris Goals*, September 10, 2018, https://www.government.is/news/article/?newsid=c7ab2ec0-b515-11e8-942c-005056bc4d74.
99 Source: German Emissions Trading Authority, *Emissions Trading in Kazakhstan Recommendations for Cap Setting*, accessed April 11, 2019, https://www.dehst.de/SharedDocs/downloads/EN/publications/country-study-kazakhstan.pdf?__blob=publicationFile&v=2.
100 Source: Ministry of Energy of the Republic of Kazakhstan, *Official Web Site*, accessed March 6, 2019, http://kz.energo.gov.kz/index.php?id=2.
101 Source: Korean Ministry of Environment, *Greenhouse Gas Emissions Trading Scheme*, December 12, 2017, http://eng.me.go.kr/eng/web/index.do?menuId=450.
102 Source: Korean Ministry of Environment, *The Total Emission Permits Allocated Set at 1,777,130,000 Tons for the next Three Years*, July 2, 2018, http://eng.me.go.kr/eng/web/board/read.do?pagerOffset=0&maxPageItems=10&maxIndexPages=10&searchKey=content&searchValue=ETS&menuId=-21&orgCd=&boardId=903010&boardMasterId=522&boardCategoryId=&decorator=.

to boost liquidity in the Korean carbon market and distribute the allowances more proportionally to actual emissions while strengthening the price signal to reduce emissions.

Mexico

On October 19, 2018, the Mexican government released the draft regulation for establishing a pilot ETS for public consultation. In December 2018, a new administration took office and decided to review the draft to strengthen capacities in the government and start a series of consultations among civil society and government. The start of the pilot is planned for 2020 and would last two years in addition to one year for transition to the next phase. The pilot ETS intends to cover the power, oil and gas, and industrial sectors. Entities with annual emissions greater than 100 $ktCO_2e$ during 2016–2018, or in any year from the launch of the pilot, will be covered under the pilot ETS.

The draft regulation follows the adopted amendments to the General Law on Climate Change by the Mexican Senate in April 2018, which included a mandate for the government to establish an ETS to incentivize cost-effective emission reductions measures while maintaining the competitiveness of its industry in the international market. The ETS would be part of a suite of measures—including its existing carbon tax—to enable Mexico to reach its NDC targets. The government continues to work on the development of rules and guidelines for the pilot phase, with the final draft due to be published in 2019.

Netherlands

On December 21, 2018, a draft for a National Climate Agreement was published, maintaining earlier intentions from the Dutch government to introduce a carbon floor price for the electricity sector to strengthen market certainty for renewable investments.[103] Under this draft National Climate Agreement, the carbon floor price would be set at €12.3/tCO_2 (US$15/$tCO_2e$) in 2020, rising to €31.9/tCO_2 (US$39/$tCO_2e$) in 2030. This is lower than the original trajectory of €18/tCO_2 (US$22/$tCO_2e$) in 2020 to €43/$tCO_2$ (US$53/$tCO_2e$) in 2030. In addition, on March 13, 2019, the Dutch government announced its intention to explore introducing a carbon tax for industry. The carbon tax would incorporate the use of EU ETS benchmarks to ensure the least efficient facilities face the highest carbon costs. Revenues from the industry carbon tax would be earmarked to finance green industrial activities.[104] The announcement of a carbon tax on industry is the result of a government-commissioned research report that the current plans are insufficient to meet the country's climate goals for 2030.[105] The Dutch government is currently working out the details of the carbon tax, a process that involves both industry and civil society organizations.

New Zealand

On December 12, 2018, the government announced decisions to strengthen the New Zealand ETS, which will support New Zealand to meet its climate change targets, including its NDC targets. The decisions include implementing a cap, introducing auctioning in the ETS, replacing the current price ceiling of NZ$25/$tCO_2e$ (US$18/$tCO_2e$) with a cost containment reserve, strengthening market governance, limiting the potential use of international credits, and investigating a price floor.[106]

The Government will decide on further policy reforms in mid-2019. Reforms under consideration include simplified forestry-sector accounting options, a potential price floor mechanism, and options for the phase-down of free allocation to emissions-intensive and trade-exposed industries. Options for strengthening the ETS market governance

103 Source: Dutch climate council, *Design of the Climate Agreement*, December 21, 2018, https://www.klimaatakkoord.nl/documenten/publicaties/2018/12/21/ontwerp-klimaatakkoord.

104 Source: Dutch Ministry of Economic Affairs and Climate, *The Government's Reaction on the Draft Climate Agreement*, March 13, 2019, https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/kamerstukken/2019/03/13/kamerbrief-met-eerste-reactie-kabinet-op-de-doorrekening-van-het-ontwerp-klimaatakkoord/kamerbrief-met-eerste-reactie-kabinet-op-de-doorrekening-van-het-ontwerp-klimaatakkoord.pdf.

105 Source: Reuters, *Dutch to Introduce "reasonable" Corporate Tax on Carbon Dioxide*, March 13, 2019, https://uk.reuters.com/article/us-climatechange-netherlands-tax/dutch-to-introduce-reasonable-corporate-tax-on-carbon-dioxide-idUKKBN1QU215.

106 Source: New Zealand Ministry for the Environment, *Proposed improvements to the NZ ETS*, accessed May 10, 2019, https://www.mfe.govt.nz/climate-change/proposed-improvements-nz-ets.

framework and improving the penalties and compliance regime are also under consideration. These policy reforms will feed into a single Bill to amend the Climate Change Response Act. It is expected that this Bill will be introduced in the second half of 2019. In addition, the Government is actively considering bringing agriculture into the ETS as a fully covered sector.[107]

In parallel to the reforms to the New Zealand ETS, New Zealand and the EU announced plans to strengthen their bilateral cooperation on emissions trading on December 17, 2018. New Zealand and the EU will hold regular technical and policy meetings to discuss the key design features and implementation of their ETSs, respective developments and possible implementation challenges, with a view to exploring options towards enhanced cooperation between the two systems.[108]

Portugal

The Portugal carbon tax rate almost doubled from €6.85/tCO_2e (US$8/$tCO_2e$) to €12.74/$tCO_2e$ (US$14/$tCO_2e$) on January 1, 2019.[109] This is the result of the tightening EU ETS market, because the carbon tax rate is tied to the average EU ETS allowance price in the preceding year. In anticipation of this increase in the tax burden for the general public, the government reduced the tax on gasoline by more than double the amount of the carbon tax increase.[110] In addition, the carbon tax rate for coal-fired electricity generation and co-generation facilities that also participate in the EU ETS was increased from €0.685/tCO_2e (US$0.8/$tCO_2e$) to €1.25/$tCO_2e$ (US$1.4/$tCO_2e$) to move away from coal. These facilities will gradually face the full tax rate in 2022.[111]

Senegal

Senegal is exploring carbon pricing as part of the policy options to reach the objectives of its NDC.[112] In 2018, the government organized consultations with stakeholders in the public and private sector to assess initial design options for the carbon pricing policy applicable to its economy. In 2018, a study on the opportunity to introduce carbon pricing at the domestic level was carried out. The government identified the need for additional analyses to explore the main elements to design a potential carbon tax in detail.

Singapore

On January 1, 2019, Singapore implemented its carbon tax. The carbon tax is set at S$5/$tCO_2e$ (US$4/$tCO_2e$) from 2019 to 2023. Singapore will review the carbon tax rate by 2023, with plans to increase the rate to S$10–$15/tCO_2e (US$8/$tCO_2e$ to US$11/$tCO_2e$) by 2030.[113] The carbon tax applies to all facilities with annual GHG emissions over 25 $ktCO_2e$ and is expected to raise revenue of nearly S$1 billion (US$760 million) in the first five years, which will help support initiatives to address climate change such as incentives for energy efficiency improvements in the industrial sector.[114]

South Africa

South Africa became the first African nation to launch a carbon tax after Parliament passed the Carbon Tax Bill on February 19, 2019.[115] The launch date of the carbon tax is June 1, 2019 and starts at R120/tCO_2e (US$8/$tCO_2e$). This accomplishment was proceeded by a lengthy process that saw the implementation

107 Source: New Zealand Interim Climate Change Committee, *Agriculture*, accessed May 11, 2019, https://www.iccc.mfe.govt.nz/what-we-do/agriculture.
108 Source: Government of New Zealand, *EU and New Zealand to strengthen cooperation on emissions trading systems*, December 18, 2018, https://www.beehive.govt.nz/release/eu-and-new-zealand-strengthen-cooperation-emissions-trading-systems.
109 Source: Government of Portugal, *Government Gazette: Finances*, January 4, 2019, https://dre.pt/application/file/a/117620377.
110 Source: Government of Portugal, *Special Taxes on Consumption*, accessed April 11, 2019, https://dre.pt/web/guest/legislacao-consolidada/-/lc/34478675/diploma?p_p_state=maximized&rp=diploma&eid=73363080.
111 Source: Government of Portugal, *Section 4 of the Government Gazette: Vehicle Tax*, December 31, 2018, http://app.parlamento.pt/webutils/docs/doc.pdf?path=6148523063446f764c324679595842774f6a63334e7a637664326c7564475634644739 7a58324677636d393259575276637938794d-4445344c3078664e7a46664d6a41784f4335775a47593d&fich=L_71_2018.pdf&Inline=true.
112 Source: CI-ACA, *Validation workshop of the opportunity study on the implementation of a carbon pricing instrument in Senegal*, December 20, 2018.
113 Source: National Environment Agency Singapore, *Carbon Tax*, January 1, 2019, https://www.nea.gov.sg/our-services/climate-change-energy-efficiency/climate-change/carbon-tax.
114 Source: Ibid.
115 Source: South African Government, *Parliament Passes Bills*, February 19, 2019, https://www.gov.za/speeches/national-assembly-passes-several-bills-%C2%A0-19-feb-2019-0000.

of the carbon tax delayed three times since its implementation was first proposed in 2013 with an initial start date of January 2015. Multiple rounds of consultations and discussions were needed to reach this stage due to its unpopularity with businesses and heavy reliance of the South African economy on coal. Since then, wind and solar power have increased in competitiveness and utilities have undergone restructuring. In addition, several changes were made compared to the initial bill following stakeholder input, including scaling down the growth of the carbon tax rate increase from initially 10 percent. The increase of the carbon tax rate until 2022 is now stated as the amount of consumer price inflation plus two percent annually. After 2022, only inflationary adjustments are envisioned. The South Africa carbon tax is one of its key instruments to meet its NDC pledge.

Switzerland

On March 22, 2019, the Swiss Parliament approved the agreement to link the Swiss and EU ETS and adopted the necessary amendments to the Swiss CO_2 Act to implement the agreement.[116] After the necessary amendments to the Swiss CO_2 Ordinance are also made, and Switzerland and the EU ratify the agreement, the link could become operational as of January 1, 2020.

The linking process took longer than originally anticipated when negotiations started in 2011. It suffered various setbacks, including a major delay when the relationship between Switzerland and the EU was strained following a Swiss referendum on immigration that conflicted with an existing agreement with the EU on free movement of persons. Another point of discussion was the inclusion of aviation, which Switzerland must add to its ETS as part of the linking agreement. This link could form a precedent for future linking negotiations with other jurisdictions, such as California-Québec, China, Korea and New Zealand. Linking can bring certain advantages to an ETS by creating a level-playing field between companies in different countries, increasing market liquidity, and lowering abatement costs.

The Switzerland carbon tax increased on January 1, 2018 from CHF84/tCO_2e to CHF96/tCO_2e (US$87/$tCO_2e$ to US$99/$tCO_2e$). In the context of the revision of Swiss climate policy for 2021–2030, the Swiss government put forward a proposal to increase the maximum possible carbon tax rate from CHF120/tCO_2e to CHF210/tCO_2e (US$126/$tCO_2e$ to US$220/$tCO_2e$). However, the revision of the climate policy was rejected in the National Council of the Swiss Parliament on December 12, 2018.[117] The revision is currently being debated by the Council of States, the other chamber of the Swiss Parliament.[118, 119]

Ukraine

Ukraine is in the process of adopting its framework law on monitoring, reporting and verification (MRV) in legislation. After the MRV system has been put in place, Ukraine plans to develop separate legislation based on at least three years of data from the MRV system to transpose other relevant EU directives into its laws and establish an ETS.[120] These developments are born out of Ukraine's commitments under the Ukraine-EU Association Agreement of 2017, which aims to converge economic policy, legislation, and regulation across broad areas including trade and climate change in Ukraine with the EU.

Ukraine has increased its carbon tax from UAH0.41/tCO_2e (US$0.02/$tCO_2e$) to UAH10/$tCO_2e$ (US$0.4/$tCO_2e$) as of January 1, 2019.[121] Under the new provisions, entities with emissions exceeding 500 tCO_2 per annum are liable to pay tax. Companies

116 Government of Switzerland, *Agreement between Switzerland and the EU on linking emissions trading systems. Approval and implementation (amendment of the CO_2 Act)*, 6 May 2019, https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20170073

117 Government of Switzerland, *Total revision of the CO_2 Act after 2020*, 6 May 2019,https://www.parlament.ch/de/ratsbetrieb/suche-curia-vista/geschaeft?AffairId=20170071

118 Source: Swiss Parliament, *Second Chance for the Total Revision of the CO_2 Law*, January 11, 2019, https://www.parlament.ch/press-releases/Pages/2019/mm-urek-s-2019-01-11.aspx?lang=1031.

119 Source: Swiss Federal office for the environment, *CO_2 Levy*, September 28, 2018, https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate-policy/co2-levy.html.

120 Source: Supreme Council of Ukraine, *Draft Law on the Basis of Monitoring, Reporting and Verification of Greenhouse Gas Emissions*, January 1, 2018, http://w1.c1.rada.gov.ua/pls/zweb2/webproc4_1?pf3511=64881.

121 Source: Legislation of Ukraine, *On Amendments to the Tax Code of Ukraine and Some Other Legislative Acts of Ukraine on Improving the Administration and Revision of the Rates of Certain Taxes*, November 23, 2018, https://zakon.rada.gov.ua/laws/show/2628-viii.

with emissions below 500 tCO_2 per annum are tax exempt, and 500 tCO_2 are subtracted from the total amount of taxed emissions from 2019.[122]

United Kingdom

Currently, the UK participates in the EU ETS and the carbon price floor applies to the power sector. In October 2018, the UK government indicated in its 2018 Budget that in a "no deal" scenario—in which no mutually satisfactory agreement can be reached between the EU and the UK, and the UK must subsequently leave the EU—it will apply a temporary carbon tax to all UK stationary installations currently participating in the EU ETS, except for the aviation sector. During the initial tax period, a rate of £16/tCO_2e (US$21/$tCO_2e$) would be applied to each tCO_2e emitted over an installation's emissions allowance, which would be based on the installation's free allocation under the current EU ETS. The carbon tax would be introduced to help meet the UK's legally binding carbon reduction commitments under the Climate Change Act. The government continues to plan for all scenarios as it prepares for Brexit and is developing options for long term carbon pricing. The UK government's preferred option is to establish a UK ETS and link it to the EU ETS. However, the UK is also considering fallback options such as a standalone UK ETS, remaining in the EU ETS and a long-term carbon tax.[123]

United States

At the federal level, lawmakers presented separate bills for an ETS and a carbon tax with both bills focusing on returning carbon pricing revenues to citizens. The Energy Innovation and Carbon Dividend Act of 2019,[124] introduced on January 24, 2019, proposes a carbon tax on the GHG emissions of all fossil fuels with revenues deposited in a Carbon Dividend Trust Fund for distribution to US citizens. The Healthy Climate and Family Security Act of 2019, introduced on March 28, 2019, proposes a cap-and-trade program for fossil fuel producers, distributors and importers based on the carbon content of the fuels they sell and distribute carbon pricing revenues to US citizens through a fund and dividend pay-out.[125] Both bills include improvements to their 2018 version,[126, 127] and are currently being discussed in committees. Several measures that directly apply or implicitly raise the price on carbon were also on the ballot during the US Midterm elections on November 6, 2018 but were all defeated. Notably, Washington state's Initiative No. 1631—also known as the Washington Carbon Emissions Fee and Revenue Allocation Initiative—proposed levying a fee of US$15/$tCO_2e$ on GHG emissions generated within the state as of 2020.[128] Revenues generated from the levy were intended to support various energy and environmental projects. While carbon pricing-related measures were defeated, it is interesting to note that in many parts of the country, such as California, Colorado, Nevada, New Mexico, Oregon, and Washington, voters supported other forms of climate action. For example, in Nevada, voters expressed a preference for having electricity utilities purchase a growing share of electricity from renewable energy sources.[129]

Overall, at the US subnational level, states, cities and companies continue to enhance cooperation on carbon pricing. For example, the Carbon Cost Coalition—an initiative bringing state legislators together to take action on climate and reduce carbon emissions through putting a price on carbon—has grown to include representation from 12 states.[130] Similarly, the Transportation and Climate Initiative (TCI) issued a statement in December 2018 reflecting plans to develop a carbon pricing initiative in the transportation sector for nine US states and

122 Source: Prime Minister of Ukraine, *On Amendments to the Tax Code of Ukraine and Certain Other Legislative Acts of Ukraine on Improving the Administration and Revision of Rates for Certain Taxes and Duties*, n.d., http://w1.c1.rada.gov.ua/pls/zweb2/webproc34?id=&pf3511=64888&pf35401=467992.

123 Source: Government of United Kingdom, *Meeting Climate Change Requirements If There's No Brexit Deal*, February 28, 2019, https://www.gov.uk/government/publications/meeting-climate-change-requirements-if-theres-no-brexit-deal/meeting-climate-change-requirements-if-theres-no-brexit-deal.

124 Source: United States Congress, *H.R.763 - Energy Innovation and Carbon Dividend Act of 2019*, January 24, 2019, https://www.congress.gov/bill/116th-congress/house-bill/763.

125 Source: United States Congress, *S.940 - Healthy Climate and Family Security Act of 2019*, March 28, 2019, https://www.congress.gov/bill/116th-congress/senate-bill/940.

126 Source: United States Congress, *S.3791 - Energy Innovation and Carbon Dividend Act of 2018*, December 19, 2018, https://www.congress.gov/bill/115th-congress/senate-bill/3791.

127 Source: United States Congress, *S.2352 - Healthy Climate and Family Security Act of 2018*, January 29, 2018, https://www.congress.gov/bill/115th-congress/senate-bill/2352.

128 Source: Washington Secretary of State, *Initiative Measure No. 1631*, March 13, 2018, https://www.sos.wa.gov/_assets/elections/initiatives/finaltext_1482.pdf.

129 Source: BallotPedia, *Nevada Question 6, Renewable Energy Standards Initiative (2018)*, accessed April 12, 2019, https://ballotpedia.org/Nevada_Question_6,_Renewable_Energy_Standards_Initiative_(2018).

130 Connecticut, Hawaii, Maine, Maryland, Massachusetts, New Hampshire, New York, Oregon, Rhode Island, Utah, Vermont, and Washington.

Washington DC.[131] Specific elements of the TCI design process include determining the cap level, establishing MRV guidelines, identifying covered entities and fuels, developing cost containment mechanisms and compliance flexibility, and specifying revenue usage. The participating TCI jurisdictions aim to complete the policy development process in the course of 2019. The implementation of the initiative would be similar to the Regional Greenhouse Gas Initiative (RGGI) where member states jointly commit to implement the carbon pricing initiative and transpose it to state laws.[132] The existing RGGI program also continues to evolve, with the states on track to adopt post-2020 cap-and-trade regulations in 2019,[133] and the potential addition of two new states in 2020.[134]

Various US states also continue to develop their own carbon pricing initiative or strengthen their existing one. Table 2 provides an overview of key carbon pricing developments in individual US states.

Table 2 / Key carbon pricing developments in individual US states[135]

Jurisdiction	Type and status	Key developments
California	ETS implemented	– In December 2018, the California Air Resources Board (CARB) approved a set of reforms for the post-2020 period. Key reforms include an addition of a price ceiling, the two allowance price containment reserve tiers below the price ceiling, no sustained free allocation, and reduced use of offsets. These reforms came into force in April 2019.[136] These changes were the result of legislative direction for AB 398 which clarified the role of the program in achieving the state's 2030 GHG emissions reductions goals. – The reforms were adopted following a 45-day pubic consultation period from September to October 2018, which included the publication of an initial statement of reason, environmental analysis and impact assessment of the reforms. CARB also held four public workshop in 2017 and 2018 that have shaped the reforms.[137]
Massachusetts	ETS implemented (own ETS and participation in RGGI)	– The Massachusetts ETS started operation in 2018 and covers the power sector. It complements RGGI to help ensure that Massachusetts achieves its mandatory mitigation targets of achieving 25% reduction of emissions in the state as compared to 1990 levels and 80% reduction of emissions by 2050 as compared to 1990 levels. – In 2019, the auctioning of allowances has been introduced. The share of auctioned allowances is set to increase annually with the rest given away for free. 25% of the total allowances are auctioned in 2019, 50% in 2020, and 100% from 2021 onwards.
New Jersey	ETS under consideration (to rejoin RGGI)	– On January 29, 2018, New Jersey's Governor signed an Executive Order to take all necessary regulatory and administrative measures to ensure New Jersey's timely return to full participation in RGGI after it left in 2011.[138] – After working with the other RGGI states to determine how best to re-engage in the program, rules were made consistent with the 2017 RGGI Model Rule on December 17, 2018.[139] New Jersey aims to have the legislation in place by May 2019 and to participate in the first RGGI auction of 2020.

131 Connecticut, Delaware, Maryland, Massachusetts, New Jersey, Pennsylvania, Rhode Island, Vermont, and Virginia.
132 Source: TCI, *Transportation & Climate Initiative Statement*, December 18, 2018, https://www.georgetownclimate.org/files/Final_TCI-statement_20181218_formatted.pdf.
133 Source: RGGI, *State Statutes & Regulations*, accessed March 19, 2019, https://www.rggi.org/program-overview-and-design/state-regulations.
134 Source: State of New Jersey, *Regional Greenhouse Gas Initiative (RGGI)*, accessed May 4, 2019, https://www.state.nj.us/dep/aqes/rggi.html; RGGI, *RGGI States Applaud Key Step for Virginia Emissions Trading Regulation*, April 19, 2019.
135 For further details on each carbon pricing initiative, please refer to: World Bank, *Carbon Pricing Dashboard*, accessed March 14, 2019, https://carbonpricingdashboard.worldbank.org/.
136 Source: California Air Resources Board, *Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market- Based Compliance Mechanisms Regulation*, February 14, 2019, https://ww2.arb.ca.gov/rulemaking/2018/california-cap-greenhouse-gas-emissions-and-market-based-compliance-mechanisms.
137 Source: Government of California, *Proposed Amendments to the California Cap on Greenhouse Gas Emissions and Market- Based Compliance Mechanisms Regulation*, March 29, 2019, https://ww2.arb.ca.gov/rulemaking/2018/california-cap-greenhouse-gas-emissions-and-market-based-compliance-mechanisms.
138 Source: Government of New Jersey, *Executive Order NO. 7*, January 29, 2018, https://nj.gov/infobank/eo/056murphy/pdf/EO-7.pdf.
139 Source: New Jersey Department of Environmental Protection, *Murphy Administration Proposes Rules For State's Re-Entry Into Regional Greenhouse Gas Initiative*, December 17, 2018, https://nj.gov/governor/news/news/562018/approved/20181217b.shtml.

Jurisdiction	Type and status	Key developments
New Mexico	Carbon pricing being explored	– On January 29, 2019, New Mexico instantiated an executive order to provide strategic direction for 2030 emission reduction targets by exploring a wide range of measures to reduce the state's GHG emissions. Measures that will be explored include a comprehensive market-based program that sets emission limits across New Mexico.[140]
Oregon	ETS under consideration	– On January 31, 2019, the Joint Committee on Carbon Reduction introduced House Bill 2020, which proposes the establishment of a statewide cap-and-trade program (Oregon Climate Action Program) in line with the agenda of the Oregon government.[141] – The program would start in 2021, covering about 80% of the GHG emissions in Oregon. The cap would be in line with a proposed target of a 45% reduction in GHG emissions below 1990 levels by 2035 and at least 80% reduction by 2050. The program's design is closely modeled on the California and Quebec ETSs. The possibility of linking with other market-based compliance mechanisms in other jurisdictions is also mentioned in the proposed legislation. – On March 25, 2019, the Joint Committee on Carbon Reduction proposed amendments to the proposal on the distribution of allowances to energy-intensive and trade-exposed sectors and the use of auction revenues following stakeholder fears for the impact on the cost of living and jobs.[142] The committee continues to refine the proposal before the 2019 legislative session ends on June 30, 2019.
Virginia	ETS under consideration	– Virginia is in the process of establishing an ETS and linking it to the RGGI program. In September 2018, the DEQ released a revised draft regulation following comments from RGGI states to ensure consistency with the RGGI 2017 Model Rule and harmonize key design elements.[143] – Virginia is holding a public consultation early 2019 on the revised draft regulations.[144] If there are no further delays, the Virginia ETS could be operational and linked to RGGI by 2020.
Washington State	ETS implemented (compliance suspended)	– The state suspended compliance requirements under the Clean Air Rule (CAR) after a court ruling on December 15, 2017 found that the Department of Ecology did not have the authority to cover suppliers of natural gas and petroleum products under its ETS as they are not direct emitters of GHGs. – The Department of Ecology filed an appeal against the court ruling with the Washington State Supreme Court on May 14, 2018.[145] The first hearing took place in March 2019, where both parties presented their arguments. The Supreme Court did not indicate when they will issue a ruling, so the compliance requirements under CAR remain suspended for the time being.

Vietnam

Vietnam is analyzing options for carbon pricing approaches applicable to the county and developing pilot crediting programs for the steel and waste sectors, which could start after 2020. A decree on a roadmap for GHG emission reduction is planned for approval in 2019, which references the use of carbon credits and a carbon policy initiative.[146]

Selected changes in regional, national and subnational carbon pricing initiatives are summarized in Box 4.

140 Source: Governor of New Mexico, *Gov. Lujan Grisham Signs Executive Order Committing New Mexico to Essential Climate Change Action*, January 29, 2019, https://www.governor.state.nm.us/2019/01/29/gov-lujan-grisham-signs-executive-order-committing-new-mexico-to-essential-climate-change-action/.
141 Source: Oregon State Legislature, *Bill for Greenhouse Gas Emissions*, January 31, 2019, https://olis.leg.state.or.us/liz/2019R1/Downloads/CommitteeMeetingDocument/155934.
142 Source: Joint Committee on Carbon Reduction, *Proposed Amendments to House Bill 2020*, March 25, 2019, https://olis.leg.state.or.us/liz/2019R1/Downloads/ProposedAmendment/14526.
143 Source: RGGI, *RGGI States Submit Comments on Proposed Virginia Regulation for Emissions Trading*, April 9, 2018, https://www.rggi.org/sites/default/files/Uploads/Press-Releases/2018_04_09_Virginia_Comments_Release.pdf.
144 Source: Virginia Department of Environmental Quality, *Greenhouse Gases*, accessed March 19, 2019, https://www.deq.virginia.gov/Programs/Air/GreenhouseGasPlan.aspx.
145 Source: Department of Ecology State of Washington, *Ecology Statement on Appeal Filed with Washington State Supreme Court*, May 14, 2018, https://ecology.wa.gov/Air-Climate/Climate-change/Clean-Air-Rule.
146 Source: PMR, *Project Implementation Status Report (ISR)*, April 3, 2018, https://www.thepmr.org/system/files/documents/Vietnam_PMR%20Project%20Implementation%20Status%20Report_April%202018.pdf.

Box 4 / Summary of selected changes in regional, national and subnational carbon pricing initiatives

Initiatives implemented in 2018:
Argentina (carbon tax) and Massachusetts (ETS)

Initiatives implemented in 2019:
Canada (federal backstop—fuel charge and OBPS), Nova Scotia (ETS), Newfoundland and Labrador (ETS and carbon tax), Prince Edward Island (carbon tax), Saskatchewan (ETS), Singapore (carbon tax), and South Africa (carbon tax)

New initiatives under consideration:
New Brunswick (Canada), Ontario (Canada), and Senegal

Initiatives under consideration that experienced new developments in the past year:
Colombia, Mexico, Netherlands, Oregon (US), Ukraine, Virginia (US), and Vietnam

Price rate changes (carbon tax only):
2018/2019: The Iceland carbon tax rate increased with 10 percent to approximately ISK3850/tCO_2 (US$31/$tCO_2e$). From January 1, 2018, the Finland carbon tax rate for heating fuels decreased from €62/tCO_2e (US$77/$tCO_2e$) to €53/$tCO_2e$ (US$60/$tCO_2e$) to compensate for a new GHG calculation method. The Portugal carbon tax rate almost doubled from €6.85/tCO_2e (US$8/$tCO_2e$) to €12.74/$tCO_2e$ (US$14/$tCO_2e$). The Switzerland carbon tax increased on January 1, 2018 from CHF84/tCO_2e (US$85/$tCO_2e$) to CHF96/$tCO_2e$ (US$97/$tCO_2e$). The Ukraine carbon tax increased to HR0.41/tCO_2e (US$0.02/$tCO_2e$) to HR10/$tCO_2e$ (US$0.4/$tCO_2e$).

Price/market stabilization mechanisms (ETS only):
2018/2019: In the EU ETS, the MSR entered into force on January 1, 2019.
Future developments: Dutch government introduced plans for a carbon price floor for electricity generators of €12.3/tCO_2e (US$14/$tCO_2e$) in 2020, rising to €31.9/tCO_2e (US$36/$tCO_2e$) in 2030. New Zealand has proposed plans to introduce a cost containment reserve in place of the current price ceiling. The California cap-and-trade program reforms for post-2020 include an allowance price containment reserve and a price ceiling that provides the upper bound of the price containment mechanism and increases each year with an estimated 2030 value of US$94 (real 2018).

Offsets:
Future developments: A series of subsidiary regulations supporting proposals has been formulated in preparation for the Taiwan ETS, including the 2018 Regulations Governing GHG Offset Program Management to enable companies to acquire carbon offsets credits.
California is reducing the maximum amount of offset usage for compliance under its cap-and-trade program from 8% to 4% from 2021 through 2025, with an increase to 6% from 2026 through 2030.

Linking and/or cooperation:
2018/2019: New Jersey intends to join RGGI in 2019. Nine states and Washington DC are working together to develop a carbon pricing initiative under the Transportation and Climate Initiative
Future developments: The EU and Switzerland ETS link could become operational as of January 1, 2020. Oregon published draft ETS legislation in January 2019 with intentions of linking ETS to other North American ETSs in the future. The Virginia ETS could be operational and linked to RGGI by 2020.

2.3 Recent developments, emerging and future trends

The detailed analysis of the recent developments in carbon pricing initiatives highlights some key trends on how carbon pricing has evolved in the past years, which are summarized below.

New carbon pricing initiatives are emerging mostly at the subnational level and in developed countries. Several developing countries are implementing readiness activities, and assistance provided by international organizations and national development agencies remains crucial to build the needed technical assistance[147, 148] to further advance carbon pricing in developing countries. The North American region has experienced many developments at the subnational level, with 9 of the 11 newly implemented carbon pricing initiatives between 2018–2019 so far originating in this region —mostly in the Canadian provinces. These initiatives were driven by Canada's Pan-Canadian Approach to Pricing Carbon Pollution which include the initiation of a federal backstop system consisting of an ETS and a fuel charge similar to a carbon tax that would be implemented in absence of sufficiently ambitious carbon pricing action at the subnational level. In the US, carbon pricing initiatives continue to grow at the subnational level, with a new ETS being implemented in Massachusetts and New Mexico starting to explore carbon pricing.

Europe has continued to strengthen and adjust its carbon pricing initiatives, particularly the EU ETS. Ukraine is making steps to set up its own ETS. Governments are also looking to reinforce their initiatives, with Iceland and Ukraine increasing their carbon tax rates and the Netherlands looking to introduce a new carbon tax to incentivize stronger emission reductions. Some governments are also facing setbacks trying to increase their carbon tax rates, with the Swiss parliament rejecting an increase in the maximum carbon tax rate and France facing societal pressure to alter its rising carbon tax trajectory.

In Asia, the Singapore carbon tax entered into force on January 1, 2019. China is still working to operationalize its national ETS, while its subnational ETS pilots are gradually transitioning their systems to align with the national one. Existing initiatives in Asia continue to develop, including the Republic of Korea ETS, which entered its second phase, and the Kazakhstan ETS, which is relaunching after a two-year suspension.

Australia and New Zealand have recently gone through a review of their initiatives and are currently working on implementing the required changes. The changes to the baseline levels for facilities under the Australia ERF Safeguard Mechanism came into effect in March 2019. New Zealand is in the process of reforming its ETS with new price stabilization measures and market governance structures being in place as of December 2018, and further reform decisions to be made by mid-2019 regarding free allocation, compliance and forestry accounting.

147 A number of jurisdictions have benefited from external support in developing carbon pricing instruments under the Partnership for Market Readiness (PMR). The PMR, established in 2011, is a partnership of 42 jurisdictions that are at the forefront of developing carbon markets. To date, the PMR has supported 23 developing countries to prepare for and implement carbon pricing instruments. For example, the PMR supported Chile to implement its carbon tax, and supported China to develop its provincial and national emissions trading schemes. More information on the PMR is available at: www.thepmr.org

148 The Carbon Pricing Leadership Coalition (CPLC) represents a coalition of 34 national and subnational government partners, 160+ private sector partners from a range of regions and sectors, and 80+ strategic partners representing NGOs, business organizations, and universities that work together to promote efforts to price carbon by sharing experiences and to expanding the evidence base on how to effectively plan design and implement carbon pricing systems and policies.

In other regions, such Latin America, Argentina launched its carbon tax, and Mexico continues to work on the start of its pilot ETS. Africa is seeing its first carbon pricing initiative enter into force in 2019. The South Africa carbon tax started on June 1, 2019. Senegal and Côte d'Ivoire are exploring carbon pricing as part of the policy options to achieve their NDCs.

Many jurisdictions are deepening their carbon pricing ambition to better align with their climate goals, and many ETSs are being reformed. Governments are increasingly recognizing carbon pricing as a key policy instrument to deliver on climate mitigation targets and are looking to raise carbon pricing ambition—either through price increases, removing exemptions or increased stringency. For example, Iceland increased its carbon tax rate by 10 percent in 2019 to bolster its effort to reach its NDC and Portugal is gradually reducing its carbon tax exemptions to transition away from coal. The European Union and New Zealand have also significantly reformed and strengthened their respective ETSs to align with their NDC. In the US, more states have opted to join the RGGI and California has planned for significant reforms in their ETS.

Increased cooperation continues across several carbon pricing initiatives around the world. Nine US states and Washington DC are working together under the TCI to develop a carbon pricing initiative for the transportation sector. RGGI is also set to grow, with New Jersey and Virginia looking to join RGGI. Oregon continues to design its own ETS with the possibility of linking to other carbon pricing initiatives and has modelled its ETS after the California and Québec cap-and-trade programs. In 2019, Switzerland and the EU made strides towards ratifying the Linking Agreement, which could see their markets linked from January 1, 2020. This cooperation also serves to exchange knowledge and strengthen capacity. The EU and California agreed at the Global Climate Action Summit held in September 2018 on more frequent knowledge exchanges. The EU also reaffirmed its continued bilateral cooperation with China in developing the China national ETS. At the 24th Conference of the Parties (COP 24), the New Zealand and the EU announced plans to strengthen their bilateral cooperation on emissions trading. To support jurisdictions in their efforts to explore cooperation and linking of their carbon pricing systems, the International Carbon Action Partnership (ICAP) published a new guide to linking ETSs.[149]

Cooperation is taking place also via the newly established Coalition of Finance Ministers for Climate Action, which includes more than 20 Finance Ministries that signed the Helsinki Principles, which promote national climate action, especially through fiscal policy and the use of public finance.[150] Another example of cooperation is the Carbon Pricing in the Americas (CPA) declaration, launched at the One Planet Summit held in December 2017, that calls for the establishment of a regional cooperation platform exclusively on carbon pricing, aimed at

149 Source: Santikarn, M., L. Li, S. La Hoz Theuer, & C. Haug. *A Guide to Linking Emissions Trading Systems*. ICAP: Berlin, 2018.

150 Peer-exchange to share experience and expertise on climate mitigation and adaptation as well work towards measures that result in effective carbon pricing are two of the principles endorsed by this Coalition. Source: https://www.cape4financeministry.org/coalition_of_finance_ministers. Countries part of this initiative are: Austria, Chile, Colombia, Costa Rica, Côte D'Ivoire, Denmark, Dominican Republic, Ecuador, Finland, Fiji, France, Germany, Guatemala, Iceland, Ireland, Kenya, Luxembourg, Marshall Islands, Mexico, Netherlands, Nigeria, Norway, Paraguay, Philippines, Poland, Spain, Sweden, Uganda, United Kingdom.

facilitating knowledge sharing, brokering peer-to-peer exchanges and overall strengthening regional and international collaboration.[151] Under the leadership of the CPA Co-chairs, Mexico and Canada, this initiative made progress in 2018 by developing and adopting a platform and delivering a series of governance and advocacy events.[152]

Developments in the past year also serve as a reminder of the need to ensure public support for the adoption and the long-term survival of carbon pricing policies, as briefly discussed in Box 5. Carbon pricing is vulnerable to social unrest and public ballots, as shown with the rejection of the Washington carbon tax and many other instances when social protests, such as the Yellow Vests movement, or political shifts have brought implemented and planned carbon pricing initiatives to an end. Building and maintaining broad, multi-partisan, public support for carbon pricing helps to make it less vulnerable to political changes. British Columbia, for example, manage to maintain and even increase public support for its carbon tax over time. The share of its population opposing carbon pricing decreased from about 60 percent to less than 45 percent between 2009 and 2015.[153] Learning from these experiences and sharing good practices is key to support jurisdictions in adopting new or reforming existing instruments.

Box 5 / Catalyzing public support for carbon pricing

For many years, the *State and Trends of Carbon Pricing* reports have described the developments of carbon pricing initiatives across the globe and clearly shown that initiatives can follow very different designs, also depending on circumstances prevailing in each economy. Accounting for local circumstances is crucial for catalyzing public support of carbon pricing, and there might not be "one-size-fits-all" approach on how to gain and maintain public acceptability. There is, however, a growing strand of research that analyzes public support for carbon pricing and can offer insights on how to build and maintain this support, for instance, via the strategic use of revenues; a gradual introduction of carbon pricing, through piloting or phasing in; and carefully crafted communication strategies. Reviewing this research would go beyond the scope of the present report, but interested readers are referred to these sources.[154]

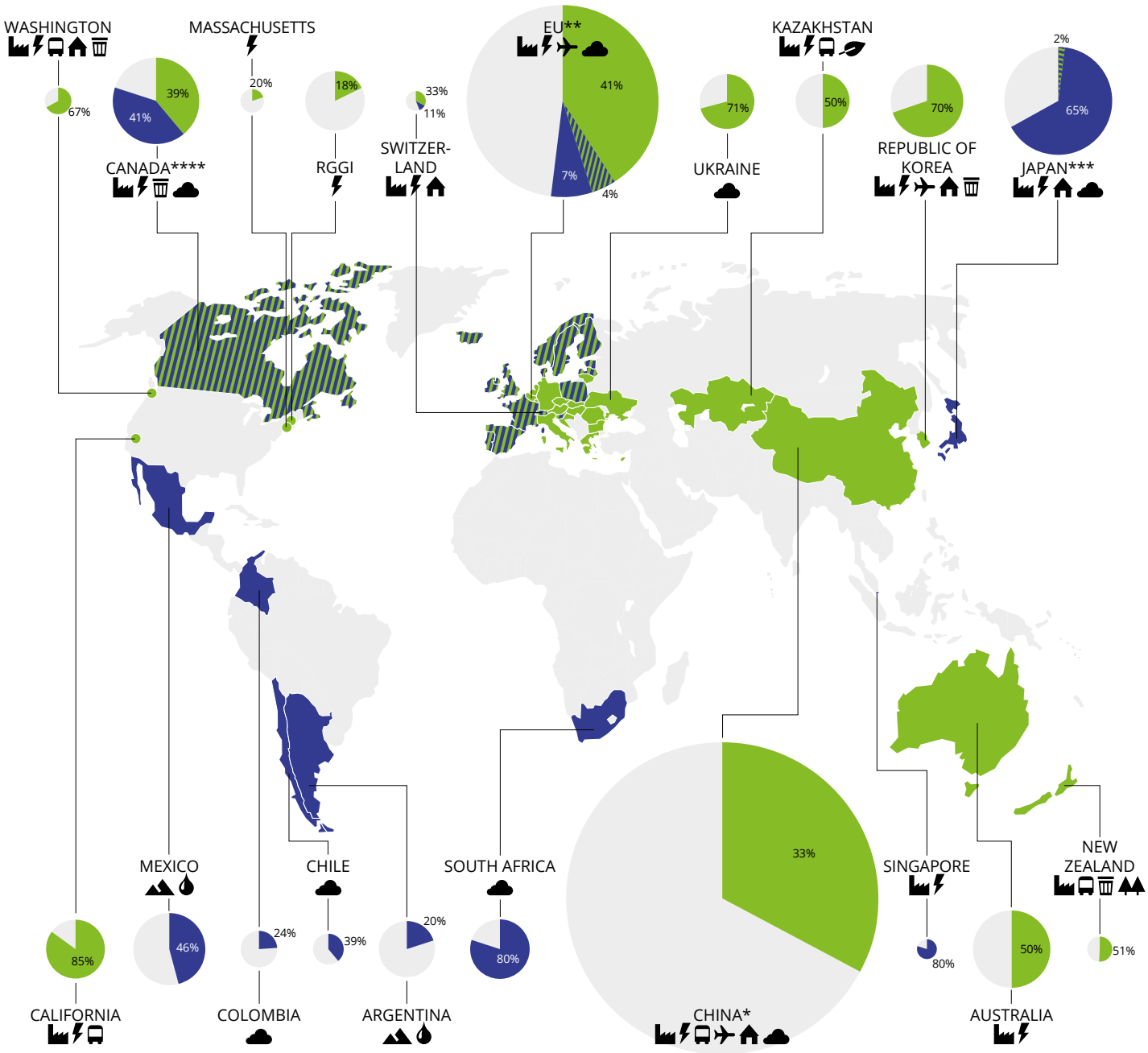
151 Countries part of this initiative are: Canada, Chile, Colombia, Costa Rica, Mexico, the Governors of California and Washington, and the Premiers of Alberta, British Columbia, Nova Scotia, Ontario and Québec.

152 Source: CPLC, *Declaration on Carbon Pricing in the Americas: Building Momentum Among Continents*, September 25, 2018, https://www.carbonpricing-leadership.org/blogs/2018/9/24/declaration-on-carbon-pricing-in-the-americas-building-momentum-among-continents.

153 Source: Murray, B. and Rivers, N., 2015. British Columbia's revenue-neutral carbon tax: A review of the latest "grand experiment" in environmental policy. Energy Policy, 86, pp. 674-683.

154 Relevant research includes: Baranzini, Andrea, et al., 2017. *Carbon Pricing in Climate Policy: Seven Reasons, Complementary Instruments, and Political Economy Considerations*. Wiley Interdisciplinary Reviews: Climate Change, 8(4), p. 462; Carattini, Stefano, Maria Carvalho, and Sam Fankhauser., 2018. *Overcoming Public Resistance to Carbon Taxes*. Wiley Interdisciplinary Reviews: Climate Change, 9(5), p. 531; Dominioni Goran and Heine Dirk, *Behavioural Economics and Public Support for Carbon Pricing: A Revenue Recycling Scheme to Address the Political Economy of Carbon Taxation*, European Journal of Risk Regulation, 2019.; Klenert, David, et al., 2018. *Making Carbon Pricing Work for Citizens*. Nature Climate Change, 8(8), pp.669-77; Pigato Miria, A., Editor. 2019. *Fiscal Policies for Development and Climate Action*. International Development in Focus. Washington, DC: World Bank; Barry Rabe, *Can We Price Carbon?*, Cambridge: MIT Press, 2018.

Figure 13 / Sectoral coverage and GHG emissions covered by carbon pricing initiatives implemented or scheduled for implementation, with sectoral coverage and GHG emissions covered



ETS implemented or scheduled for implementation
Carbon tax implemented or scheduled for implementation
ETS and carbon tax implemented or scheduled
40% Estimated coverage

Industry
Power
Transport
Aviation
Buildings
Waste
Forestry
Agriculture
All fossil fuels (tax only)
Solid fossil fuels
Liquid fossil fuels
Shipping

Note: The size of the circles reflects the volume of GHG emissions in each jurisdiction. Symbols show the sectors and/or fuels covered under the respective carbon pricing initiatives. The largest circle (China) is equivalent to 12.4 $GtCO_2e$ and the smallest circle (Switzerland) to 0.05 $GtCO_2e$. The carbon pricing initiatives have been classified in ETSs and carbon taxes according to how they operate technically. ETS does not only refer to cap-and-trade systems, but also baseline-and-credit systems such as British Columbia and baseline-and-offset systems such as in Australia. Carbon pricing has evolved over the years and they do not necessarily follow the two categories in a strict sense. The authors recognize that other classifications are possible.

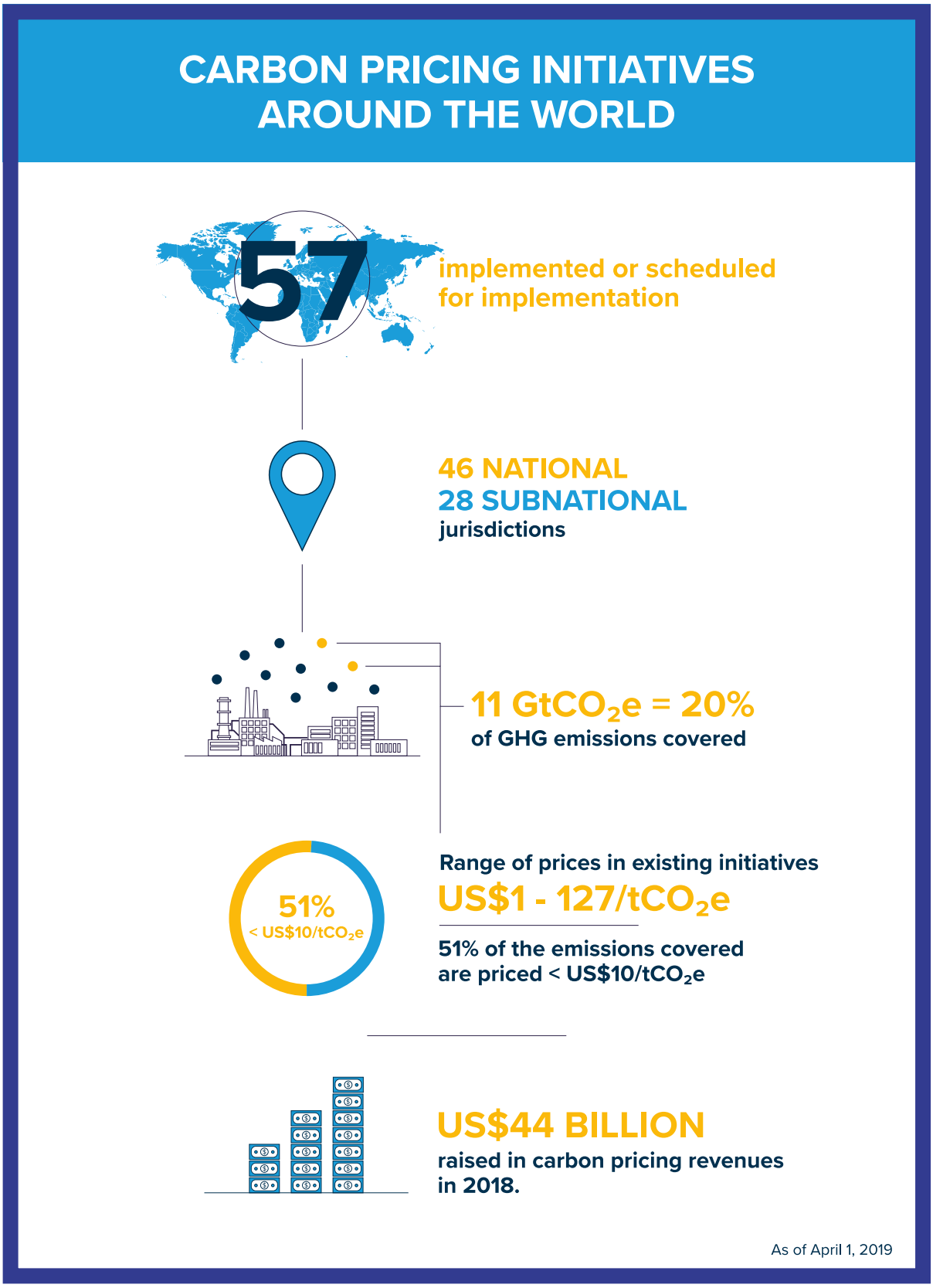
* The coverage includes the China national ETS and eight ETS pilots. The coverage represents early unofficial estimates based on the announcement of China's National Development and Reform Commission on the launch of the national ETS of December 2017 and takes into account the GHG emissions that will be covered under the national ETS and are already covered under the ETS pilots. The sector symbol refers to the covered sectors in the national ETS or (one of the) ETS pilots. The national ETS will initially cover the power sector only. The covered sectors vary per ETS pilot.

** Also includes Norway, Iceland and Liechtenstein. Carbon tax emissions are the emissions covered under various national carbon taxes; the scope varies per tax.

*** ETS emissions are the emissions covered under the Tokyo CaT and Saitama ETS.

**** The coverage includes both components of the Canada federal backstop system and the subnational carbon pricing initiatives.

Box 6 / Carbon pricing in numbers



3
International carbon pricing initiatives

3 International carbon pricing initiatives

Implementation of the Paris Agreement and NDCs

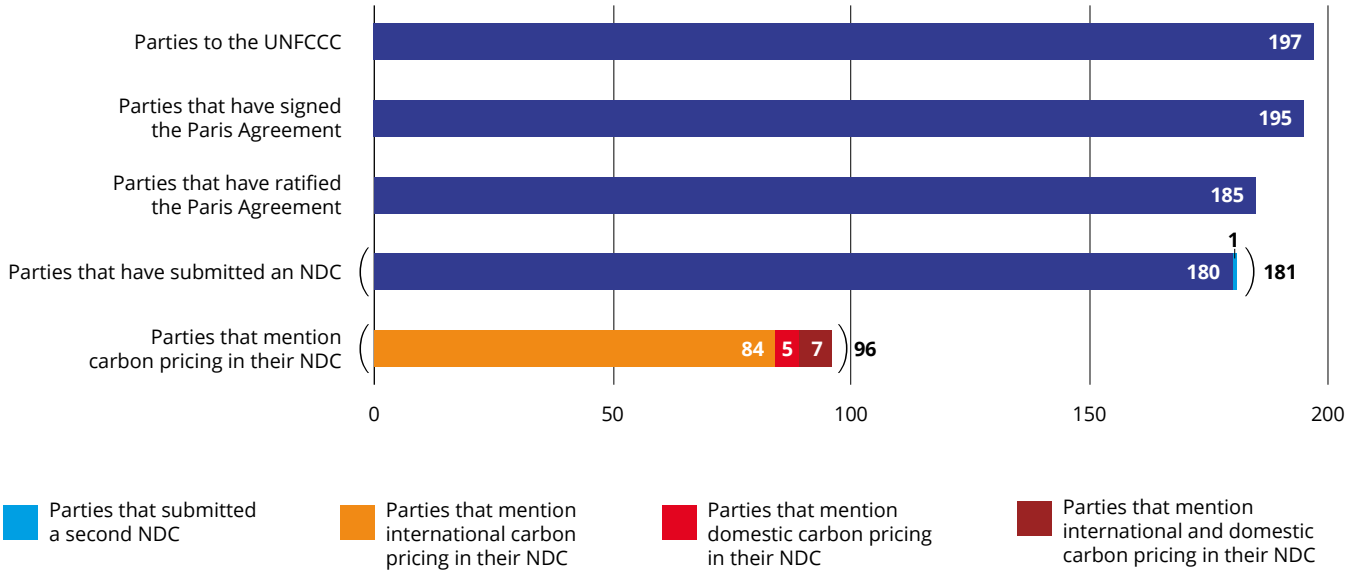
Two years after the Paris Agreement entered into force,[155] an important milestone was reached at COP 24 in Katowice, Poland. Government leaders agreed to the Katowice Climate Package, which sets out the implementation guidelines for the Paris Agreement.[156] The package includes operational guidance on the information for governments to provide in their NDCs and rules for how the Transparency Framework should function. The framework aims to build trust and confidence that all countries are contributing their fair share to the global effort against climate change.[157] Under the framework, countries will submit biennial transparency reports to the UNFCCC. These reports must contain the national inventory of GHG emissions and information for tracking the progress countries have made on implementing and achieving their NDC.[158] Developed countries must also report the financial support and technology transfer and capacity building for climate change mitigation and adaptation they provide for developing countries. Simultaneously, developing countries should report on the support they have received and still need. Countries are further encouraged to report on the impacts of climate change and adaptation actions they have taken. The first transparency report is due by December 31, 2024.[159]

As of April 1, 2019, 195 Parties have signed the Paris Agreement and 185, representing 87 percent of global GHG emissions, have deposited their instruments of ratification, as shown in Figure 14.

The Paris Agreement requires all ratifying Parties to communicate an NDC.[160] One country, the Marshall Islands, has submitted a second NDC to enhance its level of ambition. 96 Parties mention carbon pricing in their NDC, indicating that they are planning or considering the use of climate markets and/or domestic carbon pricing to meet their NDC commitments. These 96 Parties represent 55 percent of global GHG emissions; compared to a year ago,[161] this is an increase of eight Parties. The Parties

155 The Paris Agreement entered into force on November 4, 2016.
156 Source: UNFCCC, *The Katowice Climate Package: Making The Paris Agreement Work For All*, accessed March 5, 2019, https://unfccc.int/process-and-meetings/the-paris-agreement/katowice-climate-package.
157 Source: Ibid.
158 The national inventory can be submitted as part of the biennial transparency report or as a stand-alone report. Least Developed Countries and Small Island Developing States have less stringent reporting requirements.
159 Both Syria and Nicaragua have deposited their instruments of ratification but have not yet formally signed the Paris Agreement. However, both these countries have submitted their first NDCs to the NDC registry. Source: UNFCCC, *NCD Registry*, accessed March 5, 2019, https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx.
160 For most Parties, the first NDC is their originally submitted INDC. Only 11 Parties have an NDC that differs from their INDC, and 6 have submitted an entirely new NDC. In most cases, modifications to NDCs were minor, although some countries increased their ambitions. Furthermore, four Parties that did not submit an INDC submitted an NDC following ratification of the Paris Agreement, and six parties have submitted their instruments for ratification but have not yet submitted an NDC. Source: UNFCCC, *NCD Registry*, accessed March 5, 2019, https://www4.unfccc.int/sites/NDCStaging/Pages/All.aspx.
161 Comparing April 1, 2019 with April 1, 2018. Note that in the 2018 edition of the *State and Trends of Carbon Pricing* report, coverage of the NDCs mentioning carbon pricing was 57% of global emissions. Coverage increased with the additional NDCs, but an updated dataset of the underlying EDGAR database was used for the global GHG emissions in this year's report that includes emissions from biomass, resulting in a lower overall coverage in global GHG emissions.

Figure 14 / Status of NDC submissions



Note: As the modalities and procedures for the NDC registry are not yet in place, there is currently no basis to enforce a timeline on the submission of the NDC even though the Parties are technically in breach of the provisions of the Agreement. The EU is included as a separate Party in the tally above.

mentioning carbon pricing in their NDC include three Parties that did not mention carbon pricing in their intended NDCs (INDCs): Uruguay, Argentina and Mali.[162, 163]

The way in which carbon pricing is included across the submitted NDCs differs:[164]

- Five Parties that represent almost a quarter of global GHG emissions mention the intention to use a domestic carbon pricing initiative.[165]
- Seven Parties responsible for four percent of global GHG emissions mention that both international and domestic carbon pricing initiatives are under consideration.[166]
- 84 Parties that account for about 27 percent of global GHG emissions state intentions to use international carbon pricing initiatives.

For a detailed overview of the NDCs please refer to Annex II.

162 Uruguay states that although it does not rule out taking part in international GHG emissions trading markets, priority is given to the fulfillment of the commitments in its NDC.

163 Developing countries have actively been seeking focused and prioritized support from the international community on carbon pricing-related issues in order to implement their NDCs. One way in which countries have been requesting support is through the NDC Partnership, a continuously growing coalition of 124 countries and institutions working to mobilize support and achieve ambitious climate goals while enhancing sustainable development. From its members, 7 countries have requested support on market mechanisms, across the world focusing on feasibility studies for emission trading schemes, payment for ecosystem services, participation in international carbon markets and on the forestry sector.

164 This analysis is based on the number of NDCs that make a reference to forms of domestic or international carbon pricing. However, the authors recognize that there are different interpretations possible for the text in NDCs and the mention of carbon pricing in a domestic context may not necessarily mean that a domestic carbon pricing initiative is formally under consideration. Also, not all Parties that already have a carbon pricing initiative implemented, scheduled or under consideration have reported this in their NDC. The number of Parties planning or considering the use of carbon pricing in their NDC is therefore not comparable with the jurisdictions with carbon pricing initiatives implemented, scheduled or under consideration.

165 China, Gabon, Iceland, Norway and South Africa.

166 Canada, Costa Rica, Egypt, Korea, Panama, St. Lucia and Trinidad & Tobago.

International carbon pricing mechanisms under the Paris Agreement

International cooperation and climate markets can play an important role in reducing mitigation costs, increasing ambition for mitigation actions, as well as increasing resource mobilization by crowding in public and private capital. The analysis in the 2016 edition of the *State and Trends of Carbon Pricing* suggests that an international carbon market could reduce the annual cost of limiting global warming to 2°C by the middle of the century, potentially significantly, compared to countries acting alone.[167] This result indicates that for the same cost, an international carbon market would allow to achieve additional mitigation action compared to a state of the world without it. Article 6 of the Paris Agreement provides for voluntary cooperation among countries for the implementation of NDCs to allow for higher climate ambition, promote sustainable development, and promote environmental integrity:

- Article 6.2 covers cooperative approaches, where Parties could opt to meet their NDCs by using internationally transferred mitigation outcomes (ITMOs). ITMOs aim to provide a basis for facilitating international recognition of cross-border applications of subnational, national, regional and international carbon pricing initiatives.

- Article 6.4 establishes a mechanism for countries to contribute to GHG emissions mitigation and sustainable development. The emission reductions can be used to meet the NDC of either the host country or another country. The mechanism is intended to incentivize mitigation activities by both public and private entities.

Demand for the mitigation outcomes (i.e., resulting emission reductions) from international carbon pricing mechanisms have traditionally come from three major groups: compliance markets, voluntary markets, and more indirectly, through RBCF. In the context of the carbon pricing mechanisms under the Paris Agreement, one major source of demand from compliance markets will come from nations seeking to use the outcomes, such as ITMOs and potential credits from the Article 6.4 mechanism, to help meet their NDCs, summarized in Table 3.

Some NDCs mention the use of international market mechanisms, which could include credits from a new mechanism established by Article 6.4 of the Paris Agreement, while others refer to carbon markets, which could also include the use ITMOs mentioned in Article 6.2. Among the 96 NDCs that reference the use of international carbon pricing initiatives, currently, only eight—Canada, Japan, Liechtenstein, Monaco, New Zealand, Norway, South Korea and Switzerland—mention that they intend to use international credits to meet their NDCs under the Paris Agreement, while several major emitters explicitly rule out the use of international credits. However, a number of countries have adopted or are working on climate targets that go beyond their NDC, and some—such as Sweden[168]—indicated that international credits could be used to meet these more ambitious targets.

167 For further information, please refer to World Bank, Ecofys and Vivid Economics, *State and Trends of Carbon Pricing 2016*, October 2016. In principle, the cost savings could be as large as 50 percent with a fully global, friction-free carbon market.

168 Swedish Climate Policy Council, *Climate Policy Framework*, accessed April 29, 2019, https://www.klimatpolitiskaradet.se/det-klimatpolitiska-ramverket/.

Table 3 / Overview of countries seeking to use the outcomes such as ITMOs and potential credits from the Article 6.4 mechanism to help meet their NDCs

Country	NDC statement
Canada	Canada may use international mechanisms to achieve its target, subject to robust systems that deliver real and verified emissions reductions. Canada is also looking to reduce its emissions through the North American marketplace.
Japan	Japan aims at reducing 50-100 $MtCO_2e$/year through the Joint Crediting Mechanism.
Liechtenstein	In putting forward its commitment, Liechtenstein assumes to achieve emission reductions abroad which may be accounted towards its reduction target in 2030. However, primary focus will be given on domestic emission reductions.
Monaco	Monaco plans to use international emission reductions, because domestic emission reductions are 'insufficient' to meet the end goal.
New Zealand	New Zealand's NDC will remain provisional pending confirmation of access to carbon markets. New Zealand calls for unrestricted access to global carbon markets that enable trading and use of a wide variety of units that meet reasonable standards and guidelines to: – ensure the environmental integrity of units/credits generated or purchased – guard against double-claiming/double-counting, and – ensure transparency in accounting.
Norway	Norway participates in the EU ETS and for non-ETS sectors, Norway assumes access to flexibility in implementation in line with what EU member states have. In this situation, there will be no use of international market credits towards the target. Norway plans to use international credits only if it cannot secure a collective agreement with the EU.
Republic of Korea	Korea will partly use carbon credits from international market mechanisms to achieve its 2030 mitigation target, in accordance with relevant rules and standards. Credit types are not defined in the NDC.
Switzerland	Switzerland will realize its NDC mainly domestically and will partly use carbon credits from international mechanisms. Switzerland will use carbon credits from international mechanisms that deliver real, permanent, additional and verified mitigation outcomes and meet high environmental standards.

However, there is still a lack of clarity on key issues related to Article 6. Critical issues under Article 6 remain under negotiation, including:

- **Metrics:** Parties have different views on whether ITMOs should be denominated in CO_2e metrics only or should allow for non-CO_2e metric activities. While denomination of all ITMOs in a single metric may simplify accounting, exploring the inclusion of different metrics may offer some flexibility to consider a wider set of cooperative approaches.
- **Single-year versus multiyear NDCs:** One of the fundamental issues is comparability across NDCs that use multiyear budgets and those that use a single-year target. While the accounting system under the Kyoto Protocol was designed to ensure compliance with multiyear carbon budgets, most NDCs are currently defined as single-year targets. It is not clear how countries with single and multiyear targets would account for their NDCs, and whether a common basis for the use of ITMOs would emerge.

- **Corresponding adjustments:** It is unclear how countries would undertake corresponding adjustments against the transfer of ITMOs, when the adjustment would be made, and the application of a corresponding adjustment for mitigation outcomes generated outside or beyond the issuing country's NDC.

- **Inside/outside NDC:** The eligibility of mitigation outcomes generated inside and outside the NDC for transfer under Articles 6.2 and 6.4 remains to be clarified.

- **Governance:** The governance framework for Article 6 is yet to be determined. The role and functions of the Supervisory Body, as well as the different governance arrangements for Article 6.2 and 6.4 are yet to be finalized.

In addition to above, there are issues related to application of share of proceeds for 6.2 activities and transition of existing CDM projects and associated methodologies. A lack of regulatory certainty makes it difficult for market players to initiate early action. Piloting new tools, approaches, and frameworks for Article 6 is critical to ensuring that Article 6 discussions are informed by practical examples and experience. Research and piloting have already been initiated to build capacity, test, and experiment new concepts without waiting for the finalization of all the detailed rules.[169] Such pilots give countries and stakeholders an opportunity to discuss and analyze various scenarios to assess how their climate targets can be optimally achieved. They can also enhance international cooperation to develop solutions that address specific issues, such as double counting. Some of the piloting activities that are being conducted at the domestic and international level are described below.

At the international level, **the International ITMO Purchase Program** of the KliK Foundation is working to establish procedures for the purchase of ITMOs from 2021. It targets public and private organizations and aims to purchase 54 $MtCO_2e$ in emission reduction certificates that comply with Article 6 to offset emissions from the Swiss transport sector, as determined by the Swiss CO_2 law.[170]

The Pilot Activities of the Climate Cent Foundation (CCF), a Swiss foundation funded through a fuel levy that aims to invest in mitigation projects abroad and transfer the emission reduction certificates to the Swiss government. CCF is financed via proceeds from a former fuel tax.[171] The initiative aims to provide useful insights on transactional set-ups in government-to-government negotiations, which it specifies in a Mitigation Outcomes Purchase Agreement.

The Joint Crediting Mechanism (JCM) is a bilateral mechanism initiated by the Government of Japan to support mitigation actions in developing countries. Japan's Ministry of Environment is exploring how the JCM can help operationalize ITMOs under Article 6.2 and seek opportunities to build on the experience and insights from the implementation of JCM rules and accounting procedures.

Multilateral Development Banks (MDBs) jointly established a Working Group in October 2017 to help position Article 6 as a high strategic priority in climate negotiations and find opportunities to collaboratively pilot Article 6 transactions.[172]

The **Article 6 Support Facility** was established by the Asian Development Bank (ADB) to provide capacity building, technical and policy support for its developing member countries to develop and pilot Article 6 activities.[173] This initiative illustrates how MDBs can function as an influential platform preparing countries for the Paris Agreement.

169 Research can be extremely valuable to support efforts to evaluate approaches, test methods, and facilitate transactions. Research analyzing alternative institutional designs can define the potential role and value of international carbon pricing, identifying opportunities, uncertainties, and risks, and facilitating design discussion. Among other things, new research is needed to explore the potential for international carbon pricing in futures beyond the NDCs. This research should include evaluation of specific potential contexts over time, in addition to assessing how carbon pricing might facilitate increasing ambition and the pursuit of international goals.

170 Source: Swiss Federal Office for the Environment, *Total revision of the CO_2 Act*, accessed May 10, 2019, https://www.bafu.admin.ch/bafu/de/home/themen/klima/recht/totalrevision-co2-gesetz.html.

171 Source: Climate Finance Innovators, *Moving towards next generation carbon markets: observations from Article 6 pilots*, March 2019.

172 Current members of the Working Group are ADB, AfDB, EBRD, EIB, IDB, IsDB, and WBG. Further information can be found here: http://www.worldbank.org/en/topic/climatechange/brief/mdb-working-group-on-article-6-of-the-paris-agreement

173 Source: Asian Development Bank, *Establishing a Support Facility for Article 6 of the Paris Agreement*, accessed May 14, 2019, https://www.adb.org/projects/50404-001/main#project-pds.

The European Bank for Reconstruction and Development (EBRD) is working to leverage its **Integrated Carbon Programs** to test new methodologies for operationalizing Article 6.

The World Bank Group (WBG) has also initiated several piloting activities to kickstart the operationalization of Article 6 through learning-by-doing. For instance:

- **The Climate Warehouse** seeks to establish common infrastructure for post-2020 markets that would function as a database of mitigation outcomes. The WBG is working to create an initial supply of mitigation outcomes from its own portfolio of lending operations on a pilot basis, and developing risk mitigation products to facilitate early demand. This initiative is yet to be operational.

- **The Carbon Initiative for Development (Ci-Dev)** is piloting the use of new methodological frameworks, such as the Standardized Crediting Framework (SCF), to direct climate finance to client countries in preparation for the post-2020 markets under the Paris Agreement. Senegal and Rwanda so far adopted the SCF for the Ci-Dev supported programs and currently exploring to expand to other technologies and project types.

- **The Carbon Partnership Facility** is currently piloting sectoral and policy based crediting approaches under the Article 6 of the Paris Agreement in client countries and developed methodologies, validation protocol and validation guidance documents.

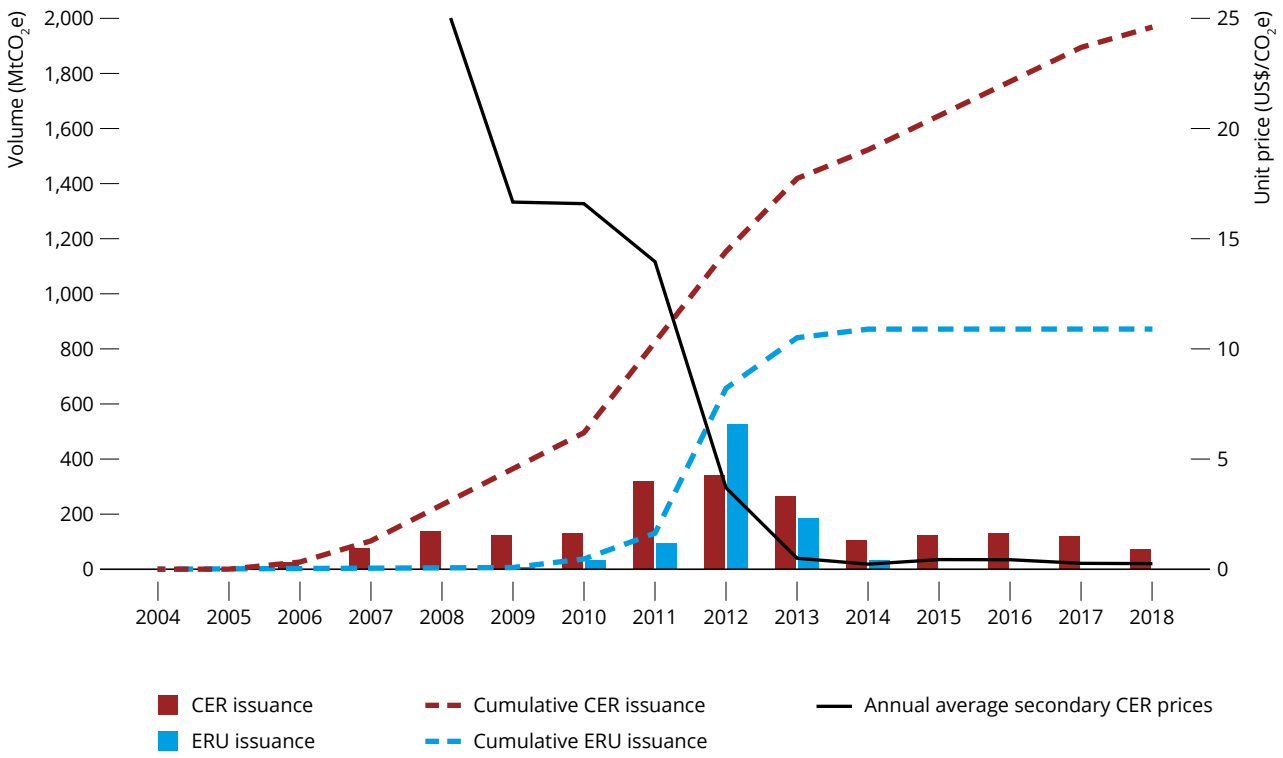
- **The Transformative Carbon Asset Facility (TCAF)** seeks to inform international negotiations on Article 6 by testing various methods to transparently transfer mitigation outcomes between parties and provide robust accounting and transparency, ensuring the environmental integrity of assets.

Clean Development Mechanism and Joint Implementation

Similar to the lack of an agreement on the Article 6 guidelines, no decision was made on the future of the Kyoto Mechanisms—the CDM (Clean Development Mechanism) and Joint Implementation (JI)—under the Paris Agreement at the Katowice COP. The two mechanisms have issued around 2.8 $GtCO_2e$ of mitigation outcome credits in the form of Certified Emission Reductions (CERs) and Emission Reduction Units (ERUs) respectively, as of December 31, 2018[174] and have a significant number of existing projects which will run for many years after 2020. Currently, there is considerable uncertainty over whether and how these projects will continue to issue credits, and how they will interact with NDCs under the Paris Agreement. According to the UNFCCC, the CDM is in principle able to issue 4.6 billion CERs to the end of 2020.[175] This potential to generate mitigation outcomes could mean that project developers and project host countries are keen to see some role for these projects in future mechanisms under the Paris Agreement. However, other countries and stakeholders are concerned that such actions could oversupply the market under the Paris Agreement, and have voiced concerns over the robustness of the CDM's rules with respect to the quality of the CERs issued. Discussions on how, or whether to, carry forward the issued credits and approved methodologies drawn up under the CDM, and if limitations should be placed on their use for meeting pledges under the Paris Agreement, were inconclusive at COP 24 and the decisions were postponed along with other Article 6 items to COP 25.

174 Issuance volume from Source: UNFCCC, *Joint Implementation & Clean Development Mechanism*, accessed April 12, 2019, http://ji.unfccc.int/index.html; http://cdm.unfccc.int/.
175 Source: UNFCCC, *CDM Insights, Project activities*, March 31, 2019, https://cdm.unfccc.int/Statistics/Public/CDMinsights/index.html.

Figure 15 / Historic CDM and JI issuances and CER prices[176]



Currently the CDM has just under 8,000 projects registered. Despite its achievements in incentivizing mitigation activities, lack of demand for these mitigation outcomes has meant that prices for CERs continue to remain very low. CERs are currently traded at around US$0.3/$tCO_2e$.[177] Such low prices and future uncertainty has led to declining CDM activities, as shown in Figure 15. 2018 saw issuances of CERs continuing to decline with approximately 73 million CERs issued compared to 119 million CERs in 2017. This makes 2018 the first time since 2007 that annual issuances have dropped below 100 million CERs.[178] Furthermore, the trading volume of CERs have continued the decreasing trend of the past years, dropping to 15 million in 2018 compared to 21 million in 2017.[179]

In efforts to increase demand for CERs, the UNFCCC has promoted the use of CERs on the voluntary market. Voluntary cancellations of CERs in 2018 stood at around 11.5 million, of which the majority were cancellations for the CERs to be used as offsets in other carbon pricing mechanisms. Around 3.5 million CERs from Korean projects were cancelled for use in the Korea ETS. New this year was that roughly 3.5 million additional CERs were cancelled

176 Issuance volume from Source: UNFCCC, *Joint Implementation & Clean Development Mechanism*, accessed April 12, 2019, http://ji.unfccc.int/index.html; http://cdm.unfccc.int/. CER prices are annual unweighted average prices from Intercontinental Exchange
177 Source: Intercontinental Exchange, *CER Daily Futures*, accessed April 8, 2019, https://www.theice.com/products/26238355/CER-Daily-Futures.
178 Source: UNFCCC, *CDM-Insights*, accessed March 5, 2019, https://cdm.unfccc.int/Statistics/Public/CDMinsights/index.html#iss.
179 Refinitiv, Carbon Market Year in Review, January 2019.

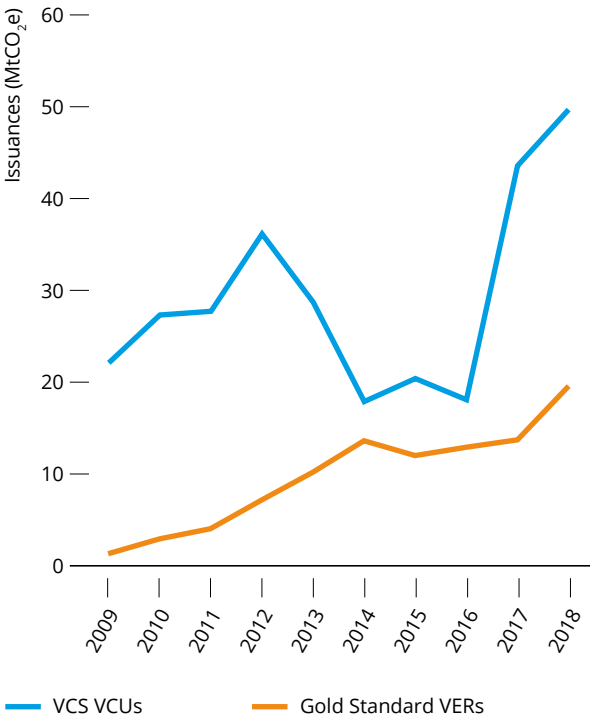
from Colombian projects, most likely for use in the Colombia carbon tax. Offsets from Colombian CDM projects are eligible to be used in the Colombia carbon tax from the end of 2017.[180] Cancellations by the general public using the UNFCCC's online Voluntary Cancellation Platform was just under 350,000 CERs.[181]

Other sources of demand remain limited. Some RBCF mechanisms still purchase limited volumes of CERs, often with additional eligibility criteria (see section *RBCF mechanisms*), but currently the Carbon Offset and Reduction Scheme for International Aviation (CORSIA) is considered to be the most likely source of demand in the near term, though large uncertainties exist (see section *International aviation*). The prospect for demand of CERs and international credits as offsets in mandatory regional, national and subnational carbon pricing initiatives is limited; of the 57 carbon pricing initiatives implemented and scheduled for implementation, only the Colombia carbon tax, EU ETS, Mexico carbon tax, Korea ETS, Slovenia carbon tax, and Switzerland ETS and carbon tax have provisions to enable the possible use of international credits. International credits need to meet certain qualitative criteria and quantitative restrictions for usage apply. In addition, the EU ETS, historically the largest source of demand for international credits has almost already fully exhausted its demand up to 2020 with 1.5 $GtCO_2e$ of the total demand of 1.6 $GtCO_2e$ fulfilled.[182] No use of international credits is foreseen in the EU ETS post-2020. The other 25 carbon pricing initiatives that have offset provisions only allow domestic offset credits or are still developing their offset provisions.[183]

Voluntary carbon market

The voluntary market is another important source of demand (and supply) of mitigation outcomes from international carbon pricing mechanisms. Voluntary market carbon pricing initiatives are also important testing grounds for piloting new ideas, such as the buffer system approach to address permanence risks for land use carbon. Overall, the size of the voluntary market is much smaller than the compliance market; as of the first quarter of 2018, more than 2,000 projects have issued over 430 $MtCO_2e$ of voluntary credits since 2005.[184] More than 75 percent of the issuances came from the two largest voluntary standards—Verra's Voluntary Carbon Standard (VCS) and the Gold Standard.

Figure 16 / Historic annual issuance of VCS and Gold Standard credits[185]



Despite its smaller size, activities within the voluntary market have been increasing, which could be indicative of a growing confidence in the projects issuing voluntary credits. A closer look at the issuance trends of the two largest voluntary standards reveal that after a dip in 2014, annual issuances of voluntary credits has picked up again since 2017 as shown in Figure 16.

180 Source: World Bank, *Carbon Pricing Dashboard*, accessed March 5, 2019, https://carbonpricingdashboard.worldbank.org/map_data.
181 Source: UNFCCC, *CDM Registry*, accessed March 5, 2019, https://cdm.unfccc.int/Registry/index.html.
182 Source: European Commission, *Report on the functioning of the European carbon market 2018*, COM/2018/842 final, December 17, 2018.
183 Alberta Carbon Competitive Incentive Regulation (CCIR), Australia ERF Safeguard Mechanism, Beijing pilot ETS, British Colombia Greenhouse Gas Industrial Reporting and Control Act (GGIRCA), California cap-and-trade program (CaT), Canada federal OBPS, China national ETS, Chongqing pilot ETS, Fujian pilot ETS, Guangdong pilot ETS, Hubei pilot ETS, Kazakhstan ETS, Liechtenstein carbon tax, Newfoundland and Labrador PSS, Nova Scotia CaT, Québec CaT, RGGI, Saitama ETS, Saskatchewan OBPS, Shanghai pilot ETS, Shenzhen pilot ETS, South Africa carbon tax, Tianjin pilot ETS, Tokyo CaT, and Washington CAR.
184 Source: Ecosystem Marketplace, *Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends*, July 27, 2018.
185 Data provided by the Gold Standard and the Verra's VCS database.

In terms of pricing, voluntary credit prices can change dramatically due to the various preferences of voluntary credit buyers. The transacted prices of voluntary credits during the first quarter of 2018 ranged from under US$0.1/tCO$_2$e to just over US$70/tCO$_2$e, but roughly half of the voluntary credits were transacted at under 1 US$/tCO$_2$e.

With the increasing number of carbon pricing initiatives around the world including even more domestic carbon pricing initiatives, and the Paris Agreement requiring all participating countries to reduce emissions, avoiding double counting will be an ever-increasing issue for the voluntary market. A survey by Ecosystem Marketplace of voluntary market stakeholders revealed that despite the uncertainties surrounding the future of the voluntary market under the Paris Agreement,[186] more than half of the respondents viewed the Paris Agreement and increasing domestic/regional compliance markets as positive new opportunities. Specifically, many expected these developments to result in both a new source of demand for voluntary market projects which could transition to selling offsets in domestic compliance markets such as in Colombia and California.

RBCF mechanisms

RBCF is a form of climate finance where funds are disbursed by the provider of climate finance to the recipient upon achievement of a pre-agreed set of climate-related results. These results are typically defined at the output or outcome level, which means that RBCF can support the development of specific low-emission technologies or the underlying climate outcomes, such as emission reductions. Some RBCF programs purchase compliance emission reduction units, including CERs, which is helping to bridge the current lack of demand for these units. Other programs not specifically designed for compliance markets use RBCF as a direct funding mechanism, although they incorporate elements of the existing carbon market infrastructure, such as the CDM MRV requirements, to help determine mitigation outcomes. Analysis from the 2017 edition of the *State and Trends of Carbon Pricing* showed that RBCF could serve as a stepping stone in the transition to an international carbon market and help to mobilize resources for investments in the low-carbon economy. Various RBCF initiatives are already in place to support this transition.

By mid-2018, the Green Climate Fund (GCF) raised the equivalent of US$10.3 billion in pledges from 43 state governments.[187] On February 27, 2019, the first ever Reducing Emissions from Deforestation and Forest Degradation (REDD+) project was approved to receive results-based payments under the GCF's REDD+ pilot program. The GCF Board approved the Brazilian project, which was backed by the United Nations Development Programme (UNDP), for the US$96.5 million it sought for 18.8 million tCO$_2$e of emission removals sequestered in the Amazon between 2014–2015. The pilot program allows for the retroactive crediting of results from 2013–2018.[188]

Further milestones indicating the emerging trend of more RBCF REDD+ activities, the World Bank's Forest Carbon Partnership Facility (FCPF) has signed two emissions reduction purchasing agreements (ERPAs) with the Countries of the Democratic Republic of Congo (DRC) and Mozambique for mitigation results from REDD+ activities in February 2019.[189] These are the first two countries out of 19 that are part of the FCPF Carbon Fund to have signed ERPAs. The total value of the ERPA for the DRC is US$55 million, while the value for the ERPA in Mozambique is US$50 million, with a goal to mitigate 10 MtCO$_2$e of emission by 2024.

186 Source: Ecosystem Marketplace, *Voluntary Carbon Markets Insights: 2018 Outlook and First-Quarter Trends*, July 27, 2018.
187 Source: GCF, *GCF in Brief: The Replenishment Process*, October 2018, https://www.greenclimate.fund/documents/20182/194568/GCF_in_Brief__The_Replenishment_Process.pdf/0fc018ad-1082-d11f-f72a-b1a07e02c9d4.
188 Source: GCF, *Meeting Reports*, accessed March 5, 2019, https://www.greenclimate.fund/boardroom/board-meetings/documents?p_p_id=122_INSTANCE_8e72dTqCP5qa&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=_118_INSTANCE_jUGwSITWV8c5__column-2&p_p_col_count=1&p_r_p_564233524_resetCur=true&p_r_p_564233524_categoryId=24003#nav-category.
189 Source: World Bank, *Mozambique and Democratic Republic of Congo Sign Landmark Deals with World Bank to Cut Carbon Emissions and Reduce Deforestation*, February 12, 2019, http://www.worldbank.org/en/news/press-release/2019/02/12/mozambique-and-democratic-republic-of-congo-sign-landmark-deals-with-world-bank-to-cut-carbon-emissions-and-reduce-deforestation?CID=CCG_TT_climatechange_EN_EXT.

The depressed prices of CERs and declining interest in the CDM are resulting in declining mitigation activities from existing projects. RBCF can offer a useful solution to maintain capacity and channel targeted finance to develop support for specific types of emission mitigation activities. For example, building on the work by the Pilot Auction Facility, the Nitric Acid Climate Auctions Program (NACAP) works in collaboration with the Nitric Acid Climate Action Group (NACAG) to support projects that reduce emissions of nitrous oxide (N_2O).[190] Currently, the World Bank expects that the NACAP will support price guarantees for eligible N_2O emission reductions generated from nitric acid plants in the CDM or VCS after January 1, 2018. The projects must also be hosted in countries that have signed NACAG's statement of undertaking lasting abatement from the nitric acid sector after 2020. To date, only Tunisia has signed this commitment.[191] NACAP will host at least one reverse auction, with a starting price of between US$8 and US$15. Auction winners will have to pay an option premium of US$0.06 per carbon credit upfront to purchase the put options.[192]

International Aviation

International aviation is emerging as an important potential demand source for international carbon pricing mitigation outcomes. The International Civil Aviation Organization (ICAO) has been working toward the start of CORSIA since it was adopted by its Member States in October 2016. CORSIA is the global carbon offsetting initiative, which aims to stabilize net emissions from international aviation at 2020 level.[193] CORSIA is expected to create demand for around 3 $GtCO_2$ in the period between 2020 and 2035, making it plausible that the aviation sector will become the largest source of demand for international credits.[194] In June 2018, the ICAO's Council approved the Standards and Recommended Practices (SARPs) for its CORSIA program. The SARPs are essentially the guidelines for CORSIA, but the approved version in June 2018 did not contain any rules on the eligibility of offset credits for CORSIA. At the time, ICAO's Council mentioned that it was hoping for additional clarity around the subject of Article 6 from the COP 24 negotiations. Despite the lack of a decision on Article 6 at COP 24, which threatened to delay the issue further, ICAO's Council approved the proposed text in the SARP to set broad eligibility criteria for CORSIA offsets on March 6, 2019.[195]

The SARP does not specify details on the types of activities, standards or vintages for offsets that would be allowed under CORSIA, though it has made clear intentions to allow for participation by activities under Article 6. These decisions are to be made at a later date, with the assistance of a yet to be established Technical Advisory Body. However, approval of the proposed text in the SARP on the emissions unit criteria means that offset programs seeking participation in CORSIA would have to meet widely accepted requirements, including additionality, avoiding double counting, and permanence.[196]

190 Source: World Bank, *Climate Auctions Program*, accessed March 5, 2019, http://www.worldbank.org/en/programs/climate-auctions-program#1.
191 Source: NACAG, *NACAG's Partner Countries*, accessed March 5, 2019, http://nitricacidaction.org/partners/eligible-countries/.
192 Source: World Bank, *Climate Auctions Program*, accessed March 5, 2019, http://www.worldbank.org/en/programs/climate-auctions-program#1.
193 Any additional emissions above 2020 levels must be offset, taking into account special circumstances and respective capabilities of Member States.
194 Source: German Society for International Cooperation (GIZ), *Crediting Forest-Related Mitigation under International Carbon Market Mechanisms*, September 7, 2018, https://newclimate.org/wp-content/uploads/2018/09/Studie_2018_REDD_and_carbon_markets.pdf.
195 Source: ICAO, *Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)*, accessed March 5, 2019, https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx.
196 Source: ICAO, *Standards and Recommended Practices Relating to the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)*, December 5, 2017, https://icsa-aviation.org/wp-content/uploads/2018/01/ICAO_CORSIA_draft_-SARP.pdf.

At the same time, there is currently continued disagreement amongst the ICAO council members on the type of offset credits to include, such as CERs and credits from domestic programs, and whether to introduce a cut-off date based on when the offset credits were generated.[197] This has generated uncertainty as to the number of countries participating in CORSIA's pilot phase (2021–2023), most notably, China, which represents 12 percent of global aviation activity. Many believe that China will be participating in the pilot phase, though the country has indicated that its participation is still to be determined.[198] Currently, 76 ICAO states representing 76 percent of international aviation activity intend to voluntarily participate in CORSIA from its outset, but this does not include the major emitters: China, India and Russia.

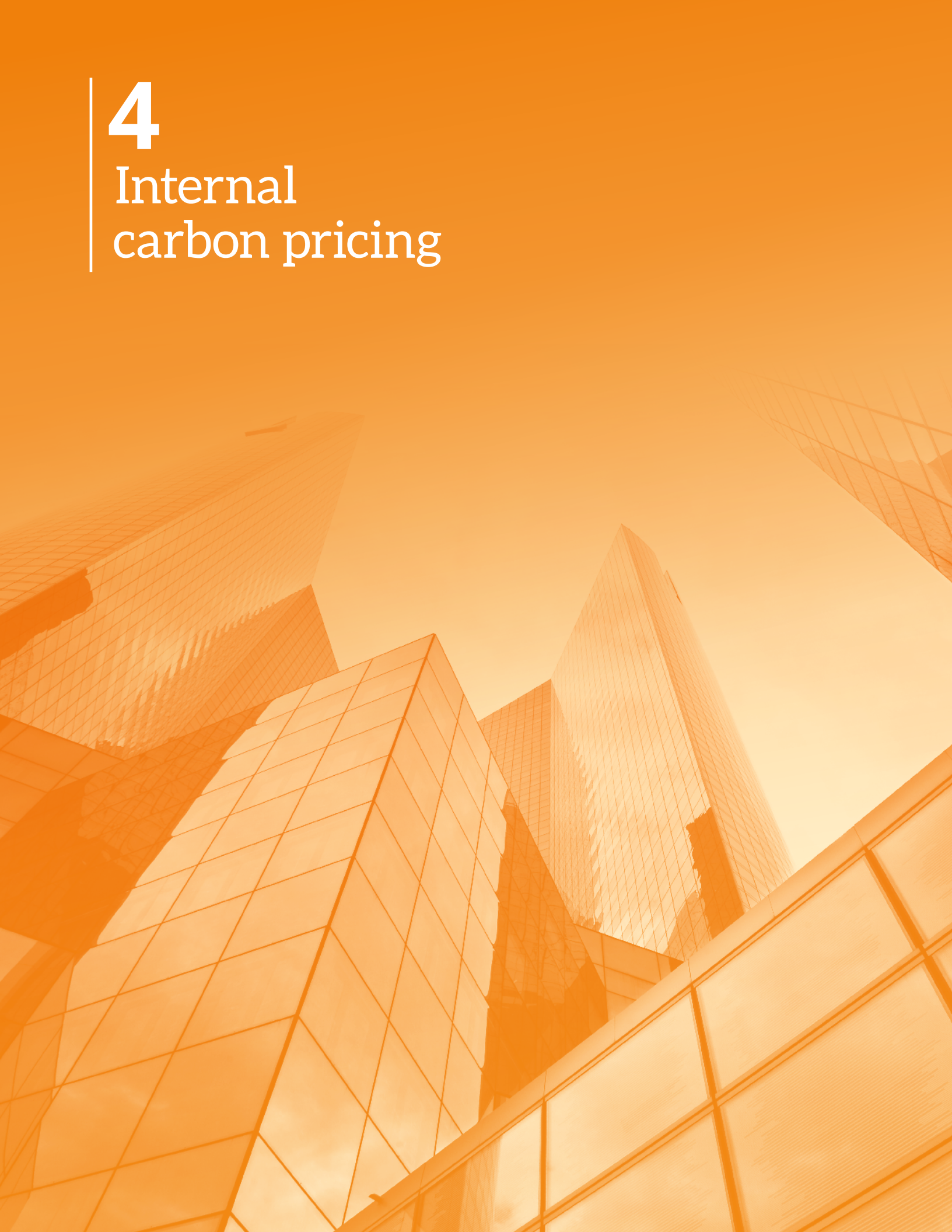
2019 is the start of the CORSIA baseline period, when all airlines are required to start monitoring their emissions. The end of February 2019 was also the deadline for airlines to submit their plans to monitor their emissions.[199]

International Maritime Transport

The international maritime transport sector is still exploring the use of carbon pricing. At its 73rd meeting in October 2018, the International Maritime Organization's (IMO) Marine Environment Protection Committee (MEPC) decided on a program of follow-up actions to plan the forthcoming discussions on short- (2018–2023), mid- (2023–2030), and long-term (post-2030) candidate measures. The main objective of IMO is to meet the targets of its initial GHG strategy, including cutting shipping emissions by at least 50 percent of 2008 levels by 2050, while pursuing efforts to achieve full decarbonization as soon as possible in this century. A package of measures will be utilized, but countries have yet to agree upon a potential future market-based mechanism (i.e. carbon pricing) to use in the shipping sector.[200] Initial discussions on a potential carbon pricing scheme are likely to take place at the MEPC 74 in May 2019, with more substantial conversations at MEPC 75 in April 2020. In parallel, the EU has required large ships calling at EU ports to collect verified CO_2 emissions data since 2018. This mandatory MRV system was adopted by the EU in 2015 as the first step to progressively integrate maritime emissions into the EU's policy for reducing GHG emissions. Data from this system will provide robust information to support future policy-making decisions at EU level and the implementation of policy tools. From this perspective, it is worth noting that the recent EU Directive 2018/410 on the EU ETS mentions that ''action from the IMO or the Union should start from 2023, including preparatory work on adoption and implementation and due consideration being given by all stakeholders".[201]

197 Source: Carbon Pulse, *COP24: ICAO Dodges CORSIA Offset Decisions as EU Aims to Keep Options Open*, December 4, 2018, https://carbon-pulse.com/64637/.
198 Source: Ibid.
199 Source: ICAO, *CORSIA - Carbon Offsetting and Reduction Scheme for International Aviation - Implementation Plan*, June 2018, https://www.icao.int/environmental-protection/Documents/CorsiaBrochure_8Panels-ENG-Web.pdf.
200 Source: MEPC, *Meeting Summaries*, October 26, 2018, http://www.imo.org/en/MediaCentre/MeetingSummaries/MEPC/Pages/MEPC-73rd-session.aspx.
201 Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814.

4
Internal carbon pricing



4 Internal carbon pricing

The private sector is increasingly integrating climate risks and opportunities into their long-term strategies and corporate governance frameworks, driven by concerns from investors to better understand companies' exposure to long-term climate risks. So far, about 1,300 companies, including more than 100 Fortune Global 500 companies with collective annual revenues of about US$7 trillion, have disclosed the use of internal carbon pricing, or plans to implement internal carbon pricing within two years.[202, 203, 204] The reported corporate carbon prices in use are diverse, ranging from US$0.3/t$CO_2$e to US$906/tCO_2e. Some companies adopt a range of carbon prices to take into account different prices across jurisdictions and/or to factor in future increases in mandatory carbon prices. In total, about half of the companies that have disclosed their internal carbon prices are using values that are higher than the mandatory prices of the jurisdictions they are headquartered in. Traditionally, companies use internal carbon pricing in their investment decisions to evaluate risks from mandatory carbon pricing initiatives.[205] However, businesses are exploring new ways of using internal carbon pricing to manage long-term climate risks.[206]

Following the Financial Stability Board-Task Force on Climate-related Financial Disclosures (FSB-TCFD) recommendation to use internal carbon pricing as one of the potential metrics for disclosure on climate-related risks, internal carbon pricing is increasingly being implemented and endorsed in various forms across the financial sector as described below and in Box 7.

- **The IFC** mainstreamed the use of internal carbon pricing in its projects in May 2018, and on October 2, 2018, it became the first multilateral development institution to disclose climate-related risks under TFCD guidelines.[207] Alongside the **World Bank and the Multilateral Investment Guarantee Agency**, the IFC will now apply a carbon price in line with the 2016 Report of the High-Level Commission on Carbon Prices to project finance transactions of more than 25 ktCO_2 in thermal power generation, cement, and chemicals.[208]

- **S&P Dow Jones Indices**, a leading index provider, launched the S&P Carbon Price Risk Adjusted Index Series in July 2018, which measures performance based on a weighted scheme on estimated market valuation at risk from predicted 2030 carbon prices.[209]

202 Source: CDP Disclosure 2018
203 The CDP questionnaire, including the internal carbon pricing question, experienced modifications between 2017 and 2018 in efforts to minimize reporting burden for companies and improve data precision. Therefore, no comparison is possible in terms of total numbers of companies using or planning to use internal carbon pricing. For more information, please see CDP's 2018 carbon pricing report.
204 Source: CDP, *Putting a Price on Carbon- Integrating Climate Risk into Business Planning*, October 2017.
205 Ibid.
206 This is implied in disclosure responses to CDP's 2018 climate change questionnaire, in which top objectives for internal carbon pricing included driving low-carbon investment, driving energy efficiency, and changing internal behavior.
207 Source: IFC, *IFC Becomes First Development Institution to Make TCFD Disclosure on Climate Risk*, October 2, 2018, https://ifcextapps.ifc.org/IFCExt/Pressroom/IFCPressRoom.nsf/0/C8A15502C84CCC698525831A00642BDC.
208 Source: IFC, *Redefining Development Finance*, 2018.
209 Source: Sustainable Brands, *New S&P Dow Jones Index Series First to Incorporate Future Carbon Price Risks*, September 2018, https://sustainablebrands.com/read/finance-investment/new-s-p-dow-jones-index-series-first-to-incorporate-future-carbon-price-risks.

- **The Technical Expert Group on Sustainable Finance** was set up by the European Commission to examine the integration of sustainability considerations into its financial policy framework to mobilize finance for sustainable growth. The Group has included internal carbon pricing in a report released in January 2019 that addresses a mandate for developing climate-related metrics on improving disclosure.[210]

- **The Informal Supplementary Document on Sustainable Taxonomy** from January 2018, which was released by the High-Level Expert Group on Sustainable Finance, mentions an internal carbon price as a potential screening criterion.[211]

- **The European Commission** has launched a targeted consultation as part of its Sustainable Finance Action Plan, with the objective of finalizing new guidance to companies on the disclosure of climate-related information. Internal carbon pricing applied in business planning is mentioned as one of the key performance indicators companies may consider disclosing. The existing guidelines on non-financial reporting, which the commission had previously published in 2017, will be supplemented by the new guidelines once they are finalized in June 2019.[212]

- **The EBRD** will integrate prices from the 2016 Report of the High-Level Commission on Carbon Prices in project financial assessments.[213] The assessments will include costs, country-specific conditions, or an international benchmark. Emissions of local air pollutants will also be taken into consideration attributing prices per ton on sulphur dioxide, nitrogen oxides, and large particulate matter based on the 2011 European Environment Agency study on costs impacts of such emissions.[214]

As climate policies, including carbon pricing, continue to strengthen around the world, investments in fossil fuels become financially less attractive and, in some cases, even a liability. Implementing internal carbon pricing assessments in potential investments enables regulatory risks to be included in business decisions and may even motivate fossil fuel divestment as a form of stranded asset risk mitigation. The divestment from fossil fuels is becoming a mainstream financial movement, and commitments to divest continue to grow rapidly. As of September 2018, nearly 1,000 institutional investors with US$6.24 trillion in assets have committed to divest from fossil fuels. In 2015 institutional investors that had committed to divest from fossil fuels accounted for a significantly lower assets value, i.e. US$52 billion.[215, 216]

The divestment movement is set to grow. Major cities around the world have made pledges to abandon millions of dollars' worth of fossil fuel stocks and bonds, reducing their exposure to climate policy risks. As part of this commitment, C40 Cities, in partnership with London and New York City, have launched the C40 Divest/Invest Forum, which is a first-of-its-kind initiative that helps urban leaders effectively and efficiently divest from fossil fuels and accelerate green investments.[217, 218, 219] There are a range of universities that have also started divesting from fossil fuels.[220, 221] If implemented at a sufficiently large scale, divestments in fossil fuel stocks and bonds could reduce the value of the assets.

210 Source: TEG on Sustainable Finance, *Report on Climate-Related Disclosures*, January 2019, https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190110-sustainable-finance-teg-report-climate-related-disclosures_en.pdf.
211 Source: European Commission, *Informal Supplementary Document on Sustainable Taxonomy*, accessed March 6, 2019, https://ec.europa.eu/info/sites/info/files/180131-sustainable-finance-final-report-annex-3_en.pdf.
212 Source: European Commission, *Technical Expert Group on Sustainable Finance: Report on Climate-Related Disclosures*, January 10, 2019, https://ec.europa.eu/info/publications/190110-sustainable-finance-teg-report-climate-related-disclosures_en.
213 Source: European Bank, *Methodology for the Economic Assessment of EBRD Projects with High Greenhouse Gas Emissions*, January 2019.
214 Source: European Environment Agency, *Revealing the Costs of Air Pollution from Industrial Facilities in Europe*, November 23, 2011.
215 Source: Arabella Advisors, *The Global Fossil Fuel Divestment and Clean Energy Investment Movement*, September 2018.
216 Source: The Guardian, *Fossil Fuel Divestment Funds Rise to $6tn*, September 10, 2018, https://www.theguardian.com/environment/2018/sep/10/fossil-fuel-divestment-funds-rise-to-6tn.
217 Source: *C40.Org*, accessed March 5, 2019, https://www.c40.org/.
218 Source: The Guardian, *As New York and London Mayors, We Call on All Cities to Divest from Fossil Fuels*, September 10, 2018, https://www.theguardian.com/commentisfree/2018/sep/10/london-new-york-cities-divest-fossil-fuels-bill-de-blasio-sadiq-khan.
219 Source: World Economic Forum, *New York, London Mayors Encourage Disinvestment from Fossil Fuel Industry*, October 9, 2018, https://www.weforum.org/agenda/2018/10/new-york-london-mayors-cities-divest-carbon-fossil-fuels/.
220 Source: The Guardian, *Edinburgh University Divests from All Fossil Fuels*, February 6, 2018, https://www.theguardian.com/environment/2018/feb/06/edinburgh-university-divests-from-all-fossil-fuels.
221 Source: DESMOGUK, *Mapped: The UK Universities That Have Pledged to Divest from Fossil Fuels*, April 13, 2018, https://www.desmog.co.uk/2018/04/13/mapped-uk-universities-have-pledged-divest-fossil-fuels.

Box 7 / Case studies on private sector finance

- **BNP Paribas** has decided to factor climate change considerations related to the energy transition into its rating methodology for the projects and companies it finances. Financing decisions will gradually include an internal carbon audit that accounts for changes in the transitioning energy industry and related risks. In 2016, a methodology was developed based on an assumed carbon price between US$25/tCO$_2$e and US$40/tCO$_2$e. The first tests were conducted in two of the six industrial sectors which generate the most emissions: oil and transport.[222]
- **Crédit Agricole** has steadily begun analyzing climate change issues when reviewing credit applications. The Sustainable Development Chair of the Paris Dauphine University has developed a specific methodology which counts financed emissions. It classifies industry macro-sectors and geographical zones according to the carbon intensity of their financing, which is measured in tCO$_2$/€. Their goal is to cover 80% of their financial portfolio and to define sectors that represent the largest portion of their footprint. This analysis is being introduced as an initial step for the main clients of the Bank, whose structured transactions are tenured beyond 2020.[223]
- **Garanti Bank** uses three carbon pricing approaches for prioritizing low-carbon investments: sensitivity analysis, which diminishes the profitability of fossil fuel investments by increasing the cost of natural gas and coal in the mid- and long-term; an Environmental and Social Risk Management System, which evaluates the non-financial risks of carbon-intensive projects; and a carbon shadow price, which applies to all fossil fuel based projects and renewable energy investments in its project finance activities. Currently, Garanti applies a price of US$5/tCO$_2$e to US$10/tCO$_2$e and has established future prices of US$22/tCO$_2$e from 2020, US$48/tCO$_2$e from 2025, and US$74/tCO$_2$e from 2030. It determined these price levels by benchmarking industry peers, monitoring the EU ETS, and integrating social costs of carbon. The bank builds flexibility into these prices based on Turkey's regulatory situation and adjusts the price in jurisdictions where a regulation already exists.[224]

Internal carbon pricing is one of the components to meet the TCFD recommendations, and financial institutions are also looking at other measures such as green bonds.[225] Annual green bond issuance has risen to more than US$155 billion globally since its inception in 2008.[226] In 2018, the IFC and Amundi launched the largest green bond fund to date raising US$1.5 billion for the Amundi Planet Emerging Green One fund.[227] Green bonds are issued in many developed countries. However, emerging markets are seeing increasing activity, particularly China and India as well as in Latin America. The Brazilian development bank, BNDES, raised US$1 billion in one of the largest green bond offerings in Latin America. Green bonds continue to gain public acceptance, investor confidence, and establish standards in new markets that impact reporting and eligibility. Ultimately, hurdles will be overcome so that investors see green bonds as a valuable asset class for the future.[228]

222 Source: CPLC, *Carbon Pricing and the Task Force on Climate-Related Financial Disclosures (TCFD)*, May 2018, https://static1.squarespace.com/static/54ff9c5ce4b0a53decccfb4c/t/5b1af63a70a6ad394e707122/1528493626398/33368-TCFD+and+Carbon+Pricing+Executive+Brief-final.pdf.
223 Source: Ibid.
224 Source: Yale, *Internal Carbon Pricing at Garanti Bank*, October 1, 2018, https://cbey.yale.edu/our-stories/internal-carbon-pricing-at-garanti-bank.
225 Bonds serve as an agreement between borrowers and investors. Issuers borrow funds from investors and are financially obligated to repay investors at an agreed rate after a specified amount of time. Green bonds follow this logic, but add the climate dimension by demonstrating the potential for investors to support climate solutions through safe investments without giving up financial returns. Green bonds typically finance projects in renewable energy, energy efficiency, sustainable housing, and industry. As demonstrated in its early years, green bonds can tap into financial pools such as pension funds, insurance, and sovereign wealth funds.
226 Source: IFC, *Green Bonds - Perspectives*, accessed April 11, 2019, https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/perspectives/perspectives-i1c2.
227 Source: Ibid.
228 Source: Ibid.

5
Looking beyond explicit carbon pricing

5 Looking beyond explicit carbon pricing

5.1 Explicit and implicit carbon pricing

This chapter discusses measures that put an implicit price on carbon, going beyond the traditional scope of the *State and Trends of Carbon Pricing* report. Previous editions have focused on reporting global developments on the implementation of measures that impose an explicit price on GHG emissions, including carbon taxes and ETSs. While this chapter does not intend to be a comprehensive description of the state and trends of implicit carbon pricing, it does describe policies that put an implicit price on carbon and their relevance for the policy debate on carbon taxes and ETSs.

While various policies can be seen as imposing an implicit price on carbon, this chapter focuses on carbon prices set by fuel taxes and fossil fuel subsidies. Estimating implicit carbon prices requires an evaluation methodology to calculate the equivalent monetary value per ton of carbon that can be associated with a given policy instrument. The term implicit carbon price is used in a variety of ways in policy and academic debate. Implicit carbon pricing can refer to policies that impose compliance costs (i.e., an implicit price) on activities that emit carbon.[229] A wide range of policies fall within this definition, such as performance standards for cars, buildings,[230] or power generation, and regulations that mandate the use of particular abatement technologies.[231] Implicit carbon pricing can refer to the sum of the carbon price imposed by an ETS and the net cost of renewable energy incentives divided by emission reductions.[232] It can also refer to carbon prices imposed by energy taxes, which are often imposed for non-climate reasons, and fossil fuel subsidies.[233] Acknowledging the existence of other policies that can be seen as putting a price on carbon, this chapter focuses on the implicit carbon prices imposed by fuel taxes (i.e., a positive carbon price) and fossil fuel subsidies reforms, which decrease a negative carbon price imposed by fossil fuel subsidies. The focus is on these two types of measures because they directly impact the price of fossil fuels and can offer useful lessons for the implementation of carbon taxes and ETSs, as further discussed in this chapter.

229 Source: OECD, *Effective Carbon Rates - Pricing CO_2 through Taxes and Emissions Trading Systems*, September 26, 2016; CPLC, *Report of the High-Level Commission on Carbon Prices*, May 29, 2017, Australian Government and Productivity Commission, *Carbon Emission Policies in Key Economies*, 2011.
230 Source: Ibid.
231 Source: OECD, *Climate and Carbon: Aligning Prices and Policies*, October 9, 2013.
232 Source: Marcantonini, Claudio, and A. Denny Ellerman, A.D., 2015. *The Implicit Carbon Price of Renewable Energy Incentives in Germany*. The Energy Journal, pp. 205-239.
233 Sources: OECD, *Climate and Carbon: Aligning Prices and Policies*, October 9, 2013; World Bank, *Report of the High-Level Commission on Carbon Prices*, May 29, 2017.

Hereafter, carbon prices imposed via a carbon tax or an ETS are referred to as explicit carbon prices to distinguish them from implicit carbon prices.

Reviewing policies that put an implicit price on carbon can help bring forward explicit carbon pricing action. Accounting for these policies in the debate on explicit carbon pricing can help policymakers and analysts obtain a more comprehensive and transparent view of the price applied to GHG emissions in various jurisdictions over time; communicate about carbon pricing with relevant stakeholders; and learn from countries' experience with implicit carbon pricing policies, as explicit and implicit carbon pricing policies often present similar implementation challenges.

The remainder of this chapter unfolds as follows. Section 5.2 discusses fossil fuel subsidies, with the aim of providing a sense of the size and the geographical distribution of these policies and the actions that have been undertaken to reduce them. This section then presents work that integrates implicit carbon prices from fuel taxes with explicit carbon prices to illustrate the magnitude of these prices in different countries and sectors. Section 5.3 discusses the relevance of the trends illustrated in Section 5.2 to inform the policy debate on explicit carbon pricing and possible next steps to move this agenda forward.

5.2 Fossil fuel subsidies and fuel taxes as implicit carbon pricing

Fossil fuel subsidies can act as a negative price on carbon by reducing the costs of using fossil fuels for businesses and individuals. For example, by lowering the costs of driving diesel and gasoline cars or combusting fossil fuels for heating or generating electricity, fossil fuel subsidies impose a negative price on carbon. In this way, they can incentivize inefficient use of carbon-intensive energy and undermine the effectiveness of any climate change mitigation efforts.

There are several types of fuel subsidies, which are tracked by IEA, OECD, and IMF. These institutions take different approaches to estimate fossil fuel subsidies. These approaches and the different types of fossil fuel subsidies are discussed in Box 8.[234]

Some types of fuel subsidies have decreased in recent years, while others have increased, making it difficult to describe an overall trend. Joint IEA-OECD estimates show that subsidies decreased from US$547 billion in 2014 to US$340 billion in 2017.[235] IEA estimates show that between 2013 and 2017 fossil fuel subsidies decreased by approximately 50 percent, from US$500 billion to US$270 billion in 2016, before increasing to US$300 billion in 2017. A similar trend is highlighted by IMF pre-tax subsidies, which decreased from US$530 billion in 2013 to US$270 billion in 2016, and then increased to US$296 billion 2017, as shown in Figure 18. While year-over-year variations can be attributed to reforms in various countries as discussed below, they are largely due to changes in global oil prices. These oil market fluctuations are particularly impactful because subsidies for oil are a large share of subsidy estimates in many countries, and natural gas prices are, to a large extent, indexed to oil prices. For example, 72 percent of subsidies in the joint IEA-OECD estimates are for petroleum products.[236] A different trend is identified by IMF estimates for post-tax subsidies, which increased from US$4.9 trillion in 2013 to US$5.2 trillion in 2017, as shown in Figure 18.[237, 238] A key reason for this trend is the increase in environmental damage.[239]

234 There are ways in which governments can support the production of fossil fuel subsidies which are not necessarily captured by the estimates discussed above. For instance, when fossil fuel producers pay only partially for losses caused by oil spills. While these subsidies might be large in some circumstances, a full discussion would go well beyond the scope of the present report.
235 Source: IEA and OECD, *Update on recent progress in reform of inefficient fossil fuel subsidies that encourage wasteful consumption*, forthcoming.
236 Source: Ibid.
237 Source: Coady, David; Parry, Ian; Sears, Louis; Shang, Baoping, *How Large Are Global Energy Subsidies?* IMF Working Paper No. 19/89, 2015.
238 Source: David Coady, Ian Parry, Nghia-Piotr Le, and Baoping Shang, *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF, Working Paper No. 19/89, 2019.
239 Source: Ibid.

Box 8 / Types of fossil fuel subsidies and estimates by IEA, IMF, and OECD

Different types of fossil fuel subsidies exist. There is one main distinction between consumer and producer subsidies. Institutions broadly agree that a consumer fuel subsidy exists when there is a positive gap between the domestic fuel price and a reference price. Thus, the subsidy can be identified via a "price-gap analysis," which estimates consumer pre-tax subsidies and consumer post-tax subsidies. Pre-tax subsidies are defined as the difference between the supply costs of fuels and the consumer price. Post-tax subsidies include pre-tax subsidies but add tax expenditures. Tax expenditures are an indirect form of subsidies, as they include public revenue losses that a government incurs by failing to collect a tax which would otherwise be due, which provides special treatments to taxpayers. Governments can also support producers of fossil fuels and increase their profitability through budgetary transfers and tax expenditures. Subsidies to fossil fuel producers are less prone to function as negative implicit carbon prices, especially when their effect on the market price of fossil fuels is minimal and the subsidy benefit flows entirely to the recipient companies.

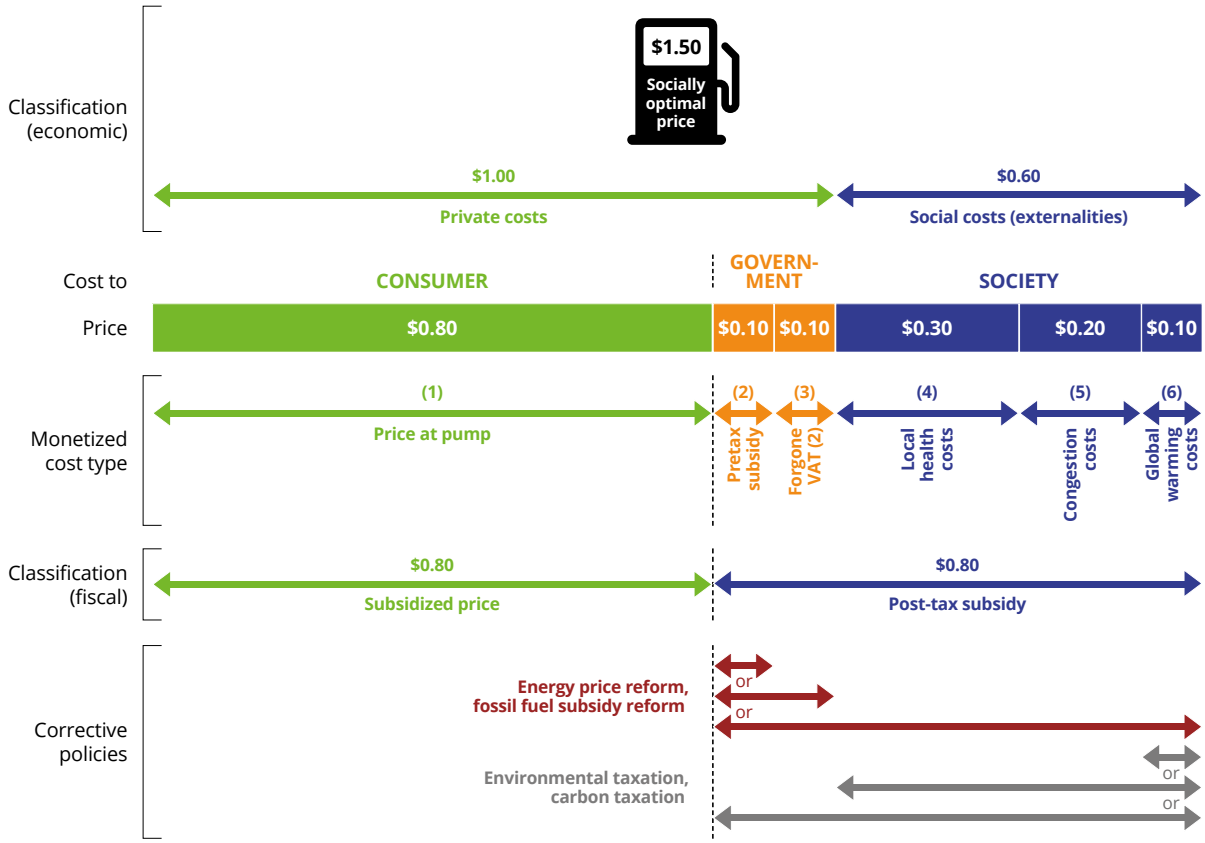
Estimates of fossil fuel subsidies proposed by IEA, IMF, and OECD vary significantly. Some factors that explain these variations include: countries covered, choice of reference price in the price gap analysis, whether subsidies are pre-tax or post-tax, and the inclusion of subsidies that may not necessarily change consumer prices (e.g. producer subsidies in the form of direct budgetary transfers). Figure 17 shows an illustrative example of pre- and post-tax subsidies. Subjective judgement plays a role in determining what is included in fossil fuel subsidy estimates.[240] The approaches taken by these institutions and the latest available estimates are briefly presented below.

IEA compares observed domestic fuel prices in 41 countries, primarily in emerging markets and developing countries, with a reference price (e.g., import parity prices). This price gap is multiplied by the total quantity of fuel consumption to estimate national amounts of subsidies provided to end-users, or for consumption as an input for electricity generation. The IEA estimate of fossil fuel subsidies across these 41 countries for 2017 is US$300 billion.[241]

IMF tracks pre-tax and post-tax subsidies for the consumption of fossil fuels and electricity in 191 countries. To quantify the pre-tax subsidies, it uses a similar methodology as the IEA. For post-tax subsidies, the IMF sums pre-tax subsidies and tax expenditures, which include the external cost of consuming fuels (such as externalities from global warming, local air pollution, and traffic congestion and accidents for fuels used in road transport)[242] and exemptions of fuels from general consumption taxes applicable to other goods (e.g. VAT) as shown in Figure 18. The IMF also estimates producers' subsidies by building on OECD estimates (which are described below). IMF pre-tax and post-tax subsidies were respectively US$296 billion and US$5.2 trillion in 2017, with higher post-tax subsidies due to the inclusion of the tax expenditures, especially the external costs of fuel consumption.[243]

240 Source: Kojima, Masami. 2017. *Energy Subsidies: Identifying and Quantifying Energy Subsidies*. World Bank, Washington, DC.
241 IEA, World Energy Outlook 2018.
242 The IMF defines tax expenditures on the basis of the fiscal principle that goods which impose "external costs" on third parties should be taxed at higher rates than other goods where all costs associated with the consumption and production of the good are paid for by those economic agents taking the consumption and production decisions. These external costs include the health costs of air pollution: the IMF holds that forcing third parties to pay for such health costs associated with the consumption of fuels is a form of subsidy. Those paying for the health costs pollution implicitly subsidize the consumers and producers of the fuel.
243 Source: David Coady, Ian Parry, Nghia-Piotr Le, and Baoping Shang, (2019) *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF, Working Paper No. 19/89. After excluding the cost of externalities, the subsidies are estimated at about US$634 billion in 2015 and about US$626 billion in 2017 (own calculations using IMF data - IMF Country-level Subsidy Estimates Database, 2018).

Figure 17 / Illustrative example of pre- and post-tax subsidies on gasoline



Source: Pigato, Miria, A., Editor, *Fiscal Policies for Development and Climate Action. International Development in Focus*, Washington, DC: World Bank, 2019.

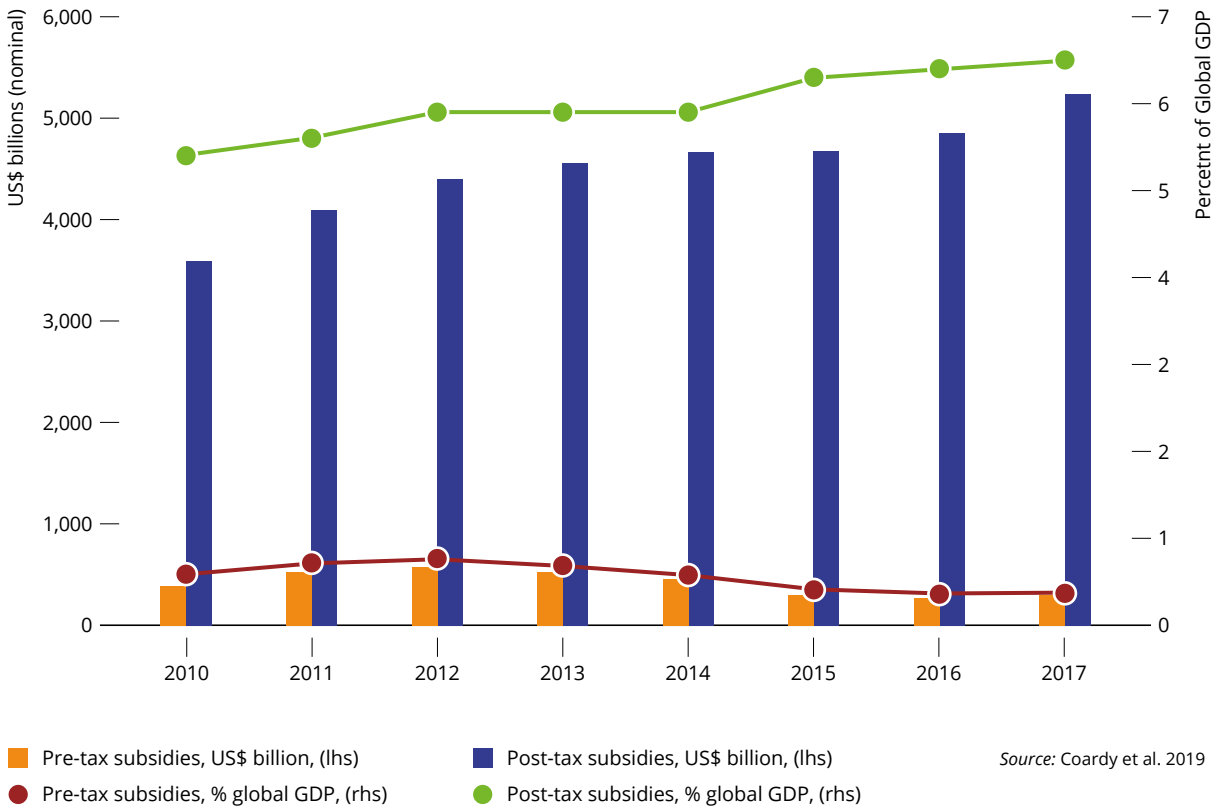
Note: Figures show potential divergence between private costs for 1 liter of gasoline and socially optimal prices due to negative externalities. All estimates are fictional. $ = US dollar. VAT = value added tax.

OECD compiles governments' direct budgetary support and tax expenditures for fuel consumption and production in the 36 OECD countries and 8 partner economies (Argentina, Brazil, Colombia, China, Indonesia, India, Russia and South Africa). OECD does not identify subsidies via a price-gap analysis. Instead it relies on an inventory of measures that support fossil fuels. Contrary to IMF, OECD does not include externalities in tax expenditures when estimating fossil fuel subsidies. According to OECD, subsidies in 2017 are estimated at about US$140 billion, with partner economies accounting for US$59 billion.[244]

OECD and IEA also provide joint-estimates of fossil fuel subsidies. These estimates cover 76 countries and account for subsidies provided via price transfers, tax expenditures (not including the external cost of fuel consumption), and budgetary transfers. The latest available OECD-IEA estimates are for 2017 and show that subsidies were US$340 billion.[245]

244 Source: OECD, *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2018*, February 21, 2018.
245 Source: IEA and OECD, *Update on recent progress in reform of inefficient fossil fuel subsidies that encourage wasteful consumption*, forthcoming.

Figure 18 / Global energy subsidies, 2011–15



Source: Coardy et al. 2019

Fossil fuel subsidies vary substantially across countries, and in some countries, they account for a large share of gross domestic product (GDP), and, if reformed, could generate significant savings. Fossil fuel subsidies estimated by IEA and IMF (pre-tax subsidies) are substantially higher in countires such as China, of which IEA estimates total US$38.3 billion and IMF estimates total US$29.7 billion, and Iran, of which IEA estimates total US$45.1 billion and IMF estimates total US$36.8billion.[246] IEA also estimates that in 2017, in the 41 countries covered by its analysis, fossil fuel subsidies averaged 2.9 percent of GDP and accounted for a much larger share of GDP (between 10–14 percent) in Iran, Libya, and Turkmenistan.[247] IMF's estimates for 2017 show that post-tax subsidies account for 6.5 percent of GDP globally. In 2015, these subsidies accounted for a much larger share of GDP in the Middle East, Afghanistan and Pakistan (13 percent), several former Soviet Union countries (36 percent),[248] and developing countries in Asia (12 percent).[249] While post-tax subsidies represent a larger percentage of GDP in these regions, in absolute terms they are highly concentrated in G20 economies. IMF data shows that in 2017, 81 percent of post-tax subsidies were accrued by G20 countries.[250] If reformed, fossil fuel subsidies could generate

246 Sources: for IEA see https://www.iea.org/weo/energysubsidies/, for IMF the data comes from- IMF Country-level Subsidy Estimates Database, 2018.
247 Source: IEA, *World Energy Outlook - Fossil-Fuel Subsidies*, accessed April 15, 2019, https://www.iea.org/weo/energysubsidies/.
248 In particular, for former URSS countries the estimate refers to the Commonwealth of Independent States, i.e., Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan and Ukraine.
249 Source: David Coady, Ian Parry, Nghia-Piotr Le, and Baoping Shang, (2019) *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF, Working Paper No. 19/89.
250 Authors' calculations using IMF data - IMF Country-level Subsidy Estimates Database, 2018.

significant savings and enable higher expenditures on key development priorities. IMF estimates indicate that projected revenues saved from phasing out post-tax fossil fuel subsidies would have amounted to approximately US$3.2 trillion in 2017, equating to 4 percent of global GDP.[251]

Phasing out fossil fuel subsidies has been a stated policy objective of many countries for at least a decade. If implemented, it would reduce negative implicit carbon prices. In 2009, G20 and APEC countries pledged to rationalize and phase out fossil fuel subsidies that incentivize wasteful consumption in the medium-term.[252] This commitment has been subsequently reaffirmed on several occasions. In 2010, a group of countries formed the coalition Friends of Fossil Fuel Subsidies Reforms to support G20 and APEC countries in phasing out fossil fuel subsidies as soon as possible.[253] In 2017, V20 countries called for the elimination of fossil fuel subsidies and urged the G20 to set a clear timeframe for their elimination.[254] In the same year, investors and insurers with more than US$2.8 trillion in assets under management asked G20 countries to phase out fossil fuel subsidies.[255] Following these commitments, several G20 economies started, or even concluded, voluntary peer-review processes of fossil fuel subsidies. These include Argentina, Canada, China, Germany, Indonesia, Italy, Mexico, and the US under the G20,[256] as well as Taiwan, China,[257] New Zealand, Peru, and the Philippines under APEC. Finland and Sweden have also completed self-reviews of their subsidies.[258] In 2019, the Coalition of Finance Ministers for Climate Action signed the Helsinki Principles, which includes the intention to work towards increasing carbon prices, partially through the reduction or elimination of fossil fuel subsidies.[259]

Despite efforts from countries to reform fossil fuel subsidies in recent years, global progress has been slow. As discussed above, IMF post-tax subsidies have increased in recent years, and most of the observed reductions in IMF's estimated pre-tax subsidies, as well as in OECD and IEA's estimates of subsidies, can be attributed to reduced oil prices. However, some countries have reduced fossil fuel subsidies through reforms, allowing them to increase spending on public priorities. Indonesia has recently reformed energy subsidies, reducing them from 3.3 percent of GDP on average from 2012-2014, to an average of 0.9 percent of GDP from 2015-2018.[260, 261] This decline was partially due to decreasing international oil prices, though it is also the result of the government eliminating subsidies on gasoline and reducing subsidies on diesel and kerosene.[262] Savings from these reforms increased the share of spending on health, infrastructure and social services.[264] In Egypt, fossil fuel subsidies were reduced from 7 percent of GDP in 2014 to 2.7 percent in 2017. Egypt aims to further reduce subsidies

251 Please note that savings from fossil fuel subsidies as a percentage of GDP remain significantly larger than carbon revenues. For instance, carbon revenues from the Finland carbon tax on transport fuels account for about 1 percent of the national GDP, which is one of the largest shares among countries that have implemented explicit carbon pricing. Source: David Coady, Ian Parry, Nghia-Piotr Le, and Baoping Shang, *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF, Working Paper No. 19/89, 2019.

252 Source: APEC, *2009 Leaders' Declaration*, November 14, 2009, https://www.apec.org/Meeting-Papers/Leaders-Declarations/2009/2009_aelm.aspx; G20, *G20 Leaders Statement: The Pittsburgh Summit*, September 24, 2009, http://www.g20.utoronto.ca/2009/2009communique0925.html.

253 Source: FFFsR, *FFFsR Statements*, accessed April 15, 2019, http://fffsr.org/statements/. Countries part of this group are Costa Rica, Denmark, Ethiopia, Finland, New Zealand, Norway, Sweden, Switzerland, Uruguay.

254 Source: V-20, *Ministerial Dialogue IV of the Vulnerable Twenty (V20) Group*, April 23, 2017, https://www.v-20.org/v20-ministerial-communique-ministerial-dialogue-iv/.

255 Source: UNFCCC, *G20 Must Phase Out Fossil Fuel Subsidies by 2020*, February 15, 2017, 20, https://unfccc.int/news/g20-must-phase-out-fossil-fuel-subsidies-by-2020.

256 The peer reviews of China, Germany, Mexico, and the US are available at Source: OECD, *G20 Voluntary Peer Reviews of the Reform of Inefficient Fossil Fuel Subsidies*, 2017, http://www.oecd.org/site/tadffss/publication/.

257 Source: APEC, *Peer Review on Fossil Fuel Subsidy Reforms in Chinese Taipei*, July 2017, https://www.apec.org/Publications/2017/07/Peer-Review-on-Fossil-Fuel-Subsidy-Reforms-in-Chinese-Taipei.

258 Source: Ivetta Gerasimchuk, Peter Wooders, Laura Merrill, Lourdes Sanchez, Lucy Kitson, *A Guidebook to Reviews of Fossil Fuel Subsidies: From Self-Reports to Peer Learning*, IISD, 2017.

259 Source: World Bank, *Finance Ministers Join Forces to Raise Climate Ambition*, accessed 10 May, 2019, http://www.worldbank.org/en/news/press-release/2019/04/13/coalition-of-finance-ministers-for-climate-action?cid=CCG_TT_climatechange_EN_EXT.

260 Source: World Bank, *Indonesia 3rd Fiscal Reform Development Policy Financing (P167297): World Bank (Pipeline Project)*, March 29, 2019, http://documents.worldbank.org/curated/en/772961539355813625/pdf/Concept-Program-Information-Document-PID-Indonesia-Fiscal-Reform-DPL-3-P167297.pdf.

261 Source: IEA, *Fossil Fuel Subsidy Reform in Mexico and Indonesia*, 2016.

262 Source: Sudarshan Gooptu, World Bank, and ESMAP, *Assessing the Fiscal Cost of Subsidies and Fiscal Impact of Reform*, n.d., http://documents.worldbank.org/curated/en/958771530881102150/pdf/ESRAF-note-2-Assessing-the-Fiscal-Cost-of-Subsidies-and-Fiscal-Impact-of-Reform.pdf.

263 Source: World Bank, *Indonesia 3rd Fiscal Reform Development Policy Financing (P167297): World Bank (Pipeline Project)*, March 29, 2019, http://documents.worldbank.org/curated/en/772961539355813625/pdf/Concept-Program-Information-Document-PID-Indonesia-Fiscal-Reform-DPL-3-P167297.pdf.

to 0.5 percent of GDP in 2019. These reductions created fiscal space that enabled the government to increase spending on social protection, health and education.[264] Additionally, in 2018, the government of Tunisia committed to improving the existing fiscal deficit in the medium-term through measures such as reducing energy subsidies. Energy subsidies were originally 2.8 percent of GDP, of which fuel subsidies accounted for the largest share at 1.8 percent. Following the 2018 commitment, electricity and gas tariffs were progressively increased. Once all planned increases are completed, savings are expected to equal 0.2 percent of GDP.[265]

Raising the cost of carbon-emitting activities can be done through specific taxes on fossil fuels. IMF and OECD's work integrates implicit carbon prices imposed via fuel taxes with ETSs and carbon taxes. Countries apply taxes to fossil fuels for various purposes, and those taxes have the effect of also implicitly pricing carbon.[266] Examples include coal taxes, such as the 2017 Philippine excise tax of US$2 per ton of coal[267] and the India Goods and Services Tax, which also applies to coal and substitutes the Clean Energy Cess,[268] as well as more common gasoline taxes,[269] such as the Kenyan gasoline tax, which was recently increased to US$0.2 per liter.[270] OECD converts specific taxes on fuels into carbon tax equivalents by dividing taxes per unit of fuel or per unit of energy by the carbon content.[271] The carbon tax equivalents are then integrated with carbon taxes and tradable emission permit prices, and the results—referred to by OECD as "Effective Carbon Rates"—are expressed in €/tCO_2.[272] IMF "Effective Carbon Prices" are estimated using a similar methodology, which however accounts for the effectiveness of each policy instrument (e.g., fuel taxes, ETSs, and carbon taxes) to drive abatements compared to an economy-wide carbon tax.[273] The resulting Effective Carbon Price is the equivalent economy-wide carbon price that, if implemented, would yield the same abatements as the combined effect of the carbon taxes, ETSs, and fuel taxes existing in a country.[274]

Even when implicit carbon prices from fuel taxes are integrated with explicit carbon prices, the resulting carbon prices are too low compared to relevant benchmark levels. The *State and Trends of Carbon Pricing* report series has shown that explicit carbon prices are too low to deliver on the Paris Agreement, according to estimates put forward by the High-level Commission on Carbon Prices of at least US$40/t$CO_2$ to US$80/t$CO_2$ by 2020.[275] Using a different benchmark, i.e., the social cost of carbon, the OECD demonstates that even when accounting for carbon prices set by fuel taxes, aggregate carbon prices (i.e. implicit and explicit) remain too low. OECD tracks progress on Effective Carbon Rates by measuring a "carbon pricing gap," which is measured by comparing the OECD's effective carbon rates across a country's carbon emissions base to a reference price of €30 (US$34) and €60 (US$67). Based on a literature review, OECD considers the €30 (US$34) benchmark a low-end estimate of the social costs of carbon in 2015[276] and the €60 (US$67) benchmark a midpoint estimate of these costs in 2020 and a low-end

264 Source: Sudarshan Gooptu, World Bank, and ESMAP, *Assessing the Fiscal Cost of Subsidies and Fiscal Impact of Reform*, n.d., http://documents.worldbank.org/curated/en/958771530881102150/pdf/ESRAF-note-2-Assessing-the-Fiscal-Cost-of-Subsidies-and-Fiscal-Impact-of-Reform.pdf.

265 Source: World Bank, *Tunisia Investment, Competitiveness and Inclusion*, June 27, 2018, http://projects.worldbank.org/P161483?lang=en.

266 While fuel taxes can be seen as imposing an implicit price on carbon, their use for mitigation call for careful consideration because a fuel tax increase can sometimes result in higher emissions. This could occur, for instance, when the increase of a tax on one fuel induces higher consumption of another fuel that has a higher carbon content per unit of useful energy.

267 Source: Government of the Philippines, *Congress Act No. 10963*, July 24, 2017, https://www.senate.gov.ph/republic_acts/ra%2010963.pdf. For more details on specific taxes on energy use see also OECD, *Taxing Energy Use 2018: Companion to the Taxing Energy Use Database*, OECD Publishing, Paris, 2018.

268 For a recent analysis of the impacts of the Goods and Services Tax on the cost of energy production see Soman et al., *India's Energy Transition: The Impact of the Goods and Services Tax on Solar Photovoltaic and Coal Power Costs*, IISD, 2019.

269 Gasoline taxes are common fiscal instruments in many countries, see Ross, M.L., Hazlett, C. and Mahdavi, P., *Global progress and backsliding on gasoline taxes and subsidies*, Nature Energy, 2(1), p.16201, 2017.

270 Source: EY, *Kenya Adjusts Excise Duty Rates*, accessed December 11, 2018, https://taxinsights.ey.com/archive/archive-news/kenya-adjusts-excise-duty-rates.aspx.

271 Source: OECD, *Effective Carbon Rates 2018 - Pricing Carbon Emissions Through Taxes and Emissions Trading*, September 18, 2018.

272 Source: Ibid.

273 Source: IMF, *Fiscal Policies for Paris Climate Strategies—From Principle to Practice*, IMF Policy Paper, 2019.

274 Source: Ibid.

275 Source: High-Level Commission on Carbon Prices. *Report of the High-Level Commission on Carbon Prices*, Washington, DC: World Bank, 2017. The report also acknowledge that low income countries may apply lower carbon prices, for instance, to account for historical emissions in different regions of the world.

276 Global efficient prices are sensitive to diverging views on discounting and on how to account for extreme risks, as discussed in Stern, Nicholas, *The Economics of Climate Change: The Stern Review* Cambridge: Cambridge University Press, 2007; Weitzman, Martin L., *Fat-Tailed Uncertainty in the Economics of Catastrophic Climate Change*, Review of Environmental Economics and Policy Vol. 5, pp. 275-92, 2011. Also, some countries use domestic estimates of the social cost of carbon, which may diverge from global estimates. Thus, there is not necessarily consensus among academics and policymakers on the use of a particular global efficient price as a benchmark to track progress on climate change mitigation.

estimate of these costs in 2030.[277] According to the OECD analysis, under the €30 (US$34) benchmark the overall gap is slowly narrowing, but remains high, as it decreased from 83 percent in 2012 to 79.5 percent in 2015, and has been estimated to further decrease to 76.5 percent in 2018.[278] In 2015, this carbon pricing gap ranged between 27 and 100 percent across countries, with the lowest gaps prevailing in Norway and Switzerland.[279] There are also large differences in the carbon pricing gap across sectors, with road transport having the lowest gap by far (21 percent), and electricity generation, commercial, residential and industry sectors having a gap above 80 percent.[280, 281] The carbon pricing gap could be significantly larger in many countries if fuel taxes that address non-climate externalities, such as those that address the health consequences of local pollution and the deterioration of roads, were not considered when pricing carbon. Besides failing to internalize the social cost of carbon, these price levels are also below the Paris-compatible price levels identified by the High-Level Commission on Carbon Prices. In this respect, it is important to stress that these Paris-compatible carbon price ranges refer exclusively to explicit carbon prices and not to implicit carbon prices imposed by fuel taxes and fossil fuel subsidies reforms.

IMF Effective Carbon Prices also show that even when accounting for both implicit and explicit carbon prices, in most jurisdictions the combined estimates remain too low to deliver on the Paris-agreement. IMF estimates of Effective Carbon Prices in 2030 show that most prices range between US$0/tCO$_2$ to US$30/tCO$_2$,[282] which is significantly below the Paris-compatible carbon price levels identified by the High-Level Commission on Carbon Prices for 2030 (US$50/tCO$_2$ to US$100/tCO$_2$). Some countries have significantly higher Effective Carbon Prices, such as Benin (US$96.7/tCO$_2$), Democratic Republic of the Congo (US$148.5/tCO$_2$), Paraguay (US$180.5/tCO$_2$), Togo (US$100/tCO$_2$), and Uruguay, (US$98.8/tCO$_2$).[283] Note that none of these countries have an explicit carbon pricing instrument in place. Thus, if we considered only these instruments, the resulting carbon price level applied in these jurisdictions would be zero. At a regional level, IMF Effective Carbon Prices tend to be higher in Africa, than in other regions.[284] IMF Effective Carbon Prices also vary significantly per type of fuel. They are highly concentrated on diesel and gasoline, and in many countries the Effective Carbon Price applied to coal and natural gas is, or is close to, US$0/tCO$_2$.[285] Please note that there can be large differences in aggregated (i.e. implicit and explicit) carbon prices as measured by OECD and IMF methodologies. For instance, the OECD Effective Carbon Rate for the US is US$22/tCO$_2$, against the IMF Effective Carbon Price of US$6/tCO$_2$ in 2030.[286]

5.3 The relevance of implicit carbon pricing for explicit carbon pricing policies

This section discusses why implicit carbon prices set by fossil fuel subsidies and fuel taxes are relevant for the policy debate on explicit carbon pricing and the efforts that are needed to move forward.

Considering fuel taxes and fossil fuel subsidies together with explicit carbon prices provides a more comprehensive view of countries' progress on explicit carbon pricing. It is widely recognized in academic research and policy circles, including

277 Source: OECD, *Effective Carbon Rates 2018 - Pricing Carbon Emissions Through Taxes and Emissions Trading*, September 18, 2018.
278 Source: Ibid.
279 Source: Ibid.
280 Source: Ibid.
281 While the gap is overall decreasing, recent evidence also indicates that taxes on some type of fuel actually decreased globally on average. For example, between 2003-2015 the global mean gasoline tax decreased by more than 13 percent. This is because while gasoline taxes increased in some countries, gasoline consumption grew more in countries with lower tax rates. Source: Ross, Michael L., Chad Hazlett, and Paasha Mahdavi., P., 2017. *Global progress and backsliding on gasoline taxes and subsidies*. Nature Energy, 2(1), p.16201.
282 Source: IMF, *Fiscal Policies for Paris Climate Strategies—From Principle to Practice*, IMF Policy Paper, 2019.
283 Source: Ibid.
284 Source: Ibid.
285 Source: Ibid.
286 Source: Ibid.

in the recent IPCC 1.5°C Report, that explicit carbon pricing is a pillar of cost-effective mitigation policy.[287] However, the level of explicit carbon prices needed to deliver on the Paris Agreement depends on the climate policy environment, as recognized by the High-level Commission on Carbon Prices report[288] (see also Box 2). Carbon prices will need to be even higher if sufficient action is not taken.[289] Thus, the metrics used in the *State and Trends of Carbon Pricing* report series to measure progress of explicit carbon pricing policies, such as the number of initiatives, scope of coverage, and level of explicit price, capture an important, but incomplete picture of the progress made by different jurisdictions towards implementing Paris-compatible carbon prices. For instance, as discussed above, IEA and IMF (pre-tax and post-tax subsidies) have increased globally in 2017, which is a relevant factor when discussing aggregate trends of implicit and explicit carbon prices. Therefore, looking beyond explicit carbon prices by integrating analyses of implicit carbon pricing policy is a key step toward providing a more comprehensive view of the progress that countries are making to cost-effectively meet the objectives of the Paris Agreement.[290]

Discussing fossil fuel subsidies and fuel taxes together with explicit carbon pricing can help reach policy alignment. As discussed in 2016 edition of the *State and Trends of Carbon Pricing*, strengthening the abatement effectiveness of explicit carbon pricing may require implementing instruments that complement carbon taxes and ETSs, such as subsidies for research and development to address knowledge externalities, and reduce policies that counteract and distort the price signal from explicit carbon pricing, such as fossil fuel subsidies.[291] Highlighting the countervailing effects of fossil fuel subsidies on explicit carbon pricing can help make the case for policy alignment, which is an important condition for the effectiveness of explicit carbon pricing policies.[292]

Discussing implicit carbon pricing policies can be a good entry point for starting to explore explicit carbon pricing policies, especially if the debate highlights the co-benefits of these policies. This year's developments, as described in Chapter 2, demonstrate that explicit carbon pricing is subject to push back from various interest groups and the public. There are many reasons for this, including difficulty in communicating the climate and non-climate benefits of explicit carbon pricing.[293] The climate benefits of carbon pricing tend to be diffuse, difficult to measure and observe, and are concentrated in the medium- to long-term, while the costs are concentrated and short-term. Efforts have been taken to address these concerns effectively,[294] but progress on explicit carbon pricing is still far from the levels needed to deliver on the Paris Agreement. Looking at implicit carbon pricing can help jurisdictions realize that they may already implicitly price carbon in some way, even if it is done negatively. Thus, explicit carbon pricing is largely an extension of, and not a radical departure from, policies that are already in place. Discussing fossil fuel subsidies and fuel taxes in terms of implicit carbon pricing may help businesses and individuals become familiar with the idea of putting an explicit price on

287 Source: IPCC, *Global Warming of 1.5°C*, 2018. The cost effectiveness of carbon pricing depends also on the use of revenues. In particular, cost-effectiveness tends to be higher when revenues are devoted to increase economic efficiency, such as when they are used to cut distortionary taxes or fund productive investments, see: IMF, *Fiscal Policies for Paris Climate Strategies - from Principle to Practice*, IMF Policy Paper, 2019.

288 Source: CPLC, *Report of the High-Level Commission on Carbon Prices*, May 29, 2017.

289 Please note that the cost of emitting carbon depends also on fossil fuel prices, which can vary substantially over time.

290 It is important to acknowledge that an even more comprehensive view could be attained by considering also the abatement incentives of other policies, such as regulation. However, these are often unavailable.

291 While being a key instrument for cost-effective climate change mitigation, carbon pricing is generally more effective when included in a carefully crafted policy package for climate mitigation. For further information, please refer to World Bank, Ecofys, and Vivid Economics, *State and Trends of Carbon Pricing 2016*, October 2016.

292 For a comprehensive discussion on how to combine implicit and explicit carbon pricing instruments effectively and efficiently see Partnership for Market Readiness (PMR), *Reconciling Carbon Pricing and Energy Policies in Developing Countries – Integrating Policies for a Clean Energy Transition*, World Bank, Washington, DC, 2019. Please also note that explicit carbon pricing might not be a viable in some countries, for instance, because of resistance from vested interests. In these situations, policymakers could start implementing other policies that implicitly price carbon, such as feebate schemes that do not increase the price of energy. For a discussion of these policies see IMF, *Fiscal Policies for Paris Climate Strategies—From Principle to Practice*, IMF Policy Paper, 2019.

293 Source: David Klenert, Linus Mattauch, Emmanuel Combet, Ottmar Edenhofer, Cameron Hepburn, Ryan Rafaty, Nicholas Stern, *Making carbon pricing work for citizens*, Nature Climate Change, 8(8), pp. 669-77, 2018.

294 Source: Partnership for Market Readiness; Carbon Pricing Leadership Coalition, *Guide to Communicating Carbon Pricing. World Bank*, Washington, DC, 2018; Dirk Heine, and Simon Black, *Benefits Beyond Climate: Environmental Tax Reform*, 2019. Miria Pigato, *Fiscal Policies for Development and Climate Action*, World Bank: Washington DC.

carbon. Additionally, communicating the existence of negative carbon prices can help build public support for explicit carbon pricing by highlighting discrepancies in how various sectors of the economy are paying for their emissions. Highlighting economic and fiscal co-benefits of implicit carbon pricing can also expand interest in explicit carbon pricing, especially in developing and low-emissions countries, where carbon mitigation is often a low priority.

Lessons learned from implementing implicit carbon pricing policies can help increase ambition on explicit carbon pricing. The political economy of explicit carbon pricing sometimes resembles the political economy of fossil fuel subsidy reform. For example, both measures tend to yield energy price increases, which impacts households and industries; they also yield co-benefits, such as reducing local pollution, and revenues that could be spent to mitigate the potential regressive impacts of these measures or finance development priorities.[295] Many countries that do not have an explicit carbon pricing initiative in place have experience with introducing higher fuel taxes and reducing fossil fuel subsidies. Countries that have reformed, or are in the process of reforming, fossil fuel subsidies could build on these experiences to implement explicit carbon pricing. For instance, Indonesia (2005), Iran (2010), and Jordan (2012) were able to reform fossil fuel subsidies also because of extensive stakeholder engagement and carefully crafted communication strategies,[296] which are important elements for catalyzing public support for carbon pricing.[297] Countries like Iran (2010) and Jordan (2012) have also gained experience in addressing the poverty effects of fossil fuel subsidy reforms via direct cash transfers or other direct benefit programs.[298] For example, the government of Jordan (2012) used various social safety net measures to protect vulnerable groups, including cash transfers to low income households, a targeted food subsidy program, and increasing the public sector wages for lower income households.[299] Iran implemented electronic cash transfers that accounted for 50 percent of projected savings from fossil fuel subsidies reforms.[300] This use of savings had a positive effect on reducing inequality in the country.[301] The remaining savings were used to mitigate the impact of the reform on businesses and the public sector.[302] Similar schemes can be implemented to reduce the potential impacts of explicit carbon pricing. Technologies, such as mobile money, may allow for the distribution of carbon revenues to large segments of the population in the rural areas of developing countries, such as Kenya and Ivory Coast.[303] The Energy Subsidy Reform Assessment Framework (ESRAF) and its guidance notes developed by the Energy Sector Management Assistance Program of the World Bank present country experiences with reforming energy subsidies and offer a useful toolkit for exploring these issues in greater detail.[304]

295 Source: Adrien Vogt Schilb, and Stephane Hallegatte, 2017. *Climate Policies and Nationally Determined Contributions: Reconciling the Needed Ambition with The Political Economy*. Wiley Interdisciplinary Reviews: Energy and Environment, 6(6), p. 256. For an extensive discussion of the distributional impacts of these measures see Partnership for Market Readiness (PMR), *Reconciling Carbon Pricing and Energy Policies in Developing Countries – Integrating Policies for a Clean Energy Transition*, World Bank, Washington, DC, 2019.

296 Source: Inchauste, Gabriela, and David G. Victor, Editors, *The Political Economy of Energy Subsidy Reform. Directions in Development*, Washington, DC: World Bank, 2017.

297 Source: Carattini, Stefano, Maria Carvalho, and Sam Fankhauser, *Overcoming Public Resistance to Carbon Taxes*, Wiley Interdisciplinary Reviews: Climate Change, 9(5), p. 531, 2018; Partnership for Market Readiness; Carbon Pricing Leadership Coalition, *Guide to Communicating Carbon Pricing*, World Bank, Washington, DC, 2018.

298 Sources: Pigato, Miria A., *Fiscal Policies for Development and Climate Action (English)*, Washington, D.C. : World Bank Group, 2019; Ruslan Yemtsov and Amr Moubarak, Good Practice Note 5, *Assessing the readiness of Social Safety Nets to Mitigate the Impact of Reforms*, ESMAP, 2018; Guillaume, Dominique M., Roman Zytek, and Mohammad Reza Farzin, *Iran: The Chronicles of the Subsidy Reform*, Washington DC, 2011; Salehi-Isfahani, Djavad, *Iran: Subsidy Reform amid Regional Turmoil*, Brookings, Washington, DC, March 3, 2011.

299 Sources: Pigato, Miria A., *Fiscal Policies for Development and Climate Action (English)*. Washington, D.C.: World Bank Group, 2019; Ruslan Yemtsov and Amr Moubarak, *Good Practice Note 5, Assessing the Readiness of Social Safety Nets to Mitigate the Impact of Reforms*, ESMAP, 2018.

300 Source: Guillaume, Dominique M., Roman Zytek, and Mohammad Reza Farzin (2011). *Iran: The Chronicles of the Subsidy Reform*. Washington DC.

301 Inequality measured via the Gini coefficient was reduced from 0.42 to 0.34, Salehi-Isfahani, Djavad, *Iran: Subsidy Reform amid Regional Turmoil. Brookings*, Washington, DC, March 3, 2011.

302 Source: Guillaume, Dominique M., Roman Zytek, and Mohammad Reza Farzin, *Iran: The Chronicles of the Subsidy Reform*, Washington DC, 2011.

303 Source: Dominioni Goran and Heine Dirk, *Behavioural Economics and Public Support for Carbon Pricing: A Revenue Recycling Scheme to Address the Political Economy of Carbon Taxation*, European Journal of Risk Regulation, 2019.

304 The Energy Subsidy Reform Assessment Framework is available online: https://esmap.org/esraf.

Obtaining more comprehensive estimates of the carbon prices applied within a country increases transparency of climate action, potentially enabling greater ambition over time. Countries do not internalize all of the benefits of their abatements and are generally incentivized to underinvest in climate mitigation. Explicit carbon pricing, fuel taxes, and fossil fuel subsidies are an important component of the mitigation incentives that could prevail in different jurisdictions, especially when considered together.[305] Reaching comparable estimates of the combined (i.e. implicit and explicit) carbon price set by these policies would increase transparency in and allow comparisons of the overall mitigation action undertaken in different countries. Increased transparency can help building trust across countries and increase the scale of climate ambition.

Moving forward, valuable work could be done to improve data availability on these policies and expand analyses that account for both implicit and explicit carbon pricing to reach more comprehensive estimates. It is widely recognized that data availability and comparability are a hurdle to reaching consistent cross-country estimates of fossil fuel subsidies, especially in developing countries.[306] For example, a large proportion of subsidies for fossil fuels are granted in the form of tax expenditures, such as deductions, exemptions, or delayed tax liabilities,[307] which are often subject to lower levels of scrutiny in parliamentary discussions than direct budgetary expenditures.[308] Additionally, coal supply costs, which are useful for identifying potential price gaps, are not always easily determined, as there is no single international price.[309] Efforts are underway to harmonize international and national level data on fossil fuel subsidies under the Sustainable Development Goals 12.C.1 indicator.[310] From 2020 to 2030, the United Nations Environment Programme (UNEP) is expected to collect national data of fossil fuel subsidies from 193 member countries, though submissions are voluntary.[311] UNEP is also responsible for developing an internationally agreed upon method to monitor fossil fuel subsidies at the global, regional and national level.[312] A second aspect that requires further work involves the integration of positive and negative carbon prices in single estimates. This could also potentially include marginal price signals from policies other than fossil fuel subsidies, fuel taxes, and explicit carbon pricing, such as tradeable performance standards.[313] Looking forward, work that combines positive and negative carbon prices could be very helpful for advancing the policy debate on carbon pricing. Expanding analyses to policies beyond fossil fuel subsidies and fuel taxes could also inform discussions in the context of Article 6 mechanisms. Further editions of this report could discuss how such policies, and the mitigation outcomes they generate, can be considered in carbon markets, building on the results from on-going "policy based" pilots described in Chapter 3.

305 Note that the climate mitigation effects of fossil fuel subsidy removal alone can be large but depend on the type of fossil fuel subsidies removed. Recent research shows that subsidies removal (estimates closer to IEA, OECD, and IMF pre-tax subsidies than to IMF post-tax subsidies) would reduce carbon emissions by 1-4 percent by 2030. Since coal, the fossil fuel that emits more carbon per unit of energy receives a small share of these subsidies, subsidies removal yields limited global abatements. The sharp decline in fossil fuel subsidies in the period 2013-2015 can also account for this result. Earlier studies had indicated that carbon abatements from phasing out fossil fuel subsidies would have been larger, i.e., between 3.5-5 percent by 2020; 5-6 percent by 2035; and between 6-9 percent by 2050, see Jewell, Jessica, et al., *Limited Emission Reductions from Fuel Subsidy Removal except in Energy-Exporting Regions*, Nature, February 8, 2018. Abatements would be substantially larger, about 28 percent in 2015, if post-tax subsidies were phased out, see David Coady, Ian Parry, Nghia-Piotr Le, and Baoping Shang, *Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates*, IMF, Working Paper No. 19/89, 2019. Another study indicates that reforming fossil fuel subsidies in 20 countries could reduce national carbon emission by 11 percent on average by 2020, see Merrill, Laura, Bassi, Andrea M., Bridle, Richard, Christensen, Lasse T., *Tackling Fossil Fuel Subsidies and Climate Change: Levelling the Energy Playing Field,* Nordic Council of Ministers, 2015.

306 Source: Kojima, Masami, *Energy Subsidies: Identifying and Quantifying Energy Subsidies*, World Bank, Washington, DC, 2017.

307 For instance, tax expenditure account for 64 percent of the value of subsidies in the OECD inventory, OECD, *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2018,* OECD Publishing, Paris, 2018.

308 Source: World Bank Group, *Climate Change Public Expenditure and Institutional Review Sourcebook*, World Bank Group, 2014.

309 Source: Ross, Michael L., Chad Hazlett, and Paasha Mahdavi, *Global Progress and Backsliding on Gasoline Taxes And Subsidies*, Nature Energy, 2(1), p. 16201, 2017.

310 Source: UN, *Sustainable Development Goal 12: Ensure sustainable consumption and production patterns*, accessed May 13, 2019, https://sustainabledevelopment.un.org/sdg12.

311 GIZ and UNEP, *Measuring fossil fuel subsidies in the context of the Sustainable Development Goals*, accessed May 12, 2019, http://www.greenfiscalpolicy.org/policy-insights/energy/measuring-fossil-fuel-subsidies-in-the-context-of-the-sustainable-development-goals/.

312 See on this UNEP, OECD and IISD, *Measuring Fossil Fuel Subsidies in the Context of the Sustainable Development Goals*, UN Environment, Nairobi, Kenya, 2019.

313 An illustration of an effort that goes in this direction is the recently proposed Price Approach, which tries to identify the net tax burden at the sectorial and jurisdiction-wide level, accounting for carbon taxes and ETS prices, specific energy taxes, subsidies that reduce end-user fuel prices, and other energy policies which raise prices. ODI and Vivid Economics, *Estimating Effective Carbon Prices: Accounting for Fossil Fuel Subsidies*, Report for the Carbon Pricing Leadership Coalition, 2019.

Annex I
Exchange rates

Table 4 / Currency conversion rates, as of April 1, 2019

Currency	Symbol	US$ equivalent
Argentinian Peso	ARS	0.0233
Australian Dollar	A$	0.7120
British Pound	£	1.3104
Canadian Dollar	CAN$	0.7497
Colombian Peso	COP	0.0003
Chilean Peso	CLP	0.0015
Chinese Yuan	CNY	0.1489
Danish Krona	DKR	0.1505
Euro	€	1.1235
Icelandic Krona	ISK	0.0081
Japanese Yen	JPY	0.0090
Kazakhstan Tenge	KZT	0.0026
Korean Won	KRW	0.0008
Mexican Peso	MXN	0.0520
New Zealand Dollar	NZD	0.6822
Norwegian Krone	NOK	0.1165
Polish Zloty	PLZ	0.2613
Singapore Dollar	S$	0.7387
South African Rand	R	0.0704
Swedish Krona	SEK	0.1080
Swiss Franc	CHF	1.0048
Ukrainian Hryvnia	UAH	0.0368

Annex II
Detailed overview of carbon pricing initiatives in the Canadian provinces and territories

Jurisdiction	Type and status	Coverage	Revenue use	Exemptions
Alberta	ETS and carbon tax implemented Federal benchmark met	90% (own initiatives)	Use of carbon pricing revenues include: – Mitigation and adaptation projects – Rebates to low- and middle-income households, which account for about 60% of the Alberta households (CAN$300/US$337 first adult, CAN$150/US$169 second adult, CAN$45/US$51 each child, full rebate for individuals and families with income below certain treshold for 2019)[314]	Exemptions and/or competitiveness measures include: – *Carbon tax:* various exemptions as rebates including gasoline and diesel used in the farming sector, fuel sold for export, fuels used as feedstock, and fuels used by CCIR facilities[315] – *CCIR:* covered facilities only face compliance costs for the emissions above their baseline and facilities experiencing economic challenges due to the compliance costs can receive support from the Compliance Cost Containment Program[316] – From November 2018, oil and gas producers are exempted from paying the carbon tax until 2023 for fuel used their production. The amendment to the Regulation was made retroactive to January 1, 2017.[317] The rebate comes as a response to competitive pressure on the oil and gas industry in Alberta.[318]
British Columbia	ETS and carbon tax implemented Federal benchmark met	70% (own initiatives)	Use of carbon pricing revenues include:[319] – Tax credits for households to protect affordability (CAN$135/US$152 per adult, CAN$40/US$45 per child for 2018)[320] – The CleanBC Program for Industry, which provides an industrial incentive to reduce carbon tax costs for industrial operations meeting world leading emissions benchmarks, and a clean industry fund that invests a portion of industrial carbon tax revenues into emissions reduction projects. According to the Provincial Inventory, the covered facilities which qualify for the CleanBC Program for Industry account for about 28% of the carbon-taxable emissions.	Exemptions and/or competitiveness measures include: – *Carbon tax:* various exemptions as rebates including exported fuels, fuel consumption by aviation and shipping travelling outside British Columbia, and colored gasoline and colored diesel purchased by farmers.[321] – *GGIRCA:* covered facilities only face compliance costs under the GGIRCA for the emissions above their baseline, but must pay revenue neutral carbon tax for their full CO_2 emissions. Covered facilities are eligible for the CleanBC Program for Industry to reduce carbon tax costs.

314 Source: Ibid.
315 Source: Ibid.
316 Source: Government of Alberta, *Carbon Competitiveness Incentive Regulation*, accessed March 5, 2019, https://www.alberta.ca/carbon-competitiveness-incentive-regulation.aspx.
317 Source: Government of Alberta, *Tax and Revenue Administration Special Notices*, February 12, 2019, https://open.alberta.ca/publications/climate-leadership-act-special-notice-vol-11-no-13-mobile-service-rigs-rebate-carbon-levy-clear-fuel#detailed.
318 Source: Calgary Herald, *Premier Rachel Notley Unveils Carbon Tax Break for Drilling Companies*, November 22, 2018, https://calgaryherald.com/business/energy/premier-rachel-notley-unveils-carbon-tax-break-for-drilling-companies.

Jurisdiction	Type and status	Coverage	Revenue use	Exemptions
Manitoba	Federal backstop system fully imposed	56% (federal backstop)[322]	Carbon pricing revenues from the federal backstop system are returned to the province's population as described above and do not go to the provincial government. Tax returns to individuals (CAN$170/US$191 single/first adult; CAN$85/US$96 for second adult in couple or first child for single parents; CAN$42/US$47 per child other than first for single parent in 2019)[323]	No additional exemptions and/or competitiveness measures to the federal backstop system have been introduced for the province.
New Brunswick	Federal backstop system fully imposed	91% (federal backstop)[324]	Carbon pricing revenues from the federal backstop system are returned to the province's population as described above and do not go to the provincial government. Tax returns to individuals (CAN$128/US$144 single/first adult; CAN$64/US$72 for second adult in couple or first child for single parents; CAN$32/US$36 per child other than first for single parent in 2019)[325]	No additional exemptions and/or competitiveness measures to the federal backstop system have been introduced for the province.
Newfound-land and Labrador	ETS and carbon tax implemented Federal benchmark met	91% (own initiatives)	Use of carbon pricing revenues include:[326] – General budget – GHG reduction project	Exemptions and/or competitiveness measures include:[327] – *Carbon tax:* various exemptions including home heating fuels, gasoline for electricity generation, farming, forestry, fishing, equipment manufacturing, and mineral exploration, fuels as feedstock, and fuels used by PSS facilities. – To minimize the impact on consumers, taxes on gasoline and diesel were reduced.[328] – *PSS:* covered facilities only face compliance costs under the PSS for the emissions above their baseline, with exemptions for methane emissions from venting and fugitives in the oil and gas sector
Northwest Territories	Carbon tax under consideration[329] Federal benchmark met	79% (own initiative)	Use of carbon pricing revenues include:[330] – Energy projects that will reduce GHG emissions as part of the 2030 NWT Energy Plan – GHG reduction projects as identified in the NWT Climate Change Strategic Framework – Enhanced benefit programs to offset the impact of carbon pricing on the cost of living of NWT families (CAN$260/US$292 annually for resident adult; CAN$300/US$337 per child, when the system will be fully implemented).[331]	Exemptions and/or competitiveness measures include:[332] – Exemption of aviation fuel, 75 percent rebate to large industrial emitters for tax paid on non-motive diesel and heating fuel – 100 percent rebate on heating fuel for most residents, businesses (non-large industrial emitters) and governments – Rebate of carbon tax paid on non-motive diesel purchased for generating electricity for distribution

319 Source: Government of British Columbia, *British Columbia's Carbon Tax*, April 11, 2019, https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax.
320 Source: Government of British Columbia, *Carbon Tax Programs*, accessed April 11, 2019, https://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax/programs.
321 Source: Government of British Columbia, *Motor Fuel Tax & Carbon Tax Exemptions*, accessed April 11, 2019, https://www2.gov.bc.ca/gov/content/taxes/sales-taxes/motor-fuel-carbon-tax/business/exemptions.
322 Source: Dobson et al., *The Greenhouse Gas Emissions Coverage of Carbon Pricing Instruments for Canadian Provinces*, SSP Research Paper, February 2019.
323 Source: Government of Canada, *Manitoba and Pollution Pricing*, accessed February 21, 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/manitoba.html.

Jurisdiction	Type and status	Coverage	Revenue use	Exemptions
Nova Scotia	ETS implemented Federal benchmark met	80% (own initiative)	Use of carbon pricing revenues include:[333] – A broad range of measures that help reduce GHG emissions, mitigate social and economic impacts, or adapt to the impacts of climate change. – Governance and administration of the funds will be established in 2019.	Exemptions and/or competitiveness measures include:[334] – Free distribution of some of the allowances each year. Auctioning of allowances will start in 2020 – Industrial facilities receive free allowances according to historical emission intensities, actual production volumes, a general cap adjustment factor and a sector-specific assistance factor – Electricity importers (except Nova Scotia Power) and fuel suppliers receive 80% of their reported emissions as free allowances – The largest utility in the province, Nova Scotia Power Inc, receives a set amount of free allowances that were based on 90% of its buisness as usual emission projections
Nunavut	Federal backstop system opt-in	77% (federal backstop)[335]	The territorial government is still considering how best to return the carbon pricing revenues to its citizens and businesses, aiming to minimize the effect of federal carbon pricing on the cost of living and doing business in Nunavut.[336]	Exemptions and/or competitiveness measures include:[337] – In addition to federal exemptions, additional relief for fuels used for aviation in the territory and diesel-fired electricity generation for remote communities
Ontario	ETS under consideration Federal backstop system fully imposed	82% (federal backstop)[338]	Carbon pricing revenues from the federal backstop system are returned to the province's population as described above and do not go to the provincial government. Tax returns to individuals (CAN$154/US$173 single/first adult; CAN$77/US$86 for second adult in couple or first child for single parents; CAN$38/US$43 per child other than first for single parent in 2019)[339]	No additional exemptions and/or competitiveness measures to the federal backstop system have been introduced for the province.

324 Source: Dobson et al., *The Greenhouse Gas Emissions Coverage of Carbon Pricing Instruments for Canadian Provinces*, SSP Research Paper, February 2019.
325 Source: Government of Canada, *New Brunswick and Pollution Pricing*, February 21, 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/new-brunswick.html.
326 Source: Ibid.
327 Source: Ibid.
328 Source: Government of Newfoundland and Labrador, *Provincial Government Releases Federally-Approved Made-in-Newfoundland and Labrador Approach to Carbon Pricing*, October 23, 2018, https://www.releases.gov.nl.ca/releases/2018/mae/1023n01.aspx.
329 The NWT carbon tax is to be introduced by July 1, 2019 pending passage of Bill 42 "An Act to Amend the Petroleum Products Tax Act". As of April 1, 2019— the cut-off date of this report—Bill 42 has not been adopted yet. The NWT carbon tax will be considered "scheduled for implementation" once it has been formally adopted through legislation. Any upcoming developments regarding the status of the NWT carbon tax will be included in the next edition of the State and Trends of Carbon Pricing report and the Carbon Pricing Dashboard.
330 Source: Government of Northwest Territories, *Implementing Carbon Pricing in the NWT - Investing in Green Initiatives*, accessed March 19, 2019, https://www.fin.gov.nt.ca/en/carbon-pricing.
331 Source: Government of Northwest Territories, *Implementing Carbon Pricing in the NWT*, accessed April 11, 2019, https://www.fin.gov.nt.ca/en/carbon-pricing.
332 Source: Ibid.
333 Source: Ibid.
334 Source: Ibid.
335 Authors' calculation based on Environment Canada, *National Inventory Report 1990-2017: Greenhouse Gas Sources and Sinks in Canada*, 2019.
336 Source: Government of Nunavut, *Budget Address 2019*, February 20, 2019, https://www.gov.nu.ca/sites/default/files/2019-20_budget_address_2019-english.pdf.
337 Source: Government of Canada, *Nunavut and Pollution Pricing*, November 23, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/nunavut.html.
338 Source: Dobson et al., *The Greenhouse Gas Emissions Coverage of Carbon Pricing Instruments for Canadian Provinces*, SSP Research Paper, February 2019.
339 Source: Government of Canada, *Ontario and Pollution Pricing*, February 21, 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/ontario.html.

Jurisdiction	Type and status	Coverage	Revenue use	Exemptions
Prince Edward Island	Carbon tax implemented Federal OBPS only opt-in	65% (own initiative) 3% (federal backstop)[340]	Use of carbon pricing revenues include:[341] – All revenues on gasoline and diesel are returned to its citizens to partly incentivize low emission activities through public transport grants, free vehicle registration for electric and plug-in hybrid vehicles, a reduction of registration fees for other vehicles, and free driver's licenses	Exemptions and/or competitiveness measures include:[342] – Various exemptions including fuel used by farmers, fishers, aquaculturists, international aviation and shipping, and fuels used by facilities under the federal OBPS – Furnace oil used for heating and propane are exempt, subject to a review in 2020[343] No additional exemptions and/or competitiveness measures to the federal OBPS have been introduced for the province.
Québec	ETS implemented Federal benchmark met	85% (own initiative)	Use of carbon pricing revenues include:[344] – Energy efficiency measures for buildings, industrial processes and vehicle fleets – Support for the development of mass and active transit – Electrification of transport – Support of renewable energy sources in all activity sectors – Research and development in the field of clean technology	Exemptions and/or competitiveness measures include:[345] – Industrial facilities that are considered emissions-intensive and trade exposed receive free allowances through benchmarks based on input of material or output of products, production levels, and an increasingly stringent GHG emission intensity target that varies per activity. – Free allowances are allocated also to voluntary emitters, i.e. entities that voluntarily participate in the scheme. Intensity targets and production levels for free allocation are increasingly stringent over time.
Saskatchewan	ETS implemented Federal backstop system partially imposed	12% (Saskatchewan OBPS) 51% (federal backstop)[346]	Contribution to a provincial technology fund is one of several compliance mechanisms in Saskatchewan's OBPS program. Funds within the technology fund will be used to invest in transformative industrial innovation that will lower greenhouse gas emissions. Carbon pricing revenues from the federal backstop system are returned to the province's population as described above and do not go to the provincial government. Tax returns to individuals (CAN$305/ US$229 single/first adult; CAN$152/ US$114 for second adult in couple or first child for single parents; CAN$76/ US$57 per child other than first for single parent in 2019)[347]	No additional exemptions and/or competitiveness measures to the federal backstop system have been introduced for the province.

340 Source: Dobson et al., *The Greenhouse Gas Emissions Coverage of Carbon Pricing Instruments for Canadian Provinces*, SSP Research Paper, February 2019.
341 Source: Government of Nova Scotia, *Nova Scotia's Cap and Trade Program - Regulatory Framework*, October 2018, https://climatechange.novascotia.ca/sites/default/files/Nova-Scotia-Cap-and-Trade-Regulatory-Framework.pdf.
342 Source: Government of Prince Edward Islands, *Carbon Levy Exemptions*, November 8, 2018, https://www.princeedwardisland.ca/en/information/finance/carbon-levy-exemptions.
343 Source: Government of Prince Edward Islands, *Carbon Levy Rates*, November 8, 2018, https://www.princeedwardisland.ca/en/information/finance/carbon-levy-rates.
344 Source: Government of Québec, *2013-2020 Climate Change Action Plan*, accessed April 11, 2019, http://www.environnement.gouv.qc.ca/changementsclimatiques/plan-action-fonds-vert-en.asp.
345 Source: ICAP, *Canada - Québec Cap-and-Trade System*, April 9, 2019, https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems[]=73.
346 Source: Dobson et al., *The Greenhouse Gas Emissions Coverage of Carbon Pricing Instruments for Canadian Provinces*, SSP Research Paper, February 2019.
347 Source: Government of Canada, *Saskatchewan and Pollution Pricing*, 21 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/saskatchewan.html.

Jurisdiction	Type and status	Coverage	Revenue use	Exemptions
Yukon	Federal backstop system opt-in	95% (federal backstop)[348]	Use of carbon pricing revenues include:[349] – Rebates to households (CAN$43/US$48 per person)[350] with a supplement for individuals who live outside of an urban area – Tax credits to businesses with additional credits for businesses who invest in clean energy generation and equipment	Exemptions and/or competitiveness measures include:[351] – In addition to federal exemptions, additional relief for fuels used for aviation in the territory and diesel-fired electricity generation for remote communities

348 Authors' calculation based on Government of Yukon, *Greenhouse gas emissions in Yukon*, 2018.
349 Source: Government of Canada, *Saskatchewan and Pollution Pricing*, 21 2019, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/saskatchewan.html.
350 Source: Government of Yukon, *Proposed Framework for the Yukon Government Carbon Price Rebate*, January 2019, https://yukon.ca/sites/yukon.ca/files/fin/proposed_framework_ygcpr_17_jan_2019.pdf.
351 Source: Government of Canada, *Nunavut and Pollution Pricing*, November 23, 2018, https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/nunavut.html.

Annex III
NDC table

Table 5 shows the main unconditional and conditional targets in the NDC of each Party, whether the NDC states that the Party is planning or considering the use of carbon pricing, and whether carbon pricing will be a domestic or international initiative. Only NDCs that have been uploaded to the UNFCCC interim NDC Registry are listed below. For the purpose of this report, carbon pricing includes ETSs, carbon taxes and other market mechanisms. The targets are based on the UNFCCC interim NDC Registry and the World Bank Group NDC Platform. The authors recognize that the text in NDCs can be interpreted in different ways and other assessments of the targets and the mention of carbon pricing/market mechanisms are possible, because this information is not always presented in a clear and consistent manner in NDCs. The mention of carbon pricing in a domestic context may not necessarily mean that a domestic carbon pricing initiative is formally under consideration. Also, not all Parties that already have a carbon pricing initiative implemented, scheduled or under consideration have reported this in their NDC. The number of Parties planning or considering the use of carbon pricing in their NDC is therefore not comparable with the jurisdictions with carbon pricing initiatives implemented, scheduled or under consideration.

Table 5 / Unconditional and conditional targets and intended use of carbon pricing and/or market instruments stated in NDCs

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Afghanistan	—	13.6% below BAU by 2030	International
Albania	11.5% below BAU by 2030	—	International
Algeria	7% below BAU levels by 2030	Additional 15% reduction is conditional	No
Andorra	37% below 1990 by 2030	—	No
Angola	35% unconditional reduction below BAU by 2030	Additional 15% is conditional	No
Antigua and Barbuda	NDC sets out a number of measures	—	International
Argentina	Argentina shall not exceed a net emission of 483 $MtCO_2eq$ by the year 2030. (18% reductions compared to BAU)	Additional 19% reductions is conditional (see graph)	International

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Armenia	——	Ensure total emissions of Armenia do not exceed 663MTCO$_2$ and 189 tonnes per person by 2030	International
Australia	26-28% below 2005 levels by 2030	——	No
Azerbaijan	35% below 1990 levels by 2030	——	No
Bahamas, The	30% compared to BAU levels	——	International
Bahrain	NDC sets out a number of sectoral measures, without setting targets	——	No
Bangladesh	5% unconditional reduction below BAU by 2030	Additional 15% is conditional	International
Barbados	——	37% below BAU levels by 2025, and 44% below BAU levels by 2030	International
Belarus	28% below 1990 levels by 2030	——	No
Belize	NDC sets out a number of sectoral measures	NDC sets out a number of sectoral measures	International
Benin	NDC sets out unconditional targets per sector: 3.63% overall; energy: 1.98%; agriculture 5.8% and LULUCF 23.4%	NDC sets out conditional targets per sector: 12.55% overall; energy: 9.53%; agriculture 25.3% and LULUCF 76.6%	No
Bhutan	Bhutan intends to remain carbon neutral whereby GHG emissions will not exceed sequestration by its forests	——	No
Bolivia	NDC sets out development goals	——	No
Bosnia and Herzegovina	2% below BAU (corresponding to +18% over 1990 levels) unconditional target	Additional 21% is conditional	International
Botswana	15% reduction below 2010 levels by 2030	——	International
Brazil	37% below 2005 by 2025, 43% by 2030 (indicative)	——	International
Brunei Darussalam	NDC sets out 3 sectoral targets	——	No
Burkina Faso	Unconditional target of 6.6% below BAU by 2030	Additional 5% is conditional	International
Burundi	Unconditional target of 3% compared to BAU levels by 2030	Additional 17% is conditional	No
Cabo Verde	30% renewable energy target by 2025.	With international support, 100% renewable energy by 2025. Overall GHG reductions will be calculated and submitted in 2016.	International
Cambodia	——	27% below 2010 levels by 2030	International
Cameroon	32% below 2010 levels by 2035	——	International
Canada	30% below 2005 levels by 2030 (unchanged from NDC)	——	International and domestic

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Central African Republic	5% below BAU by 2030	—	International
Chad	Unconditional target of 18.2% below 2010 levels	Additional 52.8% is conditional	International
Chile	30% unconditional emission intensity reduction by 2030	Additional 35-45% is conditional	International
China	60-65% carbon intensity reduction by 2030	—	Domestic
Colombia	20% below BAU by 2030	Additional 10% is subject to international support	International
Comores	84% below BAU by 2030	—	No
Congo, Democratic Republic of	17% below 2000 levels by 2030	—	No
Congo, Republic of	—	48% below BAU levels by 2025, 55% by 2030	No
Cook Islands	Unconditional target of 38% below 2006 levels by 2020 in the electricity generation sector	Conditional 81% reduction below 2006 by 2030 in the electricity generation sector	No
Costa Rica	44% reduction compared to BAU levels by 2030, and a 25% reduction compared to 2012 levels. Costa Rica is committed to becoming a carbon neutral country by 2021.	—	International and domestic
Cuba	NDC sets out a number of sectoral actions	—	No
Djibouti	40% below 2010 levels by 2030	Additional 20% is conditional	No
Dominica	—	39.2% below BAU levels by 2025, and 44.7% below BAU levels by 2030	International
Dominican Republic	—	25% below 2010 levels by 2030	International
Ecuador	Unconditional energy sector target of 20.4 to 25% below BAU levels by 2030.	Conditional target in the energy sector of 37.5 to 45.8% below BAU levels by 2030.	—
Egypt	—	NDC sets out a number of sectoral measures	International and domestic
El Salvador	NDC sets out a number of sectoral measures	—	No
Equatorial Guinea	20% below 2010 levels by 2030	—	International
Eritrea	39.2% unconditionally below BAU by 2030	Additional 41.6% is conditional	
Ethiopia	—	64% by 2030 compared to BAU projections	International
European Union	40% below 1990 levels by 2030	—	No
Fiji	Reduction of emissions from the energy sector by 30% below BAU by 2030	—	International

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Gabon	At least 50% by 2025 compared to reference scenario	—	Domestic
Gambia, The	44.4% in 2025 and 45.4% in 2030-both below 2010 levels	—	International
Georgia	15% unconditional emissions reduction below BAU by 2030	Additional 10% is conditional	No
Ghana	15% unconditional reduction below BAU by 2030	Additional 30% is conditional	International
Grenada	—	30% reduction by 2025, with an indicative reduction of 40% by 2030	International
Guatemala	11.2% unconditional below BAU by 2030	Additional 11.4% is conditional	International
Guinea	—	13% reduction below BAU by 2030	International
Guinea-Bissau	—	According to 2006 data, Guinea-Bissau is an absolute sink for greenhouse gases and as such has not put forward a GHG reduction target. It will however, implement new policies to combat deforestation in the country.	International
Guyana	52MtC02e reduction by 2025	—	International
Haiti	Unconditional target of 5% below BAU levels by 2030	Additional 21% is conditional	International
Honduras	15% below BAU by 2030	—	No
Iceland	40% below 1990 levels by 2030	—	Domestic
India	33 to 35% carbon intensity reduction over 2005 levels by 2030	—	International
Indonesia	29% below BAU by 2030	Additional 12% is conditional	International
Iran, Islamic Republic of	Unconditional reduction of 4% below BAU by 2030	Additional 8% is conditional	No
Iraq	1% reduction below BAU by 2035	Additional 13% is conditional	No
Israel	26% below 2005 levels by 2030	—	No
Ivory Coast	28% below BAU by 2030	—	International
Jamaica	7.8% unconditional reduction below BAU by 2030	Additional 2.2% is conditional	No
Japan	26% by 2030 (equivalent to 25.4% reduction compared to 2005)	—	International
Jordan	1.5% below BAU by 2030	Additional 12.5% is conditional	International
Kazakhstan	Conditional target of a 15% reduction below 1990 levels by 2030	Additional 10% is conditional	International

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Kenya	——	30% below BAU by 2030	International
Kiribati	12.8% by 2030 below BAU	Additional 49% is conditional	International
Korea, Democratic People's Republic of	Unconditional 8% reduction below BAU by 2030	An additional 32.25% reductions conditional	No
Korea, Republic of	37% below BAU by 2030	——	International and domestic
Kuwait	NDC sets out a number of measures	——	No
Kyrgyz Republic	11.49 to 13.75% below BAU levels by 2030	Additionally, with international support It could reduce emissions by 35.06 - 36.75% below BAU in 2050	No
Lao People's Democratic Republic	NDC sets out a number of sectoral measures	——	International
Lebanon	Unconditional target of 15% compared to BAU levels by 2030	Additional 15% is conditional	No
Lesotho	Unconditional target of 10% compared to BAU levels by 2030	Additional 25% is conditional	International
Liberia	——	15% below BAU levels by 2030	International
Liechtenstein	40% below 1990 levels by 2030	——	No
Madagascar	——	14% below BAU by 2030 reduction is conditional	No
Malawi	NDC sets out a number of sectoral measures	NDC sets out a number of sectoral measures	No
Malaysia	Reduce GDP emissions intensity by 35% by 2030 compared to 2005 levels	Additional 10% is conditional	No
Maldives	Unconditional target of 10% below BAU by 2030	Additional 14% is conditional	No
Mali	——	29% reduction below BAU for agriculture, 31% for energy and 21% for forests and changes in land use	International
Marshall Islands	32% GHG reduction by 2025 compared to 2010 levels; 45% reduction by 2030 compared to 2010 levels	58% reduction by 2035; net-zero by 2050	No
Mauritania	22.3% below BAU by 2030	Additional 65.7% is conditional	No
Mauritius	——	30% below BAU by 2030	No
Mexico	25% below BAU by 2030 (22% of GHG and a reduction of 51% of Black Carbon).	Additional 15% is subject to a global agreement addressing important topics such as carbon pricing, technical cooperation and access to financial resources and technology.	International

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Micronesia, Federated States of	Unconditional reduction of 28% below 2000 levels by 2025	Additional 7% is conditional	No
Moldova	64-67% reduction below 1990 levels by 2030	Additional 11-14% is conditional	International
Monaco	50% below 1990 levels by 2030	——	International
Mongolia	——	14% below BAU by 2030	International
Montenegro	30% below 1990 levels by 2030	——	International
Morocco	17 % reduction by 2030 compared to BAU, with 4% coming from AFOLU actions. Without AFOLU actions, the reduction target is 13%.	Additional 25% reduction (21% without AFOLU) is conditional	International
Mozambique	——	Reduction of 76.5 $MTCO_2e$ by 2030	International
Myanmar	NDC sets out a number of sectoral measures	——	No
Namibia	79% reduction compared to BAU levels by 2030	Additional 10% is conditional	International
Nauru	NDC sets out a number of measures in the energy sector	——	No
Nepal	——	NDC sets out sectoral targets	International
New Zealand	30% below 2005 levels by 2030	——	International
Nicaragua	Continue the increase of renewables to 60% by 2030 Maintaining the countries' carbon sink at current levels	Increase the national carbon sink by 20% compared to the business-as-usual scenario by 2030	International
Niger	Unconditional target of 2.5% below 2020 BAU levels by 2020 and 3.5% below 2030 levels by 2030	Additional 22.5 by 2020 and 31.1% by 2030 is conditional	International
Nigeria	20% unconditional reduction below BAU by 2030	Additional 25% is conditional	International
Niue	NDC sets out a number of measures in the energy sector	——	No
North Macedonia	30% reduction of CO_2 emissions from fossil fuel combustion below BAU by 2030	Additional 6% is conditional on higher level of ambition	International
Norway	At least 40% below 1990 levels by 2030	——	Domestic
Oman	——	2% below BAU by 2030	
Pakistan	NDC does not set out any specific target	——	No
Palau	22% energy sector emissions reductions below 2005 levels by 2025	——	No
Panama	10% increase of absorption capacity of forests by 2050 compared to 2015	Additional 70% absorption capacity is conditional	International and domestic

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Papua New Guinea	Carbon Neutrality by 2030	——	No
Paraguay	10% unconditional reduction below BAU by 2030	Additional 10% is conditional	International
Peru	Unconditional target of 20% below BAU by 2030	Additional 10% is conditional	International
Philippines	——	70% below BAU by 2030	
Qatar	NDC sets out a number of sectoral measures, without setting targets	——	No
Russian Federation	25-30% below 1990 levels by 2030	——	
Rwanda	Estimation of emissions reduction is underway	——	International
Samoa	Samoa is committed to 100% renewable energy generation by 2017 and maintaining this to 2025. Samoa will make an economy-wide emission reduction target with international assistance.	——	International
San Marino	20% below 2005 levels by 2030	——	International
São Tomé and Príncipe	——	24% reduction below 2005 levels by 2030	International
Saudi Arabia	NDC seeks to achieve mitigation ambitions of up to 130 million tons of CO_2e avoided by 2030 annually	——	No
Senegal	5% unconditional reduction below BAU by 2030	Additional 16% is conditional	No
Serbia	9.8% below 1990 levels by 2030	——	No
Seychelles	——	21.4% in 2025 and 29% in 2030 below BAU	No
Sierra Leone	——	Emissions will not exceed 7.58 $MtCO_2e$ in 2035 and carbon neutrality by 2050	International
Singapore	36% carbon intensity reduction by 2030	——	International
Solomon Islands	Unconditional targets of 12% below 2015 levels by 2025 and 30% below 2015 levels by 2030	Additional 15% by 2030 is conditional	International
Somalia	NDC sets out a number of sectoral measures	——	No
South Africa	SA's commitment takes the form of a peak, plateau and decline GHG emissions trajectory range. SA's emissions will peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.	——	Domestic
South Sudan	NDC sets out a number of sectoral measures	——	No

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
Sri Lanka	4% unconditional reduction below BAU in energy sector, 3% unconditional reduction in other sectors	Additional 16% conditional reductions in energy sector and 7% conditional in other sectors	No
St. Kitts and Nevis	—	35% GHG reduction below BAU by 2030	International
St. Lucia	—	23% conditional reduction below BAU by 2030	International and domestic
St. Vincent and the Grenadines	22% below BAU by 2025	—	International
Sudan	—	NDC sets out a number of sectoral measures	International
Suriname	NDC sets out a number of sectoral measures; Install renewable energy and protect coastal mangrove forests.	—	International
Swaziland	—	NDC sets out a number of sectoral measures	International
Switzerland	50% below 1990 levels by 2030	—	International
Syrian Arab Republic	—	—	No
Tajikistan	Unconditional target of 10-20% reduction of 1990 levels by 2030	Additional 5-15% is conditional	No
Tanzania	—	10-20% below BAU emissions by 2030	No
Thailand	20% unconditional below BAU by 2030	Additional 5% is conditional	International
Timor-Leste	No emissions targets, instead outlines activities to be undertaken in various sectors	—	No
Togo	11.14% unconditional below BAU by 2030	Additional 20% is conditional	International
Tonga	NDC sets out a number of sectoral targets	—	No
Trinidad and Tobago	—	15% below BAU by 2030 (conditional on international financing)	International and domestic
Tunisia	13% unconditional carbon intensity reduction by 2030	Additional 28% is conditional	International
Turkey	21% below BAU levels by 2030	—	No
Turkmenistan	—	Stabilization of greenhouse gas emissions by 2030	No
Tuvalu	60% emissions reduction below 2010 levels by 2025	Further reductions conditional upon the necessary technology and finance	No
Uganda	—	22% below BAU by 2030	International
Ukraine	Ukraine will not exceed 60% of 1990 emission levels by 2030.	—	International

NDCs	Unconditional target	Conditional target	Mention of carbon pricing
United Arab Emirates	NDC sets out a number of sectoral measures, including a clean energy target of 24% by 2021	—	No
United States	26-28% below 2005 levels by 2025	—	No
Uruguay	Uruguay's first NDC specifies unconditional targets for GHG intensity (subdivided into targets for CO_2 [-24%], CH_4 [-57%] and N_2O [-48%]), GHG emission intensity of beef production (subdivided into targets for CH_4 [-32%] and N_2O [-34%]) and the LULUCF sector (CO_2 only, but subdivided by land-use category: 100% maintenance of living biomass on forest lands and avoiding CO_2 emissions from 10% of grassland, 50% of peatland and 75% of cropland)	Uruguay's first NDC specifies conditional targets for GHG intensity (subdivided into targets for CO_2 [-29%], CH_4 [-59%] and N_2O [-52%]), GHG emission intensity of beef production (subdivided into targets for CH_4 [-37%] and N_2O [-38%]) and the LULUCF sector (CO_2 only, but subdivided by land-use category: 5% and 25% increases in native forest area and shade and shelter forest, respectively, and avoiding CO_2 emissions from 30% of grassland and 100% of peatland)	International
Uzbekistan	—	10% GHG intensity reduction from 2010 levels by 2030	No
Vanuatu	100% reduction for the power sector by 2030, 30% reduction for the energy sector as a whole	—	No
Venezuela, República Bolivariana de	20% GHG reduction below BAU by 2030	—	No
Vietnam	Unconditional target of 8% compared to BAU levels by 2030	Additional 17% subject to access to international cooperation and mechanisms	International
West Bank and Gaza	NDC sets out a number of sectoral measures	24.4% below BAU by 2040	International
Yemen, Republic of	1% unconditional reduction below BAU by 2030	Additional 13% is conditional	No
Zambia	Unconditional target of 25% compared to BAU levels by 2030	Additional 22% is conditional	International
Zimbabwe	—	33% reduction in carbon intensity below BAU levels by 2030	International

WORLD BANK GROUP

1818 H Street, NW
Washington, DC 20433 USA
www.worldbank.org