

Greenhouse gas emissions trading schemes: A global perspective

An overview of rules and developments in major jurisdictions globally, including the US, Canada, Mexico, Japan, the UK and the EU



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Navigating greenhouse gas emissions schemes worldwide

As global emissions trading systems undergo fundamental changes, understanding the policies and rules around them can alert you to opportunities as well as challenges

The impacts of greenhouse gas (GHG) emissions continue to be of great concern globally. Innovations have occurred in market-based solutions, technology development and international law, and there are 17 GHG emissions trading schemes that have been established globally, operating in 35 countries, 12 states and seven cities.

These trading schemes present a market-based approach to controlling GHG emissions and mitigating the effects of climate change by limiting the quantity of industrial discharges of GHGs, either through the allocation or purchase of emissions allowances from a central authority or the purchase of emissions credits from market participants. For example, a company that emits more GHGs than its permits allow can buy credits from others willing to sell them. GHG emissions credit units are often known as carbon credits or GHG emission-reduction credits.

With the 2013 – 2020 Kyoto Protocol compliance period coming to an end, meeting intended nationally determined contributions under the Paris Agreement has opened up new challenges, and the resulting changes are confronting GHG emissions trading globally. These changes include economic dynamics, which have lowered the value of emission-reduction credits and have affected the marketplace, potential political opposition to the policies underlying GHG emissions trading and the rise of cost-effective innovations in financing GHG emissions reductions.

This report offers readers an overview of the status of GHG emissions trading schemes in major jurisdictions globally, including the United States, Canada, Mexico, Japan, the United Kingdom and the European Union. It illustrates the current status of global GHG emissions trading systems and also offers insights into where the global GHG emissions trading system is headed, alerting readers to potential opportunities and challenges.



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United States

Individual states are expected to take the lead in regulating greenhouse gas emissions

In the US, the trading of greenhouse gas (GHG) emission-reduction credits is underway in a large group of states on the East Coast and in California. In the northeast US, New England states and a group of Mid-Atlantic states joined together to set up a carbon dioxide (CO₂) cap-and-trade regime that covers CO₂ emissions from power plants in those states. On the West Coast, California's broader trading regime, which covers a wide range of GHGs from a variety of California emitters, is looking to expand to markets outside of the state.

On the federal level however, signs are pointing to lighter regulation of GHG emissions. This results from a combination of factors, including the actions of the Trump administration and pending legal challenges to the federal Environmental Protection Agency's plans for regulation of GHG emissions. Therefore, individual states—rather than the federal government—are expected to take the lead with the development of GHG emissions regulation over the next four years.

NEW ENGLAND, NEW YORK, MARYLAND AND DELAWARE

The nine states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire,

New York, Rhode Island and Vermont jointly operate a regional CO₂ cap-and-trade system known as the Regional Greenhouse Gas Initiative (RGGI). This system was the first US mandatory cap-and-trade program for GHG emissions.

What is covered

The RGGI trading scheme, which became effective in 2009, applies only to CO₂ emissions from fossil fuel-fired power plants with capacities to generate 25 MWs or more in the nine RGGI states. The RGGI system is therefore narrower than some other regional GHG emissions trading systems that cover GHGs other than CO₂ and that apply to emitters other than power plants.

What is required

RGGI applies to emissions reductions within a regional framework, consistent with how the power system in the US operates. Together, the RGGI states set a cap for total emissions of CO₂ from covered power plants in the region. Each state implements the program through emissions caps in individual RGGI-participating states that are equal to shares of the region-wide cap. The RGGI cap declines over time, gradually tightening emissions limits. Covered power plants in participating states must obtain

an allowance for each ton of CO₂ emitted annually (RGGI auctions allowances, rather than allocating them for free). Power plants within the region may comply by purchasing allowances at quarterly auctions, purchasing allowances from other generators within the region that have excess allowances or supporting offset projects. RGGI administered its first auction of CO₂ allowances in 2008.

Future outlook

By 2020, the RGGI CO₂ cap is projected to contribute to a 45 percent reduction in the region's annual power-sector CO₂ emissions from 2005 levels. The RGGI states recently proposed changes to the program after 2020, whereby the region's CO₂ cap would decline by 2.275 million tons of CO₂ per year after 2021, resulting in a reduction in the regional CO₂ cap by 30 percent relative to 2020 levels through 2030. The RGGI states will host a public meeting on this proposal on September 25, 2017. Although Virginia is not an RGGI member, its governor recently directed environmental regulators in that state to cap power plant GHG emissions in Virginia and establish a GHG emissions trading system in the state where credits can be used in, and traded across, similar trading systems in other states. This could potentially include RGGI states. Whether Virginia establishes its trading connection with its East Coast RGGI neighbors or California's regional trading system remains to be seen. Additionally, both major political party gubernatorial candidates competing in New Jersey's upcoming election favor New Jersey's return to RGGI. New Jersey's current governor pulled the state out of the program in 2011.



The trading of greenhouse gas emission reduction credits is underway in a large group of states on the East Coast and in California.



CALIFORNIA

The State of California operates one of the most active GHG trading markets in the world, covering a significant portion of the state's economy. California's program is second in size to the European Union's Emissions Trading System. The California cap-and-trade rules came into effect in 2013.

What is covered

Following a 2015 expansion, California's GHG trading scheme applies to power plants and industrial facilities that emit 25,000 metric tons or more of CO₂-equivalent, and fuel distributors that meet the 25,000 metric ton threshold. The covered emissions include weighted equivalent values of methane, nitrous oxide, sulfur hexafluoride, perfluorocarbons and nitrogen trifluoride, along with CO₂. This makes the California cap-and-trade system broader than the East Coast's RGGI system because the California system covers emitters other than power plants and GHGs other than CO₂.

What is required

Covered emitters in California must hold enough emissions allowances to cover their emissions, and are free to buy and sell allowances on the open market. Under the California

program, some allowances are auctioned, while others are allocated or given away for free. Covered entities in California can also use offsets rather than allowances to cover a limited percentage of their emissions limits. The percentage of free allowances allocated to emitters has been reduced over time.

Future outlook

California's cap-and-trade program is one element of the state's larger climate change initiative, the California Global Warming Solutions Act of 2006, which aims to reduce the state's GHG emissions to 1990 levels by 2020 and to 40 percent below 1990 levels by 2030. On July 25, 2017, California Governor Jerry Brown signed into law legislation extending the state's GHG trading program through 2030. Notably, the extension law includes price ceilings and floors and new limits on the use of offsets. Furthermore, it prohibits local air districts from imposing additional limits on CO₂ emissions from facilities subject to the cap-and-trade rules.

California's GHG cap-and-trade system also recently overcame a legal challenge in court. A split panel of judges in California's Third District Court of Appeals recently upheld the program, rejected claims

that the state's auction revenues equate to an unconstitutional tax, and instead found that the costs of buying or selling emissions allowances are property rights that can be traded. Had the court found the revenues to be taxes, the system would have been invalidated because tax increases must be approved by a two-thirds majority of the state Legislature, and the program did not have that level of support when it passed. The California Supreme Court declined to hear an appeal of this decision.

Connections

California's cap-and-trade system is connected to a similar carbon reduction scheme in Québec, Canada, which is discussed in the Canada section on page 4. This connection represents the first multi-sector cap-and-trade program connection in North America. Under it, allowances can be traded across jurisdictions. Ontario plans to join the program by next year as well.

Nevertheless, some environmental non-governmental organizations oppose cross-border trading system connections because of their belief that GHG emissions reductions should occur directly at the source of the emissions, rather than outside of the jurisdiction where the source is located.

Canada

Ontario and Québec lead the way in developing trading schemes

Canada's federal government recently entered into an agreement with eight Canadian provinces and three Canadian territories that is likely to accelerate the development of provincial and territorial greenhouse gas (GHG) trading systems. The December 2016 Pan-Canadian Framework on Clean Growth and Climate Change Framework outlines a federal benchmark for carbon pricing in Canada. Signatory jurisdictions can implement either (1) an explicit price-based system like a carbon tax or (2) a GHG cap-and-trade system similar to the Québec-California connection, as discussed on page 3. Ontario is following Québec's lead with the development of its own GHG emissions trading scheme.

QUÉBEC

The Province of Québec's GHG emissions trading scheme is more similar to the California system than it is to the RGGI cap-and-trade initiative. As a result, the Québec scheme has been harmonized with the California system since 2014.

What is covered

Following an expansion in 2015, Québec's cap-and-trade system now applies to power plants, industrial facilities and fuel distributors. While fuel distributors are subject to a lower threshold, power plants and industrial facilities that emit 25,000 metric tons or more of carbon dioxide (CO₂)-equivalent are subject to the provincial regime.

What is required

The Québec system covers the same broad suite of GHGs that the California system covers. Covered entities must surrender equivalent allowances to their emissions. Generally, power plants and fuel

distributors have to buy 100 percent of their allowances at auction or on the secondary market. Allowances are auctioned jointly with California through the California Cap-and-Trade Program and the Québec Cap-and-Trade System Joint Auction of Greenhouse Gas Allowances. Certain industrial sectors subject to international competition—such as aluminum, cement, chemical, petrochemicals, mining, pulp and paper, and refining—receive some free allowances. However, this allocation of free allowances will continue to diminish over time. Offsets are allowed, subject to quantitative and qualitative limitations. Examples of Québec program offsets include landfill gas collection and destruction of ozone-depleting substances in insulating foam or used as refrigerants removed from refrigeration, freezer and air-conditioning appliances.

Future outlook

By 2020, Québec's system is intended to support a 20 percent provincial reduction in GHG emissions from 1990 levels.

Connections

Offsets issued by California, and any jurisdiction connected with Québec in the future, are recognized for compliance.

ONTARIO

The Ontario Cap and Trade Program is relatively new, having only come into effect in January 2017.

What is covered

The Ontario GHG emissions trading scheme applies to natural gas distributors and industrial emitters that emit 25,000 metric tons or more of CO₂-equivalent, fuel supplies that supply 200 liters or more of petroleum products, and electricity importers who first import electricity

into Ontario for consumption in cases where generation facilities receive fuel directly from inter-provincial or international gas pipelines.

What is required

The Ontario system covers the same broad suite of GHGs that the California and Québec systems cover. Emitters must cover their emissions in each compliance period with an equivalent number of emissions credits. These credits can be obtained through provincial allocations or auctions, or through purchases in the secondary market. Credits can be traded among emitters and other market participants. Offsets can be used to help meet part of a covered entity's emission requirements under the cap-and-trade program.

Future outlook

The first auction of Ontario emissions allowances was in March 2017. In the first compliance period (January 1, 2017, to December 31, 2020), most large emitters will receive most of the allowances they require free of charge. Following 2017, the number of credits issued by the province will decrease over a three-year period to support a reduction of Ontario's GHG emissions to 15 percent below 1990 levels by the end of 2020.

Connections

As discussed above, Ontario intends to connect its GHG trading scheme with the California and Québec regimes by 2018. Once this connection occurs, the three jurisdictions will hold joint auctions of emissions allowances. Emitters in any of the three jurisdictions will be able to purchase credits on the secondary market from covered entities in any of the three jurisdictions.

Global auction statistics

Recent auction clearing prices for emission allowances (by jurisdiction)

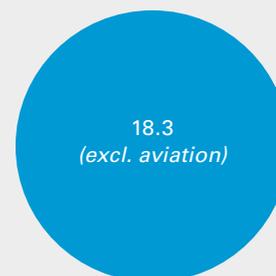
	Date of auction	Clearing price per emissions allowance
RGGI (Regional Greenhouse Gas Initiative)	June 7, 2017	US\$2.53
	March 8, 2017	US\$3.00
	December 7, 2016	US\$3.55
	September 9, 2016	US\$4.54
California cap-and-trade program	May 2017	US\$13.57
	February 2017	US\$13.57
	November 2016	US\$12.73
	August 2016	US\$12.73
EU emissions trading scheme	May 31, 2017	€5.05
	May 17, 2017	€4.52
	May 3, 2017	€4.34
	April 19, 2017	€4.90

Total auction revenues, US\$ billion (as of August 31, 2016)

RGGI
2008 – 2016



EU ETS
2012 – 2016



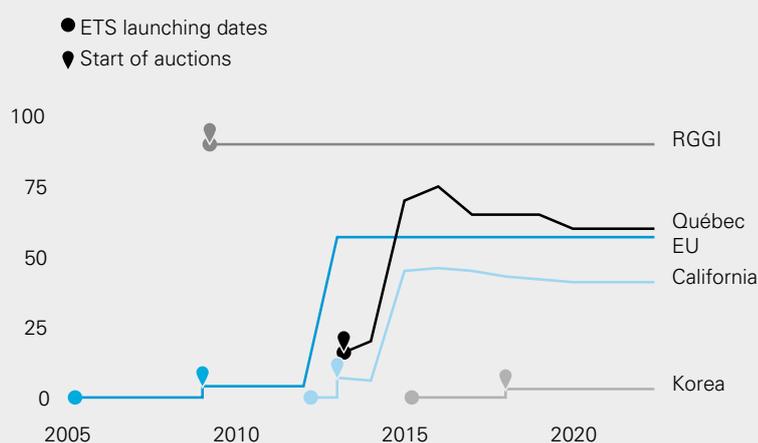
California
2012 – 2016



Québec
2013 – 2016



Estimated percentage of total auctioned permits



Source: From Carbon Market to Climate Finance: Emissions Trading Revenue (International Carbon Action Partnership, ETS Brief #5 September 2016)

Source: From Carbon Market to Climate Finance: Emissions Trading Revenue (International Carbon Action Partnership, ETS Brief #5 September 2016)

Mexico

Implementation of a cap-and-trade program and compliance market is expected by 2021

In 2012, Mexico enacted the General Law on Climate Change (GCCL), which required the creation of a national registry for greenhouse gases and provided orientation to federal, state and municipal authorities toward the authority to establish a voluntary emissions trading scheme (ETS).

In 2014, the Regulations of the GCCL for the Creation and Operation of the Emissions Registry (the GCCL Regulations) were published, followed by an implementing decree in 2015, recognizing that the first step in establishing an

efficient compliance market was implementing an accurate registry of emissions of greenhouse gases (GHGs) and compounds.

The GCCL Regulations establish a reporting threshold of 25,000 tons of carbon dioxide (CO₂)-equivalent, generated annually in all covered facilities operated by a company. Covered facilities include emitters in the energy, industrial, transport, agricultural, waste, commercial and services sectors. Although reports must be filed per facility, the sum of all covered facilities is considered for



The governments of California, Québec and Ontario are expected to participate as observers during the pilot ETS.



determining if reporting is required. For example, if a company has six different covered facilities emitting only 5,000 tons/CO₂-equivalent, it must file a report for each facility, since their total emissions (30,000 tons/CO₂-equivalent) would exceed the 25,000 tons/CO₂-equivalent threshold.

The GCCL Regulations list the GHGs and compounds that must be recorded. This includes the following:

- CO₂
- Methane
- Nitrous oxide
- Carbon black
- Chlorofluorocarbons
- Hydrochlorofluorocarbons
- Hydrofluorocarbons
- Perfluorocarbons
- Sulphur hexafluoride
- Nitrogen trifluoride
- Halogenated ethers
- Halocarbons

- Mixtures of the above
- GHGs and compounds that the Intergovernmental Panel on Climate Change lists as such and that Mexico's Federal Ministry of Environment and Natural Resources (SEMARNAT) may further publish.

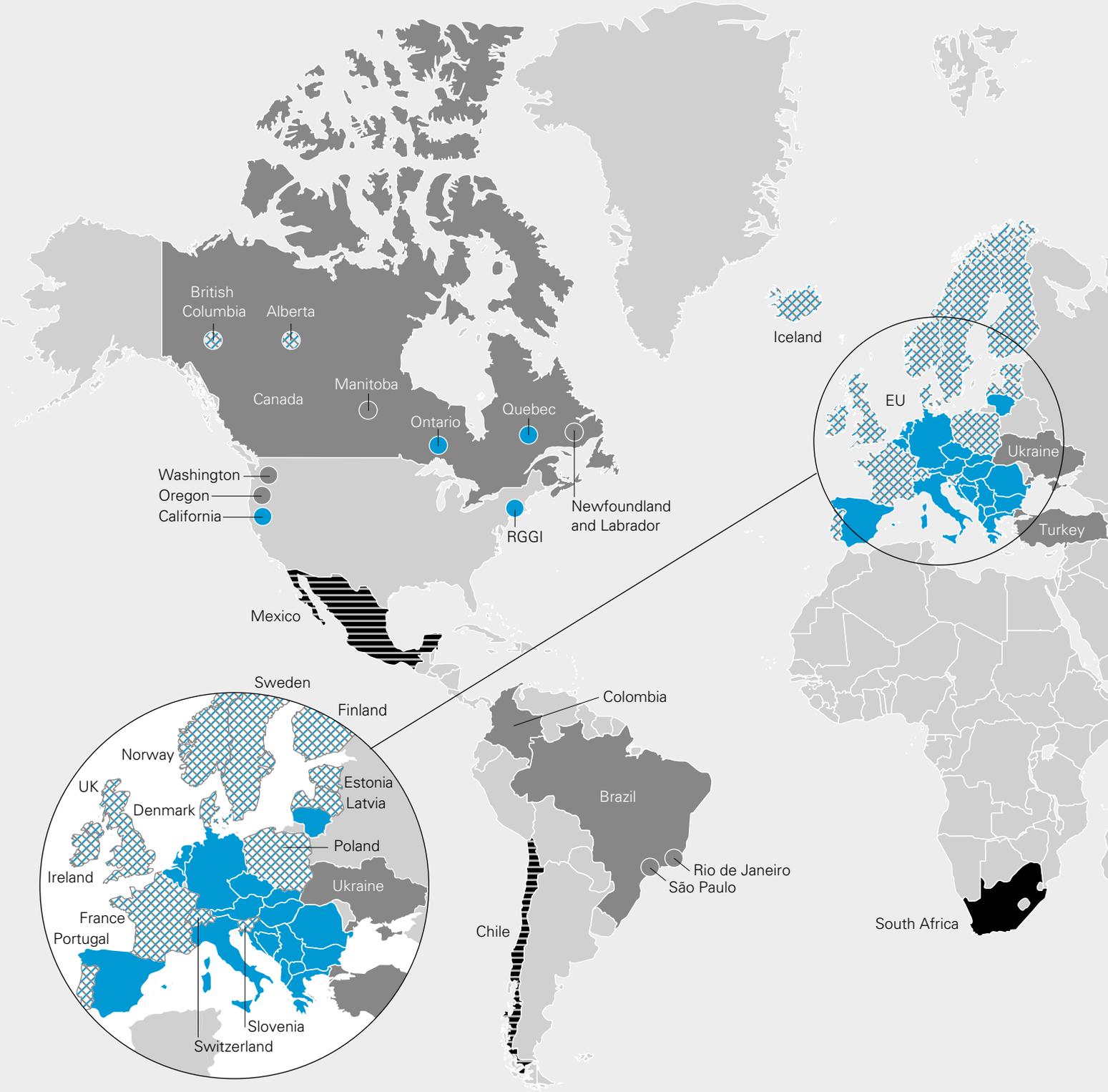
In 2016, SEMARNAT, the Mexican Stock Exchange (BMV) and MexiCO₂ (a voluntary carbon platform of the BMV) signed an agreement to implement a voluntary pilot ETS for several major companies pertaining to the power generation, manufacturing and transport sectors. Implementation of such a pilot project is currently being discussed, and its purpose is to prepare companies to create a draft ETS regulation by 2018, which would lead to a cap-and-trade program and compliance market (expected to be implemented by 2021).

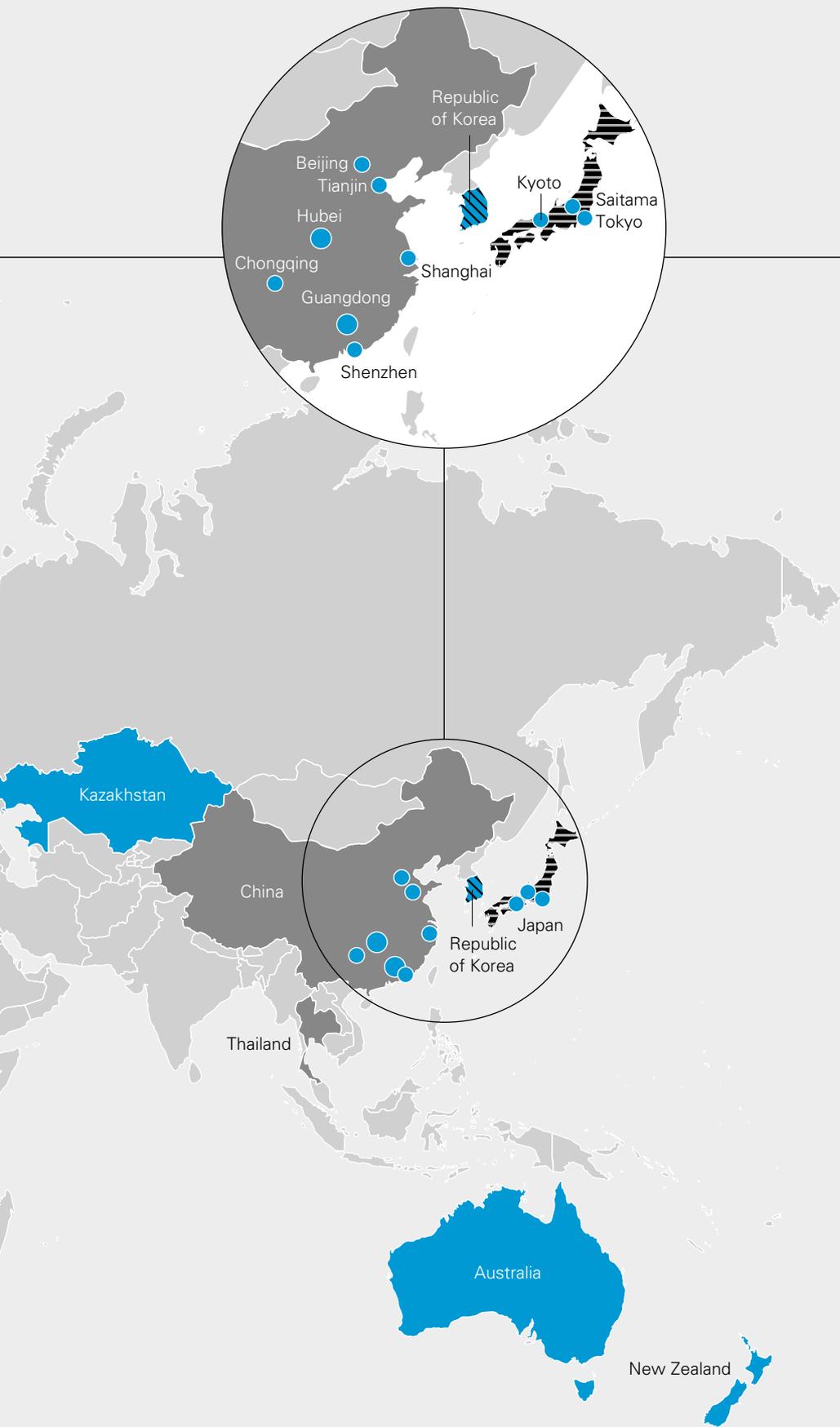
The governments of California, Québec and Ontario are expected to participate as observers during the pilot ETS, with the purpose of collaborating in the potential linkage between these ETSs. Mexico signed a Memorandum of Understanding in 2015 with Québec that includes cooperation on emissions trading, and in 2016, Mexico, Québec and Ontario issued a joint declaration on carbon markets collaboration. This collaboration would be attractive for implementing emission-reduction projects with potential lower costs in Mexico, which may be recognized for compliance in these Canadian provinces, and it is already a possibility in the voluntary market of California, managed by the Climate Action Reserve, which has implemented several protocols for projects that may be implemented in Mexico.



Mapping emissions trading globally

Existing, emerging and potential regional, national and subnational carbon pricing initiatives (ETS and tax)

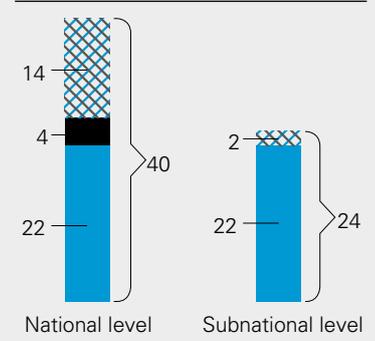




The circles represent subnational jurisdictions: Subnational regions are shown in large circles and cities are shown in small circles. The circles are not representative of the size of the carbon pricing initiative.

- 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
- ETS** implemented or scheduled, **carbon tax** under consideration
- Carbon tax** implemented or scheduled, **ETS** under consideration

Tally of carbon pricing initiatives



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. Jurisdictions that only mention carbon pricing in their INDCs are not included as different interpretations of the INDC text are possible. 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 in British Columbia and baseline-and-offset systems such as in Australia. Carbon pricing has evolved over the years and initiatives do not necessarily follow the two categories in a strict sense. The authors recognize that other classifications are possible.

Source: World Bank, *Ecofys and Vivid Economics. 2016. State and Trends of Carbon Pricing 2016* (October), by World Bank, Washington, DC.



Linking around the world

2007



NORWAY



ICELAND



LIECHTENSTEIN



EU

2011



TOKYO



SAITAMA

2014



QUÉBEC



CALIFORNIA

2016



SWITZERLAND



EU

2018



QUÉBEC



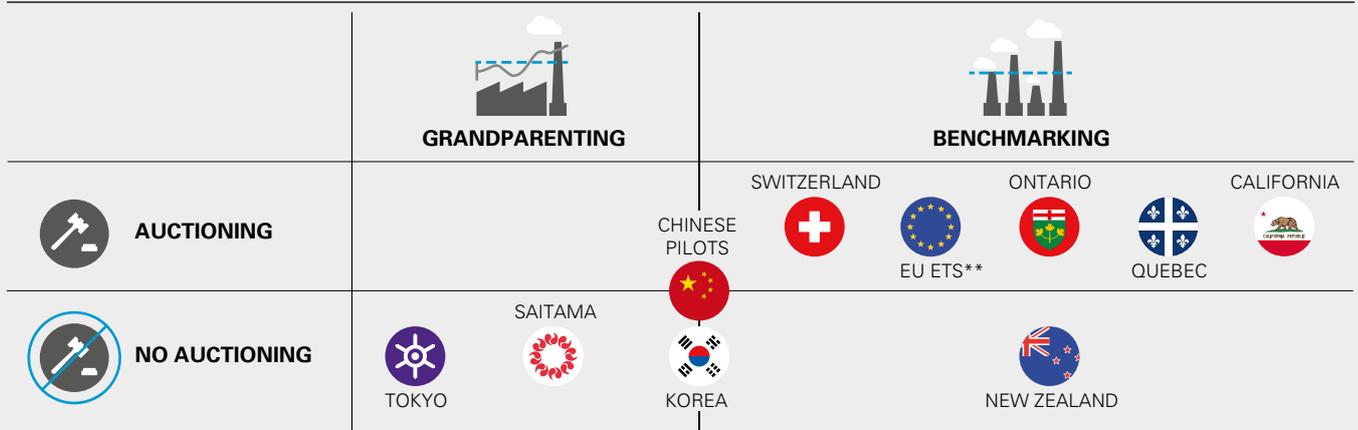
CALIFORNIA



ONTARIO

Source: *On the Way to a Global Carbon Market: Linking Emissions Trading Systems* (International Carbon Action Partnership, ETS Brief #4 May 2016)

Allocation: How emissions permits are distributed

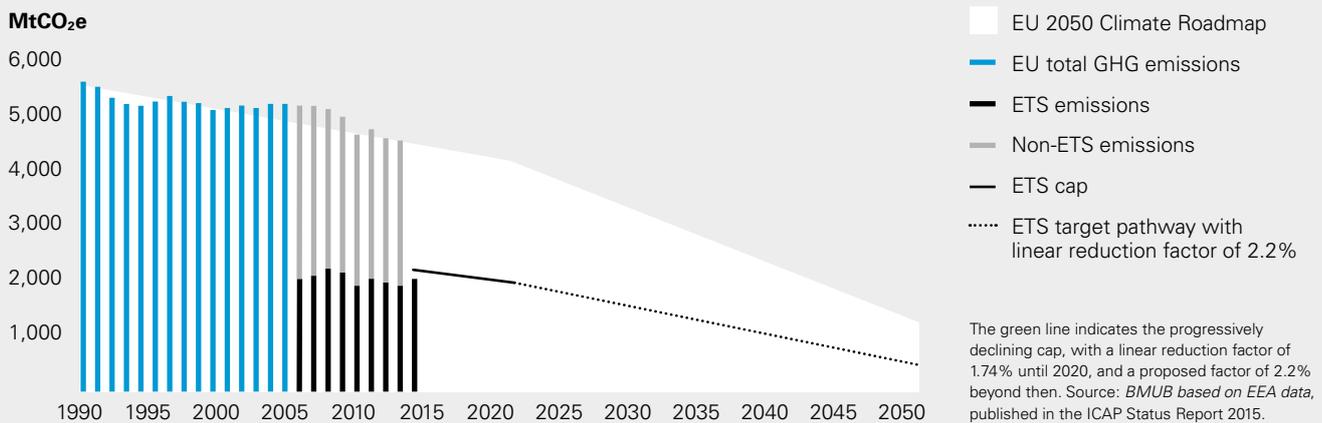


* Korean ETS uses benchmarking for cement, refinery and domestic aviation and grandparenting for the other sectors.

** EU ETS at the current phase is using benchmarking for its free allocation sectors, while in previous phases used mainly grandparenting. Currently, RGGI is the only system that does not use free allocation: almost all permits allocated via auctioning.

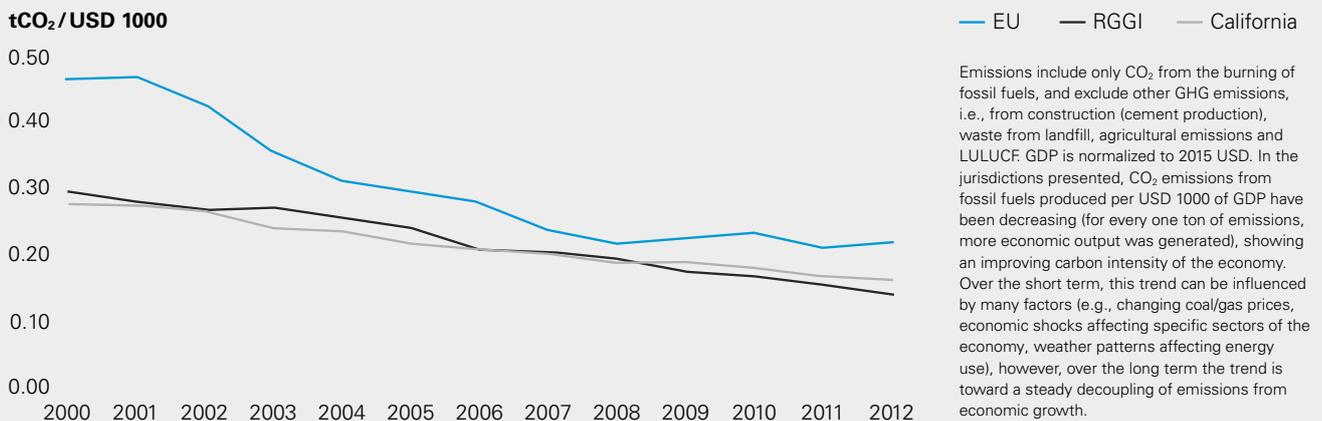
Source: Allocation: How Emissions Permits Are Distributed, ETS Brief #6, May 2017

EU Climate Plan showing emission reduction targets and the role of the EU ETS



Source: Benefits of Emissions Trading (International Carbon Action Partnership, July 2016)

Carbon intensity of the economy shown in tons of CO₂ emitted per US\$1,000 of GDP



Source: Benefits of Emissions Trading (International Carbon Action Partnership, July 2016)

United Kingdom

EU's trading scheme framework dominates, but Brexit brings uncertainty

As early as 2002, the UK began preparing for international emissions trading. It initiated a pilot emissions trading scheme (UK ETS) in anticipation of its mandatory contribution toward the EU Kyoto Protocol targets.

The UK ETS was the first cross-industry cap-and-trade greenhouse gas (GHG) emissions trading scheme of its kind in the world. It applied to certain named installations that were given caps on emissions and allowed these installations to purchase emissions in the event of a shortfall, or sell any excess to those installations that needed them to comply with their obligations under the UK ETS. By the time the EU Emissions Trading Directive came into effect in 2003, the UK had ample experience with pricing, auctions and other mechanics of emissions trading. Today, emissions trading in the UK is predominantly reflected in the EU framework, as incorporated into domestic law by the UK Climate Change Act 2008 (CCA) and the Greenhouse Gas Emissions Trading Scheme Regulations 2009, which have been updated for the current trading period of 2013 to 2020.

The CCA is the core UK statutory basis for climate change mitigation measures. It commits the UK to a target of lowering GHG emissions by the year 2050 to 80 percent below 1990 levels (which translates to 160 MtCO₂-equivalent emissions). From 2008 to 2012, the UK was capped at 3,018 MtCO₂, decreasing to 2,782 MtCO₂ between 2013 and 2017. This will further decrease to 2,544 MtCO₂ between 2018 and 2022, and it provides mechanisms by which this target can be achieved. Specifically, it confers powers to

establish trading schemes for the purposes of limiting GHG emissions and encouraging activities that reduce emissions or remove GHG from the atmosphere. In theory, therefore, the UK could participate in any, or multiple, emissions trading schemes worldwide.

In November 2015, the UK reaffirmed its commitment to mitigating climate change on the world stage as a signatory to the Paris Agreement. The UK has developed and submitted its Nationally Determined Contribution (NDC) to achieving the targets of the Paris Agreement.

What is covered

The CCA caps the UK's total net GHG emissions each year, and national authorities issue a fixed number of emissions allowances (EUAs) that may be used or traded as required and entitle relevant installations to emit a corresponding quantity of GHG. The UK ETS applies to a range of GHGs—CO₂, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. Regardless of the specific GHG, EUAs are calculated as CO₂-equivalent emissions, so volumes of each GHG are converted to one ton of CO₂. One EUA entitles the holder to emit one ton of GHG.

Installations that carry out "regulated activities" beyond a threshold amount must obtain a permit and either buy or be allocated EUAs under the ETS. The threshold for covered installations is thermal input in excess of 20 MWs (i.e., through the combustion of fossil fuel), or the production of certain listed substances such as ammonia or nitric acid, given that GHG is inherently released during the production of such substances.







The Market Stability Reserve is another mechanism introduced to solve the problem of surplus EUAs causing a disincentive to reduce GHG emissions.

Covered activities are listed in Annex A of the Regulatory Guidance for Installations. One thousand of the 11,000 covered installations participating in the EU ETS are in the UK. These include power stations, oil refineries, offshore platforms and industries that produce iron and steel, cement and lime, paper, glass, ceramics and chemicals.

What is required

The “polluter pays” principle applies to environmental protection requirements in the UK. For air emissions permits, the release of GHGs is permitted so long as the “polluting” installations pay for the right to create GHG emissions; that is, installations may only carry out regulated activities up to the number of their allocated EUAs. A proportion of those EUAs are allocated for free, and others must be purchased by auction. EUAs must be used for compliance or may be traded if the installation has a surplus of them.

Given that the aim of the ETS is to progressively reduce GHG emissions, the default position is that EUAs must be acquired at auction, with concessions being made for certain sectors to continue to have a free allocation. Under the UK ETS, each year fewer EUAs are allocated for free and more must be bought at auction. In 2013, installations that received an allocation received 80 percent of it for free. In 2020, covered installations will receive only 30 percent of their EUAs for free, and by 2027 all EUAs must

be purchased at auction. Auctions are conducted through an agent (ICE Futures Europe is currently the exchange appointed by the government as the auction agent).

Installations must be able to surrender EUAs corresponding to the amount of GHG they emit each year. If they have insufficient EUAs to match their emissions, they must either cut their emissions or acquire more EUAs on the open “carbon market.” If they have excess, they may save the EUAs for future accounting periods or sell them to other installations. This ensures that emissions are reduced where it costs the least to do so.

Future outlook

The UK introduced the Carbon Price Floor in 2013 to complement the effectiveness of its emissions trading system. Since the global financial crisis in 2007/2008, industrial output in the UK markedly decreased and, as a result, many of the covered installations ended up with surplus EUAs. These surpluses caused the market price for allowances to plummet, in addition to taking the pressure off installations to shift toward reducing GHG. The Carbon Price Floor scheme, which came into effect April 1, 2013, ensures that it does not become cheaper for installations to pollute rather than improve energy efficiency and cleanliness by imposing an annually increasing surcharge on top of the market price of EUAs for installations that are fossil fuel-burning power stations. By most accounts, the UK’s carbon price floor has been successful in producing cost-effective emissions reductions. By facilitating the switch from oil to gas, it has also contributed to large-scale emissions reductions (80 percent from 2012 to 2016).

The Market Stability Reserve is another mechanism introduced to solve the problem of surplus EUAs causing a disincentive to reduce GHG emissions. This mechanism, which will be in force from 2019, is designed to automatically withdraw a proportion of EUAs available on the carbon market and place them into a reserve once the number of

freely available allowances reaches a certain threshold. In theory, this will increase the demand for allowances and stabilize their price. If the number of available allowances should drop below a set threshold, some allowances will be released from the reserve.

The Paris Agreement will also likely have a considerable impact on the future of emissions trading in the UK and around the world. The agreement provides for the international connection of emission trading systems to facilitate the meeting of each country’s commitment under the Agreement via so-called “internationally transferred mitigation outcomes.” The Paris Agreement provides no detail, however, on how such a mechanism would be developed, and at present emissions trading around the world lacks the uniformity for the various systems to become interconnected.

Trading across borders

The UK ETS is inextricably linked to, and indeed a branch of, the EU-wide scheme provided for in the EU ETS Directive. As the carbon market is EU-wide and there is mutual recognition of EUAs across the EU, UK ETS allowances may be freely traded by installations throughout the EU.

Having one of the biggest economies in the EU, the UK is a major player in the EU ETS both in terms of influencing policy and market activity. The EU ETS is in essence a vehicle that helps both the UK and the EU as a whole reduce their GHG emissions and meet international commitments, in particular the Kyoto Protocol and the Paris Agreement. Through the 2004 Linking Directive, the EU ETS is linked to other emissions reduction schemes provided for under the Kyoto Protocol, namely Joint Implementation and the Clean Development Mechanism. Credits earned under these schemes (emission reduction units (ERUs) and certified emission reductions (CERs) respectively) may be used in lieu of EUAs for compliance with the EU ETS.

Effect of Brexit

It is unclear what the effect of Brexit will be on the UK ETS given its connection to the wider EU scheme. If, upon leaving the EU, the UK chooses to leave the EU ETS but seeks continued access to the EU carbon market, this would need to be negotiated. The terms of access may be contained in a free trade agreement (should one be agreed to) with the EU.

Although Brexit's immediate effects are not known, it is predicted that for the UK ETS, the effects are not likely to be dramatic, as many of the legal bases for the UK ETS are now derived directly from domestic law. Nonetheless, new policies will be needed to ensure continued efforts at reducing GHG emissions where previous policies were mandated through the EU, and the government has declared its intention to do this. The UK's targets as part of the global transition to a low-carbon economy and to combat the effects of climate change will remain independent of the EU stance. The UK is a participant in the United Nations Framework Convention on Climate Change and a signatory to the Kyoto Protocol and the Paris Agreement in its own capacity as well as in its role as part of the EU; therefore, its obligations under these agreements are not dependent on its membership in the EU.

Through the 2008 Climate Change Act, the UK is required to establish carbon budgets to ensure progress in GHG emissions reduction and other climate change-related commitments. Although the UK's 2050 GHG reduction targets and the legislated carbon budgets (including the recent fifth carbon budget, which runs from 2028 to

2032) remain intact, going forward the UK's carbon budgets need to be adaptable to the reality of an uncertain future if the UK is to meet its global commitments. This includes addressing the prediction that one of Brexit's consequences and the uncertainty during negotiations will be an economic downturn for the UK. This may potentially lead to a reduction in GHG emissions, simply as a result of reductions in industrial output, lower energy consumption and other economic consequences. Having ratified the Paris Agreement, the UK will need to submit its own commitments and targets for carbon reduction actions into 2050. The UK's access to the low-cost emission reduction market of the EU ETS is an important mechanism for achieving targets set by the UK. Whether Brexit means that the UK cannot continue to participate in the EU ETS after leaving the EU is an open question.



It is unclear what the effect of Brexit will be on the UK ETS.

European Union

The world's biggest trading scheme sees proposals intended to stabilize the market and links to Switzerland

The European Union Emissions Trading System (EU ETS) is the world's first and biggest international emissions trading scheme, accounting for trading of almost 50 percent of Europe's emissions. It came into effect in 2005 and since has developed in three phases. The first phase was the testing or "learning by doing phase" (2005 – 2007), followed by Phase II, coinciding with the Kyoto Protocol's first compliance period of 2008 to 2012. The current and third phase started in 2013 and will end in 2020 when Phase IV will take over.

What is covered

The EU ETS currently operates in 31 countries—the 28 EU Member States (while the UK's connection to the EU ETS post-Brexit remains to be resolved), plus Iceland, Liechtenstein and Norway. It applies to carbon dioxide (CO₂) emissions from power and heat generation equal to or more than 20 MWs of capacity and energy-intensive industry sectors (including oil refineries, steel works and production of iron, aluminum, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals). The EU ETS also applies to nitrous oxide from production of nitric, adipic and glyoxylic acids and glyoxal, as well as perfluorocarbons from aluminum production. All in all, approximately 11,000 energy-intensive installations, as well as intra-European Economic Area (EEA) civil aviation, are included, covering approximately 45 percent of EEA's greenhouse gas (GHG) emissions.

From 2012 to 2016, emissions from flights between airports located in the EEA fell within the EU ETS's scope. The EU legislature is currently considering extension

of the EU ETS's coverage of intra-EEA flights for the 2017 to 2021 period. The EU Aviation Resolution sets the trajectory for all EU countries to join the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which is a global market-based measure to address CO₂ emissions from international aviation as of 2021, with the goal of stabilizing CO₂ emissions at 2020 levels by requiring airlines to offset the growth of their emissions after 2020. Under CORSIA, airlines will be required to monitor emissions on all international routes and offset emissions from routes included in the scheme (e.g., airlines will be permitted to purchase eligible emission units generated by projects that reduce emissions in sectors such as renewable energy). Although the implementation mechanics for the scheme will be developed at the International Civil Aviation Organization level, to make CORSIA effective national measures will need to be developed, and ultimately enforced, at national domestic levels.

What is required

The EU ETS is a "cap-and-trade" system. It works by setting limits on overall emissions from high GHG-emitting industry sectors, with the limit reduced over time. Within that limit, companies may buy and sell emission allowances as needed for their production purposes. Each allowance represents the right to emit one ton of CO₂-equivalent emissions. The overall number of allowances issued determines the volume of emissions permitted, and in that way emissions are "capped." The idea is that the cap is reduced over time, thereby

reducing emissions. In the current (third) phase of the EU ETS, the number of allowances issued is declining annually. Allowances are distributed to installations by allocation and increasingly by auction. The allowances can be freely traded on the market or between covered entities. Each year, installations must surrender allowances equivalent to the amount of CO₂-equivalent emissions they emit. If installations produce more emissions than covered by allowances, they face significant financial penalties amounting to €100/tCO₂ (rising with EU inflation from 2013); if they produce less, they can trade the surplus allowances.

For installations to receive free allocation, they must meet the relevant sector's benchmarks. For those installations that are not at a significant risk of carbon leakage (i.e., where, for reasons of costs related to climate policies, businesses transfer production to other countries with fewer constraints on GHG emissions), the scheme provides that free allowances decline annually, to 30 percent of all allowances in 2020. In principle, no free



A market stability reserve will be established in 2018 to start operating in January 2019, to address the current surfeit of allowances and make the EU ETS resilient to shocks.



allowances will be available from 2027. To safeguard the competitiveness of industries, installations in sectors and sub-sectors deemed to be exposed to a significant risk of carbon leakage will continue to receive a higher share of free allowances in Phase IV compared to the other industrial installations, so long as they meet the relevant sector benchmark.

The power generation sector is not eligible for free allocation, except under special conditions in a few lower-income EU countries in order to modernize their power sectors.

Future outlook

The EU has committed under the Paris Agreement and for its 2030 Climate and Energy Policy Framework to reduce GHG emissions by at least 40 percent domestically by 2030. To accomplish this, it proposes to increase the pace of emissions cuts, address carbon leakage and fund low-carbon innovation. A market stability reserve will be established in 2018 to start operating in January

2019, to address the current surfeit of allowances and make the EU ETS resilient to shocks by introducing an adjustment to the supply of allowances that are to be auctioned. According to the EU's legislative proposal for the EU ETS (2021 to 2030), the annual rate of decline of total allowances would accelerate to 2.2 percent from the current 1.74 percent.

The proposal also aims to update sector benchmarks to reflect technological progress, provide a more targeted carbon leakage classification (and develop "predictable, robust and fair rules" to address the risk of carbon leakage), and more closely align free allocation with production levels. The proposal puts in place two new funds—an innovation fund and a modernization fund—to help industry and power sectors meet the innovation and investment challenges inherent in reducing their emissions.

Linking with others

The EU ETS is linked with the Kyoto Protocol's international

emissions trading system.

Emission-reduction credits generated from Kyoto Protocol Clean Development Mechanism and Joint Implementation projects could be used for EU ETS compliance (with quantitative restrictions). This was designed to cover reductions in sectors not included in the EU ETS as well as help expand market access to low-cost emissions reductions and support technology transfer. The EU ETS adopts this through the 2004 EU Linking Directive, allowing operators to use Kyoto Protocol credits for compliance with the EU ETS on a one-for-one basis.

Additionally, the EU and Switzerland have finalized technical negotiations and in principle have agreed to link their systems. However, the final conclusion of the Linking Agreement is dependent on negotiations on a broader package of issues with Switzerland. Once the agreement has entered into force, linking will result in the mutual recognition of EU and Swiss emissions allowances.

Japan

Tokyo Metropolitan Government's and Saitama Prefecture's schemes are connected as Japan considers a national scheme

Similar in some ways to regional emissions trading schemes in the US and Canada, Japan has locally connected emissions trading regimes in the Tokyo Metropolitan Government and Saitama Prefecture. On the national level, although Japan's Voluntary Emissions Trading Scheme has existed since 2005, after efforts to implement a mandatory national emissions trading system were postponed in December 2010, the stance of Japan's government has been to carefully consider an emissions trading scheme, evaluating its burden on Japanese industry, associated impacts on employment, developments and effects of emissions trading schemes in other countries, and global warming countermeasures that are already implemented in Japan (e.g., voluntary actions by industry).

TOKYO METROPOLITAN GOVERNMENT

The Tokyo Metropolitan Government started the "Mandatory CO₂ Reduction and Emissions Trading Program" in April 2010. It requires mandatory reduction of absolute carbon dioxide (CO₂) emissions and implements a cap-and-trade program by amending the Tokyo Metropolitan Environmental Security Ordinance.

What is covered

The cap applies to large-scale facilities (buildings and factories) with a total consumption of fuels, heat and electricity of 1,500 kiloliters or larger per year in crude oil-equivalent. These facilities include large CO₂ emitters such as office buildings and factories. The program targets only energy-related CO₂ in the first stage; other gases will be added sequentially as necessary. The program covers approximately 1,300 facilities in Tokyo including 1,100 business facilities and 200 factories, and it

covers approximately 40 percent of the total volume of greenhouse gas (GHG) emissions by industrial and commercial facilities in Tokyo. The program differs from that of its EU ETS and US RGGI counterparts since it also includes within its scope large-scale office buildings.

What is required

The program sets five-year compliance periods and targets for total emissions over each five-year period. The first compliance period covered fiscal year 2010 through fiscal year 2014; the second compliance period covers fiscal year 2015 to fiscal year 2019. Covered facilities in the program must reduce energy-related CO₂ emissions (i.e., consumption of fuels, heat and electricity). During the first compliance period, 8 percent reductions were required for business facilities such as office buildings, and 6 percent reductions were required for industrial facilities such as factories. The percentage of reductions are calculated using base-year emissions, which are the average emissions of three consecutive fiscal years selected between fiscal year 2002 and fiscal year 2007. Total emissions of the covered facilities for the fiscal year 2014 were reduced by 25 percent from base-year emissions, amounting to a 14 million ton reduction in the first compliance period. For the second compliance period, the target has increased to a 17 percent reduction for business

facilities and a 15 percent reduction for industrial facilities. Owners of covered facilities must report the previous fiscal year's emissions to the Tokyo Metropolitan Government by the end of November every year.

Emissions trading launched in April 2010, when the registry started to manage emissions trading records. A filing must be made with the registry when acquiring, transferring or using excess reduction or offset credits to fulfill the reduction obligation. Five types of credits—Excess Credits (excess emission reductions), Small and Midsize Facility Credits (emission reductions from small and midsize facilities in Tokyo), Renewable Energy Credits, Outside Tokyo Credits (emission reductions outside Tokyo area) and Saitama Credits—are under the cap-and-trade program. Of those credits, Small and Midsize Facility Credits, Renewable Energy Credits, Outside Tokyo Credits and Saitama Credits are offset credits, which may be used to fulfill obligations under the program.

Future outlook

Looking forward to the Tokyo 2020 Olympic and Paralympic Games and beyond, the Tokyo Metropolitan Government set up a new Environmental Master Plan in 2016 that showcases the environmental policies to be implemented by 2030, which include the target of reducing greenhouse gas emissions by 30 percent below 2000 levels.



Emissions trading launched in April 2010, when the registry started to manage emissions trading records.

Connections

Tokyo Metropolitan Government and Saitama Prefecture signed the agreement to connect their emissions trading programs in September 2010. Since April 2011, Tokyo Metropolitan Government's cap-and-trade system has been connected to a similar reduction scheme in Saitama Prefecture. Excess Credits and Small and Midsize Facilities Credits issued by Saitama Prefecture are tradable under the Tokyo system.

SAITAMA PREFECTURE

One year after Tokyo, Saitama Prefecture established and started the "Target-Setting Emissions Trading Program," in which the prefecture sets reduction targets of covered facilities and allows them to trade allowances, in accordance with the Saitama Prefecture Global Warming Strategy Promoting Ordinance of April 2011.

What is covered

The coverage is basically the same as Tokyo's. It covers large-scale facilities (buildings and factories) with total consumption of fuels, heat and electricity of 1,500 kiloliters or more per year in crude oil-equivalent. Approximately 600 facilities are covered.

What is required

The first compliance period was a four-year term starting from fiscal year 2011 to fiscal year 2014 and now is in the middle of the five-year second compliance period starting from fiscal year 2015 to fiscal year 2019. For the first compliance period, an 8 percent reduction below base-year emissions was required for business facilities such as office buildings and commercial facilities and a 6 percent reduction was required for industrial facilities such as factories. As for the second compliance period, the target has increased to 15 percent for office buildings and commercial facilities and 13 percent for factories. Unlike the Tokyo scheme, there is no penalty for unachieved facilities.

Six types of credits—Excess Credits (excess emission reductions), Small and Midsize Facility Credits

(emission reductions from small and midsize facilities in Saitama), Renewable Energy Credits, Outside Saitama Credits (emission reductions outside Saitama Prefecture), Forest Absorption Credits (credits from forests inside the Saitama Prefecture) and Tokyo Credits—are tradable under the cap-and-trade program. The five credits other than Excess Credits are offset credits to be used to fulfill reduction obligations under the program.

Future outlook

Saitama Prefecture revised its global warming strategy action plan—Stop Global Warming Saitama Navigation 2050—in 2015 and set a target greenhouse gas reduction of 21 percent below 2005 levels by 2020.

Connections

Saitama's cap-and-trade program is connected to the Tokyo Metropolitan Government's program. Excess Credits from Tokyo Metropolitan Government's emissions trading system and Small and Midsize Facility Credits issued by Tokyo Metropolitan Government are officially eligible as offset credits.

KYOTO PREFECTURE

The Kyoto Prefecture has a "Kyoto Verified Emission Reduction" scheme managed by the "Kyoto CO₂ Reduction Bank," whose members are Kyoto Prefecture, Kyoto City, Kyoto Chamber of Commerce and Industry, The Kansai Electric Power Co., Inc., Osaka Gas, Co., Ltd., and four other industry associations and one environmental non-profit organization. It started in October 2011 and offers a unique credit system and emissions trading system. However, it does not impose any reduction obligation on facilities in Kyoto, like Tokyo, or set targeted reduction percentages on facilities in Kyoto, like Saitama, although the Kyoto Prefecture does have a target of 25 percent reduction below fiscal year 1990 levels by the fiscal year 2020.



The global future

Regional trading systems are expected to expand and increase their connections with one another

Carbon pricing and trading regimes are developing regionally in a bottom-up approach, rather than through a global top-down approach as some may have anticipated. As a result of this approach, regional trading programs are expected to expand in the coming years. For example, as the Canadian Province of Ontario intends to connect its emerging greenhouse gas (GHG) trading scheme with the California and Québec regimes by 2018, in the US, Oregon and Washington State are reportedly considering similar action.

However, the lack of an overarching global trading system leaves regional systems and those entities regulated by those systems in a slightly precarious position, as demonstrated by the litigation surrounding California's regional trading system. Other regional programs, such as the Australian emissions trading system, have already been disbanded due to political changes in the region.

The force of international cooperation, even in the form of "soft law" should not be underestimated though.

With COP23 coming up in November 2017, those who see emissions trading as a potential solution for carbon reduction will be eager to see the development of rules and procedures for international carbon trading.

Regulated businesses in the industrial and electricity sectors developing or acquiring power generation and other regulated stationary sources that have or are developing carbon pricing and/or trading regimes should understand the scope and limitations of emissions trading. Carbon trading systems may present operators and acquirers of regulated facilities with unique local compliance obligations, along with potential opportunities to take advantage of connections between different regional systems.

Going forward, as regional trading markets emerge, disband, change and connect with other regions, it will be important for market participants to remain aware of the legal and political developments and opportunities surrounding these issues as they develop, finance, acquire, sell and operate regulated emissions sources.



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