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Climate Change

State and Trends of Carbon Pricing

Washington DC
May 2014

2014

ECOFYS

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This report follows the evolution of carbon pricing around the world. Last year's report *mapped* the main carbon pricing initiatives. This year, the report presents the status of each of these developing initiatives and explores the emerging *trends* of carbon pricing. The focus is on the recent highlights from around the world, and on key lessons that can be drawn from the growing experience.

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LIST OF ABBREVIATIONS AND ACRONYMS

	°C	Degrees Celsius
A	**AAU**	Assigned Amount Unit
	ACCU	Australian Carbon Credit Unit
	ACR	American Carbon Registry
	ADB	Asian Development Bank
	ADP	Ad Hoc Working Group on the Durban Platform for Enhanced Action
	ARB	Air Resources Board
	ANREU	Australian National Registry of Emissions Units
B	**BAU**	Business as usual
	BOCM	Bilateral Offset Credit Mechanism
C	**CCB**	Climate, Community and Biodiversity
	CCER	Chinese Certified Emissions Reduction
	CCR	Cost Containment Reserve
	CCS	Carbon Capture and Storage
	CDM	Clean Development Mechanism
	CER	Certified Emission Reduction
	CFI	Carbon Farming Initiative
	CH_4	Methane
	Ci-Dev	Carbon Initiative for Development
	CITSS	Compliance Instrument Tracking System Service
	CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
	CO_2	Carbon dioxide
	CO_2e	Carbon dioxide equivalent
	COP	Conference of the Parties
	CP1	First Commitment Period under the Kyoto Protocol
	CP2	Second Commitment Period under the Kyoto Protocol
	CPM	Carbon Pricing Mechanism

D	**DNA**	Designated National Authority
	DOE	Designated Operational Entity
	DRC	Development and Reform Commission
E	**EB**	Executive Board
	EBRD	European Bank of Reconstruction and Development
	EC	European Commission
	EEA	European Economic Area
	EPC	Emissions Performance Credits
	ERPA	Emission Reductions Purchase Agreement
	ERU	Emission Reduction Unit
	ETS	Emissions Trading Scheme
	EU	European Union
	EUA	European Union Allowance
	EU ETS	European Union Emissions Trading System
F	**FCPF**	Forest Carbon Partnership Facility
	FVA	Framework for Various Approaches
G	**GCF**	Green Climate Fund
	GHG	Greenhouse gas
	GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Technical Cooperation Organization)
	$GtCO_2e$	Gigaton of carbon dioxide equivalent
H	**HFC**	Hydrofluorocarbon
	HFC-23	Trifluoromethane hydrofluorocarbon 23
I	**IBRD**	International Bank for Reconstruction and Development
	ICAO	International Civil Aviation Organization
	ICAP	International Carbon Action Partnership
	ICE	IntercontinentalExchange
	IEA	International Energy Agency
	IET	International Emissions Trading
	IETA	International Emissions Trading Association
	IGES	Institute for Global Environmental Strategies
	IMF	International Monetary Fund
	IPCC	Intergovernmental Panel on Climate Change
	ISO	International Organization for Standardization
	ITL	International Transaction Log

J	**J-CDM**	Japan Domestic Credit Scheme
	JCM	Joint Crediting Mechanism
	JCOS	Japan Carbon Offset Scheme
	JI	Joint Implementation
	JISC	Joint Implementation Supervisory Committee
	JNR	Jurisdictional and Nested REDD+
	J-VER	Japan Verified Emission Reduction Scheme
	JVETS	Japan Voluntary Emissions Trading Scheme
K	**KAZ ETS**	Kazakhstan Emissions Trading Scheme
	ktCO$_2$e	Kiloton of carbon dioxide equivalent
L	**LAC**	Latin America and the Caribbean
	LDC	Least Developed Country
	LEPID	Liable Entities Public Information Database
	LULUCF	Land Use, Land-Use Change and Forestry
M	**MOEJ**	Ministry of Environment Japan
	MOTCC	Mineral Oil Tax: Carbon Charge
	MRP	Market Readiness Proposal
	MRV	Monitoring, Reporting and Verification
	MtCO$_2$e	Megaton of carbon dioxide equivalent
	Mt	Megaton
	MW	Megawatt
N	**N$_2$O**	Nitrous oxide
	NAM	National Association of Manufacturers
	NAMA	Nationally Appropriate Mitigation Action
	NDRC	China's National Development and Reform Commission
	NGCT	Natural Gas Carbon Tax
	NGER	National Greenhouse and Energy Reporting
	NICFI	Norwegian International Climate and Forest Initiative
	NIM	National Implementation Measure
	NMM	New Market-based Mechanism
	NZ ETS	New Zealand Emissions Trading Scheme
	NZ EUR	New Zealand Emission Unit Register
O	**OECD**	Organisation for Economic Co-operation and Development
	OPR	Offset Project Registry
P	**PFC**	Perfluorocarbon
	PMR	Partnership for Market Readiness
	PoA	Program of Activities
	ppm	Parts per million

R /	**RBF**	Results-based Financing
	REDD	Reducing Emissions from Deforestation and Forest Degradation
	REDD+	Extends REDD by including sustainable forest management, conservation of forests, and enhancement of carbon sinks
	RGGI	Regional Greenhouse Gas Initiative
	RMU	Removal Unit
S /	**SBI**	Subsidiary Body for Implementation
	SBSTA	Subsidiary Body for Scientific and Technological Advice
	sCER	Secondary Certified Emission Reduction
	SF_6	Sulfur hexafluoride
	SGER	Specified Gas Emitters Regulation
T /	**t**	Ton (note that, unless specified otherwise, ton in this report refers to a metric ton = 1,000kg)
	tCO_2	Ton of carbon dioxide
	tCO_2e	Ton of carbon dioxide equivalent
U /	**UK**	United Kingdom
	UN	United Nations
	UNDP	United Nations Development Programme
	UNEP	United Nations Environment Programme
	UNFCCC	United Nations Framework Convention on Climate Change
	US	United States
	US EPA	United States Environmental Protection Agency
V /	**VCS**	Verified Carbon Standard
	VCU	Voluntary Carbon Units
W /	**WB**	World Bank
	WCI	Western Climate Initiative
Y /	**y**	Year
	y/y	Year-on-year

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Executive summary

Despite the difficult ongoing international climate negotiations, there is an increased focus on climate change policy and several economies are planning, implementing or refining domestic mitigation actions. These activities take careful note of past experiences, mirroring successes and dealing with weaknesses.

At the international level, the second commitment period of the Kyoto Protocol (CP2) covers only 12%[1] of global greenhouse gas (GHG) emissions. With only nine countries ratifying to date,[2] all eyes are on the United Nations Framework Convention on Climate Change (UNFCCC) 2015 Conference Of the Parties (COP) in Paris, which offers an opportunity for convergence on concerted international climate action. A consensual and robust international solution could revive private sector confidence to invest in carbon markets, as they remain reluctant to engage, having experienced significant losses within recent memory.

At a time when the international market is uncertain, it is the continued traction at regional, national and sub-national levels that shows some promise for the future (see Figure 1). The actions at domestic level have the potential to collectively overcome the international regulatory gap by fostering targeted low-carbon investments at regional and national level. Today, about 40 countries and over 20 sub-national jurisdictions are putting a price on carbon. Together, these carbon pricing instruments cover almost 6 gigatons of carbon dioxide equivalent ($GtCO_2e$) or about 12% of the annual global GHG emissions.[3, 4]

Carbon pricing comes in different guises

Scaling up GHG emission reductions and lowering the cost of mitigation is crucial to combating climate change. Given the size and urgency imposed by the climate challenge, a full range of carbon pricing approaches will be required. Carbon pricing instruments such as carbon taxes, emissions trading schemes, and crediting mechanisms are of fundamental relevance to internalize the external cost of climate change in the broadest possible

1 Ukraine, Kazakhstan, and Belarus included, although these countries have not yet decided whether or not they will ratify CP2.

2 As of May 1, 2014. Bangladesh, Barbados, Honduras, Kenya, Mauritius, Micronesia (Federated States of), Monaco, Sudan and the United Arab Emirates. At COP 18 CP2 was agreed in the form of the Doha amendment to the Kyoto Protocol. Ratification by 144 Parties is needed for the amendment to enter into force, but Parties agreed at COP 18 to apply it provisionally as of January 1, 2013 pending its entry into force.

3 Source for national emissions: Joint Research Centre of the European Commission/PBL Netherlands Environmental Assessment Agency, *EDGAR Version 4.2 FT2010*, 2012, http://edgar.jrc.ec.europa.eu/index.php. Rounded to two significant digits.

4 This calculation excludes the GHG emissions covered by the EU Effort Sharing Decision as well as the emissions covered by CP2. If these two mechanisms are considered, these numbers reach almost 9 $GtCO_2e$ or 17.5% of the global emissions (i.e., Ukraine, Belarus, and Kazakhstan are still pending ratification of CP2 as of the cut-off time of this report, and their GHG emissions were not included in the calculation).

»About 40 national and over 20 sub-national jurisdictions are putting a price on carbon. Together these carbon pricing instruments cover almost 6 $GtCO_2e$ or about 12% of the annual global GHG emissions.«

range of economic decision making and in setting economic incentives for clean development. In light of the limited public resources available, carbon pricing instruments are also needed to tackle the climate problem at scale and for their ability to foster complementary private sector investments and generate fiscal dividends.

Considering different carbon pricing approaches, a carbon tax, on the one hand, guarantees the carbon price in the economic system. An emissions trading scheme, on the other hand, provides certainty about the environmental impact, through the cap, but the price remains flexible. Sudden and unexpected changes in economic parameters can be harmful, disrupting the basic functioning of the market, one of the issues currently being tackled in the European Union Emissions Trading System (EU ETS).

In terms of stimulating mitigation activity, the choice between these instruments is less important than getting the design details right. Both instruments impact economic decision making through setting a price on carbon and both instruments raise revenues. In particular, taxes raise revenue directly, as do auctions in an emissions trading scheme. Careful use of the income stream can improve the effectiveness of the policy instrument.

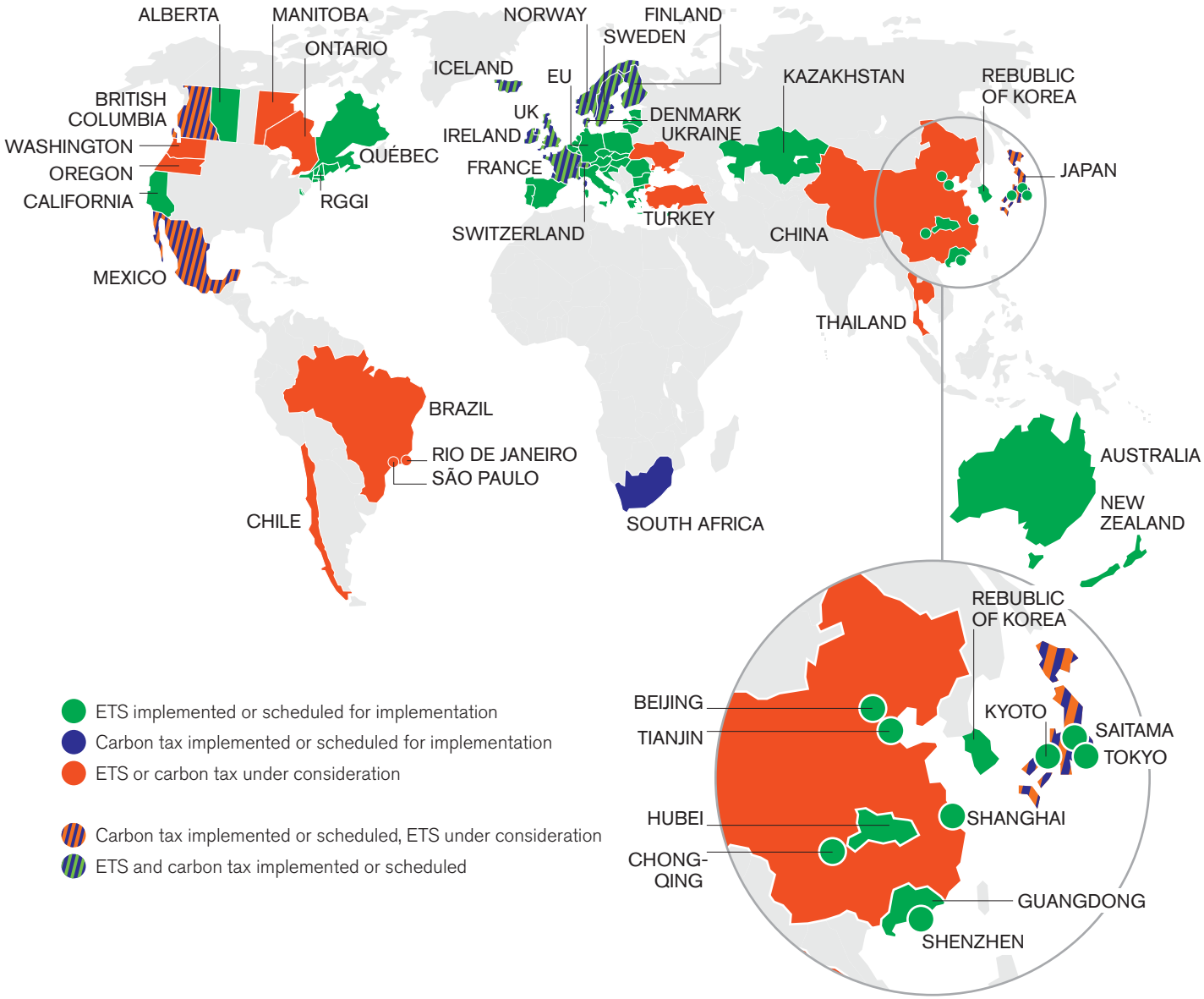
The reach of carbon pricing is steadily increasing Carbon pricing systems are now in operation in sub-national jurisdictions of the United States (US) and China. Whilst overall progress at the national level in China and the US may take some time, it is notable that the world's two largest emitters are now home to carbon pricing instruments. In addition, the increase in discussions between these two countries shows promise at global level.

»The world's two largest emitters are now home to carbon pricing instruments.«

Progress across the globe is steady. A total of eight new carbon markets[5] opened their doors in 2013 alone. With these new joiners, the world's emissions trading schemes are worth about US$30 billion.[6] China now houses the second largest carbon market in the world, covering 1,115 megatons of carbon dioxide equivalent ($MtCO_2e$),[7] after the EU ETS with its 2,084 $MtCO_2e$ cap in 2013.[8] Carbon taxation is also gaining ground. New carbon taxes were introduced in Mexico and France this past year. In North America, Oregon and Washington are searching for the right carbon pricing options, joining first-movers California, Québec and British Columbia in concerted efforts to tackle climate change.

5 California Cap-and-Trade Program, Québec Cap-and-Trade System, Kazakhstan Emissions Trading Scheme, and five Chinese pilot emissions trading schemes (Shenzhen, Shanghai, Beijing, Guangdong, and Tianjin).
6 This is for the national, regional and sub-national emissions trading schemes where a cap has been defined. It does not include the Kyoto Protocol international emissions trading. Calculated as the 2013 cap multiplied by the allowance price on December 31, 2013, or the latest available data before this date.
7 Cap for the six Chinese pilot emissions trading schemes in operation as of May 1, 2014 (Beijing, Guangdong, Hubei, Shanghai, Shenzhen, and Tianjin).
8 Excluding aviation.

Figure 1 Summary map of existing, emerging, and potential regional, national and sub-national carbon pricing instruments (ETS and tax)

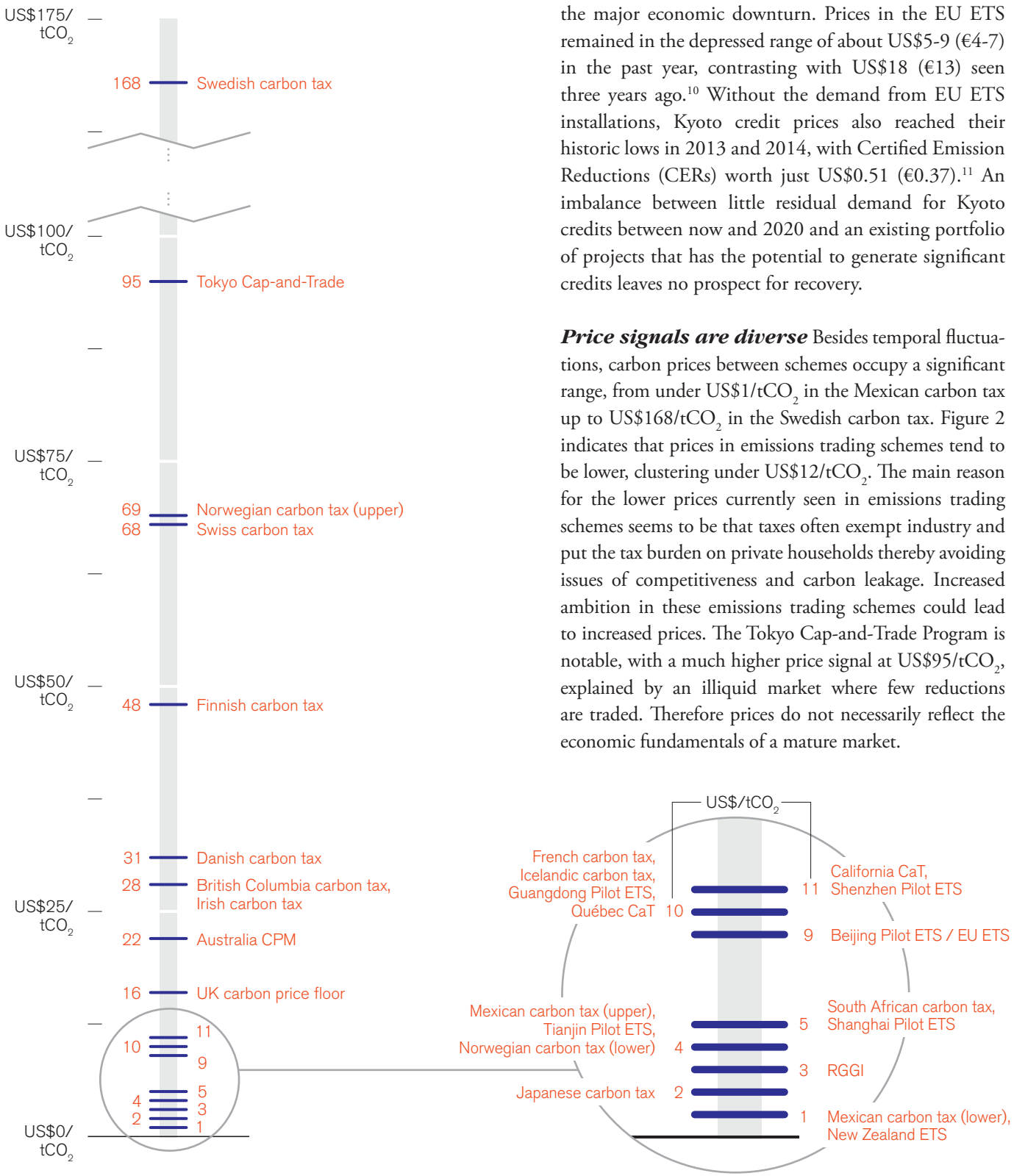


Two steps forward, one step back While some nations are taking concrete steps forward on carbon pricing, recent developments in others are a setback. The Australian government plans to repeal its Carbon Pricing Mechanism legislation and three major emitters, Japan, New Zealand and Russia,[9] officially pulled out of the second commitment period of the Kyoto Protocol.

In addition, the infrastructure created by the market-based mechanisms under the Kyoto Protocol continues to be dismantled as many players, including financial institutions, private sector intermediaries and aggregators, and Designated Operational Entities (DOEs) have either exited the market or substantially reduced their activities. No sign of a short-term recovery in demand for international credits from the existing and emerging initiatives led to an intensified exodus of private sector players in the last two years. Fears abound that the demobilization of the Clean Development Mechanism (CDM) market infrastructure could substantially damage the institutional memory that has been created, and delay the market recovery, if and when positive policy signals are given.

9 In addition, Canada withdrew from the Kyoto Protocol during the first commitment period.

Figure 2 Prices in existing carbon pricing schemes



Confidence in the EU ETS has been hit hard as the mechanism design has been unable to cope with the major economic downturn. Prices in the EU ETS remained in the depressed range of about US$5-9 (€4-7) in the past year, contrasting with US$18 (€13) seen three years ago.[10] Without the demand from EU ETS installations, Kyoto credit prices also reached their historic lows in 2013 and 2014, with Certified Emission Reductions (CERs) worth just US$0.51 (€0.37).[11] An imbalance between little residual demand for Kyoto credits between now and 2020 and an existing portfolio of projects that has the potential to generate significant credits leaves no prospect for recovery.

Price signals are diverse Besides temporal fluctuations, carbon prices between schemes occupy a significant range, from under US$1/tCO$_2$ in the Mexican carbon tax up to US$168/tCO$_2$ in the Swedish carbon tax. Figure 2 indicates that prices in emissions trading schemes tend to be lower, clustering under US$12/tCO$_2$. The main reason for the lower prices currently seen in emissions trading schemes seems to be that taxes often exempt industry and put the tax burden on private households thereby avoiding issues of competitiveness and carbon leakage. Increased ambition in these emissions trading schemes could lead to increased prices. The Tokyo Cap-and-Trade Program is notable, with a much higher price signal at US$95/tCO$_2$, explained by an illiquid market where few reductions are traded. Therefore prices do not necessarily reflect the economic fundamentals of a mature market.

10 Average price of EUAs in 2011. Source: IntercontinentalExchange, *EUA Daily Futures*, March 20, 2014.
11 Average price of secondary CERs in 2013. Record-low price of €0.03 observed in April 2013. Source: Ibid.

In carbon taxation schemes the prices are set and therefore reflect a range of political realities and goals, explaining the variety between countries. However, the majority of prices in existing systems are below $\$35/tCO_2$, one recent estimate of an appropriate shadow price of carbon.[12] Prices shall in principle suffice to stimulate low-carbon investments at scale and maximize mitigation in support of the transformation required to address the climate challenge.

Established players innovate with new and improved designs As experience with carbon pricing grows, scheme design is gaining in maturity and sophistication, introducing innovative features to tackle key challenges. The economic downturn, amongst others, has led to a significant surplus of allowances in the EU ETS, reducing scarcity and depressing prices. Realizing there is slim chance of future recovery under existing conditions, EU stakeholders, led by the European Commission (EC), have designed a plan to shore up the EU ETS. "Backloading"[13] in the short term, and the proposed market stability reserve in the long term, introduce some flexibility into the cap of this established system. This plan should enable the EU ETS to better contend with unenvisaged changes in economic circumstances. In the Regional Greenhouse Gas Initiative (RGGI), participating states increased their level of ambition by scaling back the overall cap by 45% in 2013 compared with the original plan, triggering a doubling of the price per allowance.

The Danish carbon tax stimulated emission reductions in the private sector, but with the additional revenues, government subsidies reinforced the signal from the tax and broadened the distribution of mitigation actions. Such complementary policy features help strengthen the effectiveness of a carbon tax.

At the international level, the design of the CDM evolved over time to integrate the lessons learned, making it a dynamic, but also ever-changing, mechanism. This had positive as well as negative impacts on transaction costs under the mechanism, as elaborated further in this report.

Blending of carbon taxation and emissions trading approaches is becoming more popular. Several jurisdictions are now experimenting with carbon pricing options that include elements of taxation, emissions trading schemes and offset crediting. In South Africa and Mexico, for example, taxes are combined with the offset credits.

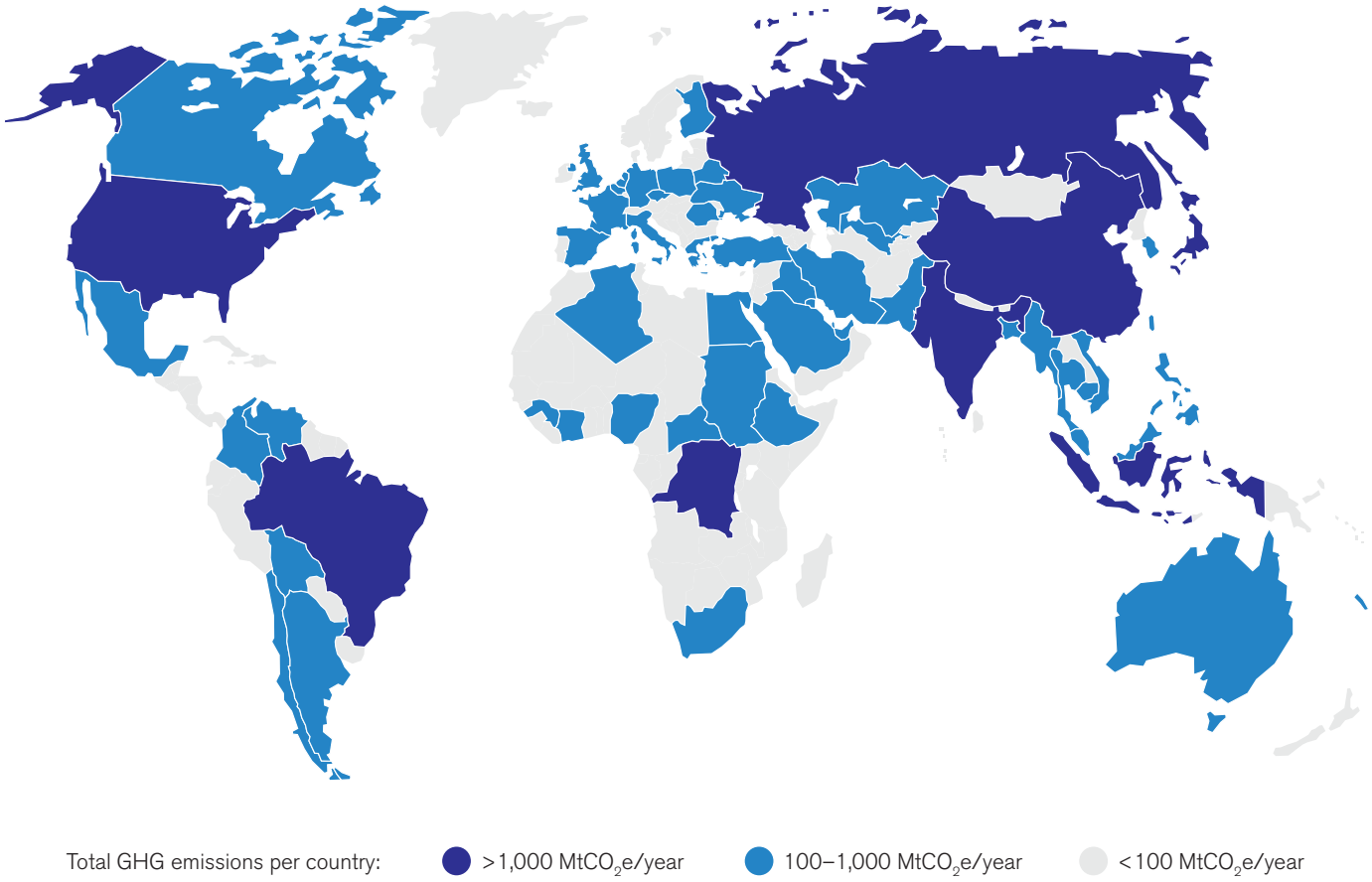
New designs need to find a way to maximize the effectiveness of market instruments, building efficiently on the past, but also deploying more suitable tools. In particular, different levers are needed to overturn the plethora of sectoral and regional investment barriers faced by many low-carbon technologies located in business environments with high levels of perceived risk.

Importantly, cooperation remains a key feature of success The international market has been struggling for some time. However, the current spate of domestic action has been buoyed by growing cooperation among regional, national and sub-national stakeholders. Although unilateral political changes have challenged the EU-Australia link, showing that linking is not always straightforward, cooperation between California and Québec demonstrates that carbon markets can grow through linking. In the future a variety of cooperative approaches could strengthen carbon pricing, and wider climate change policy, even further.

Figure 3 illustrates total GHG emissions for countries around the world. The substantial difference in countries' domestic emissions – and consequently, in emission reduction opportunities – across the globe, underlines the need for some sort of international cooperation that takes into account the vast range of domestic realities, priorities, and possibilities.

12 Source: United States Inter-Agency Working Group, *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, 2013.
13 Backloading involves shifting the planned auctioning of 900 million EUAs from the originally planned auctions from 2014 onwards, to the end of Phase III, i.e., 2019 and 2020, as an initial step to redress the current supply-demand imbalance.

Figure 3 Greenhouse gas emissions by country[14]

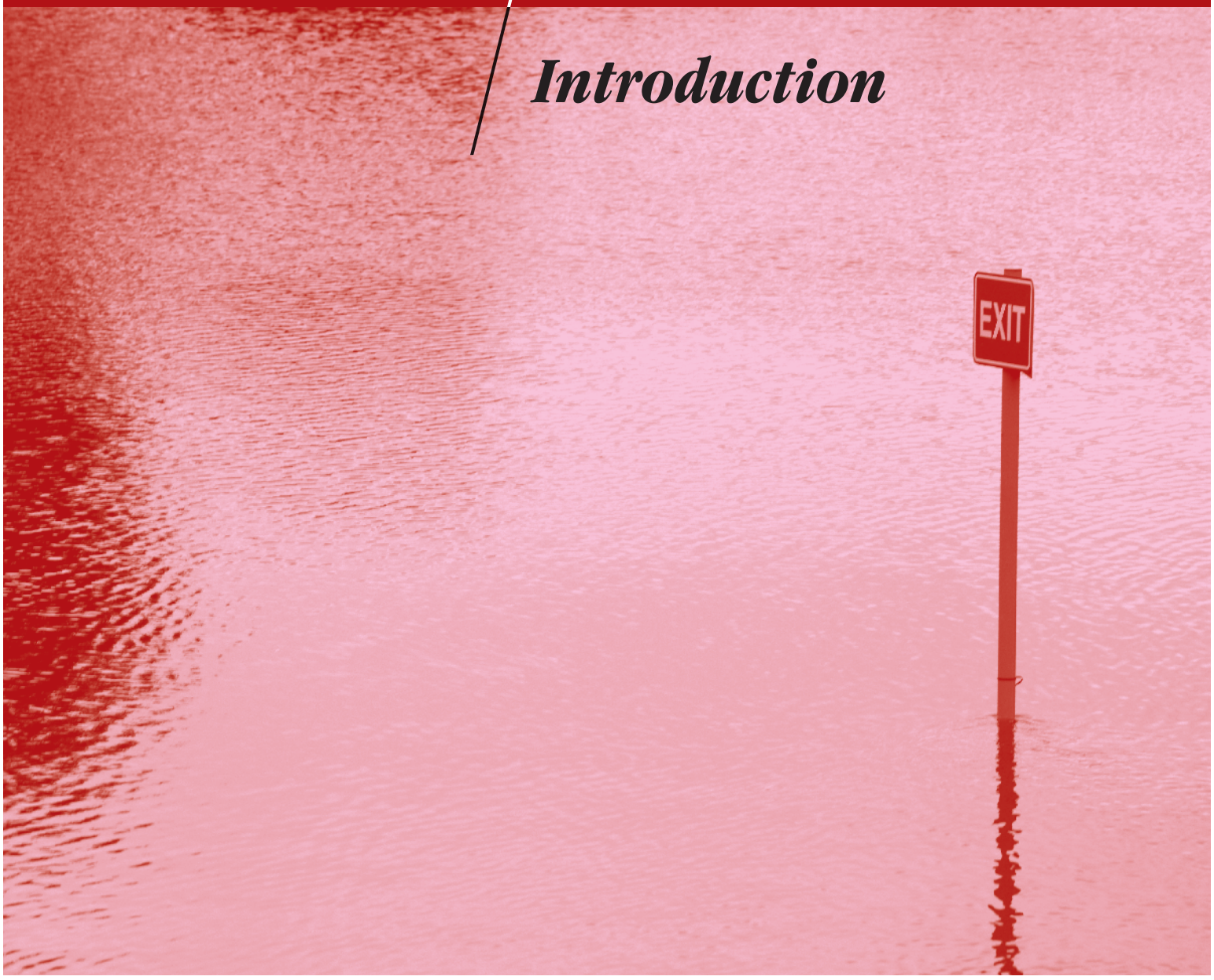


Such cooperation can create the basis for ambition. In turn, ambition itself can drive cooperation, as a tool to control cost and provide flexibility in compliance. Careful cooperation takes time, and may take several forms. Piloting and scaling up carbon pricing on an international level and increasing climate finance through market-based mechanisms is an important first step. The next challenge would be to create a product that is greater than the sum of its parts by converting fragmented initiatives into internationally integrated carbon pricing approaches.

14 Source for national emissions: Joint Research Centre of the European Commission/PBL Netherlands Environmental Assessment Agency, *EDGAR Version 4.2 FT2010*, 2012, http://edgar.jrc.ec.europa.eu/index.php. Rounded to two significant digits.

section **1**

Introduction



1 Introduction

» Those who are already feeling the effects of climate change don't have time to deny it – they're busy dealing with it. «

Barack Obama

Globally, 2013 was the fourth warmest year on record.[15] The Intergovernmental Panel on Climate Change (IPCC) confirmed that continuing our current pattern of greenhouse gas (GHG) emissions would likely lead to a rise in mean global temperatures of more than 2 degrees Celsius (2°C) and could trigger warming that exceeds 4°C by the end of the century.[16] This scale of increase will pose unprecedented risks to peoples' lives and well-being,[17] potentially reversing decades of economic development. Food, water, and human health crises, as well as other catastrophic risks, will be inevitable if climate systems are pushed beyond their tipping points.

Limiting the average global temperature rise to below 2°C compared to pre-industrial levels is commonly regarded as a prerequisite to avoid dangerous climate change. Achieving the 2°C target is still feasible on paper, although the window of opportunity is narrowing. Global GHG emissions reached approximately 50 gigatons of carbon dioxide equivalent ($GtCO_2e$) in 2010[18] and are projected to climb to 59 $GtCO_2e$ by 2020. The international community needs to slash GHG emissions by 15 $GtCO_2e$ to 44 $GtCO_2e$[19] to limit temperature rises to 2°C during the 21st century. Although this scale of change may seem beyond reach, it is technically possible. The total technical emission reduction potential is estimated to be in the range of 14 to 20 $GtCO_2e$ in 2020.[20] In practice, this means that the emission reduction potential in all countries needs to be mobilized to keep the 2°C target within reach.

15 Source: National Climate Data Center (NOAA), *Global Analysis – Annual 2013*, accessed March 24, 2014, http://www.ncdc.noaa.gov/sotc/global/2013/13.
16 Source: IPCC, *Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2013.
17 Source: IPCC, *Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*, 2012.
18 This figure is based on the EDGAR database, with 95% probability range of 45.6–54.6 $GtCO_2e$ in 2010. Source: UNEP, *The Emissions Gap Report 2013*, 2013.
19 This is needed to have at least a 66% chance of achieving a 2°C limit, and is based on least-cost mitigation pathway developed in Source: UNEP, *The Emissions Gap Report 2013*, 2013. To keep the prospect of a 2°C world alive in the longer term, global annual GHG emissions have to be curbed to 35 $GtCO_2e$ by 2030 and to 22 $GtCO_2e$ by 2050.
20 Source: UNEP, *The Emissions Gap Report 2013*, March 12, 2013.

A transformation of the global economy will be necessary to fully exploit this potential. Looking forward, over 70% of the reductions possible are in developing economies and economies in transition.[21] Given the new emissions scenarios, robust international cooperation will be needed to work together towards the common target. Serious efforts are required through public and private investments in green technologies, and clear and credible policies to correct market failures and to provide the right incentives. In the energy sector alone, the additional investment required consistent with a 2°C scenario is estimated to be US$910 billion per annum during 2010-2050.[22] This represents three times the entire existing climate finance flow of US$337 billion for mitigation purposes in 2012.[23]

» The emission reduction potential in all countries needs to be mobilized to keep the 2°C target within reach. «

Although countries are taking steps to address the problem, action to date is far from having the required impact at scale and covers a small fraction of the resources needed. Furthermore, countries participating in the second commitment period of the Kyoto Protocol represent only 12% of global GHG emissions.[24] Current pledges,[25] if fully implemented, are expected to help cut 5 $GtCO_2e$ in 2020 on average, thus leaving a mitigation gap of about 10 $GtCO_2e$. This gap is roughly equivalent to the annual GHG emissions from the European Union (EU), Russia and India combined.

Clearly and undeniably, the pledges put forward fall short of what is needed to achieve a 2°C world. Nevertheless, they constitute an important initial step towards internationally shared efforts that have to be pursued continuously and more aggressively post-2020. In 2011, at the 17th Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), Parties decided to complete negotiations on a new globally binding agreement by 2015, for implementation from 2020. Eyes will be on the outcomes of the 2015 COP in Paris, which will set the stage for the much needed international partnerships.

Scaling up emission reductions and lowering their cost is crucial to combating climate change. This requires, among other important aspects, the support of targeted policies, methodologies and regulatory frameworks. Given the size and urgency imposed by the climate challenge, a full plethora of policies will be required, and policy makers will have to ensure that these instruments can coexist in harmony and complement each other effectively. Policies need to create a business-enabling environment to support the deployment of low-carbon technologies that are currently less financially viable, and support the development of more efficient ones.

21 Source: IEA, *World Energy Outlook 2012*, 2012..
22 Source: IEA, *Energy Technology Perspectives*, 2012.
23 Source: Climate Policy Initiative, *The Global Landscape of Climate Finance*, 2013.
24 Ukraine, Kazakhstan, and Belarus included, although these countries have not yet decided whether or not they will ratify CP2.
25 According to several sources, even if countries keep up with their existing pledges, the global mean temperature is expected to rise in the range of 3 to 4°C by 2100, relative to the pre-industrial level. Source: UNEP, *The Emissions Gap Report 2013*, March 12, 2013; Climate Action Tracker, accessed March 17, 2014, www.climateactiontracker.org; World Bank, *Mapping Carbon Pricing Initiatives 2013, Developments and Prospects*, May 2013.

In recognition of the substantial incremental finance required and the limited public resources available to tackle the problem at scale, carbon pricing instruments are of fundamental relevance. They have an inherent capacity to foster the most-needed complementary private sector investments. For the purpose of this report, carbon pricing refers to initiatives that put an explicit price on GHG emissions. This includes emissions trading schemes, offset mechanisms, carbon taxes, and results-based financing. Such initiatives – which will be discussed at length in this report – are being planned and implemented at international, regional, national, as well as sub-national levels. Other policies that implicitly price GHG emissions, such as the removal of fossil fuel subsidies, fuel taxation, support for renewable energy, and energy efficiency certificate trading are also needed,[26] but this report focuses solely on those policies that aim to put an explicit price on emissions.

The objective of this report is to inform readers on existing and emerging carbon pricing initiatives worldwide, indicating key lessons learned from experiences so far and suggesting the possible role for carbon pricing in the context of the existing challenges. Section 2 first provides an overview of the carbon pricing approaches around the world, explores commonalities among the global initiatives and provides hints on how lessons from past experience are helping to shape new trends. Sections 3, 4 and 5 follow the same structure. Section 3 takes stock of the current state of international carbon pricing initiatives and analyses two existing initiatives, aiming to draw lessons learned and evaluate effectiveness. Sections 4 and 5 focus, respectively, on emissions trading schemes and crediting approaches, and on carbon taxes. These three sections highlight key updates compared to last year's report; detailed information can be found in Annexes I and II. The sign → ? indicates the page number in the annexes where further information can be found. The main body of the report concludes in Section 6 on the importance of international cooperation and the potential role of market instruments in the effort to stay within the 2°C path.

26 Source: IPCC WGIII, *Summary for Policymakers, Final Draft*, April 13, 2014; IPCC WGIII, *Climate Change 2007, Mitigation of Climate Change*, 2007.

section **2**

Carbon pricing instruments: overview, emerging trends and lessons learned

2 Carbon pricing instruments: overview, emerging trends and lessons learned

2.1 GLOBAL OVERVIEW OF CARBON PRICING INSTRUMENTS

About 40 national and over 20 sub-national jurisdictions are putting a price on carbon. The carbon pricing instruments specifically cover almost 6 $GtCO_2e$ or about 12% of the annual global GHG emissions.[27]

These carbon pricing instruments can be diverse, incorporating carbon taxes, emissions trading schemes, offsets and results-based financing, amongst others. Table 1 provides a count of the national and sub-national jurisdictions engaging with the two most prominent carbon pricing policies: emissions trading schemes and carbon taxes.[28]

Figure 4 shows which jurisdictions are developing these carbon pricing instruments. Some are choosing an emission trading scheme or tax specifically; others combine the two approaches or keep their policy options open.

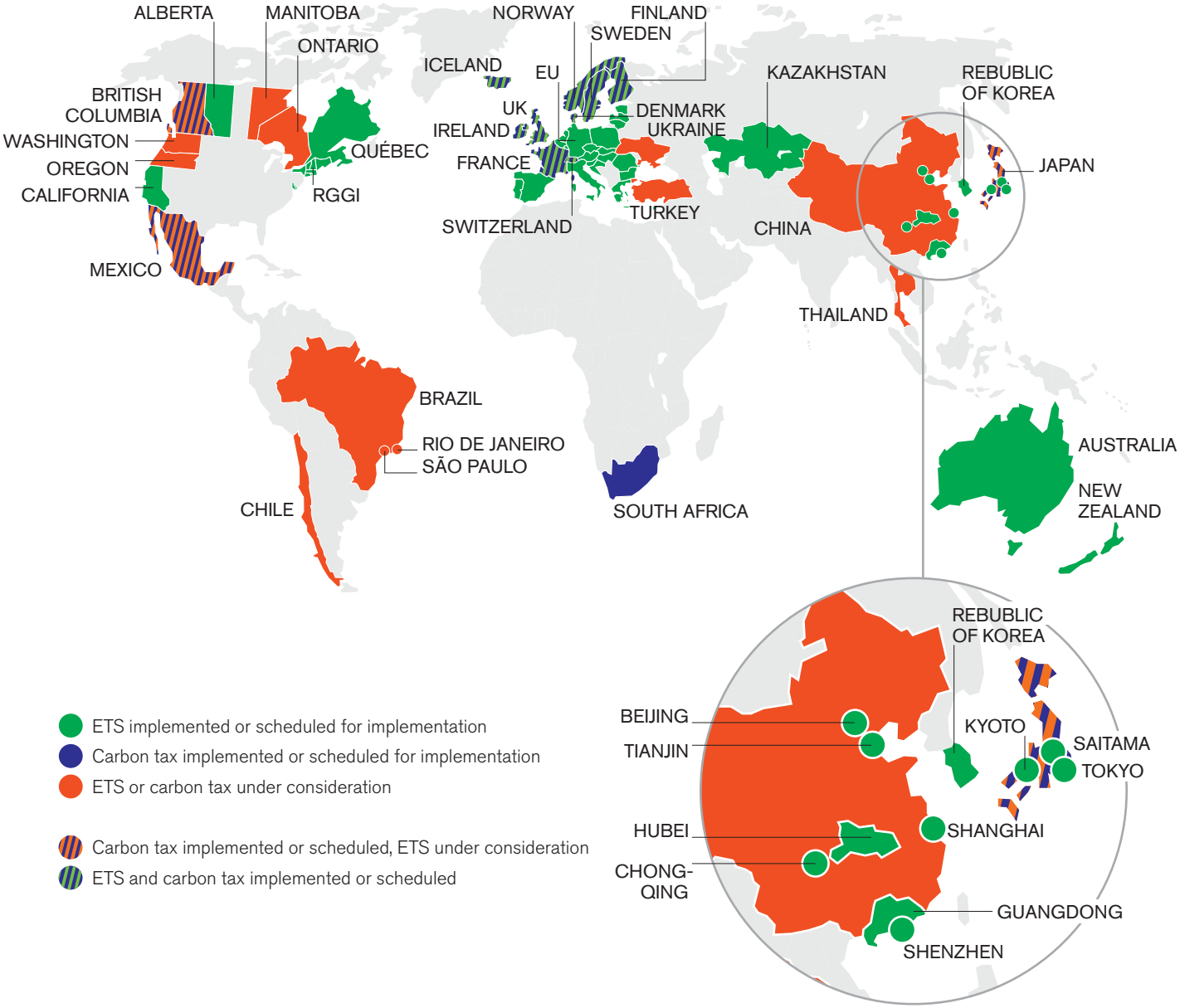
Table 1 Snapshot of number of emissions trading schemes and carbon taxes (existing and emerging)

Instrument	Status	Regional	National	Sub-national	Total
ETS	Implemented	1 (31 countries)	4	13	18
	Implementation scheduled		1	1	2
	Under consideration		8	3	11
Tax	Implemented		11	1	12
	Implementation scheduled		1		1
	Under consideration		2		2
Yet to be chosen			11	3	14

27 This calculation excludes the GHG emissions covered by the EU Effort Sharing Decision as well as the emissions covered by CP2. If these two mechanisms are considered, these numbers reach almost 9 $GtCO_2e$ or 17.5% of the global emissions (i.e., Ukraine, Belarus, and Kazakhstan are still pending ratification of CP2 as of the cut-off time of this report, and their GHG emissions were not included in the calculation).

28 ETS - implemented: Regional ETS: EU ETS; National ETS: Australia, Kazakhstan, New Zealand, Switzerland; Sub-national ETS: Alberta, California, six Chinese pilots, three Japanese schemes, Quebec, RGGI. / ETS – implementation scheduled: National ETS: Republic of Korea; Sub-national ETS: Chongqing. / ETS – under consideration: National ETS: Brazil, Chile, China, Japan, Mexico, Thailand, Turkey, Ukraine; Sub-national ETS: Rio de Janeiro, São Paulo, Washington State. / Tax – implemented: National tax: Denmark, Finland, France, Iceland, Ireland, Japan, Mexico, Norway, Sweden, Switzerland, UK; Sub-national tax: British Columbia. / Tax – implementation scheduled: National tax: South Africa. / Tax – under consideration: Chile, Republic of Korea. / Carbon pricing instrument to be chosen: National: Colombia, Costa Rica, India, Indonesia, Iran, Jordan, Morocco, Peru, Russia, Tunisia, Vietnam. Sub-national: Manitoba, Ontario, Oregon.

Figure 4 Summary map of existing, emerging, and potential regional, national and sub-national carbon pricing instruments (ETS and tax)



Note 1: The carbon pricing instruments under consideration (in orange) refer to emissions trading schemes, except in the case of Oregon, where discussions on the type of initiative to be implemented are underway.

Note 2: For more information on emissions trading schemes, see Figure 11. For more information on carbon taxes, see Figure 23.

2.2
EMERGING TRENDS IN CARBON PRICING INSTRUMENTS

This report's stock-take of recent developments in carbon pricing demonstrates that although the international climate negotiations are under some strain, experience with carbon pricing is growing and price information is becoming more widely available. Innovative solutions based on lessons from the past are being incorporated into the development of the new schemes, and into the continuous improvements of existing ones. The key emerging trends are set out here.

International regulatory environment remains uncertain It has been another year of slow progress at the international level. Although dialogue continues to focus on a robust and meaningful international climate change agreement in 2015, the pre-2020 ambition levels remain low, and there is uncertainty about the future climate regime.

This overarching context has fuelled further decline in the international carbon markets and without a substantial increase in the demand for Kyoto credits, there is little incentive for new origination of credits at project level. This scenario also contributes to the trend toward domestically-driven carbon pricing instruments.

In addition, the international context is one reason why the results-based financing (RBF) approach is gaining prominence. RBF has the potential to achieve concrete results, whilst leaving all market and non-market options open for the future.

Ongoing progress at the national level, but at a cautious pace The trend towards increasing national or regional level carbon pricing schemes continued at a steady pace in 2013. A total of eight new carbon markets[29] opened their doors in 2013 alone, with an additional market opening in Hubei in 2014. With these new joiners, the world's emissions trading schemes are worth about US$30 billion.[30] China now houses the second-largest carbon market in the world, covering 1,115 $MtCO_2e$,[31] after the EU ETS with its 2,084 $MtCO_2e$ cap in 2013.[32]

Countries and regions who already had plans have been elaborating their individual policies further this year[33] such as Brazil, Chile, Thailand, Indonesia and South Africa. The introduction of a carbon tax in Mexico and the announcement of a possible ETS in its energy sector mark a clear addition to the global carbon pricing picture. Other countries and regions have shown steps forward in their level of interest in carbon pricing, for example Tunisia[34] and Russia, the latter of which published a Presidential decree that could take them on a path to an ETS in the longer term. In addition to government initiatives, the International Civil Aviation Organization (ICAO) has discussed the potential of a market-based mechanism for aviation by 2020.

»A total of eight new carbon markets opened their doors in 2013 alone.«

Despite the steady and continuing trend towards the introduction of carbon pricing, there have been some steps in the other direction. The proposal from the current Australian government to remove the Carbon Pricing Mechanism (CPM), although foreseen last year, is a significant setback, as are statements by Japan about a reduced emission reduction target, and the official withdrawal from Japan, New Zealand, and Russia from the second commitment period of the Kyoto Protocol.

29 California Cap-and-Trade Program, Québec Cap-and-Trade System, Kazakhstan Emissions Trading Scheme, and five Chinese pilot emissions trading schemes (Shenzhen, Shanghai, Beijing, Guangdong, and Tianjin).
30 This is for the national, regional and sub-national emissions trading schemes where a cap has been defined. It does not include the Kyoto Protocol international emissions trading. Calculated as the 2013 cap multiplied by the allowance price on December 31, 2013, or the latest available data before this date.
31 Cap for the six Chinese pilot emissions trading schemes in operation (Beijing, Guangdong, Hubei, Shanghai, Shenzhen, and Tianjin).
32 Excluding aviation.
33 Including many of the Partnership for Market Readiness (PMR) countries.
34 Tunisia joined the Partnership for Market Readiness (PMR) in March 2014.

National circumstances continue to play an important role Reasons behind the notable changes observed, such as those in Australia, Japan and Mexico are diverse. Political statements and positioning are important, but so are the attitudes of the local population and broader political issues such as energy prices, economic growth and perceptions of competitiveness. Carbon pricing decisions are expected to remain specific to the national context and strategic priorities, as well as to these other pressures.

Importantly, the geographic spread of the existing and planned carbon pricing initiatives remains wide, spanning from Thailand, China and Australia through North and South America and into Europe. However, the distribution of actual implementation is not even. Many countries are taking into account their experiences, often as hosts of the Clean Development Mechanism (CDM) or Joint Implementation (JI), and are reluctant to commit to a new initiative until they are certain it is robust and will take hold.

In some of the fast-emerging economies, economic growth may speak to a faster development of climate change policies than the institutions and existing legislative background is ready for. Countries such as Morocco, Kazakhstan, Turkey and Tunisia are benefitting from a range of donor-funded programs to help them develop their institutional and legal framework to enable the implementation of carbon pricing instruments now, as in the case of Kazakhstan, and in the future. Through a range of programs run by GIZ, EuropeAid, the World Bank (WB), USAID and NORAD, amongst others, carbon pricing instruments are increasingly integrated in such countries' broader climate change mitigation agendas through targets or voluntary emission reduction goals.

Governments in developing countries, such as Mexico and China, are building on their experience with the CDM to develop instruments that are adapted to their context. They may directly use existing projects or methodologies. At the same time, these countries can try and combine climate considerations with development priorities and constraints, e.g., through valuation of co-benefits and contribution to local development. This proactive engagement will help address the limited ability of the Kyoto mechanisms to capture and properly respond to the interactions between the climate and development agendas.

Designs support economic growth There continues to be a clear emphasis on creating schemes that offer advantages domestically as well as fitting into the global climate change goals. There has been an increase in competitiveness measures both in some taxation countries, e.g., in Denmark and in the EU ETS, which this year introduced compensation mechanisms for the indirect impact of the scheme on electricity prices in electro-intensive industries. These types of measures, although important to the economy, have to be designed in a way that ensures they do not risk counteracting the main purpose of an instrument. Some analysts posit that the UK's unilateral implementation of a carbon price floor, which on the one hand is deemed relevant to enable the UK to remain on track to their ambitious 2050 emission reduction cuts, on the other hand, could reduce GHG emissions in the UK, decreasing the overall demand for EUAs and ultimately bringing down the European Union Allowance (EUA) price below transformational levels. This would potentially reduce UK emissions at the cost of increasing emissions in other EU economies.

In addition, many of the new carbon pricing instruments, such as the Mexican tax, include domestic offsetting programs, which channel resources back into the relevant jurisdiction. These offsetting schemes demonstrate a desire to support the national economy but also some learning from the CDM and voluntary markets.

A focus on preparatory no-lose measures is prevalent Concerns about the future of international carbon markets and a preference for a cautious approach are restricting activities in some countries to no-regret measures. There is an emphasis on readiness and building basic infrastructures, such as data management and monitoring, reporting and verification (MRV), as in the case of Turkey, to allow countries to be flexible and well prepared for whatever might come next.

This slow but steady approach is likely to fast-track the design and operationalization of future national and sub-national schemes when the time is right. This approach is particularly well suited to countries currently relying on international demand for credits and that are not yet ready to create schemes that generate domestic demand. In parallel, the experience gained during this preparatory stage will feed into the formulation of international mechanisms.

Cooperation continues but formal linking moves more slowly The Québec–California linkage was cemented in 2013, becoming a reality at the start of 2014. This is a significant further step towards integrating carbon markets, and demonstrates how aligning design at the outset can simplify the linkage of schemes. However, no further linking activity was observed in 2013, and in a sense this is slower progress than seemed apparent in previous years. Furthermore, the recent changes in Australia call into question the likelihood of the Australian–EU ETS link coming to fruition and the Swiss linkage with the EU ETS is also temporarily stalled.

Linking between nascent domestic carbon markets appears to be rather difficult, from a political perspective, and is not currently the priority for most jurisdictions. However, linking is not necessarily the only or right solution for countries to create efficient carbon pricing instruments.

On the other hand, strong international cooperation continues to inform the development of carbon pricing instruments, with increasing dialogue about developments both at the political and technical level and between private sector and public sector actors. Australia has signed a Memorandum of Understanding with China, the US and China have engaged in promising discussions towards converging objectives, and the EU is actively engaged in sharing experiences in China as well. Donor programs provide an opportunity for South–South and South–North dialogue. In addition, many private sector practitioners previously engaged in CDM activities are now bringing their know-how into new carbon pricing instruments. This cooperation spreads the knowledge and experience on carbon pricing, which helps mitigate the risk of the "brain drain" currently experienced by the CDM and JI markets.

The carbon tax vs. ETS debate is defusing Carbon taxes and emissions trading schemes are among the most common carbon pricing options. As more countries tackle questions related to carbon pricing, the perceived choice between a carbon tax and an ETS is becoming less acute. Box 1 outlines the core features required to ensure that these instruments achieve their goals.

A carbon tax, on the one hand, guarantees the carbon price in the system. An emissions trading scheme, on the other hand, provides certainty about the environmental impact, through the cap, but the price remains flexible. Sudden and unexpected changes in economic parameters can be harmful, disrupting the basic functioning of the market.

Box 1 Desirable design features for carbon pricing instruments

By Ian Parry,
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From the perspective of economic efficiency, desirable design features for carbon pricing schemes include:[35]

- **Comprehensive coverage of emissions**, which can be achieved through implementing pricing in proportion to carbon content on the supply of petroleum products, coal, and natural gas. Alternatively, for some sectors (e.g., electricity) charges can be levied at the point of fuel combustion, though administration may be more involved (and small-scale emitters are often excluded).

- **A uniform price applied to all emissions**, which is appropriate as the damage per ton of emissions is the same, regardless of which fuel they come from or who is using the fuel.

- **Stable and predictable emissions prices**, which promote cost-effectiveness through equating incremental abatement costs at different points in time and help to establish the longer-term signals needed to promote clean technology investments. Provisions to prevent prices declining are also needed to improve compatibility with other mitigation measures (e.g., incentives for renewables).

- **Emissions prices aligned with environmental damages or climate stabilization goals**. Estimates of future climate change damages suggest CO_2 should be priced in the order of $35 per ton,[36] though damage assessments are highly contentious. Alternatively, for example, a global CO_2 price starting at about $30 per ton (in current dollars) in 2020 and rising at around 5% a year would be roughly in line with ultimately containing mean projected warming to 2.5°C at least cost[37]

- **Maximizing the fiscal dividend**, which means raising revenues and using the revenues productively, particularly lowering the burden of broader taxes that distort the economy or funding socially desirable (climate-related or other) spending. Failure to exploit the fiscal dividend can undermine the case for carbon pricing over regulatory approaches on cost-effectiveness grounds.[38]

- **Carefully targeted compensation schemes for vulnerable households and firms**. Excessive compensation has a high cost in terms of diverting funds from the public budget. With regard to trade-exposed firms, international price floor agreements (analogous to those applied to value added and excise taxes in the EU) provide some protection against losses in competitiveness while allowing individual countries the flexibility to price emissions more aggressively (e.g., due to fiscal and ancillary environmental benefits or green preferences). →

35 Source: International Monetary Fund, *Fiscal Policy to Mitigate Climate Change: A Guide for Policymakers* (Washington DC, 2012).
36 Source: United States Inter-Agency Working Group, *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, 2013.
37 Source: Nordhaus, W.D., *The Climate Casino: Risk, Uncertainty, and Economics for a Warming World* (New Haven, Connecticut: Yale University Press, 2013).
38 Source: Parry, I. and Williams, R.C., *Moving US Climate Policy Forward: Are Carbon Tax Shifts the Only Good Alternative?* (Climate Change and Common Sense: Essays in Honor of Tom Schelling, Oxford University Press, 2012).

In principle, either carbon taxes or emissions trading schemes can meet the above criteria, and in this regard the choice between which type of instrument is less important than getting the design details right of the instrument that is implemented. For example, trading schemes can include allowance auctions to raise revenue and price stability provisions (e.g., price floors where allowances are withdrawn from the market as needed to prevent prices falling below a target level).

On the other hand, a carbon tax can be a more natural extension of existing fuel excises, which are widely accepted and easily administered, without major exemptions (and charges for other environmental damages, most notably air pollution from coal, could be levied at the same time). Moreover, with finance ministries responsible for tax collection, the prospects might be better for using revenues to lower broader taxes on work effort and capital accumulation.

The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.

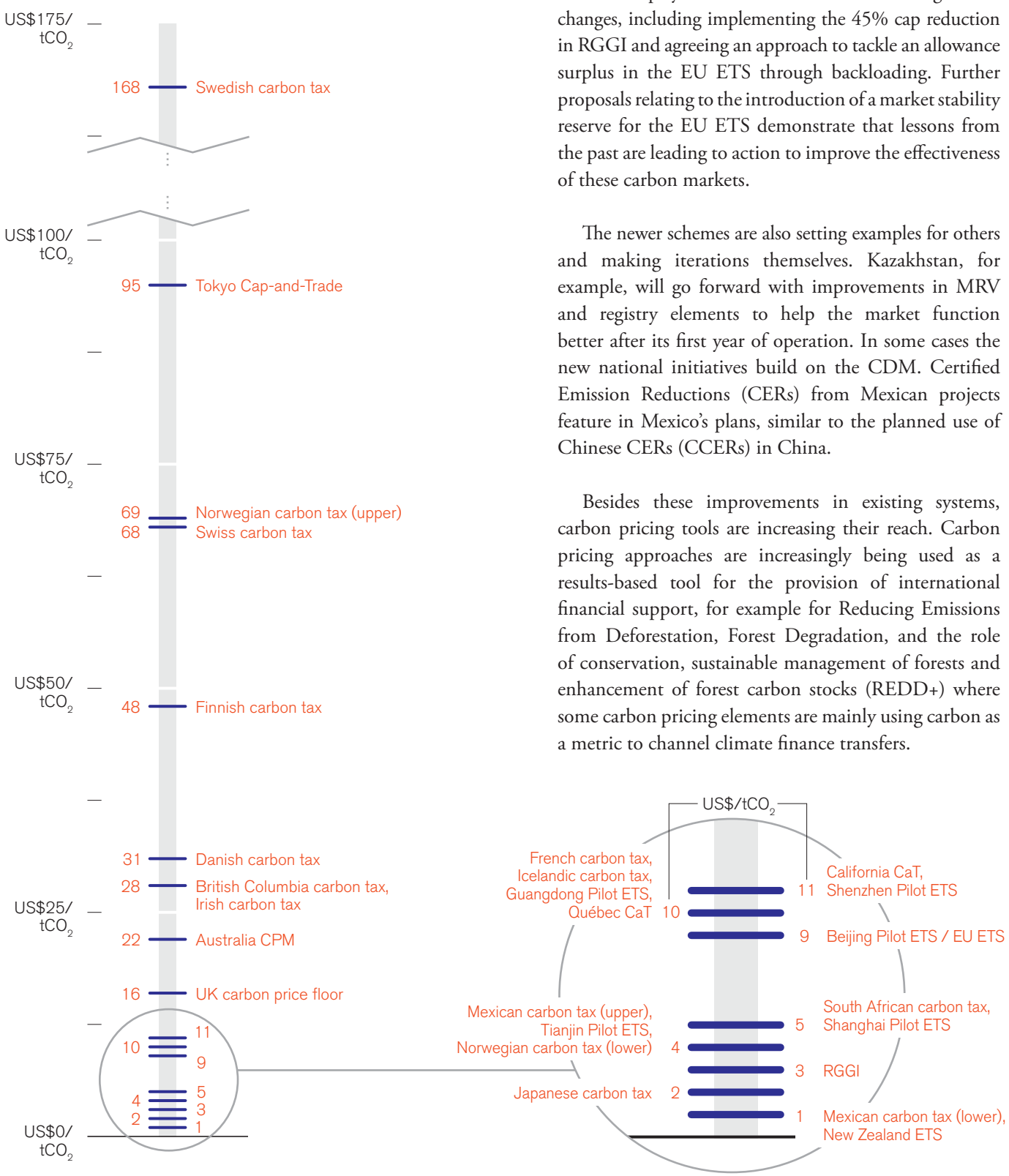
In terms of stimulating mitigation activity, the choice between these instruments is less important than getting the design details right. In particular, taxes raise revenue directly, as do auctions in an emissions trading scheme. The careful use of these revenues can help to ensure the effectiveness of the policy instrument.

The choice of instrument will be governed by a number of priorities and circumstances. A carbon tax can often be easier and faster to implement, particularly in sectors that might be less well suited to a market approach, e.g., sectors with few players, which would not allow for functional trading. An ETS may offer different advantages, including opening a dialogue with the private sector, enabling flexibility in compliance approaches, and having a predetermined environmental outcome. More policy makers are using a mix of features from the two instruments to optimise their approach.

In the North American Pacific Northwest, several states are considering carbon pricing, and are making choices about the design of their instrument: tax-like or ETS-like. In Brazil, the investigation of a potential ETS roadmap was accompanied by a thorough study of carbon taxes. Furthermore, the government of Chile, which is considering an ETS, recently stated it was open to considering a carbon tax. Several regions are applying hybrid approaches, such as South Africa, which includes offsets in its taxation system, California and Regional Greenhouse Gas Initiative (RGGI) which include a cost containment element to their ETS making them somewhat more tax-like in character. The CPM in Australia started as a tax, with plans to gradually develop into an ETS later on.

In this report, carbon pricing is investigated in the separate categories of carbon tax and ETS, but this division is not black and white.

Figure 5 Prices in existing carbon pricing schemes



Carbon pricing continues to become more sophisticated and is diversifying The established players have moved forward with significant changes, including implementing the 45% cap reduction in RGGI and agreeing an approach to tackle an allowance surplus in the EU ETS through backloading. Further proposals relating to the introduction of a market stability reserve for the EU ETS demonstrate that lessons from the past are leading to action to improve the effectiveness of these carbon markets.

The newer schemes are also setting examples for others and making iterations themselves. Kazakhstan, for example, will go forward with improvements in MRV and registry elements to help the market function better after its first year of operation. In some cases the new national initiatives build on the CDM. Certified Emission Reductions (CERs) from Mexican projects feature in Mexico's plans, similar to the planned use of Chinese CERs (CCERs) in China.

Besides these improvements in existing systems, carbon pricing tools are increasing their reach. Carbon pricing approaches are increasingly being used as a results-based tool for the provision of international financial support, for example for Reducing Emissions from Deforestation, Forest Degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) where some carbon pricing elements are mainly using carbon as a metric to channel climate finance transfers.

The market is increasingly revealing new price information The emissions trading schemes in California, Québec, Kazakhstan and six of the seven Chinese regions entered into operation in 2013 and early 2014, making it a significant period of time in terms of actual carbon market development and price discovery. Prices vary significantly from scheme to scheme, and in the Québec and California programs they are hovering just above the minimum auction price.

Besides temporal fluctuations, carbon prices between schemes occupy a significant range, from under US$1/tCO$_2$ in the Mexican carbon tax up to US$168/tCO$_2$ in the Swedish carbon tax. Figure 5 indicates that prices in existing emissions trading schemes tend to be lower than taxes, clustering under US$12/tCO$_2$. The main reason for the lower prices currently seen in emissions trading schemes seems to be that taxes often exempt industry and put the tax burden on private households thereby avoiding issues of competitiveness and carbon leakage.

Increased ambition in these systems could lead to increased prices. The recent price rise in RGGI, following the tightening of the cap, illustrates the potential for prices to increase as schemes mature and are refined.

The Tokyo Cap-and-Trade Program is notable, with a much higher price signal than most emissions trading schemes at US$95/tCO$_2$, explained by an illiquid market where few reductions are traded. Therefore prices do not necessarily reflect the economic fundamentals of a mature market.

The prices are set in carbon taxation schemes and therefore reflect a range of political realities and goals, explaining the variation between countries. The majority of existing pricing instruments generate carbon prices below US$35/tCO$_2$, one recent estimate of an appropriate shadow price of carbon.[39] Getting the price right, as explained in Box 1, is a key principle of a carbon pricing instrument.

2.3 POLICY DESIGN LESSONS FROM THE EXISTING EXPERIENCES

Looking in more detail at a selection of the longest-running carbon pricing instruments provides further insights on the outcomes, market operation, and policy design of such instruments. This report looks more closely at several such instruments: international emissions trading under the Kyoto Protocol, the CDM, the EU ETS, the NZ ETS, and the Danish and British Columbian carbon taxes. The main findings are presented below.

Carbon pricing instruments work: but not always in the manner or to the extent expected All of the instruments listed above have stimulated emission reductions, and have gone some way towards climate change mitigation. However, not all of the results are of the scale expected, as was the case with the Danish carbon tax voluntary agreements, where the emission reductions achieved were lower than initially estimated.

Emission reductions are not always distributed in the manner expected. The NZ ETS did not stimulate emission reductions domestically at the rate envisaged and the CDM experience showed an uneven distribution between countries and technologies. Some flexibility in the distributional aspects of outcomes can be acceptable, depending on the original policy goals, and that flexibility should be expected when introducing a carbon pricing instrument.

39 Source: United States Inter-Agency Working Group, *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, 2013.

Often complementary measures are needed in addition to a main carbon pricing instrument. For example in the case of the Danish tax, additional policies are still required to stimulate energy efficiency. In the CDM, investments in projects need to be accompanied by other design features or instruments to enable transformational change in an economy. The EU ETS tends to be implemented together with carbon taxes in a complementary manner in the Nordic countries, showing that often more than just one instrument or policy-lever is required.

The emissions trading schemes and offset systems investigated here had the power to create independently functioning and sophisticated markets, which were attractive to the financial sector and resulted in the engagement of a wide range of market participants. The financial infrastructure related to the EU ETS and the CDM in particular was able to respond quickly to opportunities, sometimes providing important liquidity to the market, but at other times being forced to follow short-term signals that eventually contradicted the goals of long-term mitigation.

In addition, and as was the intention, the emission reductions achieved through market-based mechanisms were mostly through least-cost abatement options, but they therefore resulted in a narrow focus of reduction efforts on certain sectors, e.g. in the case of the CDM. In addition, although low prices could be perceived as an indicator of good policy design, policy makers in the EU were criticised by some for designing a system that delivered prices that were too low to support a wide range of more expensive long-term investments, e.g., in renewable power.

Instruments can be designed to be more cost-effective and flexible Lower implementation costs could have helped maximize the cost-effectiveness of each instrument. The transaction costs under the CDM, including MRV and legal costs, further concentrated the mechanism on low-risk investments in proven clean technologies. This observation may help lend support to more streamlined and simplified approaches in the future that, nevertheless, do not compromise integrity significantly.

The instruments with market elements were not designed to adapt to changes in macro-economic conditions. This led to an oversupply of carbon allowances and credits under a scenario of low demand. The EU ETS suffers from a surplus now because of this initial inflexibility which has consequently impacted the CDM market. Furthermore, the overarching lack of demand in the international context has influenced the CDM market, which has had a knock-on impact on the NZ ETS.

Increasingly, as in the EU ETS, more rules are being added to carbon pricing instruments to create stability and certainty. The design of these rules needs to be carefully tuned to avoid being too complex, whilst providing sufficient predictability in the schemes.

Linking can influence market behavior with both positive and negative results These experiences also show that linking between markets, both directly and indirectly, is powerful and effective. The prices in the NZ ETS were eventually wholly determined by the CDM market, and the CER prices were heavily dependent on the EU ETS. These linkages have both proved to be positive, in the case of strong demand to get the CDM market up and running, and in lowering the potential high costs of mitigation in New Zealand, and negative as problems occurring in one market are transferred to every player in the chain.

Levers that work for the private sector do not always deliver at government level The Assigned Amount Unit (AAU) trading experience under the Kyoto Protocol demonstrates that the drivers to engage sovereign governments and the private sector are different, and therefore a variety of policy approaches are needed to engage these different types of players. However, this experience also shows that the private and public sector entities can complement each other and play different roles, e.g., demonstration of projects, risk taker, arbiter, etc.

The private sector role in achieving emission reductions was powerful and welcome. This leverage of private finance, as well as skills, is important to the ultimate success of climate mitigation policy. However, the reliance on private sector led efforts – as is the case under the CDM – can limit the integration of the emission reduction activities in the wider climate change strategies of host countries.

Policy designers need to take overlaps and interactions into account Importantly, all of these cases show that interaction with other policies is complex and difficult to predict fully. These interactions may be with domestic policies, as in the case of the EU ETS where the impacts of renewable energy and energy efficiency policies were not properly accounted for, or they may be with other international policies, as in the case of the NZ ETS where the full impact of the open link with the Kyoto flexible mechanisms was not anticipated.

These lessons should help policy makers implementing carbon pricing instruments to predict more clearly which policy overlaps are important from the outset. In addition, the need to have mechanisms to review policies and account for mismatches between expectations and delivery is an important way to achieve results and also to keep all players engaged on both the government and private sector sides.

Deeper investigations will help guide better policy choices The extent to which the economic theory which underpins carbon pricing approaches is borne out in reality will help develop carbon pricing instruments that deliver mitigation in a given national context. Further scrutiny of existing schemes would be welcome and should guide these trends in the future.

section **3**

International carbon pricing approaches

3 International carbon pricing approaches

3.1 STATUS OF THE INTERNATIONAL CLIMATE NEGOTIATIONS

COP 19 took place in Warsaw, Poland, in November 2013, marking the mid-point in the four-year negotiation window for the new post-2020 climate agreement. Sharp divisions between Parties remain to be tackled before a new agreement can be concluded. The large emitters, among emerging economies, have made it clear that they will not agree to binding emission reduction targets post-2020 if developed countries do not increase their level of ambition. The objective following COP 20, due to take place in Lima, Peru, is to have a negotiating text ready by May 2015.[40] Parties are invited to submit their post-2020 national mitigation "contributions" by the first quarter of 2015, in advance of COP 21.

The lack of mitigation ambition pre-2020 continued to slow down discussions on existing and new international market-based mechanisms.[41] Parties participating in the second commitment period of the Kyoto Protocol (CP2) – from 2013 to 2020 – represent only 12% of global emissions, and the Doha Amendment, which contains the emission reduction targets Parties put forward for CP2, is not in force yet. The COP put forward an invitation to Parties to promote the voluntary cancellation of CERs, without double counting, as a means of contributing to closing the pre-2020 ambition gap. Under the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), the COP urged Parties to broaden, enhance and implement their existing emission reduction pledges for 2020, and invited Parties which have not done so to submit their pledges.[42]

Warsaw marked a milestone in the integration of local and sub-national governments in the international climate negotiations. The discussions focused on urbanization, and specifically buildings and transport, and on the role of local governments to enhance global mitigation efforts through action at the local level.[43]

40 Source: UNFCCC, Decision 1/CP.19, *Further Advancing the Durban Platform*, January 31, 2014.
41 Existing: the Clean Development Mechanism (CDM) and Joint Implementation (JI), see Sections 3.2.2 and 3.2.3. New: New Market-based Mechanism (NMM) and Framwork for Various Approches (FVA), see Section 3.3.
42 Source: UNFCCC, Decision 1/CP.19, *Further Advancing the Durban Platform*, January 31, 2014.
43 Source: *Workshop on Pre-2020 Ambition: Urbanization and the Role of Governments in Facilitating Climate Action in Cities*, November 14, 2013, http://unfccc.int/files/documentation/submissions_from_parties/adp/application/pdf/adp2.3_urbanization_workshop_agenda_.pdf.

3.2 MECHANISMS UNDER THE KYOTO PROTOCOL

3.2.1 Supply and demand outlook for Kyoto credits

98 ← ***Demand*** With no increase in countries' ambitions under the UNFCCC the demand for Kyoto credits (CERs and Emission Reduction Units – ERUs) remains low. Major emitters pulling out of the Kyoto Protocol and Australia questioning its CPM further depress the already limited demand. The maximum residual demand is estimated at around 1,120 to 1,230 megatons of carbon dioxide equivalent ($MtCO_2e$), coming mostly from the EU ETS and the Effort Sharing Decision (See Table 2). This is likely to be overestimated given the progress of EU member states towards the targets under the Effort Sharing Decision. Market analysts estimate that EU ETS installations are likely to use most of their Kyoto credit limit in the next couple of years, six years ahead of the 2020 deadline, given the current low price and the spread with European Union Allowances (EUAs), and uncertainty on the eligibility of Kyoto credits post-2020.[44] That will leave Kyoto credits without their largest historical buyers.

Supply The current CDM and JI portfolio is estimated to have the potential to issue between 3,500 and 5,400 $MtCO_2e$ for 2014-2020, should the demand exist (See Table 2). This is around three to five times the expected residual demand. This balance is not expected to tip until 2020. The actual supply of credits will continue to head downwards towards demand.

Addressing the supply–demand imbalance Various initiatives underway might create additional demand for international credits pre-2020. A few governments recently launched tenders to purchase CERs (see Section 3.2.2), and some domestic schemes like the new Mexican tax (see Section 5.2.9) and the Chinese emissions trading scheme pilots (see Section 4.3.1) allow the use of CERs issued by CDM projects located in the country. The impact of these initiatives is uncertain at this stage, but it will not be enough to fill the ambition gap and revive the market.

3.2.2 The Clean Development Mechanism (CDM)

Market update Since the second half of 2012 there has been a growing feeling in the CDM market that demand is saturated. With little prospect of a significant recovery, the biggest players have begun to leave the market, along with their skills and expertise. A first wave saw investment banks and trading houses exit. In parallel, project developers continued to consolidate, reducing their carbon operations, and diversifying their activities. In February 2014, as a further sign of the steady decline of the CDM, DNV GL, once the biggest Designated Operational Entity (DOE), announced its withdrawal from the validation and verification service → 99 business, followed by JCI in March.

This exodus dilutes the knowledge and know-how that have been built up over the past 15 years. It also undermines the trust of private sector players and the public confidence in the CDM in particular and in carbon markets in general. After the severe losses faced

Table 2 Residual demand for and potential issuance of CERs and ERUs (2014–2020)

	Residual demand for 2014–2020 ($MtCO_2e$)	Full potential for issuance for 2014–2020 ($MtCO_2e$) Figure based on the registered portfolio, not considering the effect of the demand on the issuance levels
CERs and ERUs	EU ETS: 400–500 Effort Sharing Decision: < 700 NZ ETS: 20–30 Total: < 1,120–1,230	3,500–5,400

Source: Own calculations, Thomson Reuters Point Carbon, December 19, 2013 and CDC Climat, December 2013.

44 Under the current EU proposal for 2030 emission reduction targets, no demand for international credits post-2020 is planned.

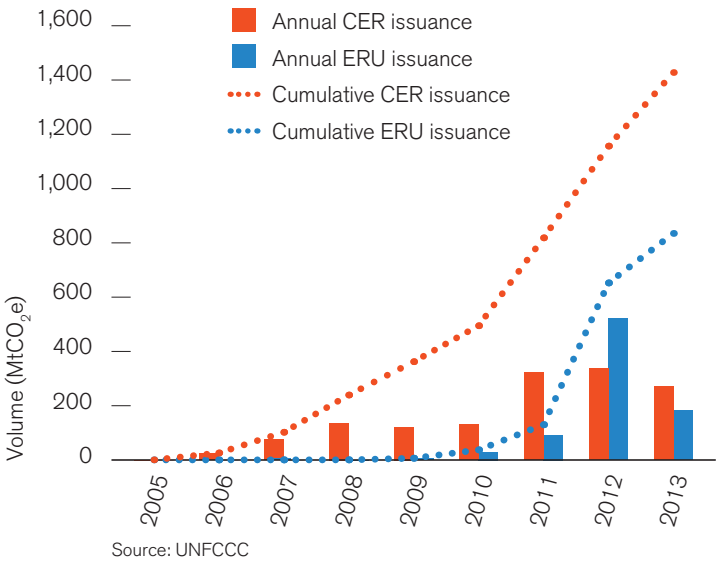
by many private sector pioneers – some estimates of stranded CDM costs are as high as US$66 billion asset value write-down[45] – both trust and skills will have to be rebuilt for the market to recover.

100 ←

The level of activity in CDM projects on the ground mirrors the market downturn, as shown in Figures 6 and 7. With a CER price that averaged €0.37 ($US0.51) in 2013[46] and no price recovery foreseen in the near future, the whole CDM pipeline, from start of validation to issuance, has seen a considerable decrease in 2013:

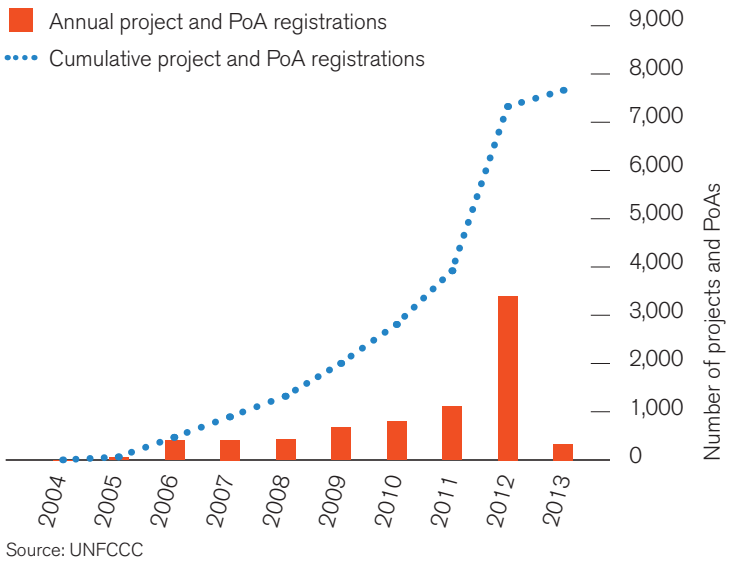
- ***An 88% decrease in submissions for validation observed in 2013 compared to 2012:*** 226 projects and programs of activities (PoAs) were submitted for validation, compared to 1,891 in 2012. In 2013 as a whole, 30% fewer projects started validation than in April 2012 alone, which witnessed the highest number of new validations in the CDM's history.[47]
- ***Ten times fewer projects and PoAs registered in 2013 compared to 2012:*** 338 registrations were made in 2013 compared to 3,428 in 2012 (see Figure 7). Furthermore, some of the 2013 registrations were due to a backload of projects that developers had hoped would make the December 31, 2012 deadline for acceptance of CERs into Phase III of the EU ETS. The number of registrations in 2014 is therefore likely to be even lower. In parallel, the rate of renewal of crediting periods for existing projects is also decreasing.
- ***March 2014 bore the lowest monthly CER issuance for the past three years:*** just under 6 $MtCO_2e$ were issued in March 2014, more than 75% lower than the 28 $MtCO_2e$ issued on average every month in 2012. Issuances in 2013 dropped by 22% compared to 2012 (see Figure 6). In total 265 $MtCO_2e$ was issued in 2013, of which 58%[48] was before the entry into force on April 30 of the ban on CERs from some industrial gas projects in the EU ETS.[49] The current carbon price barely covers the costs of MRV, which are estimated to be from €0.20 to over €1 per tCO_2e.[50] More projects are likely to stop these MRV activities and some are at risk of stopping emission reductions altogether by venting their greenhouse gases. About 161 $MtCO_2e$ is expected to be issued in 2014, which represents a 40% decrease compared to 2013.[51]

Figure 6 CER and ERU issuance (2005-2013)



Source: UNFCCC

Figure 7 Project and PoA registrations (2004–2013)



Source: UNFCCC

45 Source: Philp, L., *Stranded Costs from the Demise of the Clean Development Mechanism*, May 2013, http://www.co2spain.com/strandedcostpaper.php.
46 Average price of secondary CERs in 2013. Source: IntercontinentalExchange, *Daily Future sCERs*.
47 Source: UNFCCC, Personal Communication, May 6, 2014.
48 Source: UNFCCC, Personal Communication, April 28, 2014; UNFCCC, Personal Communication, May 6, 2014.
49 CERs from projects involving the destruction of trifluoromethane hydrofluorocarbon 23 (HFC-23) and nitrous oxide (N_2O) emissions from adipic acid production.
50 Source: Ecofys, *CDM Market Support Study*, May 10, 2013; Warnecke, C., *Can CDM Monitoring Requirements Be Reduced While Maintaining Environmental Integrity?*, Climate Policy, 2014.
51 Source: Thomson Reuters Point Carbon, *Carbon Market Outlook 2014–2016 … Steady Does It…*, Carbon Market Analyst, February 26, 2014.

Analysts predict that around 125 $MtCO_2e$ will be traded on the primary CER market in 2014, a 38% drop compared to 2013. Further decreases to 70 $MtCO_2e$ in 2015 and 30 $MtCO_2e$ in 2016 are forecast. In the secondary CER (sCER) market it is estimated that 527 $MtCO_2e$ was traded in 2013, down by 76% compared to 2012. The sCER market value is expected to reach around €236 million in 2014.[52]

101 ← The CDM Executive Board (EB), the private sector and public sector institutional investors are exploring financing and policy instruments to revive the carbon market. For example the establishment of a CER floor price, cancellation of CERs, activation of new demand sources, purchase activities and results-based financing (RBF).[53] It is unlikely that these initiatives will offset the need for Parties to address the ambition gap. Large public sector institutional investors, active at the start of the CDM, are playing a more prominent role again to slow infrastructure demobilization, enable the use of the CDM to deliver RBF, and to test new approaches to market-based mechanisms.

Policy update Efforts to improve and streamline the design of the CDM continue. These aim to position the CDM as a functioning tool for when demand increases and to make it attractive for non-compliance usage including through RBF. They, however, do not address the pressing issues of the lack of demand and the weakening of the market infrastructure.

The first four standardized baselines under the CDM[54] were approved in 2013. Work on streamlining procedures for PoAs and supporting the top-down development of methodologies also continued. Regional cooperation centers provided capacity building and direct support for project development in regions currently under-represented in the CDM.[55]

At COP 19, the negotiations on CDM reform were encouraging given current market circumstances and prospects. The areas for reform currently being considered are the historical ones, namely governance, streamlining of procedures and environmental integrity.[56] Revision of the CDM modalities and procedures was postponed, with a recommendation on this expected at COP 20.[57]

3.2.3 Joint Implementation (JI)

Market update JI faces a dual challenge of the lack of ambition and the uncertainty over the future regulatory infrastructure to issue ERUs. In 2012 issuance of ERUs was higher than that of CERs, reversing a trend seen since the inception of the market in 2005 (see Figure 6). Russia and Ukraine issued 492 million of the total 526 million ERUs that year before the end of the first commitment period of the Kyoto Protocol (CP1) and prior to the new eligibility rules for their largest buyers (the EU ETS installations). A significant issuance of 184 million ERUs was seen in 2013. Most of the ERUs came out of Track 1 (97% in 2013 and 98% in 2012), without the supervision of the Joint Implementation Supervisory Committee (JISC), triggering some speculation on the level of rigor applied.

In 2013, 26 new JI projects entered the UNFCCC pipeline compared to 229 in 2012, which represents a nine-fold reduction. Only five new projects were listed in 2013, which is a 98% decrease compared to 2012,[58] a clear indication of the lack of ambition.

52 Source: Thomson Reuters Point Carbon, *Carbon Market Outlook 2014–2016 … Steady Does It…*, Carbon Market Analyst, February 26, 2014.
53 Source: Ecofys, *CDM Market Support Study*, May 10, 2013.
54 Two grid emission factors (Southern African Power Pool and Republic of Uzbekistan), a baseline for charcoal production in Uganda and a baseline for technology switch in rice mills in Cambodia. Source: UNFCCC, *Standardized Baselines*, accessed February 17, 2014, https://cdm.unfccc.int/methodologies/standard_base/new/sb7_index.html.
55 Particularly some countries in Africa, the Caribbean and Latin America.
56 Governance: membership and composition of the EB, role of the designated national authority (DNA), liability of DOEs. Streamlining of procedures: provisions for PoAs, length of crediting period, simplification of project cycle for certain project categories. Environmental integrity: additionality demonstration.
57 Source: UNFCCC, *Decision -/CMP.9 Review of the Modalities and Procedures for the Clean Development Mechanism*, 2013.
58 Source: UNEP Risoe, *JI Pipeline*, March 1, 2014, http://cdmpipeline.org/publications/JiPipeline.xlsx.

Policy update As ERUs for post-2012 reductions cannot be created until Assigned Amount Units (AAUs) for CP2 are issued, 2013 ERU issuances correspond to pre-2012 emission reductions. To enable the issuance of ERUs for post-2012 emission reductions, the JISC asked the COP to allow JI host Parties with a target to undertake advance issuance of AAUs. With no decision made in Warsaw, the issue remains.[59] Although JISC requested an urgent reform of the mechanism, the review of the JI guidelines was deferred. Discussions will continue this year and negotiators aim for a decision to be adopted at COP 20.

3.2.4 International Emissions Trading (IET)

No further decisions have been made since Doha, 2012, on carry-over of AAUs from CP1 to CP2. Parties are still buying and selling AAUs from CP1, as they have to surrender AAUs equivalent to their target in the first half of 2015. The World Bank estimated cumulative purchases of AAUs and Removal Units (RMUs) of 277 $MtCO_2e$ by the end of 2011.[60] Additional known AAU purchases in 2012 and 2013 amount to approximately 121.6 $MtCO_2e$. Although trading is still permitted throughout 2014, little purchasing of AAUs is foreseen from this point, with potential further purchases from Spain and Luxembourg planned totalling 14 $MtCO_2e$.[61]

3.3 NEW APPROACHES TO MARKET INSTRUMENTS UNDER THE UNFCCC: THE NEW MARKET-BASED MECHANISM (NMM) AND THE FRAMEWORK FOR VARIOUS APPROACHES (FVA)

The top-down new market-based mechanism (NMM) and the Framework for Various Approaches (FVA) have been under discussion for the last two years. At COP 18 in Doha, the Subsidiary Body for Scientific and Technological Advice (SBSTA) was tasked to work on the role of these two mechanisms and their technical design.[62, 63] However, an increasing number of developing countries question the relevance of discussing new instruments until developed countries have increased their level of ambition. As a result, negotiations around the NMM and the FVA moved at a slow pace in 2013, and the SBSTA did not reach any consensus. In Warsaw negotiations were curtailed by a broader discussion on the use of markets as a mitigation tool and on the potential role of the FVA in laying the basis for accounting rules in the 2015 agreement. Some form of consensus emerged on the role of the FVA as an information-sharing platform, but the negotiations eventually broke down and no decision was made. Talks are to resume at the next SBSTA meeting in June 2014.

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In parallel to international negotiations, an increasing number of initiatives are underway to test new approaches to market-based mechanisms and feed into the negotiations.

59 Source: UNFCCC, *FCCC/KP/CMP/2013/4, Annual Report of the Joint Implementation Supervisory Committee to the Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol*, October 21, 2013.
60 Source: Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012.
61 Source: Thomson Reuters Point Carbon, *Carbon Market Outlook 2014–2016 … Steady Does It…*, February 26, 2014.
62 Source: UNFCCC, *FCCC/TP/2013/6, Technical Synthesis on the New Market-Based Mechanism, October 22, 2013. Source: UNFCCC, FCCC/TP/2013/5, Technical Synthesis on the Framework for Various Approaches*, October 22, 2013.
63 Recognizing that countries need a mix of market and non-market based approaches to tackle climate change, the SBSTA was mandated in Doha to initiate a third work program on non-market-based approaches (NMAs). Discussions are undwerway, but NMAs are not defined yet, and their relationship with the NMM and the FVA remains unclear.

3.4 OTHER INTERNATIONAL CARBON PRICING APPROACHES

3.4.1 Results-based financing (RBF)

Results-based financing[64] (RBF) is a financing approach increasingly employed to support development objectives and domestic policy goals. The defining element is that payments are made upon the delivery of pre-defined, verified results. RBF was pioneered in the health sector, but is increasingly being considered as a means to finance the adoption of low-carbon development pathways and GHG emissions abatement, including through the Green Climate Fund (GCF).[65]

In the climate finance context, payments for verified results fit well with the requirements for MRV and the objective to incentivize private sector mitigation activities. RBF can use different metrics as a basis for payments including emission reductions or avoided emissions. When using a carbon metric it becomes an instrument of direct carbon pricing and can build on the infrastructure of existing market instruments. This feature is recognized under the UNFCCC. To enhance pre-2020 ambition to ensure the highest possible mitigation efforts under the Convention, the COP invites Parties to promote the voluntary cancellation of CERs (see Section 3.1).

Several climate finance initiatives are being considered with RBF and cancellation of emission reductions in mind. For example, a study group on methane finance, established in late 2012 on the request of the G8, recommended that RBF uses a carbon metric as an instrument to achieve methane abatement. This could be done by making use of the CDM infrastructure and other carbon offset standards, and by using an auctioning approach.[66] As a result of the study group a dedicated pilot auction facility for methane and climate mitigation is being designed to inform the scale-up of pay-for-performance climate finance approaches, including through the Green Climate Fund. There is also increasing interest to deploy RBF for mitigation activities with high development benefits, such as under the Ci-Dev initiative.

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3.4.2 Reducing Emissions from Deforestation, Forest Degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+)

REDD+ became a major negotiating issue at the 2007 COP in Bali, which created an opportunity to develop a formal mitigation mechanism linked to forests as part of a post-2012 climate change agreement (annual emissions arising from forest loss amount to about 3,000 $MtCO_2e$ globally).[67]

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At COP 19 in November 2013, important progress was made on REDD+ with the adoption of the Warsaw REDD+ framework,[68] which includes seven decisions on finance, institutional arrangements and methodological issues. Together with earlier COP decisions made between 2007 and 2012, these form the building blocks for REDD+. Specifically on financing of REDD+, it was reaffirmed in Warsaw that RBF for REDD+ may come from a variety of sources, including markets as well as public sources. The GCF was recognized as playing a "key role" for REDD+ financing.

The development of large emission reduction programs for REDD+ thus far occurs in the absence of a compliance mechanism. The majority of the funding is coming from bilateral and multilateral funding such as

64 Many terms are currently used to describe funding approaches where payment is made upon the verified delivery of pre-defined results. This report uses RBF as an umbrella term to encompass the full range of funding instruments operating in this way.
65 "The Fund may employ results-based financing approaches, including, in particular for incentivizing mitigation actions, payment for verified results, where appropriate.", Source: Green Climate Fund, *Governing Instrument for the Green Climate Fund*, 2011.
66 Source: Methane Finance Study Group, *Methane Finance Study Group Report*, April 2013.
67 Source: Harris, N., Brown, S., Hagen, S. C., Baccini, A., Houghton, R., *Progress toward a Consensus on Carbon Emission from Tropical Deforestation*, November 2012.
68 Source: UNFCCC, *Report of the Conference of the Parties on Its Nineteenth Session, Held in Warsaw from 11 to 23 November 2013, Part One: Proceedings, Advance Version, Paragraph 44*, January 31, 2014.

the Forest Carbon Partnership Facility (FCPF) and the new BioCarbon Fund Initiative for Sustainable Forest Landscapes. The pricing approaches for the different initiatives are fragmented between the limited number of other REDD+ RBF schemes at program scale. One example is Norway's International Climate and Forest Initiative, where a payment level of US$5/tCO$_2$e has been used for both the Brazil Amazon Fund and the Guyana REDD+ Investment Fund.[69] Other emission reductions transacted in the forest carbon markets are generated by project-level activities, as opposed to REDD+ programs envisaged at national or jurisdictional level. In 2012, the average price for forestry offsets fell slightly to US$7.8/tCO$_2$e.[70] Prices have been declining due to limited demand and increasing supply. In early 2014, the average bid and offer for issued credits was US$5–6/tCO$_2$e.[71] Almost all project-level REDD+ emission reductions are currently transacted in the voluntary carbon market, but they are characterized by heterogeneity of demand, high price variability, and lack of transparency.

Leveraging the private sector and markets is generally considered essential to generate the level of REDD+ funding to cover a larger share of REDD+ emission reductions and to increase overall cost-efficiency of mitigation. However, these preconditions are difficult to achieve given the current lack of demand for carbon credits at the international level.

3.4.3 Private sector voluntary market[72]

Demand for voluntary carbon offsetting is driven by motivations other than regulatory compliance. Nonetheless, international policy events and signals – for better or worse – impact both voluntary offset supply and demand.

Following several years marked by only slight variations in voluntary offset demand, offset suppliers reported a decline in both market size and average price in 2013. According to preliminary survey results published by Forest Trends' Ecosystem Marketplace, suppliers transacted at least 67 MtCO$_2$e in 2013, down from 101 MtCO$_2$e in 2012. The global average offset price also dropped by approximately 17% to US$4.9/tCO$_2$e.

This development largely reflects policy influences, including California's launch as a compliance offset market and stalled demand for Australia-based offsets in the wake of the recent uncertainty around carbon pricing.[73]

The market's slightly lower price is reflective of increasingly competitive pressures among offset suppliers facing both depressed compliance offset prices and oversupply, and the continued issuance of new offsets from purely voluntary offset projects in the forestry and clean cookstoves project sectors. Suppliers that successfully transacted offsets in 2013 described buyers' continued focus on projects and methodologies that deliver and measure the environmental and social "co-benefits" of offset projects – above and beyond emissions reductions.

At the national level there are several voluntary carbon markets in Japan (see Section 4.2.10). At the corporate level, there is further evidence of companies taking carbon seriously even outside compliance regimes. In the US 29 companies have introduced an internal carbon price of some sort, ranging from US$6 to US$60/tCO$_2$e. This is prevalent in utility and energy companies whose core business is carbon intensive (e.g., BP and ExxonMobil), but carbon pricing is present across all sectors (e.g., as used by Google, Microsoft, Disney, Walmart, and Delta Airlines).[74]

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69 Source: Norwegian Government, *Calculating 2012 Performance Based Payments to Guyana Based on Interim Performance Indicators*, 2012, http://www.regjeringen.no/upload/MD/2012/Nyheter/Technical_note_payments.pdf.

70 Source: Peters-Stanley, M. et al., *Covering New Ground, State of the Forest Carbon Markets in 2013*, 2013.

71 Source: Thomson Reuters Point Carbon, March 2014 REDD price report, April 16, 2014.

72 This section strongly benefited from the kind contributions from Forest Trends' Ecosystem Market Place. Assertions here are supported by data gathered by Forest Trends' Ecosystem Market Place and published in a similar timeframe to this report.

73 The transactions are thus no longer tracked in this Forest Trends' Ecosystem Marketplace annual survey. Pre-compliance preparations for California's program developments constituted approximately 10 MtCO$_2$e/year transacted in previous years.

74 Examples include: Delphi Automotive Plc., Walt Disney Company, ConAgra Foods, Inc., Wal-Mart Stores, Inc., Apache Corporation, BP, Chevron Corporation, ConocoPhillips, Devon Energy Corporation, Exxon Mobil Corporation, Hess Corporation, Royal Dutch Shell, Total, Wells Fargo & Company, Cummins Inc., Delta Air Lines, general Electric Company, Google Inc., Jabil Circuit Inc., Microsoft corporation, E.I. du Pont de Nemours and Company and various utilities. Source: Carbon Disclosure Project, *Use of Internal Carbon Price by Companies as Incentive and Strategic Planning Tool: A Review of Findings from CDP 2013 Disclosure*, December 2013.

3.5 LOOKING BACK AT INTERNATIONAL CARBON PRICING APPROACHES: INTERNATIONAL EMISSIONS TRADING AND THE CDM

3.5.1 International emissions trading under the Kyoto Protocol

The AAU trading experience provides some insights into what can be expected from a carbon market. Some key lessons are provided below:

Making trading central to the international architecture might not improve cost-effectiveness The AAU market was set up with the intention to allow the countries with obligations to achieve these at least cost. Some commentators observed early on that even with trading, the heterogeneity of national policies would mean that AAU trading could not achieve a least-cost outcome. Individual countries would still make policy decisions related to other priorities, and their national context, and would not necessarily optimize on carbon price alone.[75]

The AAU system was hindered by a lack of clarity about environmental outcomes, impacting its attractiveness for sovereign buyers[76] With the collapse of Eastern bloc countries shortly after the signing of the Kyoto Protocol, a supply of AAUs was immediately available without clear evidence of their environmental merit. The development of Green Investment Schemes (GIS) did not ensure the environmental integrity of AAU purchases as intended. Governments also did not appear to make purchases in a way that minimized the cost of achieving targets, focusing on other factors before choosing to adopt an early trading strategy.

In addition, lack of transparent procedures led to accusations of illicit activity, such as the uncertainty about the use of funds from Japanese purchases of Ukrainian AAUs, and also introduced a reputational risk for purchasing countries. Any future construct may need to make transfers even more public.

Data on AAU purchases show a very limited range of buyers Most purchase activity is from private sector purchasers in Japan, sovereign purchasers in Spain and Austria and the World Bank – acting as a trustee of carbon funds – many of whom are the same as referred to above.[77] The countries that chose to trade are those that may have anticipated the greatest shortfall of AAUs, and therefore made provisions early on. From the sellers' perspective, the sale of allowances may have been held back over concerns that they might create a carbon constraint for themselves in the future by selling in advance, or by not having the correct complementary rules in place, e.g., GIS.

It cannot be assumed that sovereign players will use a marketplace. The trading activity is primarily driven by private sector players. If a market, such as the AAU market, is to be made effective there may need to be an explicit role for the private sector.

3.5.2 International offset mechanism: the CDM

The CDM has been operating for over ten years. It is the market-based mechanism that has involved the largest number of countries – developed and developing – in efforts to reduce GHG emissions. Looking back at key outcomes of the CDM, and how they compare to expectations, offers insights into the functioning of offset mechanisms.

The CDM grew to a scale that enabled significant emission reductions and financial flows to developing countries Despite successive setbacks in the market the CDM is operating in, the mechanism has performed as well as was forecast by analysts prior to 2001. By the end of 2011, 2,400 million pre-2013 CERs had been contracted in the primary market, and by the end of 2012, 1,155 billion CERs had been issued. By 2012 US$28 billion worth of pre-2013 CERs

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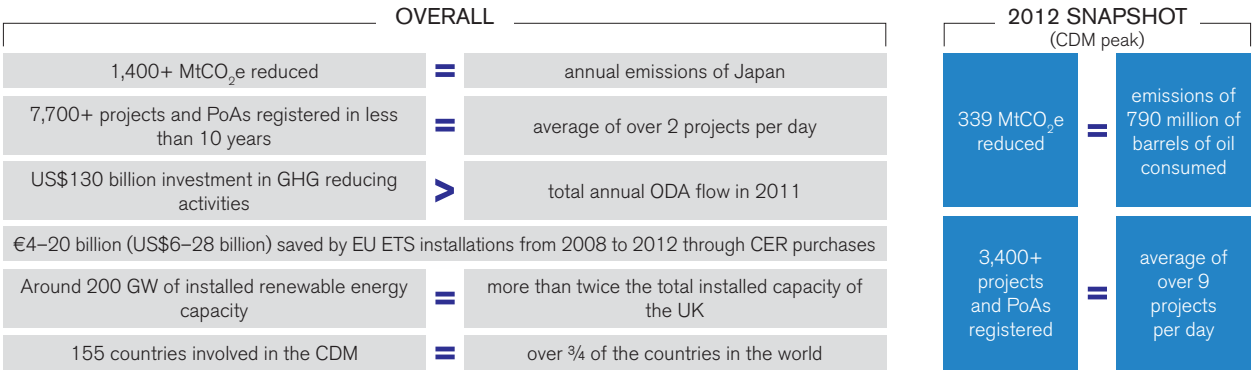
75 Source: Stavins, R., Hahn, R., *What Has Kyoto Wrought? The Real Architecture of International Tradable Permit Markets*, March 1999.
76 Source: Aldrich, E., Korner, C., *Unveiling Assigned Amount Unit (AAU) Trades: Current Market Impacts and Prospects for the Future*, March 2012.
77 Source: Ranson, M., Stavins, R., *Linkage of Greenhouse Gas Emissions Trading Systems: Learning from Experience*, November 2013.

had been contracted forward and the CDM had prompted US$130 billion investment in GHG reducing activities.[78]

In 2012 alone – the peak of the CDM in terms of volumes of projects and issuance of CERs – 3,403 projects and PoAs were registered and 339 $MtCO_2e$ was issued (see Figure 8). Overall, 90% of the CERs issued were generated at a cost below US$13, the average market price in 2008-2012.[79] This confirms that crediting mechanisms have the capacity to mobilize capital efficiently toward cost-effective low-carbon investments.

The learning-by-doing ability of the CDM is one of the key factors in its success, but also a factor that limited its growth The changes to the CDM, summarized in Table 3, highlight one key strength of the mechanism, its capacity to learn-by-doing. However this also contributes to its complexity and the associated high transaction costs. It furthermore concentrates the experience of the mechanism into specialized organizations, such as consultancies focusing on the CDM, limiting the accessibility to and reach of the mechanism.

Figure 8 The CDM in numbers



Note 1: Sources for project and country figures: UNFCCC, *Personal Communication*, April 28, 2014, and own calculations.
Note 2: Source for national emissions: Joint Research Centre of the European Commission/PBL Netherlands Environmental Assessment Agency, *EDGAR Version 4.2 FT2010*, 2012.
Note 3: Source for investment figure: Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012. Total ODA flow: US$125 billion in 2011; source: OECD, *OECD Factbook 2013: Economic, Environmental and Social Statistics*, 2013.
Note 4: Source for the savings by EU ETS installations: CDC Climat Research, *Climate Report No. 43*, January 2014.
Note 5: Total installed capacity in the UK: 89 GW in 2012; source: Department of Energy & Climate Change, *Electricity: chapter 5, Digest of United Kingdom energy statistics (DUKES)*, July 2013. Total installed capacity under the CDM: 110 GW in 2012; source: Kirkman, G.A., Haites, E., Seres, S., Spalding-Fecher, R., *Benefits of the Clean Development Mechanism 2012*, UNFCCC, 2012. Estimated to have approximately roughly doubled since then; source: UNFCCC, *Personal Communication*, April 28, 2014.

Table 3 Evolution of the CDM design

Issues identified		Examples of reforms introduced or underway
Complex procedures leading to high transaction costs *Missed low-cost mitigation opportunities* *Impact on cost-effectiveness of the CDM*	→	– Introduction of standardized baselines – Consolidations of rules, e.g., Validation and Verification Standard – Introduction of materiality concept – Use of positive lists – Enhanced communication with market participants
Non-additional projects being registered Gaming (e.g., HFC-23) *Business-as-usual projects and emission reductions credited* *Impact on environmental integrity of the mechanism, too many emission reductions being claimed*	→	– Constant revision of the tool for the demonstration of additionality – Revision of methodologies – Introduction of procedures for the demonstration of prior consideration of the CDM – External expert advice
Benefits of the CDM concentrated in a set of star countries *Addresses the majority of non-Annex I emissions but questions the relevance of the mechanism for least developed countries*	→	– Introduction of PoAs – Inclusion of the concept of suppressed demand – Creation of regional cooperation centers

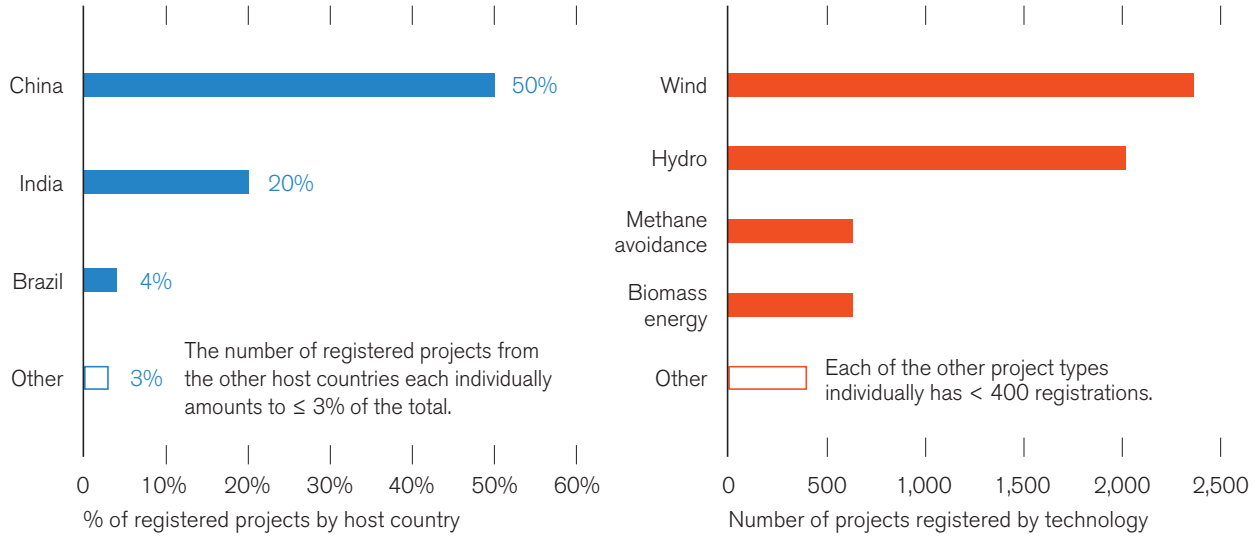
78 Source: Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012.
79 Source: CDC Climat Research, *Moving from the CDM to "various Approaches,"* 2014, http://www.cdcclimat.com/Climate-Brief-no34-Moving-from-the.html.

The private sector reacts quickly to positive–but also negative–signals from the CDM market Through its project-based approach, the CDM has directly involved the private sector in projects. This enables significant financial flows to developing countries. However, private participants exit the market when conditions deteriorate, as discussed in Section 3.2.2. A balance is needed between relying on private sector players, and ensuring a proactive role for host country governments to enable institutional capacity building.

The CDM has proved to be an efficient search engine for abatement opportunities especially in a scenario of low investment barriers[80] CDM projects are concentrated in a set of star countries and technologies, as highlighted in Figure 9.

Examining some central characteristics of the CDM, such as the timing of revenues from the sale of CERs and the level of certainty over the magnitude of these reve-

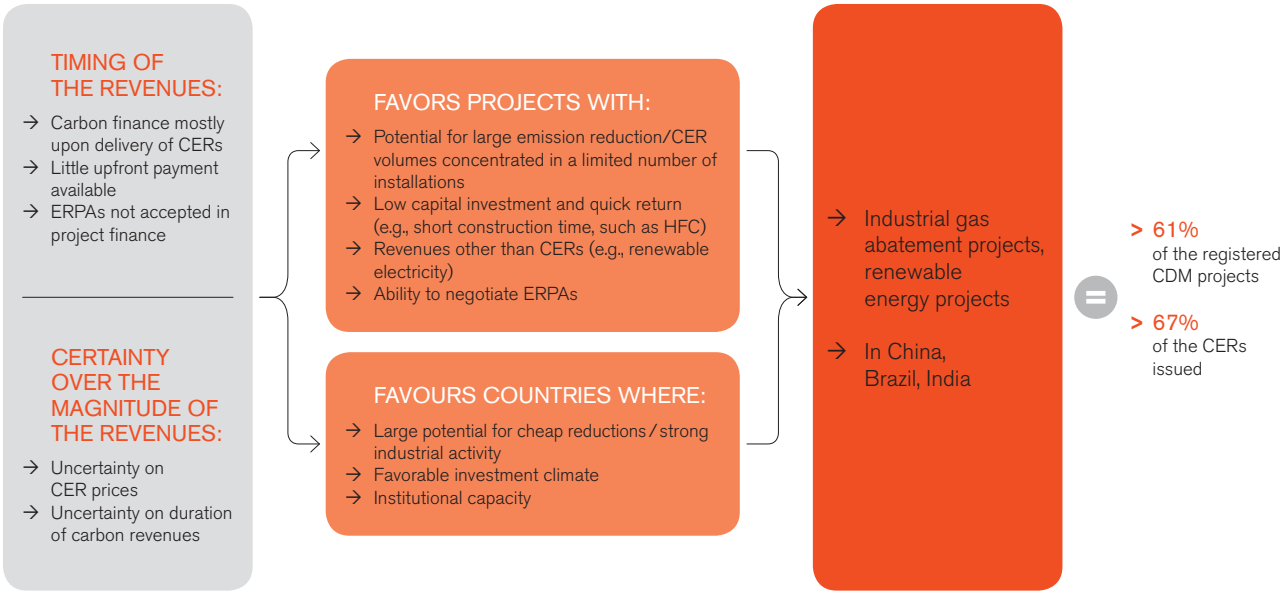
Figure 9 Distribution of registered CDM projects by country and technology



Source: UNFCCC, UNEP Risoe Centre

80 As highlighted in Source: Kossoy, A., Ambrosi, P., *State and Trends of the Carbon Market 2010*, 2010.

Figure 10 Determinants for the country and technology distribution of CDM projects



nues, shows that the design of the CDM favors certain projects (Figure 10). Industrial gas abatement and renewable energy projects in Brazil, China and India are particularly favoured, representing 61% of the registered CDM projects.

This country distribution is consistent with general investments in sustainable energy and with the distribution of developing countries' emissions, China, Brazil and India being the top three emerging economies in terms of investment in renewable energy in 2012[81] and the top three emitting developing countries. This suggests that the CDM has made relatively low-risk investments in proven technologies with marginal rates of return more attractive and profitable, enhancing their chances of being developed and remaining operational.[82]

Using the CDM example in a structured way to prepare for the next generation of instruments will help fast-track their deployment and maximize investment in low-carbon technologies Ten years of CDM experience can be tapped into for the new crediting mechanisms, e.g., a reformed CDM, or NMM. Most new initiatives address this by including concerted readiness activities before the start of the instruments and/or at their outset. There is a need to balance flexibility to allow for improvements and maintain environmental integrity with sufficient simplicity and stability for participants. This is being assessed as part of the review of the CDM modalities and procedures (see Section 3.2.2), the definition of the NMM (see Section 3.3) and initiatives outside the UNFCCC negotiations such as the PMR.

81 Source: UNEP, *Global Trends in Renewable Energy Investment 2013*, 2013.
82 As highlighted in Source: Kossoy, A., Ambrosi, P., *State and Trends of the Carbon Market 2010*, 2010.

section **4**

Regional, national, and sub-national emissions trading schemes and crediting approaches

4 Regional, national, and sub-national emissions trading schemes and crediting approaches

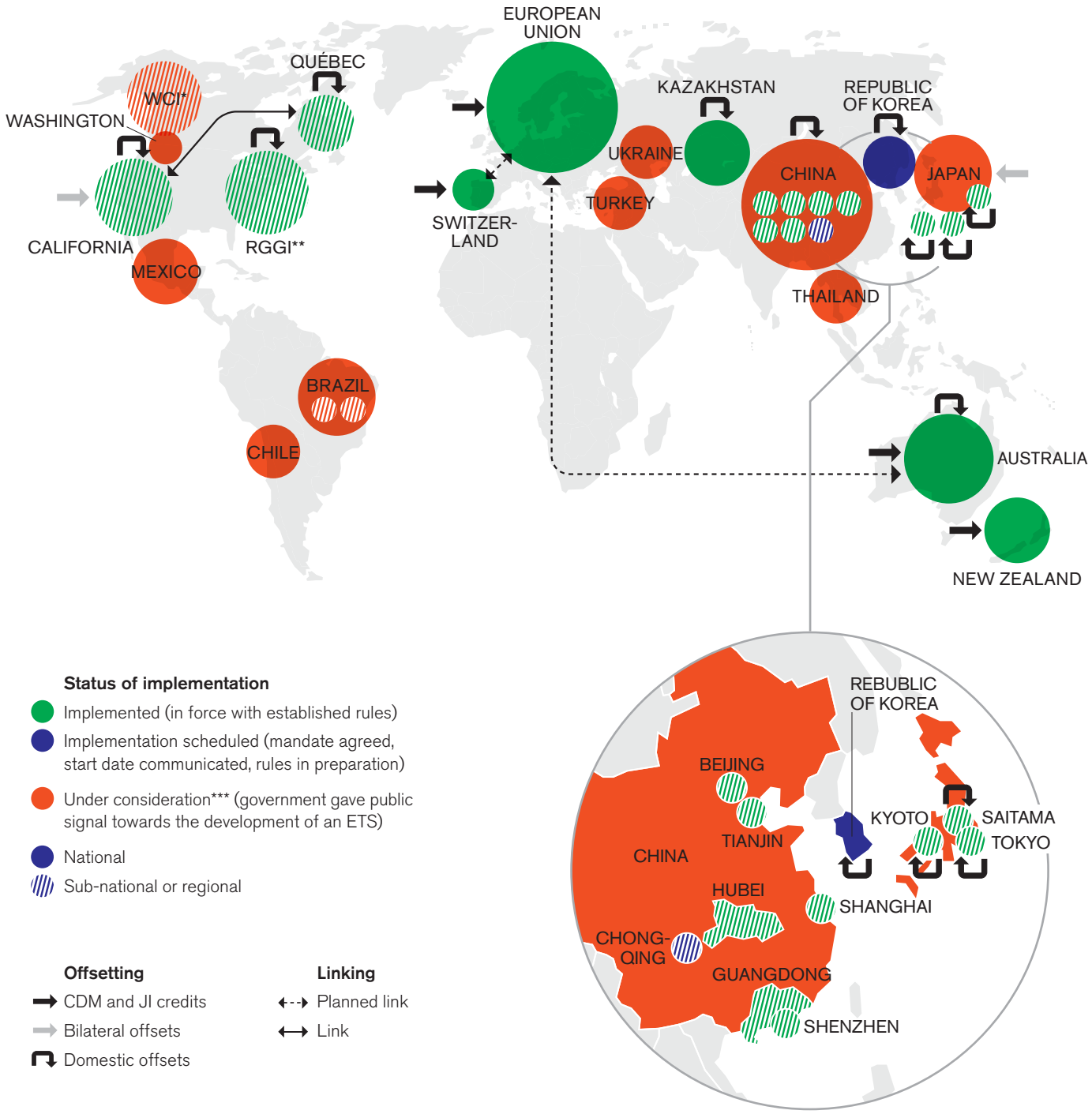
4.1 OVERVIEW OF REGIONAL, NATIONAL, AND SUB-NATIONAL EMISSIONS TRADING SCHEMES (ETS) AND CREDITING APPROACHES

Regional, national, and sub-national emissions trading schemes and crediting approaches continue to develop at pace, despite the dire state of the international carbon market. This section first presents key characteristics of the main schemes (Figure 12 to Figure 14 and Table 4) and then dives into the detail of notable developments in each one over the past year.[83] For some of the schemes (EU ETS, California's Cap-and-Trade Program, RGGI, Québec, Australia and China), additional information is provided in the relevant detailed update sheet in Annex II.

»Regional, national, and sub-national emissions trading schemes and crediting approaches continue to develop at pace, despite the dire state of the international carbon market.«

83 From January 2013 to April 2014.

Figure 11 Map of existing, emerging, and potential emissions trading schemes



* WCI – Western Climate Initiative. Participating jurisdictions are British Columbia, California, Manitoba, Ontario and Québec

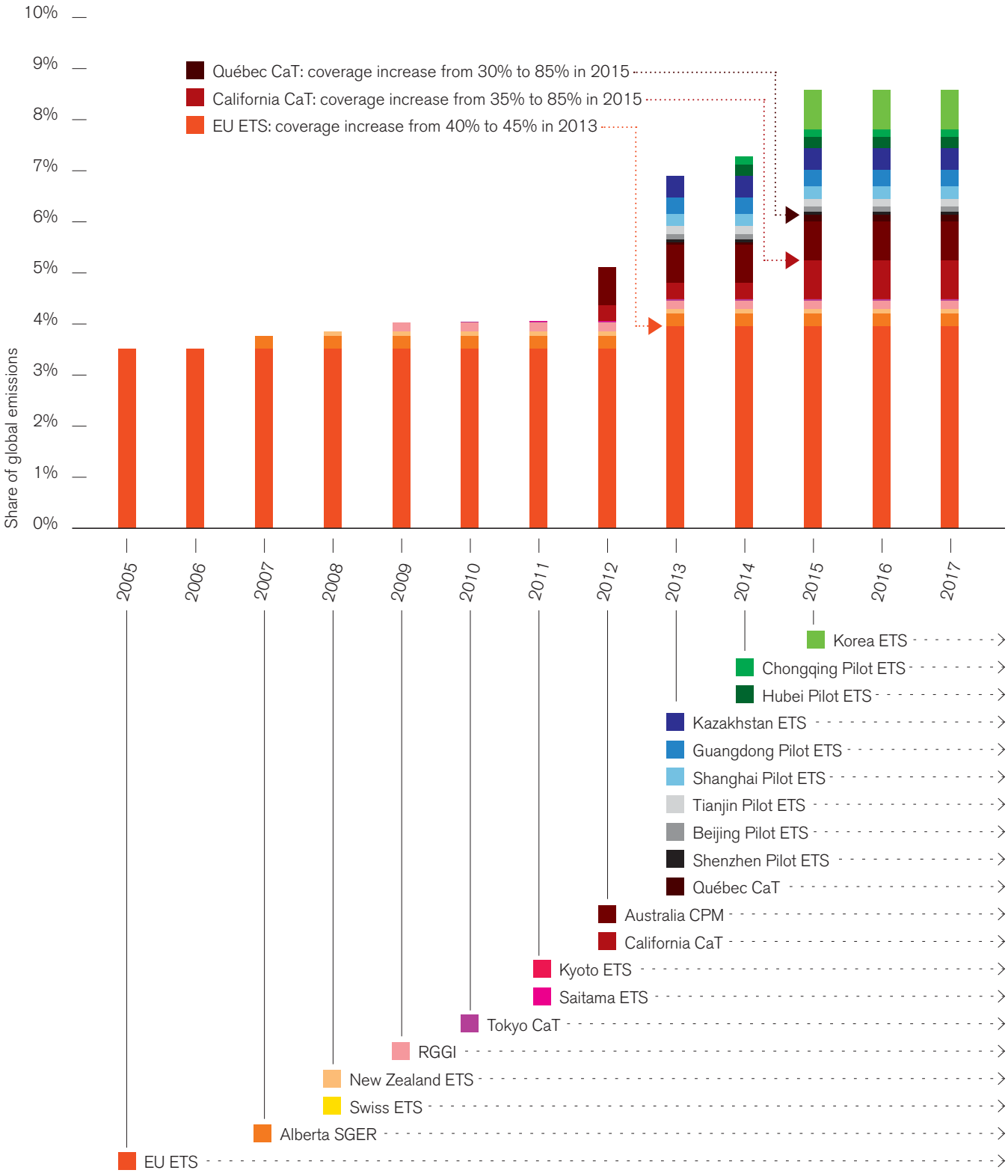
** RGGI – Regional Greenhouse Gas Initiative

*** Schemes under consideration are at different stages in the process. See Section 4.3.3 for more details.

Note 1: The size of the circles is not representative of the size of the schemes.

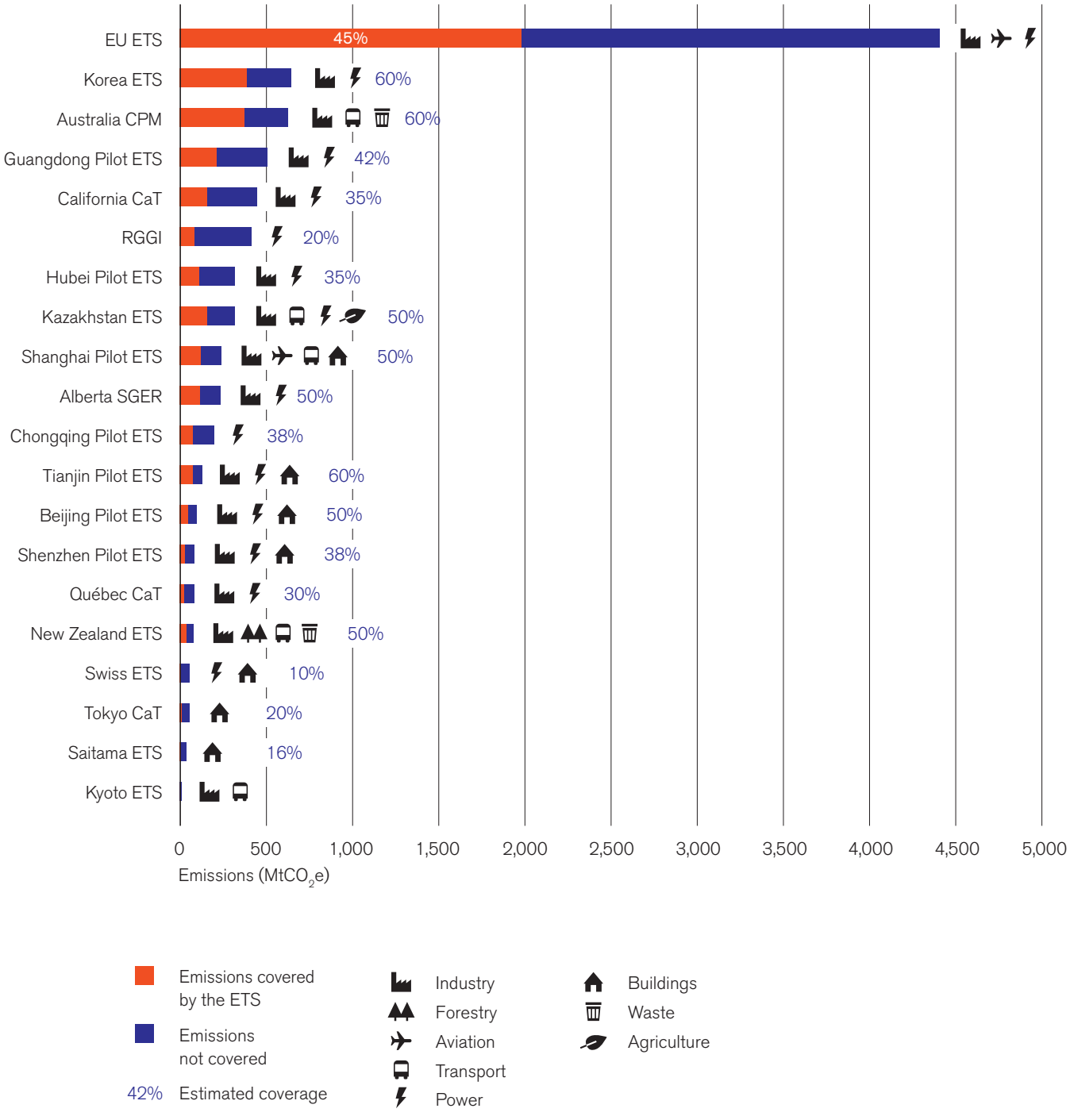
Note 2: In Alberta there is an emissions intensity based scheme in place (Alberta Greenhouse Gas Reduction Program, see Section 4.2.5).

Figure 12 Regional, national, and sub-national emissions trading schemes: share of global emissions covered[84]



84 Only the introduction or removal of an ETS is shown. Emissions are as a share of global emissions in 2010. Annual changes in global, regional, national, and sub-national GHG emissions are not shown in the graph.

Figure 13 Regional, national, and sub-national emissions trading schemes: scope



Note 1: Symbols stand for the sectors covered. Blue bars represent emissions. Orange bars indicate how much of the total emissions are covered by the ETS. Some schemes could cover more sectors than shown in the figure due to the way liable entities are defined. The total emissions covered by the Kyoto ETS are not provided as it is a voluntary ETS.

Table 4 Regional, national, and sub-national emissions trading schemes: allocation approaches

Jurisdiction	Free allocation		Purchase allowances		Other mechanisms or comments
	Bench-marking	Grand-fathering	Auction	Fixed	
EU ETS	●	●	●		● Grandfathering for process emissions only (<1% of allowances) Rest is benchmarking
Swiss ETS	●	●	●		● Grandfathering for process emissions only, rest is benchmarking
California CaT	●	●	●	●	● Allowances must be resold at auction
RGGI			●		
Alberta SGER					● Other mechanism: crediting (earning emission allowances after reductions made)
Québec CaT		●	●	●	
KAZ ETS		●			
Australia CPM	●	●		●	
NZ ETS	●	●		●	
Tokyo, Saitama and Kyoto CaT					● Other mechanism: crediting (earning emission allowances after reductions made)
Beijing Pilot ETS	●	●			
Chongqing Pilot ETS	○	○	○	○	○ No information available at this moment
Guangdong Pilot ETS	●	●	●		
Hubei Pilot ETS	●	●	●		
Shanghai Pilot ETS	●	●			
Shenzhen Pilot ETS	●				
Tianjin Pilot ETS	●	●			
Korea ETS	●	●			

Note: The table shows how the allowances are distributed in each ETS.

This report investigates each of the emissions trading schemes in relation to key topics: scope, allocation approaches, competitiveness concerns, use of offsets, price stabilization mechanisms, performance and effectiveness, MRV and registry, and linking to other schemes. Table 5 shows for which topics developments took place in 2013. The following sections of the report focus on these areas of development.

Table 5 Regional, national, and sub-national emissions trading schemes: areas of development in 2013

Areas of development in 2013	Scope	Allocation approaches	Competitiveness Considerations	Use of offsets	Price stabilization mechanisms	Performance and effectiveness	MRV and registry	Linking to other schemes
EU ETS	●	●	●	●	●	●	●	●
Swiss ETS		●						●
California CaT		●	●	●		●		●
RGGI	●					●		
Alberta SGER	●			●	●			
Québec CaT						●		●
KAZ ETS	●	●		●	●	●	●	●
Australia CPM	●		●		●	●		●
NZ ETS	●	●		●		●		
Japan (various)		●						●
China pilots	●	●		●	●	●	●	●
Korea ETS	●	●	●	●	●	●	●	

Note: Orange dots indicate that a notable development occurred in that area over the past year. Only these areas are covered in the following sections. Additional background information can be found in the Mapping Carbon Pricing Initiatives, Developments and Prospects, 2013 report.[85]

4.2 EXISTING EMISSIONS TRADING SCHEMES AND CREDITING APPROACHES

4.2.1 European Union Emissions Trading System (EU ETS)

The EU ETS is Europe's mandatory cap-and-trade scheme and has been in place since 2005. Phase III of the scheme started in 2013. This was a year with many uncertainties for the participants and important decisions on the future functioning of the scheme, including a formal endorsement of backloading. The scope of the scheme is also expanded from Phase III to include Croatia and new sectors and gases. In 2013, the new cap for stationary installations in the EU ETS was 2,084 million allowances, compared to the previous 1,977 million allowances in 2012.[86] For aviation, the "Stop the Clock" amendment is extended until 2016, following a plenary vote in favour by the European Parliament in March 2014 and endorsement by the European Council in April 2014. This will result in only flights within the European Economic Area (EEA) being covered and therefore a lower aviation cap than the provisional 210 million allowances.[87]

85 Source: World Bank, *Mapping Carbon Pricing Initiatives 2013, Developments and Prospects*, May 2013.
86 One allowance equals one metric ton of CO_2e.
87 The 210 million allowance cap had assumed that all flights to and from countries in the EEA would be included. Source: European Commission, *Allowances and Caps*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/cap/index_en.htm.

106 ←

The key developments in the EU ETS in 2013 are summarized below and further information can be found in the detailed update sheet in Annex II.

Scope Entry of Croatia in the EU ETS at the start of Phase III.
Extension of the EU ETS amendment "Stop the Clock" to enter into force on May 1, 2014.

Allocation approaches Change in the allocation approaches at the start of Phase III: 100% auction for electricity production in utilities,[88] some free allowances for their heat production and for industrial participants through benchmarking.

Competitiveness considerations Direct emissions: the list of sectors for 2015–2019 entitled to additional free allowances to mitigate carbon leakage risk is expected to be renewed in 2014. A draft list was published in May 2014.[89]
Indirect emissions: state aid compensation in Germany, the UK, the Netherlands, Spain and Belgium (Flanders) from 2013.

Use of offsets Around three quarters of the 2008–2020 entitlement for Kyoto credits used by EU ETS operators.
Given the current CER prices and the CER–EUA spread, most of the remaining limit expected to be used up in the next couple of years.
In Phase III, Kyoto credits now need to be exchanged for EUAs before being surrendered, following a change in registry regulations.

Price stabilization mechanism After several months of reiterations and uncertainties, backloading proposal put into legislation in February 2014.

In 2013 EUA prices were dominated by evolving expectations leading up to backloading decisions and announcements (see Figure 14).

Performance and effectiveness Debate over the so-called surplus has continued this year. NER300 fund established in Phase III, targeted at demonstration projects in innovative renewable energy technologies and carbon capture and storage, using revenues from the auction of 300 million earmarked EUAs from the New Entrants Reserve (NER).
Auction of these EUAs completed in April 2014.

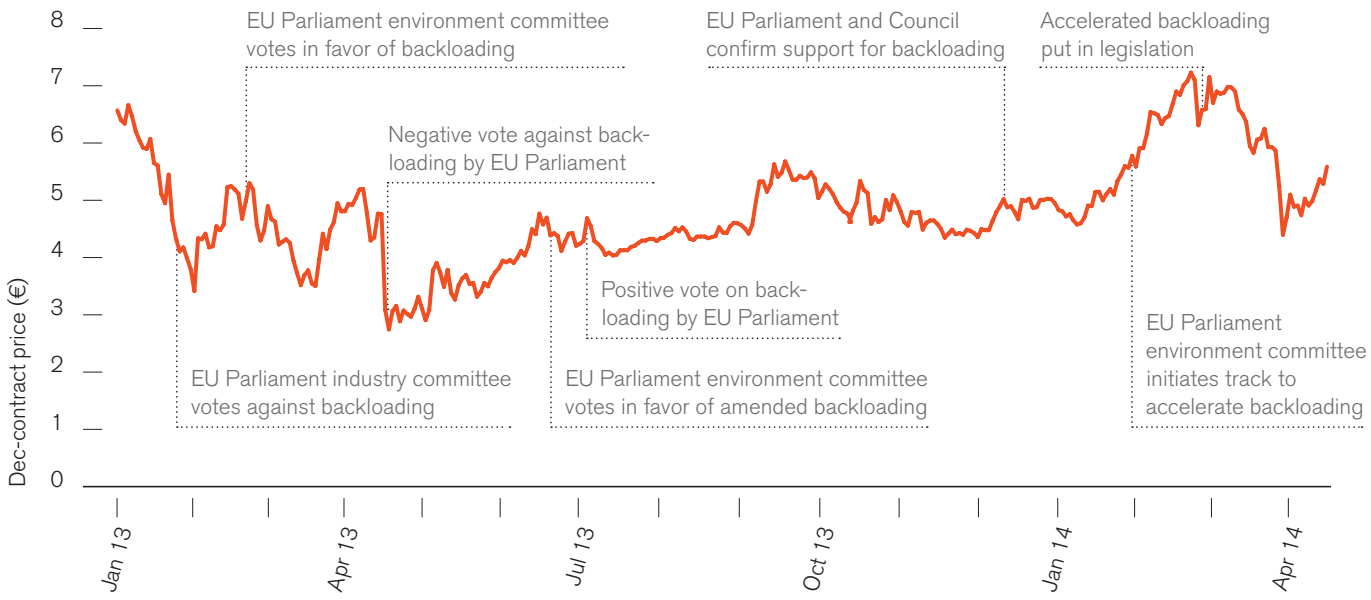
MRV and registry New legislation in the Monitoring & Reporting Regulation (MRR) and Accreditation and Verification Regulation (AVR) entered into force in 2013. Registry regulations were amended in May 2013 to change the way international credits are surrendered for compliance in the EU ETS (see Use of offsets above).

Linking to other schemes Negotiations ongoing to link the Swiss scheme with the EU ETS.
Progress on linking with the Australian CPM currently on hold due to uncertainties about the future of the Australian scheme.

Looking ahead European framework on climate and energy to 2030 published in January 2014. Proposals include: 40% GHG reduction target for the EU as a whole below 1990 levels, increase in the linear annual reduction of the EU ETS cap, all emission reductions from 2020 onwards to be met within the EU, market stability reserve to be introduced under the EU ETS from Phase IV onwards.

88 Except some transitional free allowances for Eastern European member states to modernise their power plants.
89 Source: European Commission – DG Climate Action. Newsitem: Commission submits proposed carbon leakage list for 2015-2019. Accessed May 7, 2014, http://ec.europa.eu/clima/news/articles/news_2014050501_en.htm.

Figure 14 EU allowance price development labeled with key developments in the backloading proposal process



Source: Thomson Reuters Point Carbon

4.2.2 Switzerland Emissions Trading Scheme

The Swiss Emissions Trading Scheme covers 55 companies from 25 categories of activities. Since 2013, the scheme has been mandatory for large energy intensive industries (>20MW thermal input and other specific thresholds). Medium-sized industries may choose to opt in on a voluntary basis (>10MW).[90] In the 2013–2020 phase participants in the ETS are exempt from the CO_2 tax. An overall reduction path of 1.74% per year compared to 2010 emissions is applied over the Swiss ETS.

Allocation approaches Free allocation based on industry benchmarks, similar to the EU ETS, during the mandatory phase (2013-2020). Sectors at risk of carbon leakage receive 100% of the benchmark, other industry sectors receive a linearly decreasing share of free allowances (80% free allocation in 2013, decreasing to 30% in 2020). No free allocation for power sector. Correction factor applied if benchmarked allocation exceeds overall emissions cap.
5% of allowances set aside in the New Entrants Reserve.[91]

Linking to other schemes Negotiations on linking with the EU ETS ongoing but slow (see Section 4.2.1). The agreement should cover aviation and stationary installations.

90 Source: Federal Office for the Environment, Switzerland, *Participation in the Emissions Trading Scheme and Registration Deadlines*, accessed January 22, 2014, http://www.bafu.admin.ch/emissionshandel/05545/12432/index.html?lang=en.
91 Source: Federal Office for the Environment, Switzerland, *Emission Allowances Issued for Free (benchmark Approach)*, accessed January 22, 2014, http://www.bafu.admin.ch/emissionshandel/05545/12434/index.html?lang=en.

4.2.3 California Cap-and-Trade Program (US)

The California Cap-and-Trade Program started in 2012 and entered into its first compliance period from January 1, 2013. The California Air Resources Board's (ARB) Climate Change Scoping Plan Update summarizes developments over the past five years, and the outlook to 2020. The Program remains a central part of the state's climate change plans, both stimulating emission reductions and raising revenues through auctions for other climate change related activities.[92]

114 ← The key developments in the California Cap-and-Trade Program in 2013 are summarized below and further information can be found in the detailed update sheet in Annex II.

Allocation approaches Investment plan approved in May 2013[93] on use of proceeds from auctioning.
In August 2013 legal decisions[94] rule in favor of ARB in relation to use of auctioning in the Program.

Competitiveness considerations Carbon leakage assessments are ongoing.
ARB are considering the use of border carbon adjustments in the cement sector, a detailed proposal is expected in July 2014.[95]

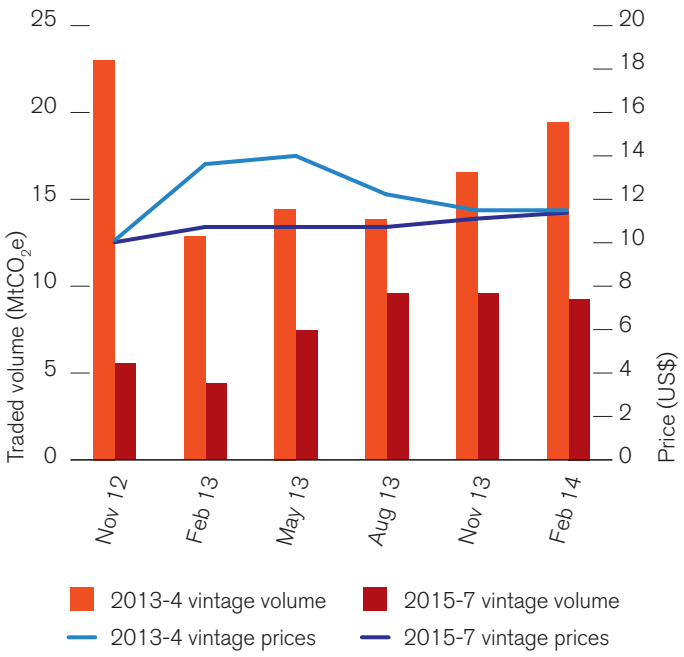
Use of offsets Two new protocols are being prepared. Over seven and a half million compliance and early action offsets as of April 2014.[96]

Performance and effectiveness Stable prices in the primary allowance market. Figure 15 shows prices of allowances in the California primary market to date.[97]

Linking to other schemes Start of formal linking with Québec in January 2014.

Looking ahead Proposed amendments to the overarching legislation include allocation rules, market program implementation, and offset program implementation.[98]
Ongoing collaborative initiatives include the Pacific Coast Action Plan on Climate and Energy and a Memorandum of Understanding with China.[99]

Figure 15 Price of allowances auctioned and traded volumes in the primary market in California Cap-and-Trade Program[100]



92 Source: California Air Resources Board, *Climate Change Scoping Plan First Update*, October 1, 2013.
93 Source:California Air Resources Board, *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013–14 through 2015–16*, May 14, 2013.
94 Source: Superior Court of California, County of Sacramento, *Joint Ruling on Submitted Matters Case No: 34-2012-80001313 and Related Case No: 34-2013-80001464*, August 28, 2013.
95 Source: California Air Resources Board, *California Cap-and-Trade Program: Potential Border Carbon Adjustment for the Cement Sector*, February 5, 2014, http://www.arb.ca.gov/cc/capandtrade/meetings/020514/border-carbon-adjustment.pdf.
96 Source: California Air Resources Board, *California's Compliance Offset Programme*, February 19, 2014.
97 Source: California Air Resources Board, *California Air Resources Board Quarterly Auction 6 February 2014, Summary Results Report*, February 24, 2014, http://www.arb.ca.gov/cc/capandtrade/auction/february-2014/results.pdf.
98 Source: California Air Resources Board, *Notice and Summary of Proposed Changes to the California Cap and Trade Programme*, accessed February 25, 2014, http://www.arb.ca.gov/cc/capandtrade/meetings/071813/ctnotice0713.pdf.
99 Source: Pacific Coast Collaborative, accessed March 28, 2014, http://www.pacificcoastcollaborative.org/Pages/Welcome.aspx.
100 Source: California Air Resources Board, *Auction Information*, accessed March 21, 2014, http://www.arb.ca.gov/cc/capandtrade/auction/auction.htm.

4.2.4 Regional Greenhouse Gas Initiative (RGGI)

RGGI is a market-based GHG reduction program covering CO_2 emissions from power plants in nine Northeast and Mid-Atlantic states of the US. In January 2014, having completed revisions to their State CO_2 Budget Trading Programmes, the RGGI cap was reduced. The new 2014 cap is 91 million short tons of CO_2, representing a 45% reduction from the previous cap.[101] The RGGI cap will decline by a further 2.5% each year from 2015 to 2020.

117 ← The key developments in RGGI in 2013 are summarized below.

Scope No scope changes in 2013, but in New Jersey some stakeholders continue to push the state to rejoin RGGI.

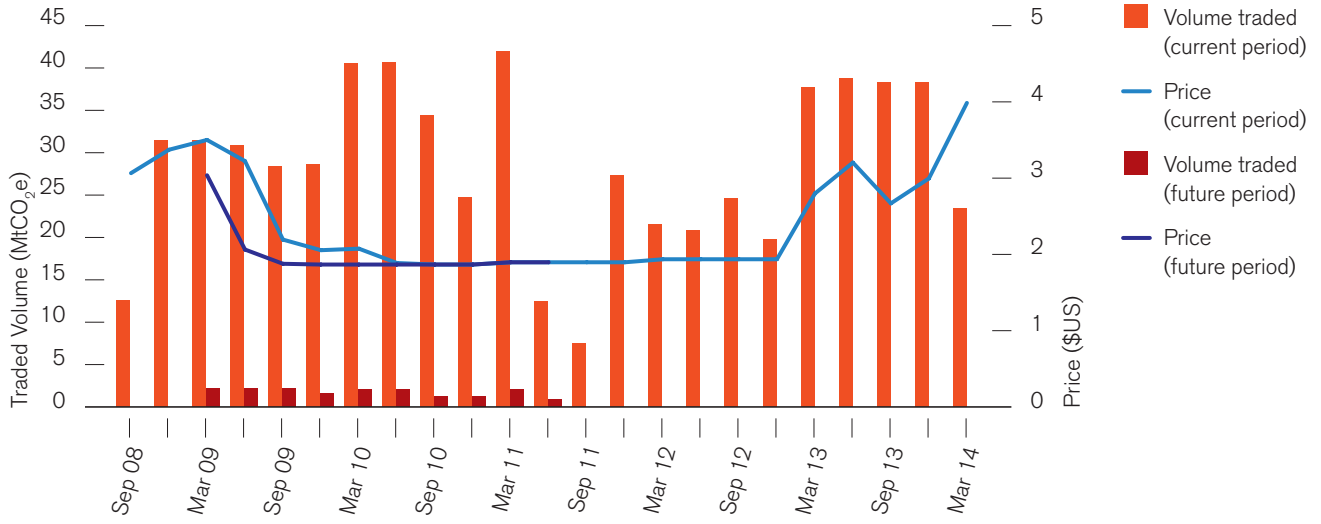
Performance and effectiveness In Q3 2013 primary and secondary market prices were in line at around US$3 (see Figure 16).[102] RGGI's cost containment reserve (CCR) was triggered for the first time in March 2014.[103]

Looking ahead RGGI states submitted comments to the US EPA in relation to the Clean Air Act, emphasizing a need to reward early actors, and allow flexibility to states on how to adhere to rules about carbon pollution, with the option to use, amongst other mechanisms, a market-based approach.[104]

4.2.5 Alberta Greenhouse Gas Reduction Program (Canada)

Since July 1, 2007 facilities in Alberta that emit more than 0.1 $MtCO_2e$ per year are required by the Specified Gas Emitters Regulation (SGER) to reduce their emissions intensity (i.e. emissions per unit of production) by 12% compared to the average emissions intensity in 2003–2005.[106] In 2012, 120 $MtCO_2e$ was covered by the Greenhouse Gas Reduction Program of the SGER, equivalent to approximately 50% of the total GHG emissions in Alberta.[107] New facilities have a reduction target of 2% starting in the fourth year of operation, which increases by 2% annually up to 12%.[108]

Figure 16 Price of allowances auctioned and auction volumes in RGGI[105]



101 Source: Regional Greenhouse Gas Initiative, Inc., *RGGI States Make Major Cuts to Greenhouse Gas Emissions from Power Plants*, January 13, 2014, http://www.rggi.org/docs/PressReleases/PR011314_AuctionNotice23.pdf.
102 Source: Potomac Economics, *Report on the Secondary Market for RGGI CO_2 Allowances: Fourth Quarter 2013*, February 2014.
103 Source: RGGI Inc., *Auction Results*, http://www.rggi.org/market/co2_auctions/results/auction-23, Accessed April 25, 2014.
104 Source: Esty, D.C. et al., *Letter to Administrator McCarthy*, December 2, 2013, http://www.rggi.org/docs/RGGI_States_111d_Letter_Comments.pdf.
105 Source: Potomac Economics, *Report on the Secondary Market for RGGI CO_2 Allowances: Third Quarter 2013*, November 2013; Regional Greenhouse Gas Initiative, Inc., Auction Results, accessed March 21, 2014, http://www.rggi.org/market/co2_auctions/results.
106 This intensity reduction applies to every compliance period, and remains stable at 12% of the baseline intensity, without a ratcheting effect. The percentage reduction required is different for installations deemed to be new.
107 Source: Alberta Government, Annual Summary of Specified Gas Emitters Regulation: 2009, February 29, 2012; Alberta Environment and Sustainable Resource Development, Personal Communication, April 28, 2014.
108 Source: Alberta Government, *Technical Guidance for Completing Specified Gas Baseline Emission Intensity Applications, Version 4.0*, July 2012.

Scope, Use of offsets, Prize stabilization mechanism Facilities can meet their obligations either by improving their GHG performance or by offsetting their emissions via one of three options:

- Delivering to the Government Emission Performance Credits (EPC), which can be earned by going beyond the 12% emissions intensity reduction. EPCs can either be banked for future compliance or sold to other facilities.[109]
- Delivering to the Government Offset Credits that have been created in Alberta using protocols approved by the Alberta government.[110] Currently 34 protocols have been approved with more under development.
- Contributing to the Climate Change and Emissions Management Fund at CAN$15/t$CO_2$e (US$14/tCO_2e) beyond the mandatory target.[111] Since there is no limit on how much can be contributed to the fund, this acts as a price ceiling on EPCs and offsets. The fund collected over CAN$398 million (US$374 million) since inception, which is used to provide funding for climate-friendly technologies and projects.

Looking ahead Alberta is in the process of renewing its Climate Change Strategy and the SGER, which expires September 2014. There has been some speculation that the details of the current Greenhouse Gas Reduction Program may change.

4.2.6 Québec Cap-and-Trade System (Canada)

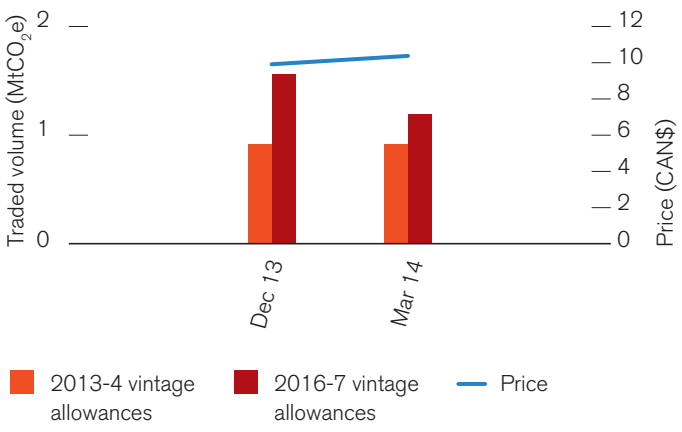
The Québec Cap-and-Trade System started operation in January 2013 and continues to be central to Québec's climate change policy. The system is outlined as a key element of the province's 2013–2020 Climate Change Action Plan, both in terms of delivering emission reductions and also as a source of revenue to fund other parts of the plan.[112]

The key developments in the Québec System in 2013 → 117 are summarized below and further information can be found in the detailed update sheet in Annex II.

Performance and effectiveness Information on the outcomes of the first auctions in the system provided in Figure 17.

Linking to other schemes Québec and California cap-and-trade programs officially linked on January 1, 2014.[113]

Price of allowances auctioned and auction volumes in Québec Cap-and-Trade System[114] **Figure 17**



4.2.7 Kazakhstan Emissions Trading Scheme

Kazakhstan Emissions Trading Scheme (KAZ ETS) started with a pilot phase in 2013 as a mandatory scheme covering CO_2 emissions. The scheme has the basic technical aspects such as scope, coverage and cap setting in place. Some issues remain to be resolved, however, primarily related to the collection of accurate verified emissions data at the installation level.[115]

109 Source: Alberta Government, *Greenhouse Gas Reduction Program*, accessed January 31, 2014, http://environment.alberta.ca/01838.html.
110 Source: Alberta Government, *Offset Credit System Protocols*, accessed January 31, 2014, http://environment.alberta.ca/02275.html.
111 Source: Alberta Government, *Climate Change and Emissions Management Fund*, accessed January 31, 2014, http://environment.alberta.ca/02486.html.
112 Source: Government of Québec, *2013–2020 Climate Change Action Plan Phase 1*, 2012.
113 Source: Government of Québec, *Gazette Officielle Du Québec, Vol 145, No 49*, December 4, 2013.
114 Source: Government of Québec, *Auction of Québec Greenhouse Gas Emission Units on December 3, 2013, Summary Report Results*, 2013; Government of Québec, *Auction of Québec Greenhouse Gas Emission Units on March 4 2014, Summary Report Results*, 2014.
115 Source: Thomson Reuters Point Carbon, *Existing Emissions Trading Schemes – A Comparative Analysis, Prepared for the PETER Project*, February 2013.

Scope Covers CO_2 emissions in 2013, only monitoring methane (CH_4) and N_2O. CH_4 included in offset projects.[116]
The point of compliance is set at the operator level due to the lack of detailed installation level data: 166 operators emitting more than 20,000 tCO_2e/y.[117]
Energy, mining and metallurgy, chemicals, cement and the power sector included.[118] Initially, legislation included agriculture and transport, but now unlikely.

Allocation approaches Free allocation based on grandfathering of historical emissions for the first three years (2013–2015). Baseline for 2013: unverified emissions from 2010. For 2014 and 2015: verified emissions from 2011 and 2012 respectively.
Allocation for 2014 is the same as the baseline, and for 2015 it is reduced by 1.5%.[119] Auctioning and benchmarks based on verified emissions data gathered during the pilot phase may be used in from 2016 onwards.[120, 121]

Use of offsets Preferred sectors for domestic offsetting projects: mining and metallurgy; agriculture; housing and communal services; forestry; prevention of land degradation; renewables; processing of municipal waste; transport; and energy efficient construction. No formal limit on the use of credits from other sectors.[122]

The use of international credits (CERs, ERUs) is theoretically possible but requires linking of the registry to the International Transaction Log (ITL).[123] There is no clear price signal for the KAZ ETS and therefore it is not possible to assess demand for international credits.

Price stabilization mechanism Price corridor managed through the exchange, exact price levels to be determined. The reserve includes both allowances and money to purchase them.

Performance and effectiveness Data challenges existed in the first phase of the KAZ ETS. Changes to the legislative package, including the details of the allocation plan are foreseen. The first compliance point in May for companies to submit a verified GHG report was enforced. The second compliance point, the surrender of allowances, was not enforced because of data and registry issues. Full enforcement will be in place in 2014–15.

MRV and registry The Kazakh registry is in place, but requires some security improvements, and is the focus of current work. Allowances can only be bought or sold through the exchange. The MRV system is being upgraded including the legislation, reporting formats, the provision of detailed methodology templates and monitoring plans, and clearer requirements for verifiers.[124]

Linking to other schemes No formal studies, however linking is expected in the future. The KAZ ETS has to a large extent aligned its MRV and allocation rules with those of the EU ETS.

Looking ahead The Kazakh government is looking at changes in the national legislation, the potential to develop sectoral benchmarks for future allocation plans and the need for more verifiers, amongst other detailed technical issues. A wide variety of donors are funding activities on the KAZ ETS.[125, 126, 127]

116 Source: Sergazina, G. and Khakimzhanova, B., *Kazakhstan's National Emission Trading Scheme*, October 23, 2013, http://www.thepmr.org/system/files/documents/Kazakhstan_Update_October%202013.pdf.
117 Source: Government of Kazakhstan, *National Allocation Plan for 2014–2015. Decree Nr. 1536 of the Government of Kazakhstan*, December 31, 2013, http://www.eco.gov.kz/files/pprk-20-01-2014-1-rus.htm.
118 Source: Thomson Reuters Point Carbon, *Existing Emissions Trading Schemes – A Comparative Analysis, Prepared for the PETER Project*, February 2013.
119 Source: Government of Kazakhstan, *National Allocation Plan for 2014-2015. Decree Nr. 1536 of the Government of Kazakhstan*, December 31, 2013, http://www.eco.gov.kz/files/pprk-20-01-2014-1-rus.htm.
120 Source: Sergazina, G. and Khakimzhanova, B., *Kazakhstan's National Emission Trading Scheme*, October 23, 2013, http://www.thepmr.org/system/files/documents/Kazakhstan_Update_October%202013.pdf.
121 Source: Sergazina, G., Tanayev, E. and Baigunakova, D., *Kazakhstan's National Emission Trading Scheme*, May 27, 2013, https://www.thepmr.org/system/files/documents/PA6_Info_Sharing_Kazakhstan_May_22.pdf.
122 Source: Thomson Reuters Point Carbon, *Existing Emissions Trading Schemes – A Comparative Analysis, Prepared for the PETER Project*, February 2013.
123 Source: Sergazina, G. and Khakimzhanova, B., *Kazakhstan's National Emission Trading Scheme*, October 23, 2013, http://www.thepmr.org/system/files/documents/Kazakhstan_Update_October%202013.pdf.
124 Source: Sergazina, G. and Khakimzhanova, B., *Kazakhstan's National Emission Trading Scheme*, October 23, 2013, http://www.thepmr.org/system/files/documents/Kazakhstan_Update_October%202013.pdf.
125 Source: Project PETER, *PETER Preparedness for Emissions Trading in the EBRD Region*, accessed February 18, 2014, http://www.ebrdpeter.info/EngNews.html.
126 Source: Sergazina, G. and *Khakimzhanova, B., Kazakhstan's National Emission Trading Scheme*, October 23, 2013, http://www.thepmr.org/system/files/documents/Kazakhstan_Update_October%202013.pdf.
127 Source: Vassilyev, S., *Kazakhstan's Proposal for PMR Targeted Technical Support*, March 4, 2014, https://www.thepmr.org/system/files/documents/Kazakhstan%27s%20Proposal%20for%20Targeted%20Technical%20Support_0.pdf.

4.2.8 Australia Carbon Pricing Mechanism (CPM)

The Australia Carbon Pricing Mechanism (CPM) came into operation in July 2012. It takes place in two steps, a fixed price period from 2012 to 2015 and a flexible price period planned to start in 2015. Change of government in Australia in 2013 has had a significant impact on these policies and the status of the CPM is in flux. The current administration proposes to abolish the CPM and implement the Direct Action Plan.[128] Together with the Renewable Energy Target, the Direct Action Plan is intended to support Australia in meeting its existing minimum emission reduction target of 5% below 2000 emissions by 2020.[129]

The main elements of the CPM, if it is to continue as planned, are included below and further details about the possible changes in Australia are included in the detailed update sheet in Annex II.

118 ←

Scope In the 2012–2013 year the CPM covered at least 285 $MtCO_2e$, over 348 entities. The Climate Change Authority recommended Australia's 2020 target from 5% to a minimum of 15% below 2000 emissions, and proposed new CPM caps accordingly.

Competitiveness considerations The first 104 million units issued were issued in relation to competitiveness compensation;[130] 84 million units have been issued so far for the second year.[131]

Use of offsets For the first year 281 million carbon units and 2.6 million Australian Carbon Credit Units (ACCUs) have been surrendered. International credits are not eligible for compliance in the fixed price period.

Performance and effectiveness GHG emissions from the sectors covered by the CPM fell by 1.5% in the first year, mostly through reductions in the electricity production sector.

Linking to other schemes Linking with the EU ETS is on hold while the future of the CPM is uncertain.

Looking ahead The centerpiece of the Direct Action Plan is the Emissions Reduction Fund.[132] Government offers financial incentives for low cost emission reductions through reverse auctions. The fund is set to run from July 1, 2014 until 2020 with an initial A$2.55 billion (US$2.3 billion).[133] Under the Emissions Reduction Fund, firms will be encouraged to reduce their emissions, equal to historical BAU emissions. A 'safeguard' mechanism will incentivize firms to remain below baseline emissions. The recent White Paper provides more detail on the approach.[134]

4.2.9 New Zealand Emissions Trading Scheme (NZ ETS)

The New Zealand Emissions Trading Scheme (NZ ETS) started in 2008, with legislated amendments made in 2009 and 2012. The scheme is mandatory and includes some voluntary opt-ins. Allowances are called New Zealand Units (NZUs).

Scope Compliance obligation of biological emissions in agriculture is delayed indefinitely.[135]

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128 Source: Clean Energy Regulator, Australian Government, *Carbon Pricing Mechanism*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Pages/default.aspx.
129 A conditional target range of 5–25% remains.
130 Source: Clean Energy Regulator, Australian Government, *Units Issued in the 2012-13 Financial Year*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Industry-Assistance/jobs-and-competitiveness-program/free-carbon-units/Pages/units-issued-in-2012-13.aspx.
131 Source: Clean Energy Regulator, Australian Government, *Issue of Free Carbon Units*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Industry-Assistance/jobs-and-competitiveness-program/free-carbon-units/Pages/default.aspx.
132 Source: Department of the Environment, Australian Government, *Emissions Reduction Fund*, accessed January 21, 2014, http://www.environment.gov.au/topics/cleaner-environment/clean-air/emissions-reduction-fund.
133 Source: Australian Government, *Emission Reduction Fund White Paper*, April 2014.
134 Source: Australian Government, *Emission Reduction Fund White Paper*, April 2014.
135 Source: Ministry for the Environment, New Zealand, *Legislative Changes to the New Zealand Emissions Trading Scheme (NZ ETS)*, accessed January 20, 2014, http://www.climatechange.govt.nz/emissions-trading-scheme/ets-amendments/index.html.

Allocation approaches Existing transitional measures extended; i.e., surrendering one emission unit for two tons of CO_2 in the non-forestry sectors, and fixed price option to meet obligations by paying the government NZ$25/t$CO_2$e (US$21/tCO_2e).
Free allowances provisions for pre-1990 forest landowners completed, and offset provision for pre-1990 forestry converted to other land-use remains.
Government enabled to increase the supply of NZUs through auctioning within an overall cap.

Use of offsets Currently no quantitative limit on international credits that can be used for compliance in the NZ ETS. A freeze is in place preventing New Zealand entities from participating in new CDM projects that generate CP2 credits.[135]
International credits from CP1 can be used for compliance up to May 31, 2015.[136] After that date participants need to surrender NZUs or banked New Zealand-originated AAUs from CP1 for compliance. Pre-1990 forestry owners also have the option to offset by directly planting an emissions equivalent forest elsewhere in New Zealand. Apart from NZ-AAUs, all international credits in non-crown accounts will be cancelled when international carry-over is imposed by the UNFCCC.[137]

Performance and effectiveness The NZ ETS plays a pivotal role in New Zealand achieving its CP1 commitment. 27 million units surrendered for compliance in 2012; 95% international units.[138] NZU prices fell from NZ$8 to NZ$2.5 (US$6.5 to US$2) in 2012, following the prevailing price of international credits. No participants used the fixed price option of NZ$25 (US$21) per emission unit. These international credits combined with the NZ ETS disincentivizing deforestation resulted in a net surplus 90 million unit for CP1 compliance in April 2014, with minimal purchasing by the government.[139]

In January 2014 the price of one NZU was around NZ$3.50 (US$3),[140] up from NZ$2 (US$1.5) a year earlier.[141] The expectation is that after 2015 the demand for NZUs will increase with CP1 credits no longer eligible and access to CP2 credits restricted as New Zealand has not taken any target under CP2.

Looking ahead In August 2013 the government set an unconditional emission reduction target for New Zealand of 5% below 1990 levels by 2020, on top of their conditional target of 10–20% below 1990 by 2020 announced in 2009.[142] A review of the NZ ETS is expected in 2015.

4.2.10 Japan (various schemes)

During COP 19 in Warsaw Japan announced that they will lower their 2020 emission reduction target to 3.8% below 2005 fiscal year levels, which is equivalent to an increase of 3.1% relative to 1990.[143] The main reason given is the shutdown of nuclear energy in Japan following the Fukushima incident in 2011. This approach may be revised after Japan reviews its energy policy.[144] This target is expected to be achieved through domestic reduction, including forest conservation and offsets generated under the Joint Crediting Mechanism (JCM).

Despite the target revision, Japan continues its experimentation with a wide array of trading and crediting schemes, at both the sub-national and international levels (see Table 6).

136 Source: New Zealand Government, *Decisions on Kyoto Protocol Emission Units*, accessed January 20, 2014, http://www.beehive.govt.nz/release/decisions-kyoto-protocol-emission-units.
137 Source: New Zealand Government, *Announcement of Carry-over and Access to Kyoto Markets Post-2015*, accessed January 20, 2014, http://www.eur.govt.nz/how-to/guides-hmtl/guides-pdf/Post%202015%20announcement%20factsheet.pdf.
138 Source: Ministry for the Environment, New Zealand, *ETS 2012 – Facts and Figures*, September 2013.
139 Source: Ministry for the Environment, New Zealand, *New Zealand's Net Position under the Kyoto Protocol*, accessed May 2, 2014, http://www.mfe.govt.nz/issues/climate/greenhouse-gas-emissions/net-position/index.html.
140 Source: Carbon Match, *Carbon Match*, accessed January 20, 2014, http://www.carbonmatch.co.nz/.
141 Source: Thomson Reuters Point Carbon, *Carbon Market Australia-New Zealand Vol 6 Issue 8*, August 16, 2013.
142 Source: Ministry for the Environment, New Zealand, *Reducing Greenhouse Gas Emissions*, accessed January 20, 2014, http://www.mfe.govt.nz/issues/climate/policies-initiatives/.
143 Source: Ecofys, Climate Analytics, and Potsdam Institute for Climate Impact Research, Japan: *From Frontrunner to Laggard*, November 15, 2013, http://climateactiontracker.org/assets/publications/briefing_papers/CAT_Policy_brief_Japan-Nov15-2011.pdf.
144 Source: Ishihara, N., *Statement by Nobuteru Ishihara, Japanese Minister of the Environment, at COP19/CMP9*, accessed January 22, 2014, http://unfccc.int/files/meetings/warsaw_nov_2013/statements/application/pdf/cop19_hls_japan.pdf.

Table 6 Carbon pricing instruments in Japan

Level	Type of instrument	Name
Sub-national (Tokyo)	ETS	Tokyo Cap-and-Trade Program
Sub-national (Saitama)	ETS	Target-Setting Emissions Trading Program in Saitama
Sub-national (Kyoto)	Voluntary ETS	Kyoto ETS
Sub-national (various prefectures)	Offset schemes	Various offsetting schemes
National (under consideration)[145]	ETS	Under consideration
National (ended in 2012)	Voluntary ETS	Japan Voluntary Emissions Trading Scheme (JVETS)
National	Voluntary crediting	J-Credit Scheme (previously Japan Domestic Credit Scheme (J-CDM) and Offset Credit (J-VER) Scheme)
National (ended in 2013)	Voluntary agreement with offsetting	Keidanren Voluntary Action Plan
National	Voluntary agreement with offsetting	Keidanren's Commitment to a Low Carbon Society
National	Carbon tax	Tax for Climate Change Mitigation
International	Voluntary crediting	Joint crediting mechanism (JCM)

Sub-national levels (Tokyo, Saitama and Kyoto) These schemes continue to play a small but important role in carbon pricing in Japan and cover 8% of total GHG emissions in Japan.[146]

All schemes operate in the same way: facilities that have overachieved their emission reduction target for a given year can either use the excess reductions for the following years or apply to be issued with excess reduction credits to sell to other facilities.[147] The Tokyo and Saitama schemes are compulsory, and the Kyoto one is voluntary with non-binding targets. The first compliance periods of the three schemes run to the end of fiscal year 2014.

In November 2013 the price in the Tokyo scheme was estimated at ¥8,000-10,000/tCO_2e (US$76-95/t$CO_2$e).[148] In 2012 only six trades were conducted and 11 trades in 2013.[149] The relatively high price compared to the rest of the world may be attributed to the hesitation to sell excess reduction credits until the second compliance period.[150] In the second compliance period, trading of credits from the first compliance period will be possible between the Saitama and Tokyo schemes.

145 The Ministry of Environment has been investigating the challenges of introducing a national ETS, but no new announcements have been made since March 2012 on the progress. Source: Ministry of the Environment, Government of Japan, *Domestic Emissions Trading Scheme (Cap-and-Trade)*, accessed March 12, 2014, https://www.env.go.jp/earth/ondanka/det/capandtrade.html.

146 Own calculations. Source: Tokyo Metropolitan Bureau of Environment, *Greenhouse Gas Emissions in Tokyo*, accessed January 30, 2014, http://www.kankyo.metro.tokyo.jp/climate/other/emissions_tokyo.html; Saitama Prefecture, *Situation of Greenhouse Gas Emissions in Saitama Prefecture*, May 22, 2013, http://www.pref.saitama.lg.jp/page/ontaico2.html; Kyoto Prefecture Website, *Kyoto Greenhouse Gas Emissions (for Fiscal 2011 Preliminary Figures)*, July 23, 2013, http://www.pref.kyoto.jp/tikyu/news/press/2013/haishuturyou.html; Ministry of the Environment, Government of Japan, *Japan's National Greenhouse Gas Emissions in Fiscal Year 2011 (Final Figures)*, April 12, 2013, http://www.env.go.jp/en/headline/headline.php?serial=1935.

147 Source: Tokyo Metropolitan Government, *Total Reduction Obligations in the Emissions Trading Scheme – Emissions Trading Operational Guidelines*, April 30, 2013; Saitama Prefecture Government, *Various Credits in the Saitama Prefecture System*, accessed January 30, 2014, http://www.pref.saitama.lg.jp/page/saitamacredit.html; Kyoto Environmental Action Promotion Council, *Kyoto's Version of the CO_2 Emissions Trading Scheme*, accessed January 30, 2014, http://www.kyoto-ets.com/kyoto_co2_toha.html.

148 Source: Tokyo Metropolitan Government, *Total Reduction Obligations in the Emissions Trading Scheme – Assessment Result for the Transaction Price*, December 2013, http://www.kankyo.metro.tokyo.jp/climate/large_scale/attachement/kakakusatei_201312.pdf.

149 Source: Tokyo Metropolitan Government, *Information Related to Emissions Trading (fiscal Year 2012)*, accessed March 31, 2014, http://www.kankyo.metro.tokyo.jp/climate/large_scale/attachement/torihiki_kouhyou_201303.pdf; Tokyo Metropolitan Government, *Information Related to Emissions Trading (February 2014)*, accessed March 31, 2014, http://www.kankyo.metro.tokyo.jp/climate/large_scale/attachement/torihiki_kouhyou_201402.pdf.

150 Source: Tokyo Metropolitan Government, *Questionnaire on the Emissions Trading Scheme in Tokyo – Key Findings*, December 25, 2013, http://www.kankyo.metro.tokyo.jp/climate/large_scale/%E3%82%A2%E3%83%B3%E3%82%B1%E3%83%BC%E3%83%88_131224.pdf.

National level (J-Credit Scheme) In 2013 the two national domestic voluntary crediting schemes, the Japan Domestic Credit Scheme (J-CDM)[151] and the Offset Credit (J-VER) Scheme[152] were merged into the new J-Credit Scheme managed by the central government.[153] The credits generated can be used for various purposes (fulfilling the obligation under the Keidanren's Commitment to a Low Carbon Society,[154] voluntary carbon offsetting). The Scheme is scheduled to be terminated on March 31, 2021. No plans after this date have been provided so far.

121 ← ***International level (JCM)*** The Japanese government intends to allow JCM credits as offsets from fiscal year 2014 onwards and is currently working on setting up the necessary registry infrastructure.

Japan has signed a bilateral agreement under the JCM with 11 countries: Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Vietnam, Lao PDR, Indonesia and Costa Rica, which all joined in 2013, and Palau and Cambodia in 2014.[155] In December 2013 ten projects were selected for financing[156] under the JCM Promotion Scheme: five projects in Indonesia, two in Vietnam, one in Cambodia, one in Mongolia and one in Bangladesh.[157]

4.2.11 China Emissions Trading Schemes (Beijing, Guangdong, Hubei, Shanghai, Shenzhen, and Tianjin)

The National Development and Reform Commission (NDRC) announced its plan to develop seven official ETS pilot programs (Beijing, Shanghai, Tianjin, Chongqing, Guangdong, Hubei and Shenzhen) in 2011.[158] This plan began to deliver from 2013. By April 2014, six of the seven pilot schemes[159] started trading (see Table 7), with the remaining one – Chongqing – due to start in 2014. See Section 4.3.1 for more information on the Chongqing ETS pilot program and on the plans for a national ETS.

Carbon markets are now officially open for business in China. The total 2013 allocations of these six pilots combined amounts to 1,115 $MtCO_2e$, making China the second largest carbon market in the world, after the EU ETS. Guangdong ETS, the largest of the Chinese ETS pilots, itself covers 388 $MtCO_2e$ in 2013,[160] similar to the size of France's emissions in 2012.[161]

Table 7 Overview of the Chinese ETS pilots pilots in operation

	Shenzhen	Shanghai	Beijing	Guangdong	Tianjin	Hubei
Starting date	June 18, 2013[162]	November 26, 2013[163]	November 28, 2013[164]	December 18, 2013[165]	December 26, 2013[166]	April 2, 2014[167]
Traded volumes[168] ($ktCO_2e$)	0.250	0.239	0.096	0.126	0.140	1.608
Average price[169] (CNY) [$US]	75.2 [12.4]	31.4 [5.2]	52.6 [8.7]	61.8 [10.2]	34.7 [5.7]	24.7 [4.1]

151 Managed by the Ministry of Economy, Trade and Industry (METI), the Ministry of the Environment (MOE) and the Ministry of Agriculture, Forestry and Fisheries (MAFF).
152 Managed by MOE.
153 Source: *J-Credit Scheme*, November 2013, http://japancredit.go.jp/pdf/english/credit_english_001_2.pdf.
154 The Keidanren's Commitment to a Low Carbon Society is a "pledge and review" system and the successor of the Keidanren Voluntary Action Plan that ended in fiscal year 2012. More information on the Keidanren's Commitment to a Low Carbon Society can be found at *Keidanren's Commitment to a Low Carbon Society*, January 17, 2013, http://www.keidanren.or.jp/en/policy/2013/003_commitment.pdf.
155 Source: Government of Japan, *Recent Development of The Joint Crediting Mechanism (JCM)*, January 2014, http://www.mmechanisms.org/document/20140122_JCM_goj.pdf.
156 Includes offset purchase and investment finance.
157 The JCM Promotion Scheme finances up to half of the investment costs of a project and in return half of the JCM credits issued are to be delivered to the Government of Japan. Source: Bannai, O., *JCM Financing Programme and Study Programme*, November 12, 2013, http://www.mmechanisms.org/document/cop19_sideevents/unfccc/6_GEC.pdf.
158 Source: National Development and Reform Commission of the People's Republic of China, *Notice on Carbon Emissions Trading System Pilots*, October 29, 2011.
159 Shenzhen, Shanghai, Beijing, Guangdong, Tianjin and Hubei
160 Source: SinoCarbon, *2013 Carbon Markets Annual Report*, January 2014.
161 Source: PBL Netherlands Environmental Assessment Agency, *Are Global CO_2 Emissions Still Rising?*, n.d., http://infographics.pbl.nl/website/globalco2/.

Each of the pilots has unique characteristics; the way in which the carbon markets play out will help policy makers learn lessons that can be applied in the national context. Box 2 and Figure 18 paint a picture of some of the notable features.

Box 2 In brief: characteristics of the Chinese ETS pilots in operation

Shenzhen was the first of the Chinese ETS pilots to start operating and therefore has the longest price history (see Figure 19). Shenzhen's industrial base includes light manufacturing, e.g., semiconductor and car-part production. Therefore, to create a market with enough emissions to enable liquidity, Shenzhen has to cover 635 enterprises. As the only pilot with Special Economic Zone (SEZ) status, Shenzhen had the legislative ability to pass a bill to support ETS implementation.

Shanghai is China's financial center and, as such, the region has announced plans to explore innovative financial tools that boost liquidity in the scheme. Shanghai is a city with some heavy industry and light industry, and so the scheme covers a broad array of sectors, including aviation and ports. Shanghai hosts a large number of multinational companies, many of which have already experienced ETS compliance in other parts of the world, which may help engagement with industrial participants.

Beijing is the capital, with a high profile. As such, many of the lessons learned in this pilot will feed directly into the national scheme. Prior to the 2008 Olympic Games, heavy industries including power, steel and cement were forced to move out of Beijing, increasing the energy use and the emissions of the neighbouring regions (Tianjin and Hebei). Therefore, Beijing's ETS covers a reduced power sector, and not all those that service the city.

Guangdong is one of the industrial powerhouses in southern China and has the ETS with the largest volume of emissions covered. Guangdong is also the first pilot to incorporate auctioning into the design of their scheme. Current rules mandate participants to purchase a minimum of 3% of their total allocation in the primary markets at a reserve price of CNY60 (US$10) before the remaining 97% of allowances can be traded.

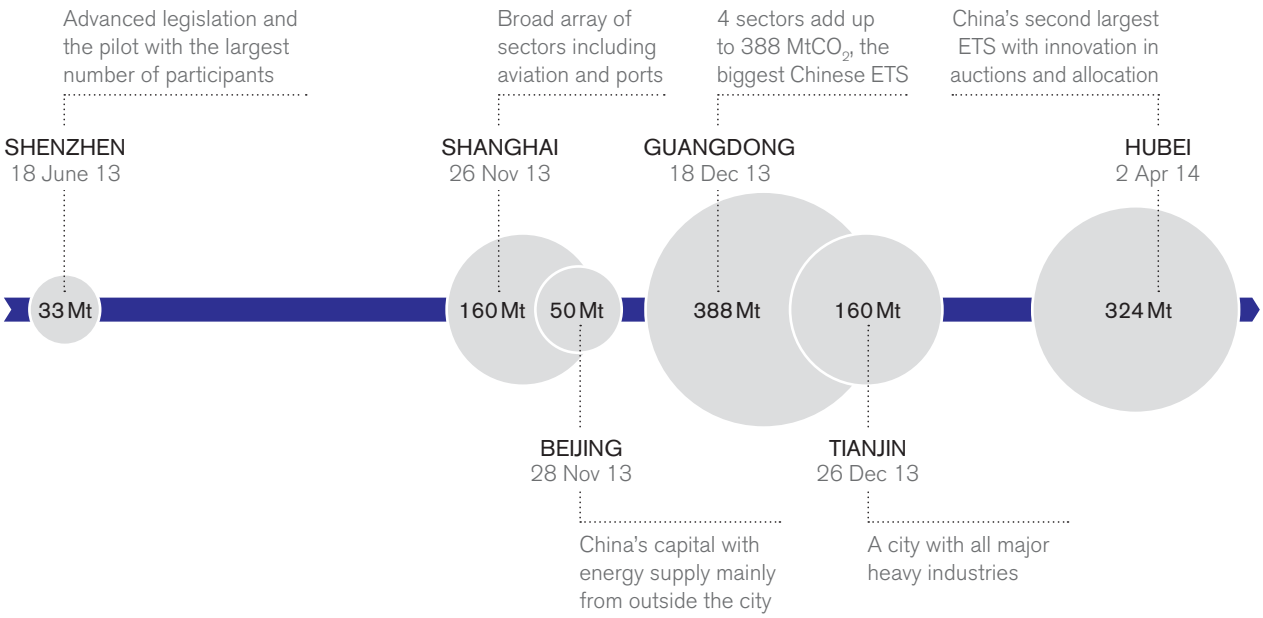
Tianjin is a port city with a strong industrial base. Tianjin is part of the Beijing-Tianjin-Hebei area experiencing severe air pollution. To cut emissisons, Tianjin's ETS covers a number of key industries (power and heat, iron and steel, chemical, petrochemicals and oil and gas exploration), raising serious concerns over competitiveness.

Hubei is located at the heart of central China, a transport hub with a faster than average economic growth rate. Iron and steel production accounts for a significant proportion of emissions. Hubei's ETS covers 12 sectors, including pharmaceutical and food and beverage, which other pilots do not cover. Hubei includes some innovations in auctioning and allocation.

Note: the schemes are presented in order of entry into force.

162 Source: China Shenzhen Emission Exchange, *Shenzhen Emission Trading Pilot Launch Official Press Release*, accessed March 10, 2014, http://www.cerx.cn/cn/trade_details.aspx?ArticleID=274.
163 Source: Shanghai Energy and Environment Exchange, *Shanghai Pilot Kick-off Official Press Release*, November 26, 2013, http://www.cneeex.com/xwdt/tpxw/383432.shtml.
164 Source: China News, *Launch of the Beijing Pilot, More Launches Expected during the Course of the Year*, November 28, 2013, http://finance.chinanews.com/ny/2013/11-28/5559428.shtml.
165 Source: China Climate Change Info-Net, *Guangdong Emissions Trading Launched*, December 20, 2013, http://www.ccchina.gov.cn/Detail.aspx?newsId=42530&TId=57.
166 Source: Tianjin Climate Exchange, *Tianjin Pilot Launch Press Release*, December 27, 2013, http://www.chinatcx.com.cn/tcxweb/pages/news/news_info.jsp?article_id=2136.
167 Source: Hubei Emission Exchange, *Hubei ETS Launched*, April 8, 2014, http://www.hbets.cn/html/zxdtXwzx/1079_1.shtml.
168 Volume traded in the secondary market from the start of the scheme until April 18, 2014. Analysis on source from Chinese emission exchanges in Shenzhen, Beijing, Shanghai, Guangdong, Tianjin and Hubei.
169 Ibid.

Figure 18 Characteristics of the Chinese ETS pilots in operation



Notable progress on scheme design has been made since the start of 2013. All pilots have published their ETS Implementation Plans, the key document defining the specific design aspects. Some pilots have released Carbon Emission Allowance Allocation Plans and ETS Pilot Management Methods. However many of the details remain to be further clarified or are not publicly available, and it is expected that this will take place during the coming year.

Key developments are described below, and further information can be found in the detailed update sheet in Annex II.

122 ←

Scope Most pilots have an absolute cap, Shenzhen has an intensity-based cap. Overall, therefore, the pilots have a growing cap, in line with China's 40–45% carbon intensity reduction target by 2020.

Allocation approaches Most pilots use historical intensity or emissions-based free allocation. Guangdong is the first pilot to use auctioning.[170] Dynamic allocation is included in the ETS Implementation Plans for Shenzhen,[171] Tianjin,[172] and Shanghai.[173]
Allocation for the power sector is similar across pilots, based on benchmarks of different generation technologies and installation capacities.[174]

Use of offsets By April 2014, 178 CCER methodologies based on CDM methodologies published. About 200 projects have been approved by the NDRC.[175]

Price stabilization mechanism Shenzhen, Guangdong and Hubei have set aside reserve allowances to manage price fluctuations.

170 Source: Guangdong Development and Reform Commission, *Guangdong ETS Allocation and Auctioning Announcement*, December 10, 2013, http://www.gddpc.gov.cn/xxgk/tztg/201312/t20131210_232286.htm.
171 Source: Shenzhen Municipal Government, *Shenzhen ETS Implementation Plan (Draft)*, October 29, 2013, http://fzj.sz.gov.cn:8080/cms/fzbDetails.action?-siteName=fzb&pageId=4443.
172 Source: Tianjin Government, *Tianjin Municipal People's Government Office Interim Measures on Carbon Emissions Trading in Tianjin*, December 20, 2013, http://www.tj.gov.cn/zwgk/wjgz/szfbgtwj/201312/t20131224_227448.htm.
173 Source: Shanghai Municipal Government, *Shanghai Carbon Market Implementation Plan*, November 18, 2013, http://www.shanghai.gov.cn/shanghai/node2314/node2319/node12344/u26ai37414.html.
174 Source: Ecofys, *Suggestions for the Design of Tianjin's ETS*, November 8, 2013.
175 Source: *China Certified Emission Reduction Exchange Info-Platform*, n.d., http://203.207.195.145:92/zylist.aspx?clmId=162.

Performance and effectiveness Carbon prices in the pilots to date range from approximately CNY120/tCO_2e (US$20) in Shenzhen,[176] to CNY22/tCO_2e (US$3.6) in Hubei (see Figure 19).[177]

MRV and registry GHG accounting methodologies released for 10 sectors.[178] Guidance also provided for monitoring of emissions in smaller installations.

Linking to other schemes Potential to link Hubei with Guangdong but no official progress or details.

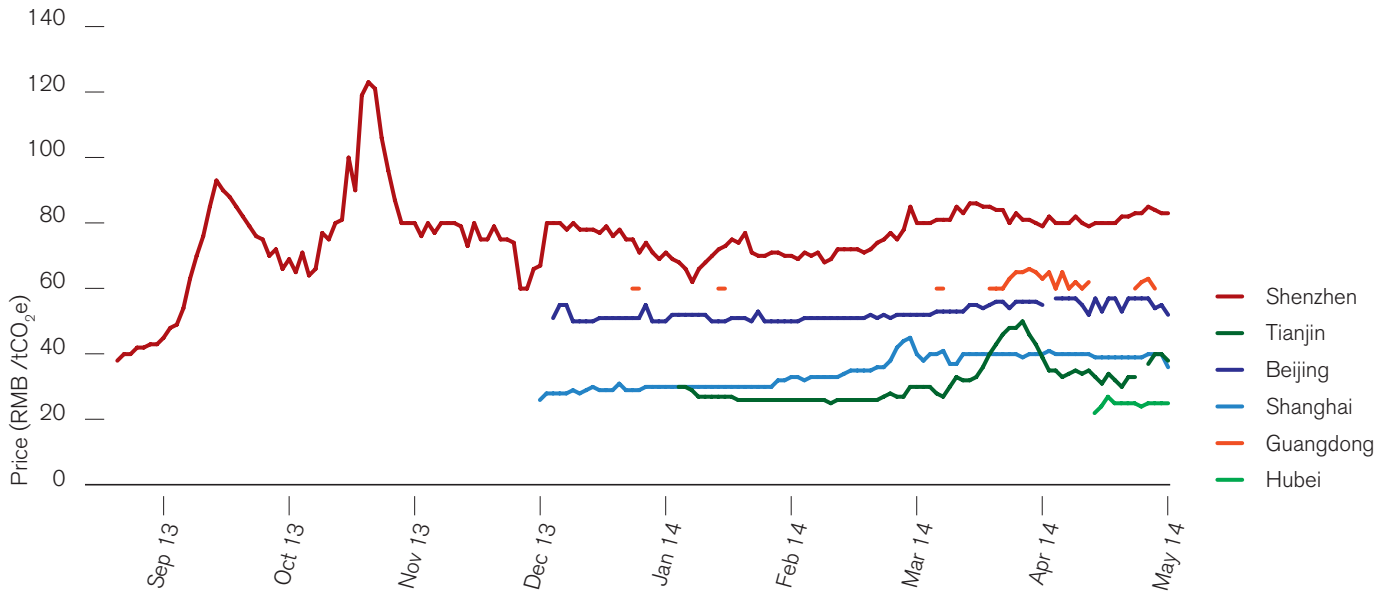
Looking ahead The first pilot phase is planned to end in June 2016 and should provide lessons for the national ETS. No clarity yet on how the pilots and national ETS will relate to each other.[179]
See Section 4.3.1 for more information on the national ETS.

4.3 EMERGING EMISSIONS TRADING SCHEMES AND CREDITING APPROACHES

4.3.1 China Emissions Trading Schemes (national and Chongqing)

The national China ETS is expected to start during the 13th Five Year Plan (2016–2020). Some preparation has already begun, with more details expected by the end of 2014.[180] In the meantime, the seventh ETS pilot program – Chongqing – is expected to start in 2014. See Section 4.2.11 for details of the six ETS pilot programs currently in force.[181]

Figure 19 Prices to date in the Chinese ETS pilots



Source: combined information Crystal carbon, website of Chinese emissions exchanges, as of April 18, 2014.

176 Shenzhen Climate Exchange updates its pricing data on a daily basis through the China Emissions Exchange Website. Source: China Emissions Exchange, *China Emissions Exchange*, accessed January 24, 2014, http://www.szets.com/Portal/home.seam.
177 Source: China Hubei Emission Exchange, *Allowance Trading Daily Report*, April 2, 2014, http://www.hbets.cn/html/zxggXxpl/1075_1.shtml.
178 Source: National Development and Reform Commission, *GHG Accounting Methodologies and Reporting Guidance for 10 Industries*, 2013, http://www.ndrc.gov.cn/zcfb/zcfbtz/2013tz/t20131101_565313.htm.
179 Source: Bo, K. and Freeman, C., *Making Sense of Carbon Market Development in China, Carbon and Climate Law Review, Issue 3*, 2013.
180 Source: China Energy Newspaper, *National Carbon Allowances Will Be Issued by the Government*, April 20, 2014, http://energy.people.com.cn/n/2014/0420/c71661-24918882.html.
181 In addition, Taiwan, China set-up in 2013 rules for an early action crediting and offset program. The first early action credits were issued in 2013, and by March 2013 16 $MtCO_2$ had been issued. This is a first step towards developing a domestic carbon market, which might include an ETS at a later stage. Source: Taiwan GHG Reduction Management Office Environmental Protection Administration, *Taiwan's MRVSystem and Carbon Market Development*, April 18, 2014.

4.3.2 Republic of Korea Emissions Trading Scheme

The ETS is due to start from January 2015 with three phases running up to 2025. The Republic of Korea (Korea) remains on course to meet its target of a 30% cut (233 $MtCO_2e$) in GHG emissions by 2020 and the Korean Ministry of Environment published the new National GHG Emissions Reduction Roadmap 2020 in early 2014.[182, 183]

Scope The basis for the overarching and sectoral emissions cap for the ETS sectors is now available.[184] The industry, power and building sectors will share over 80% (190 $MtCO_2e$) of Korea's emission reductions by 2020.[185]

Allocation approaches Free allocation via grandfathering for existing facilities and benchmarking used for new entrants.[186] Free allocation will decrease from 2018.[187]

Competitiveness considerations Industry eligible for 100% free allocation if "Production Cost Occurrence Rate"[188] is greater than 5% or if Trade Intensity[189] exceeds 10%, or if either of these two ratios is greater than 30% as a result of ETS implementation.

Use of offsets Offsets permitted up to a limit of 10% of total allowances. International offsets will only be allowed after the first and second phases (2015–2020) and volume must not exceed the number of domestic offsets used for each compliance year.

Price stabilization mechanism Stabilization measures will be triggered when the trading price or volume fluctuate severely. The Korea Exchange will host trading under the ETS.[190]

Performance and effectiveness During the first and second phases, only ETS participants, the Industrial Bank of Korea, the Export-Import Bank of Korea, and the Korea Finance Corporation will be allowed to trade.

A penalty of three times the average allowance price during the compliance year will be applied for failure to surrender allowances, to a maximum of KRW100,000/tCO_2e (US$90/$tCO_2e$).[191]

MRV and registry The National Institute of Environmental Research has developed 25 new methods for GHG and energy emissions verification for use in the ETS.[192]

Looking ahead The National Allocation Plan with specific allocation rules and criteria is expected to be published by June 2014, after consultation with controlled entities and voluntary participants. A list of entities covered by the scheme will follow. The idea of an ETS trading simulation has been proposed to build operational experience. The coordination of the ETS policy with the target management system needs some further work.

182 Source: Responding to Climate Change, *South Korea Confirms 30% Carbon Reduction Target by 2020*, January 31, 2014, http://www.rtcc.org/2014/01/31/south-korea-confirms-30-carbon-reduction-target-by-2020/.

183 Source: Ministry of Environment, Korea, *National Greenhouse Gas Emissions Reduction Roadmap 2020*, January 28, 2014, http://eng.me.go.kr/eng/web/board/read.do?menuId=21&boardMasterId=522&boardId=339283.

184 Source: Ministry of Environment, Korea, *National Greenhouse Gas Emissions Reduction Roadmap 2020*, January 28, 2014, http://eng.me.go.kr/eng/web/board/read.do?menuId=21&boardMasterId=522&boardId=339283.

185 Source: Ministry of Environment, Korea, *National Greenhouse Gas Emissions Reduction Roadmap 2020*, January 28, 2014, http://eng.me.go.kr/eng/web/board/read.do?menuId=21&boardMasterId=522&boardId=339283.

186 Source: Ministry of Environment, Korea, *Enforcement Decree of Emissions Trading Scheme Article 15*, November 15, 2012.

187 Source: Ministry of Environment, Korea, *Enforcement Decree of Emissions Trading Scheme Article 13*, 14, November 15, 2012.

188 Production Cost Occurrence Rate: (Average total GHG emission of applicable industry's baseline period x Average allowance price of baseline period) / Average total generated value added of applicable industry's baseline period.

189 Trade Intensity: Average annual trade amount of applicable industry's baseline period / (Average annual sales of applicable industry's baseline period + Average annual income of applicable industry's baseline period).

190 Source: Ministry of Environment, Korea, *Designate Korea Exchange Inc. as Emission Permits Exchange*, January 15, 2014, http://eng.me.go.kr/eng/web/board/read.do?pagerOffset=10&maxPageItems=10&maxIndexPages=10&searchKey=&searchValue=&menuId=21&orgCd=&boardId=338102&boardMasterId=522&boardCategoryId=&decorator=.

191 6 months prior to the start of the next implementation year.

192 Source: Ministry of Environment, Korea, *Raise Greenhouse Gas Emissions Verification to a Higher Level*, December 31, 2013, http://eng.me.go.kr/eng/web/board/read.do?pagerOffset=10&maxPageItems=10&maxIndexPages=10&searchKey=&searchValue=&menuId=21&orgCd=&boardId=336822&boardMasterId=522&boardCategoryId=&decorator=.

4.3.3
Other potential schemes in Brazil, Chile, Costa Rica, Mexico, North American Pacific Coast, Russia, Thailand, Turkey, and Ukraine

Several other countries are making headway with carbon pricing instruments. While some are explicitly working toward an ETS, others are leaving their options open, assessing various instruments and the potential implications of their implementation. This section summarizes progress in countries which have expressed an interest in an ETS.

Brazil No notable progress has been made on Brazil's national ETS plans. At the regional level, opposition from industry for the launch of a Rio de Janeiro ETS continues,[193] and no progress has been made on the ETS plans for São Paulo. However, some companies have shown interest in gaining practical experience in an ETS to form their own perspective. This led to the launch of the Emissions Trading Scheme of the Businesses for Climate Platform (SCE EPC) and the first auction of allowances in March 2014. The SCE EPC is a simulated ETS with 22 major companies,[194] emitting a total of 22 $MtCO_2e$ in 2012, and it is set to run until the end of November 2014.[195] Allowances can be traded through the exchange platform BVTrade. On March 21, 2014 allowances were offered at R$35.00 (US$14.83) and requested at R$24.15 (US$10.24), with the last trade taking place at R$25.00 (US$10.60).[196]

Chile is preparing for a possible ETS in the energy sector. The PMR is supporting these efforts by funding regulatory, economic and institutional analyses, as well as the design and implementation of MRV and registry systems.[197]

Costa Rica In September 2013 Costa Rica's President signed a decree for the regulation and operation of the domestic carbon market. In October 2013, BANCO2 was created, the carbon exchange for the domestic carbon units, Costa Rican Carbon Units.[198] The PMR is supporting Costa Rica to set up and operate their domestic carbon market.[199] In December 2013, Costa Rica signed a bilateral agreement to join the Japanese JCM, bringing the number of countries participating in the JCM to nine (see Section 4.2.9 for more details on the JCM).[200]

Mexico In February 2014 the Ministry of Energy mentioned the development of a potential ETS in the energy sector.[201] The recently introduced Mexican carbon tax is discussed in Section 5.2.9.

North American Pacific Coast[202] On October 28, 2013, the states of California, Washington, Oregon and British Columbia signed a regional agreement, the Pacific Coast Action Plan on Climate and Energy, to align policies to reduce GHG emissions. Cooperation will include activities around carbon pricing and GHG reduction targets. The pact commits Oregon and Washington to take action on carbon pricing. Oregon is exploring options to setting a price on emissions including an ETS and a carbon tax (see section 5.3.2 for the tax) and Washington is considering a cap-and-trade scheme.[203] British Colombia and California will

193 Source: Thomson Reuters Point Carbon, *Brazilian Minister Slams Industry for Blocking Local Carbon Market*, August 28, 2013, http://www.pointcarbon.com/news/1.2540889?date=20130828&sdtc=1.

194 Companies participating in the simulation include Banco do Brasil, CCR, Braskem, Camargo Corrêa, Anglo American, Citibank, Duratex, EDP, Furnas, Grupo Abril, Klabin, Raízen and TAM.

195 Source: Thomson Reuters Eikon, Vale, *Braskem to Enter Cap-and-Trade Simulation in Brazil - RTRS*, March 13, 2014, http://www.bvrio.org/site/images/pressreleases/katerva-reuters.pdf.

196 Source: BV Trade, *BV Trading Platform*, accessed March 21, 2014, http://www.bvtrade.org/login/homepage.do?notices=carbono.somente.habilitados.

197 Source: Fernandez, I., *Chile Update on MRP Implementation Phase*, October 2013, http://www.thepmr.org/system/files/documents/PA%26_Chile%20MRP%20update%20PMR%20Marrakech%20Oct%202013.pdf. Chile was part of the first group of countries to receive implementation funding from the PMR in March 2013 for the implementation of their Market Readiness Proposal.

198 Source: BanCO2, BanCO2, accessed March 17, 2014, http://www.banco2.com/BCO2_WEB/; Thomson Reuters Point Carbon, *New Bank To Handle Costa Rica's Carbon Credits Trading*, October 23, 2013, http://www.pointcarbon.com/news/1.2675033?date=20131023&sdtc=1.

199 Source: *Costa Rica PMR Update*, October 2013, http://www.thepmr.org/system/files/documents/Costa%20Rica_MRP%20Implementation%20Update%20Oct%2013.pdf. Costa Rica is also part of the first group of countries to receive implementation funding in March 2013 from the PMR.

200 Source: *Memorandum of Cooperation on the Low Carbon Growth between the Japanese Side and the Costa Rican Side*, accessed February 12, 2014, http://www.mmechanisms.org/document/JCM/costarica/JCM_CR_bilateral_document.pdf., Accessed February 12, 2014.

201 Source: Mexican Ministry of Energy, *The Energy Reform Will Boost Clean Energy*, February 26, 2014, http://energia.gob.mx/portal/Default.aspx?id=2762.

202 Source: Office of Governor Edmund G. Brown Jr., *Governor Brown Joins Oregon, Washington, British Columbia Leaders to Combat Climate Change*, October 28, 2013, http://gov.ca.gov/news.php?id=18284.

203 Source: State of Washington, Office of the governor, *Executive Order 14-04, Washington carbon pollution reduction and clear energy action*, April 29, 2014. http://governor.wa.gov/office/execorders/documents/14-04.pdf.

maintain their existing carbon pricing programs. The pact states that linking between schemes should be considered whenever possible.

Russia In 2011 Russia announced that it would not participate in CP2 of the Kyoto Protocol, but did commit to the Durban Action Plan. In April 2014, the Russian government established an emission reduction target of 25% compared to 1990 levels by 2020.[204] The government has developed an action plan to achieve these targets, which includes the development of a national registry and MRV framework in 2014 and the development of sector-level emission reduction indicators in 2015. Initially companies may face obligatory MRV requirements. As a next step government funds may be deployed to provide JI-like results-based payments for emission reductions. The draft action plan includes the potential for the development of other policy measures to reduce GHG emissions before 2020, and looking ahead to 2030. These policy measures might include market-based mechanisms but the final choice is still open. The plan also envisages the potential for linking with regulatory emission reduction systems in other countries and cooperation with international financial institutions. The Russian government is developing these policy ideas in close consultation with Russian business and industry.

Thailand is designing a domestic market-based mechanism to reduce energy consumption and GHG emissions in the energy sector with a view to transforming it into an ETS. In March 2014, Thailand was allocated US$3 million from the PMR to assist with this work. Phase one of the work will focus on designing an Energy Performance Certificate Scheme (EPC) and preparing the infrastructure for a data collection and MRV system.[205] A study on a possible legal framework for a potential ETS will also be done. Phase two of the work will focus on implementation of the EPC.

Turkey adopted MRV legislation in 2012. Installations covered have to submit monitoring plans to the Ministry of Environment and Urbanization by June 2014. The PMR is supporting the implementation of the existing legislation, including the analysis and choice of appropriate market-based mechanisms, including a possible ETS in the electricity sector.[206]

Ukraine The United Nations Environment Programme (UNEP) is working on the potential to develop a carbon market approach in Ukraine, whilst EBRD is supporting Ukraine in a complementary approach that might involve carbon taxes and other levers. The PMR will support Ukraine to develop a GHG MRV system as a first step toward a potential ETS. These initiatives should help Ukraine converge on an appropriate approach on carbon pricing.

Colombia, India, Indonesia, Jordan, Morocco, Peru, Tunisia and the Socialist Republic of Vietnam (***Vietnam***) are also exploring carbon pricing instruments under the PMR and ***Iran*** is carrying out studies for a potential ETS.[207]

4.4 LOOKING BACK AT INSTALLATION LEVEL EMISSIONS TRADING: THE EU ETS AND THE NZ ETS

4.4.1 The EU ETS

The EU ETS was established in 2005 following extensive negotiations between the European member states of the time. Several years on, it is possible to compare expected outcomes with the results in relation to the fundamental determinants of carbon price, the use and role of Kyoto credits and the way in which the market itself operated.

204 Source: Government of the Russian Federation, *Presidential Decree 504p*, April 2, 2014; Government of the Russian Federation, Presidential Decree 752, September 20, 2013.

205 Source: Partnership for Market Readiness, *Allocation of Implementation Phase Funding to Thailand*, March 2014, https://www.thepmr.org/system/files/documents/PMR%20Resolution%20PA%202014_2_Allocation_Implementation%20Funding_Thailand.pdf.

206 Source: Ozkal, S. and Ecer, M., *Turkey Final Market Readiness Proposal*, May 27, 2013, http://www.thepmr.org/system/files/documents/Final-MRP-Presentation_Turkey_v3.pdf. Turkey received US$3 million from the PMR in May 2013.

207 See www.thepmr.org for more information on countries activies under the PMR. For Iran, see: Shana, *Carbon Bourse Envisaged*, February 16, 2014.

»An inflexible, predefined supply of allowances does not address unforeseen macro-economic changes, while the demand adjusts itself.«

The carbon price and its determinants The European Commission's (EC) expectation in 2008 – at the start of Phase II of the scheme – was that it would allow international credits "up to a level which would ensure that the carbon price in the EU is not higher than €30/tCO_2e" (US$41/t$CO_2$e).[208] Other scenarios showed prices mostly in the range of €30 to €40/tCO_2e (US$41 to US$55/tCO_2e). A carbon price of €4/tCO_2e (US$5.5/t$CO_2$e) was mentioned in the EC's original modeling scenario with unlimited access to international credits. While the impact of a renewables target and the use of international credits were both assessed, the economic crisis was not anticipated in any of the models.

In reality the carbon price has been well below €30/tCO_2e (US$41/t$CO_2$e) since 2009, dropping to €4/tCO_2e (US$5.5/t$CO_2$e) in 2013. Significant reductions in the emissions within the EU ETS scope have led to a higher supply of allowances than predicted and therefore a lower price than originally foreseen. The EC cites the international economic crisis as the main cause of the emission reductions achieved in the EU ETS.[209] According to some analysts the low carbon price is caused primarily by the large uptake of renewables: compared to business as usual, renewables contribute to around 60% of the emission reductions, while the recession accounts for only around 30%.[210] On the contrary, others note that the recent and projected growth path for renewables matches quite well with the assumptions used to set the EU ETS cap. They therefore conclude, in line with the EC, that the recession is the primary cause of the supply-demand imbalance.[211]

The reduced emissions in the system have led to a supply-demand imbalance, resulting in a build-up of so-called surplus allowances that have been issued but are not yet needed. The main lesson of the EU ETS has been made explicit in the proposal for a market stability reserve. The mechanism learned from experience that an inflexible, predefined supply of allowances does not address unforeseen macro-economic changes, while the demand adjusts itself. The proposed reserve should both tackle current surplus and make future supply of allowances more flexible against changing economic conditions. From a purely economic point of view, the question would be whether the proposed market stability reserve will drive up the EU carbon price: the total supply of allowances is not reduced, but allowances are "parked" in the reserve temporarily and will be made available later, i.e., a reflection of the idea behind backloading. However, the current market experience witnessed through the backloading negotiations does suggest that the carbon price responds to some degree to any news related to the topic. This response may indicate that current prices do, to a certain extent, reflect shorter-term priorities, and may reflect an expectation that these allowances might eventually be cancelled.

208 Source: Commission of the European Communities, *Annex to the Impact Assessment, Document Accompanying the Package of Implementation Measures for the EU's Objectives on Climate Change and Renewable Energy for 2020*, SEC (2008) 85, Vol. II, February 27, 2008.
209 Source: European Commission, *The State of the European Carbon Market in 2012, COM (2012) 652 Final*, November 14, 2012.
210 Source: CDC Climat Research, *Climate Brief No. 32*, October 2013.
211 Source: Öko-Institut, *Strengthening the European Union Emissions Trading Scheme and Raising Climate Ambition*, June 2012.

The use of Kyoto credits Installations in the EU ETS are allowed to surrender up to around 1,600 to 1,700 million Kyoto credits (CERs and ERUs) in addition to EUAs in the period 2008–2020. The EC's 2008 impact assessment[212] anticipated that access to international credits in Phases II and III of the EU ETS would decrease direct costs at the EU level from 0.61% to 0.45% of EU GDP in 2020, equal to a cost advantage of around €25 billion.[213] In turn the carbon price was expected to be reduced from €43/tCO_2e to €30/tCO_2e (US$59/t$CO_2$e to US$41/tCO_2e) in the scenario with the use of international credits. A lower carbon price leads to reduced revenues from auctions for member states and therefore increased support necessary to meet the renewable energy targets, although no quantitative impact is estimated. With the use of international credits, domestic CO_2 reductions are estimated to decrease from a 20% saving to a 14% saving by 2020 compared to 1990.

In the period 2008–2012 (Phase II), operators already used 1,059 million international credits (64% CERs and 36% ERUs). The use of CERs and ERUs in 2008–2012 led to estimated cost savings for EU ETS installations of between €4 billion and €20 billion (US$6 billion to US$28 billion).[214] These savings were achieved both due to the price difference between international credits and EUAs, and the lower price of EUAs. The very low price of international credits led to 70% of EU ETS installations making use of the opportunity to surrender such credits instead of EUAs, including those installations that had a surplus of EUAs, to minimize their compliance cost. The low carbon prices should have led to additional costs for member states to support renewable energy and reach renewable energy targets, although such data are not readily available. It is important to note that the current estimate of the so-called surplus in the EU ETS, almost 2 billion allowances, is significantly higher than the international allowances used so far, and so even in the absence of international credits, there would be some surplus.[215]

Current proposals put forward by the EU suggest a much reduced role for international credits in the EU ETS post-2020 (see Section 4.2.1).

EUA market sophistication The sections above outline the fundamental policy issues that determine the carbon price; however, day to day prices are determined by the actors in the market. The EUA market quickly developed a very high level of sophistication, something that was not explicitly anticipated at the outset. Private sector market players were swift to react to stimuli and put in place complex financial infrastructures.

In 2009, during the economic downturn, cash-strapped industrial participants in the EU ETS were selling carbon assets at a very low price to raise cash at a time of limited access to credit. At the same time, with the end of Phase II of the EU ETS in sight, many entities, in particular utilities, sought to buy EUA vintages under the assumption that they would no longer receive free allocations after 2012, and that they would therefore need to hedge their exposure to Phase III. As a result, the EUA price curve steepened significantly in a contango shape, contrary to the CDM price curve that skewed towards a backwardation curve.[216]

212 Source: Commission of the European Communities, *Annex to the Impact Assessment, Document Accompanying the Package of Implementation Measures for the EU's Objectives on Climate Change and Renewable Energy for 2020, SEC (2008) 85, Vol. II*, February 27, 2008.
213 The reference case is the cost-efficient reference option + distributed non-ETS targets.
214 Source: CDC Climat Research, *Climate Report No. 43*, January 2014.
215 Analysis based on Source: European Environment Agency, *EU Emissions Trading System (ETS) data viewer*, accessed May 2, 2014, http://www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer.
216 Contango: a forward sloping curve i.e. the price of the future is greater than the spot price of the underlying commodity. Backwardation: future price lower than spot price responding to specific market circumstances where underdelivery leads sellers to pay a premium over spot CERs in the market to honor pre-existing sale commitments.

Taken together, these two factors created an opportunity for the financial sector to profit from engagement in this business. Some were already involved in relation to trading strategies for the energy sector, but this new arbitrage role was an additional involvement. The curve began to flatten out only during the second half of 2009, when liquidity increased and the cost of funding declined.[217]

The EU ETS had an influence on wider Kyoto markets too. Data on the purchases of Kyoto credits in the primary markets show that the predominant source of demand in the system was always Europe, mainly driven by the EU ETS.[218] Private sector participants in the EU ETS boosted market liquidity with 24,061 million allowances transacted over the period 2008–2011 inclusive, compared to a cumulative cap of 7,437 million allowances over the same period. This boost came because annual compliance targets stimulated quick actions, in contrast to the targets in the Kyoto Protocol, which were over the whole period.

As much as AAU trading illustrates that governments are not as well equipped as market participants, the sophistication of the EUA and CER markets shows the ability that the private sector has to react quickly to market circumstances. These opportunistic behaviors are unstable and prone to reversion, should the context change. Although the private sector is the key enabling agent in a market-based mechanism, these short-term strategies are in contradiction to the long-term perspective needed to tackle climate change. Some measures are increasingly implemented to mitigate these risks (e.g., price stabilization mechanisms) but the very flexibility and sophistication of the financial sector makes it difficult to anticipate how the market might react to such changes.

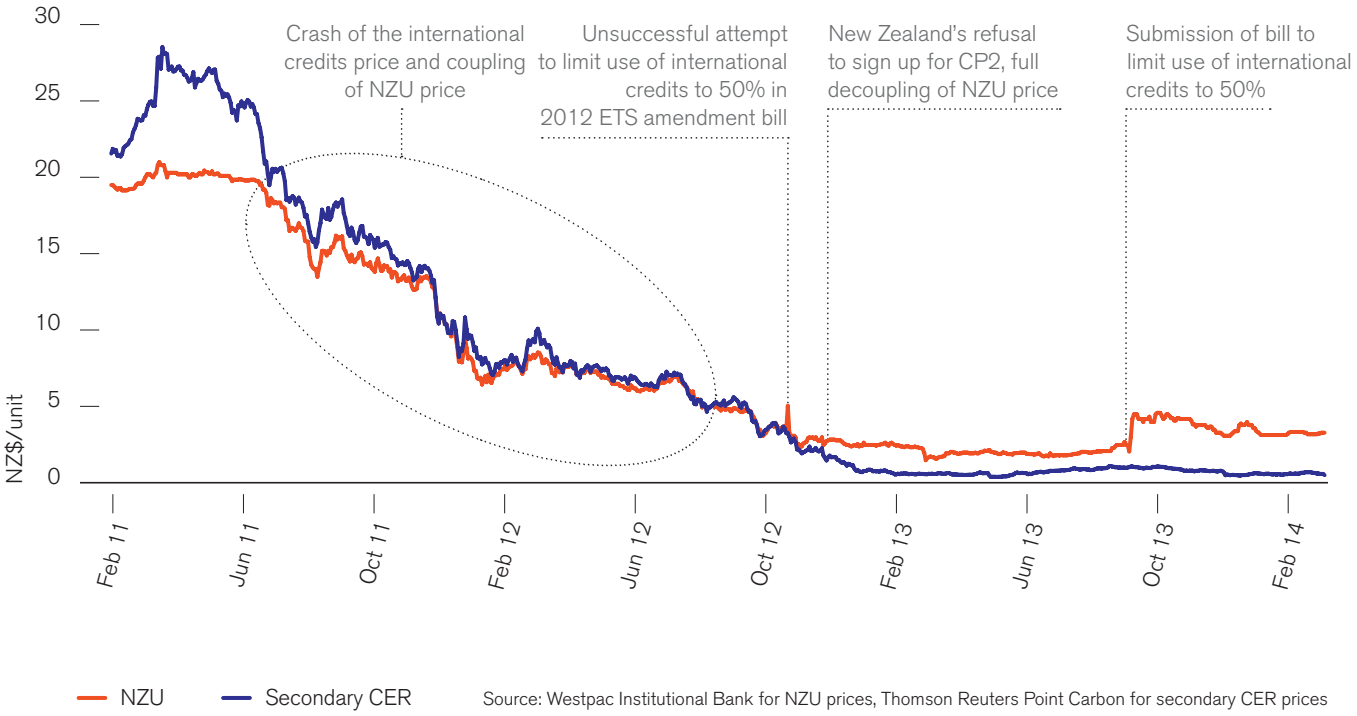
4.4.2 The New Zealand (uncapped) ETS

The NZ ETS is identifiable by its soft emissions cap, which is linked to New Zealand's international commitment. As such, the NZ ETS provides insights into a mechanism which allows unlimited use of offsets. In August 2013 the government announced the adoption of an unconditional target of 5% net below 1990 levels by 2020.[219] Current policies and measures are not sufficient to achieve this target domestically.[220] The unlimited use of international credits in the NZ ETS, combined with the record low price for these international credits, has resulted in insufficient domestic reductions, although this outcome is in line with an ETS designed to recognize domestic and international emission reductions equally. On the other hand, the NZ ETS had a positive impact on forestry removals and deincentivized deforestation, although less than expected due to the low NZU price, with New Zealand meeting its CP1 commitment even without CERs or ERUs.[221] Forestry removals are projected to decrease and New Zealand would have to rely on international carbon markets and recognition of its CP1 surplus to meet the 2020 target.[222]

The impact of the unlimited link to international offsets on the carbon price The purpose of allowing the unlimited use of offsets was to support market liquidity and reduce volatility in an otherwise small market and to align the market with international prices.[223] New Zealand firms could then achieve environmental goals at a lower cost.

217 As highlighted in Source: Kossoy, A., Ambrosi, P., *State and Trends of the Carbon Market 2010*, 2010.
218 Source: Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012.
219 Source: Groser, T., *Letter to Ms Christiana Figueres*, August 29, 2013, http://unfccc.int/files/documentation/submissions_from_parties/application/pdf/13-1620.pdf.
220 Source: Climate Action Tracker, *New Zealand*, accessed February 13, 2014, http://climateactiontracker.org/countries/newzealand.
221 Source: Ministry of the Environment, New Zealand, New Zealand's Greenhouse Gas Inventory 1990–2012, accessed May 2, 2014, http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-2014/index.html.
222 Source: Ministry of the Environment, New Zealand, New Zealand's Sixth National Communication under the UNFCCC and Kyoto Protocol, December 2013.
223 Source: Ministry for the Environment, New Zealand, *Liquidity and Prices in the New Zealand Emissions Trading Scheme - The Role of Government*, accessed February 13, 2014, https://www.mfe.govt.nz/publications/climate/liquidity-prices-nz-ets-role-government-dec07/liquidity-prices-nz-ets-role-government-dec07.html.

Figure 20 Development of the NZU price compared to the secondary CER price in NZ$ labeled with events affecting international credit usage[224]



Source: Westpac Institutional Bank for NZU prices, Thomson Reuters Point Carbon for secondary CER prices

As the prices of international credits began to reduce significantly participants in the NZ ETS started to buy CERs and ERUs instead of NZUs. CER and ERU prices began to dictate the NZU price, which then fell (Figure 20). Risks that international credits could not be used from 2015 resulted in a full decoupling of the NZU price in later years, although NZU prices remained low.

The NZ ETS and domestic mitigation action

As a result of the significant price difference between NZUs and international credits, NZ ETS participants almost exclusively bought and surrendered international credits, rather than NZUs, for the compliance year 2012 (Figure 21).

Emissions from the energy, industry and liquid fossil fuels sectors have not decreased in the three years that they have participated in the NZ ETS (Figure 22). The emission increase in the energy and industry sector largely relate to the inclusion of new sectors from 2012, while emissions from the other sectors remained stable. The unlimited access to international credits did lower the carbon price and provided a very limited financial incentive for NZ participants to reduce emissions, invest in clean technology and renewable power generation, and plant trees.[225]

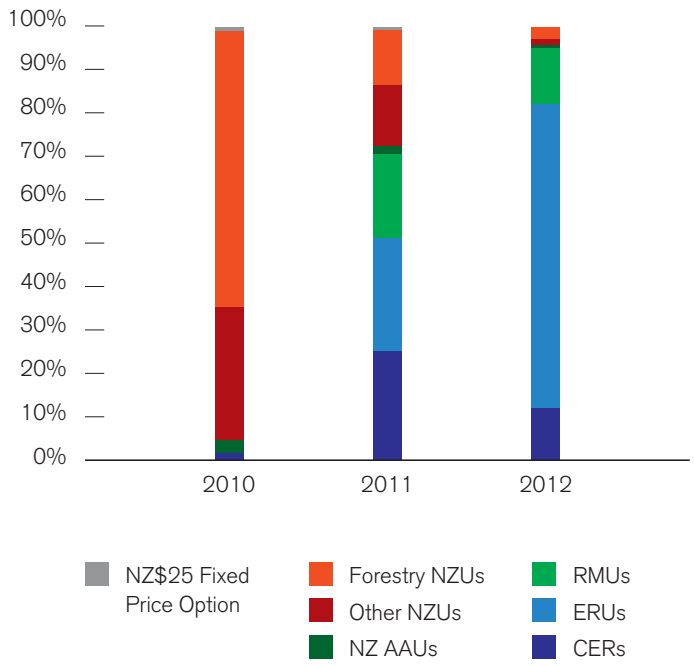
224 In August 2013 a bill was proposed again to limit the use of international credits to 50%, but it has not yet been debated in parliament. Prices are shown until start of March 2014. Source: New Zealand Parliament, *Climate Change Response (Restriction of International Units) Amendment Bill*, August 5, 2013, http://www.parliament.nz/en-nz/pb/legislation/proposed-bills/50HOH_MEMBILL223_1/climate-change-response-restriction-of-international-units.

225 Source: Ministry for the Environment, New Zealand, *Why We Have the NZ ETS*, accessed February 13, 2014, https://www.climatechange.govt.nz/emissions-trading-scheme/about/why.html.

Emissions from deforestation and harvesting show a significant increase from 2011 to 2012. When harvesting forests, landowners have to surrender NZUs or international credits. Forestry landowners receive NZUs under the NZ ETS, which can be used to fulfill this obligation. The low prices for NZUs and international credits may have made it more attractive for forestry owners to convert their forest to other land-uses and surrender the cheaper international credits to meet their obligation.[226] The NZUs already received are banked for later use or sold on. Since forestry owners can decide report their emissions annually or at the end of the compliance period 2008–2012 in 2012, this may also partly explain the increase in emissions. The other reason for the increase in emissions is a loophole in the NZ ETS which allows post-1989 forestry landowners to earn windfall profits.[227]

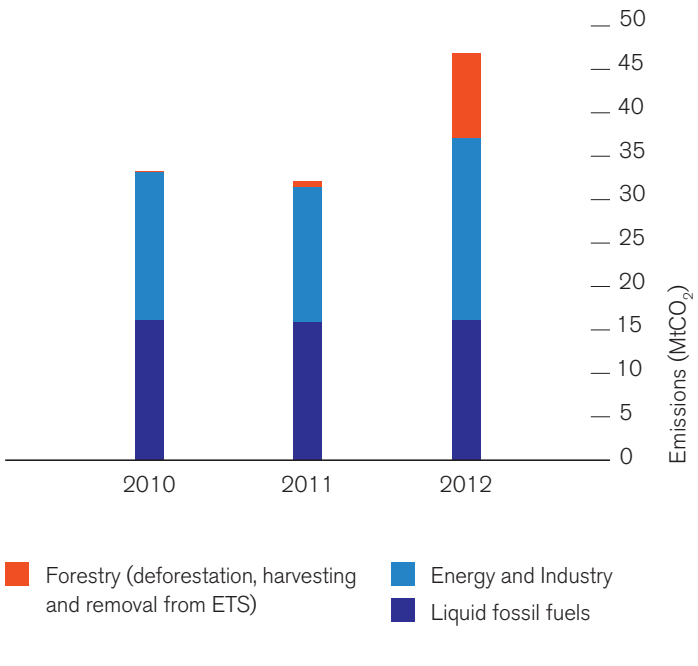
A lesson on linking The experience in New Zealand demonstrates that a soft cap can compromise the financial incentive to reduce emissions domestically, and that links to larger markets can have a significant influence on a smaller market. This experience emphasizes the care that needs to be taken by linking, in assessing clearly the potential outcomes for both players.

Figure 21 Share of surrendered units for compliance in the NZ ETS per compliance year



Source: Government of New Zealand

Figure 22 Emissions under the NZ ETS of the forestry, energy and industry, and liquid fossil fuels sectors



Source: Government of New Zealand

226 Source: Thomson Reuters Point Carbon, *Carbon Market Australia–New Zealand Vol 6 Issue 8*, August 16, 2013.
227 Source: Thomson Reuters Point Carbon, *NZ Foresters Reap Windfall Profits as CO_2 Prices Crash*, February 8, 2013, http://www.pointcarbon.com/news/1.2175692.

section **5**

National and sub-national carbon taxes

5 National and sub-national carbon taxes

5.1 OVERVIEW OF CARBON TAXES

For the purpose of this report, carbon taxes are defined as taxes explicitly stating a price on carbon or using a metric directly based on carbon (i.e. price per tCO_2e). Some jurisdictions have energy taxes partly based on the carbon content of the fuel and some have implemented taxes stating GHG emission reduction as a goal: neither of these are included in this report. The taxes covered in the report are shown in Figure 23.

This section presents key characteristics of the main taxes and dives into the detail of notable developments in each one over the past year.[228] This report investigates each of the taxes in relation to its rate and other interesting features, including revenue recycling and competitiveness considerations.

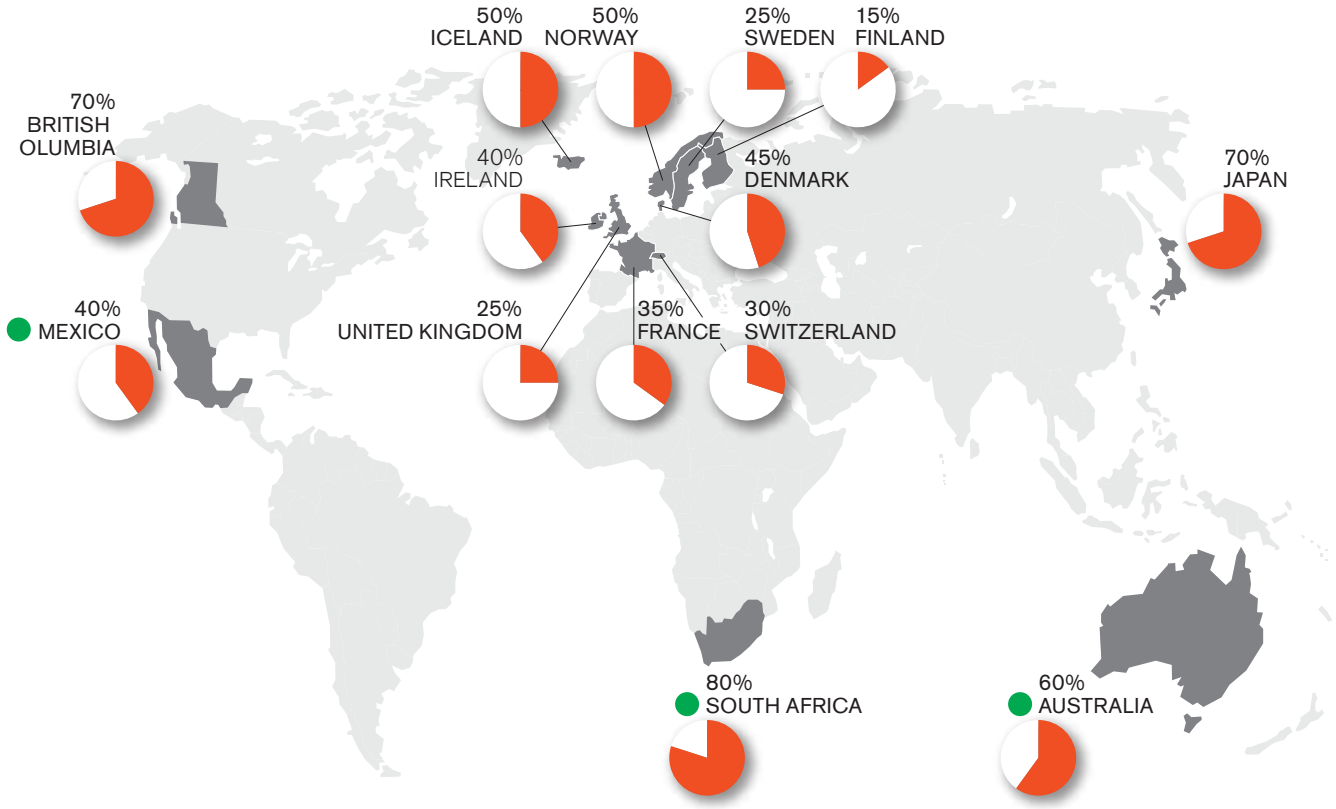
Carbon taxes have all been introduced on environmental grounds with the main purpose to reduce GHG emissions, but in very different contexts. In the Nordic countries carbon taxes have been implemented since the nineties and have evolved as environmental targets have changed. In some countries (e.g., Sweden) the carbon tax was introduced on top of an existing energy tax, while in others (e.g., Denmark and Finland) the energy or income tax was lowered to maintain the overall tax burden.[229] With the introduction of the EU ETS, exemptions on the carbon tax were gradually granted to entities that would otherwise experience a double carbon pricing burden, which could result in a loss of competitiveness.

Carbon taxes introduced alongside an existing carbon pricing instrument aim to cover the emissions not already under the carbon pricing instrument, such as in Ireland and France. An exception is the UK where the carbon tax was introduced because the existing instrument was deemed to be too weak. South Africa has decided to pursue a carbon tax instead of an ETS given the limited number of emitters that would fall under a trading scheme. This, however, does not take away the possibility that South Africa may choose to introduce an ETS in the future.

The designs of carbon taxes have evolved to allow more flexibility to reduce emissions. Entities could be (partially) exempt from the carbon tax through, for example, voluntary agreements to improve energy efficiency (Denmark) or the adoption of an emission reduction target (Switzerland). In the newer schemes in South Africa and Mexico, entities will be allowed to use offsets to meet their liability under a carbon tax. In Mexico, where only credits from domestic CDM projects are allowed, this should result in a boost for the local offset market.

228 From January 2013 to April 2014.
229 Source: Speck, S. et al., *The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001–2005*, 2006.

Figure 23 Carbon taxes around the world and the estimated share of GHG emissions covered in their jurisdiction



● Reduction of the carbon tax/price rate possible through the use of offsets

Note 1: The carbon tax in South Africa is scheduled to into effect in January 2016.
Note 2: Australia's CPM is not a carbon tax, but during the fixed-price period it can be considered similar to a carbon tax.

5.2 EXISTING CARBON TAXES

5.2.1 Australia

Australia's CPM started in July 2012 covering all large emitters from the industrial sectors, large gas consumers and landfill facilities, equivalent to 60% of the total GHG emissions. The CPM is technically an ETS, but currently operates with a fixed price, effectively acting as a carbon tax.

Tax rate A$24.15/tCO$_2$e (US$21.54/tCO$_2$e). Tax rate from July 1, 2013[230]

Interesting features See Section 4.2.8 for the latest developments

230 Source: Clean Energy Regulator, Australian Government, *Fixed Price 2012–2015*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/About-the-Mechanism/Fixed-Price-2012-15/Pages/default.aspx.

5.2.2
British Columbia

The British Columbia renevue-neutral carbon tax was introduced in 2008, covering all consumers of fuels and of peat and tires combusted for heat or energy, which amounts to approximately 70% of all the GHG emissions.[228] Exported fuels and fuel consumption by aviation and shipping also travelling outside British Columbia are not covered by the carbon tax. Non-combustion GHG emissions such as industrial process emissions, venting and fugitive emissions are not covered either. Revenue neutrality is achieved through various income tax reductions and tax credits.

Tax rate CAN$30/t$CO_2$e[232] (US$28/tCO_2e). Tax rate frozen since 2012. 80% exemption to the carbon tax on natural gas and propane for heating and CO_2 production for greenhouse growers, and exemption for colored gasoline and colored diesel purchased by farmers from January 2014.

Interesting features The carbon tax has been even revenue-negative since its introduction, with the tax cut and credits exceeding the revenue. The forecasts of the budgets up to 2016/17 show that this will remain the case.

5.2.3
Denmark

Denmark introduced the CO_2-afgiftsloven (CO_2 tax act) in 1992, which applies to oil, gas, coal and electricity, covering approximately 45% of the total GHG emissions.[233] Industries subject to EU ETS are generally exempt from the CO_2 tax on fuels for process and power generation. However, fuels for the production of district heating are subject to a CO_2 tax, even though the district heating plants are in the EU ETS. Energy-intensive sectors not in the EU ETS are given carbon tax exemptions similar to free allowances in the EU ETS. From 2013 waste incineration plants are included in the EU ETS and thus also double regulated.

Tax rate Dkr.167/tCO_2 (US$31/t$CO_2$). Tax rate from 2014. Between 2008 and 2015 1.8% annual increase.

Interesting features Before 2014, energy-intensive sectors, which are already covered under the EU ETS, could be exempted from the energy saving tax on electricity (formerly the CO_2 tax for electricity usage) via a voluntary agreement. In 2013 the government abolished the latter tax for these users and terminated the voluntary agreement scheme.[234]

5.2.4
Finland

In 1990 Finland introduced the Hiilidioksidivero (CO_2 tax), making it the first country to introduce a carbon tax. The carbon tax covers all consumers of fossil fuels, except for fuels for electricity production, commercial aviation and commercial yachting. Approximately 15% of the total GHG emissions are covered.[235]

Tax rate Increase of the rate for heating fuels in 2013 from €30/tCO_2 (US$41/t$CO_2$) to €35/t$CO_2$ (US$48/t$CO_2$).[236] Rate for liquid traffic fuels remains unchanged at €60/tCO_2 (US$83/t$CO_2$).[237]

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231 Source: British Columbia Ministry of Finance, *Myths and Facts about the Carbon Tax*, April 28, 2013, http://www.fin.gov.bc.ca/tbs/tp/climate/A6.htm.
232 Source: British Columbia Government, *Carbon Tax Review*, accessed January 21, 2014, http://www.fin.gov.bc.ca/tbs/tp/climate/Carbon_Tax_Review_Topic_Box.pdf.
233 Source: Authors' calculations and IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
234 Source: Government of Denmark, *Law Amending the Waste and Raw Materials Tax Act, the Carbon Dioxide Tax on Certain En-Ergy Products, the Tax on Electricity, VAT Act and Various Other Acts*, accessed January 21, 2014, https://www.retsinformation.dk/Forms/r0710.aspx?id=152727.
235 Source: Authors' calculations and IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
236 Source: Finland Ministry of Justice, *Government Bill on the Law on Liquid Fuels and the Law on Electricity and Certain Fuels*, January 21, 2014, http://www.finlex.fi/fi/esitykset/he/2012/20120091.
237 Source: Government of Finland, *State Budget Proposals*, accessed January 21, 2014, http://budjetti.vm.fi/indox/sisalto.jsp?year=2014&lang=fi&maindoc=/2014/tae/hallituksenEsitys/hallituksenEsitys.xml&id=/2014/tae/hallituksenEsitys/YksityiskohtaisetPerustelut/11/08/07/07.html.

5.2.5 France

In December 2013 the French parliament approved the introduction of a CO_2 component in the Taxe intérieure de consommation sur les produits énergétiques (Domestic consumption tax on energy products). This tax, in effect from April 1, 2014, is on the use of natural gas, heavy fuel oil and coal not covered by the EU ETS, and covers approximately 35% of all GHG emissions.[238] From 2015 onwards the carbon tax will be extended to transport fuels and heating oil.[239]

Tax rate €7/tCO_2 (US$10/$tCO_2$) set to increase to €14.5/tCO_2 (US$20/$tCO_2$) in 2015 and €22/$tCO_2$ (US$30/$tCO_2$) in 2016.[240]

5.2.6 Iceland

In 2010 Iceland introduced the Kolefnisgjald á kolefni af jarðefnauppruna (Carbon tax on carbon of fossil origin). The carbon tax covers the use of gas oil, diesel, gasoline, heavy fuel oil, petroleum gas and other gaseous hydrocarbons, amounting to approximately 50% of the total GHG emissions.[241] The carbon tax applies to all imported and domestically produced or processed fuels, but vehicles with a foreign destination can have the carbon tax refunded. Initially the tax was only applicable to liquid fossil fuels and set to expire at the end of 2012, and was later extended indefinitely. Firms included in the EU ETS are exempted from the tax.

Tax rate Íkr1120/tCO_2 (US$10/$tCO_2$) from 2014. Rate based on an EU ETS reference price of Íkr4000 per tonne of carbon or Íkr1090/tCO_2.[242] The carbon tax in 2010 was calculated as 50% of the EU ETS reference price, rising to 75% in 2011 and 100% in 2012. In 2013 it was decided that the carbon tax would increase by 3% or in line with inflation in 2014.[243]

5.2.7 Ireland

A carbon tax in the Republic of Ireland was implemented in 2010 for all consumers of natural gas under the Natural Gas Carbon Tax and of mineral oil under the Mineral Oil Tax. The carbon charge covers approximately 40% of all GHG emissions.[244] In 2013 a carbon tax was also put on solid fossil fuels under the Solid Fuel Carbon tax. Operators under the EU ETS are exempted from these taxes.

Tax rate €20/tCO_2 (US$28/$tCO_2$) for all fossil fuels from May 2014. Tax rate on natural gas and mineral oil remains unchanged from 2012,[245] and on solid fuel increased from €10/tCO_2 (US$14/$tCO_2$) to €20/$tCO_2$ (US$28/$tCO_2$) from May 1, 2014.[246]

5.2.8 Japan

In Japan the Tax for Climate Change Mitigation applies from 2012 and covers the use of all fossil fuels except for certain parts of the agriculture, transport, industry and electricity production sectors. The coverage of the carbon tax is approximately 70% of the total GHG emissions.[247]

238 Source: Authors' calculation Government of France, *Finance Bill 2014*, accessed January 21, 2014, http://www.assemblee-nationale.fr/14/projets/pl1395.asp.
239 Source: Ministry of Ecology, Sustainable Development and Energy, France, *Taxation of Energy Products Applicable in 2014*, accessed January 21, 2014, http://www.developpement-durable.gouv.fr/La-fiscalite-des-produits,11221.html.
240 Source: Ministry of the Economy and Finance, France, *Clarification on Energy and Environmental Taxation under the Financial Legislation 2014*, March 12, 2014, http://circulaire.legifrance.gouv.fr/pdf/2014/03/cir_38051.pdf; Government of France, *Law No. 2013-1278 of December 29, 2013 on Finance for 2014*, December 30, 2013, http://www.legifrance.gouv.fr/affichTexte.do;jsessionid=C112ACA602EF0580353CFCAEDCFFDE56.tpdjo09v_1?cidTexte=JORFTEXT000028399511&categorieLien=id.
241 Source: Authors' calculation and Iceland Government, *Act on Various Grounds Draft Budget for 2014 (Price Etc.)*, accessed January 21, 2014, http://www.althingi.is/altext/143/s/0471.html.
242 Source: Iceland Government, *Bill of Environmental and Resource Taxes*, accessed January 21, 2014, http://www.althingi.is/altext/138/s/0293.html.
243 Source: Iceland Government, *Act on Various Grounds Draft Budget for 2014 (Price Etc.)*, accessed January 21, 2014, http://www.althingi.is/altext/143/s/0471.html.
244 Does not include the GHG emissions covered by the carbon tax on solid fuels. Source: Convery, F.J., Dunne, L., Joyce, D., *Ireland's Carbon Tax and the Fiscal Crisis. Issues in Fiscal Adjustment, Environmental Effectiveness, Competitiveness, Leakage and Equity Implications*, OECD Environment Working Papers, October 3, 2013.
245 Source: Revenue Irish Tax and Customs, *Guide to Natural Gas Carbon Tax*, November 2013.
246 Source: Revenue Irish Tax and Customs, *Guidance Note on Solid Fuel Carbon Tax*, December 2013.
247 Source: Authors' calculations, Ministry of the Environment, Japan, *Details on the Carbon Tax (Tax for Climate Change Mitigation)*, accessed January 21, 2014, http://www.env.go.jp/en/policy/tax/env-tax/20121001a_dct.pdf.

Tax rate ¥192/tCO_2 (US$2/$tCO_2$) from April 1, 2014 set to increase to ¥289/tCO_2 (US$3/$tCO_2$) stepwise over 3.5 years.[248] When the tax was introduced in October 2012 a third of the full tax rate was enforced. In April 2014 this doubled, and the full tax rate will be enforced from April 2016.

Interesting features The revenues from the carbon tax will be used for measures to reduce energy-related CO_2 emissions such as innovation in low-carbon technology, promotion of energy-saving equipment in small and medium-sized businesses and promotion of renewable energy.[249]

5.2.9 Mexico

Under the Ley del impuesto especial sobre producción y servicios (Special tax on production and services), the government introduced a carbon tax on fossil fuel sales and import by manufacturers, producers and importers. This tax, in effect from 2014, covers approximately 40% of the total GHG emissions.[250] It is not a tax on the full carbon content of fuels, but rather on the additional emissions compared to natural gas. Natural gas therefore is not subject to the carbon tax, though it could be in a future iteration. For now, excluding gas also serves to support fuel switching where possible.

Tax rate Mex$10–50/$tCO_2$ (US$1–4/$tCO_2$) from 2014. Depends on type of fuel. Capped at 3% of the sales price of the fuel.

Interesting features Companies liable to pay the carbon tax may choose to pay with credits from CDM projects developed in Mexico, equivalent to the market value of the credits at the time of paying the tax.[251] The exact details for using CERs to pay the carbon tax will be specified by the Ministry of Finance.

5.2.10 Norway

Norway introduced the CO_2 avgift (CO_2 tax) in 1991. The tax applies to all consumption of mineral oil, gasoline and natural gas. Approximately 50% of the total GHG emissions are covered by the carbon tax.[252] Operators included in the EU ETS are (partially) exempted from the carbon tax, except for the offshore petroleum industry.

Tax rate Nkr.25–419/tCO_2 (US$4–69/$tCO_2$) from 2014. Depends on the fuel type and usage. Increased in 2013 for mineral oil and natural gas as well as fuel use in domestic aviation.[253] The purpose of the carbon tax increase for domestic aviation is to balance out the reduction of the EUA price.

Interesting features The offshore petroleum sector is paying the highest tax rates while it is also covered under the EU ETS. This is to encourage the use of electricity generated onshore, which is almost entirely from hydropower, instead of electricity generated on petroleum platforms.[253]

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248 Source: Ministry of the Environment, Japan, *Details on the Carbon Tax (Tax for Climate Change Mitigation)*, accessed January 21, 2014, http://www.env.go.jp/en/policy/tax/env-tax/20121001a_dct.pdf.

249 Source: Ministry of the Environment, Japan, *Introduction of the Tax for Climate Change Mitigation*, April 28, 2014, http://www.env.go.jp/policy/tax/about.html.

250 Includes natural gas that was initially covered under the carbon tax as well, but exempted in the final bill. Source: Authors' calculations; Federal Government of Mexico, *Initiative for a Law on Federal Revenues for the 2014 Fiscal Year*, January 1, 2014, http://www.diputados.gob.mx/PEF2014/ingresos/01_lif_2014.pdf; Federal Government of Mexico, *Initiative for a Decree Reforming, Adding and Amending Several of the Dispositions of the Law on Value Added, the Law on the Special Tax on Production and Services, and the Fiscal Code of the Federation*, January 1, 2014, http://www.diputados.gob.mx/PEF2014/ingresos/03_liva.pdf.

251 Source: *Special Tax Law and Production Services*, December 11, 2013, http://www.normateca.gob.mx/Archivos/66_D_3629_13-01-2014.pdf.

252 Source: Authors' calculations and IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.

253 Source: Department of Finance, Norway, *Taxes and Customs 2014*, accessed January 21, 2014, http://www.regjeringen.no/nb/dep/fin/dok/regpubl/prop/2013-2014/prop-1-ls-20132014/7.html?id=741130.

5.2.11 Sweden

In 1991 Sweden introduced the Koldioxidskatt (CO_2 tax), which covers all fossil fuels used for heating and motor fuels, around 25% of the GHG emissions.[254] Households and services are fully covered by the carbon tax, whereas non-ETS industry and agriculture are partially exempted. Fossil fuel use by EU ETS installations is fully exempted if it is used for manufacturing purposes and partially exempted for other purposes.

Tax rate Skr.1076/tCO_2 (US$168/t$CO_2$) from January 1, 2014. Slight decrease or no change in 2013 and 2014 for most fuels.[255]

Interesting features Instead of directly providing exemptions to all GHG emissions covered under the EU ETS, carbon tax exemptions have gradually increased over the years.[256] District heating plants participating in the EU ETS and heat from EU ETS plants not used for manufacturing purposes now have to pay 80% of the tax rate compared to 94% before 2014.[257]

5.2.12 Switzerland

From 2008 Switzerland imposes a CO_2 levy on fossil fuels used for heating and lighting purposes, electricity production in thermal plants and operation of combined heat and power plants. Motor fuels are not included. The coverage of the carbon tax is approximately 30% of the total GHG emissions.[258] Swiss ETS installations are exempted from the tax.

Tax rate SFr.60/tCO_2 (US$68/t$CO_2$) from 2014. Can be increased up to SFr.120/tCO_2 (US$135/t$CO_2$) if certain emission reduction targets are not achieved. In July 2013, the rate was raised from SFr.36/tCO_2 to SFr.60/tCO_2 (US$41/t$CO_2$ to US$68/t$CO_2$) after it became clear that Switzerland would miss its CO_2 emission reduction target for 2012.[259] The Swiss government indicated that further adjustments to the carbon tax are possible in 2016 and 2018.[260]

Interesting features Energy-intensive companies not in the Swiss ETS from industrial sectors with a relatively high carbon tax burden and competitiveness risks can be exempted from the carbon tax. In return they have to take on an emission reduction target.[261] The targets are set individually according to economically viable GHG emission reduction measures and decrease annually from 2013 until 2020. The achievements are evaluated at the end of the commitment period in 2021 and non-compliance results in a penalty.

254 Source: IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
255 Source: Swedish Tax Agency, *Energy, Carbon Dioxide and Sulfur Taxes*, accessed January 21, 2014, http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/energiskatter.4.18e1b10334ebe8bc8000843.html.
256 Source: Swedish Tax Agency, *Reduced Carbon Tax on Fuels Used in the Installation Covered by the ETS*, accessed January 21, 2014, http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/energiskatter/utslappsratter.4.121b82f011a74172e5880006846.html.
257 Source: Swedish Tax Agency, *Reduced Carbon Tax for Certain Heat*, accessed January 21, 2014, http://www.skatteverket.se/foretagorganisationer/skatter/punktskatter/energiskatter/sanktkoldioxidskattforvissvarmeproduktion.4.8dcbbe4142d38302d71373.html.
258 Source: Authors' calculations and IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
259 Source: Federal Office for the Environment, Switzerland, *2012 CO_2 Target Is Not Reached: CO_2 Tax on Fuels Will Be Increased in 2014*, July 3, 2013, http://www.bafu.admin.ch/dokumentation/medieninformation/00962/index.html?lang=de&msg-id=49576.
260 Source: Federal Office for the Environment, Switzerland, *CO_2 Tax Levied on Fuels*, accessed January 21, 2014, http://www.bafu.admin.ch/co2-abgabe/12357/index.html?lang=de.
261 Source: Federal Office for the Environment, Switzerland, *CO_2 Tax Levied on Fuels*, accessed April 29, 2014, http://www.bafu.admin.ch/co2-abgabe/12357/index.html?lang=de.

5.2.13 United Kingdom

The United Kingdom implemented the Carbon Price Floor from 2013, which applies to fossil fuels used for electricity generation. The geographical coverage is limited to Great Britain (i.e. Northern Ireland is not included), bringing the coverage of the carbon tax to approximately 25% of the total GHG emissions.[262] The goal of the tax is to provide a stable carbon price signal in light of the volatile EUA prices, targeting the electricity generation sector covered by the EU ETS on purpose.

Tax rate £9.55/tCO_2 (US$15.75/$tCO_2$) from April 1, 2014. Updated annually and calculated as the difference between the EUA price and annual Carbon Price Floor target, which is starting at £16/tCO_2 in 2013, linearly increasing to £30/tCO_2 by 2020. On March 19, 2014 the government announced a cap of £18/tCO_2 (US$30/$tCO_2$) on the tax rate from April 1, 2016 until March 31, 2020, essentially freezing the tax rate around the 2015–2016 levels of £18.08/tCO_2 (US$29.93/$tCO_2$).[263]

Interesting features The government is planning to introduce from April 1, 2015 an exemption from the tax for fossil fuels used in combined heat and power plants that generate good quality electricity used on-site. The specifications will be published after a stakeholder consultation around the time of the Autumn Statement 2014.[264]

5.3 EMERGING CARBON TAXES

5.3.1 South Africa

On February 26, 2014 the Treasury announced a year's delay in the introduction of the carbon tax to 2016 to allow time for technical analysis of the tax design and assessment of its potential impact. The tax is expected to have a near neutral impact on GDP over the medium term.[265] The government published a paper on the carbon tax in May 2013,[266] proposing a fuel input tax based on the carbon content of the fuel. The carbon tax will cover all stationary direct GHG emissions from both fuel combustion and non-energy industrial process emissions, amounting to approximately 80% of the total GHG emissions.[267]

Tax rate Intended to be R120/tCO_2 (US$12/$tCO_2$) from 2016, increasing by 10% per year until the end of 2019, after which the annual increase is subject to a review. In the transitional period of 2016–2019, a basic tax-free threshold will be introduced for all sectors, bringing the maximum effective tax rate to R48/tCO_2 (US$5/$tCO_2$).

Interesting features A complementary offset scheme is also proposed, though its parameters have not been finalized. As in Mexico, entities would be able to meet some of their tax liability (currently the proposal is 5–10%) with carbon offsets. To address competitiveness concerns for trade-exposed sectors, South Africa is considering several measures, including phasing in the tax over a 10–15-year period, and tax allowances.

262 Source: Authors' calculations and Aether & Ricardo-AEA, *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990–2011*, May 31, 2013.
263 Source: HM Revenue & Customs, *Carbon Price Floor: Reform and Other Technical Amendments*, accessed March 24, 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293849/TIIN_6002_7047_carbon_price_floor_and_other_technical_amendments.pdf.
264 Source: HM Revenue & Customs, *Carbon Price Floor*, accessed April 29, 2014, http://www.hmrc.gov.uk/climate-change-levy/carbon-pf.htm.
265 Source: Gordhan, P., *Budget Speech*, February 26, 2014, http://www.treasury.gov.za/documents/national%20budget/2014/speech/speech.pdf.
266 Source: National Treasury, Republic of South Africa, *Updated Carbon Tax Policy Paper: Request for Public Comments*, May 2, 2013, http://www.treasury.gov.za/public%20comments/Press%20Release%20-%20Carbon%20Tax%20Policy%20Paper%202013.pdf.
267 Authors' calculations using most recent GHG emissions divided per sector for the year 2000.

5.3.2 Other potential taxes in Brazil, Chile, Oregon and Republic of Korea

Brazil The government is looking into various carbon pricing instruments, including a carbon tax.[268] In 2013 Brazil conducted an economic evaluation on the impact of various instruments and a study on the international experience with carbon taxes under the PMR.

Chile The newly elected government of Chile plans to introduce a carbon tax, which will have a large impact on a power sector that is heavily reliant on coal. Should the bill pass congress, operators with boilers or turbines with a rated thermal capacity equal to or above 50 MW will be subject to a carbon tax of US$5/tCO$_2$.[269] The carbon tax is part of the tax reform that will see an increase in green taxes.

Oregon The state of Oregon is investigating the feasibility and impact of a carbon tax on the economy and GHG emissions. The study is expected to be concluded before November 15, 2014.[270] Design options include a carbon tax with revenue recycling, similar to the carbon tax in British Columbia.

Republic of Korea Korea is considering introducing a carbon tax on vehicles from January 2015.[271] The government is working on coordination of the potential carbon tax with the Korea ETS, the target management system and the 6th Basic Plan for the power sector.

5.4 LOOKING BACK AT CARBON TAXES: THE DANISH AND BRITISH COLUMBIA EXAMPLES

5.4.1 The Danish carbon tax

More than 20 years of experience The Nordic countries first introduced carbon taxes in the nineties, with Finland imposing a carbon tax in 1990, Sweden and Norway in 1991 and Denmark in 1992. Performance of these tax schemes has been mixed. All countries show an improvement in energy intensity between 1990 and 2006, with the strongest decline exhibited by Denmark and a very limited decrease in energy intensity in Norway.[272] However, it is not clear to what degree this can be attributed to the carbon taxes.

The purpose of the Danish carbon tax was to increase the profile of climate change and provide an economic incentive to consume less energy from carbon-intensive sources.[273] It was introduced gradually as part of a larger environmental tax package, which includes energy taxes and a sulfur tax, as well as subsidies for green investments. The purpose was not to increase the overall tax burden, so the energy tax was lowered with the introduction of the carbon tax.[274]

The Danish carbon tax covers all consumption of fossil fuels (natural gas, oil, coal and non-biodegradable waste used as fuel), with (partial) exemption and refund provisions for sectors covered by the EU ETS (see section 5.2.3).[275]

268 Source: Ministry of Finance, Brazil, *Tax and Financial Mechanisms for a Low Carbon Economy*, August 2013, http://www19.senado.gov.br/sdleg-getter/public/getDocument?docverid=2f586209-8d54-4ba3-ad16-cdea14fca104;1.1.
269 Source: Government of Chile, *Tax Reform – Presidential Message No. 24-362*, April 1, 2014, http://reformatributaria.gob.cl/Proyecto.pdf.
270 Source: Government of Oregon, *Senate Bill 306*, accessed May 1, 2014, http://gov.oregonlive.com/bill/2013/SB306/.
271 Source: Ministry of Environment Republic of Korea, *Review of the Carbon Tax. Discrimination against Domestic Cars Will Not Be Reversed*, accessed April 30, 2014, http://www.me.go.kr/home/web/board/read.do?boardMasterId=1&boardId=342566&menuId=286.
272 Source: Prasad, M., Taxation as a Regulatory Tool: *Lessons from Environmental Taxes in Europe*, 2009.
273 Source: Speck, S. et al., *The Use of Economic Instruments in Nordic and Baltic Environmental Policy 2001–2005*, 2006.
274 Source: The Working Group on Environment and Economics, *The Use of Economic Instruments in Nordic Environmental Policy 1999–2001*, 2002.
275 Source: SKAT, *History of the CO_2 Tax, Legal Guidance 2014-1*, accessed January 21, 2014, http://www.skat.dk/SKAT.aspx?oID=2060515&chk=209219.

A combination of effective design and an enabling environment Primary energy intensity declined by 26% from 1990 to 2010 and CO_2 emissions reduced by 25% per produced unit from 1993 to 2000. This is largely due to the combination of environmental taxes, including the carbon tax, with subsidies for energy efficiency and wind energy.[276] It is suggested that the strong reliance on coal and the limited development of renewable energy in the 1990s left significant potential for emission reductions and contributed to the success of the carbon tax.[277] The impact on GDP and employment was evaluated as generally positive as several measures that had an impact on, amongst others, income tax were introduced alongside the carbon tax.

Furthermore, the Danish carbon tax was designed to minimize effects on the competitiveness of industry. The tax was implemented gradually and differentiated between energy uses. When introduced in 1992, companies could obtain full refunds on the carbon tax. The refund was lowered to 50% from 1993, with additional provisions for manufacturing companies that experienced a loss of competitiveness. From 1996, only energy-intensive companies, for whom the tax had a large impact on their value added, could receive carbon tax refunds by entering into a voluntary agreement with the Danish Energy Agency. The agreement committed participants to implement energy efficiency and management measures.[278]

The Danish government expected that these voluntary agreements would save a total of 400 $ktCO_2$. It is estimated that they actually saved 230 $ktCO_2$ between 1996 and 2003.[279] Participants in the agreement were generally positive about the initiative but highlighted the difficulty of continuous energy efficiency improvements. This implies that meeting the initially estimated emission reductions would have been very challenging.

In 2010 the Danish voluntary agreement was changed to exempt emissions covered under the EU ETS from the carbon tax, and to limit the agreement to electricity consumption and space heating for heavy industry. From 2014 the voluntary agreement is terminated as part of the electricity tax reform, which abolishes the carbon tax on electricity (energy saving tax) as this is already covered by the EU ETS.[280]

Carbon tax and the EU ETS: avoiding "double taxation" Denmark participates in the EU ETS. To avoid double "taxation" on CO_2 emissions, a large part of the industry is exempt from the carbon tax. Only fuels used by companies that do not participate in the EU ETS are subject to the tax. However, district heating and, from 2013, waste incineration are included in EU ETS and thus double-regulated. Since the EUA price is much lower than the carbon tax rate, this could create an incentive to voluntarily participate in the EU ETS. Nevertheless, firms cannot just decide to opt in to the EU ETS; any inclusion of additional sectors has to be proposed by the member state and approved by the EC. Furthermore, energy intensive industries not in the EU ETS receive a reduction on the carbon tax, matching the free allowances for EU ETS sectors. By design the relatively low carbon price in the EU ETS will therefore have a limited impact on the future operation of the carbon tax.

276 Source: IRENA, *Denmark: Market Overview*, accessed March 28, 2014, https://www.irena.org/DocumentDownloads/Publications/GWEC_Denmark.pdf.
277 Source: Institute for European Environmental Policy, *Evaluation of Environmental Tax Reforms: International Experiences, Annexes to Final Report*, June 21, 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
278 Source: Danish Energy Agency, *Voluntary Agreements Industry on Energy Efficiency*, accessed February 19, 2014, http://www.ens.dk/en/consumption-savings/energy-consumption-production-industries/voluntary-agreements-industry-energy.
279 Source: Ericsson, K., *Evaluation of the Danish Voluntary Agreements on Energy Efficiency in Trade and Industry*, April 13, 2006, http://www.ens.dk/sites/ens.dk/files/forbrug-besparelser/indsats-virksomheder-0/tilskud-energispareafgift-aftale-energieffektivisering/evaluation%20of%20the%20danish%20voluntary%20agreements%20april%202006.pdf.
280 Source: Denmark Ministry of Taxation, *Overview of the Fiscal Elements of the Danish Growth Plan*, accessed January 21, 2014, http://www.skm.dk/media/11864/faktaark_vaekst.pdf.

5.4.2 The British Columbia revenue-neutral carbon tax

The British Columbia revenue-neutral carbon tax (BC carbon tax) was introduced in 2008 as the first carbon pricing instrument with a significant carbon price in North America. The BC carbon tax is one of the key instruments in the Climate Action Plan to reduce British Columbia's GHG emissions by 33% below 2007 levels by 2020.[281] In 2012 a large review of the BC carbon tax was held, but the key features remain largely unchanged since its introduction.

A set of core design principles The primary goal of the BC carbon tax is to encourage low-carbon development without increasing the overall tax burden. The BC carbon tax adheres to the following principles:[282]

- *The tax has the broadest possible base.* The same BC carbon tax has to be paid by all consumers of fuels and of peat and tires combusted for heat or energy,[283] which amounts to approximately 70% of total GHG emissions (see Section 5.2.2).

- *The tax rate started low and increased gradually.* The initial carbon tax rate was CAN$10/t$CO_2$e, gradually increasing by an annual rate of CAN$5/t$CO_2$e to CAN$30/tCO_2e in 2012. The British Columbia government has committed to freezing the tax rate for five years, but may be revised if other jurisdictions, especially in North America, introduce similar carbon pricing instruments.

- *All carbon tax revenue is recycled through tax reductions.* Every year the Minister of Finance is required by law to prepare a plan for the coming three years in the annual budget and fiscal plan, outlining how the carbon tax revenues will be recycled to taxpayers through tax reductions. The Minister's salary will be cut by 15% if insufficient measures are taken to ensure revenue neutrality.

- *Low-income individuals and families are protected.* The revenue recycling mechanism includes various tax cuts and credits for low-income households to offset their carbon tax liabilities.

- *The tax will be integrated with other measures.* The British Columbia government has committed to integrating the carbon tax with other instruments, such as a cap-and-trade program, when these have been designed and implemented in British Columbia.

The BC carbon tax was designed with contributions from academic experts through confidential exchanges, but there was no lobbying or open debate in the media.[284] The carbon tax is collected in the same way as motor fuel taxes, including using the same administrative infrastructure, except for natural gas that is collected at the retail level.[285] These factors contributed to the swift introduction of the tax.

Debate on the impact of the tax despite a focus on revenue-neutrality The British Columbia government strongly emphasises the revenue-neutral aspect of the tax. The revenue is returned through tax cuts in personal and corporate income tax and tax credits.[286] The BC carbon tax has in fact been revenue-negative as the tax cuts and credits have exceeded the revenue from the tax and are expected to remain this way.[287]

281 Other initiatives in the 2008 Plan included the Greenhouse Gas Reductions Targets Act, the Greenhouse Gas Reduction (Cap and Trade) Act enabling the establishment of an ETS, vehicle emissions standards, emission standards to regulate landfill gas, incentives for low-carbon energy generation projects, renewable and low-carbon fuel requirements and development of green communities. See http://www.gov.bc.ca/premier/attachments/climate_action_plan.pdf for more details.
282 Source: British Columbia Ministry of Finance, *What Is a Carbon Tax?*, accessed April 28, 2014, http://www.fin.gov.bc.ca/tbs/tp/climate/A1.htm.
283 Source: British Columbia Ministry of Finance, *Tax Rates on Fuels*, June 2013, http://www.sbr.gov.bc.ca/documents_library/bulletins/mft-ct_005.pdf.
284 Source: Jaccard, M., *The Political Acceptability of Carbon Taxes: Lessons from British Columbia*, Handbook of Research on Environmental Taxation (Edgar Elgar Publishing, December 2012).
285 British Columbia Ministry of Finance, *How the Carbon Tax Works*, accessed April 28, 2014, http://www.fin.gov.bc.ca/tbs/tp/climate/A4.htm
286 Source: IEEP, *Evaluation of Environmental Tax Reforms: International Experiences - Annexes to Final Report*, June 2013, http://www.ieep.eu/assets/1282/ETR_study_by_IEEP_for_the_Swiss_Government_-_Annexes_-_21_June_2013.pdf.
287 Source: British Columbia Ministry of Finance, *Budget and Fiscal Plan – 2014/15 to 2016/17 Carbon Tax Report and Plan*, February 2014.

The public responded in a broadly positive manner to the introduction of the BC carbon tax in 2008.[288] The revenue-neutrality feature was key to securing public support and even the business community was mildly supportive of the tax. However, soon after the introduction of the tax fuel prices spiked, resulting in criticism of the tax. It is estimated, however, that the tax was only responsible for 6% of the price hike.[289] In 2009 there were campaigns to get rid of the tax and replace it with a cap-and-trade scheme. However, following the provincial election the tax remained in place.

»From 2008, when the tax was introduced, to 2011 British Columbia reduced its GHG emissions per capita from sources subject to the carbon tax by a total of 10%.«

A wide range of interest groups continues to express their concerns about the carbon tax, some arguing that low-income households are being increasingly hit harder than high-income households.[290] Over the years the government has made several concessions to various interest groups through grants and exemptions, with the latest being partial grants for greenhouse growers and exemptions for colored gasoline and diesel for farmers, following the 2012 carbon tax review.[291] Contrary to other carbon pricing instruments, no specific concessions have been made to the energy-intensive industry.

The economic impact of the tax was central to the 2012 review and indicated a small negative impact on the gross domestic product in the province.[291] It has been estimated that economic growth in British Columbia has been on par with the rest of Canada whilst the tax has been in force.[292] The BC carbon tax had a significant environmental impact. From 2008, when the tax was introduced, to 2011 British Columbia reduced its GHG emissions per capita from sources subject to the carbon tax by a total of 10%, while the rest of Canada only reduced their emissions from the same source types by 1% over the same period.[292] The reduction in fuel consumption was even stronger. The per capita consumption of fuels subject to the BC carbon tax declined by almost 19% compared to the rest of Canada in this four-year period. This is equivalent to a 5% per year decrease in consumption compared to the rest of the country, breaking away from the historical trend of fuel consumption which was in line with the rest of Canada. Approximately 80% of the reduction was due to the stronger than normal demand impact of the carbon tax compared to a regular price spike.[293] Abundant access to hydroelectricity also contributed to GHG reductions in British Columbia.[289]

The BC carbon tax has become an integral part of the British Columbia fiscal policy and the budget has become increasingly reliant on the carbon tax revenues, making it politically easier to keep than abolish the existing carbon tax.[289] While the BC carbon tax has been successful since its introduction and generally supported by the public through effective communication and feedback, the question is whether it will remain succesful in future. While other North American jurisdictions have implemented or are looking to implement carbon pricing instruments, the political pressure to extend concessions in light of competitiveness concerns is expected to keep increasing as long as British Columbia has by far the highest carbon price in North America.

288 Source: Harrison, K., A Tale of Two Taxes: *The Fate of Environmental Tax Reform in Canada, Review of Policy Research, Vol. 29 (3), Pp. 93-114.*, 2012.
289 Source: Harrison, K., *The Political Economy of British Columbia's Carbon Tax*, OECD Environment Working Papers, No. 63 (OECD Publishing, 2013).
290 Source: Lee, M., *Fair and Effective Carbon Pricing – Lessons from BC*, February 2011.
291 Source: British Columbia Ministry of Finance, *Budget and Fiscal Plan – 2013/14 to 2015/16 Carbon Tax Report and Plan, June 2013 Update*, 2013.
292 Source: Elgie, S. and McClay, J., *BC's Carbon Tax Shift after Five Years: Results – An Environmental (and Economic) Success Story*, July 2013.
293 Source: Rivers, N. and Schaufele, B., *Carbon Tax Salience and Gasoline Demand, University of Ottawa, Department of Economics Working Paper 1211E*, August 2012.

section **6**

Carbon pricing in the international climate cooperation

6 Carbon pricing in the international climate cooperation

Climate policy developments at the national level, including carbon pricing, support countries in implementing their 2020 emission reduction pledges (see Table 8). However, with the initiatives currently implemented, only three (India, the EU and Brazil) out of the 22 major emitters that submitted an international pledge are likely to meet it.[294] Even if all 22 were on track, the current pledges are insufficient to keep global emissions on a pathway that is consistent with limiting temperature increase to 2°C.[295] The gap between the pledges and a 2°C pathway is estimated to be 10 $GtCO_2e$ (see Table 9).

There is no doubt that increased action is needed. A central question is the role that carbon pricing can play in making this step-change.

» The gap between the pledges and a 2°C pathway is estimated to be 10 $GtCO_2e$. There is no doubt that increased action is needed. A central question is the role that carbon pricing can play in making this step-change. «

294 Source: Vieweg, M. et al, A*nalysis of Current Greenhouse Gas Emission Trends*, 2013, http://climateactiontracker.org/assets/publications/publications/CAT_Trend_Report.pdf.

295 Source: UNEP, *The Emissions Gap Report 2013*, March 12, 2013; Rogelj, J. et al., Copenhagen Accord Pledges Are Paltry. Nature, 464, 2010.

Table 8 Emission reduction pledges to 2020

Country	2010 emissions ($MtCO_2e$)[296]	Pledge emission level for 2020 ($MtCO_2e$)[297]	Current trajectory for 2020 ($MtCO_2e$)[298]	Pledge description[299]	Commitments beyond 2020[300]
China	11,182	13,445–13,561	12,770–14,765	40-45% reduction in CO_2e emissions per GDP, relative to 2005 levels 15% share of non fossil energy Increase forest cover to 23% of total landmass	None
US	6,715	5,974	6,041–6,465	17% below 2005 levels	83% below 2005 levels by 2050
EU	5,023	3,935–4,479	4,500	20% below 1990 levels (unconditional) 30% below 1990 levels (conditional)	80–95% below 1990 levels in 2050
India	2,692	3,751–3,834	2,655–4,016	20–25% reduction in CO_2e emissions per GDP, relative to 2005 levels	None
Russian Federation	2,510	2,515–2,763	2,085–2,750	15–25% below 1990 levels	50% below 1990 levels in 2050
Indonesia	1,946	1,603–1,820	N/A	26–41% below BAU levels	None
Brazil	1,621	1,973–2,068	1,500–2,630	36–39% below BAU levels	None
Japan	1,379	*Data outdated*	*Data outdated*	3.8% below financial year 2005 levels – current pledge[301]	60–80% below 2005 levels in 2050
Congo (the Democratic Republic of the)	1,113	No pledge			
Germany	979	Part of EU pledge			
Canada	728	614	730–780	17% below 2005 levels	60–70% below 2006 levels in 2050
Mexico	661	672	800–845	30% below BAU levels	50% below 2000 levels in 2050
Korea, Republic of	647	543	630–675	30% below BAU level	None

296 Total CO_2e emissions excluding short-cycle biomass burning in 2010. Source: European Commission, EDGAR – Emission Database for Global Atmospheric Research, accessed March 17, 2013, http://edgar.jrc.ec.europa.eu/.
297 Source: UNEP, *The Emissions Gap Report 2013*, March 12, 2013.
298 Independent and official estimates are provided. Official estimates are indicated in brackets. Source: UNEP, *The Emissions Gap Report 2013*, March 12, 2013.
299 Source: Climate Action Tracker, *Climate Action Tracker*, accessed December 18, 2013, www.climateactiontracker.org.
300 Source: Climate Action Tracker, *Climate Action Tracker*, accessed December 18, 2013, www.climateactiontracker.org.
301 Copenhagen pledge was 25% below 1990 levels but has been revised at COP 19 in Warsaw (2013) to 3.8%.

Country	2010 emissions ($MtCO_2e$)[296]	Pledge emission level for 2020 ($MtCO_2e$)[297]	Current trajectory for 2020 ($MtCO_2e$)[298]	Pledge description[299]	Commitments beyond 2020[300]
Australia	629	427–541	475–645	5% below 2000 levels (unconditional) 15–25% below 2000 levels (conditional)	80% below 2000 levels in 2050
United Kingdom	620	Part of EU pledge			80% below 1990 levels in 2050 (UK climate change Act)
France	538	Part of EU pledge			
Iran, Islamic Republic of	528	No pledge			
Central African Republic	512	No pledge			
Saudi Arabia	495	No pledge			
Italy	491	Part of EU pledge			
Poland	450	Part of EU pledge			
South Africa	422	400–600	560–690	34% below BAU level	40% below BAU level in 2025 Stabilization at this level, decrease after 2035
Turkey	420	No pledge			
Thailand	413	No pledge			
Ukraine	397			20% below 1990 levels (0.7 $GtCO_2e$) 14% below base year emissions (conditional)	50% below 1990 levels by 2050
Myanmar	362	No pledge			
Spain	354	Part of EU pledge			
Pakistan	340	No pledge			
Malaysia	330	No pledge			
Kazakhstan	318			10% below 1990 levels (conditional) - Kyoto Protocol 15% below 1990 emissions - Copenhagen pledge	25% below 1992 levels in 2050

Table 9 Global emission pathway until 2020 and 2050[302]

	Value for 2020 in $GtCO_2e$	Value for 2050 in $GtCO_2e$
Business as usual	59	
Emission level for current pledges (median)[303]	52–56	
Emission level consistent with 2°C (median)[304]	44	22
Gap to stay within 2°C limit compared to business as usual	15	
Remaining gap to stay within 2°C limit considering pledges	10 (range: 8–12)	

Making different policies work more effectively together Given the characteristics of the climate change problem, carbon pricing instruments can be a cost-effective means of mitigating emissions. They can enable a comprehensive coverage across all GHG, sectors, sources and technologies, taking advantage of least-cost mitigation opportunities at a global scale, and can support integrated decision making over time. Existing emissions trading schemes cover key sectors of the economy including industry (14 ETS[305]) and electricity (12 ETS), and, to a lesser extent, transport (5 ETS[306]) and buildings (5 ETS[307]). However, at the current level of ambition and in a context of uncertainty over the international regime, the political and institutional complexity of designing, linking and regulating the multilateral use of carbon pricing instruments creates a challenge.

To ensure that carbon pricing can have a wider application, some issues need to be properly addressed, including the impact of carbon pricing on international competition, and the limited ability of market design approaches so far to provide a robust price signal. The interactions of carbon pricing with other energy and economic policies also needs to be tackled. Support within countries for renewable energy is expanding – all major emitters have renewable energy targets of some sort – widespread efficiency standards are in place for appliances and building codes, and new car efficiency standards are being implemented.[308] Some suggest that linking of policies could help optimize the variety of international policies in place (see Box 3).

302 Source: UNEP, *The Emissions Gap Report 2013*, 2013.
303 Compared to median estimate of emission level consistent with 2°C.
304 Likely range (≥66%) for limiting global temperature increase to 2°C.
305 Including Chongqing.
306 Including transport fuel opt-in for Australia.
307 Four Chinese pilots and Tokyo.
308 Source: Ecofys, Climate Analytics, and Potsdam Institute for Climate Impact Research, *Analysis of Current Greenhouse Gas Emission Trends*, November 30, 2013.

Box 3 Linking heterogeneous regulatory systems

By Gilbert E. Metcalf,
Associate Scholar, Harvard Environmental Economics Program, Harvard Kennedy School of Government; and Professor of Economics, Tufts University

A new international climate agreement is to be completed by December 2015, at the Twenty-First Conference of the Parties of the United Nations Framework Convention on Climate Change, in Paris. This agreement will become effective in 2020. Countries that are party to the Convention will likely offer commitments of emission reductions that vary widely, with regard to level of ambition and type of contribution (e.g., absolute economy-wide emission reductions, intensity targets, policies with potentially quantifiable outcomes). Countries are also likely to be free to choose how they might fulfill their commitments (possibly subject to some as-yet unspecified review process), and domestic policies will include both market-based mechanisms and non-market regulation.

Given the volume of emission reductions that climate science and integrated assessment modeling suggest will be needed after 2020, it is reasonable to explore potential synergies and economies of scale among disparate national efforts. One such approach may involve linkage, which typically refers to the mutual recognition of permits (emissions allowances) between cap-and-trade systems. The central purpose of a cap-and-trade system is to enable emitters, through (explicit, in this case) price signals to identify and pursue their lowest-cost abatement options, thereby allowing system-wide marginal abatement costs to converge and the system as a whole to achieve its emissions-reduction target in a cost-effective manner. Linkage between cap-and-trade systems enhances cost-effectiveness across the linked systems by creating a larger pool of abatement opportunities – hence advancing price harmonization, reducing leakage (migration of carbon-intensive production due to cost disparities), increasing market liquidity, and decreasing price volatility and the potential for market concentration.

Is it possible to capture the benefits of linkage on the larger scale that will be required post-2020 by linking heterogeneous systems – cap-and-trade, carbon tax, and non-market regulatory systems? Linking cap-and-trade and carbon tax systems would be relatively easy, as the price in each is explicit. (A carbon tax system may also be considered a market-based system, in which the carbon price, rather than the quantity of emission reductions, is constrained.) Consider country A with a cap-and-trade system and country B with a carbon tax. A firm in country B could purchase country A permits and remit them in lieu of tax payments at the country B tax rate. Conversely, a firm in country B could remit carbon tax payments to its government in excess of its emissions and receive emissions-tax-payment credits (ETPCs) for the excess tax payment, which could be sold to firms in country A for use in place of permits. →

Linking a cap-and-trade or tax system, in which prices are explicit, with a non-market system, in which they are not, is more difficult. Non-market systems are themselves diverse, but consider one case of country A with a quantity standard (e.g., in this case a fixed emission cap at the level of an individual industrial facility or power plant) and country B with a cap-and-trade system or tax. A linked system would allow firms in country A to produce emissions above the standard if those firms submitted permits or ETPCs purchased from firms in country B. If the country with a quantity standard also allows firms to receive credits for emission reductions in excess of their required reduction, then those credits could be sold to firms in country B.

Similar linkages could be designed for countries subject to intensity standards (e.g., a quantity emissions standard per unit GDP). Linkage with countries using a technology standard (e.g., power plants of a particular type must use "best available technology") would be more difficult, largely due to the difficulty in specifying the emissions level in the absence of the standard. Assuming this "additionality" problem is adequately addressed or is determined to be of insufficient importance (a very significant assumption), the remainder of the exercise would proceed in a manner similar to other non-market systems.

Linking heterogeneous systems is not without its administrative and political challenges. But it does increase the likelihood of achieving – in a cost-effective and hence politically feasible manner – what will be significantly more ambitious emission reduction requirements after 2020. More research, analysis, and experimentation are required, however, before heterogeneous linkage might be implemented on a significant scale.

For a more detailed analysis, see: Gilbert E. Metcalf and David Weisbach (2010). Linking Policies When Tastes Differ: Global Climate Policy in a Heterogeneous World. Harvard Project on Climate Agreements, Cambridge, Massachusetts, USA. http://belfercenter.ksg.harvard.edu/publication/20264

In the short term, despite a proliferation of carbon pricing initiatives at the national and sub-national level and the increasing variety of forms and tools of carbon pricing that can be used by international climate cooperation, the prospects for coordination are limited. Nevertheless, considerable potential remains to move toward coordination of the many separate carbon pricing initiatives (see Box 4). In the absence of a global treaty, this could become a pragmatic strategy for achieving more effective cooperation, even if it comes at the expense of some of the cost-effectiveness gains that a broader regime could offer.

Box 4 A carbon market for 2°C

By Massimo Tavoni,
Fondazione Eni Enrico Mattei (FEEM) and Euro-Mediterranean Center on Climate Change (CMCC)

Maintaining global temperature increase below 2°C with reasonable probability will require broad and ambitious action on global emission reductions. Given the slow process of international climate negotiations over the past 20 years, such a transition is likely to happen – if at all – in progressive stages. However, such a fragmented policy action has been shown to significantly increase the costs and feasibility of climate policies, further jeopardizing the chances of seeing policies legislated and implemented.[309] The fundamental reasons for the policy impasse reside in the natural tension between responsibility and need for action, which is widely differentiated across regions: countries which will be contributing mostly to additional GHG emissions in the next decades are the ones which have contributed less in the past.

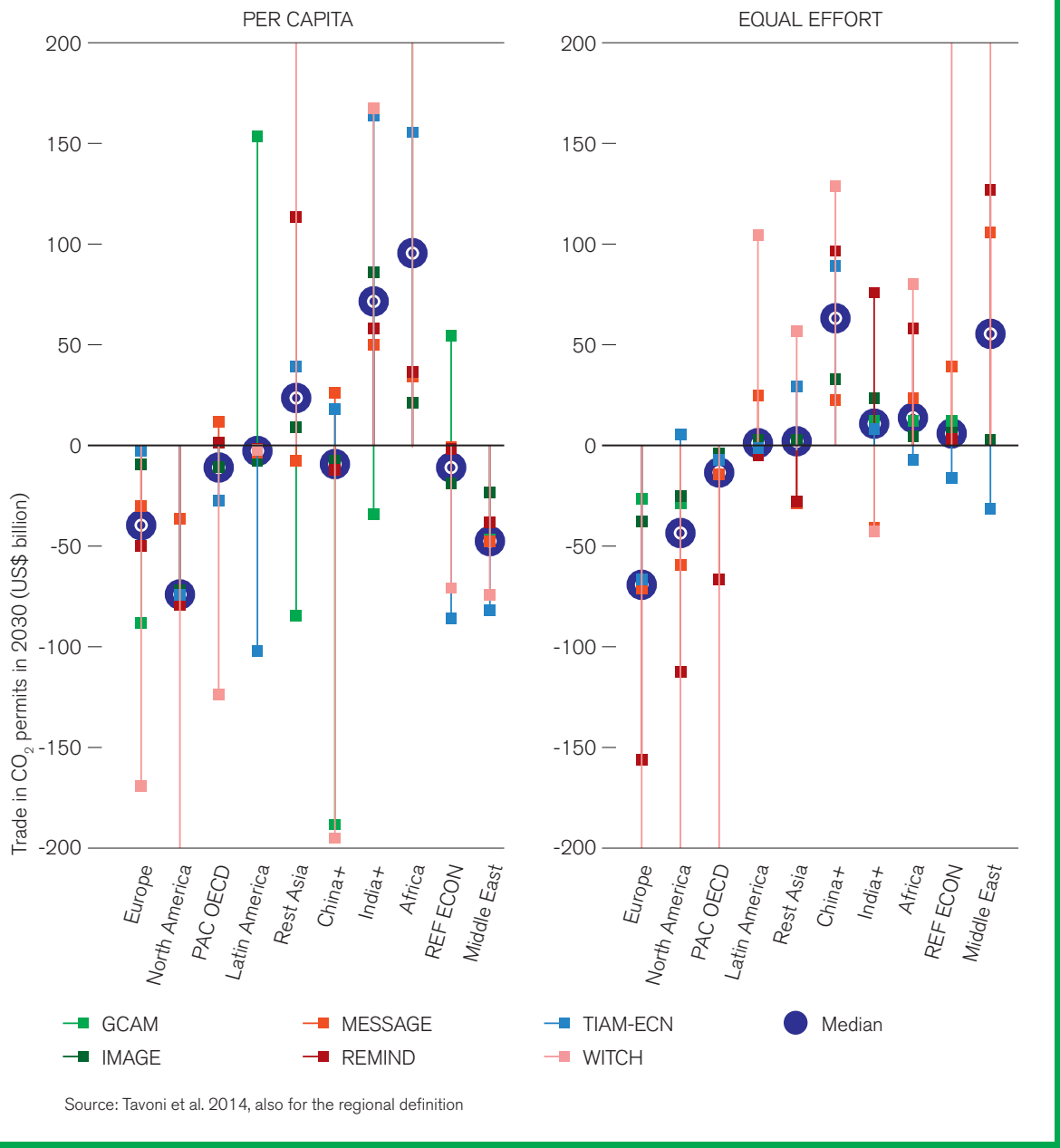
Carbon markets offer the opportunity for reconciling equity and efficiency considerations. By distinguishing those who commit to emission reductions from those who pay for such reductions, carbon markets have the potential to ensure that climate policy is attained at the lowest (or close to lowest) cost, while at the same time allowing for different equity principles. Though such mechanisms are well understood in theory and have played a role in the Kyoto process via the Clean Development Mechanism (CDM), it remains to be seen whether they can also be used in the context of ambitious climate stabilization policies such as 2°C. A recently completed research project (LIMITS) has explored these issues by employing a set of state of the art integrated assessment models to run a series of climate policy scenarios consistent with 2°C. The models assume that efficiency and equity can be managed simultaneously by endowing countries with carbon permits and allowing free trade of them, and have simulated the resulting carbon market which would emerge by a global post-2020 agreement to reach 2°C for different burden sharing schemes. In particular, a resource-sharing scheme based on the equalization of per capita emission rights by mid-century was compared to an effort sharing one in which policy costs (expressed in % points of GDP losses) would be equalized across regions.

The main results for the policy relevant year of 2030 are summarized in Figure 24. The chart shows that, notwithstanding the expected differences across models and the type of burden sharing scheme, the financial flows associated with the 2030 carbon market trading would be significant, with OECD countries like Europe and North America buying roughly US$50 billion worth of CO_2 permits each. This is due to the large trading volumes and the sustained carbon prices needed to attain policies compatible with 2°C. In both burden sharing schemes, OECD countries would be net buyers of permits. The majority of permits would be sold by India and Africa in the per capita allocation scheme, given their low per capita emissions and fast growing population, and by China and the Middle East in the equal effort one. This suggests that developing economies characterized by high emission intensity (like China) or heavily involved in fossil trading (like the Middle East) would be adversely hit by a climate policy without carbon trading vis à vis the other regions, and would need to be compensated with emission rights.[310] →

309 Source: Clarke, L. et al., *International Climate Policy Architectures: Overview of the EMF 22 International Scenarios, Energy Economics Vol 31, Vol Supplement 2, Issue 0*, December 2009; Kriegler, E. et al., *Making or Breaking Climate Targets: The AMPERE Study on Staged Accession Scenarios for Climate Policy, Accepted for Publication in Technological Forecasting and Social Change*, 2014.

310 Source: Stern, D.I. et al., *Where in the World Is It Cheapest to Cut Carbon Emissions? Australian Journal of Agricultural and Resource Economics Vol 56, Issue 3*, 2012; Tavoni, M. et al., *The Distribution of the Major Economies' Effort in the Durban Platform Scenarios, accepted for publication in Climate Change Economics*, 2014.

Figure 24 Regional trade flows of GHG emission permits in 2030 for two effort sharing schemes and the 2°C global objective (positive=selling, negative=buying)



Source: Tavoni et al. 2014, also for the regional definition

This analysis indicates that a 2°C carbon market would be a major up-scaling from the current experience with CDM credits (CERs), requiring significant development in terms of institutions, monitoring and verification, property rights, etc. Moreover, the trading positions of the various regions would be highly dependent on the burden sharing scheme chosen, and it is doubtful whether there is one scheme which fits the needs of all. Yet, the alternatives are much gloomier: they would either lead to a continuation on the current trends of limited climate change control action, or to a fragmentation in terms of policies which would do little for the climate and for the economy. The possibility to develop a common platform for making emission reductions where it is most convenient to do so, remains our most important opportunity for tackling climate change. Linking the experiences and markets developed in specific countries (like the EU, California, etc), and extending those to the major emitting economies, is the right place to start.

Full deployment of available instruments of international cooperation is needed In the longer run, independent of an observed emission pathway and of a given scenario of mitigation action, the level of cooperative engagement would need to significantly increase to maintain the overall mitigation costs at the lowest possible level. As highlighted above, closing the emission gap to the 2°C target will require a substantial lift in the scope and scale of the mitigation effort, calling for fuller deployment of all available instruments of international cooperation. IPCC's most recent analysis concludes that climate change is addressed in a growing number of fora and institutions and across a wider range of scales, from international to sub-national and non-state levels. It also highlights that some regimes that previously focused on other issues, e.g., trade, energy, biodiversity, and human rights, have begun to address climate change.[311]

The growing experience around carbon markets, at all levels, will help design more robust and more flexible instruments and take advantage of opportunities for cooperation and coordination. One key lesson from existing carbon pricing instruments is that building efficient carbon markets takes time. Both policy makers and market players need to go through a learning curve.

Piloting carbon pricing at an international level and providing climate finance through market-based mechanisms such as RBF might help to bridge the gap in time between having broadly separate national and sub-national carbon pricing approaches and internationally integrated carbon pricing approaches. Non-market based forms of cooperation (e.g., direct monetary transfers via climate finance, technology transfers and technical assistance)[312] are also gaining prominence as a way to support development of national carbon pricing initiatives and to stimulate exchange of emerging good practices.

More importantly, the growing urgency and pressing costs of global climate change mitigation and adaptation efforts has the potential to rank carbon pricing instruments alongside other fundamental components of a well-functioning economy. This may change the dynamics of carbon pricing interactions with other policies and reduce barriers to political acceptability and deployment of market instruments. There may be a point at which increasing ambition will need to be accommodated by international carbon pricing approaches. Although it is not possible to predict when this moment might occur, action needs to start early to enable preparation and to deliver timely mitigation.

311 Source: IPCC, Working Group III, *Chapter 13 International Cooperation: Agreements and Instruments, Final Draft*, December 17, 2013.
312 Innovative financial tools that bring together the private sector and institutional investors are gaining in importance, such as climate bonds. See Box 5 in Annex I.

ANNEX I
FACTS AND FIGURES ON INTERNATIONAL CARBON PRICING APPROACHES

I Demand outlook for Kyoto credits

This residual demand for Kyoto credits (CERs and Emission Reduction Units – ERUs) is coming mostly from the EU ETS and the Effort Sharing Decision.[313]

Under the EU ETS, the total demand for Kyoto credits for 2008–2020 is estimated to be about 1,600 to 1,700 $MtCO_2e$, including aviation. Out of this, 1,192 $MtCO_2e$ has already been used up to the end of 2013 by compliance installations.[314] A further **400 to 500 $MtCO_2e$** is therefore available for use until 2020. Market analysts estimate that EU ETS installations are likely to use most of their Kyoto credits limit in the next couple of years, six years ahead of the 2020 deadline, given the current low price and the spread with EUAs and uncertainty on the eligibility of Kyoto credits post-2020.[315]

The maximum demand under the Decision is about **700 $MtCO_2e$**. However, most EU member states are on track to meet their emission reduction target, or the majority of it, and they will therefore not need to use Kyoto credits.

Demand is also coming from the NZ ETS, where it is estimated that about 60–70 $MtCO_2e$ have been used for compliance by the end of 2013, and around **20–30 $MtCO_2e$** are expected to be used in 2014. International credits are currently not allowed from 2015.

With Japan pulling out of the Kyoto Protocol and the EU ETS demand being met, the demand from Japan, which was coming mainly from the government and trading companies, is estimated to be minimal, if any. Other residual demand from private sector players in voluntary schemes is also estimated to be minimal.

313 For more details on the Effort Sharing Decision, see the EU ETS detailed update sheet.

314 1,059 $MtCO_2e$ were used up to the end of 2012 and 132.8 $MtCO_2e$ were swapped for EUAs up to end of 2013. The 2013 swapping figure is lower than what most analysts expected. This may be due to the delays in launching the new swapping mechanism, which became operational only six weeks before the swapping deadline. Source: European Commission, *Number of international credits exchanged totals 132.8 million*, May 2, 2014, http://ec.europa.eu/clima/news/articles/news_2014050201_en.htm.

315 Under the current EU proposal for 2030 emission reduction targets, no demand for international credits post-2020 is planned.

The demand for international credits in Australia is currently uncertain. It will depend on whether the CPM is repealed or not and whether the government's Direct Action Plan will entail any role for international credits. It will also be influenced by the government's position on targets, i.e. whether or not the government sticks with its minimum target to reduce emissions by 5% compared to 2000 levels by 2020, or whether it chooses to adopt a stronger target as recommended recently by the Climate Change Authority.

Taken together, this suggests a maximum residual demand of **around 1,120 to 1,230 $MtCO_2e$**, coming from the EU ETS, the Effort Sharing Decision and NZ ETS.[316] However, this is likely to be overestimated given the progress of EU member states towards the targets under the Effort Sharing Decision.

II CDM

Figure 25 Market exodus

Source: Thomson Reuters Point Carbon

316 In California, CERs and ERUs are not allowed. The California Cap-and-Trade Regulations allow 2% in REDD credits in the first and second compliance period, and 4% in the third compliance period, amounting to a maximum demand of about 90 $MtCO_2e$.

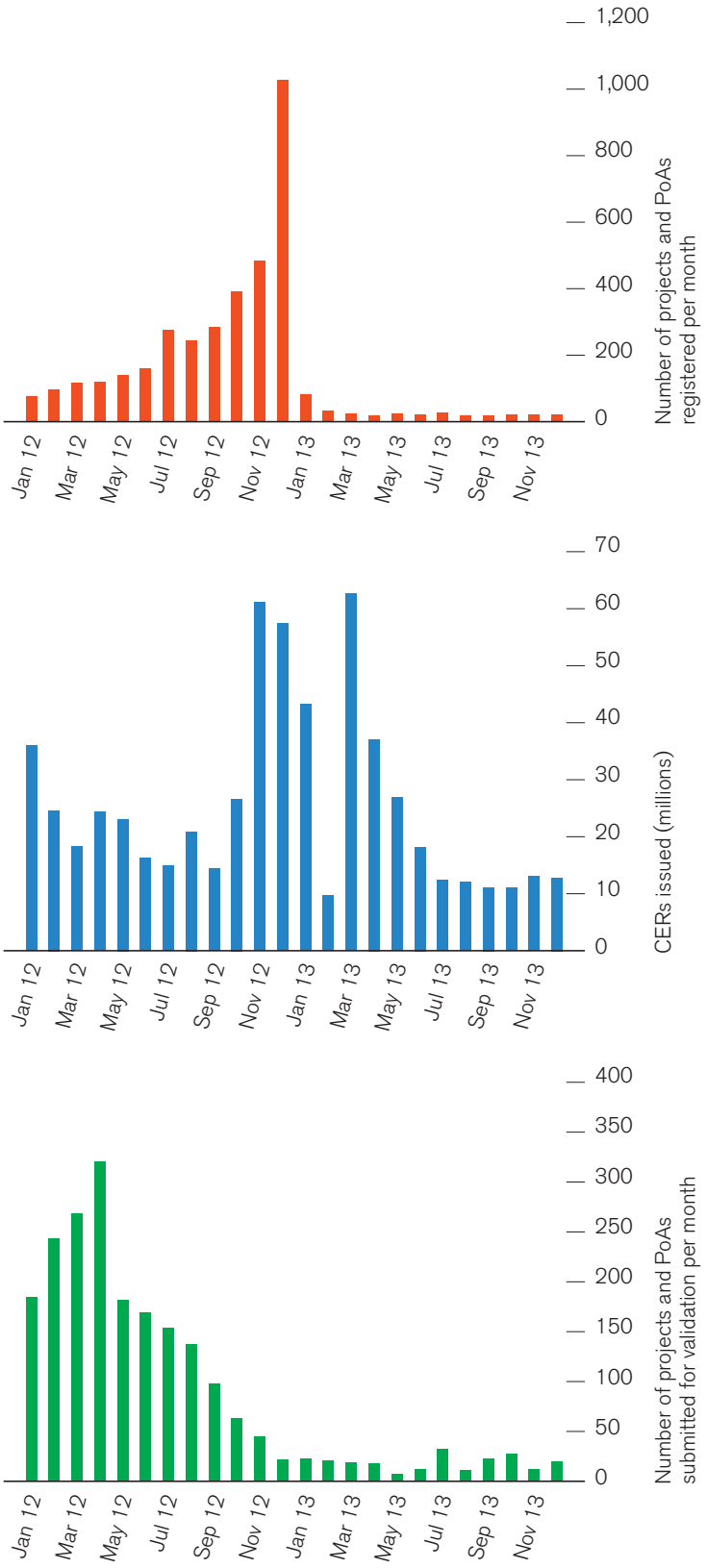
Table 10 CDM project and PoA registrations and CER issuances

	Registrations (number of projects and PoAs)	Issuances ($MtCO_2e$)
Total to date	7,740	1,451
In 2013	338	265
In 2012	3,428	339
In 2011	1,119	320
In 2010	812	132
In 2009	686	123
In 2008	431	138
In 2007	426	77
In 2006	409	26
In 2005	62	0.1
In 2004	1	-

Source: UNFCCC, Personal Communication, April 28, 2014.

Note 1: The numbers are as of April 25, 2014.
Note 2: The number of registrations witnessed in 2013 does not include projects submitted for registration in 2013 but not yet completely processed. Some of these projects might have a retroactive registration date in 2013.

Figure 26 Monthly CER and ERU issuance, projects and PoA registrations, and new submissions for validation in 2012 and 2013

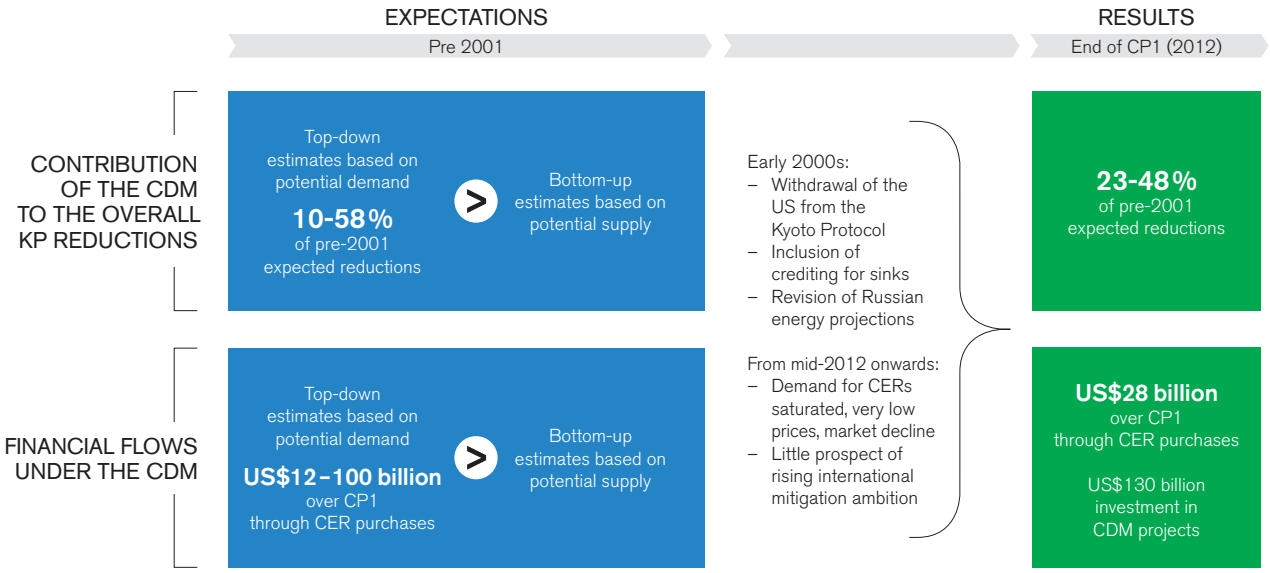


Source: UNFCCC, Personal Communication, May 7, 2014.

Table 11 Examples of initiatives to support the CDM

Instruments	In place	Examples of (potential) initiatives	For more information see
Establishment of a CER floor price	Suggested	Establishment of a CER floor price by Parties suggested by the EB	UNFCCC, *Draft Text on CMP Agenda Item 4 (a), Issues Relating to the Clean Development Mechanism, Version 2 of 18 November 2013 at 09:30 Hrs*, November 18, 2013
Cancellation of CERs	Yes	Voluntary cancellation of CERs by Parties and the private sector, facilitated by rules adopted by the EB in September 2012. Since then 790,815 CERs have been voluntarily cancelled in the CDM Registry Encouragement for the promotion of voluntary cancellation of CERs by Parties as a means of closing the pre-2020 ambition gap included in the Warsaw ADP decision	UNFCCC, *Executive Board of the Clean Development Mechanism Sixty-Ninth Meeting Report*, September 13, 2012. UNFCCC, *List of Attestations of Voluntary Cancellations*, accessed April 30, 2014, http://cdm.unfccc.int/Registry/vc_attest/index.html. UNFCCC, Decision 1/CP.19, *Further Advancing the Durban Platform*, January 31, 2014.
Activation of new demand sources	Yes	Acceptance of CERs as offsets under non-Kyoto Protocol schemes, carbon pricing schemes such as, e.g. under the Mexican carbon tax, the pilot schemes in China, and the ETS in the Republic of Korea	
Purchase activities	Yes	Continuation or stepping-up of CER purchase funds, e.g.: – The Norwegian government, through its Norwegian Carbon Procurement Facility (NorCaP), launched a call for proposals in November 2013 to buy up to 30 million CERs from vulnerable projects by 2020 – The Swedish government launched a similar call for proposals in December 2013 to buy up to 10 million CERs from renewable energy, energy efficiency and waste management projects that have not yet been commissioned, and from projects that are at risk of being discontinued and/or are located in Least Developed Countries	Nordic Environment Finance Corporation, NEFCO Norwegian Carbon Procurement Facility (NorCaP) - Call for Proposals, accessed March 17, 2014, http://www.nefco.org/financing/norcap_call_for_proposals Swedish Energy Agency, Call for CDM Proposals, December 20, 2013, https://www.energimyndigheten.se/en/Cooperation/For-a-better-climate/Flexible-mechanisms-for-monitoring-green-house-gas-emissions/Swedish-CDM-and-JI-climate-programmes-/Call-for-CDM-proposals-/
RBF	Yes	Use of CERs in RBF schemes, e.g.: – The existing Carbon Initiative for Development (Ci-Dev) which earmarked US$95 million to purchase CERs (see Section 3.4.1 for more details) – Possibly, the Green Climate Fund and the Global Environment Facility in the future – The African Group suggested substantial reforms to improve access to the CDM for projects in low income countries to facilitate its use to deliver RBF	Ci-Dev: → 103

Figure 27 Looking back at the CDM: expectations and results



Note 1: Before 2001, annual demand for emission reductions under the Kyoto Protocol was estimated at around 1,000 $MtCO_2e$ over CP1, i.e. 5,000 $MtCO_2e$ over CP1. The CDM was expected to contribute between 10 and 58% of these reductions according to top-down estimates, based on marginal abatement cost curves.

Note 2: Analysts highlighted more than once that in initial pre-2001 predictions, top-down estimates of CDM use were probably over-estimated, and their bottom-up estimates of the emission reduction potential of the CDM were generally toward the lower end of the scale. This was due mostly to the political limitations, institutional challenges in developing countries, transaction costs and huge efforts needed to set up the operational infrastructure of the mechanism.

Note 3: By the end of 2011, 2,400 million pre-2013 CERs had been contracted in the primary market, and by the end of 2012, 1,155 billion CERs had been issued, comfortably in the range of the pre-2001 estimates (respectively representing 48% and 23% of the emission reductions expected under CP1).

Note 4: Financial flows to developing countries are mostly through direct investment in CDM projects and purchase of primary CERs. By 2012, US$28 billion worth of pre-2013 CERs had been contracted forward.

Note 5: The US$130 billion investment figure assumes that all underlying projects are implemented. Source: Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012.

Sources: Grubb, M., *The Economics of the Kyoto Protocol, World Economics, Vol. 4, No. 3*, 2003; Kossoy, A., Guigon, P., *State and Trends of the Carbon Market 2012*, 2012; Michaelowa, A. and Dutschke, M., *Integration of Climate and Development Policies through the Clean Development Mechanism*, Europe and the South in the 21st Century. Challenges for Renewed Cooperation, CD-Rom, 2002; Vrolijk, C., *The Potential Size of the Clean Development Mechanism*, April 1999; Zhang, Z.X., *An Economic Assessment of the Kyoto Protocol Using a Global Model Based on the Marginal Abatement Costs of 12 Regions*, November 2001.

III NMM and FVA

Table 12 Summary of the main discussion points on the role and technical design of the NMM and the FVA

NMM	FVA
Role – Role of the NMM in the design of the 2015 agreement, especially with regards to raising Parties' ambition in terms of mitigation and financial support, pre and post-2020 – Relationship with other mechanisms such as the FVA, the CDM, JI and Nationally Appropriate Mitigation Actions (NAMAs)	**Role** – Role of the FVA in the design of the 2015 agreement, especially with regards to raising Parties' ambition in terms of mitigation and financial support, pre and post-2020. – Purpose of the FVA: three main options emerged: 1) a set of common rules, 2) a set of minimum criteria and review, and 3) a platform for the sharing of information, reporting and assessment – Scope of the FVA: only carbon units from market-based approaches or also outcomes from non-market based approaches; only UNFCCC approaches or also regional, national, and sub-national and bilateral approaches; only mitigation mechanisms or also adaptation related ones. Possible approaches to be covered include CDM and JI, NMM, regional, national and sub-national ETS, bilateral offset schemes, REDD+, NAMAs, domestic regulations/policies/targets/taxes, etc.
Technical design – Role of the COP in the NMM – Participation in the NMM: restriction to developing countries or possible participation of developed countries – Types of standard to ensure environmental integrity, e.g., standards which will be defined under the FVA, International Organization for Standardization (ISO) standards, standards based on the practices under the CDM and JI – Determination of baselines – Modalities for net mitigation: discounting at the point of use or issuance, conservative crediting thresholds, set-aside of credits by the host country – MRV rules: what standards to learn from, how to best use the CDM experience – Design: sectoral trading and crediting vs. broader scope of approaches – Definition of broad segments of the economy – Options for recording and tracking NMM units	**Technical design** – The technical design will depend on the purpose and scope of the FVA. The aspects to be covered include accounting standards, MRV standards, reporting requirements, independent verification, core characteristics of units, tracking infrastructure, contribution to sustainable development in host country, approach to net mitigation

IV RBF

Ci-Dev initiative The Ci-Dev will use the CDM to support energy access projects in low income countries with a focus on Africa. Most of the purchased CERs will be cancelled and not used against mitigation obligations of the fund participants. One of the key objectives of Ci-Dev is to improve and extend the scope of the CDM, especially for PoAs in the context of applicability of standardized baselines and establishment of suppressed demand accounting standards. Ci-Dev will particularly focus on areas that benefit community and households such as rural electrification, household energy access and energy efficiency. It also aims to demonstrate that RBF through CER purchases can lead to successful and viable business models that will attract private sector participation.

V REDD+

Warsaw REDD+ decisions At COP 19 in November 2013, important progress was made on REDD+ with the adoption of the Warsaw REDD+ framework,[317] which includes seven decisions on finance, institutional arrangements and methodological issues. Together with earlier COP decisions made between 2007 and 2012, these form the building blocks for REDD+. Specifically on financing of REDD+, it was reaffirmed in Warsaw that RBF for REDD+ may come from a variety of sources, including markets as well as public sources. The GCF was recognized as playing a "key role" for REDD+ financing.

In Warsaw, it was also agreed that a UNFCCC information hub for REDD+ activities would be established, thus paving the way for tracking RBF for REDD+ prior to an agreement on a post-2020 climate framework. Building on the Cancun decision on safeguards, Parties agreed that receipt of RBF should be contingent on reporting on safeguards following the same reporting schedule as applicable to national communications.

On methodological aspects,[318] guidelines and procedures for the review and technical assessment of forest reference emission levels and forest reference levels were agreed. Monitoring and reporting on REDD+ activities should be based on a national forest monitoring system and is expected to build upon existing systems. Monitoring should further reflect the phased approach for REDD+, i.e., scaling from an initial sub-national level up to the national level.

REDD+ funds By and large, the adoption of the Warsaw REDD+ framework provided renewed momentum for the REDD+ agenda. Formerly, the principal source of funding for REDD+ had been directed towards readiness activities. The progress in Warsaw leveraged substantial new pledges from donors for multilateral initiatives that are piloting RBF for emission reductions from land-use programs at scale, e.g., the Forest Carbon Partnership Facility (FCPF) and the new BioCarbon Fund Initiative for Sustainable Forest Landscapes.

– The FCPF is a multilateral global initiative created in 2008 to promote REDD+ capacity building and implementation. An important contribution of the FCPF has been the development of an operational framework for readiness preparation activities consistent with the phased policy framework under the UNFCCC. The Carbon Fund of the FCPF, operational since 2011, is a multilateral funding mechanism to pilot REDD+ RBF at scale. With a current capitalization of approximately $465 million, the Carbon Fund is set up to pay for emission reductions delivered by a few (indicatively six) large programs at a jurisdictional (e.g., provincial) or national scale. For illustration, a hypothetical price of US$5–10/$tCO_2e$ could cover about 2% of current emissions from deforestation, i.e., 60 $MtCO_2e$ of total annual emissions of 3,000 $MtCO_2e$.

317 Source: UNFCCC, *Report of the Conference of the Parties on Its Nineteenth Session, Held in Warsaw from 11 to 23 November 2013, Part One: Proceedings, Advance Version, Paragraph 44*, January 31, 2014.
318 Source: UNFCCC, *Decisions 9 to 15/CP.19*, January 31, 2014.

– The BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL) is a new multilateral facility, supported by donor governments and managed by the World Bank. Launched in November 2013, ISFL seeks to promote emission reductions from the land sector, REDD+ and sustainable agriculture, as well as smarter land-use planning, policies and practices. With the current level of funding ($309 million), the BioCF ISFL will create a portfolio of about 4–6 jurisdictional programs.

VI Climate bonds

Box 5 Climate bonds

The growing risks brought on by climate change are raising development costs for the world's fast-growing cities and developing countries. Government funds alone will never be enough to build resilience to extreme weather and deal with the threats to energy, water and food supplies. The private sector and institutional investors must be involved. Green bonds are an example of an innovation that gives investors an entry point to supporting renewable energy, energy efficiency and other low-carbon projects. This can help countries adapt to and mitigate climate change through a liquid, tradeable instrument in the currency and maturity of their choice, regardless of the lifetime of the supported projects. Bonds represent the largest single pool of capital (US$80 trillion versus US$53 trillion in equities) and the mobilization of the bond market is key to meeting climate finance targets.[319]

While bonds have been issued to raise finance for low-carbon infrastructure for decades, particularly for rail, they have rarely been labeled as "green" or "climate". The Climate Bonds Initiative estimates that this unlabeled market linked to climate change stood at US$346 billion in 2013.[320] Recently, bonds have been issued specifically as "green" or "climate". Those financial instruments have been successful in developing a green bond market that helps to mobilize private sector funding for environmental projects and, ultimately, to raise awareness about climate finance opportunities in the capital markets. In 2013, issuers raised in aggregate more than US$11 billion through bonds explicitly tagged as "green bonds".[321]

As this new market grows, it expands to more issuers and types of products across the risk spectrum. It can provide much-needed additional financing to build a climate-resilient economy and increase engagement between investors and issuers. It also demonstrates that fixed income investors can achieve a positive environmental impact from their investments as well as financial returns.

319 Source: Climate Bonds Initiative, *2013 Overview: The Dawn of an Age of Green Bonds?*, February 6, 2014, http://www.climatebonds.net/2014/02/2013-overview/.
320 Source: Climate Bonds Initiative, *Bonds and Climate Change – The State of the Market in 2013*, June 2013.
321 To date, the World Bank Group has issued a total of US$8.7 billion equivalent (US$5.3 billion equivalent from IBRD through over 60 green bond transactions in 17 currencies and US$3.4 billion from International Finance Corporation).

ANNEX II
DETAILED UPDATE SHEETS ON EMISSIONS TRADING SCHEMES

The following sections provide further detail on the developments in several of the emissions trading schemes and crediting approaches, complementing the summary information in Section 4.

VII EU ETS

Scope The biggest stationary emitters in Croatia joined the EU ETS from the start of Phase III, six months ahead of the official accession of Croatia to the EU. From January 1, 2014 the aviation sector in Croatia is also fully covered under the EU ETS. Emissions from flights within Croatia and between Croatia and non-EEA countries already had to be monitored and reported from July 1, 2013, when Croatia officially joined the EU.[322]

Box 6 The EU ETS and international air transport

All flights from and to EU-28 airports and Norway, Liechtenstein and Iceland (European Economic Area; EEA) were to be covered under the EU ETS from January 2012. However, there was fierce opposition from other countries on the inclusion of their flights, so in November 2012 the EC issued the "Stop the Clock" amendment. This action exempts international flights from and to all EEA countries from the EU ETS for one year to allow time for a decision to develop a global market-based mechanism during the International Civil Aviation Organization (ICAO) General Assembly in October 2013. →

322 Source: European Commission, *Integration of Croatia into the Aviation Part of the EU ETS*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/transport/aviation/croatia/index_en.htm.

On October 3, 2013 the 38th ICAO General Assembly agreed to develop a global market-based mechanism by the next ICAO General Assembly in 2016, with the prospect of implementing the scheme by 2020.[323] The goals are for international aviation to reach carbon neutrality in their emissions growth starting in 2020. The work to design a global market-based mechanism for international aviation emissions has already started in 2014 within the ICAO framework.

Developing countries included an amendment in the ICAO resolution stating that a mutual agreement must be reached between countries for them to be included in a new or existing market-based mechanism.[324] The EU presented a formal reservation to this resolution.[325]

In response to the outcome of the ICAO General Assembly and to create momentum towards the successful establishment of a global market-based mechanism for aviation, the EC proposed to limit the emissions covered from aviation under the EU ETS to the airspace of the EEA from 2014 to 2020.[326] In line with the decision at the ICAO General Assembly, flights from and to developing countries with less than 1% of the global transport volume (in revenue ton kilometres) in international civil aviation activities would be exempt from the EU ETS.[327] The EC also proposes that aircraft operators do not have the option to participate voluntarily in the full scope of the EU ETS (and receive free allowances for it). The obligations under the EU ETS for flights between airports in the EEA remain unchanged and will be fully enforced.

After negotiations the European Council and Parliament reached agreement in March 2014 to extend "Stop to Clock" until 2016, limiting the aviation emissions covered in the EU ETS to flights within the EEA for the period from 2013 to 2016. The European Parliament voted in favor of the extension on April 3, 2014 and it is expected to enter into force on May 1, 2014.

Aircraft operators do not have the option to participate in the EU ETS if they are not included, or not fully included. In 2016, in light of the ICAO Assembly that year, a new legislative proposal could be presented by the Commission.

Allocation approaches Allocation in Phase III of the EU ETS is different for utilities and industry sectors. Utilities need to buy all of the allowances that they require at auction or from other sources, whilst there are still some free allowances available to industrial participants on the basis of benchmarks.

323 Source: ICAO, *Resolution A38-18, Provisional Edition, Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection – Climate Change, Paragraph 19*, November 2013, 19.
324 Source: ICAO, *Resolution A38-18, Provisional Edition, Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection – Climate Change, Paragraph 16a*, November 2013.
325 Source: ICAO, *Summary Listing of Reservations to Resolution A38-18*, November 2013.
326 Source: European Commission, *Proposal for a Directive of the European Parliament and of the Council Amending Directive 2003/87/EC Establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community, in View of the Implementation by 2020 of an International Agreement Applying a Single Global Market-Based Measure to International Aviation Emissions*, October 16, 2013.
327 Source: ICAO, *Resolution A38-18, Provisional Edition, Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection – Climate Change, Paragraph 16b*, November 2013.

In 2013 the member states submitted their preliminary allocation plans for these free allowances (National Implementation Measures – NIMs) to the EC. The EC determined in September 2013 that a cross-sectoral correction factor was necessary to limit the amount of free allowances to industry to a specific amount, which reduces year on year.[328, 329] In principle the reduction trajectory is fixed for the whole of Phase III. Utilities were already subject to a reduction factor for their non-electricity emissions, which increases annually by 1.74% in a linear fashion.

In September 2013 the rules on the cross-sectoral correction factor were published.[330] Since then member states have started allocating free allowances to installations for 2013. Free allocation can still vary in the case of significant capacity changes and partial cessation. The allocation of 2013 allowances was completed on February 27, 2014.[331] One day later, the window opened for the allocation of 2014 allowances and member states could start handing out 2014 allowances.

In 2013 the *free* allowances for industry and heat production totaled 848 million EUAs[332] for the EU-28 and transitional free allowances for electricity generators totaled 152 million EUAs.[333]

Competitiveness considerations Sectors vulnerable to a risk of carbon leakage are entitled to more free allowances. The list of eligible sectors expires in 2014 and will be renewed in the course of the year. The EC's proposal is to use the same criteria and assumptions that have been used for the current sector list, including a reference carbon price of €30/tCO_2.[334]

Additional free allowances for sectors at risk of carbon leakage are given only to cover their direct emissions. To mitigate the potential impact of carbon leakage of sectors due to indirect emissions costs from electricity consumption, the EC allows electricity intensive sectors to be given financial compensation in the form of state aid.[335] Whether sectors will receive financial compensation is subject to the discretion of member states. At the moment Germany, the UK, the Netherlands,

328 Source: DG Climate Action, European Commission, *Calculations for the Determination of the Cross-Sectoral Correction Factor in the EU ETS in 2013 to 2020*, October 22, 2013, http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/cross_sectoral_correction_factor_en.pdf.

329 This means that the total preliminary free allowances of all industrial installations will be reduced from 100% in 2012 to 94.3% in 2013 and 92.6% in 2014, decreasing to 82.4% in 2020. Source: European Commission, *Commission Decision (2013/448/EU) of 5 September 2013 Concerning National Implementation Measures for the Transitional Free Allocation of Greenhouse Gas Emission Allowances in Accordance with Article 11 (3) of Directive 2003/87/EC of the European Parliament and of the Council OJ L240/27*, 2013.

330 This was the last rule required for member states to determine the final amount of free allowances to each installation.

331 Source: European Commission, *Status Table on Free Allocation to Industry and Heat Production for 2013, Final Update*, February 26, 2014, http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/process_overview_nat_en.pdf.

332 Source: European Commission, *Status table on free allocation to industry and heat production for Phase 3, Final update for 2013 and 2014 allocations*, May 5, 2014, http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/process_overview_nat_2014_en.pdf.

333 Source: European Commission, *Status Table on Transitional Free Allocation to Power Generators for 2013*, January 28, 2014, http://ec.europa.eu/clima/policies/ets/cap/auctioning/docs/process_overview_10c_en.pdf.

334 Source: European Commission, *Commission Decision determining, pursuant to Directive 2003/87/EC of the European Parliament and of the Council, a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019 (draft)*, 2014.

335 Source: European Commission, *Guidelines on Certain State Aid Masures in the Context of the Greenhouse Gas Emission Allowance Trading Scheme Post-2012, 2012/C 158/04*, 2012.

Spain and Belgium (Flanders) have decided to provide financial compensation, which has been approved by the EC.[336] Norway is also providing financial compensation for electricity intensive sectors.[337]

Use of offsets Under the EU ETS operators are allowed to use eligible international credits to cover part of their emissions.[338] The minimum entitlement to use international credits is specified in Article 11a of the EU ETS Directive for 2008–2020. In November 2013 the EC set the maximum permitted use of international credits equal to the minimum level that the legislation allows,[339] which is estimated around 1,600 to 1,700 million international credits for 2008–2020. In total operators used 1,059 million Kyoto credits in Phase II, and swapped 133 million Kyoto credits in 2013, leaving room for the use of 400–500 million international credits to meet their compliance obligations up to 2020.[340] Given the current CER prices and the CER–EUA spread, most of the limit for international credits is expected to be used up in the next couple of years.

In Phase II international credits could be directly surrendered for compliance. Starting from Phase III, under the new registry regulations, international credits cannot be used directly for compliance and operators need to convert them to EUAs before being able to surrender them. International credits that are eligible for compliance in the EU ETS will be marked "eligible International Credit Holdings" (ICH) and only eligible ICHs can be exchanged for EUAs.[341] The final deadlines for converting international credits are the end of March 2015 and December 2020, depending on project specifications backing the credits.[342]

Price stabilization mechanism In 2012 the EC proposed a one-off "backloading" proposal, to postpone the auctioning of 900 million EUAs from the beginning to the end of Phase III. For the proposal to be implemented it faced scrutiny from the European Parliament and Council and the approval of the EU Climate Change Committee.

Over the course of 2013 the backloading proposal faced several delays and amendments as opinion is divided in the Parliament and Council. Some are concerned that the EUA price is too low to stimulate any low-carbon technology investment and prevent lock-in of carbon-intensive technologies due to the large surplus of allowances. See below under "Performance and effectiveness". Others worry that the backloading proposal will have a negative impact on the

336 Source: European Commission, *State Aids Cases by Date - Last 3 Months*, accessed January 28, 2014, http://ec.europa.eu/competition/elojade/isef/index.cfm?fuseaction=dsp_sa_by_date.

337 Source: EFTA Surveillance Authority, *State Aid: Norwegian CO_2 Compensation Scheme Approved*, accessed January 28, 2014, http://www.eftasurv.int/press--publications/press-releases/state-aid/nr/2082.

338 For a list of eligible international credits in the EU ETS, see 2013 report and http://ec.europa.eu/clima/policies/ets/linking/faq_en.htm

339 Source: European Commission, *Commission Regulation (EU) on Determining International Credit Entitlements pursuant to Directive 2003/87/EC of the European Parliament and of the Council (Draft Legislation)*, 2013.

340 Source: World Bank, *Mapping Carbon Pricing Initiatives 2013, Developments and Prospects, May 2013; European Commission, International Carbon Market*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/linking/index_en.htm.

341 Source: European Commission, *Questions & Answers on Implementation of Rules Regarding the Eligibility of International Credits in the EU ETS (07/2013)*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/linking/faq_en.htm.

342 Source: European Commission, *Commission Regulation (EU) No 389/2013 of 2 May 2013 establishing a Union Registry pursuant to Directive 2003/87/EC of the European Parliament and of the Council, Decisions No 280/2004/EC and No 406/2009/EC of the European Parliament and of the Council and repealing Commission Regulations (EU) No 920/2010 and No 1193/2011*, 2013.

competitiveness of the EU and may set a precedent for political intervention in the EU ETS in the future. The expectations and announcements by various member states and EU committees regarding the backloading proposal largely dominated the EUA price development (see Figure 14).

The backloading proposal went through several parliament committee votes before going to the European Parliament plenary vote. The Parliament's industry committee (ITRE) voted against the proposal in January 2013. However, the environment committee (ENVI) leads on this dossier so the ITRE vote only had an advisory role. In February ENVI voted in favor of the proposal, but they were not able to agree whether the discussions could already move to the European Council or wait until after the full Parliament vote. This resulted in a relatively weak positive impact on the EUA price.

In April 2013 the Parliament rejected the backloading draft amendment, sending the EUA price tumbling by over 40% to a record low of €2.60[343] and forcing the amendment to be sent back for revision. In June ENVI voted in favor of the revised backloading amendment and the bill was presented to the Parliament again in July with two key amendments, this time passing the vote. A precondition was added that it should not result in the loss of competitiveness for industry and emphasizing that the amendment was a "one-off" measure. After several months of uncertainty due to national elections in different member states, in December 2013 the European Council also agreed to the backloading amendment and the Parliament reaffirmed its support. In January 2014 backloading was approved by the EU Climate Change Committee.[344]

After several months of reiterations and uncertainties, the backloading proposal was finally put into legislation in February 2014.[345] This paves the way for 400 million EUAs to be held back from auctions in 2014, 300 million in 2015 and another 200 million in 2016. The allowances will be gradually released for sale in auctions in 2019 (300 million EUAs) and 2020 (600 million EUAs).

A more permanent price stabilization mechanism is planned for Phase IV of the scheme (see below under "Looking ahead"). Part of the proposal is essentially to spread out the re-introduction of the 600 million EUAs in 2020 over 2021 and 2022.

Performance and effectiveness Demand outstripped emissions in Phase II of the EU ETS, resulting in low carbon prices and a so-called surplus of nearly 2 billion allowances. The most appropriate way to treat this surplus has been the subject of intense debate in 2013. The "NER300" fund is established in Phase III, targeted at demonstration projects in innovative renewable energy technologies and carbon capture and storage. The fund is so-called as the mon-

343 Source: Thomson Reuters Point Carbon, *EU Parliament Rejects Carbon Market Rescue Fix*, April 16, 2013, http://www.pointcarbon.com/news/1.2282756?-date=20130416&sdtc=1.
344 Source: European Commission, *Structural Reform of the European Carbon Market*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/reform/index_en.htm.
345 Source: European Commission, *Back-Loading: 2014 Auction Volume Reduced by 400 Million Allowances*, February 27, 2014, http://ec.europa.eu/clima/news/articles/news_2014022701_en.htm.

ey comes from the revenue from the sale of the 300 million EUAs from the New Entrants Reserve (NER). At the end of 2012, 200 million EUAs had already been auctioned, and the remaining 100 million are in the process of being auctioned.

MRV and registry In 2013 two new legally binding regulations came into force: the Monitoring and Reporting Regulation and Accreditation and Verification Regulation, which should further harmonise MRV across European member states. The registry regulations were amended in May 2013 to change the way international credits are surrendered for compliance in the EU ETS.[346] (See under "Use of offsets" above.)

Linking to other schemes Negotiations are ongoing to link the Swiss scheme with the EU ETS. The fourth and fifth rounds of negotiations were held in July and December 2013 respectively. Linking with the Australian CPM had been planned; however, with uncertainties about the future of the Australian scheme, discussions are on hold for the moment.

Looking ahead On January 22, 2014 the EC announced their intentions for a European framework on climate and energy to 2030. The framework is the first proposal for 2030 and will be heavily debated in the coming years by the European Parliament and the Council before being set in law. Nonetheless, the proposal provides a concrete indication of the future the EC is working towards.

The 2030 framework contains a proposed GHG reduction target for the European Union as a whole of 40% below 1990 levels by 2030.[347] As part of this, the EC proposes to increase the linear annual reduction of the EU ETS cap from 1.74% to 2.2%, starting from the beginning of Phase IV in 2021.

In the proposal, all emission reductions from 2020 onwards will need to be met within the EU. Allowances carried over from Phase III of the EU ETS can be used after 2020, but emission reduction obligations for the EU as a whole cannot be met through international credits. If a global agreement on climate change is reached in 2015 the emission reduction target for the EU will be increased and the use of international credits may be revised.

As part of the ongoing reform of the EU ETS, the 2030 framework includes a proposal for a market stability reserve under the EU ETS from Phase IV onwards.[348] The purpose of the reserve is to address the surplus of allowances that has built up and improve the system's resilience against major demand shocks in the future. This is done by adjusting the amount of allowances to be auctioned according to clear predefined rules that prevent any discretionary adjustments by the EC or member states.

346 Source: European Commission, *Questions & Answers on Implementation of Rules Regarding the Eligibility of International Credits in the EU ETS (07/2013)*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/linking/faq_en.htm.

347 Source: European Commission, *Commission Launches Second Step to Reform the EU ETS*, January 22, 2014, http://ec.europa.eu/clima/news/articles/news_2014012201_en.htm.

348 Source: European Commission, *Structural Reform of the European Carbon Market*, accessed January 28, 2014, http://ec.europa.eu/clima/policies/ets/reform/index_en.htm.

The market stability reserve proposed by the EC will start in 2021 and is triggered when the market surplus of allowances (termed "emission allowances in circulation" by the EC) is not within a predefined range:[349]

- If the market surplus recorded two years back is larger than 833 million EUAs (or approximately 42% of the total annual allocation cap of 2,084 million tons), 12% of the surplus allowances will be withheld from the auction volumes and added into the reserve.

- If the market surplus is smaller than 400 million EUAs, a predefined volume of 100 million EUAs per year will be released.

The market surplus[350] is the amount of allowances left from previous years, which can be used for compliance in future years, and is published by the EC annually in May.

In addition, if the total surplus is above 400 million EUAs the release of allowances from the reserve can also be triggered by Article 29a of the EU ETS Directive. This means that if the actual EUA price is more than three times the average EUA price during the two preceding years for six consecutive months, 100 million EUAs will be added to future auction volumes (or all EUAs if there are less than 100 million in the reserve).

A review of the market stability reserve will take place by December 31, 2026, with a focus on the level of the triggers and the amount of surplus to withhold and release.

The market stability reserve of the EU ETS will be the first of its kind in the world as it is triggered by the total surplus of allowances. The schemes in California, Québec and the Regional Greenhouse Gas Initiative (RGGI) also have a market stability reserve, but these use the allowance price as a trigger to regulate auctioning volumes instead of a quantity-based indicator such as the surplus of allowances.

Carbon pricing in context Carbon pricing instruments often coexist with other heterogeneous policies that may directly or indirectly contribute to reducing GHG emissions by addressing areas such energy or infrastructure. Thus, they have to be planned to interact and complement other strategic priorities at regional and national levels. The EU ETS remains the backbone of EU climate policy. Other related policies at the EU level are illustrated in Box 7 below.

349 Source: European Commission, *Proposal for a Decision of the European Parliament and of the Council Concerning the Establishment and Operation of a Market Stability Reserve for the Union Greenhouse Gas Emission Trading Scheme and Amending Directive 2003/87/EC*, 2014.

350 The market surplus is calculated by adding the total amount of international credits used from 2008 to the previous year to the total amount of EUAs issued in the same period, followed by subtracting the total emissions from 2008 to the previous year and the number of allowances in the market stability reserve in the previous year.

Box 7 Europe's climate ambitions: the EU ETS in context

The EU ETS is the major carbon pricing mechanism in Europe and has been operational since January 2005, covering the power sector, selected industry sectors and aviation. This is complemented by the Effort Sharing Decision, which covers sectors outside the ETS. In addition, Directives are in place for renewable energy and energy efficiency development. An overview of the most important policies is given in Table 13.

Table 13 Most relevant non-carbon pricing policies at the EU level and their link to the EU ETS[351]

Policy	Implications for GHG emissions	Linkage to and overlap with the EU ETS
Effort Sharing Decision	National GHG reduction targets for non-ETS sectors for 2013–2020, taking full account of the flexibility provisions such as transfers between member states	No overlap as it explicitly covers the non-ETS sectors. Restricted use of flexible mechanisms possible but no trading link to ETS
Renewable Energy Directive	National targets to increase the share of renewable energy in overall energy consumption to reach the 20% EU wide target by 2020	Overlap as contributes to achievement of ETS target in power sector
Energy Efficiency Directive	Expected to influence energy efficiency in different sectors	Overlap as energy efficiency achieved on the demand side contributes to achievement of ETS target in power sector
Recast of the Energy Performance of Buildings Directive	New building requirements are expected to positively affect thermal integrity of buildings and requirements for new buildings after 2020	Overlap if electricity or district heating is reduced, however this is likely only to a limited extent
Ecodesign and Energy Labelling Framework Directives	The Directive sets energy performance standards for a wide range of products. As requirements and labeling concern only new products, the effect will be gradual (marginal in 2010; rather small in 2015 up to full effect by 2030)	Overlap as energy efficiency achieved on the demand side contributes to achievement of ETS target in power sector

Comprehensiveness of climate action The EU has set climate and energy targets for 2020 as part of the climate and energy package. The so-called "20-20-20" targets are as follows: a 20% reduction in GHG from 1990 levels, an increase in energy consumption produced from renewable resources to 20%, and a 20% improvement in energy efficiency. However, the targets are not internally consistent – if the renewable energy and energy efficiency targets are achieved the GHG target will be overachieved.[352] To 2030 a proposal by the EC sets a vision for a 40% GHG reduction target (compared to 1990) and a renewable energy target of at least 27%.[353] The vision is still to be agreed and details to be clarified.

351 Source: Roelfsema, M. et al., *Are Major Economies on Track to Achieve their Pledges for 2020? An Assessment of Domestic Climate and Energy Policies, Energy Policy*, 2013.
352 Source: Höhne, N. et al., *Consistency of Policy Instruments. How the EU Could Move to a -30% Greenhouse Gas Reduction Target*, 2011.
353 Source: European Commission, *2030 Climate and Energy Goals for a Competitive, Secure and Low-Carbon EU Economy*, January 22, 2014, http://europa.eu/rapid/press-release_IP-14-54_en.htm.

VIII California Cap-and-Trade Program

Allocation approaches Allocation is based on a combination of auctioning and free allocation according to dynamic product-based benchmarking. An investment plan was approved in May 2013,[354] which sets out how the proceeds from auctioning allowances from the Program will be used and recommends funding priorities. The Greenhouse Gas Reduction Fund receives the full proceeds from auctioning, both of allowances and from the central reserve. Funding is recommended to be prioritized into three key areas: sustainable communities and clean transportation; energy efficiency and clean energy; and natural resources and waste diversion. Eligibility for funding includes all types of activities from the initial idea through to implementation. Public sector agencies applying for funding must adhere to the requirements of the legislation regarding the processes to follow and the use of the money.

In August 2013 there were rulings[355] in favor of the ARB in two similar lawsuits related to auctioning. Both the California Chamber of Commerce and the Morning Star Packing Company claimed that allowance auctions under the Californian Program are tantamount to a tax and therefore the development of the regulation had not been approved through the appropriate bodies. The judge ruled that this is not the case and that the auctions are akin to a regulatory fee, and therefore permissible.

Competitiveness considerations Carbon leakage assessments are ongoing, in particular considering the ability of the agricultural sector and food producers to pass on carbon costs to their consumers. Any changes to the regulations in relation to carbon leakage determinants and allocation approaches need to be in place by November 2014.

In February 2014 ARB held a public meeting to discuss the possibility of a border carbon adjustment to address carbon leakage in the cement sector, as an alternative to the free allocation approach currently used to address carbon leakage in all sectors. A detailed proposal is expected in July 2014.[356]

Use of offsets California offset protocols are only valid in the lower 48 states.[357] Offsets from Canada are also acceptable if issued by Québec. California-issued offsets must adhere to an approved offset protocol. Protocols are available for projects relating to: forests, urban forests, livestock and ozone depleting substances. Two new protocols are currently being discussed – mine methane capture and rice cultivation – with decisions expected in Spring and Fall 2014 respectively.

ARB regularly lists early-action offset projects, transforming voluntary credits into compliance offsets, and compliance offset projects developed under ARB's offset protocols. ARB had issued over 7.5 million compliance and early action offsets as of April 2014.[358]

354 Source: California Air Resources Board, *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013–14 through 2015–16*, May 14, 2013.
355 Source: Superior Court of California, County of Sacremento, *Joint Ruling on Submitted Matters Case No: 34-2012-80001313 and Related Case No: 34-2013-80001464*, August 28, 2013.
356 Source: California Air Resources Board, *California Cap-and-Trade Program: Potential Border Carbon Adjustment for the Cement Sector*, February 5, 2014, http://www.arb.ca.gov/cc/capandtrade/meetings/020514/border-carbon-adjustment.pdf.
357 Lower 48 states excludes Alaska and Hawaii.
358 Source: California Air Resources Board, *California's Compliance Offset Programme*, February 19, 2014.

International offsets from eligible sector-based systems can be used up to a limit of 2% of the total compliance obligation in the first and second compliance periods (or 25% of the total 8% limit for offsets usage), and up to 4% in the third period. The framework is constructed in a way that should enable the participation of relevant international programs of sufficient quality and at a sector level in a region. This framework particularly refers to REDD+, but needs further development. It could be used more broadly than REDD+ eventually.[359]

Performance and effectiveness Allowance prices at auction are stable and in the range indicated at the start of the Program. Reserve auctions have not been triggered to date as allowance prices have been significantly below the trigger price of US$40.[360]

Linking to other schemes In October 2013, ARB and the Government of Québec confirmed that linking of the two cap-and-trade programs would go ahead. A clear agreement defining the process for working together to harmonize and integrate the two programs was at the heart of this announcement.[361] Formal linking began in January 2014. The first joint auctions should take place in Fall 2014.[362] A linkage readiness report outlines some areas where further work will be needed, including coordinating future development of the programs and working towards a joint auctioning platform.[363] Linking these two programs was a result of the common development route of the two programs, which both use the Western Climate Initiative (WCI) templates. In addition, the California and Québec Programs already have pre-defined criteria to assess another scheme as appropriate for linking. The programs will use a common registry, the Compliance Instrument Tracking System Service (CITSS).

Looking ahead Areas of proposed amendments to the overarching legislation include allocation rules, market program implementation, and offset program implementation.[364] Within allocation rules, ARB is considering allocation for new sectors and changes to transition assistance for existing sectors. To further support GHG reduction investments, there is a proposal to delay the reduction in

359 Source: California Air Resources Board, *ARB Emissions Trading Program Overview*, January 21, 2011, http://www.arb.ca.gov/cc/factsheets/emissions_trading_program.pdf.

360 Source: California Air Resources Board, *California Air Resources Board Quarterly Auction 6 February 2014, Summary Results Report*, February 24, 2014, http://www.arb.ca.gov/cc/capandtrade/auction/february-2014/results.pdf.

361 Source: California Air Resources Board, *Linkage*, accessed January 6, 2014, http://www.arb.ca.gov/cc/capandtrade/linkage/linkage.htm.

362 Source: California Air Resources Board, *Letter to Governor Brown*, November 1, 2013, http://www.arb.ca.gov/cc/capandtrade/linkage/readiness_report_transmittal_final.pdf.

363 Source: California Air Resources Board, *Linkage Readiness Report*, November 1, 2013.

364 Further specific changes include: the addition of lead acid batter recyclers; clarification on inclusion thresholds and modification on the treatment of waste-to-energy facilities; adding a placeholder to decide how to treat closures where allocation has taken place, but the compliance period has not ended; clarifications about opt-in entities to prevent allocation being given and then entities rescinding their interest to opt in; market protection clauses to ensure that individuals that will participate as voluntarily associated entities or registered participants do not have conflicts of interest; clarity provided on resource shuffling; removal of a sunset clause on exemption of military facilities; limited use of borrowing allowed; allocation date changed to October 15 from November 1 to facilitate limited borrowing; leakage assistance factor shifted so that it will be kept at 100% for the second compliance period. In the third compliance period it will be 100% for high, 75% for medium and 50% for low leakage classifications. In the third compliance period assessment of the leakage classifications is anticipated; revised or modified product benchmarks for a number of sectors including upstream oil and gas, refining, glass manufacturing and several others; new proposal for allocation to natural gas suppliers (the approach will start with 100% free allocation and then phasing in consignment and use of related funds); provisions to enable the linking with Québec to function appropriately; modifications and clarifications to MRV rules relating to offset projects.

allowance allocation assistance factors[365] by one compliance period to give industry greater advanced warning about their number of allowances.[366] Ongoing collaborative initiatives include the Pacific Coast Action Plan on Climate and Energy, building on agreements between West Coast US states and British Columbia in 2008, and a Memorandum of Understanding with China.[367]

Carbon pricing efforts at the state level coexist with other state and federal level policies that may directly or indirectly contribute to reduce GHG emissions. Examples of such policies are given in Box 8.

Box 8 US carbon pricing instruments in context

Major GHG emission policies A variety of activities are taking place in the US, at both the state and federal level, and in all sectors. State level activities have a large influence on activities at the local level. Table 14 highlights potential linkages between federal level policies and state level carbon pricing instruments.

Table 14 Most relevant non-carbon pricing policies at the national level in the US and their link to carbon pricing

Policy	Implications on GHG emissions	Linkage to and overlap with carbon pricing
Light duty vehicle standard, phase II	Mainly long-term impact (after 2020)	Overlap with state level carbon pricing, e.g., in California, where transport is included, no explicit link
New Source Performance Standard	Hardly any deviation from business as usual (BAU) due to low gas prices	Overlap with state level carbon pricing mechanism (e.g., California)
The President's Climate Action Plan (CAP)	Targets set would lead to achieving the international pledge of reducing national emissions by 17% below 2005 in 2020, but not fully implemented yet	No carbon pricing explicitly included but various elements of the plan could overlap with the Californian program

Comprehensiveness of climate action The US pledge under the Copenhagen Accord is a 17% emission reduction relative to 2005 levels in 2020, as well as a long-term target to 2050. Obama's "Climate Action Plan" is a relatively comprehensive list of additional activities, most of which still need to be implemented. It describes mitigation actions and includes instructions for the US Environmental Protection Agency (EPA) to regulate GHG emissions. However currently it includes no discussion of carbon pricing, emissions trading or carbon taxes. The EPA is exploring the use of the Clean Air Act to regulate GHG emissions, and this could include allowing the flexibility for states to adhere to new rules using a range of policies, including carbon pricing mechanisms.

365 These factors relate to carbon leakage risk and are used, in conjunction with the allocation benchmark methodology, to calculate allocation of free allowances.
366 Source: California Air Resources Board, *Notice and Summary of Proposed Changes to the California Cap and Trade Programme*, accessed February 25, 2014, http://www.arb.ca.gov/cc/capandtrade/meetings/071813/ctnotice0713.pdf.
367 Source: Pacific Coast Collaborative, accessed March 28, 2014, http://www.pacificcoastcollaborative.org/Pages/Welcome.aspx.

IX RGGI

Scope Following the withdrawal of New Jersey in 2011, the program now covers power sector CO_2 emissions in nine states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

In New Jersey some stakeholders continue to push the state to rejoin RGGI. On December 14, 2013 the Senate's Environment and Solid Waste Committee voted in favor of a resolution to ask voters if the state should participate in the initiative. This state resolution vote is not planned yet, and may not take place for several years.[368] In March 2014, the Appellate Division of the New Jersey Superior Court ruled that the New Jersey administration did not follow proper procedures when it pulled out of RGGI in 2011, but this ruling does not mean that the state will need to rejoin.[369]

Performance and effectiveness In the third quarter of 2013 auction prices stood at US$3, in line with average prices in the secondary market of just over US$3 in the same period.[370] Volumes being traded in the primary market are increasing. RGGI's cost containment reserve (CCR) was triggered for the first time in the March 2014 auction, when the trigger price of US$4 was reached, and an extra 5 million allowances released and sold at this price.[371]

Looking ahead The RGGI states submitted comments to the US EPA on what they would like to see happen in relation to proposed GHG targets for existing power plants under the Clean Air Act. These comments emphasized a need to reward early actors, and allow flexibility to states on how to adhere to rules about carbon pollution, with the option to use, amongst other mechanisms, a market-based approach.[372]

X Québec Cap-and-Trade System (Canada)

Performance and effectiveness All of the proceeds from auction sales are devoted to implementing the 2013–2020 climate change action plan which includes programs encouraging energy efficiency, the use of renewable energies, public transportation and the electrification of transport. By 2020, the government expects to collect at least CAN$3 billion that will be entirely invested in GHG mitigation and climate change adaptation initiatives. Already, 98% of Québec's electricity production and 50% of its energy use come from renewable sources, mostly hydro and wind.[373]

368 Source: Friedman, M., *Senate Panel Seeks to Go around Chris Christie to Rejoin RGGI*, December 12, 2013, http://www.nj.com/politics/index.ssf/2013/12/senate_panel_seeks_to_go_around_chris_christie_to_re-join_rggi.html; Environmental Finance, RGGI: A Revived Greenhouse Gas Initiative, March 12, 2014, http://www.environmental-finance.com/content/analysis/rggi-a-revived-greenhouse-gas-initiative.html.
369 Source: Sheppard, K., *Court: Christie Administration Didn't Follow Rules in Exit From Emissions Program*, March 25, 2014.
370 Source: Potomac Economics, *Report on the Secondary Market for RGGI CO_2 Allowances: Fourth Quarter 2013*, February 2014.
371 Source: Regional Greenhouse Gas Initiative, Inc., *Auction Results*, accessed April 25, 2014, http://www.rggi.org/market/co2_auctions/results/auction-23.
372 Source: Esty, D.C. et al., *Letter to Administrator McCarthy*, December 2, 2013, http://www.rggi.org/docs/RGGI_States_111d_Letter_Comments.pdf.
373 Source: Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, *Direct Communication*, March 31, 2014.

Linking to other schemes The Québec and California cap-and-trade programs were officially linked on January 1, 2014.[374] Detailed preparations took place during 2013 (see Section 4.2.3 on California). As part of the agreement a consultation committee is established to monitor and coordinate the link. Québec is represented on this committee by the Assistant Deputy Minister of the Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, and California by an ARB Executive Officer. Regular consultation takes place to ensure continued harmonization of the systems.

Québec and California are the only WCI members to have put in place a cap-and-trade system. However, the Board meetings have also been attended by the Canadian Provinces of Ontario and British Columbia.[375] Engagement of other provinces and states wishing to set up similar schemes that could be linked to Québec and California's systems are welcome.

XI Australia CPM

The Australia CPM came into operation in July 2012. It takes place in two steps, a fixed price period from 2012 to 2015 and a flexible price period planned to start in 2015. The status of the CPM is in flux. The current administration proposes to abolish the CPM and implement the Direct Action Plan.[376] Together with the Renewable Energy Target, the Direct Action Plan is intended to support Australia in meeting its existing minimum emission reduction target of 5% below 2000 emissions by 2020.[377]

The purpose of the Direct Action Plan is to incentivize abatement activities across the whole economy. The centerpiece of the Direct Action Plan is the Emissions Reduction Fund.[378] The government plans to "buy" abatement through the fund by offering financial incentives for low cost emission reductions in the form of reverse auctions. The fund is set to run from July 1, 2014 until 2020 and will receive an initial allocation of A$2.55 billion (US$2.3 billion).[379] The fund will be based on the existing Carbon Farming Initiative (CFI). Emission reductions made in light of the Direct Action Plan will receive the same ACCUs as under the CFI. The Government is consulting on the length of contracts to be offered under the Emissions Reduction Fund.[380]

Under the Emissions Reduction Fund, firms will be encouraged to reduce their emissions, equal to historical BAU emissions. An additional 'safeguard' mechanism will be developed to incentivize firms to remain below baseline emissions. The recent White Paper provides more detail on the approach.[381]

374 Source: Government of Québec, *Gazette Officielle Du Québec, Vol 145, No 49*, December 4, 2013.
375 Source: WCI, Inc., http://www.wci-inc.org/docs/2013-09-19_WCI%20Inc%20Board%20Minutes.pdf, *Minutes of Board of Directors*, September 19, 2013.
376 Source: Clean Energy Regulator, Australian Government, *Carbon Pricing Mechanism*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Pages/default.aspx.
377 A conditional target range of 5–25% remains.
378 Source: Department of the Environment, Australian Government, *Emissions Reduction Fund*, accessed January 21, 2014, http://www.environment.gov.au/topics/cleaner-environment/clean-air/emissions-reduction-fund.
379 Source: Australian Government, *Emission Reduction Fund White Paper*, April 2014.
380 Source: Department of the Environment, Australian Government, *Emissions Reduction Fund Green Paper*, 2013.
381 Source: Australian Government, *Emission Reduction Fund White Paper*, April 2014.

The government started the process to abolish the CPM in November 2013 by introducing the Clean Energy Legislation (Carbon Tax Repeal) Bill 2013 and a package of other bills, which would repeal the Clean Energy Act 2011, the legislative basis for the CPM.[382] In the bill the CPM is set to end on June 30, 2014, even if the bill does not pass before that date. In the latter case retrospective changes would apply.[383]

To repeal the CPM, the bill needs to be passed in both the House of Representatives and the Senate. The government holds a majority in the House of Representatives, which passed the bill on November 21, 2013.[384] However, the government does not have a majority in the Senate[385] and they rejected the bill on March 20, 2014.[386] From July 2014 the composition of the Senate will change, which may lead to the bill being passed later in 2014.

In the meantime Australia's CPM continues its operations and completed its first year of operation on June 30, 2013. The first three years of the scheme have a fixed carbon price: A$23 (US$20.52) in the first year, rising to A$24.15 (US$21.54) for the second year.[387]

Scope In the first trading year of the CPM, 348 entities were included in the mechanism, as published in the Liable Entities Public Information Database (LEPID).[388] As of March 14, 2014 the total annual emissions reported by these entities was 285 $MtCO_2e$.

In February 2014 the Climate Change Authority, tasked with the review of Australia's emission reduction target, recommended increasing the 2020 target from 5% to a minimum of 15% below 2000 emissions. Taking Australia's carry-over of unused allowances under CP1 of the Kyoto Protocol into account, the Climate Change Authority recommends an effective target of 19% below 2000 emissions by 2020. The cap in the flexible-price period of the CPM under the recommended target is provided in Table 15.[389]

382 Source: Department of the Environment, Australian Government, *Repealing the Carbon Tax*, accessed January 21, 2014, http://www.environment.gov.au/topics/cleaner-environment/clean-air/repealing-carbon-tax.
383 Source: Parliament of Australia, *Clean Energy Legislation (Carbon Tax Repeal) Bill 2013*, accessed January 21, 2014, http://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A%22legislation%2Fbills%2Fr5137_first-reps%2F0000%22.
384 Source: Parliament of Australia, *Clean Energy Legislation (Carbon Tax Repeal) Bill 2013*, accessed January 21, 2014, http://www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bId=r5137.
385 Source: Parliament of Australia, *Senate Composition*, accessed January 21, 2014, http://www.aph.gov.au/Senators_and_Members/Senators/Senate_composition.
386 Source: Parliament of Australia, *Clean Energy Legislation (Carbon Tax Repeal) Bill 2013*, accessed January 21, 2014, http://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id%3A%22legislation%2Fbillhome%2Fr5137%22.
387 Source: Clean Energy Regulator, Australian Government, *Fixed Price 2012–2015*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/About-the-Mechanism/Fixed-Price-2012-15/Pages/default.aspx.
388 Source: Clean Energy Regulator, Australian Government, *LEPID for 2012–13 Financial Year*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Liable-Entities-Public-Information-Database/LEPID-for-2012-13-Financial-year/Pages/default.aspx.
389 Source: Climate Change Authority, Australian Government, *Reducing Australia's Greenhouse Gas Emissions – Targets and Progress Review, Final Report*, February 2014, http://climatechangeauthority.gov.au/sites/climatechangeauthority.gov.au/files/files/Target-Progress-Review/Targets%20and%20Progress%20Review%20Final%20Report.pdf.

Table 15 Proposed cap for the CPM scenarios for the first five years of the flexible-price period

Year	Cap under a 2020 target of 15% below 2000 levels ($MtCO_2e$)
2015–16	234
2016–17	229
2017–18	222
2018–19	215
2019–20	209

Competitiveness considerations Under the Jobs and Competitiveness Program, in the first year a total of 129 applications for free carbon units were approved and 104 million units issued.[390] As of March 11, 2014, 111 applications have been approved for the second trading year and 84 million units have been issued.[391]

Use of offsets For the first year of the fixed price period 281 million carbon units and 2.6 million ACCUs have been surrendered. International credits are not eligible for compliance in the fixed price period.

Performance and effectiveness Australia's total emissions dropped by only 0.1% in the first CPM year, below the previous year.[392] However, GHG emissions from the sectors covered by the CPM fell by 1.5% over the same period. Emissions reduced by 6% in the electricity production sector, covering over 50% of total CPM emissions. Fugitive emissions increased by 11%, but represent less than 15% of the emissions covered.[393] It is important to note that the annual caps of the CPM have been designed to ensure that there is a very high likelihood that Australia would achieve its emission reduction target for 2012–2020.

Linking to other schemes With the potential repeal of the CPM, the negotiations with the EU over the future two-way linking by 2018 have ceased. In the event that the CPM is abolished, there will be no call for a one-way linking between the EU ETS and Australia's CPM from 2015 either.

390 Source: Clean Energy Regulator, Australian Government, *Units Issued in the 2012–13 Financial Year*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Industry-Assistance/jobs-and-competitiveness-program/free-carbon-units/Pages/units-issued-in-2012-13.aspx.

391 Source: Clean Energy Regulator, Australian Government, *Issue of Free Carbon Units*, accessed January 21, 2014, http://www.cleanenergyregulator.gov.au/Carbon-Pricing-Mechanism/Industry-Assistance/jobs-and-competitiveness-program/free-carbon-units/Pages/default.aspx.

392 Source: Hunt, G., *No Change in Domestic Emissions under the Carbon Tax*, October 24, 2013, http://www.environment.gov.au/minister/hunt/2013/mr20131024.html?utm_source=mins&utm_medium=rss&utm_campaign=feed.

393 Source: Climate Change Authority, Australian Government, *Reducing Australia's Greenhouse Gas Emissions – Targets and Progress Review, Final Report*, February 2014.

Comparing the Carbon Pricing Mechanism and the Direct Action Plan

Several reports find that under the funds proposed for the Direct Action Plan, Australia will not only fall short of its emission reduction target, but emissions will even increase by 8 to 18% above 2000 levels by 2020.[394] However, these studies had to use assumptions in the absence of the precise design details of the proposed funds.

XII JCM

The JCM, developed by the Japanese government, supports the transfer of low-carbon technologies, products, systems, services and infrastructure to developing countries.[395] Japan seeks international recognition of the JCM under the UNFCCC FVA to allow for the use of JCM credits towards Japan's emission reduction target.

The government sees the JCM as supplementary to CDM, but since Japan is not signing up for CP2, the future access to CERs will be limited to CERs generated from CDM projects with direct participation of Japanese entities.[396] The demand for JCM credits pre-2020 may therefore come from the government or parts of the Japanese private sector who are participating in domestic schemes, although the level of demand remains a large uncertainty.

The JCM was designed to tackle challenges the Japanese government perceived in implementing the CDM. Therefore the JCM structure is similar to the CDM with some differences.[397] For example, instead of assessing the additionality of each project against hypothetical scenarios, the JCM proposes, among others, the use of positive lists and benchmarks, and standardized baselines to ensure a net reduction of GHG emissions.[398] This aims to enable a broad coverage of projects under the JCM. Also, MRV rules, which are being defined, will aim to be simple and transparent. More entities are allowed to validate and verify projects under the JCM, i.e., ISO 140565 accredited organizations additional to DOEs. The JCM governance is partly decentralized: there is some flexibility in the definition of rules and guidelines for a project in a given host country, although consistency with other host countries must be ensured. One of the challenges of the JCM will be to combine environmental integrity and streamlined rules.

It is currently uncertain how the JCM will fit under the international framework and what impact this will have on compliance costs overall. This will become clearer as JCM projects are implemented and negotiations around the FVA progress.

394 Source: The Climate Institute, *Coalition Climate Policy and the National Climate Interest, August 2013;* RepuTex, *Behind the Numbers: Adding up to the Direct Action Plan*, September 12, 2013, http://www.reputex.com/publications/behind-the-numbers-adding-up-to-the-direct-action-plan/.

395 Source: Government of Japan, *Recent Development of The Joint Crediting Mechanism (JCM)*, December 2013, http://www.mmechanisms.org/document/20131226_JCM_goj.pdf.

396 Source: Hongo, T., Mitsui Global Strategic Studies Institute, International Emissions Trading Association, *Greenhouse Gas Market 2013*, 2013.

397 Source: Sterk, W., Kachi, A., and Taenzler, D., *The CDM as Glue for the International Carbon Market?*, February 2013, http://www.dehst.de/SharedDocs/Downloads/EN/Publications/discussion_paper_glue_CDM.pdf?__blob=publicationFile.

398 More information on how emission reductions are calculated to ensure net GHG mitigation can be found at Government of Japan, *Recent Development of The Joint Crediting Mechanism (JCM)*, December 2013, http://www.mmechanisms.org/document/20131226_JCM_goj.pdf.

XIII China (existing and emerging)

Table 16 below shows some of the key characteristics of the Chinese ETS pilots. More descriptive detail follows the table.

Table 16 Key characteristics of the Chinese ETS pilots

	Shenzhen	Shanghai	Beijing	Hubei	Guangdong	Tianjin	Chongqing
Carbon Intensity Target (2011–2015)	-21%	-21%	-18%	-17%	-19.5%	-19%	-17%
Total emissions of the region in 2010[399] $MtCO_2e$	83.4	230	110	306	541	155	131
Threshold	>20,000 tCO_2e	>20,000 tCO_2e	>10,000 tCO_2e	>60,000 tSCE	>20,000 tCO_2e	>20,000 tCO_2e	>20,000 tCO_2e
Entities covered in 2013[400]	635	191	490	138	242	114	N/A
Initial year allowances[401]	33 Mt	160 Mt	50 Mt	324 Mt[402]	388 Mt	160 Mt	N/A
Emissions covered %	38%	50%	50%	35%	42%	60%	35%–40%
Allocation (main approaches)	Bench-marking	Historical emissions + bench-marking (power)	Historical emissions + historical intensity + bench-marking	Historical emissions + bench-marking	Historical emissions + bench-marking	Historical emissions + historical intensity + bench-marking (power)	Historical emissions
Penalties	3x market price	10K–100K CNY	3–5x market price	3x market price	3x market price	N/A	2x market price
Offsets	10%	5%	5%	10%	10%	10%	N/A

Scope Unlike many other emissions trading schemes, the Chinese ETS pilots have a growing cap. The cap is in line with China's overall 40–45% carbon intensity reduction target by 2020, compared to 2005 (or 11.7%–19% carbon intensity reduction by 2020 compared to 2015).[403]

399 Source: Quemin, S. and Wang, W., *Overview of Climate Change Policies and Development of Emissions Trading in China*, March 20, 2014, http://www.postcarbonpathways.net.au/2014/03/21/overview-of-climate-change-policies-and-development-of-emissions-trading-in-china/#.U13Qw_mSzVU.
400 Source: SinoCarbon, *2013 Carbon Markets Annual Report*, January 2014.
401 Source: 21 Century Business Herald, *China Carbon Market Prospect: Liquidity, Cap and Reduction Potential*, January 21, 2014, http://epaper.21cbh.com/html/2014-01/21/content_89329.htm?div=-1.
402 Source: SinoCarbon, *Hubei to Trade, Allocation Plan to Annouce*, March 31, 2014, http://mp.weixin.qq.com/s?__biz=MjM5NjgzMjQ2NA==&mid=200162138&idx=1&sn=ce2f4c04c48d298aa1b8d8387be22fe1.
403 Source: World Resources Institute, *China's State Council Unveils 40-45% Carbon Intensity Target*, November 26, 2009, http://www.wri.org/blog/china%E2%80%99s-state-council-unveils-40-45-carbon-intensity-target.

Whereas the majority of pilots in China have set absolute GHG emission caps, Shenzhen has a mandatory intensity cap. This is calculated on the basis of tCO_2e for every CNY10,000 (US$1,650) of industrial output. The ETS sectors have a bigger share of emission reductions, since the carbon intensity target is a 32% reduction from 2011 to 2015, compared to the average target of Shenzhen which is 21% reduction (from 0.812 tCO_2e/CNY10,000 to 0.641 tCO_2e/CNY10,000).[404]

Allocation approaches All operating pilots except Shenzhen feature free allocation based on historical intensity or historical emissions, sometimes with additional factors relating to sector growth or efficiency. Guangdong was the first pilot to use auctioning.[405] After four auctions, 10.7 million allowances were sold at a reserve price of CNY60 (US$10).[406] Hubei sold 2 million allowances at its first auction on March 31, 2014 at a price of CNY20 (US$3.3)[407] and it plans to auction up to 8 million allowances of 2014.[408]

Corrections to the allocation during the pilot based on actual production, so-called dynamic allocation, are included in the ETS Implementation Plans for Shenzhen,[409] Tianjin,[410] and Shanghai.[411]

Allocation for the power sector is similar across pilots. It is based on benchmarks of different generation technologies and installation capacities,[412] except for Beijing and Tianjin, where historical intensity (tCO_2/kWh) is used. Grandfathering is the main approach for other sectors.

Table 17 summarizes allocation approaches for the pilots already in operation.[413]

404 Source: Shenzhen Municipal Government, *Shenzhen ETS Conference Press Release*, May 21, 2013, http://www.sz.gov.cn/cn/xxgk/xwfyr/wqhg/20130521/.
405 Source: Guangdong Development and Reform Commission, *Guangdong ETS Allocation and Auctioning Announcement*, December 10, 2013, http://www.gddpc.gov.cn/xxgk/tztg/201312/t20131210_232286.htm.
406 Source: Guangdong Emissions Exchange, *Auction Reports*, accessed April 20, 2014, http://www.cnemission.com/article/news/jysgg/.
407 Source: Hubei Emission Exchange, *First Auction Report*, April 1, 2014, http://www.hbets.cn/html/zxggXxpl/1074_1.shtml.
408 Source: Sino Carbon, Hubei to Trade, Allocation Plan to Annouce, March 31, 2014 http://mp.weixin.qq.com/s?__biz=MjM5NjgzMjQ2NA==&mid=200162138&idx=1&sn=ce2f4c04c48d298aa1b8d8387be22fe1
409 Source: Shenzhen Municipal Government, *Shenzhen ETS Implementation Plan (Draft)*, October 29, 2013, http://fzj.sz.gov.cn:8080/cms/fzbDetails.action?siteName=fzb&pageId=4443.
410 Source: Tianjin Government, *Tianjin Municipal People's Government Office Interim Measures on Carbon Emissions Trading in Tianjin*, December 20, 2013, http://www.tj.gov.cn/zwgk/wjgz/szfbgtwj/201312/t20131224_227448.htm.
411 Source: Shanghai Municipal Government, *Shanghai Carbon Market Implementation Plan*, November 18, 2013, http://www.shanghai.gov.cn/shanghai/node2314/node2319/node12344/u26ai37414.html.
412 Source: Ecofys, *Suggestions for the Design of Tianjin's ETS*, November 8, 2013.
413 Source: SinoCarbon, *2013 Carbon Markets Annual Report*, January 2014.

Table 17 Allocation approaches for the Chinese ETS pilots in operation

Pilot	Historical emissions	Historical intensity	Benchmarking
Shenzhen	No	Power (minority)	Power (majority), water utilities buildings and industrial sectors
Shanghai	Industrial sector except power, public buildings	No	Power, aviation, airports and ports
Beijing	Cement, chemicals, other industrial sectors	Power and heat existing capacity	New entrants and expanded capacity
Guangdong	Cogeneration, mining in cement, petrochemicals, iron and steel scap processing	No	Power, cement, long process iron and steel making
Tianjin	Steel, chemicals, petrochemicals, refining	Power and heat existing capacity	New entrants and expanded capacity
Hubei[414]	Steel, cement, petrochemical, chemical, automobile and other manufacturing, nonferrous and other metals, glass and construction materials, synthetic fibre, paper, pharmaceutical, food and beverage	No	Power (50% preallocated based on historical emissions, the rest based on benchmarks)

Use of offsets In June 2012 the NDRC published "Tentative Measures for the Administration of Voluntary Greenhouse Gases Emissions Trading" to encourage voluntary trading via CCERs and to ensure that trading activities are conducted in an appropriate manner.[415] The document also includes strict personnel and capital requirements to qualify CDM DOEs for the assessment of CCER generating projects.

By April 2014, NDRC had published four rounds, 178 CCER methodologies based on CDM methodologies.[416] About 200 projects have been approved by the NDRC, waiting for official CCER registration, expected by mid-2014.[417]

Price stabilization mechanism There has been some discussion that the national scheme will feature some form of price stabilization mechanism, although details remain to be confirmed.[418] Shenzhen, Guangdong and Hubei have set aside reserve allowances to manage price fluctuations.

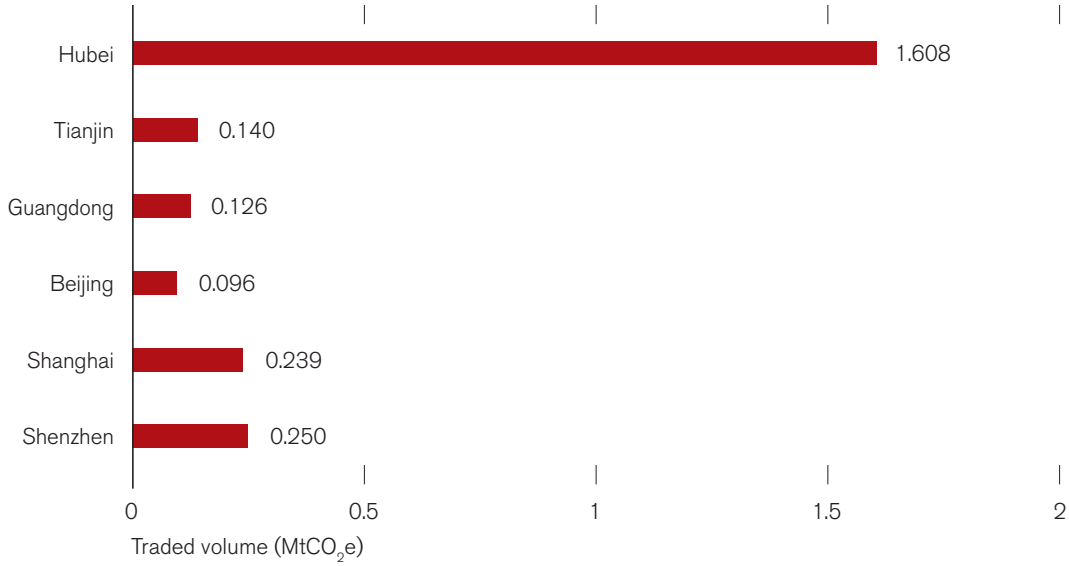
Performance and effectiveness Diverging prices may pose a challenge for the development of a national ETS for China. Carbon prices in the pilots to date range from approximately CNY120/tCO_2e (US$20) in Shenzhen,[419] to CNY22/tCO_2e (US$3.6) in Hubei.[420]

414 Source: Hubei Emission Exchange, *Hubei ETS Launched*, accessed April 8, 2014, http://www.hbets.cn/html/zxdtXwzx/1079_1.shtml.
415 Source: National Development and Reform Commission, *Tentative Measures for the Administration of Voluntary Greenhouse Gasses Emissions Trading*, accessed March 5, 2014, http://qhs.ndrc.gov.cn/zcfg/t20120621_487133.htm.
416 Source: *China Certified Emission Reduction Exchange Info-Platform*, n.d., http://203.207.195.145:92/ccer.aspx.
417 Source: Reuters, *China's State Utilities Move on Preferential Rules in Carbon Offset Market*, January 8, 2014, http://in.reuters.com/article/2014/01/08/china-carbon-idINL3N0KI2E820140108.
418 Source: International Emission Trading Association, *A User's Guide to Emissions Trading in China*, September 2013.
419 Shenzhen Climate Exchange updates its pricing data on a daily basis through the China Emissions Exchange Website. Source: *China Emissions Exchange, China Emissions Exchange*, accessed January 24, 2014, http://www.szets.com/Portal/home.seam.
420 Source: Hubei Emission Exchange, *Allowance Trading Daily Report*, April 2014, http://www.hbets.cn/html/zxggXxpl/1075_1.shtml.

Compared to the size of the markets, the volume of transactions in the operational pilots is not large (Figure 28). One of the main reasons is that only spot trading is allowed in the Chinese ETS pilots, which hinders the formation of liquidity in the secondary market.

Chinese ETS pilots are searching for ways to activate trading. The Shanghai Energy and Environment Exchange, for example, is actively exploring financial tools and products to increase liquidity in the scheme. Guangdong requires companies to purchase allowances from the primary market before they are allowed to participate in the secondary market.

Figure 28 Volumes traded on the spot market in Chinese ETS pilots



Source: data collected from various Chinese emissions exchanges, as of April 18, 2014

MRV and registry On October 15, 2013, the NDRC announced GHG accounting methodologies and Reporting Guidance for ten sectors: power generation, power distribution, cement, steel, chemicals, aluminum electrolyte, plate glass, magnesium smelting, ceramics and aviation.[421] These guidelines were developed using funds from the Norwegian government through the United Nations Development Programme (UNDP) in China.[422] The Australian government signed an MoU with the NDRC on April 10, 2013 to work on the development of the MRV Guidelines for three more sectors: coal, refining, oil and gas exploration.[423]

421 Source: National Development and Reform Commission, *GHG Accounting Methodologies and Reporting Guidance for 10 Industries*, 2013, http://www.ndrc.gov.cn/zcfb/zcfbtz/2013tz/t20131101_565313.htm.
422 Source: Ecofys, *Suggestions for the Design of Tianjin's ETS*, November 8, 2013.
423 Source: Australian Embassy in Beijing, *Prime Minister Julia Gillard's Visit to China*, April 10, 2013, http://www.china.embassy.gov.au/files/bjng/China%20Visit%20-%20Overview%20of%20Annoucements-EN.docx.

In January 2014, the NDRC issued a note on its website that all companies that emitted more than 13,000 tCO_2e in 2010 must report their future annual emissions of all six major GHGs.[424]

Linking to other schemes There were discussions in 2011 about linking Hubei with Guangdong. This link was meant to test the potential for linking between China's industrial powerhouses (in the Pearl River Delta and coastal regions) with the Western and Central regions, and would provide valuable lessons for the establishment of a national market post-2015. The NDRC would like to see linking between these two schemes, but it has not yet officially confirmed or endorsed linking. Details remain to be confirmed.

Looking ahead According to the 12th Five Year Plan, the national ETS is intended to build upon the lessons learned from the seven pilots. Originally announced to be developed by 2015, the implementation of the national scheme is now expected to start in later years during the 13th Five Year Plan (2016–2020).

Some preparation at national level has already started, primarily on the work related to the national registry, GHG inventory, MRV guidelines for a number of industries and CCER methodologies. A preliminary national allocation plan will be developed in due course according to senior NDRC officals.[425] Work on the legal framework is yet to be done.

The NDRC has not specified how the pilots should feed into a national scheme. This lack of a clear signal for the period after 2015 (only Guangdong has drafted plans that go up to 2020) creates some uncertainty about the future of the carbon market in China. Whether the national scheme develops in a more top-down or bottom-up approach remains to be seen.[426]

The first compliance cycle will finish by June 30, 2014, and the first pilot phase is currently planned to last until the end of June 2016. Until then, China will continue to find out what design features are appropriate for the flourishing of ETS pilots and which need to be tweaked in view of the emerging national scheme.

Carbon pricing is one instrument used to tackle climate change in China. Box 9 gives examples of other policies that help, directly or indirectly, reduce emissions in China.

424 Source: National Development and Reform Commission, China, *Notice on Organising Major Companies to Report GHG Emissions*, January 13, 2014, http://www.sdpc.gov.cn/zcfb/zcfbtz/201403/t20140314_602463.html.

425 Source: China Energy Newspaper, *National Carbon Allowances Will Be Issued by the Government*, April 20, 2014, http://energy.people.com.cn/n/2014/0420/c71661-24918882.html.

426 Source: Bo, K. and Freeman, C., *Making Sense of Carbon Market Development in China, Carbon and Climate Law Review, Issue 3*, 2013.

Box 9 China's climate ambitions: the ETS pilots in context

China committed to developing a national-level ETS pilot during its 12th Five Year Plan (2011-2015) as a policy tool to reduce its carbon intensity by 40%–45% from 2005 to 2020. The ETS is expected to start during the 13th Five Year Plan (2016-2020). China has other national targets to meet related to GHG emissions. These include: reducing energy intensity by 16% from 2011 to 2015; increasing the share of non-fossil fuels in primary energy consumption to around 15% by 2020; and increasing forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from 2005 levels. The table below provdes examples of some of the important broader mitigation policies in China and their link to ETS.

Table 18 Most relevant non-carbon pricing policies at the national level in China and their link to carbon pricing[427]

Policy	Implications on GHG emissions	Linkage to and overlap with carbon pricing
Renewable energy capacity plans in updated 12th Five Year Plan	Targeted share of non-fossil energy under international pledge will be surpassed, target: 700 GW capacity in 2020	Overlap with sub-national ETS schemes: Renewable energy policies likely to contribute to achievement of ETS target in power sector in regions
TOP 10,000 enterprises	Implementation expected to be in line with Five Year Plan	Overlap with sub-national ETS schemes: Energy efficiency achieved through TOP 10,000 enterprises program likely to contribute to achievement of ETS target in power sector in regions

427 Source: Roelfsema, M. et al., *Are Major Economies on Track to Achieve their Pledges for 2020? An Assessment of Domestic Climate and Energy Policies, Energy Policy.*

ANNEX III
CONVERSION RATES

Table 19 Currency conversion rates as of December 31, 2013

Currency	Symbol	US$ equivalent
Australian Dollar	A$	1.12
Brazilian Real	R$	2.36
British Pound	£	0.61
Canadian Dollar	CAN$	1.06
Chinese Yuan	CNY	6.05
Danish Krone	Dkr	5.40
Euro	€	0.72
Iceland Krona	Íkr	115.27
Japanese Yen	¥	104.93
Mexican Peso	Mex$	13.06
New Zealand Dollar	NZ$	1.22
Norwegian Krone	Nkr	6.07
South African Rand	R	10.42
Swedish Krona	Skr	6.41
Swiss Franc	SFr	0.89

Source: Yahoo! Finance, *Currency Converter*, accessed April 3, 2014, http://finance.yahoo.com/currency-converter/#from=USD;to=EUR;amt=1.

GLOSSARY

Additionality

A project activity is additional if anthropogenic GHG emissions are lower than those that would have occurred in the absence of the project activity.

Annex I (Parties)

The industrialized countries listed in Annex I to the UNFCCC were committed to return their GHG emissions to 1990 levels by 2000. They currently include Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, the United Kingdom, and the United States, as well as the European Union.

Assigned Amount Unit (AAU)

Annex I Parties are issued AAUs up to the level of their assigned amount, corresponding to the quantity of GHG they can release in accordance with the Kyoto Protocol (Article 3), during the first commitment period of that protocol (2008–2012). One AAU represents the right to emit one metric ton of carbon dioxide equivalent.

Backloading

To rebalance supply and demand of emission allowances in the EU ETS in the short term the European Commission proposed to temporarily postpone the auctioning of 900 million allowances from the beginning to the end of Phase III. This measure will affect the distribution of auctions over the period but it would not reduce the overall number of allowances to be auctioned during Phase III. After several months of reiterations and uncertainties, the backloading proposal was put into legislation in February 2014.

Banking or Carry-over Compliance units under the various schemes to manage GHG emissions in existence may or may not be carried over from one commitment period to the next. Banking may encourage early action by mandated entities depending on their current situation and their anticipations of future carbon constraints. In addition, banking brings market continuity. Banking between Phase I and Phase II of the EU ETS is not allowed; it is allowed between Phase II and further phases. Some restrictions on the amount of units that can be carried over may apply; for instance, EUAs may be banked with no restriction, while the amount of CERs that can be carried over by a Kyoto Party is limited to 2.5% of the assigned amount of each Party.

Baseline The emission of GHG that would occur without the policy intervention or project activity under consideration.

Benchmarking Benchmarking is used to compare operations of a company with those of others, to industry average, or to best practice, to determine whether they have opportunities to improve energy efficiency or reduce GHG emissions. In the EU ETS, for example, free allocation is carried out on the basis of ambitious benchmarks of GHG emissions performance. These benchmarks reward best practice in low-emission production.

Cap-and-Trade Cap-and-trade schemes set a desired maximum ceiling for emissions (or cap) and let the market determine the price for keeping emissions within that cap. To comply with their emission targets at least cost, regulated entities can either opt for internal abatement measures or acquire allowances or emission reductions in the carbon market, depending on the relative costs of these options.

Carbon Asset The potential of GHG emission reductions that a project is able to generate and sell.

Carbon Dioxide Equivalent (CO_2e) The universal unit of measurement used to indicate the global warming potential of each of the six GHG regulated under the Kyoto Protocol. Carbon dioxide – a naturally occurring gas that is a by-product of burning fossil fuels and biomass, land-use changes, and other industrial processes – is the reference gas against which the other GHG are measured, using their global warming potential.

Carbon Finance Resources provided to activities generating (or expected to generate) GHG emission reductions through the transaction of such emission reductions.

Carbon Leakage Shift in CO_2 emissions from countries taking stringent mitigation actions to countries taking less stringent mitigation actions.

Certified Emission Reduction (CER)	A unit of GHG emission reductions issued pursuant to the Clean Development Mechanism of the Kyoto Protocol and measured in metric tons of carbon dioxide equivalent. One CER represents a reduction in GHG emissions of one metric ton of carbon dioxide equivalent.
Chinese Certified Emission Reduction (CCER)	The NDRC issued rules to regulate the voluntary emission reduction credits market in China, in the form of CCERs, in June 2012. These will be issued in unit of tCO_2e, and will include CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6.
Clean Development Mechanism (CDM)	The mechanism provided by Article 12 of the Kyoto Protocol, designed to assist developing countries in achieving sustainable development by allowing entities from Annex I Parties to participate in low-carbon projects and obtain CERs in return.
Conference of the Parties (COP)	The supreme body of the UNFCCC. It currently meets once a year to review the UNFCCC's progress. The word "conference" is not used here in the sense of "meeting" but rather of "association", which explains the seemingly redundant expression "fourth session of the Conference of the Parties".
Conference of the Parties Serving as the Meeting of the Parties (CMP)	The UNFCCC's supreme body is the COP, which serves as the meeting of the Parties to the Kyoto Protocol. The sessions of the COP and the CMP are held during the same period to reduce costs and improve coordination between the UNFCCC and the Kyoto Protocol.
Colored fuel	Fuels such as gasoline and diesel dyed with a specific color to indicate the appropriate level of tax that should be levied on the fuel. This generally depends on the purpose of the fuel. In British Columbia, for example, fuels used for farming purposes are colored.
Designated Operational Entity (DOE)	A designated operational entity is an independent auditor who assesses whether a potential project meets all the eligibility requirements of the CDM (validation) and whether the project has achieved GHG emission reductions (verification and certification).
Effort Sharing Decision	The Effort Sharing Decision establishes binding annual GHG emission targets for EU Member States for the period 2013–2020. These targets concern emissions from most sectors not included in the EU ETS, such as transport (except aviation), buildings, agriculture and waste.
Emission Reduction	The measurable reduction of release of GHG into the atmosphere from a specified activity, and a specified period.

Emission Reductions Purchase Agreement (ERPA)	Agreement that governs the transaction of emission reductions.
Emission Reduction Unit (ERU)	A unit of emission reductions issued pursuant to Joint Implementation. One ERU represents the right to emit one metric ton of carbon dioxide equivalent.
Emissions Trading Scheme (ETS)	See cap-and-trade.
European Union Allowance (EUA)	The allowances in use under the EU ETS. An EUA unit is equal to one metric ton of carbon dioxide equivalent.
First Commitment Period under the Kyoto Protocol (CP1)	The five-year period, from 2008 to 2012, during which industrialized countries committed to collectively reduce their GHG emissions by an average of 5.2% compared with 1990 emissions under the Kyoto Protocol.
Framework for Various Approaches (FVA)	Defined at COP 17 in Durban, general framework at the UNFCCC level that allows various approaches, including opportunities for using markets, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries, that must meet standards that deliver real, permanent, additional and verified mitigation outcomes, avoid double counting of effort, and achieve a net decrease and/or avoidance of GHG emissions.
Greenhouse Gas (GHG)	Both natural and anthropogenic, GHGs trap heat in the Earth's atmosphere, causing the greenhouse effect. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) are the primary GHGs. The emission of GHG through human activities (such as fossil fuel combustion or deforestation) and their accumulation in the atmosphere is responsible for an additional forcing, contributing to climate change.
Joint Implementation (JI)	Mechanism provided by Article 6 of the Kyoto Protocol whereby entities from Annex I Parties may participate in low-carbon projects hosted in Annex I countries and obtain Emission Reduction Units (ERUs) in return.
Kyoto GHGs	The Kyoto Protocol regulates six GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).
Kyoto Mechanisms	The three flexibility mechanisms that may be used by Annex I Parties to the Kyoto Protocol to fulfill their commitments. These are the Joint Implementation (JI, Article 6), Clean Development Mechanism (CDM, Article 12), and International Emissions Trading (Article 17).

Kyoto Protocol	Adopted at the third Conference of the Parties to the UNFCCC held in Kyoto, Japan, in December 1997, the Kyoto Protocol commits industrialized country signatories to collectively reduce their GHG emissions by at least 5.2% below 1990 levels on average over 2008–2012 while developing countries can take no-regret actions and participate voluntarily in emission reductions and removal activities through the CDM. The Kyoto Protocol entered into force in February 2005.
Monitoring Plan	A set of requirements for monitoring and verification of emission reductions achieved by a project.
National Allocation Plan (NAP)	A document which details the quantity of allowances and how they will be allocated. The document includes, for example, the list of installations in the ETS, the allocation rules, the emissions cap, the criteria for determining allocation, the quantity of emission allowances each installation is allocated and any international credits that may be used by these installations in each specific year, as well as other features, such as the size of the new entrants reserve, the treatment of exiting installations, and the process of allocation (free allocation or auctioning). NAPs were published by each member state in preparation for Phases I and II of the EU ETS and are used in many new schemes such as the KAZ ETS, the Chinese pilot schemes and the Korea ETS.
Nationally Appropriate Mitigation Action (NAMA)	Refers to a set of mitigation policies and/or actions a developing country undertakes aiming at reducing its GHG emissions and reports to UNFCCC on a voluntary basis. The concept of NAMAs was defined in 2007 under the UNFCCC Bali Action Plan, as "Nationally Appropriate Mitigation Actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner."
New Entrants Reserve (NER)	A reserve of allowances designated for new installations that enter the ETS or capacity expansions by existing installations. These allowances can be allocated for free or auctioned.
New Market-based Mechanism (NMM)	Defined at COP 17 in Durban, new market-based mechanism operating under the guidance and authority of the COP to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries, as guided by decision 1/CP.18, paragraph 51. It may assist developed countries to meet part of their mitigation targets under the UNFCCC but should consider the principle of supplementarity.
Offset	An offset designates the emission reductions from project-based activities that can be used to meet compliance or corporate citizenship objectives vis-à-vis GHG mitigation.

Primary Transaction	A transaction between the original owner (or issuer) of the carbon asset and a buyer.
REDD Plus (REDD+)	All activities that reduce emissions from deforestation and forest degradation and contribute to conservation, sustainable management of forests, and enhancement of forest carbon stocks.
Registration	The formal acceptance by the CDM Executive Board of a validated project as a CDM project activity.
Removal Unit (RMU)	RMUs are issued by Parties to the Kyoto Protocol in respect of net removals by sinks from activities covered by Article 3(3) and Article 3(4) of the Kyoto Protocol.
Second Commitment Period under the Kyoto Protocol (CP2)	The eight-year period, from 2013 to 2020, in which Annex I Parties to the Kyoto Protocol committed to reduce GHG emissions by at least 18% percent below 1990 levels. The composition of Parties in the second commitment period is different from that in the first.
Secondary Transaction	A transaction where the seller is not the original owner (or issuer) of the carbon asset.
Shadow Price of Carbon	The social cost of carbon given a stabilization goal for the atmospheric concentration of GHG emissions.
Supplementarity	Following the Marrakesh Accords, the use of the Kyoto mechanisms shall be supplemental to domestic action, which shall thus constitute a significant element of the effort made by each Party to meet its commitment under the Kyoto Protocol. There is no quantitative limit, however, to the utilization of such mechanisms. Supplementarity also needs to be considered in the development of modalities and procedures for the UNFCCC NMM (Draft decision -/CP.18, para 51, February 28, 2013).
Union Registry	An online database that holds accounts for stationary installations which have been transferred from national registries, as well as accounts for aircraft operators, which have been included in the EU ETS since January 2012. The Union registry replaces EU member states' national registries.
United Nations Framework Convention on Climate Change (UNFCCC)	The international legal framework adopted in June 1992 at the Rio Earth Summit to address climate change. It commits the Parties to the UNFCCC to stabilize human-induced GHG emissions at levels that would prevent dangerous manmade interference with the climate system, following "common but differentiated responsibilities" based on "respective capabilities".

Validation	Validation is the process of independent evaluation of a project activity by a Designated Operational Entity (DOE) against the requirements of the CDM. The CDM requirements include the CDM modalities and procedures and subsequent decisions by the CMP and documents released by the CDM Executive Board.
Verification	Verification is the review and *ex post* determination by an independent third party of the monitored reductions in emissions generated by a registered CDM project or a determined JI project (or a project approved under another standard) during the verification period.
Verified Emission Reduction (VER)	A unit of GHG emission reductions that has been verified by an independent auditor. Most often, this designates emission reductions units that are traded on the voluntary market.
Voluntary Carbon Market	The voluntary carbon market caters to the needs of those entities that voluntarily decide to reduce their carbon footprint using offsets. The regulatory vacuum in some countries and the anticipation of imminent legislation on GHG emissions also motivates some pre-compliance activity.
Western Climate Initiative (WCI)	The Western Climate Initiative is a collaboration among states and provinces to tackle climate change at a regional level. Currently British Columbia, California, Ontario, Quebec, and Manitoba are working together through the WCI to develop and harmonize their emissions trading scheme policies.

Notes

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