

Emissions Trading Systems: A factor the mining industry cannot ignore

- Emissions Trading Systems [ETS] seen as cost-effective tool.
- Carbon taxation as alternative measure to reduce GHG
- Certified Emissions Reduction Credits help reduce GHG
- EU Emissions Trading System as cornerstone to cutting CO₂ emissions

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The predominant school of thought postulates that greenhouse gases [GHG] emitted by human and animal activities are warming the earth and causing changes in the global climate with increasingly severe human, economic and environmental impacts. Major GHG are carbon dioxide [CO₂], methane, nitrous oxide [N₂O], and fluorinated gases, but the common shorthand for GHG is 'Carbon', such as in 'carbon emissions', 'carbon prices', 'carbon trading' etc.

A direct corollary of this belief is that, to prevent climate change from reaching the

most dangerous proportions, the world needs to stop the growth in emissions of greenhouse gases by 2020 at the latest, and then reduce them sharply by at least half of 1990 levels by 2050, and more after that.

The Kyoto Protocol was adopted on 11 December 1997 and put in force on 16 February 2005. It initiated the formulation and implementation of worldwide policies to mitigate global warming.

Emissions trading systems [ETS] are being used as cost-effective tools for cutting GHG. Elsewhere, so-called carbon taxation is being applied. The EU and EFTA countries have been pioneers in setting up the major cap-and-trade market worldwide, even though less than 10% of the GHG emitted worldwide each year comes from within the EU. Details on the EU/EFTA ETS are given in a subsequent section of this article.

Such schemes directly affect mining as well as some of its major customers in other energy-intensive industries like steel, aluminum, cement, graphite, glass, alloys, petrochemicals, magnesia, lime and

refractories. All these sectors are intensive users of energy in its various forms: fuel and electricity are needed in the various steps of production and transport, energy is needed to convert the material and create the so-called 'process emissions' as in limestone or dolomite to lime and magnesite or magnesium hydroxide to magnesia etc.

How much each of these sectors is financially burdened by the imposition of an ETS depends mostly on the price of carbon in ETS markets, but also on whether (or for which period and under what conditions) a sector is allowed *free allocations*, as in the case of the danger of carbon leakage due to energy intensity and exposure to international trade.

Figure 1 gives an estimation of GHG emissions by country.

Figure 2 below presents total anthropogenic GHG emissions [Gt CO₂ eq/yr] by economic sectors. The inner circle shows direct GHG emission shares [in % of total anthropogenic GHG emissions] of five economic sectors in 2010. The pull-out shows how indirect CO₂ emission shares [in % of total anthropogenic GHG emissions] from electricity and heat production are attributed to sectors of final energy use. 'Other Energy' refers to all GHG emission sources in the energy sector. The use of 'AFOLU' includes land-based CO₂ emissions from forest fires, peat fires and peat decay that approximate to net CO₂ flux from the Forestry and Other Land Use [FOLU] sub-sector. Emissions are converted into CO₂-equivalents based on GWP100 6 from the IPCC Second Assessment Report.

Globally, economic and population growth are considered as the most important drivers of increases in CO₂ emissions from fossil fuel combustion. The contribution of population growth between 2000 and 2010 remained roughly identical to the previous three decades, while the contribution of economic growth has risen sharply. Between 2000 and 2010, both drivers outpaced emission reductions from improvements in energy intensity. Increased use of coal relative to other energy sources has reversed the longstanding trend of gradual decarbonization of the world's energy supply.

Figure 1: Greenhouse gas emissions by country

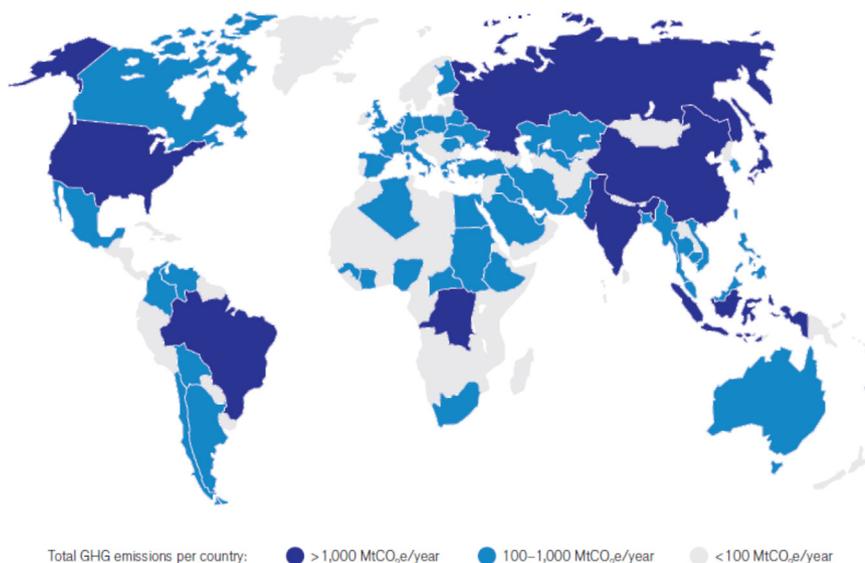


Table 1: Linking Different ETS- Current State and Future Perspectives

Country/Region	EU	Australia	California	China (Guangdong)	South Korea
Million inhabitants	501.1 (2010 – EU 27)	22.5 (2010)	37 (2010) (Quebec: 7.9)	104 (2010)	50 (2010)
GDP \$bn	17,570 (2011)	1,244 (2010); 1,487 (2011)	1,877 (2010)	838 (2011)	1,015 (2010); 1,116 (2011)
Start ETS	1st TP: 1.1.2005-31.12.2007 2nd TP: 1.1.2008-31.12.2012 3rd. TP: 1.1.2013-31.12.2020	Fixed price: 1.7.2012 Flexible price: 1.7.2015 The current government plans to abolish the system from 1 July, 2014 on.	1.1.2013 (first auction in Nov 2012)	Pilot phase: 2013-2015 (first auction in Sep 2012)	1.1.2015
Scope	<ul style="list-style-type: none"> CO₂, also N₂O, PFCs from 3rd TP Installations with emissions > 25,000 tonnes CO₂-e/a from defined activities Energy production and industry Approx. 46% of emissions 	<ul style="list-style-type: none"> CO₂, CH₄, N₂O, PFCs Installations with emissions > 25,000 tonnes CO₂-e/a; also natural gas suppliers and landfills Fuel taxes are based on CO₂ price 60% of GHG emissions 	<ul style="list-style-type: none"> CO₂, CH₄, N₂O, NF₃, PFCs, HFCs, SF₆, Installations with emissions > 25,000 tonnes CO₂-e/a Industry and energy production and energy consumption outside the country, but in 2015 also fuel and propellant traders 85% of GHG emissions (from 2015) 	<ul style="list-style-type: none"> CO₂ Direct and indirect emissions Units with emissions > 20,000 tonnes CO₂ Energy production and eight industry branches, • From 2015 also buildings and transport 828 enterprises 42% of energy consumption, 63% of industrial emissions 	<ul style="list-style-type: none"> CO₂, CH₄, N₂O, PFCs, HFCs, SF₆ approx. 490 installations or corporations with emissions > 25,000 tonnes CO₂-e/a Industry and energy sector, buildings and transport sector, landfills and agriculture 60% of GHG emissions
Cap setting	<ul style="list-style-type: none"> Cap is set ante for the relevant trading period Cap decreases annually 1.74% in the 3rd TP Cap 2013: 2.04 bn tonnes CO₂-e 	<ul style="list-style-type: none"> The cap was set for the first five years by 31.05.2014 Afterwards, the emission cap will always be set annually for the fifth trading year in the future (rolling cap) Cap in 2015 (estimated): approx. 380 m tonnes 	<ul style="list-style-type: none"> Cap decreases annually 2% (2013-2014) or 3% (2015-2020) Cap in 2013: 162.8 m tonnes Cap in 2014: 160 m tonnes Cap in 2015: 394.5 m tonnes 	<ul style="list-style-type: none"> Derived from BIP expectation and emission intensity target Cap allows absolute emission growth Cap for 2015: 277 m tonnes (42% of emission target of province) 	<ul style="list-style-type: none"> Cap not yet set Derived from BIP expectation and reduction target of -30% vis-à-vis BAU by 2020 (corresponds to approx. 341 m tonnes CO₂-e at 60% of national emissions in 2020)
Allocation	<ul style="list-style-type: none"> Full auctioning for electricity production in 3rd TP 100% free allocation for carbon leakage exposed industries (energy and trade intensity), other industries will also receive free allocation, but with a decreasing percentage Allocation according to product benchmarks (emission rate of the top 10% of installations) Total share of free allocation may not exceed industry cap 	<ul style="list-style-type: none"> Basically auction (transitional free allocation for about 30% of emission allowances) For energy- and tradeintensive sectors, there is a transitional period with free allocation (between 66% and 95% of the industry average emissions of the previous year at decreasing percentages) based on benchmarks that are founded on the industry average (for both direct and indirect emissions), as well as for a limited number of energy producers 	<ul style="list-style-type: none"> Free allocation according to BM. The free allocation is about 90% of historical emissions. The remaining 10 % will be auctioned. 	<ul style="list-style-type: none"> 100% free allocation in the amount of expected emissions Partial auctioning for capacity extension/new entrants Details still to be clarified 	<ul style="list-style-type: none"> 95% free allocation between 2015 and 2020 (100% for energyand trade-intensive industries) Early auctions possible

State and trends of GHG pricing internationally

The EU's share of global emissions is falling as Europe reduces its own emissions, whilst those from other parts of the world, especially the major emerging economies, continue to grow.

The share of GHG emissions covered by domestic GHG pricing initiatives increased significantly over the past year, led by the launch of six carbon markets in China. In May 2014, 39 national and 23 sub-national jurisdictions, responsible for almost a quarter of the global GHG emissions, have implemented, or are scheduled to implement, carbon pricing instruments, including ETS and taxes, building the momentum for a bottom-up approach to climate action.

A total of eight new carbon markets opened in 2013, and another launched in early 2014. With these additions, the world's ETS are valued at about \$30bn. China now houses the second largest carbon market in the world, covering the equivalent of 1,115m tonnes of CO₂e after the EU ETS, with its 2,039 tonnes CO₂e cap in 2013.

Carbon taxation is also gaining ground. New carbon taxes were introduced in Mexico and France in 2013. In North America, the states of Oregon and Washington are exploring carbon pricing options to join California, Québec, and British Columbia in a concerted effort to tackle climate change.

Overview of ETS worldwide, 2013-2014

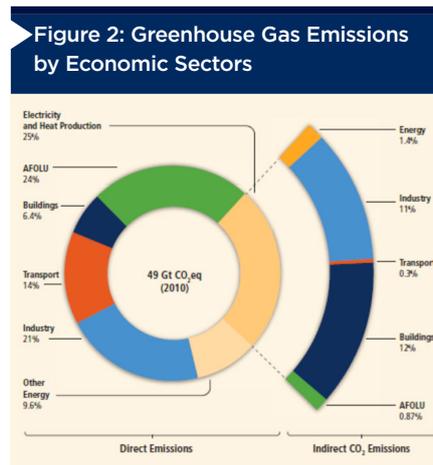
Table 1 shows existing selected Emissions Trading Systems or those under preparation. More recent information is provided immediately below this table and elsewhere in this article.

Linking different ETS - Current state and future perspectives

As suitable instruments for reaching the obligations beyond national mitigation efforts, the Kyoto Protocol specifies three flexible mechanisms that can be used by the contracting states.

These are [a] international emissions trading between countries or IET, [b] Clean Development Mechanism or CDM and [c] Joint Implementation or JI.

The CDM allows emission-reduction projects in developing countries to earn certified emission reduction [CER] credits, each equivalent to one tonne of CO₂e. These CERs can be traded and sold and used by industrialized countries to a meet a part of their emission reduction targets under the Kyoto Protocol. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction limitation targets.



For example, a mining company with operations in the EU can use CER credits obtained from projects in developing countries. These projects can include mining activities in these countries or other businesses like renewable energy projects.

The CDM is the main source of income for the UNFCCC Adaptation Fund, which was established to finance adaptation projects and programs in developing countries party to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change. The Adaptation Fund is financed by a 2% levy on CERs issued by the CDM.

The central feature of the Kyoto Protocol is its requirement that countries limit or reduce their GHG. By setting such targets, emission reductions took on economic value. To help countries meet their emission targets, and to encourage the private sector and developing countries to contribute to emission reduction efforts, negotiators of the Protocol included three market-based mechanisms; emissions trading, the CDM and Joint Implementation [JI].

State and trends of carbon pricing

According to the World Bank Group the current CDM and JI portfolio is estimated to have the potential to issue between 3,500 and 5,400 tonnes CO₂e for 2014-2020, should the demand exist. 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.

Various initiatives underway might create an additional demand for international credits pre-2020. A few governments recently launched tenders to purchase CERs and some domestic schemes, like the Chinese emissions trading scheme, allowing 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.

Instruments can be designed to be more cost-effective and flexible. Lower implementation costs could have helped maximise the cost-effectiveness of each instrument. The transaction costs under the CDM, including MRV (monitoring, reporting and verification) and legal costs, further concentrates 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 has 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 also providing sufficient predictability in the schemes.

EU/EFTA ETS

The European Union launched the EU Emissions Trading System [EU ETS] in 2005 as the cornerstone of its strategy for cutting CO₂ emissions and other GHG. In contrast to traditional 'command and control' regulation, ETS aims at harnessing market forces to find the cheapest ways of reducing emissions. The EU ETS is now joined by EFTA countries with the exception of Switzerland that has its own carbon tax system.

The EU/EFTA ETS is the world's first major carbon market and remains by far the biggest today. The EU/EFTA was the first international ETS to address greenhouse gas emissions from companies, accounting for over three-quarters of the trading volume of the international carbon market and functions as its engine.

It covers more than 11,000 power stations and industrial plants in 31 countries, as well as airlines. GHG and sectors covered include power and heat generation, energy-intensive industry sectors, including oil refineries, steel works and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals, and lastly, civil aviation.

As for perfluorocarbons and nitrous oxide, the system covers PFCs from aluminum production and N₂O from production of nitric, adipic, glyoxal and glyoxalic acids.

EU ETS Phases

The EU ETS has three operational phases:

- Phase I, 1 Jan 2005 - 31 Dec 2007, was an initial learning-by-doing phase and is now complete.
- Phase II, 1 Jan 2008 - 31 Dec 2012, included revised monitoring and reporting rules, more stringent emissions caps, additional combustion sources and is now complete.
- Phase III, 1 Jan 2013 - 31 Dec 2020, brings harmonised EU allocation methodologies and covers additional GHG and emission sources. Phase III also allows eligible small emitters and hospitals to choose to be excluded from certain EU ETS obligations.

In 2021-2028 there will be a 4th [trading] period.

As compared to the previous phases, the changes for phase III were:

- Broad definition of combustion added that captures all burning of fuel.
- Inclusion of nitrous oxide [N₂O], perfluorocarbons, aluminum production, carbon capture, transport and geological storage.
- No free allocation for any electricity production except in the combustion of waste gases.
- Small emitters and hospitals have the choice of being excluded.
- Installations where only biomass is used are excluded and fossil fuels may be used for start-up and shut-down.

Carbon leakage

To address the competitiveness of industries covered by the EU ETS, production from sectors and sub-sectors deemed to be exposed to a significant risk of 'carbon leakage' will receive a higher share of free allowances in the third trading period between 2013 and 2020. This is because they face competition from industries in developing countries which are not subject to comparable greenhouse gas emissions restrictions.

In view of preparing the carbon leakage list for 2015-2019, the EC organised meetings in 2013 to consult stakeholders, including member states, industry, NGOs and academia.

The EC made clear in its communication regarding a 2030 policy framework for climate and energy, that it intends to maintain the current criteria and existing

assumptions in the 2015-2019 list. This would guarantee continuity in the composition of the list.

The draft proposal for the new list was published on 5 May 2014 and July 8, 2014. The EU Climate Change Committee discussed, and agreed, the proposed list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage, for the period 2015 to 2019. The committee is expected to vote on the draft list before the summer break. Once agreed, the draft decision will go to the European Parliament and the council for the compulsory three-months scrutiny. It is foreseen that the final carbon leakage list for 2015-19 will be adopted by the EC before the end of 2014 and applied to free allocation for the first time in 2015.

On the EC's Revision of the Carbon Leakage list Euromines, the European Association of Mining Industries, Metal Ores & Industrial Minerals, has pointed out that the EC is also providing guidance for the inclusion of certain sectors into the Annexes of the EU subsidy regulation, which would allow sectors to receive compensation for increased electricity prices due to the ETS Directive.

Backloading, market stability reserve and linear reduction factor

The EC is taking action to address a surplus of emission allowances that has built up in the EU ETS, largely as a result of the economic crisis and high imports of international credits. Since 2009 the EU ETS has experienced a growing surplus of allowances and international credits compared to emissions which has significantly weakened the carbon price signal.

At the start of phase III the surplus stood at almost two billion allowances, double its level

in early 2012, and by the end of 2013 it had grown further to over 2.1 bn. While the EC expects the rapid build-up to end from 2014, it does not anticipate that the overall surplus will decline significantly during phase III. Potentially there will be a structural surplus in most of phase III of around 2 billion allowances. This risk, according to the EC, undermines the orderly function of the carbon market. Moreover, if these imbalances are not addressed, they will profoundly affect the ability of the EU ETS to meet more demanding emission reduction targets in future phases in a cost-effective manner.

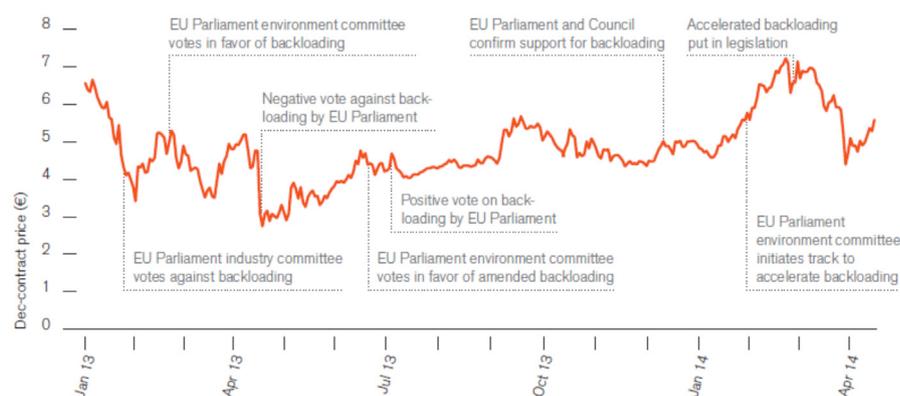
The EC is taking action on two fronts. As a temporary measure, the EC is postponing the auctioning of 900m allowances until 2019-2020 to allow demand to pick up. This backloading of auctions is being implemented through an amendment to the EU ETS Auctioning Regulation.

Backloading does not reduce the overall number of allowances to be auctioned during phase III, only the distribution of auctions over the period. In 2014 the auction volume will be reduced by 400m allowances, in 2015 by 300m, and in 2016 by 200m. Figure 3 presents carbon prices in correlation with backloading.

The position of Euromines on backloading was that, "The proposal for the EU ETS scheme post 2013 will be another constraint on the competitiveness of the European industry by imposing further costs on the enterprises which competing producers worldwide do not have to reckon with. It is therefore crucial that energy-intensive industries which face fierce competition are given special allowances in this new scheme."

As backloading is only a temporary measure, a sustainable solution to the imbalance between supply and demand requires structural changes to the EU ETS. The EC proposes to establish a market

Figure 3: Carbon prices, correlation with backloading



Source: Thomson Reuters Point Carbon

stability reserve at the beginning of the next trading period in 2021, hoping this reserve will both address the surplus of emission allowances that has built up and improve the system's resilience to major shocks by adjusting the supply of allowances to be auctioned. It would operate entirely according to pre-defined rules which would leave no discretion to the EC or Member States on its implementation.

Efforts to address the market imbalance would also be helped by an increase in the annual linear reduction factor which determines the EU ETS cap. To achieve the target of a 40% reduction in EU greenhouse gas emissions below 1990 levels by 2030, set out in its 2030 framework for climate and energy policy, the EC proposes an increase in the linear reduction factor to 2.2% per year from 2021, from 1.74% currently.

EU ETS carbon prices

Following highs of over €30/tonne CO₂ in the period before the global economic downturn, carbon prices in the last 18 months have been in the range between €3-7.

GHG Market Sentiment

According to the IETA of 2014, price expectations for Phase III of the EU ETS continue their downward trend but may show signs of stabilising. Under current EU ETS rules, respondents expect the average EUA price during Phase III will be €8, down from €34 in 2008 and €10 in 2013. 63% of respondents expect the average EUA price for Phase III of the EU ETS will be €5-10 under current market rules, broadly in line with the €5 EUA price at the time of writing. 15% think it will be below €5, and 23% of respondents expect the average price to be above €10.

Carbon tariffs?

A little-known provision in the EU ETS legislature is that the Union can, under certain conditions, impose duties on carbon-intensive imports from third world countries that have no equivalent system and, thus, create conditions for unfair competition.

This could create a significant tool for the EU mining and other energy-intensive industries that compete internationally. However, such a move by the EU, "Could scupper the chances of striking a global agreement to tackle climate change next year," Jos Delbeke, director general of the EC's climate department, said on July 10, 2014.

"If we were to put a border tax on the table before Paris, it's the recipe that could torpedo that process," Delbeke told an online meeting of industry officials on the so-called carbon leakage issue in Brussels.

EU leaders have agreed to decide by October 2014 whether to set a 2030 goal to cut carbon emissions as the EU contribution to a global pact to tackle climate change, due to be signed in Paris in late 2015 and take effect from 2020.

Last month France suggested measures could be taken against imported goods to ease concerns that the 2030 goals could threaten heavy industries competing with foreign rivals that might be subject to later environmental goals.

EU ETS Carbon Leakage Provisions Post 2020, Public Consultation

This EC consultation was launched on 8 May, 2014, the aim being to canvass opinions on different options for a system to avoid carbon leakage after 2020. Based on a questionnaire, the online consultation complements three stakeholder meetings to be held in the coming months. The consultation will run until 31 July 2014, but earlier replies are encouraged.

The results of the consultation will feed into further work on the 2030 climate and energy policy framework regarding the determination of post-2020 rules on free allocation and carbon leakage provisions in the EU ETS. Responses to the questionnaire will also serve to stimulate more focused discussions during the stakeholder meetings.

For this consultation, which ends on 31 July, 2014, Euromines is submitting a position paper. Among the questions that are most relevant to the mining sector are the following:

- What share of the post-2020 allowance budget should be dedicated to carbon leakage and competitiveness purposes?
- Currently the EC implements the NER300 programme to provide EU ETS specific support for large-scale demonstration of Carbon Capture Storage [CCS] projects and innovative renewable energy. 300m allowances, representing ca. 2% of total phase III allowances, are dedicated for this purpose. What share of the post-2020 allowance budget should be dedicated to such innovation support?
- If innovative low carbon technologies in the industry are to be further supported, which could be possible sources of funding?
- Is there a need for additional measures beyond free allocation and EU-level innovation support to address the risk of carbon leakage for energy intensive sectors covered by the EU ETS, post-2020?
- Currently there are two categories for sectors in terms of exposure to the risk of carbon leakage; sectors are either deemed to be exposed to such risk or not. Should

the system continue with two carbon leakage exposure groups or is some further differentiation needed?

- Currently, exposure of sectors to the risk of carbon leakage is primarily measured by the share of 'carbon costs' in their gross value added and by the intensity of trade with developing countries. What carbon leakage criteria should be defined for the post-2020 period?
- Currently benchmarks are set to the average greenhouse gas emission performance of the 10% best performing installations in the EU for a given product. What adaptations of benchmarks for 2021 onwards should be considered, if any?
- Should there be a harmonised EU-wide compensation scheme for indirect costs, ie. for increases in electricity costs resulting from the ETS?
- Should the allowances funding low-carbon innovation support come from the Member States' auction budgets or from free allocation?

The US and Canada Regional Greenhouse Gas Initiative RGGI

This is the first US mandatory market-based emissions trading program to reduce GHG and the first anywhere to use the cap-and-invest model for reducing pollution.

When the participating states established the program in 2005, they envisioned it as a model for emission trading in other regions and in the US as a whole, pioneering the auction of emission allowances and the investment of proceeds to advance efficiency and clean energy as well as providing consumer benefits.

Launched in January 2009, RGGI currently applies to 168 electricity generation facilities in nine Northeast and Mid-Atlantic states [Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont]. Together, these facilities account for approximately 95% of CO₂ emissions from electricity generation in the region.

In creating RGGI, the participating states sought to stabilise power sector CO₂ emissions over the first six years of the program [2009–2014] at a level roughly equal to 2005 emissions. Subsequently, the emissions cap was set to decline by 2.5% per year for the four years 2015 through 2018.

The RGGI participating states established a regional cap on CO₂ pollution from the power sector and require power plants to possess a tradable CO₂ allowance for each tonne of CO₂ emitted. Under RGGI, nearly 90% of emission allowances are distributed through auction.

As of September 2013, cumulative auction

proceeds totaled nearly \$1.5bn. Participating states have invested approximately 80% of these auction proceeds in consumer benefit programs, including investments stimulating local economies and creating jobs through the development of greenhouse gas abatement technologies, and end-use energy efficiency and renewable energy deployment at both state and local levels.

EPA clean power plan proposal

On 2 June 2014 the EPA proposed the first guidelines to cut carbon pollution from existing power plants [clean power plan] which, "for the first time cuts carbon pollution from existing power plants, the single largest source of carbon pollution in the US,". President Barack Obama said the following day, after a meeting with Polish Prime Minister Donald Tusk.

"The US and Europe had to lead by example in fighting global warming... This has to be a global effort," Obama added.

Other GHG

On 8 June 2014, in its regulatory analysis for the new carbon rule, the EPA recognised the methane problem, but has punted on the issue for now. "The EPA is aware that other GHGs, such as nitrous oxide N_2O , and to a lesser extent methane CH_4 , may be emitted from fossil-fuel-fired electricity generating units... The EPA is not proposing separate N_2O or CH_4 guidelines or an equivalent CO_2 emission limit because of a lack of available data for these affected sources," the report said.

Western Climate Initiative [WCI]

WCI is an initiative of American state and Canadian provincial governments that aims to develop a joint strategy to reduce GHG via a regional cap-and-trade program. Currently, British Columbia, California, Manitoba, Ontario and Québec are members of the initiative. California and Québec independently established cap-and-trade systems, their first compliance periods started on 1 January 2013. One year later, California and Québec linked their systems creating the first international cap-and-trade scheme consisting of sub-national jurisdictions.

The California cap-and-trade programme

This programme started in 2012 and entered into its first compliance period from 1 January, 2013. According to the California air resources board's climate change scoping plan update, the programme 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.

Figure 4: Price of allowances auctioned and traded volumes, primary market, California cap-and-trade programme

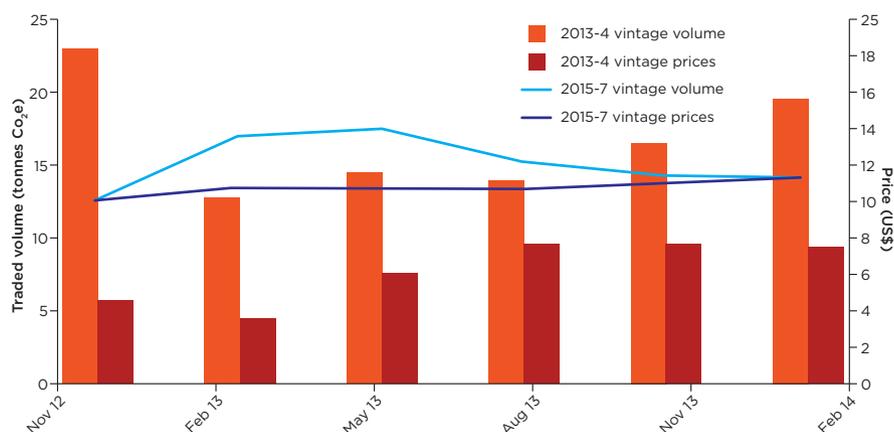
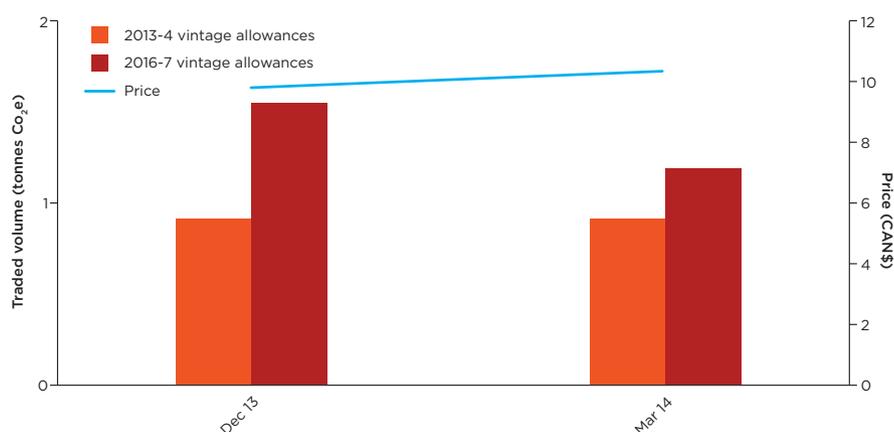


Figure 5: Price of allowances auctioned and auction volumes, Quebec Cap-and-Trade System



Of particular interest are the following: Firstly, competitiveness considerations such as ongoing carbon leakage assessments that consider the use of border carbon adjustments in the cement sector, a detailed proposal is expected in July 2014. Secondly, linking to other schemes, for example, with Quebec in January 2014 as mentioned earlier. Thirdly, collaborative initiatives that include the Pacific Coast action plan on climate and energy and a memorandum of understanding (MoU) with China.

The performance of this program is shown in Figure 4 above.

The Quebec cap-and-trade system

This system started operation in January 2013 and 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. Figure 5 shows recent trade volumes and prices for the Quebec scheme.

Australia

Australia carbon pricing mechanism [CPM]

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 change of government in Australia in 2013 has had a significant impact on these policies, and as a consequence, the status of the CPM is in flux. The current administration has proposed to abolish the CPM and, on 17 July 2014, the Australian Senate voted to scrap the country's carbon tax and plans for emissions trading, a major victory for the Prime Minister, Tony Abbott, leaving uncertainty about how the country will meet its carbon reduction goals.

Table 2: Development of China's Emissions Trading Scheme

Time	Milestones
2007	China's national climate change program.
2008	China's policies and actions for addressing climate change; Tianjin, Beijing and Shanghai.
2009	China pledges to reduce the intensity of carbon dioxide emissions per unit of GDP by 2020 by 40-45 percent compared with the level of 2005.
2010	12th Five Year Plan requires establishing ETS in China; launch of low carbon pilots.
2011	The national Development and Reform Commission (NDRC) published the list of China pilot ETSs: Beijing, Shanghai, Tianjin, Chongqing, Shenzhen, Guangdong, Shenzhen, Guangdong and Hebei; 12th Five Year Plan Control Scheme for GHG Emissions.
2012	Pilot ETSs started to release Working Papers on ETS

An alternative could be the Direct Action Plan, which, together with the renewable energy target, is intended to support Australia in meeting its existing minimum emission reduction target of 5% below 2000 emissions by 2020, the centerpiece of the Direct Action Plan being an emissions reduction fund.

The Australian 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\$2.55bn (\$2.3 bn). Under the emissions reduction fund, firms will be encouraged to reduce their emissions, equal to historical BAU emissions. A 'safeguard' mechanism will incentivise firms to remain below baseline emissions. A recent White Paper provides detail on the approach.

China

A significant, and to some a rather surprising development, was the imposition of GHG measures in China. Major moves are summarised in Table 2 above.

In more detail, the National Development and Reform Commission [NDRC] announced its plans to develop seven official ETS pilot programmes in Beijing, Shanghai, Tianjin, Chongqing, Guangdong, Hubei and Shenzhen in 2011. This plan began to deliver from 2013. By April 2014, six of the seven pilot schemes started trading, with the remaining one, Chongqing, due to start in 2014.

Carbon markets are now officially open for business in China. The total 2013 allocations of these six pilots combined amounts to 1,115 tonnes CO₂e as mentioned previously, 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 tonnes CO₂e in 2013, similar to the size of France's emissions in 2012.

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.

Characteristics of Chinese pilot plans

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

As for free allocation, most pilots use historical intensity or emissions-based free allocation. Guangdong is the first pilot to use auctioning. Dynamic allocation is included in the ETS Implementation Plans for Shenzhen, Tianjin and Shanghai. Allocation for the power sector is similar across pilots, based on benchmarks of different generation technologies and installation capacities.

By April 2014, CCER methodologies based on CDM methodologies 'Use of Offsets' were published. About 200 projects have been approved by the NDRC.

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

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.

Problems

Given a potential threat to businesses' bottom lines, Chinese industrial firms have pushed back. In Guangdong, although 97% of emission allowances are given away for free, also known as "grandfathering", emitters are required to purchase 3 pct of allowances via auction. Media reports suggest that some

firms may be unable to afford such an expense and may simply refuse to obey ETS requirements, choosing instead to pay the resulting fines.

High price volatility has also been cited as a potential problem, although it has died down considerably since the early stages of the pilot ETSs. Although Shenzhen ETS allowance prices spiked to more than Chinese renminbi (Rmb) 120/tonne (\$19/tonne) in late 2013, they have since dropped to about Rmb60-80/tonne (\$10-13/tonne). A similar spike in Tianjin ETS allowances occurred in April 2014, but prices have since flattened out.

Additionally, there have been concerns about the pilot programs' viability in terms of real emission reduction and market stability. Industry sources suggest that firms in China have been slow to grasp the concept of emission trading, in some cases even mistaking their allocated allowance certifications for local government awards.

The *Financial Times* referred to China's ETSs as a 'black hole', citing low traded volumes and high price differentials across jurisdictions. For example, Shenzhen allowances have traded for as much as Rmb120/tonne (\$19/tonne), while Hubei allowances have traded for as little as Rmb20/tonne (\$3/tonne).

The absence of harmonised standards across jurisdictions has been a major factor in the observed price differences. "It will be a while before you see any uniform carbon price, whether that comes from cap and trade or a carbon tax," says Sieren Ernst, a DC-based climate consultant who has worked in China.

The dominant role of state-owned enterprises has inhibited competitive price discovery on China's ETS exchanges, which may also explain the price differences. Most of the ETS exchanges only permit participation by regulated firms, according to Larry Liu, a Chinese climate policy researcher for Warwick McKibbin of the Brookings Institution. Only Shenzhen, Tianjin, and Guangdong allow individual investors, such as financial institutions, to trade, and Liu believes there have been virtually no market-drive trades so far.

A national carbon tax is the likely outcome, if the pilot ETSs do not ultimately mature to a point where they can be scaled up to a national level. Jiang Kejun, a researcher with the National Development and Reform Commission's Energy Research Institute, refers to carbon taxes as a "Plan B" in the event that serious problems arise in the pilot ETSs.

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