

CARBON MARKET YEAR IN REVIEW

Record high value of carbon markets in 2019

22 January 2020

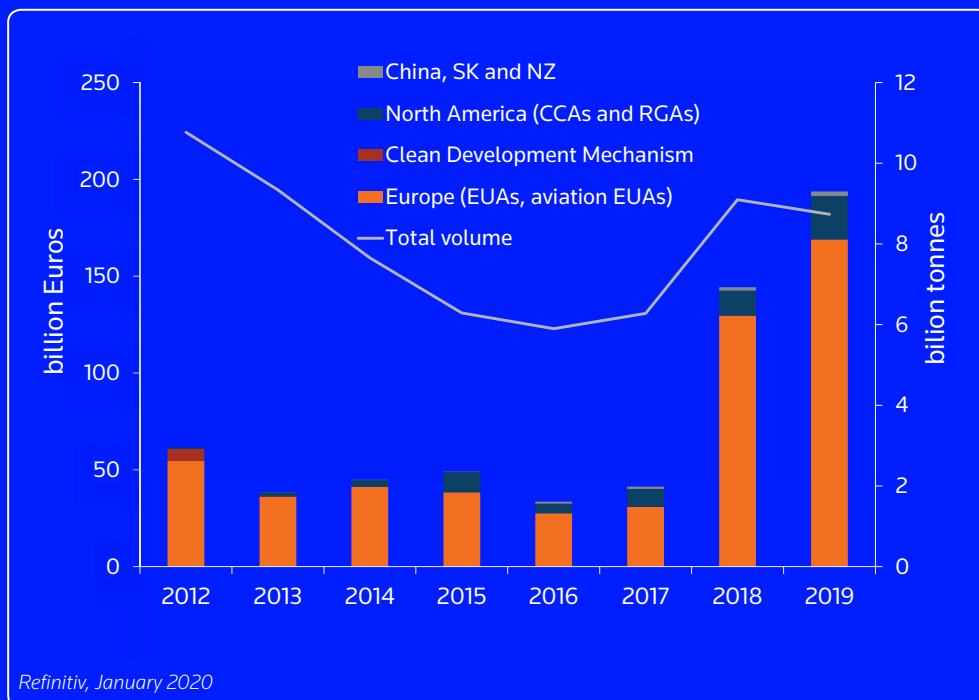
- Total value of global carbon markets grew 34 percent in 2019, reaching €194 billion based on our assessment of traded volume and carbon prices across the world. That marks a third consecutive year of record growth and almost five times the value in 2017. All major carbon markets saw prices rising on current or expected tightening market rules.
- Record strong prices in the European Emissions Trading System (EU ETS), which makes up almost 80 percent of global traded volume, was the main reason behind the growth in value. The average carbon price in the EU ETS was €25/t last year, up €9/t compared to 2018.
- The main driver for this increase was the Market Stability Reserve that came into effect in January 2019, withholding a significant amount of allowances and tightening the supply side. The Green Deal proposals of the new European Commission, and talk of reopening the 2030 emission reduction target, also lent support. Higher carbon prices made gas power plants more competitive against coal in Europe, and helped reduce emissions.
- Globally, the total traded volume of allowances declined some 4 percent in 2019 after jumping 45 percent in 2018.
- The two North American carbon markets (WCI and RGGI) both saw an increase in traded volume and overall value from 2018, with their combined value growing 74 percent to €22 billion. Prices increased on expectations of tighter credit supply in 2021 when both markets enter new phase with more ambitious caps.
- China's national ETS will start in 2020, initially covering the power sector with the ambition to expand to other sectors. In the nine Chinese pilot emission trading systems, about 93 million allowances changed hands in 2019 - significantly more than the 78 million total volume of 2018. The total value of the combined pilots reached €272 million, 40 percent higher year-on-year.

CONTENTS

3	Carbon markets in 2019
5	Europe
9	North America
11	China
14	South Korea
16	New Zealand
17	Paris Agreement
19	International aviation

World Carbon Markets 2012-2019

Value by segment, total volume



Refinitiv, January 2020

REVIEW OF CARBON MARKETS IN 2019

22 January 2020

This report presents Refinitiv's assessment of the world's major carbon markets in 2019. The aim is to show the main market trends and policy developments in global emission trading systems, and areas where such systems are emerging. We collect data from official sources (most notably carbon trading platforms such as ICE, EEX, KRX, and the Chinese carbon exchanges) and estimate the size of bilateral (over-the-counter) transactions. This gives us an estimate of the actual volume traded.

It covers the main regions in which there are existing or emerging emission markets: Europe (the EU ETS), North America (the WCI and RGGI, emerging market in Mexico), China (regional pilot ETS, emerging national ETS), South Korea (KETS), New Zealand and global transactions in the CDM market as well as developments toward the future international offset market for aviation emissions. In order to facilitate easy trend comparisons, we attempt to minimise changes in the report's scope from one year to another. However, sometimes we do need to update the selection of market segments, to ensure that the analysis reflects the markets that are currently important - either because of actual trading, or because of anticipation of future trading. This means that some markets that used to be important are no longer covered, e.g. the Joint Implementation mechanism whose offset units (ERUs) are no longer eligible in the EU ETS, or Kazakhstan's ETS (minimal trading activity in 2019).

We do not include trading in so-called voluntary (non-compliance) markets targeting individual consumers and companies (e.g. for offsetting carbon footprint of flights). We do include volumes from the UNFCCC platform for voluntary cancellation of CERs. For trades not documented on a trading platform, we multiply volumes with (average) prices at the time of transaction, which gives us an assessment of the overall value of the respective market.

Note that our numbers have often varied significantly from other slightly similar analyses that seek to assess the size and/or geographical scope of carbon pricing systems. Most important among these is the World Bank's annual mapping. The World Bank looks primarily at the size of covered emissions in the various systems (issued volumes of allowances), not the traded volumes. This approach tends to show a much lower volume than in our assessment, which takes into account the fact that allowance and offset units typically change hands more than once during a year.

The carbon team at Refinitiv (formerly Point Carbon/Thomson Reuters) has published annual assessments of global carbon markets since 2006. These publications have consistently served as a reference in the world of carbon trading.

This report has been co-authored by the following team of analysts: Jon Berntsen, Anders Nordeng, Aje Singh Rihel, Hæge Fjellheim, Lisa Zelljadt, Cathy Liao and Maria Kolos.

1. Carbon Market Values: All-time Highs on Record Prices

GLOBAL CARBON MARKETS INCREASED 34 PERCENT TO HIT ALMOST €200 BILLION

The total value of global carbon markets grew a solid 34 percent year-on-year in 2019 on higher prices and steady traded volume. Traded volume reached 8.7 billion tonnes (Gt) of emission allowances, down 4 percent from 9.1 Gt in 2018 (see Table 1.1). We estimate the total value of these transactions to be in the order of €194 billion. The modest drop in volume was far outweighed by the strong rise in prices, particularly in the European Emissions Trading System (EU ETS), where EUAs stayed close to €25/t during the year. That was €9/t higher on average compared to the previous year. The Market Stability Reserve (MSR), withholding significant amounts of EUAs, was the underlying supportive factor to the year's elevated carbon prices, having come into effect 1 January 2019.

In the North American markets (WCI and RGGI) volumes grew 49 percent to 1.7 Gt while the market value grew a whopping 74 percent to €22 bn as prices were also higher on expectations of tighter credit supply next year when both North American markets enter a new phase with more ambitious caps in 2021.

In the eight Chinese pilot emission trading systems about 93 million allowances changed hands, significantly higher compared to 78 million allowances in 2018. The total value of the Chinese pilot systems collectively reached €272 million, 40 percent higher year-on-year.

Trading also picked up in New Zealand - total volume came in at 119 million NZUs, compared to 88 million in 2018. NZU prices, which hinged on news from the government about long-awaited ETS reforms, fluctuated accordingly throughout the year with a steep upswing in December. The resulting market value increased

from €1.2 billion to €1.7 billion.

Almost 17 million allowances were traded in the Korean emissions trading system in 2019. This includes allowance units (KAUs) and offsets (KOCs). The total value of the Korean ETS was €373 million, €17 million lower compared to the previous year, as a drop in traded volume offset the effect of rising allowance prices.

EUROPE: SUPPLY CURB AND DEMAND DROP

While less volatile than the previous two years, European carbon still traded in a wide range in 2019. The bellwether EUA front-year contract closed between €18.80/t (21 February) and €29.81/t (23 July). Over the year it averaged €24.9/t.

The Market Stability Reserve (MSR) came into effect in January 2019 and absorbed about a quarter of the estimated aggregate allowances in circulation. This, combined with expectations of more tightening to come, created a shortage in the year's supply-demand balance, which we see as the key underlying support for prices in 2019.

Higher carbon costs coincided with a price drop in natural gas in Europe. The front-month TTF gas contract plunged from €22/MWh to as low as €9.8/MWh in July, before recovering some of the losses in second half of the year. Coal prices dropped as well, but relatively less than gas. This had a major impact on fuel switching: there was an increased shift away from coal towards gas and renewable electricity in 2019.

Spanish power production from coal, for instance, was down 66 percent and was mostly replaced by increased use of available gas-fired capacity. German coal-based generation also fell sharply.

Table 1.1 Global carbon market size 2017-2019

Refinitiv's assessment of volume and value of the major carbon markets from 2017 to 2019. Millions of tonnes (Mt), millions of euros.

	2017		2018		2019		Volume change 2018-19	Value change 2018-19	Share of total value
	Mt	€ million	Mt	€ million	Mt	€ million			
*Europe (EUAs, aviation EUAs)	5 129	30 919	7 754	129 736	6 777	168 966	-12%	30%	87%
CERs (primary and secondary)	21	23	15	32	12	40	-21%	25%	
North America (CCAs, **RGGAs)	923	9 238	1 126	12 871	1 673	22 365	49%	74%	12%
South Korea (exchange-traded and auction data, excluding OTC)	7	140	22	390	17	373	-23%	-4%	
Chinese pilot schemes (allowances and offsets)	125	174	103	194	136	272	32%	40%	
New Zealand	81	870	88	1 165	119	1 746	35%	50%	1%
Total	6 288	41 394	9 104	144 361	8 734	193 762	-4%	34%	

* Volume and value of EUAs excludes option positions

**The units traded in the Regional Greenhouse Gas Initiative are short tons, which are 0.907 metric tonnes. For unit consistency, we have converted RGGI's total volume figures to metric tonnes. All non-European transactions are priced in local currencies, for the sake of consistency we have converted values into euros.

Source: Refinitiv, January 2020

Preliminary data indicate a 22 percent drop in lignite and hard coal power generation combined. Electricity production from gas rose 10 percent year-on-year in Germany. Overall, we estimate that European power sector emissions fell 70 million tonnes as a result of the switch from coal to gas in 2019 compared to what would otherwise be the case without a price on emissions.

On the climate policy front, 2019 was a busy year for decision makers both at the level of the EU and of the member states. Heads of governments discussed plans for 2050 climate neutrality over several council meetings, before reaching an agreement in December (albeit with a potentially important opt-out for Poland).

The European Parliament elections ushered in more pro-climate MEPs (Greens and Renew Europe). The new Commission of Ursula von der Leyen embarked on an ambitious Green Deal programme that will include 2030 and 2050 targets and fresh money to fund the transition away from fossil fuels. A roadmap unveiled in December 2019 shows that the Commission intends to revise several relevant EU policies – including the ETS directive – to achieve those new targets.

After three and a half years of confused back-and-forth, the UK is finally on its way to leave the EU on 31 January. In practice however, the UK will enter a transition period in which it will abide by all EU rules. This means that the UK will have full ETS obligations for 2019 and 2020. Companies will have to surrender EUAs, and the UK government will resume auctioning and free allocation. We expect the auction volumes for 2019 and 2020 to be combined and offered at fortnightly Wednesday auctions over the year 2020.

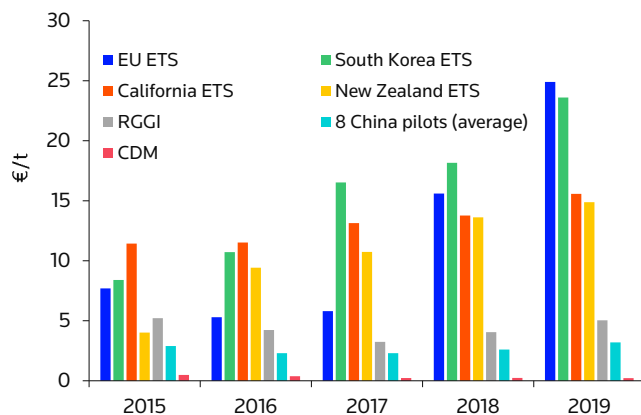
CONTINUED GROWTH IN NORTH AMERICA, CHINA TO START NATIONAL TRADING IN Q3 2020

Both the Western Climate Initiative (WCI) and the Regional Greenhouse Gas Initiative (RGGI) are operating under expectations of a significantly tighter market next year, as they enter a new trading period with more ambitious caps from 2021. Their combined market values were up 74 percent compared to 2018.

Allowance prices in the WCI rose over the first half of the year, peaking at over \$18/t in late May, followed by a slow decline towards the \$17/t level before edging back up to \$17.60/t in the last two months. RGGI prices fluctuated within about a 50-cent range over the year, hitting their high point in May at \$5.75/short tonne (st) and the year's low in August at \$5.23/st.

In China, the government continues preparations for allowance allocation and the creation of a national carbon registry. We expect a detailed administrative framework for the national ETS to be released in Q1 2020 before the Chinese New Year, and actual trading to start in Q3. The national programme will first cover only the power sector, though expansion to other sectors is foreseen. In the short term, the existing eight ETS pilots - all of which cover at least some non-power sectors - will continue to operate in parallel to the national market. In the eight Chinese pilot emission trading systems, about 93 million allowances changed hands in 2019 - significantly more than the 78 million total volume of 2018. The total value of the combined pilots reached €272 million, 40 percent higher year-on-year.

Figure 1.1: Annual average price per tonne



Source: Refinitiv

GLOBAL CLIMATE MARKET RULES STILL UNCERTAIN

While all regional cap-and-trade emission markets saw growth (in terms of value), 2019 did not bring much certainty to the future of rules for international carbon trading. Article 6 of the Paris Agreement, dealing with international carbon markets, was in focus at the global climate summit in Madrid (COP25), but negotiators failed to agree.

The continued uncertainty on this provision of the Paris Agreement will not necessarily prevent parties from establishing bilateral carbon trading agreements or using markets to meet their NDC targets. At the regional level, countries can and will continue their domestic market initiatives, some of which may link to each other even in the absence of UNFCCC consensus on how to do so. What Article 6 could add though, is accountability and environmental integrity rules for international carbon trading. With that in place, markets might be able to contribute significantly to global GHG mitigation at lower net cost.

INTERNATIONAL AVIATION – CORSIA READY FOR TAKE-OFF?

Airlines will potentially represent the biggest source of demand for offset units through the Carbon Offset and Reduction Scheme for International Aviation (CORSIA). Set up under the International Civil Aviation Organization, it requires airlines to offset emission increases beyond a 2020 baseline. The first, voluntary phase is set to begin in 2021, but the world's leading aviation countries have so far failed to agree on which types and vintages of offsets should be eligible under the scheme.

The main divide on this issue is between mature economies with relatively little growth in air travel (e.g. European and North American countries), and emerging economies with rapidly expanding carriers (e.g. Middle Eastern countries as well as China and India). The latter group does not want to limit its growth potential, and thus favours generous offset eligibility.

Some had hoped for some guidance on eligibility from the UNFCCC negotiations on Article 6, but this was not to be. ICAO delegates will continue negotiations in 2020.

2. Europe

PRICES AND VOLUMES: IT'S ALL ABOUT THE MARKET STABILITY RESERVE

A total of 6.8 Gt worth of emission allowances (regular EUAs and aviation EUAs) changed hands in the European carbon market in 2019, 13 percent below traded volume in 2018. Despite lower volume, the market value of the European Emission Trading System (EU ETS) rose from €130 billion to €169 billion on persistently high carbon prices over the year. The front-year EUA contract averaged €24.9/t in 2019, which was €9/t higher than the year before and relatively higher than other European energy commodities (see Table 2.1). The EUA front-Dec price ended the year at €24.60/t, €0.70/t down from the start of the year (see Figure 2.1).

The Market Stability Reserve (MSR) was the underlying supportive factor to the year's elevated carbon prices, having come into effect 1 January 2019. Designed to address the European carbon market's chronic oversupply of allowances accumulated since the financial crisis in 2008, the MSR absorbs 24 percent of the estimated oversupply (total number of allowances in circulation) each year by cutting them out of the pool to be auctioned. Over 2019, this withheld close to 40 percent of the volume originally planned to be auctioned - and thereby turned the otherwise long market short on an annual basis as the amount of allowances offered to the market was lower than emissions from Europe's power generators and industrial facilities for the year.

Although there are still more than 1.6 billion EUAs available in the market, the yearly deficit from reduced auction volumes - combined with expectations of further tightening going forward - kept prices in the mid-20s for most of 2019. Reducing the surplus through the MSR mechanism has turned the EU ETS back into a market in which prices are based on fundamentals and abatement costs.

POWER MARKET FUNDAMENTALS – FUEL SWITCHING BACK IN THE GAME

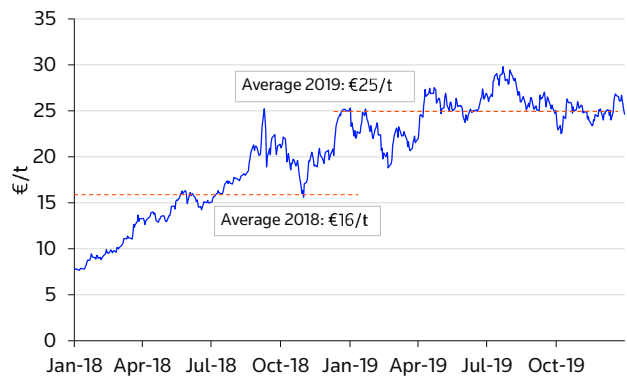
Those higher carbon costs combined with lower prices for natural gas in Europe had a major impact on fuel switching as can be observed in Figure 2.2: there was an increased shift away from coal towards gas and renewable energy in 2019.

Except for a few brief periods, the EUA Dec-19 contract traded above €20/t throughout 2019. The price of gas in Europe - which had been higher in 2018 due to tight supply conditions - on the other hand stayed on a downward trend since January. The front-

Table 2.1: European EUA price on ICE grew relatively more than other European commodity prices in 2019. The table shows yearly average prices for key energy contracts in 2019 vs. 2018 (in parenthesis).

Contracts (year-ahead)	Yearly averages	Change
EUA Dec-20	€24.92/t (15.95)	56%
German power	€48.14/MWh (44.17)	9%
Brent crude oil	\$64.16/bbl (71.69)	-11%
TTF gas	€18.20/MWh (20.66)	-12%
Coal API2	\$69.51/t (87.42)	-20%

Figure 2.1: Average front-year EUA on ICE rose more than 50 percent in 2019

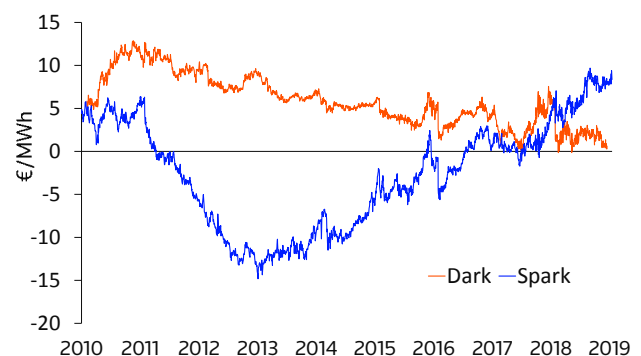


Source: Refinitiv

month TTF gas contract plunged from €22/MWh to as low as €9.8/MWh in July before recovering somewhat in second half of the year. Elevated inventory levels due to mild winter temperatures and high liquified natural gas (LNG) arrivals contributed to the lengthy period of low prices. Coal prices dropped as well, but relatively less than gas. Given coal's relative disadvantage to gas in terms of higher CO₂ content, the result was gas displacing coal power plants in the merit order. We even observed lignite-fired plants idling for weeks because running them became unprofitable for the first time in 2019 (see Figure 2.2).

Europe's power generation mix is defined by a complex interaction between power-, carbon-, coal- and gas prices. Very little fuel switching took place since the inception of the EU ETS almost 15 years ago, mainly because European carbon prices were below €8/t during most of that time - not high enough to make gas cheaper than coal given the mix of factors above. Not even in 2018, when prices for European carbon tripled from €7/t to €21/t, did we observe much fuel switching from coal to gas. The then prevailing high prices for natural gas (due to tight LNG supplies and low

Figure 2.2: Elevated carbon prices make gas power plants' margins more competitive against coal power plants



Clean dark- and spark spreads assuming front year German Phelix base, API2 coal, TTF gas, ICE EUA and 38% coal plant efficiency and 55% gas plants efficiency

Source: Refinitiv

inventory levels in Northwest Europe) made switching unprofitable.

That changed markedly in 2019. We estimate 70 million tonnes of emissions were reduced due to the switch from coal to gas in 2019 compared to what would otherwise be the case without a price on emissions (see Textbox 2.1 for details).

Preliminary numbers from the European Network of Transmission Operators for Electricity and national statistics show that power generation from coal in the European Union declined by a whopping 20 percent from 2018 to 2019. Electricity generation from lignite and hard coal fell 22 and 17 percent, respectively, replaced by incumbent gas generation and new solar and wind production. The share of gas power generation in the EU28 increased from 20 to 22 percent, while the share of renewably generated electricity inched up from 33 to 34.5 percent (see Figure 2.3).

Countries in western Europe saw the largest declines in coal-fired generation. In Spain, power production from coal was down 66 percent - the capacity was entirely replaced by increased utilisation of available gas-power.

Germany’s decline in power generation from coal was also dramatic: preliminary data indicates that lignite and hard coal use combined dropped 22 percent - mostly replaced by wind generation. German gas power generation rose 10 percent from 2018.

Other coal heavy countries like Poland, Czech Republic, Hungary and Greece also posted unusually strong declines in the share of coal-fired generation, with most replaced by increases in gas-fired generation.

EU POLICYMAKERS FOCUSING ON CLIMATE

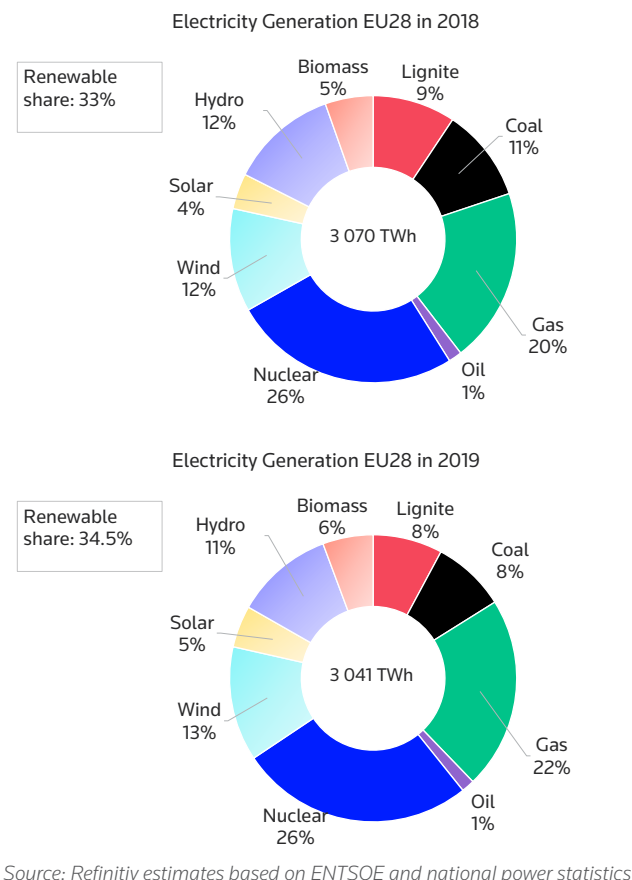
The EU climate policy initiatives most relevant to the carbon market in 2019 were the effort to achieve climate neutrality by 2050, ramp-up of Europe’s 2030 emissions targets, and the presentation of the Green Deal in December. Some member states launched domestic climate measures in addition to these EU actions, the most important being the coal phase-out plan of Europe’s top carbon emitter Germany. Though not a climate measure, Brexit affected the European carbon price throughout 2019 by creating uncertainty as to when/how the UK will leave the EU ETS.

At the general political level, European Parliament elections in May resulted in weaker EPP (centre-right) and S&D (centre-left) groupings while strengthening Renew Europe (liberals) and the

Textbox 2.1: Fuel switching explained

The gross margin for coal power plants is the difference between the electricity price, the cost of coal, and the cost of emission allowances after adjusting for efficiency of the power plant. Being subject to the EU ETS means European thermal power plants must cover their emissions with EUAs. Hard coal and lignite have roughly twice the carbon emissions compared to gas for the same amount of electricity produced, so when the price for emitting a tonne of CO2 is high the programme incentivises fuel switching from coal to gas. ‘Clean dark’ and ‘clean spark’ spreads are coal and gas plants’ short-term marginal costs including the price of carbon. We use our inhouse EU power model to estimate fuel switching levels, using detailed power generating capacity and consumption assumptions for each EU28 country and daily fuel prices. Our estimate on yearly fuel switching is against a scenario with no price on emissions.

Figure 2.3: Renewable- and gas shares increasing at the cost of coal and lignite shares in 2019



Source: Refinitiv estimates based on ENTSOE and national power statistics

Greens. In July, Ursula von der Leyen became president of the European Commission after having emphasised climate change mitigation as one of her top priorities.

GERMANY WILL CLOSE COAL POWER PLANTS AND CANCEL EUAS

On 1 February 2019, Germany’s coal phase-out commission presented its long-awaited recommendations: the group outlined a gradual decrease from the country’s current coal capacity of 43 GW (hard coal and lignite combined) to closing the last coal power plant no later than 2038. The next three years should see 12.6 GW go offline, followed by another 13 GW by 2030. This is significant as German coal power plants represent the sector with largest emissions in the EU ETS. We estimate that the coal phase-out will reduce emissions (hence demand for EUAs) by some 250 Mt for the period 2019–2030 compared to business as usual. To avoid creating a downward pressure on the EUA price, the coal phase-out commission recommended that the German government cancel a significant number of EUAs from its future auction volumes. The EU ETS directive specifically allows countries to voluntarily cancel EUA to offset the bearish effect on EU ETS prices.

Since February, the big question has been whether the German government will indeed cancel auction volumes and forego that revenue - and if so, by how much. Draft laws leaked in summer and autumn 2019 contained no mention of cancellation. During the climate summit in Madrid in early December, however,

Table 2.2: EU ETS by segment (excluding options market)

	2016		2017		2018		2019	
	Mt	€ million	Mt	€ million	Mt	€ million	Mt	€ million
EUAs Auction	724	3 788	934	5 366	916	14 090	589	14 503
EUAs exchange traded	4 173	22 516	3 830	23 263	5 977	101 778	5 823	145 231
EUAs OTC	230	1 203	352	2 178	845	13 670	360	9 094
Aviation EUAs	7	35	5	34	6	104	6	137
sCERs exchange traded	8	3	7	2	7	2	3	1
sCERs OTC traded	3	1	0	0	0	0	0	0
Total	5 145	27 545	5 129	30 842	7 751	129 644	6 781	168 966

German officials said the country's ruling coalition had agreed on cancellation. The latest draft version of the coal phaseout law, from 18 December, indicates that EUAs will be cancelled - but the amount depends on how much the MSR removes from the market. On 16 January 2020 German political leaders presented more details, most notably the disbursement of some €40 bn to affected regions, workers and mining and power operators. They also reiterated their intention to cancel surplus EUAs, to nullify the effect of dwindling demand. A draft legislative proposal should be brought before the Bundestag by the end of January.

2050 TARGET: NEARLY THERE, BUT NOT QUITE

In March the outgoing European Parliament passed a non-binding resolution calling for climate neutrality by 2050. The new parliament reiterated this position in a narrow vote on 28 November, and again, with a strong majority, on 15 January 2020.

In the Council, a group of member states wanted the same level of ambition, but Poland, Hungary, the Czech Republic and Estonia opposed the idea and council summits in May and June failed to produce agreement on this issue. Finland took over the presidency of the Council in July and continued the push for a common position on climate ambition. A Council meeting on 12 December ended with a conclusion calling for climate neutrality by 2050 for everyone except Poland, which reserved the right to choose its own timing. This marked a deviation from the hitherto usual practice of either making a statement on behalf of all member states or not making one at all.

We see the Polish hold-out as an effort to leverage more EU funding, with a unanimous decision possible if the other member states agree to provide Poland more financial support. However, the unusual opt-out may prevent the new law from enshrining the 2050 target. A draft legislative proposal will be tabled in March - as scheduled in the Green Deal roadmap - but Poland has said it wants to reflect on this issue until June.

2030 TARGET: HARD NEGOTIATIONS AHEAD

The existing headline greenhouse gas target for 2030 is to reduce emissions by at least 40 percent compared to 1990 levels. That level of ambition was set by European leaders in October 2014. Ensuing climate legislation - most notably the revision of the EU ETS directive - was aligned with this target.

The EU then set new targets for the share of renewable energy and

energy efficiency improvements in June 2018, both higher than what the Commission had initially proposed. The previous climate and energy Commissioner Miguel Arias Cañete argued that, with strengthened ambitions for renewables and energy efficiency, Europe would achieve deeper emission cuts and therefore be in position to raise the 2030 target to 45 percent.

Member states including Denmark, France, Luxemburg, the Netherlands, Portugal, Spain, and Sweden formed a pro-climate coalition that repeatedly pushed to ramp up the 2030 reduction target. Poland, Hungary and the Czech Republic resisted this push, with Germany vacillating.

When von der Leyen addressed the European Parliament in July 2019 in her bid to become president of the European Commission, she promised to push for ramping up the 2030 emission reduction target to 50 or possibly 55 percent. She put dutchman Frans Timmermans - who had been her main opponent for the Commission presidency - into the position of vice-president in charge of the European Green Deal. According to the Green Deal roadmap unveiled on 11 December, the Commission will present a comprehensive plan for increasing the EU 2030 climate target to at least 50 percent and towards 55 percent in summer 2020. Concrete revision proposals for the relevant EU ETS legislation as well as effort sharing, energy efficiency, and renewables will follow by June 2021. On 15 January the European Parliament expressed support for more ambitious emission reduction targets for 2030. Eventually, in order to change the 2030 target, the new executive must convince all member states.

BREXIT

In addition to developments in EU and German climate policy European carbon traders were following closely how the Brexit saga was unfolding in 2019. In the early months of the year, the UK Parliament repeatedly rejected the deal Prime Minister Theresa May had reached with the EU. She had to ask the EU for an extension on the UK's departure from the EU (beyond the original deadline of 29 March) and then stepped down, handing the premiership to Boris Johnson as the new leader of the Conservative Party in July. He in turn had to call for a new election (on 12 December) to get a majority in Parliament to approve the new departure deal.

Bar any last-minute surprise, the UK will officially leave the EU on 31 January 2020. In practice however, the UK will enter a transition period in which it will abide by all EU rules. This means that UK will have full ETS obligations for 2019 and 2020. Companies will have

to surrender EUAs, and the UK government will resume auctioning and free allocation. We expect the auction volumes for 2019 and 2020 to be combined and offered over fortnightly Wednesday auctions over the year 2020.

As of now, the transition period is set to expire end 2020, by which time Boris Johnson has promised to negotiate and get approval for a deal with the EU on their future relationship. The status of UK emitters beyond 2020 is thus still uncertain. We know they will have to cover their 2020 emissions by handing in EUAs in the common EU registry in early 2021. But to what jurisdiction they will account

for their 2021 emissions depends on the fate of the upcoming negotiations around the future EU-UK relationship.

OUTLOOK FOR 2020

European climate and energy policy discussions are set to intensify in 2020, as the new European Commission starts presenting draft legislation to implement a target for 2050 and to adjust the one for 2030. In addition, market participants will be watching the German coal phase-out and the negotiations for a future relationship between the EU and the UK. Key upcoming policy events are listed in the calendar in Table 2.3.

Table 2.3: 2020 Calendar for European climate and energy policy

Jan-June	Croatian EU presidency	Croatia holds rotating presidency of EU Council.
16 Jan	German coal phase-out	German political leaders presented details on the implementation of the recommendations of the coal phase-out Commission (from February 2019). The key element is the disbursement of some €40 bn to affected regions, workers and mining and power operators. Officials reiterated the government's intention to cancel surplus EUAs, to nullify the demand shock. Legislation should be brought before the Bundestag by the end of January.
31 Jan	Brexit day	Bar any last-minute surprises, the UK will officially leave the EU. In practice it will enter a transition period set to run until (at least) 31 December 2020.
March	Start of Brexit future relationship negotiations?	Both Brussels and London want to get started on the negotiations on the future relationship. The withdrawal deal from 2019 regulates the conditions and modalities for the UK departure (including the transition period).
March	Draft law on 2050 climate neutrality	Commission to present draft legislative proposal to enshrine long term climate target into law. A Council meeting in December 2019 endorsed climate neutrality, but Poland reserved the right to choose its own timing. Poland later said it will reflect on the question until June 2020.
26-27 March	European Council	Summit of EU leaders. The draft law to enshrine 2050 climate neutrality and revise upwards the 2030 target will probably be high on the agenda, as will negotiations on the funding of the green transition.
1 June (tbc)	Deadline for first tender for German hard coal capacity shutdown	According to a draft law released 12 November 2019, this will be the deadline for utilities to compete for decommissioning compensation under the 4 GW close-downs envisaged for 2020. The results of the tender are to be announced on 1 October.
June	Stock-take of Brexit negotiations?	Seen as last chance for UK to ask EU for transition period extension, if it so wishes.
18-19 June	European Council	Summit of EU leaders. The draft law to enshrine 2050 climate neutrality and revise upwards the 2030 target will probably be high on the agenda, as will negotiations on the funding of the green transition. Poland said in January it will consider to fully endorse the 2050 target, and will return to the issue in June.
End June	German coal phase-out law	The draft law – to be presented in late January – is expected to be completed by the end of H1 2020.
July-Dec	German EU presidency	Germany holds rotating presidency of EU Council.
Summer	Plan for raising 2030 target to 50% or beyond	Commission to present a comprehensive and impact assessed plan on how to increase EU GHG target for 2030 [currently set at 40%] to at least 50% and towards 55% in a responsible way.
Autumn	EU-China summit in Leipzig	Will cover several topics, with global climate policy high on the agenda. Date to be confirmed.
15-16 Oct	European Council	Summit of EU leaders
9-19 Nov	Global climate summit, Glasgow	UK government will host COP26. One key priority will be to agree on rules for international climate markets (Article 6.2 and 6.4), following the failure in Madrid in 2019. Also, 2020 is meant to a “year of ambition” in which countries should revise the intended nationally determined contributions (INDCs) they have submitted to the UNFCCC.
26 Nov	Deadline for Brexit relationship deal	Brussels says a deal must be ready, translated and presented to the European Parliament by this date, in order to be processed in time for a new arrangement to be effective from 1 January 2021.
10-11 Dec	European Council	Summit of EU leaders
31 Dec	Brexit - end of transition period (unless extended)	If no deal is in place, the UK will fall back on the default situation of trading with the EU on WTO terms.

3. North America

North American carbon markets grew in 2019 in terms of volume traded and overall market value. Including allowance purchases at auctions, the Western Climate Initiative (WCI) saw over 1.3 billion permits change hands, with a total market value of over \$23 billion (€20.7 billion). The Regional Greenhouse Gas Initiative (RGGI) saw 323 short tons trade over the year for a total market value of \$1.8 billion (€1.6 billion) (see Table 3.1). Both markets are operating under expectations of a significantly tighter market next year, as they enter a new phase/trading period with more ambitious caps and tighter rules in 2021. Allowance prices in the WCI rose over the first half of the year, peaking at over \$18/t in late May, then declined slowly for the rest of the year to just above \$17/t with a rise to above \$17.60/t in the last two months. RGGI prices fluctuated within about a 50-cent range over the year, hitting their high point in May at \$5.75/short ton (st) and the year's low in August at \$5.23/st. We expect both markets to firm over 2020 in expectation of next year's tightened compliance rules.

WESTERN CLIMATE INITIATIVE

The first half of 2019 saw more excitement in the California/Quebec carbon market than the second, with a bull run that started after an oversubscribed February auction and continued through the May auction. Though all four quarterly auctions were oversubscribed, the May one featured both the highest clearing price and the highest premium over the auction price floor ever seen at a WCI joint auction.

Another initially bullish factor was the absence at auctions of one of California's largest emitters: the power company Pacific Gas and Electric (PG&E) was undergoing bankruptcy proceedings that precluded it from auction participation and rendered it less active in the secondary market. Since the firm still has a compliance obligation under the ETS, market players assumed it would eventually need to purchase a huge amount of allowances. That drove up prices for CCAs on expectations of big demand from the utility in the near future. However, media reports in August indicated that PG&E had enough allowances from allocation to its natural gas division to cover its short-term compliance obligation, making a sudden burst of demand from this large player unlikely. In mid-December, a bankruptcy judge approved two settlements to cover the utility's liabilities from the devastating wildfires in 2017 and 2018 whose costs caused it to declare bankruptcy in the first place - this renders PG&E more likely to reach its self-declared goal of exiting bankruptcy by June 2020.

In our view, the CCA price retraction from May through November is also due to news of decreased California power sector emissions, and data showing lower-than-expected fuel consumption in the WCI as a whole - both make for lower allowance demand. Also, a raft of new speculative buyers participated in the secondary market and at auctions from March to May but were less active the rest of the year.

October saw the highest monthly traded CCA volume of the year, which is not unusual given the WCI's November partial compliance deadline. The fact that the US federal government sued the state of California over its participation in the WCI on 23 October may also have played a role in the volume increase, though the major price dip it caused lasted only one day.

The Trump administration's justice department filed suit in the Eastern District of California on grounds that it was illegal for California to have linked its carbon market to that of Canadian province Quebec, since treaties with foreign jurisdictions fall under the purview of the federal government only - not state governments or local jurisdictions - as per the US constitution. We foresee little further market impact of this suit, as it does not directly challenge or seek to eliminate California's cap-and-trade programme - only the validity of its link to that of Quebec, which accounts for a small portion of the WCI in terms of volume.

REGIONAL GREENHOUSE GAS INITIATIVE

Allowance prices in RGGI mimicked those of the WCI in that they were highest in May, after having increased strongly in late February and March. The quarterly allowance auction in March cleared at a nine-cent premium to the secondary market price at the time, which drove that short-term price increase.

Both prices and volumes were low over the north-eastern states' summer months, during which RGGI emitters' CO₂ output dropped more than 10 percent amid milder weather that reduced the need for air conditioning. Particularly Massachusetts and RGGI's biggest member New York saw their power generating facilities emitting much less than in previous months - relative to the same timeframe in previous years.

While fundamentals thus put bearish pressure on prices, the fact that RGGI will cover more emissions in 2020 added bullish pressure that kept prices relatively stagnant over H2. New Jersey, which was part of RGGI from its start in 2009 through 2012, re-joined the

Table 3.1: North American carbon markets

	2016		2017		2018		2019	
	Mt	€ million	Mt	€ million	Mt	€ million	Mt	€ million
WCI	338	4 088	628	7 351	887	11 763	1 380	20 738
*RGGI	173	825	185	615	239	1 107	293	1 627
Ontario	n/a	n/a	110	1 272	n/a	n/a	n/a	n/a
Total	511	4 913	923	9 238	1 126	12 871	1 673	22 365

*The units traded in the Regional Greenhouse Gas Initiative are short tons, which are 0.907 metric tonnes. For unit consistency, we have converted RGGI's total volume figures to metric tonnes.

programme starting 1 January 2020: the state emitted 19.3 million short tons of CO₂ in 2018, while its 2020 cap is 18 million short tons.

These expectations for 2020 likely contributed to the major volume surge at the end of 2019 (see Figure 3.1): December transactions accounted for 45 percent of the entire year’s exchange traded volume, as market participants moved their positions further out on the curve after the quarterly auction early in the month. That auction settled at a nine-cent discount to the secondary market price, after which RGA prices dropped significantly.

Overall, pricing was influenced strongly by RGGI’s Emission Containment Reserve (ECR) - a mechanism somewhat resembling the market stability reserve (MSR) of the EU ETS in that it reduces the amount of allowances in circulation. Starting in 2021, RGGI states implementing the ECR will withhold allowances from circulation (i.e. not offer them at the quarterly auctions) if prices fall below a pre-agreed level (\$6/st in 2021). This ensures that a supply cut (which makes prices go up if demand remains the same) only occurs if it is unexpectedly cheap to reduce emissions. The ECR was adopted by all RGGI states except Maine and New Hampshire, which together account for only a small portion of the cap. It contains 10 percent of the total allowance budgets of the eight states that implemented it. This means that if RGA prices hit \$6/st or less in 2021, those states offer 10 percent fewer allowances at auction, essentially taking that volume out of circulation. This in turn reduces the supply/demand ratio for allowances, which typically brings prices back up, which in turn incentivises further emissions cuts.

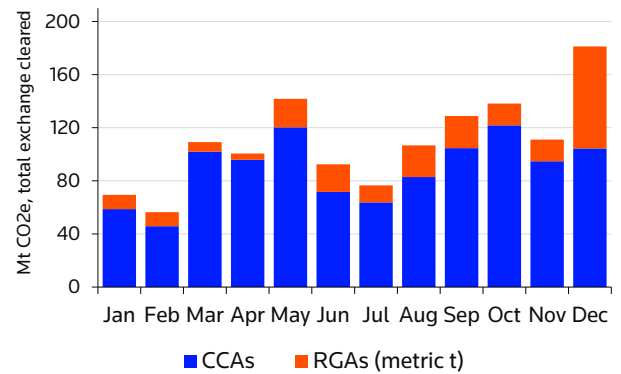
The ECR’s “trigger” price has been a primary driver of RGA prices over 2019 because market players anticipate that level being hit early in 2021. Indeed, prices did not exceed \$6/t during 2019.

Another factor influencing longer-term price expectations in RGGI over 2019 was the ongoing prospect that the coal-heavy and populous state of Virginia would join, becoming the programme’s 11th participant after New Jersey rejoined. Virginia’s Democratic governor made establishing an ETS that will link to RGGI a priority, despite strong opposition from the state’s Republican-dominated legislature. That legislature rejected in January a proposal to join RGGI outright, but the state’s environment agency moved forward with setting up an ETS via regulations that did not require legislative approval. The legislature then passed a bill to block adoption of a cap-and-trade programme without its approval, but the governor vetoed that bill in April. The question of how proponents of Virginia joining RGGI could move forward was punted to state elections in November, as it looked like Democrats could take over the legislature and thereby remove opposition to becoming part of the carbon market. Indeed, Virginia’s elections resulted in a democratic majority in the state’s upper and lower legislative chambers - this simplifies entry into RGGI, as the governor may get direct legislative approval to join the programme by 2021.

MEXICO

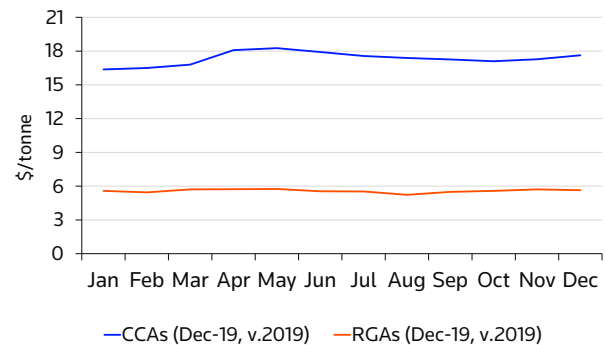
Emitters in Mexico have been preparing to be covered by an emission trading scheme since the country’s government started

Figure 3.1: CCA and RGA traded volumes in 2019



Source: Intercontinental Exchange (ICE) and Nodal Exchange

Figure 3.2: CCA and RGA prices in 2019



Source: Intercontinental Exchange (ICE) and Nodal Exchange

developing one back in 2012. The process has been slowed repeatedly, mainly by changes of government: new heads of state keep pledging to continue the effort toward a national carbon market, but then put it on the back burner in the face of other priorities. Indeed, rulemaking for Mexico’s long-awaited pilot ETS was delayed after current President Andres Manuel Lopez Obrador (AMLO) took office in December 2018: though it was scheduled to begin in January 2019, the AMLO administration took well into the year to familiarise itself with the programme and to publish its final rules.

Mexico’s environment ministry released draft ETS rules in May 2019 for public consultation, then officially adopted them in October. These laid out the timeline and structure of the pilot programme, but did not contain important details like the annual emissions cap. Those specifics in turn followed in late November, with emissions limits and sectoral breakdowns for the first two years of the pilot laid out, as well as confirmation of the official start on 1 January 2020. Mexico is now the first country in Latin America running a national ETS.

The scheme covers the roughly 300 emitters in Mexico that generate over 100 000 tonnes CO₂ equivalent per year. These are primarily in the power sector (accounting for about half the covered emissions), the oil and gas sector (35 percent of covered emissions),

as well as several other industrial sectors for a total of 271.3 million tonnes in 2020 and 273.1 million in 2021. Because 2022 constitutes the programme's "transition year" to the mandatory phase, its cap has not yet been set: compliance obligations enter into force for all covered emitters in 2023.

The Mexican ETS shares many logistical components with the WCI, including three-year compliance periods during which emitters may bank allowances, and a final compliance deadline on 1 November of the year following the final compliance year. Covered entities may meet up to 10 percent of their compliance obligation with offsets, though the projects that generate those units must be in Mexico. The government has not yet published approved offset methodologies.

Though the pilot ETS is already in force, we expect little market activity in this first year given that several logistical components - including in registry design - are still outstanding. Since the rules allow for little to no carryover of allowances from the pilot phase to the compliance phase in 2023, we expect little trading in the pilot phase overall.

4. China

The China national ETS has finally awakened after a long period of hibernation. Intense preparations have been taking place in 2019 to get the market's rules in place and the participants ready so that trading can start in 2020. After the release of several draft policy documents last year, the authorities are set to publish the final legislation early this year. We expect a detailed regulatory framework for the national ETS to be released in Q1 2020 and actual trading to start in Q3 2020. In the short term, the existing nine ETS pilots - all of which cover at least some non-power sectors - will continue to operate in parallel to the national market, as the power sector emissions will be covered by the national scheme.

THE NATIONAL ETS TAKES SHAPE

After China's major government reshuffle in 2018, the new Ministry of Ecology and Environment (MEE) (taking over from the National Development and Reform Commission (NDRC)) is in charge of getting the system off the ground. 2019 gave more clarity on the design and operational rules of China's national emission trading system. The MEE started the process of data collection from power entities in May last year as a basis for developing allocation rules and the setup of a national registry. The draft allocation plan was released in September as a basis for trial allocation. Table 4.1 gives a detailed account of key policy documents published over 2019 clarifying the rules of the national emissions trading.

The national ETS will cover 1700 enterprises in the power sector that collectively emitted roughly 4.5 billion tonnes CO₂ in 2019. The power sector emissions covered by the nine pilot systems will

OUTLOOK FOR 2020

We expect the WCI to continue its firm trend in 2020 for several reasons. In the near term, we believe PG&E's return to quarterly allowance auctions will increase demand for allowances at least slightly, relative to auctions without participation from this large emitter. We also expect the reduced amount of allowances offered at those auctions to support high prices: the allowance supply is comparatively lower than previous years because all auctions in those previous years sold out, meaning no unsold permits carried forward to subsequent auctions. Finally, overall expectations of a tighter market in the WCI's 2021-2030 phases given all the new rules going into effect in 2021 make for higher prices in the run-up to that year.

Whether RGGI's expansion to include New Jersey ends up bullish for prices remains to be seen: additional demand from the state's covered entities may not outweigh the amount of allowances New Jersey adds to overall supply. Environmental groups in the region have criticised the state's regulators for setting the 2020 cap too generously. If the stronger-than-expected emissions decline seen in New York and Massachusetts during 2019 continues, RGGI could well be longer than expected.

be covered by the national scheme, but the pilots are set to run in parallel with the national ETS going forward for non-power sector emissions. The government intends to expand the carbon market to cover eight industry sectors by 2025.

The September draft allocation plan confirmed earlier reports that China's national ETS will have an intensity-based target rather than a fixed cap as in the EU ETS. The choice of benchmark is an essential parameter that will define the required reduction in the ETS sectors, which effectively reflects the desired emissions intensity for the power sector with ex-post adjustments for actual production.

Allowances will be handed out for free, based on fuel-specific benchmarks. The initial allocation is set to be generous. From power generation data for 2019 and the proposed benchmarks, we have estimated the total allocation for 2019 to reach between 4 Gt and 4.4 Gt of allowances.

The MEE plans to gradually tighten the allocation as the system matures by lowering the benchmarks over time. At a later stage when the ETS is fully functioning, auctioning may be introduced.

The national ETS regulation explicitly states that emitters will be allowed to use offsets for compliance. However, the initial phase starting in 2020 does not allow offset use at the national level and it is so far unclear when this will change.

2019 also saw extensive initiatives for capacity building of ETS-related personnel in the provinces. The NDRC and its provincial affiliates had established a pool of experts in ETS design and implementation before 2018, and while those were largely

transferred from the NDRC to the MEE at the national level, the local level restructuring is still underway. The trial allocation plan, for example, was accompanied by requirements for training sessions on allowance allocation and management by the MEE for its provincial counterparts - these were conducted between October and early December 2019 and attended by key staff from provincial authorities and 2400 power generation facilities from every province in China. The ETS trainings have improved local participants' competence in the national ETS.

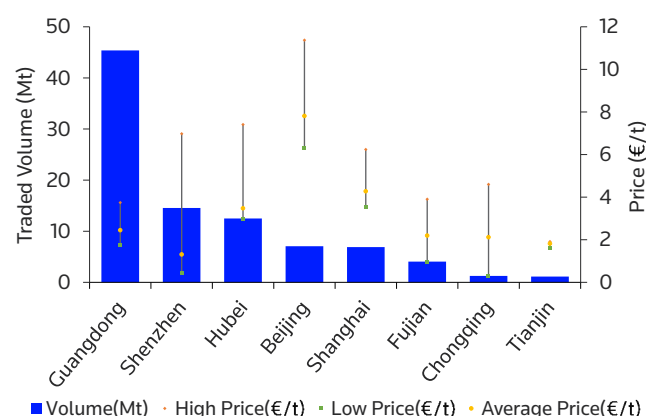
PILOT ETS PERFORMANCE

In 2019, about 93 million allowances changed hands in the nine Chinese pilot emission trading systems (seven official pilots plus Fujian and Sichuan) - these transactions were collectively worth €272 million.

Both volume and value were significantly higher than the previous year, in which less than 73 Mt were traded and the market value was €194 million.

In terms of liquidity, Guangdong continued to top the list of pilots: allowances traded on the Guangdong Exchange increased sharply and reached 45 million, with a market value of more than €111 million. We attribute this sharp climb in trading and prices to policies released in 2019. The Development Plan for Guangdong-Hong Kong-Macau Greater Bay Area, released by the Central Committee of the Communist Party and the State Council in February 2019, initiated the creation of a futures exchange in Guangdong's capital Guangzhou, with carbon allowances as its first futures product. The favorable investing environment attracted liquidity providers, which in turn led to an increase in the number of transactions involving financial products such as carbon repo deals

Figure 4.1: Traded volume and prices on exchanges in China's pilot ETS 2019



Source: Refinitiv

and futures - those accounted for 18 percent of the total traded volume in Guangdong in 2019 (Table 4.2).

With increased certainty that allowances of the ETS pilots will not be valid under the national ETS, regional authorities sought to reduce surplus allowances in their programmes with more tightening, and the tightening was typically done by adopting tougher benchmarks and/or tougher emission reduction factors. Average allowance prices in Beijing, Hubei, and Shanghai reached record highs for this reason. Especially in Beijing's carbon market, prices reached CNY87.5/t (~ €11.4/t)* on 18 September - more than double the average price in 2018. Because of the higher prices, fewer market participants were willing to undertake transactions

Table 4.1: Milestones in China national ETS in 2019

Date	Policy document	Key events
Jan-2019	A notice on requiring reporting and verification of 2018 carbon emissions data, as well as development of monitoring plans going forward, by MEE.	Facilities in eight industrial sectors (power and heat, iron and steel, non-ferrous metals, construction materials, chemicals, petrochemicals, pulp and paper manufacturing, and civil aviation) were required to submit the reports.
Apr-2019	The Interim Regulation on the Management of Carbon Emission Rights Trading (draft for comments), by MEE.	This is the first major policy released by the MEE after restructuring and constitutes primary legal basis for the national carbon market. We consider it as a signal that the national government is serious about pursuing the national ETS - but the draft regulation is still in the comment phase. It has been endorsed by the Ministry of Justice, and normally it takes one to three years to receive final approval by the State Council to become official regulation.
May-2019	An official notice requiring provincial authorities to submit a list of key emitters in the power sector to be covered by national ETS, by MEE.	These are power generation entities with annual emissions of at least ~26,000 tonnes of CO ₂ in one year over the period of 2013-2018. Power generating facilities owned by companies in other sectors (such as on-site generation for metals or chemicals manufacturing) are formally included within the scope. Provincial authorities submitted their lists by September, revealing that 2400 power generating facilities (including 700 industrial self-owned power plants) exceeding the threshold.
Sep-2019	A technical guidance on trial allowance allocation for the power sector, by MEE.	According to the Plan, entities will first receive allowances at 70 percent of their 2018 power generation level multiplied by a corresponding benchmark factor. Allocation will be adjusted ex-post, reflecting the actual generation in 2019. Gas-fired power plants will receive allocation, but do not have compliance obligations. Therefore, only coal-fired power plants are covered at this stage. The MEE is currently analysing the results of its trial allocation and will revise benchmarks and allocation methods accordingly.
Dec-2019	An interim provisions on accounting rules for carbon allowance trading, by China's Ministry of Finance.	This is slightly a simplified version from the draft regulation in 2016. All enterprises that will be regulated by the national scheme are required to apply these rules as of 1 January 2020.

*In this report, the exchange rate is CNY1 = €0.13

Table 4.2: China Pilots ETS trading summary in 2019

Pilots	2019 annual			Changes 2018-2019		
	Volume (Mt)	Value (€ Million)	Average Price (€/t)	Volume	Value	Price
Guangdong	45.38	111.05	2.45	60.0%	141.7%	51.0%
Shenzhen	14.55	19.05	1.31	13.7%	-51.3%	-57.2%
Hubei	12.49	43.40	3.47	12.9%	40.7%	24.7%
Beijing	7.07	55.25	7.81	-20.8%	24.2%	56.9%
Shanghai	6.89	29.47	4.28	13.9%	27.1%	11.5%
Fujian	4.07	8.93	2.20	38.5%	36.4%	-1.5%
Chongqing	1.27	2.68	2.12	369.8%	1654.4%	273.4%
Tianjin	1.13	2.06	1.82	-50.6%	-40.4%	20.5%
Total	92.85	271.89	2.93	27.7%	40.3%	9.9%

of such expensive units and led to a decrease in traded volume in Beijing.

Tianjin and Shanghai held one-time auctions on 27 June and 29 November (compliance deadlines) respectively, to help short entities comply and balance the supply and demand. In total, some 1,076,539 allowances were sold at the floor price of CNY14.6/t (€1.9/t) to ten companies in Tianjin, and 73,421 allowances were sold at the floor price of CNY48/t (~ €6.2/t) to three companies in Shanghai.

Unlike the other pilots, Shenzhen bucked this trend by experiencing a large drop in market value and allowance price, after surpassing Hubei to become the pilot with the second most trading last year. With an average price of CNY10/t (~ €1.3/t), the Shenzhen pilot's market value was only €19 million - half of 2018. The market was clearly oversupplied, and the price decline was exacerbated by the fact that financial institutions were losing interest in the pilots given the imminent national programme - they sold their oversupply of allowances at low prices.

In Tianjin, trading occurred almost entirely between May and August due to a change in trading rules. The city's emissions exchange published requests to purchase allowances on behalf of covered entities. All trades for the 2018 vintage allowance (TJEA18) took place bilaterally at CNY 12-14/t (~ €1.6-€1.8/t) except the one-time auction held in June, and those trades were driven solely by compliance needs.

On the administrative front the reshuffle of climate policy competency that occurred at both the national and regional level in 2018 impacted provincial officials involved in pilot ETS as well. All provinces and municipalities that run pilot ETS established new "Department of Ecology and Environment" and "Bureau of Ecology and Environment" (the provincial and municipal MEE counterpart) and disclosed that new body's personnel in 2019. All pilots held trainings and capacity building sessions, the key purpose of which was to facilitate a smooth transition from pilot ETS to the national ETS.

OFFSET MARKET

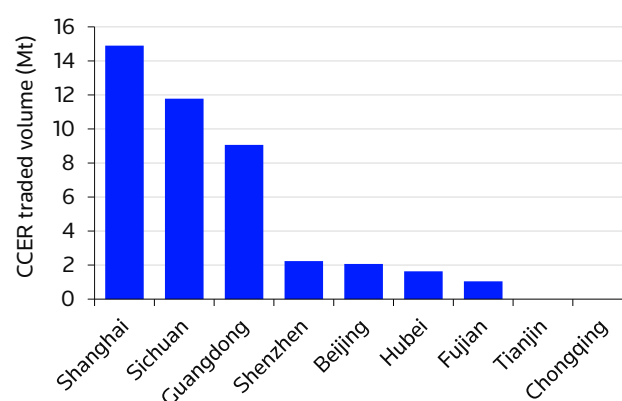
In 2019, the market for Chinese Certified Emission Reductions (CCERs, Chinese offsets) amounted to 43 million ts – increased

by 40% from last year. This is because from March 2017, all CCER approvals were suspended while the NDRC revised regulations. Operation of the CCER trading platform resumed only in May 2018, so the year 2019 encompassed most of the correlating offset market rebound.

Among the pilots, Shanghai continued to have the most active CCER trading: almost 15 million CCERs changed hands in 2019, accounting for 35 percent of the total traded offset volume in all pilots. Guangdong was second with over nine million CCERs changing hands. Offsets are traded outside the pilot ETS as well, with the Sichuan United Environment Exchange being nationally accredited for CCER transactions. Nearly 12 million CCERs traded on this platform in 2019. Although entities in most pilots may buy CCERs on any of the nine exchanges as long as they cancel them in the CCER registry, they always purchase on the pilot exchange of the province in which they have their compliance obligation.

The increase of trades in the Sichuan exchange is due to it having opened multiple investment platforms to individual investors in H1 2019. Chongqing and Tianjin did not see any CCER trading in 2019.

Only the Shanghai, Beijing and Sichuan exchanges disclose CCER prices - their online traded price of a CCER ranged from €0.8 to €3.5 /t. Prices for CCERs trading on the Shanghai market were

Figure 4.2: CCER traded volume in nine regional markets in 2019

Source: Refinitiv

much higher (€3.3 to €3.5/t) compared with those of the Beijing market (€0.8 to €1.6 /t) and Sichuan market (€0.7 to €1.7/t).

In terms of offset development, since oversupply of CCERs has been recognized as a major factor putting downward pressure on allowance prices in many pilots, the central government has still not yet clarified when it will resume CCER project registration and issuance - those have continued to be suspended since March 2017 despite reopening of exchange trading and registries. By the end of 2019, in total 2,871 Chinese offset projects have been made public for review and 1,104 have been registered - CCERs have been issued to 358 projects. Since the regulator started issuing CCERs in 2014, around 73 million have been issued. Certification reports are available for 291 of those, showing that they collectively represent 59 million tonnes CO₂ equivalent. The reports indicate that wind, small-scale hydro, solar PV and household biogas projects are most popular - this is due in part to the offset rules for CCERs in the pilot carbon markets.

Beyond CCERs regulated by the national authority, some pilots have developed their own offset mechanisms. The resulting units are only traded and accepted in the pilot where they are issued. Guangdong's Pu Hui Certified Emission Reduction (PHCER)

mechanism issued roughly 210,000 local offsets in H2 2019. It also held three offset auctions in November, selling 197,395 PHCERs with an average closing price at 4.2 €/t.

OUTLOOK FOR 2020

We expect the first actual trading in China's national ETS to take place this year. The MEE is currently analysing the results of its trial allocation and will revise benchmarks and allocation methods accordingly. We expect policy documents on final allocation and a cap-setting, which are now at the stage of soliciting opinions, to be endorsed by the Ministry of Justice and finally approved by the State Council in Q1 2020. The national market is officially entering into force in the beginning of 2020 as the legislation is completed.

On January 8, the MEE issued a notice requiring reporting and verification of 2019 emission data by 31 May 2020. Allowance allocation related information must be completed for allocation and trading to start. We therefore expect actual trading in the national ETS to start early Q3. Based on the benchmarks used in the trial allocation and our analysis of the Chinese coal fleet, we expect initial prices of allowances in the national ETS to be around €10/t.

5. South Korea

The overall market value of the South Korean emissions trading system (KETS) decreased in 2019, as a drop in traded volume outweighed the effect of rising allowance prices. Higher prices were the result of tighter supply due to emitters' unwillingness to sell surplus permits. The KAU-19 contract price at KRX increased 70 percent over the year. While allowances (KAUs) were traded on exchanges, Korean offsets (KOCs) were traded almost exclusively over-the-counter (OTC). The government sold almost 8 million allowances (KAUs) to emitters at monthly auctions throughout 2019.

MARKET OVERVIEW: EVER INCREASING PRICES

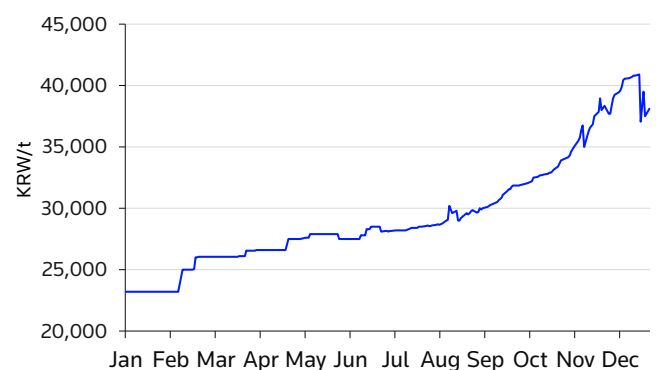
Almost 17 million allowances (KAUs) and offsets (KOCs) changed hands in the Korean emissions trading system (ETS) in 2019, which is 23 percent decrease vs. the previous year. Due to stronger KAU prices in 2019 (Figure 5.1), the total value of the Korean ETS (including both exchange- and auction volumes) suffered only a moderate decrease. The total value in 2019 was KRW 488 billion (~€373 million), slightly lower compared to KRW 500 billion market value in 2018.

Some 8 million KAUs traded on the Korean exchange (KRX), while almost 8 million KAUs were sold on government auctions. Only half the amount of allowances that traded on the exchange in 2018 changed hands on the exchange in 2019, while auction volumes were 70 percent higher than in 2018.

The Korean carbon market is over-allocated, but only very few allowances were in circulation as Korea's industrial entities are banking KAUs ahead of next year's compliance deadline. This makes

for artificially limited supply with resulting high prices, as can be seen in Figure 5.1. The government has been trying to address the price hike through policies forcing emitters holding a significant surplus to sell rather than continuing to bank. Introduced in mid-2019, those modifications have not resolved the supply problem: traded volume remains low, as can be seen in Figure 5.2, and prices continued to rise throughout the year. KAU19 contracts gained more than 70 percent over the course of the year, reaching a record 40,000 KRW (~€30/t) in late December. Activity in the Korean market usually increases during several months leading to the annual compliance deadline in September, while for the rest of the year trades are low, which explains the increase in traded volume over May-September.

Figure 5.1: Korean Carbon Price in 2019 (KAU19)



Source: Korea Exchange (KRX)

About half of the 2019 KAUs volume was sold at auctions. The Korean government held 12 auctions over the year (vs. only one in 2018), selling nearly 8 million KAUs total. In the most recent auction, clearing prices surpassed prices for KAU-19 contracts traded on KRX at that time. The oversubscription demonstrated Korean compliance entities' challenges in covering emissions with allowances in the secondary market.

Exchange data does not reflect the actual market volume in Korea, as a significant share of transactions are made OTC with low price transparency. According to Korean consulting firm Ecoeye, which tracks OTC transactions, over 16 million KAUs traded OTC with close to 55 percent of that volume being KAU-18 contracts and about three million being Korean offsets or KOCs. Ecoeye estimates that OTC units normally trade at a 10-20 percent discount to the exchange.

Nearly half the OTC transactions of KAUs in 2019 took place in August, prior to the compliance deadline for 2018 emissions in September.

OFFSET MARKET

Korean firms can cover up to 10 percent of their compliance obligation with offsets – of which half can be sourced from non-Korean projects. Offset units are traded mostly over-the-counter (OTC) in Korea: only about one million KOCs traded on the KRX exchange in 2019, whereas Ecoeye's data shows roughly three million were sold over the counter in 2019. Mimicking allowance prices, KOC prices (at KRX) increased dramatically over the year from KRW 24 500/t (~€19/t) in early January to KRW 39 500/t (~€30/t) in late December.

Nearly all KOCs are "converted" CERs from Korean CDM projects. KETS rules allow compliance entities to buy those CERs and cancel them from the CDM registry as an act of conversion into KOCs. In total, 23 million CERs from Korean projects were cancelled to be converted into KOCs - about half the total volume cancelled from the CDM registry overall.

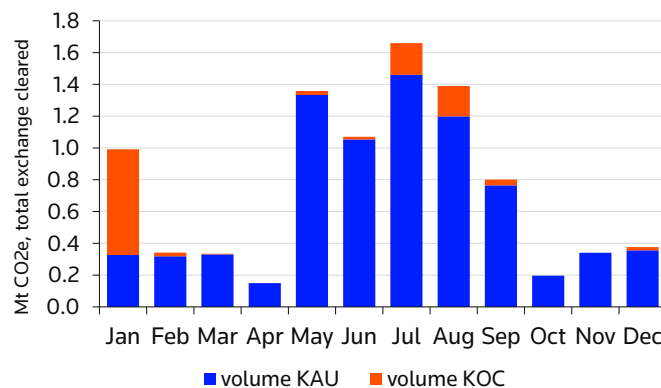
Regulators plan to remove the distinction between international and domestic offsets in the scheme's third phase starting in 2021. This would theoretically increase demand for international offsets to 60 million units annually.

OUTLOOK FOR 2020

The South Korean government plans to tighten KETS rules in the third phase of the KETS from 2021-2025 by reducing annual allocation by 4 percent compared to the current 2018-2020 phase. It will also increase the share of KAUs it auctions (rather than allocating to emitters for free) to 10 percent from the current three percent. These prospects send a bullish signal to the market, which is already seeing record-high prices due to a lack of permits in circulation.

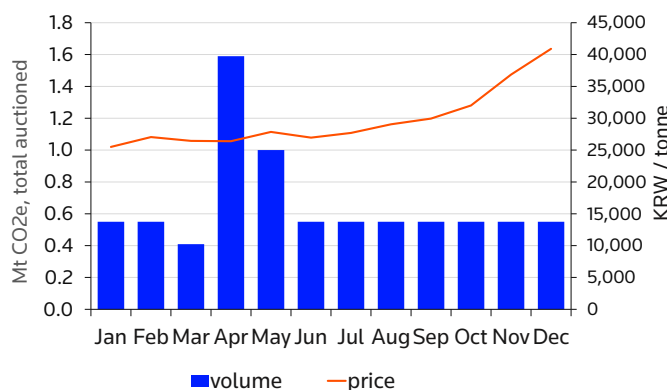
We expect prices for KETS allowances and offsets to stay high in 2020, due to the existing shortage of available units and expectations of a tighter market. But decreasing energy-related emissions (as a result of lower power demand and increased nuclear power generation) forecasted for 2019 and 2020 could dampen the price growth by the end of this year.

Figure 5.2: KETS traded volumes (at KRX) in 2019



Source: Korea Exchange (KRX)

Figure 5.3: KETS auctioned volumes in 2019



Source: Korea Exchange (KRX)

Table 5.1: KETS trading summary in 2019

Product	Exchange-traded volume [Mt]*	Exchange-traded value [bn KRW]	OTC volume [Mt]**
KAU-20	0.03	1.1	0.9
KAU-19	2.0	65.25	7.4
KAU-18	5.8	161.69	8.9
Offset (KOC)	1.2	31.93	3.4
Total	9.0	259.94	20.5

*source: Korea Exchange (KRX)

**source: Ecoeye

The Korean government will sell 8.25 million permits over 2020, some 300 000 more than in 2019. We anticipate fully subscribed auctions in line with current trend of hedging against future price increase.

6. New Zealand

The total value of New Zealand's ETS increased slightly compared to 2018 as both prices and traded volume increased. Prices stayed above the programme's de-facto price ceiling of NZ\$25/t (or €15/t) for most of the year because market participants expected the government to announce major reforms to the ETS that would tighten the market going forward. A proposal containing such reforms was made public in late December, causing NZU prices to jump 15 percent overnight. We expect the prospect of a tighter market to keep sending bullish signals to the market in 2020.

MARKET OVERVIEW: PRICE FLUCTUATIONS ON POLICY CHANGES

More NZUs changed hands in 2019 than during the previous year. Total volume came in at 119 million compared to 88 million in 2018. NZU prices, which hinged on news from the government about long-awaited ETS reforms, fluctuated accordingly throughout the year with a steep upswing in December. The market value increased from €1.2 billion in 2018 to €1.7 billion in 2019.

During the first four months of 2019, NZU prices remained at or above the so-called fixed price option (FPO) of NZ\$25/t because the government had indicated in late 2018 that an FPO increase was imminent. The FPO is a fee that emitters can pay for emissions directly to the government, rather than buying and then surrendering NZUs for compliance. It thus constitutes a de facto price ceiling under "normal" circumstances. Still, prices stayed above this level for the first months of the year on expectations that the FPO would be raised (or eliminated altogether).

Without any news on changes to the FPO by the 2018 compliance deadline in, market players sold off their NZUs and opted to pay the fixed price instead, making May the month with the highest traded volume in 2019 (see Figure 6.1) and caused a correspondingly large price slump that continued through Q3 (see Figure 6.2). Government data released in August revealed that more than half of total emissions of 32.8 million tonnes CO₂e were met through the payoff option, rather than by surrendering NZUs.

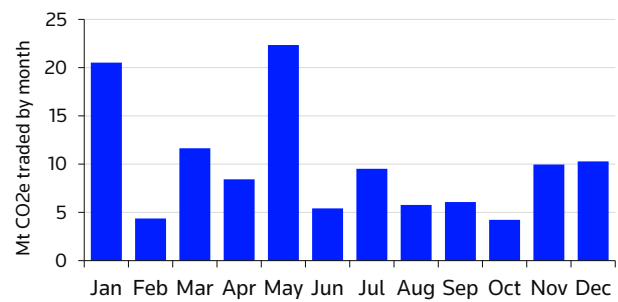
The month of May also saw a string of mixed market messages, as the government released a fresh batch of ETS reform proposals mid-month that included dropping the FPO altogether by 2022, but not clarifying whether it would remain at NZ\$25/t until then. Subsequent statements by ministry officials indicated the FPO would stay at its current level throughout 2019, which slowly brought prices back up toward NZ\$25/t and kept them there for most of Q4.

In late December, the government released a new draft carbon budget envisaging major change to the ETS. These include increasing the FPO to NZ\$35/t (~€20/t) for 2020 emissions. The very next day, the NZU price increased over 15 percent, soaring to a record NZ\$28.50/t.

REFORMS AHEAD

Beyond the FPO, December's carbon budget proposal - which is separate from but related to the rounds of ETS revisions that have been working their way through the regulatory and legislative

Figure 6.1: NZUs - monthly traded volumes in 2019



Source: New Zealand Environmental Protection Authority

Figure 6.2: NZUs - spot daily prices in 2019



Source: CommTrade

process for years - also includes other important changes to the NZ ETS. A cost containment reserve (CCR) would be introduced in 2020 and replace the FPO sometime in 2021, fulfilling the government's promise in May that the fixed price would be phased out by 2022. The CCR would apply for auctions, with the government releasing additional allowances for sale if a trigger price is reached at an auction - that trigger price would be NZ\$50/t (~€30/t) for the five-year period from 2021 through 2025. Other ETS that employ CCRs (albeit in different forms) include the US Regional Greenhouse Gas Initiative and Western Climate Initiative.

The NZ ETS was originally designed to operate without a specific cap, as it set a limit on emissions from covered sectors (forestry, stationary energy, industrial processing, liquid fossil fuels, waste and synthetic GHGs) and obliged compliance entities to surrender carbon units (or pay the FPO) for each excess tonne. The new draft rules set a cap and foresee the government auctioning carbon units instead of giving most allowances to emitters for free.

The proposal precludes use of international carbon units over the five-year period, although the nuances of that ban are still subject to modifications pending developments at e.g. the UNFCCC. New Zealand's recently adopted Zero Carbon Act, which aims to make the country nearly carbon neutral by 2050 and allows sourcing of emissions reductions from overseas - but only as a last resort. Theoretically some international carbon units could thus enter the NZ ETS if the country faces difficulties reaching its Paris target.

AGRICULTURE IS STILL OUT

The proposed reforms did not include agriculture, which accounts for nearly half of New Zealand's greenhouse gas emissions and has therefore long been the subject of conflict between green groups pushing for its inclusion in the ETS and farming/ranching interests who argue that would kill their industry. The government had been vacillating for years over whether and how to include agriculture in the ETS - until it announced definitively in late October that the sector would not be part of the country's carbon market.

Government officials instead said they would work with farmers and ranchers to develop a separate carbon pricing mechanism for the sector by 2025. In 2022, New Zealand's independent Climate Change Commission will review progress toward this separate mechanism, with the mandate to include agriculture in the ETS before 2025 if it deems progress lacking.

OUTLOOK FOR 2020

The carbon budget proposal is under public consultation until the end of February and depending on how fast the plans proceed through the legislature, a final decision could come in the second half of this year.

Meanwhile, 2020 is the first year in which emitters must surrender permits (or pay the fixed price) for all of their previous year's emissions. Non-forestry ETS participants had been allowed to surrender only one allowance for every two tonnes CO₂ emitted, but that option has been on a pre-agreed phaseout: emitters had to surrender enough units to cover 67 percent of their 2017 emissions in 2018, with the share growing to 83 percent of 2018 emissions in 2019 and 100 per cent of 2019 emissions in 2020.

Expectations of a tighter market, due to the full compliance requirement and the proposed revisions, should continue putting upward pressure on NZU prices in 2020 - especially around the May compliance deadline. In the case of NZU prices above the fixed price option at NZ\$25/t, compliance entities will likely prefer the latter option to the greatest extent possible.

Table 6.1: NZUs - spot prices

Closing prices for contracts on the last trading day of 2019 vs. 2018

NZUs - spot (NZ\$)	2019 prices	2018 prices	Difference
	28.5	25.12	13%

7. Paris Agreement

The 25th UN Climate Change Conference (COP 25) in Madrid ended with no agreement on rules for international carbon trading (Article 6), the final piece to complete the Paris Agreement rulebook. The fate of UN's Clean Development Mechanism (CDM), and its transformation into a post-2020 market mechanism, remains one of the most critical of the decisions left open for COP26 in November after negotiators could not agree on how much of the current mechanism will be let into a new one. The absence of common rules will not necessarily prevent Parties from establishing bilateral agreements and using markets to meet their National Determined Contributions (NDC).

A YEAR WITHOUT PROGRESS

With COP24 in Katowice having punted all important market-related issues, negotiators were prepared that carbon trading rules would be front and centre in 2019. The June intersessional talks in Bonn did not narrow down much the plethora of open options. The relevant parts of the Paris Agreement (Articles 6.2 on international trading and 6.4 on a market mechanism) remained full of bracketed text going into the talks in Madrid.

The Madrid talks became the longest-ever COP, partially because it looked like the disparate positions on Article 6 might be reconciled

- but even though the final draft Article 6 texts contained only few areas of disagreement, those were so deep that negotiators ended up rejecting the final drafts altogether. None of the details for international carbon trading rules were adopted, and the fate of the Clean Development Mechanism (CDM) remains unclear. Decisions were again postponed to the next annual climate summit, COP26 in Glasgow at the end of 2020.

The key points of disagreement included:

- How to account for internationally transferred mitigation outcomes (ITMOs) via corresponding adjustments to the NDCs of the countries involved - this is key to avoiding double counting of units.
- Whether to apply those same adjustments for a market mechanism under Art. 6.4, with some parties arguing that credits generated by projects outside of the host country's NDC do not need to be accounted for.
- How to interpret the goal of "overall mitigation in global emissions" in terms of transferred mitigation, both for trading among parties (Art. 6.2) and for a new mechanism (Art. 6.4). Parties had proposed cancelling some share of the units transferred in order to ensure net mitigation rather than just redistribution of emission reduction. In the end, they could

not agree on what share, or even whether to require such cancellation.

- Whether trading should involve a share of proceeds going to the adaptation fund, and if so, what share.
- Whether and to what extent credits from CDM projects (CERs) should be valid in a post-2020 regime (i.e. carry-over of “old” Kyoto units).

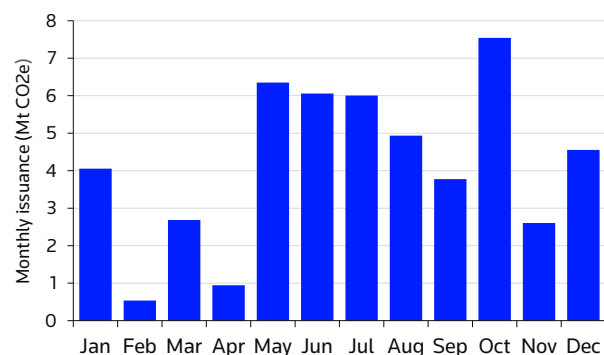
Brazil, the U.S. and Australia were the major opponents and prevented a deal on the above questions. Saudi Arabia, India and China also pushed for options that breached the environmental integrity of the Paris Agreement. In particular, the latter countries insisted to allow the carry-over of Kyoto units into the future regime despite this being unacceptable to most parties. Beyond the discussions on the CDM, Australia also insisted on counting its surplus of 400 million CER units from the Kyoto period as part of its NDC.

By the end of the second week of negotiations, a draft final text saw the carry-over of unused CERs allowed (albeit with restrictions on applying them toward an NDC), in exchange for Brazil accepting the rule that transfer of carbon units requires corresponding adjustments to countries’ NDCs (albeit with an undefined opt-out period). In the end, however, most parties considered the “loopholes” this text left too large: 31 countries led by Costa Rica signed a set of integrity standards strict enough to preclude the carry-over of old CDM units and opting out of ITMO accounting. This final lack of agreement deadlocked negotiations, which will therefore resume this year.

CLEAN DEVELOPMENT MECHANISM IN 2019

CER prices remained miniscule throughout 2019 at around 21 – 22 cents per tonne for Dec-19 delivery. Only 3.4 million CERs traded on exchanges during 2019 - a 50 percent decrease from the previous year (Table 7.1). Primary market volumes remained in line with 2018 at about 8 million tonnes. The value of this primary market was thus a tick higher than in 2018, whereas secondary market value decreased from 2018. Roughly half of the CERs cancelled in 2019 were applied toward compliance to the Korean ETS as offsets and to Colombia’s carbon tax in lieu of that country’s \$5/t payment requirement. The rest satisfied corporate social responsibility (CSR) goals of voluntary buyers in various other countries. Few new CDM projects were registered and few CERs were issued (Figure 7.1).

Figure 7.1: CERs issuance by month in 2019



Sources: Refinitiv

OUTLOOK FOR 2020

Negotiators will meet again for the annual intersessional negotiations in Bonn, in June. Article 6 will be high on the agenda. They will meet again in Glasgow November to try to complete the Paris Agreement rulebook. Ambition will be at the heart of the Glasgow summit; countries are expected to review - and raise - their national contributions (NDC) this year.

Article 6 must be understood as a vehicle for higher ambition –the underlying purpose is not necessarily to create a global carbon market (or even facilitate carbon trading) but to support higher ambition. Transferring mitigation outcomes has the potential to enable bigger emissions cuts at lower net cost.

In the end, Article 6 does not create a carbon market - it rather provides accountability and environmental integrity rules for international carbon trading that would improve markets’ ability to contribute to global GHG mitigation at lower net cost.

The lack of decision on this provision of the Paris Agreement will not prevent parties from establishing e.g. bilateral carbon trading agreements or using markets to meet their national climate ambitions. At the regional level, countries can and will continue their domestic market initiatives, some of which may link to each other even in the absence of UNFCCC consensus on how to do so. However, agreement on common rules under Article 6 could facilitate linking of regional emission trading systems and thus enlarge existing carbon markets and their impact. Furthermore, clarity and confidence in the rules will be needed to trigger a private sector involvement that could potentially unleash vast investments in abatement projects in developing countries.

Table 7.1: CERs by segment

	2016		2017		2018		2019	
	Mt	€ million	Mt	€ million	Mt	€ million	Mt	€ million
Primary	38	60	11	18	8	30	8	39
Secondary	11	3	10	5	7	2	3	0.7
Total	49	63	21	23	15	32	12	40

8. International aviation

In 2016, the International Civil Aviation Organization (ICAO) adopted its Carbon Offset and Reduction Scheme for International Aviation (CORSIA) as a key instrument to meet the sector's aim of carbon neutral growth. CORSIA aims to offset international aviation emissions growth from 2020, with its first voluntary phase starting in 2021.

With international air travel and emissions from international aviation rapidly increasing, the sector could be an important source of demand for international carbon offsets. Initially, CORSIA will cover flights between the 81 countries that will participate in the scheme from 2021. Large emitters like China and India are slated to join when the programme enters its mandatory phase in 2027. The sector's appetite for offsets hinges on which units are eligible, which has yet to be determined.

RESERVATIONS MEAN MORE TROUBLE AHEAD

Countries representing close to 77 percent of international aviation activity signed up for CORSIA's first voluntary phase starting in 2021, but the four "BRICs" (Brazil, Russia, India and China) have not. Together with 21 small and medium-sized ICAO members, these countries vehemently opposed the CORSIA resolutions adopted at the 40th ICAO Assembly meeting in late 2019. To make their position official, the BRIC group submitted written versions of their opposition ("reservations" in ICAO terminology), objecting to core principles of the scheme itself.

The countries' reservations contend that keeping emissions at 2020 levels presents a disproportionate burden for their aviation industries. They also dispute ICAO's top-down approach in CORSIA (both to setting an emission reduction goal and to monitoring and oversight of compliance), preferring a bottom-up approach in which they set their own targets and monitor themselves.

Though the reservations reveal internal conflict within ICAO member states, they do not stop actual implementation of CORSIA - that began in January 2019, when all countries became subject to the programme's requirement to collect international emissions data from their air carriers and report it to ICAO for baseline-setting.

TOWARDS CLARITY ON CORSIA OFFSET ELIGIBILITY RULES?

In early 2019, ICAO released CORSIA eligibility criteria for emissions units - a document setting basic principles for which types and categories of offset units should be accepted. This includes additionality, transparent methodologies, avoidance of double-counting, and that the offset projects should contribute to sustainable development. But the criteria did not list specific project types or vintages, leaving air carriers and offset providers without a clear idea of which projects to pursue.

In late March, ICAO established CORSIA's Technical Advisory Body (TAB), which unites 19 experts representing ICAO's main geographical regions including Brazil, China, India, Nigeria, Russia, Saudi Arabia and the U.S. This group assesses the emission reduction programmes that apply to have their offsets considered

eligible under CORSIA and makes recommendations to ICAO's governing 36-country council for decision. Their recommendations, which are to be reached by consensus, will be made on a case-by-case basis. This iterative process means that there will be no "final decision" on which offsets or offset types are allowed under CORSIA: programmes are evaluated but can change their application based on TAB's recommendations and "re-apply," with successive recommendations by the TAB to the ICAO Council, which can in turn accept those recommendations or not.

In early August 2019, ICAO made public the 14 offset eligibility applications it had received by then. The requests range from project-based programmes (including CDM) to others newer ones focusing exclusively on forest and land use emission reduction measures. The TAB is currently assessing the applications and will present recommendations to ICAO in early 2020, after which the Council will formally decide which will be eligible. The decision from the Council is expected some time in 2020. ICAO had clearly hoped for advice from UNFCCC eligibility, but with the non-result from COP25 (see section 7 of this report), ICAO's decisionmakers are currently left without guidance when it comes to eligibility of emission reduction units from CDM projects.

OUTLOOK FOR 2020

2020 is the final year of preparations ahead of the start of the first phase of CORSIA. Implementation is underway, with countries set to report on their carriers' emissions for 2019 by 31 August. According to the TAB's own timeline, it will offer first recommendations to the Council in February 2020. The Council could thus formally declare at least some types of offsets eligible under the scheme in 2020, though the lack of direction from COP25 leaves ICAO's decision makers without guidance as regards eligibility of credits from CDM projects.

Contacts

EDITORIAL ENQUIRIES

Jon Berntsen

jon.berntsen@refinitiv.com

Tel +47 99 24 38 75

OTHER ENQUIRIES

Refinitiv Carbon Team

Dronning Eufemias gate 16

0191 Oslo, Norway

www.refinitiv.com

THE FINANCIAL AND RISK BUSINESS OF THOMSON REUTERS IS NOW REFINTIV

Refinitiv, formerly the Financial and Risk business of Thomson Reuters, is one of the world's largest providers of financial markets data and infrastructure. Serving more than 40,000 institutions in over 190 countries, we provide information, insights, and technology that drive innovation and performance in global markets. Our 160-year Reuters heritage of integrity enables customers to make critical decisions with confidence, while our unique open platform, best-in-class data, and cutting-edge technology bring greater opportunity to our customers. By advancing our customers, we drive progress for the entire financial community.

All names and marks owned by Thomson Reuters, including "Thomson", "Reuters" and the Kinesis logo are used under license from Thomson Reuters and its affiliated companies.

