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TITLE

China's emissions trading takes steps toward big ambitions

STANDFIRST

China recently announced its national emissions trading scheme, advancing market-based approaches to cutting greenhouse gas emissions. Its evolution over coming years will determine whether it becomes an effective part of China's portfolio of climate policies.

MAIN TEXT

China's climate pledge to the Paris climate agreement had two main components: to reduce the carbon dioxide (CO₂) emissions intensity of the economy by 60-65% in 2030 relative to 2005, and to stop the rise in absolute CO₂ emissions around 2030. China is on track to meet its earlier 2020 target of a 40-45% reduction in emissions intensity (Figure 1). Absolute emissions levels plateaued in recent years but are thought to have increased again in 2017.¹

To date, China has used a mix of different policy instruments to reduce emissions, relying mainly on direct state intervention such as mandating the closure of high-polluting plants, steering investment towards cleaner technologies and less resource intensive industries, and requiring industrial firms to improve energy efficiency. At the same time, there has been a broader drive towards greater "marketization" of China's economy and the introduction of economic policy instruments should be seen in this context.

By putting a price on CO₂ and allowing emitters to buy and sell reduction obligations, an emissions trading system (ETS) is intended to chart a "least-cost" course toward meeting emissions targets. Establishing a functioning market for CO₂ with effective incentives in China will be more difficult than in many other countries because of the extent of state involvement in China's energy and industry sectors. China's government will have to manage both the transitional costs of decarbonising power and industrial sectors, and the large regional disparities in wealth and industrial structure, which are reflected in the initial design of the scheme. Building the conditions for success will take time.

China's national ETS

In 2015, after several years of deliberation, China's national government officially announced the intent to create a national emissions market.² Seven pilot trading schemes had been implemented in the previous few years, with pilot cities and provinces chosen to reflect China's diverse conditions.^{3,4} These pilots demonstrated that emissions trading, monitoring and reporting is possible in China.⁵ However, regional governments shaped the systems to account for political and economic preferences, in ways that may have tempered ambition or effective implementation.⁶

The national scheme announced in December 2017⁷ implies a long start to emissions trading on a national scale. The first phase, over one year, will build a national emissions reporting framework. A trial run for the electricity sector (referred to as a 'simulation' in the government's announcement) is anticipated to take another year. Around 2020 the scheme is intended to operate fully in the electricity sector and then gradually expand to other industries. At full coverage, the ETS is expected to include most heavy industries and aviation, and draw in around 6,000 companies. This will cover about half of China's total carbon dioxide emissions.⁷ China's scheme would encompass around 5 GtCO₂ per year. By comparison, the EU scheme – the world's first and largest ETS for greenhouse gases – covers around 11,000 installations (with many companies owning several installations) and around 1.8 GtCO₂.

As an electricity-only scheme, China's ETS will cover around 3 GtCO₂ per year: about 8% of global CO₂ emissions. Curbing emissions from electricity generation is crucial for effective decarbonisation. From 2005 to 2016, China's electricity generation has increased by 144%, while total emissions from electricity generation have increased by 66% according to Chinese official data (including a drop between 2013 and 2016). The decline in carbon intensity of electricity supply has been due to both an increase in the proportion of non-fossil fuel electricity, and a rapid decline in the average carbon intensity of electricity from fossil fuel plants.

While many experts anticipated an earlier start involving a greater share of China's emissions,⁸ a gradual start focused on institution-building has merits. China's national monitoring, reporting and verification system is currently being developed, and an emissions assessment at company-level for 2016 and 2017 is underway. This process is crucial. The EU scheme started with what was effectively

a three-year trial period. China's challenges in design and implementation are much greater than they were in Europe, and other developed countries and subnational jurisdictions.

Many details of the scheme's design remain unknown: available information is summarized in Box 1.

Emissions caps and ambition

Most existing ETS have "caps" that define how many emissions allowances will be issued to market participants. By contrast, the emissions limit for participating Chinese companies varies with their production volume. Correspondingly, companies will receive emissions allowances in proportion to their actual output of electricity or products. This "output-based allocation" to some extent mirrors the nature of China's national emissions target, which is indexed to GDP.⁹

For now, the level of ambition and thus likely prices in the Chinese scheme remain unclear. A relatively low price level seems probable, given the evident caution in design and implementation of the scheme. Experience in other countries including Europe suggests that ambition is often constrained at the start, resulting in low carbon prices and limiting effects on investment.¹⁰

In China, the five-year planning cycle remains crucially important. The parameters of China's ETS might be adjusted in line with the aspirations of successive five-year plans. It would not be surprising if initial carbon prices under the ETS were below the range identified as necessary to achieve reductions in line with the Paris goal of limiting the global temperature increase to less than 2 degrees C.¹¹ A related question is whether China's national ETS will include provisions to strengthen ambition if the initially-set emissions targets are easily achieved and the trading price is low. Options include automatically reducing future emissions caps, setting aside allowances as under certain market conditions now done under the EU ETS, or – as favoured by many economists – introducing a price floor, as included in the Hubei and Guangdong pilot schemes.

Free output-based allowances

The current plan for the Chinese scheme is for most allowances to be given to emitters for free and for only a small share of allowances, if any, to be sold by the government to emitters. This has been the starting point for many emissions trading systems. Notably, the EU ETS started with an almost 100% free allocation in 2005 but moved to almost full auctioning for the power sector in 2013. It is unclear what role auctioning plays in the future of China's national ETS.

China is opting for output-based allocation, which means that free permits are allocated to companies in proportion to their output of product.¹² Fully free output-based allocation removes the CO₂ cost from outputs and has been the default for industries where there is concern that they cannot readily pass carbon prices onto their customers.

In China's case, power stations will obtain allowances per megawatt hour of electricity produced, according to a number of different 'benchmarks', which differentiate by technology (e.g. old vs new generating units) and fuel type. This creates incentives to improve the fuel efficiency of existing generation units but weakens or eliminates the incentives to use more efficient units instead of older ones, or to shift from coal to gas or renewables. **It will also lessen or reduce incentives for more efficient electricity use that could follow from** passing through carbon costs to electricity prices.

Moving away from fully free output-based allowance allocation requires continued reform in China's highly state-directed power sector, which still has price controls and to a significant extent still dispatches plants based on generation quotas. Dispatching power plants on a least-cost and least-emissions basis can reap economic and environmental benefits and helps make ETS effective in reducing the CO₂ intensity of electricity supply.¹³ China has begun to put its electricity sector on more of a market footing; starting with industry and the commercial sector where generators can

now partially pass changes in their cost base onto end users. However, electricity prices for households remain fixed.

Several of China's pilot ETS have also covered the end-use of electricity. This was done by requiring industrial electricity consumers to surrender allowances for their electricity use based on the average carbon intensity of power production in each province. It is unclear whether the national ETS will make use of such consumption charges in the power sector or for basic materials, which aim to reinstate carbon price incentives on the demand side.

Trajectory for development

China's ETS will need to evolve if it is to play a significant role in overall efforts to cut emissions. We identify five aspects of change necessary for the system to become more effective and efficient over time.

1. *Monitoring, reporting and verification of emissions* should be pursued to a high standard.
2. *Permit allocation needs to move towards auctioning* to alleviate distortions from free, output-based allocation in narrowly defined categories.
3. *Electricity sector reform needs to be closely coordinated with ETS development.*
4. *A mechanism needs to be devised to ensure that the carbon price is at a level that provides meaningful incentives to reduce emissions.*
5. *Coverage of the ETS needs to be broadened to industrial energy use and emissions, as foreshadowed in the ETS announcement.*

Global implications

China's effort to introduce a national emissions trading system is an important step forward in mitigating global climate change. If it is successful, China could lead the next generation of global carbon markets in industrializing and developing countries.

The road to an effective and efficient ETS in China is long and not yet well defined. The recent announcement was an essential first step. Evolution to a fully effective scheme is a taller order than it was in Europe and other market economies, where viable systems took years to establish. It will also require complementary reforms beyond the realm of emissions pricing.

Beyond the ETS, China has many targeted measures that will continue to drive clean energy and industrial modernization. An effective ETS has the potential to realize additional emissions reductions, and to do so cost effectively. However, using it to clean up the world's single biggest emitting sectors – the Chinese electricity and manufacturing industries – is a vast endeavor.

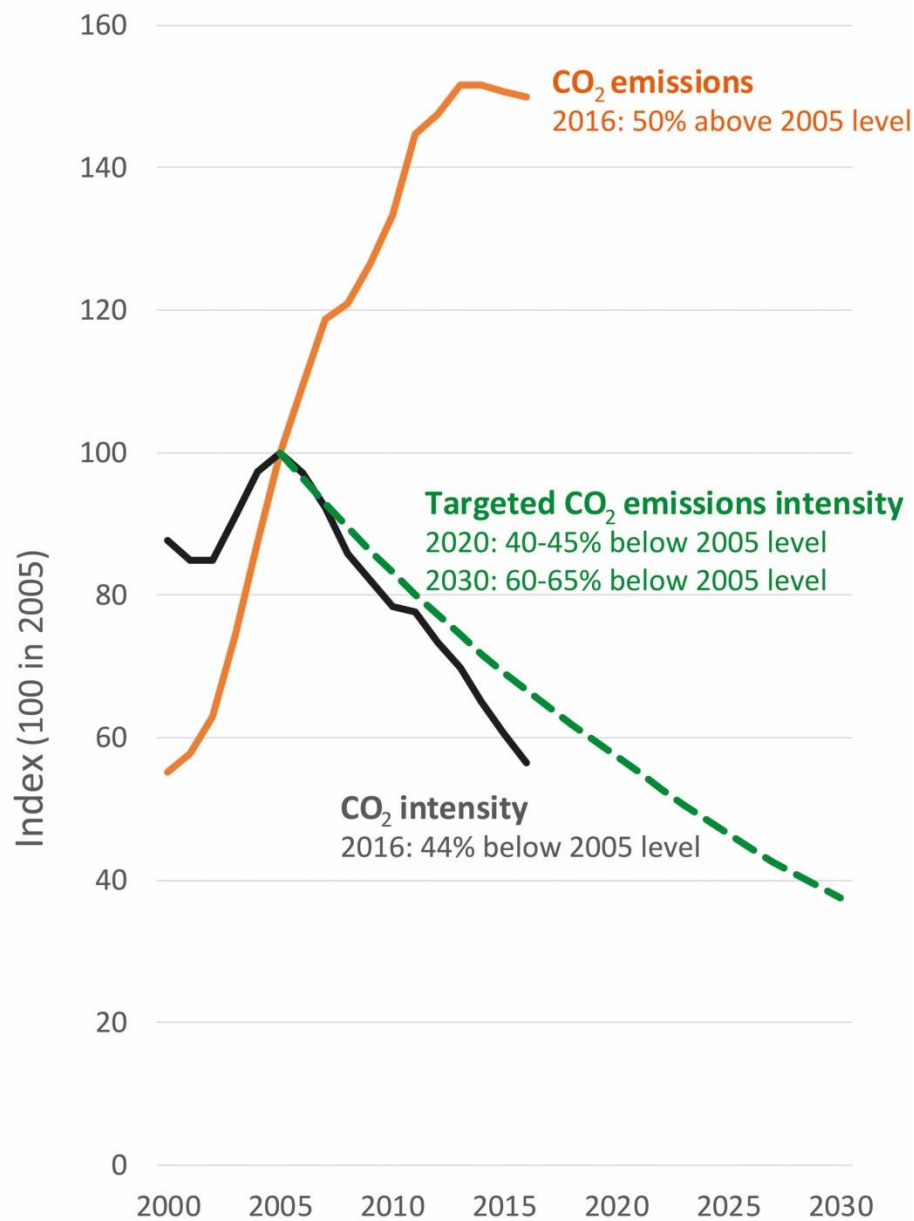
Chinese analysts often refer to the philosophy of 'crossing the river by feeling the stones'. This is a sensible approach, given how the rich world has struggled to introduce effective emissions pricing, but the river is wide and deep. Reaching the far shores of truly effective carbon pricing will require vision and determination, as well as learning and iteration.

Box 1: Features of China's national ETS as announced in December 2017

Nationally Determined Contribution (NDC)	Stop the rise in absolute CO ₂ emissions around 2030 Reduce CO ₂ emissions intensity of the economy by 60-65% in 2030 relative to 2005
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	Increase the share of non-fossil fuels in primary energy consumption to around 20% in 2030
ETS Timing and Phases	<p>Announced in December 2017</p> <p>First phase: national emissions reporting framework (one year)</p> <p>Second phase: trial run (“simulation”) for the electricity sector (one year)</p> <p>Third phase: full operation in the electricity sector (around 2020)</p> <p>Gradual expansion to other industries: building materials; petrochemicals; chemicals; iron and steel; non-ferrous metal processing; pulp and paper; aviation</p>
Coverage and Threshold	<p>Electricity sector coverage: around 3 Gt CO₂</p> <p>Full expected coverage: around 5 Gt CO₂</p> <p>Threshold: ETS covers companies with emissions above roughly 26,000 tCO₂ per year (annual energy consumption of more than 10,000 t coal equivalent)</p>
Allocation of Emissions Allowances	<p>Majority of allowances to be given for free to industry</p> <p>Output-based allocation based on benchmarks (sub-sectoral performance standard) with ex-post adjustments</p>

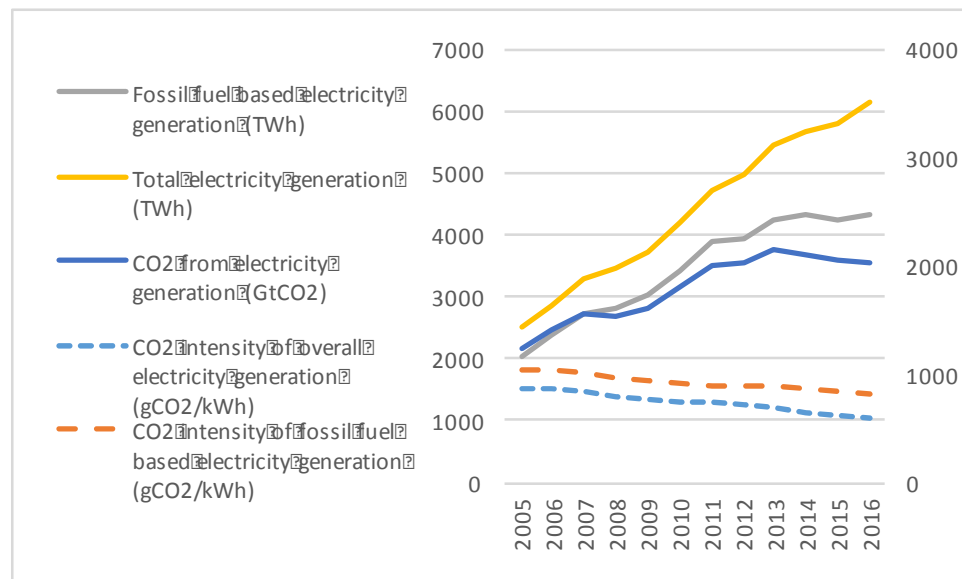
Figure 1: China's carbon dioxide emissions, emissions intensity and emissions intensity target trajectory



Data: CO₂ emissions: IEA¹⁴ to 2015, BP¹⁵ for 2016. GDP: IMF¹⁶.

Figure 2: China's electricity generation and emissions from electricity generation

[this Figure is still to be made pretty]



Data: China Electricity Council¹⁷

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COMPETING INTERESTS STATEMENT

The authors declare no competing interests.

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