



China's Carbon Emission Market: A Step towards Carbon Neutrality

By LI Yao and Sarah Y TONG

AN UP AND RUNNING CARBON TRADING MARKET

On 16 July 2021, China launched its National Carbon Emission Trading System (NCETS) on the Shanghai Environment and Energy Exchange, an important milestone in its efforts to combat climate change and accelerate China's development of green finance.

To achieve carbon neutrality by 2060, a goal set by China's President Xi Jinping,¹ China must implement large-scale decarbonisation by cutting carbon-intensive economic activities and expanding low-carbon sectors in the coming decades. According to estimations by Boston Consulting Group, China's carbon neutral efforts could cost a total of RMB90 trillion to RMB100 trillion (or about \$13.5 trillion to \$15 trillion),² which present both challenges and opportunities for the financial sector.

At this initial stage in 2021, only spot trading of Carbon Emission Allowances (CEAs) was carried out under the NCETS, guided by several specific rules. For example, the unit of valuation is the "price per tonne of carbon dioxide (CO₂) equivalent", the minimum amount of one tonne of CO₂ equivalent and a minimum change in the declared price of RMB0.01. Specifically, CEAs that are bought cannot be sold again within the same day.

On the first day of trade (16 July 2021), the market opened at RMB48 (\$7.42) per tonne of carbon and closed at RMB51.23 (\$7.92), a gain of 6.7%. A total of 4.104 million tonnes of CEAs worth more than RMB210 million (\$32.46 million) changed hands. Ten enterprises

¹ At the United Nations General Assembly on 22 September 2020, President Xi Jinping pledged that China would strive to peak its carbon dioxide emissions before 2030 and achieve carbon neutrality before 2060.

² For more details, please refer to <https://www.bcg.com/publications/2020/how-china-can-achieve-carbon-neutrality-by-2060>, accessed 27 July 2021.

participated in the trading, including six power companies, two local state-owned enterprises and China's two largest oil companies.³

Considering the importance of the electricity industry in CO₂ emissions and the relatively better data availability, the first batch of CEAs for NCETS was distributed to key companies in the industry. Around 4.5 billion tonnes of CEAs were allocated to 2,162 companies (including companies with combined heat and power and on-site generators in other industries), which are also the first batch of entities permitted to take part in the trading.

NCETS currently supports two forms of trading: agreement transfer or one-way bidding. Agreement transfers include listing agreement transactions and block agreement transactions. The number of declarations for a listing (block) agreement transaction should be less than (no less than) 10,000 tonnes of CO₂ equivalent and the transaction price must be within $\pm 10\%$ ($\pm 30\%$) of the closing price of the previous trading day. Traders can select the trading format based on the size and purpose of their expected transactions, as well as market performance. To fit the transaction demand better, NCETS provides diverse trading schedules for different forms of trading.⁴

Currently, two locations are involved in NCETS, namely Hubei and Shanghai, which are each responsible for the construction, operation and maintenance of the Carbon Emission Rights registration system and trading system. The initial allocation of CEAs and the related information are available at the National Pollution Discharge Permits Administration Information Platform (NPDIP).⁵ According to the *2019-2020 National Carbon Emission Quota Setting and Allocation Plan for Electricity Industry*, provincial ecological environment authorities are responsible for collecting the data of companies' power generator equipment and annual power generation, verifying the eligibility of companies and number of power generator sets to be involved in the NCETS, calculating and determining companies' original CEAs based on their 2018-2020 production and emission data, as well as reporting all these information to the NPDIP. The Ministry of Ecology and Environment then decides the total number of CEAs at the national level as the sum of all provincial CEAs.

There are still large gaps between China's NCETS and the European carbon market in terms of trading volumes and prices, industry coverages, availability of trade types and trading format (Table 1). The control targets for carbon emission are also different for the two markets. Nevertheless, the beginning of a national level exchange in China is significant. First, it could accelerate the growth of China's carbon trading, number of market participants, industry coverage and volume. Second, it could promote the development of carbon related financial products and services, including the green credit and green bond. Third, it provides the foundation for the development of financial derivatives and other innovative financial products, as well as linkages with the international financial market.

³ The 10 traders were China Huadian Group, China Resources Power, National Energy Group, State Power Investment Group, China Huaneng Group, China Datang Group, Shenergy Group, Zhejiang Energy Group, Petro China and Sinopec.

⁴ Except for statutory holidays and closed days announced by trading institutions, the trading hours for listing agreements from Monday to Friday are between 9:30 and 11:30 in the morning and from 13:00 to 15:00 in the afternoon. The trading hours of the agreement method are from 13:00 to 15:00 in the afternoon from Monday to Friday, while that for the one-way bidding method shall be announced separately by the trading institution.

⁵ The platform is maintained by the Ministry of Ecology and Environment.

TABLE 1 COMPARISON OF EU'S AND CHINA'S CARBON MARKETS

Market	China	European
Starting Date	7/16/2021	1/1/2005
Total Trading Volumes (Mn tonnes)	8.44	2.38
Regional Total CO ₂ Emission in 2020 (Mn tonnes)	9,893.51	2,549.82
Spot per Tonne Prices	RMB45.09-58.7	€50.71-58.95
Industry Coverage	2,162 companies from the electricity industry of China	More than 11,000 power stations and industrial plants from over 15 industries in 31 countries
Trading Participants	Companies with emission control obligations	Energy and industry companies with emission control obligations and financial intermediaries
Types of Trades	Spot	Spot, forwards, futures, swaps and options
Trading Format	Auction or through the exchange system	OTC, auction and through the exchange system
Control Target	To lower carbon emission per unit of output	To lower total carbon emission

Note: "Total Trading Volume" and range of "Spot per Tonne Prices" cover the trades between 16 July 2021 and 27 August 2021.

Source: Wind and EU ETS Handbook 2015, available online at https://ec.europa.eu/clima/sites/clima/files/docs/ets_handbook_en.pdf, accessed 25 August 2021.

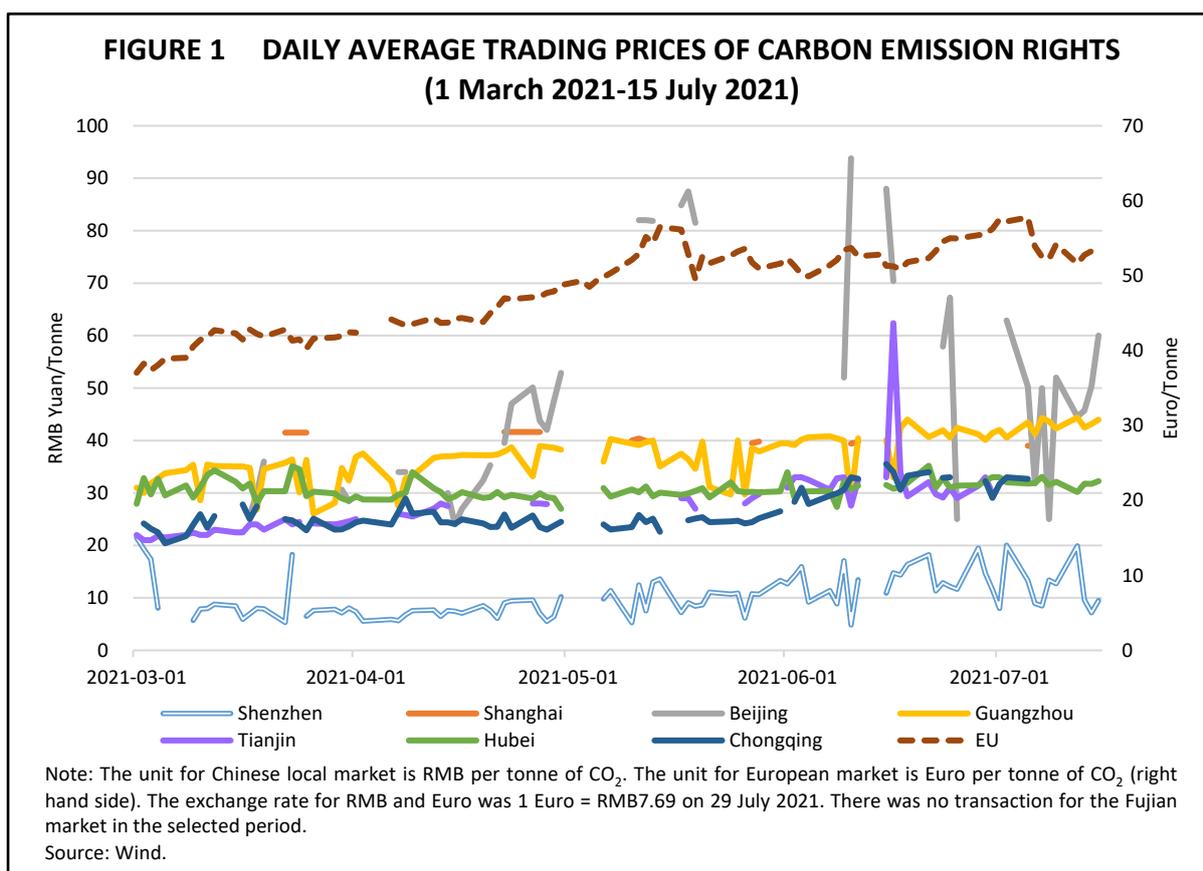
A DECADE-LONG DEVELOPMENT THROUGH PILOT PROJECTS

China's development of emissions trading system (ETS) for CO₂ started in 2011 when policymakers introduced CO₂ emissions intensity as a development target in the 12th Five-Year Plan (2011–2016). Since October 2011, eight pilot projects for carbon emissions trading have been launched, including in Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangzhou, Shenzhen and Fujian. As of June 2021, these pilot local markets covered nearly 3,000 key emission units in more than 20 industries, including electricity, steel and cement. Cumulative emission allowances amounted to 480 million tonnes of CO₂ equivalent and a total turnover of approximately RMB11.4 billion.

These pilot markets are important for the development of NCETS with the accumulation of experience and capacity in legislation, policies and supervision. They helped enforce compliance with carbon emission limits of key firms and reduced the total amount of carbon emissions and carbon emission per output unit covered in pilot markets. However, many issues remain. First, as the numbers of entities are restricted in most pilot markets, carbon trading is not active and liquidity is low. As pilot markets have different trading rules, emission calculation methods and other aspects, cross-market trading are not practical and disallowed, making the markets even more sluggish.

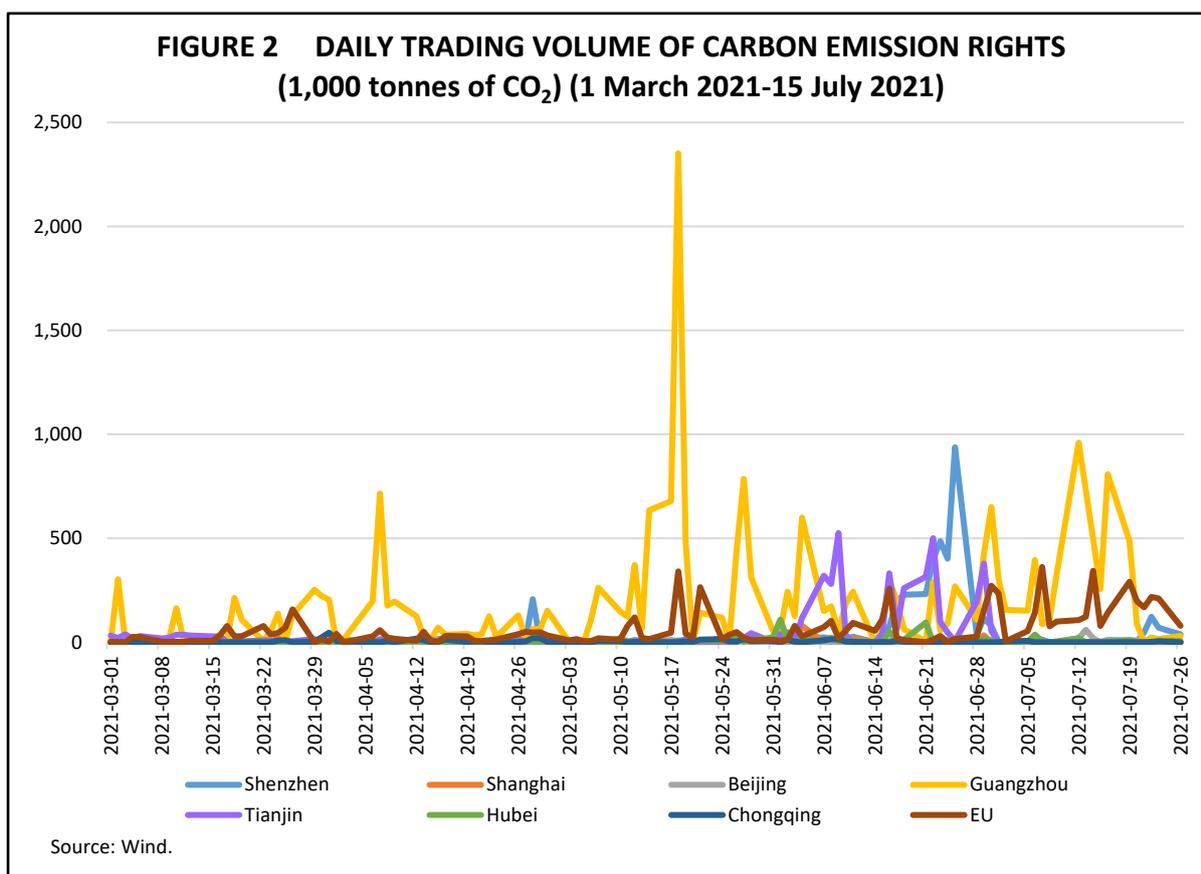
Second, there are considerable variations across pilot market with respect to both price and volume of carbon allowance trading. Between early March and mid-July 2021, trading prices ranged from below RMB10 to above RMB90 (Figure 1) and daily trading volumes from one

tonne to more than 2.3 million tonnes (Figure 2) across pilot markets. China's pilot local markets are also quite volatile, relative to a mature market like the European market, both in prices and in volume.⁶ As the financial function⁷ of these pilot markets is still weak, most transactions are to meet the compliance requirement. Hence, for most pilot markets, trading prices generally show a general trend of high opening, a quick declining, then a slow increase towards the end of each annual cycle for carbon emission compliance, normally on 30 June. The trading volumes also tend to surge before the end of each cycle and drop thereafter. This indicates that companies are not active during the year until they rush to fulfil the compliance target when approaching the end of the compliance cycle.



⁶ For the period of 1 March 2021 to 15 July 2021 (before the launch of NCETS), the standard deviation of daily changes $[(\text{Day 2 value} - \text{Day 1 value}) / \text{Day 1 value} - 1]$ ranged from 0.16 (Hubei) to 0.57 (Beijing) for prices and 5.2 (Shanghai) to 1219 (Chongqing) for trading volume, while the corresponding values for European market are only 0.1 and 3.33.

⁷ Companies can finance the upgrade to lower carbon emission equipment by selling their carbon emission rights. They can also monetarise their saved carbon emission rights to improve their financial statement.



The launch of NCETS in July 2021 should reduce market segmentation in carbon trading by setting national trading rules and standard, particularly if NCETS further expand participation of investors in more regions and numbers of tradeable CEAs.

Indeed, according to the overall design,⁸ the national carbon market will cover eight high energy-consuming industries in electricity, petrochemicals, chemicals, building materials, steel, non-ferrous metals, paper and civil aviation. The Ministry of Ecology and Environment has commissioned China Building Materials Federation, Nonferrous Metals Association and China Steel Association to prepare for emission rights trading in the building materials industry, nonferrous industry and steel industry, respectively.⁹ The expansion of industry coverage can increase and diversify market participants, as well as increase tradeable allowances for the market.

According to the “Administrative Measures for Carbon Emission Trading (Trial)”, the national carbon emissions trading entities include key emitters and institutions and individuals who must comply with relevant national trading rules. However, no individual or institutional investors have obtained the transaction permit to NCETS so far.

A larger number of investors, tradeable allowances and more diversified market participants will lead to a more active and liquid carbon market, further reducing market volatility, attracting more investment and promoting the institutional development of the market.

⁸ For more details, please refer to <http://www.gov.cn/xinwen/2021zccfh/30/sjbb.htm#hygqmd>, accessed 29 July 2021.

⁹ For more details, please refer to <http://finance.eastmoney.com/a/202107071988392423.html>, accessed 29 July 2021.

MORE GREEN FINANCIAL PRODUCTS AND SERVICES NEEDED

A robust NCETS can support the development of other green financial products and services. First, carbon emission rights can be collaterals for banks to expand financing and become a new source of liquidity. At present, to support national carbon emission reduction, the banking industry includes carbon emission as an important risk management indicator in loan credit evaluation. However, carbon emission information is difficult to collect and verify for banks. Carbon pricing as a benchmark indicator to perform precise quantitative analysis in credit, financing and loan decision-making would be a better alternative.

Second, as NCETS promotes the building of governments' capabilities in monitoring, reporting and verification (MRV) of CO₂ emissions, reliable firm-level CO₂ emission information becomes readily available. The timeseries data of carbon emission can help detect the abnormal performance of a company. This will improve the borrower's information disclosure for the capital market, which can help in assessing financial risks, attracting more investors and increasing green financing.

Third, based on transactions under NCETS, green financial derivatives and other green financial innovations can be developed. Financial derivatives related to emissions allowances such as futures, options and swaps have been available in the EU for many years, but have yet to be launched in China. These derivatives can help manage risks associated with climate change for both Chinese companies and households.

Climate shocks such as extreme weather events can cause direct risks to households and companies, including the risks of loan defaults, revenue reduction, asset depreciation, business disruption or even sovereign risk. The rapid transition to a carbon neutral economy means fast decarbonisation of high-carbon sectors like energy, power, industry, transportation and construction. This could lead to high business risks and changes to energy and commodity prices, corporate bonds, equities and some derivative contracts. Changes in technology, or consumer and investor behaviour may increase operating costs of high-emission enterprises and reduce their profitability and solvency, and ultimately increase financial risks of investors.

Financial derivatives or other new financial products and services can be designed based on the relationship between carbon emission and climate change or China's carbon neutral efforts so that they can be used to hedge against the aforementioned climate change-related risks.

LINK TO THE INTERNATIONAL MARKET

As China is the world's largest carbon emitter, it is expected to become the world's largest carbon emissions trading market. In fact, the electricity industry alone or the daily trading volumes of pilot markets have made China the largest spot trading market for carbon in the world. Figure 2 shows that before the launch of NCETS, the trading volume of Guangzhou market exceeded that of the European market in most trading days. When other sectors are included, China's carbon market will be even larger and could attract a huge amount of capital and technological investment.

The development of carbon finance can support the internationalisation of Renminbi (RMB). The functions of international commodity pricing and settlement are an important signal of transaction power for an international currency. With the rapid development of carbon finance and the continuous expansion of transaction scale globally, the use of carbon credit currency in the transaction process may surpass crude oil and other commodities to become a new type of "commodity" that affects global transactions. If NCETS integrates with the international carbon market, it will increase its participation and competitiveness in the future global carbon

market system. This will further enhance China's position, increase the proportion of RMB settlement in the global carbon market, further enhance the international liquidity of the RMB and promote the internationalisation of the RMB.

CHALLENGES FOR CARBON MARKET-BASED GREEN FINANCING DEVELOPMENT

Challenges for China to speed up the development of its green finance through the NCETS abound. The two most urgent ones are cross-region gaps in governance capability of MRV and enforcement mechanisms. NCETS strongly relies on the governments' ability to account accurately for the CO₂ emissions of participating companies. China's local governments have attempted to establish records of companies' historical CO₂ emissions and emissions intensity through the MRV. They also tracked the changes of MRV data over time. However, in eight pilot markets, the measures implemented to support high-quality MRV varied widely. Given provincial and sectoral variation in incentives and institutional capacity, how the segmented local MRVs could be integrated to support the NCETS well is still unknown.

In addition, current enforcement mechanisms for emission quota administration, including non-compliance penalties, must carefully balance incentives to deter non-compliance¹⁰ while maintaining the cooperation of market participants. According to current national regulations, false reporting or concealed emissions will result in a fine of between RMB10,000 and RMB30,000, which is a fraction of the annual profit of most covered firms. If allowances are not surrendered on time and in full, local authorities may impose a higher fine of RMB20,000 to RMB30,000. However, financial penalties are not expected to be the only deterrent or most effective measure for non-compliance, relative to other tools that pilot provinces have used such as restricting access to financing or other forms of assistance to firms.

LI Yao is research fellow, East Asian Institute, National University of Singapore. Sarah Y TONG is senior research fellow at the same institute.

EAI commentaries serve to provide quick insights on current topics, based on ongoing research. The opinions expressed in the commentaries are those of the authors and do not necessarily reflect those of the East Asian Institute, or its Board Members.

¹⁰ During the period of 2013 to 2016, except for Shanghai, there were non-compliance cases in all other pilots, especially Shenzhen, which failed to achieve 100% compliance for four consecutive years. For regions and years with 100% compliance, there were delays in compliance. For example, Hubei postponed the compliance deadline for nearly two months in 2014. Both Hubei and Chongqing postponed the deadline in 2015.