

ZhongXiang Zhang Regional Pilots and Carbon Pricing in China¹

China had relied mostly on administrative means to meet its 20 percent energy-intensity reduction goal for 2010 (Zhang 2010a,b and 2011a,b). These administrative measures were effective but not efficient. In the end, China had limited success in meeting its goal (Zhang 2011a,b). Going forward, China has realized that it cannot continue to rely on costly administrative measures to honor its pledge to cut its carbon intensity by 40–45 percent by 2020 relative to its 2005 levels and its commitment to cap its carbon emissions around 2030 and to try to peak early. These commitments were officially incorporated into China's Intended Nationally Determined Contributions submitted to the UNFCCC (United Nations Framework Convention on Climate Change) Secretariat. In addition, China pledged to reduce the carbon intensity of its economy by 60–65 percent by 2030 compared to 2005 levels (NDRC 2015).²

As an integrated package of mitigating carbon emissions and combating global climate change, the National Development and Reform Commission (NDRC) in late October 2011 approved seven pilot carbon emissions trading schemes in Beijing, Chongqing, Guangdong, Hubei, Shanghai, Tianjin, and Shenzhen. The seven pilots are deliberately selected to be located in regions at varying stages of development and are given considerable leeway to design their own schemes. These schemes have features in common, but vary considerably in their approach to a variety of issues, such as the coverage of sectors, allocation of allowances, price uncertainty, and enforcement and compliance. All launched their first trading from June 2013 to June 2014. In December 2017, NDRC (2017) announced the launch of a national emissions trading scheme (ETS) to regulate the CO₂ emissions from the power sector and released a work plan for construction of the national carbon emissions trading market (power generation sector).

This article examines China's carbon trading pilots, the design, implementation, and compliance of the national ETS, and the pressing work to ensure that the national ETS functions properly and

achieves a smooth interconnection of the carbon trading pilots and the national ETS.

CARBON TRADING PILOTS

All pilot schemes have some features in common. All of the pilots cover CO₂ only except for the Chongqing pilot, which considers all six greenhouse gases covered under the Kyoto Protocol. Moreover, all pilots require third-party verification of the emission reports of the entities covered.

In the meantime, the seven pilot regions are given considerable leeway to design their own schemes. The pilot schemes have different coverage of sectors, ranging from 6 sectors in Guangdong to 26 sectors in Shenzhen. The threshold to determine whether an emissions source is covered differs across pilots. A combination of the two factors leads the number of covered entities to differ significantly, from 107 in Tianjin to 947 in Beijing. Consequently, the share of covered emissions in the total emissions in each pilot region varies significantly.

Differing from the ETS of the European Union and California, the covered emissions sources are enterprises in all the pilot schemes in China. Also, unlike the EU ETS, all the pilot schemes cover indirect emissions both from electricity generated within the pilot region and from electricity imported from outside pilot regions. This design feature could help to reduce carbon leakage (Zhang 2015a).

In each pilot scheme, the majority of allowances are for initial distribution, with a small portion of allowances used for adjustments, for new entrants, and for auctioning, and reserved for maintaining the price stabilization. While the allowances are granted to new entrants based on benchmarking, allocations to existing emissions sources are based on historical emissions, emissions intensities, or benchmarking depending on sectors. Even if allowances are grandfathered on a historical basis, the treatment of early abatement actions differs among pilots in terms of time profile of historical emissions, allocation methods, and allowance reward. In most pilots, allowances are allocated for free year by year, whereas the Beijing and Shanghai pilots distribute all the 2013–2015 emission allowances for free for all the covered enterprises at one time. Beijing and Shanghai shifted to an annual cycle in 2016 to allow intertemporal flexibility to update the cap. The pilots also allow the mandated entities to apply for adjustments in allowances in case a significant shortage of allowances occurs, but the conditions and mechanisms for ex post adjustments in allowances differ across pilots.

All carbon trading pilots in China except for Chongqing have reserved a small portion of allowances for cost containment purposes, but only Beijing sets a specific ceiling and floor price at which the regulator can, but is not required to, release



ZhongXiang Zhang
Ma Yinchu School of
Economics,
Tianjin University.

¹ This article is based on the two lengthy articles by Zhang (2015a,b), which provide full references to all the data cited. This work is financially supported by the National Natural Science Foundation of China under grant Nos. 71690243 and 71373055.

² See Zhang (2017) for further discussion on stringency of China's climate commitment.

allowances from the reserve or buy back allowances. To limit price volatility, all pilots design daily trading risk management mechanisms to regulate the maximum increase and decrease of daily prices (typically around 10 percent to 30 percent). All pilots allow banking, but it is only in the Hubei pilot that allowances that have been transacted can be banked to enhance liquidity. Borrowing is not authorized. All pilots allow to varying degrees the use of China Certified Emission Reductions (CCERs), ranging from 5 percent to 10 percent of their emissions caps, but pilots differ regarding the origin of CCERs.

Ways to prevent market power of dominated players, or at least mitigate market power concerns differ. Some pilot regions set limits to the amount of allowances that each entity can bid, while other pilots specify the ways to handle larger orders of allowances. To enforce the compliance of covered entities with their emissions obligations, all pilots have built a variety of public disclosure and punishment mechanisms. Some pilots deprive those non-complying entities for a certain period of time from applying for public energy saving funds, and from being given preferential treatment in their application for public financial support for low-carbon development, energy conservation, and renewable energy projects. Some pilots go further. In the Beijing pilot, depending on the extent of noncompliance, entities are subject to fines equal to three to five times the prevailing average market prices over the past six months for each shortfall allowance. Non-complying entities in the Hubei pilot are charged at 1–3 times the yearly average market prices for each shortfall allowance, with the imposed penalty capped at CNY 150,000, and two times the amount of their shortfall allowances are deducted from the amount to be allocated in the following year. The Shenzhen and Shanghai pilots auction additional allowances, with eligibility specified only for those enterprises of compliance gap, and the allowances received are only for compliance needs and cannot be traded on the market.

By June 2014, all seven carbon trading pilots had begun trading. These pilots together cover about 2,900 entities in 2019, with the total amount of allowances capped at 1.16 billion tons of CO₂ emissions (Zhou 2020). According to the Vice Minister of China's Ministry of Ecology and Environment (MOEE), by the end of October 2019, the total accumulated value of traded allowances by all carbon trading pilots reached CNY 7.68 billion, and the total accumulated volume of traded allowances reached 347 million tons of CO₂ (Zhang et al. 2019). But pilots differ significantly in the total accumulated volume and value of traded allowances and the resulting average price, with the total accumulated volume of traded allowances ranging from 44.7 million tons of CO₂ in Guangdong to 51,160 tons of CO₂ in Chongqing, and

the yearly average price per ton of traded allowance ranging from CNY 83.3 in Beijing to CNY 6.9 in Chongqing in 2019 (Hong 2020). In terms of compliance, Shanghai is the only pilot that has consecutively achieved a compliance rate of 100 percent since launching trading in 2013. Guangdong and Hubei have achieved a compliance rate of 100 percent four times consecutively. Moreover, all pilot regions have not only cut their total carbon emissions; the carbon intensity of the covered entities goes down year by year. For example, through technical innovations, 80 percent of the covered enterprises in Guangdong were estimated to have cut to differing degrees their emissions per unit of product (Li and He 2014). This is a significant accomplishment for a big manufacturing province like Guangdong.

TOWARD A NATIONWIDE ETS

In December 2017, NDRC released a work plan for construction of the national carbon emissions trading market (power generation sector). This sectoral coverage is much narrower than the initially planned coverage of eight sectors (power generation, metallurgy, nonferrous metals, building materials, petrochemicals, chemicals, papermaking, and aviation). The threshold for an emissions source from the power generation sector to be covered is set at 26,000 tons of CO₂ equivalent per year. As such, 1,700 power generation firms are estimated to be covered in the national ETS (For reference, the 10,000 Enterprises Energy Conservation Low Carbon Action Program covers 16,078 enterprises. They include industrial and transportation enterprises consuming energy of 10,000 tons of coal equivalent (tce) and other entities consuming energy of 5,000 tce in 2010.). Combined, they emit over 3.3 billion tons of CO₂ annually, which is about 30 percent of China's overall CO₂ emissions (ICAP 2018). Once put into operation, this would establish China's ETS as the world's largest scheme.

Based on the MOEE's interim measures for carbon emissions trading, the national ETS will be governed by the two-tier management system (MOEE 2019a). MOEE is mandated to set national rules to ensure, among other things, the same rules regarding coverage and scope; uniform standards for monitoring, reporting and verification, and the allocation of allowances; and standard rules of compliance across provinces or equivalent. In the meantime, local ecology and environment bureaus (LEEBs) are assigned to take responsibility for implementing the rules. This includes but is not limited to identifying the entities covered and determining their emissions, calculating the amount of free allowances to the entities covered and, once approved by the local government and submitted to the MOEE, distributing these allowances to the entities and implementing compliance rules. LEEBs should be allowed to set

even stricter rules than the national rules. For example, they could increase the coverage of sectors and the scope of entities, and have even stricter rules for the allocation of allowances.

The initial distribution of allowances will be free, with allowance reserves for adjustments, for new entrants, and for auctioning, and reserved for maintaining the price stabilization. Benchmarks will be used for initial allocations wherever possible. In September 2019, the details of the benchmarks for thermal power generation units were released (MOEE 2019b). Without giving preference, two options are given for the trial calculation of allowances. One option classifies the units into three categories (conventional coal fired, unconventional coal fired, and gas turbine). Another option classifies the generation units into four categories by further dividing the conventional coal-fired units into two types based on scale (over 300 MW, and 300 MW and below) (MOEE 2019b). Differing from the pilot schemes where offsetting is allowed to different degrees, CCERs are not allowed in the national ETS until the market becomes mature (NDRC 2017).

To make the carbon market run smoothly, the national ETS will establish the regulatory framework for mitigating carbon trading risk management. Mechanisms to manage excessive price volatility include daily price limits that regulate the maximum increase and decrease of daily prices, risk-warning, and auctioning additional allowances to those entities of compliance gap (MOEE 2019a). However, the extent to which the daily trading risk management mechanisms are activated is unspecified.

To enforce the compliance of covered entities with their emissions obligations in the national ETS, penalties are imposed both on auditors and on entities that do not comply with reporting requirements. To increase the rate of compliance, non-compliance is included in the credit record of non-complying entities and is made public to financial institutions and the general public. Given that the penalty for non-complying entities in the Shanghai pilot is not the strictest as compared to its peers, this provision is considered as key to helping Shanghai achieve 100 percent compliance. Moreover, non-complying entities are charged at 2–5 times the yearly average market prices for each shortfall allowance (MOEE 2019a). In the Beijing pilot, a fine of three times the average market price is imposed if the emissions of non-complying entities exceed their emissions allowance by less than 10 percent, while a fine of five times the average market price is applied if non-complying entities emit 20 percent more than their emissions allowance. If the non-complying entity's emissions are more than 10 percent but less than 20 percent of the allowance, a fine of four times the average market price is imposed (BMDRC 2014). However, the extent of noncompliance and the corresponding fine have not yet been disclosed in the national ETS.

FURTHER WORK FOR THE NATIONAL ETS TO FUNCTION PROPERLY

The carbon trading pilots started trading in June 2013. These pilots have experienced ups and downs, but they generally perform in line with expectation. Their strong start and performance not only suggest that emissions trading is a useful means of helping the covered entities to meet their emissions obligations; they also encourage development of China's national ETS. Building on these carbon trading pilots and a lot of preparation work, the national ETS was planned to launch in 2019, but has been delayed to 2020/2021. More work needs to be done to ensure that the national ETS functions properly and that a smooth interconnection of the carbon pilots and the national ETS is achieved.

Ideally, national ETS legislation needs to be established to authorize emission trading at the national level. The aforementioned MOEE's interim measures are not enough. The provisions governing emissions trading across regions in the form of interim measures need to be elevated to a level of greater legal strength, at least to the State Council's regulation. This is essential because disputes could become more intensive and frequent as the carbon market expands beyond the institutional jurisdiction of administrative regions.

The initial coverage of power generation and the high threshold under the national ETS imply coexistence of regional and national ETSs. Until a nationwide carbon market becomes fully functional, the regional ETS will continue to function in parallel and those entities covered in the existing regional ETSs will be unconditionally integrated into a nationwide ETS if they meet the latter's threshold. This raises the issue of achieving a smooth interconnection of the carbon pilots and the national ETS. A variety of the pressing issues that need to be addressed include how to integrate carbon pilots into a united, nationwide carbon market; how to deal with a potential surplus of unused allowances under carbon pilots as the pilot phase ends; how to deal with those sectors covered in the pilots but not in the national ETS; how to strike a balance between pilots' preferences to keep their own autonomy and characteristics and the need to have a harmonized national carbon trading scheme; how to ensure that each unit of emissions reduction is reliable and comparable among sectors and across regions; and how to deal with the potential of intensive and frequent disputes as the carbon market expands beyond the jurisdiction of administrative regions, just to mention a few.

Let us focus on one thorny issue, that is, unused allowances from the seven pilot markets. Ruling out the banking of these allowances to the national scheme would likely cause regional carbon prices to crash. But allowing all or some of the units to be carried forward, while maintaining their value,

would risk burdening the national market with a sizeable oversupply upon its launch. There are several options. One is to consider a conversion mechanism that would allow pilot allowances to be eligible in the national market, but at a discounted value. A conversion rate would depend on the degree of over-allocation and the price levels in the market from where they originate, giving surplus allowances from very over-allocated pilots a higher discount rate than those from the markets with only slight surpluses. Another is to allow the pilot permits to be used, but only for a portion of the allowances carried forward each year in a limited period. The third option is to link the level of allowances with bankable surplus allowances from the pilot region. This will let allowances from the pilot carbon markets be banked to the national emissions trading system, but at the expense of reduced allocation levels in that region. Which option would prevail in the end will depend on the outcome of intense negotiations between the central government, regional governments, and industry over how to treat unused allowances from the seven pilot markets in the national ETS, and could have a huge bearing on the success of the world's biggest carbon market. Furthermore, price uncertainty and market stabilization are expected to become even bigger issues in a nationwide ETS. Using reserved allowances for cost-containment purposes in carbon pilots may be even more problematic in a national ETS. Thus, an easy but effective measure against price uncertainty would be to introduce both a price ceiling and a price floor.

The MOEE's interim measure indicates that those equivalent to allowances can be used to meet the emissions obligations of the covered entities (MOEE 2019a). This is widely considered as a green light for the use of the offsetting, but the types and conditions to use offsetting have not been specified. To help lower the compliance costs of the covered entities in the national ETS and encourage those not covered in the national ETS to take more abatement actions, combined with the lessons learned from the pilots in this context, there is great necessity to authorize the use of a flexible offsetting mechanism and specify the mechanism's conditions of use.

Experience in the pilot regions shows that the entities have not recognized that emissions trading is not only a means of helping the covered entities to meet their emissions obligations, but it can also help them achieve that goal at low costs. Many entities believe that governments may not be that serious about enforcing compliance, so they take advantage of emissions trading only at the last minute. While the majority of them meet their obligations in the end, they pay higher prices than what would otherwise be the case. For example, the total volume of traded allowances in the last month in Beijing, Shanghai, and Shenzhen accounted for 75 percent, 73 percent, and 65 percent, respectively, of the total

accumulated volume of trade from the first to the last trading day of the first-year compliance circle. Consequently, not only the volume of traded allowances rose rapidly in the last month of the compliance circle; so did their online trading prices (Zhang 2015b). Chongqing, as a representative region of China's development level, performed poorly in the overall compliance of the seven pilots. All these suggest that the expansion of carbon trading pilots to a nationwide ETS is not easy, and that educating the covered entities and strictly enforcing compliance rules are crucial to enabling active participation in carbon emissions trading.

REFERENCES

- Beijing Municipal Development and Reform Commission (BMDRC) (2014), *A Circular on Specifying Discretion of Administrative Punishments Under Carbon Emissions Trading*, Beijing.
- Hong, R. (2020), 2019 China Carbon Market Report, <http://www.tanjiaoyi.com/article-30146-1.html> (accessed 19 February 2020).
- International Carbon Action Partnership (ICAP) (2018), *Emissions Trading Worldwide: Status Report 2018*, ICAP, Berlin.
- Li, G. and Y. He (2014), "Carbon Trading Pilot in the First Year Met with Expectation, 98.9 Percent of the Covered Enterprises in Guangdong Complied with Their Obligations", *People's Daily*, 20 July.
- Ministry of Ecology and Environment (MOEE) (2019a), *Interim Measures on the Management of Carbon Emissions Trading (Draft for Comment)*, Beijing, 29 March.
- Ministry of Ecology and Environment (MOEE) (2019b), Implementation Plan for CO₂ Emissions Allowances Allocation of Key Emitting Entities of Power Generation Sector (Including Self-Owned Power Plants and Co-Generations) in 2019 (For Trial Calculation), <http://www.mee.gov.cn/xxgk2018/xxgk/xxgk06/201909/W020190930789281533906.pdf> (accessed 6 February 2020).
- National Development and Reform Commission (NDRC) (2015), Department of Climate Change: Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions, <http://www4.unfccc.int/submissions/INDC/Published%20Documents/China/1/China's%20INDC%20-%20on%2030%20June%202015.pdf> (accessed 6 February 2020).
- National Development and Reform Commission (NDRC) (2017), Work Plan for Establishment of The National Carbon Emissions Trading Market (Power Generation Sector), Beijing, 18 December.
- Zhang, J., H. Ren and J. Fen (2019), China News Release: Vice Minister Zhang Yingmin of China's Ministry of Ecology and Environment: Firm Implementation of the Paris Agreement, <http://www.chinanews.com/gn/2019/12-12/9031652.shtml> (accessed 19 February 2020).
- Zhang, Z. X. (2010a), "Is It Fair to Treat China as a Christmas Tree to Hang Everybody's Complaints? Putting its Own Energy Saving into Perspective", *Energy Economics* 32, 47–56.
- Zhang Z. X. (2010b), "China in the Transition to a Low-Carbon Economy", *Energy Policy* 38, 6638–53.
- Zhang, Z. X. (2011a), *Energy and Environmental Policy in China: Towards a Low-carbon Economy*, Edward Elgar, Cheltenham, UK and Northampton, USA.
- Zhang, Z. X. (2011b), "Assessing China's Carbon Intensity Pledge for 2020: Stringency and Credibility Issues and their Implications", *Environmental Economics and Policy Studies* 13 (3), 219–35.
- Zhang, Z. X. (2015a), "Crossing the River by Feeling the Stones: The Case of Carbon Trading in China", *Environmental Economics and Policy Studies* 17 (2), 263–97.
- Zhang, Z. X. (2015b), "Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme", *Climate Policy* 15, 104–26.
- Zhang, Z. X. (2017), "Are China's Climate Commitments in a Post-Paris Agreement Sufficiently Ambitious?", *Wiley Interdisciplinary Reviews: Climate Change* 8 (2), e443.
- Zhou, X. (2020), China Chemical News Release: Carbon Market Quota Exceeds 3 Billion Tons during the 14th Five-Year Plan, Where Does Carbon Cost the Most?, <http://www.tanjiaoyi.com/article-30362-1.html> (accessed 19 February 2020).