Carbon Trading in China: Progress and Challenges

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The historic Paris Climate Agreement[1] approved in December 2015 by 196 nations sets an ambitious goal of holding the global average temperature increase "well below" 2° Celsius (C) above pre-industrial levels. However, the emission reduction pledges made to date fall far short of achieving that goal. The agreement creates a process to monitor and ratchet up the pledges over time. But time is short if we are to avoid the worst consequences of climate disruption. Much more aggressive action is needed to decarbonize the global economy and accelerate the transformation to cleaner, more efficient energy sources.

China and the United States deserve a great deal of credit for the successful outcome in Paris. Their landmark 2014 agreement[2] committing each nation to reduce emissions and promote cleaner energy sources inspired a record number of nations to submit their intended nationally determined contributions (INDCs) to climate mitigation and adaptation. This commitment was underscored by the joint statement issued by President Xi Jinping and President Barack Obama at the United States-China Climate Summit in September 2015,[3] in which China announced that it will enact a national emission trading system (ETS) in 2017 covering power generation, steel, cement, and other key industrial sectors.

China's 12th Five-Year Plan, covering 2011-2015, lays out plans to "gradually develop a carbon trading market." China is currently implementing seven pilot ETS that are expected to serve as the testing ground for the national ETS. The seven pilot ETS could eventually regulate approximately one billion tons of carbon dioxide (CO_2), and if linked would become the second largest trading market in the world. By comparison, the European Union (EU) ETS is about twice as big.

The 2017 timetable to implement a national trading system is extremely ambitious. China has yet to enact legislation authorizing a national ETS system and there are many other obstacles to overcome. This Comment will review the progress to date and identify the challenges ahead, including institutional capacity; allocation of allowances; carbon accounting; monitoring, reporting, and verification (MRV); and financial regulation to control price volatility.

I. Background: The Scientific and Economic Imperative for Action

For the first time since recordkeeping began, CO_2 levels in the atmosphere have surpassed 400 parts per million (ppm) globally.[4] According to many reports, the world is on the brink of crossing the 1°C threshold, which is halfway to the 2°C target embodied in international law.[5] With this warming has come accelerated melting of the Greenland and Antarctic ice sheets and a corresponding increase in sea-level rise greater than climate models have been predicting.[6] Human-caused climate disruption is intensifying droughts, storms, floods, wildfires, heat waves, and diseases all across the globe.[7] It is also contributing to species extinctions and ecosystem degradation on a scale that rivals the five great mass extinction events in the earth's history.[8]

Global climate change is no longer a distant threat. The world is changing before our eyes. Climate disruption is

1. U.N. Framework Convention on Climate Change, Adoption of the Paris Agreement (2015), *available at* http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf.
2. U.S.-China Joint Announcement on Climate Change (Nov. 11, 2015), *at* https://www.whitehouse.gov/the-press-office/2014/11/11/us-china-joint-announcement-climate-change.
3. U.S.-China Joint Presidential Statement on Climate Change (Sept. 25, 2015), *at* https://www.whitehouse.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change.
4. National Oceanic & Atmospheric Admin. (NOAA), NOAA Global Monitoring Program, http://www.esrl.noaa.gov/gmd/ccgg/mbl/map.php.
5. U.K. Met Office, Global Climate in Context as the World Approaches 1°C Above Pre-Industrial for the First Time (2015), http://www.metoffice.gov.uk/research/news/2015/global-average-temperature-2015.
6. Press Release, National Aeronautics & Space Admin., NASA Science Zeros in on Ocean Rise: How Much? How Soon? (Aug. 26, 2015), http://www.nasa.gov/press-release/nasa-science-zeros-in-on-ocean-rise-how-much-how-soon.
7. Friederike E.L. Otto, *Climate Change: Attribution of Extreme Weather*, 8 Nature Geoscience 581-82 (2015).
8. Gerardo Ceballos et al., *Accelerated Modern Human-Induced Species Losses: Entering the Sixth Mass Extinction*, 1 Sci. Advances 19 (2015).

affecting human health and safety; it is causing substantial economic damage to property and infrastructure; and it is contributing to political instability and dislocation of human populations.[9] The best scientific minds in the world are warning of far more serious and irreversible consequences for humanity unless there is a concerted effort by government and the private sector to end the fossil fuel era in time to avoid utter catastrophe.

Climate change has been called the "greatest and widest-ranging market failure ever seen."[10] Carbon pollution is a classic example of a market externality that can only be corrected by governmental policies. But those policies must be intelligent, well-designed, and cost-effective. They must also take into account the disproportionate burden on vulnerable countries and peoples who have had little to do with creating the problem. The principle of "common but differentiated responsibilities" incorporated into the original United Nations Framework Convention on Climate Change remains a central feature of international cooperation, including the Paris Agreement, to address climate mitigation and adaptation. Simple justice demands that those who have benefited the most from the industrial era, and who have the resources and technologies to make a difference, must take the lead by internalizing the social cost of the carbon pollution through regulatory and fiscal policies.

There are many approaches to internalizing the social cost of carbon. For example, traditional "command-and-control" regulations, as exemplified by President Obama's Clean Power Plan[11] for the electricity sector and fuel economy standards for the transportation sector adopted under the Clean Air Act (CAA),[12] will continue to be effective in many areas. Carbon disclosure requirements are now incorporated into securities filings that must be made by publicly traded companies in the United States and elsewhere.[13] Tradable permits developed under the CAA Acid Rain Program have been adapted for use in the EU ETS system. Carbon taxes have been used successfully in British Columbia and elsewhere.[14] Market-based mechanisms are clearly the instruments of choice when it comes to fashioning global policies to achieve significant reductions in carbon emissions. Since China is now the largest emitter of CO_2, with 29% of the global emissions, it is important to understand the challenges and prospects facing China's emerging trading program.

II. China's Pilot Programs

At the 15th Conference of the Parties in Copenhagen in 2009, China committed to a 40-45% carbon intensity reduction per unit of gross domestic product (GDP) by 2020 based on 2005 levels. Following up on the nonbinding Copenhagen Accord, China's State Council announced plans to establish a carbon ETS in October 2010. In October 2011, China's National Development and Reform Commission (NDRC) issued the "Notice of the General Office of the National Development and Reform Commission on the Pilot Trading of Carbon Emission Rights." NDRC selected four municipalities, two provinces, and one special economic zone—dubbed the 4+2+1 program. The seven pilot programs are Beijing, Chongqing, Guangdong, Hubei, Shanghai, Shenzhento, and Tianjin.

The program was officially launched in January 2012. The goal of carbon ETS pilot programs is to reach the 2020 carbon intensity reduction goal through market-based mechanisms. NDRC requested that local governments where the pilot programs are located consider adopting regulations and procedures to establish emission caps, set up a system for allowance allocations, require MRVsystems, and construct a carbon exchange platform.

The seven pilots cover a wide range of different economic, industrial, and geographic circumstances. Together they comprise about 25% of the country's annual GDP and represent the spectrum of economic development and wealth within the country. As of August 2015, about 2,000 companies have participated in the pilot programs, and carbon allowances permitting more than 40.24 million metric tons (Mt) of CO_2 have been traded at a combined value of about US$195 million; the amount of carbon allowances auctioned reaches 16.64 metric tons with the total value of US$123 million.[15] The pilot programs are independent of each other and have different designs in many aspects, as described below.

A. *Setting the Cap*

The caps for each pilot program are shown in Table 1. Caps reflect regional carbon-intensity goals; therefore, they are subject to adjustment because the actual GDP growth would differ based on projected economic growth.[16]

9. Coral Davenport, *Climate Change Deemed Growing Security Threat by Military Researchers*, N.Y. Times, May 13, 2014.
10. Nicholas Stern, The Stern Review on the Economics of Climate Change, Exec. Summary at i (2007).
11. *See* White House, Climate Change and President Obama's Action Plan, https://www.whitehouse.gov/climate-change.
12. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618.
13. Press Release, U.S. Securities & Exch. Comm'n, SEC Issues Interpretive Guidance on Disclosure Related to Business or Legal Developments Regarding Climate Change (Jan. 27, 2010), https://www.sec.gov/news/press/2010/2010-15.htm.
14. B.C. Ministry of Finance (Can.), Overview of the Revenue-Neutral Carbon Tax, http://www.fin.gov.bc.ca/tbs/tp/climate/carbon_tax.htm (last visited Dec. 20, 2015).
15. State Council: 2015 Annual Report of China's Policies and Actions on Dealing With Climate Change, http://www.china.com.cn/zhibo/zhuanti/ch-xinwen/2015-11/19/content_37106833_3.htm.
16. Clayton Munnings et al., *Assessing the Design of Three Pilot Programs for Carbon Trading in China* 17 (Resources for the Future Discussion Paper No. 14-36) (Oct. 2014), *available at* http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-DP-14-36.pdf.

Table 1: Cap Setting

Cities or Provinces	Cap of GHG emissions (in metric tons of CO_2 equivalent per year)
Beijing	70
Shanghai	150
Tianjin	150
Chongqing	100
Guangdong	350
Hubei	120
Shenzhen	30

Source: Shuang Zhen, *Survey of the Pilot Programs of C&T System of the Seven Provinces or Cities*, 2 J. China Energy 22, 25 (2014).

B. Sources Covered

The emission sources covered by the pilot programs vary from place to place, as shown in Table 2. Guangdong, the largest one, covers electricity, cement, steel, and petrochemical companies that emit more than 20,000 tons of carbon or consume more than 10,000 tons of coal energy annually, as well as companies in the commercial sector emitting more than 5,000 tons of carbon per year. Shanghai covers the electricity, industrial, commercial, and transportation sectors including airports and seaports. Beijing covers the following sectors: electricity, heat, cement, petrochemical, and service. The majority of participants are regulated entities that emit over 10,000 tons of carbon annually; other entities that consume at least 2,000 tons of coal energy per year may voluntarily join the program. Chongqing's pilot program covers the industrial enterprises for which annual CO_2 emissions exceeded 20,000 tons during 2008-2012.

C. Allowance Allocation

Nearly all of the allowances were initially allocated for free based on the criteria of grandfathering, ability to pass along costs to consumers, output of production, or other factors. Guangdong, Hubei, and Shenzhen have auctioned a small fraction of allowances based on floor prices that have been fixed by the regulators. Each region has a separate and independent carbon exchange. Membership in the exchange is a prerequisite to trading.

D. Reserve Allowances

There are two types of reserve allowances for different purposes: new entry reserve and government reserve. The new entry reserve is kept to meet the pilot entities' needs for economic growth capacity and new emitters, and is distributed free of charge. The government reserve, amounting to a fraction of the total amount, is kept for stabilizing prices and may be sold by auction or at a fixed price. The credits eligible for trading are carbon emission allowances, Chinese Certified Emission Reductions, and other voluntary emission reductions and carbon credits certified or approved by relevant local authorities.

The average price of CO_2 per ton in the seven markets varies from $1.40 to $13.00. The price is volatile within each market as well. The highest price of CO_2 per ton reached $23.60 in the Shenzhen CEEX in 2013, while the lowest price for offset credits in the Guangdong GZEEX was close to $3.00 in the same year. The price of carbon per ton in the seven markets on December 16, 2015, is shown in Table 3.

Table 2: Emissions Coverage

Cities or Provinces	Covered Entities	Covered Industries	Covered GHGs
Beijing	490	Electricity, heat, cement, petrochemical, service	CO_2
Shanghai	191	Electricity, steel, petrochemical, chemical, nonferrous metals, building materials, textile, paper making, rubber, chemical fiber, aviation, airports, seaports, shopping malls, hotels, office buildings, railway stations	CO_2
Tianjin	114	Electricity, cement, steel, petrochemical, chemical, extraction of oil and gas	CO_2
Chongqing	240	Industrial enterprises	CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride
Guangdong	242	Electricity, cement, steel, petrochemical	CO_2
Hubei	153	Building materials, chemical, electricity, metallurgy, food and beverage, petroleum, automobile, chemical finer, medicine, paper making	CO_2
Shenzhen	832	Industrial enterprises, building industry	CO_2

Source: Wenda Tang, *Comparative Study of the Allowance Allocation in the Pilot Programs of C&T*, J. Mod. Bus. 281, 285 (2014).

Table 3: Carbon Price

Cities or Provinces	Price of CO_2 per ton (in US$)
CBEEX, Beijing	$5.99
SEEX, Shanghai	$1.64
TCX, Tianjin	$3.52
CCETC, Chongqing	No transaction, previous record was $1.93 on Dec. 1, 2015
GZEEX, Guangdong	No transaction, previous record was $2.35 on Dec. 11, 2015
CHEEX, Hubei	No transaction, previous record was $3.55 on Dec. 15, 2015
CEEX, Shenzhen	$5.97

Source: China Carbon Trading Network, http://www.tanjiaoyi.com/tanshichang/.

E. Monitoring, Reporting, and Verification

All mandatory participants are required to implement a monitoring system, report their annual emissions, and have the report verified by an accredited third party within given periods. Each pilot entity has established its own MRV system. A mandatory participant must surrender a sufficient amount of allowances, equivalent to the volume of its actual carbon emissions for the compliance year. The penalty for noncompliance varies from region to region.

Beijing, Guangdong, Shanghai, Shenzhen, and Tianjin have each set a different default penalty provision. The penalties fall into four categories: reducing the number of free allowances; publicizing the compliance status of firms to create social pressure; restricting the violator's access to special funds for energy conservation for two years or other programs for a period of time; and assessing penalties that are three times the average allowance price if emissions exceed allowances by any amount.

III. Recent Developments

China is moving on two fronts. NDRC has drafted a new law, the "Dealing With Climate Change Act of the PRC" (CCA), which is being circulated for comments from governmental agencies and relevant industries. At the same time, the State Council is developing a regulation on carbon emission trading to implement the national trading scheme.

The CCA contains a number of elements, including a statement of purpose and goals, scope of its application, definition of climate change, legal principles of dealing with climate change, supervisory agency for dealing with climate change, plan for dealing with climate change, information disclosure, mitigation and adaptation measures, international cooperation, and incentives such as the carbon emission trading mechanism.

A main purpose of the CCA is to follow through on the commitments that China has made in the China-United States Joint Statement and to the international community in Paris. These include:

- A pledge to peak emissions of greenhouse gases by 2030, with the possibility of reaching the peak earlier if other parties take further actions.
- A pledge to reduce carbon intensity by 60-65% by 2030 (based on 2005 levels).
- The launch of the "Green Dispatch" program to prioritize renewable power and higher efficiency fossil fuel power generation (i.e., supercritical systems).
- A commitment of US$3.1 billion for South-South Cooperation[17] funds to support developing nations.
- A pledge to increase generation of solar power by 150-200 gigawatts and wind power by 250 gigawatts by 2020.
- A pledge to improve public transportation and ease traffic congestion with a goal of public transport accounting for 60% of all motor vehicle use in major cities.

In addition to including a number of mitigation techniques such as carbon trading, carbon taxes, product labeling to disclose the product's carbon footprint, government procurement, and efficiency standards for cars and appliances, the draft CCA addresses the need to increase carbon sinks through improved forestry practices, conservation of agricultural soils and grasslands, and investments in afforestation projects. The draft CCA also requires assessments of the climate change implications of major plans, policies, and projects under China's 1989 Environmental Protection Law.[18]

Similar to many environmental laws in China, the draft CAA is written in very broad terms, leaving many of the details on compliance, enforcement, and other issues to be worked out after passage of the law. In fact, as of January 2016, the draft CCA had not been submitted to the National People's Congress (NPC) and it is too soon to predict what will happen there.

The draft of the Regulation on Carbon Emission Trading of PRC is also an ongoing legislative project launched by NDRC. It is likely to be enacted by the State Council in 2016, because it is easier for a law to get passed by the State Council than for the draft of the CCA to be approved by NPC. Further, even if it gets passed by NPC, the CAA still needs an enforcement tool to make it operational.

In addition, Chinese President Xi is proactive on climate change and environmental issues; his leadership

17. "South-South Cooperation" generally refers to the exchange of resources, technology, and knowledge between developing countries.
18. Xiangbai He, *Integrating Climate Change Factors Within China's Environmental Impact Assessment Legislation: New Challenges and Developments*, 9 L. Env't & Dev. J. 50 (2013), *available at* http://www.lead-journal.org/content/13050.pdf.

unquestionably speeds up the lawmaking process. Promoting sustainable development, strengthening the rule of law, and enforcing anti-corruption laws have become the hallmarks of his leadership. His commitment to restructuring the industrial and energy systems will have a profound influence on the Chinese economy and environmental protection, for these are the root causes of environmental degradation and climate disruption in China and elsewhere.

President Xi's commitment to formulating a national carbon market in 2017 provides the vital political support to push forward the lawmaking process on carbon emissions trading regulation in particular, and climate change law in general. His leadership role was shown in the recent Paris Conference and Agreement, and will be shown in the compliance and enforcement of the Paris Agreement and the subsequent international cooperation efforts, including more vigorous INDC in the future.

IV. Challenges and Opportunities

Even with strong political leadership at the top, China faces a host of challenges in setting up its national carbon ETS. Chief among these is the need for a national legal framework to integrate, harmonize, and expand the pilot programs. Investors must have legal certainty and political stability to ensure that profits will not be lost. Carbon accounting must be accurate and transparent. The lack of transparency has been a major issue in the pilot programs. Recently, it was reported that China has been burning up to 17% more coal per year than the government previously disclosed.[19] Designing and enforcing an effective MRV system will be critical to creating confidence in market participants.

Price volatility is also a major issue. The 2015 China Carbon Pricing Survey, conducted by the China Carbon Forum and ICF International, showed that prices in the seven pilot schemes have fluctuated significantly. When the survey was taken in mid-2015, prices ranged from 9 yuan (US$1.42) per ton in Shanghai to 42 yuan (US$6.61) per ton in Beijing. Overallocation of allowances, a problem that has plagued the EU ETS and other emissions trading markets, is a likely cause of the volatility.[20]

Policymakers face a number of choices. If they decide to provide free allocations, it will be necessary to specify who will receive these allowances and on what basis (for example, past or current emission levels, some benchmark performance standard, or another basis). If the allowances are auctioned, decisions must be made regarding the type of auction that will be conducted and how the funds generated will be used. If a combined approach is utilized, with some allowances given away and the rest auctioned, policymakers will face all of these decisions.

Another challenge facing policymakers is how to integrate carbon trading with the other policies relating to energy conservation, air pollution prevention, carbon intensity reduction, and coal consumption. These policies influence carbon trading pilot programs on two levels. At the firm level, a facility under a carbon trading program may forgo an opportunity to buy an allowance because an additional ton of carbon emission allowances would put it out of compliance with an energy conservation goal. At the market level, the abovementioned policies that reduce carbon emissions from the same sources covered by the cap would reduce the demand for allowances and lower the price of allowances. Further, the domestic markets are separated by several sectors, and each market has its own unique design in many aspects; this will impair the establishment of a united national carbon market in the future.[21]

The legitimacy of a carbon ETS depends on domestic institutions that can police transactions and make sure they are honest. In the United States, the acid rain trading system—which has served as the model for trading programs around the world—functions within a robust regulatory system. Regulators require that emissions steadily decrease over time and back that up with very tough penalties and criminal sanctions. If the government fails to act, the law authorizes citizen watchdogs to file suit to enforce the rules. Traders must use elaborate mandated accounting measures, and transactions are transparent and tracked on the website of the U.S. Environmental Protection Agency. Courts in the United States are independent and vigorous in their review of agency neglect or malfeasance. By contrast, in China, neither the administrative enforcement nor the judicial supervision are strong enough and the rule of law is still an ongoing process.

On the plus side, the slowing of the pace of GDP growth provides some breathing room and an opportunity for China to construct a viable carbon market. Breakneck economic growth limited the supply of sellers from previous Chinese attempts to start regional sulfur dioxide markets and the pilot CO_2 markets. Demand was increasing so rapidly that power generators had no excess emissions credits to sell. The result was stilted, forced trades with largely symbolic value. With slowing economic growth, China's expanded fleet of more efficient power plants and renewable assets, and declining output of manufacturing iron, steel, and coal plants, there is the potential for a growing cadre of real credit sellers.

Success with the ETS can also produce important cobenefits by helping to lower fine particulate pollution ($PM_{2.5}$) that is the main source of the crippling pollution in Chinese cities. The air pollution problem is a big motivator for the Chinese government and the cities to work hard

19. Chris Buckley, *China Burns Much More Coal Than Reported, Complicating Climate Talks*, N.Y. Times, Nov. 3, 2015.
20. International Emissions Trading Ass'n, China: An Emissions Trading Case Study (2015).
21. *See* T. Schatzki & R.N. Stavins, Implications of Policy Interactions for California's Climate Policy (2012), *available at* http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/implications_policy_interactions_california_climate_policy.pdf.

on implementing a robust ETS, along with other moves to strengthen air pollution laws and regulations.

In the end, it is important to take a long-term view of the efficacy of China's bold attempt to create the world's largest carbon market. No other ETS in the world has built itself from the bottom up using provincial- and city-scale pilot systems. In the short term, other policies such as energy efficiency policies and renewable energy policies are likely to have a bigger impact on reducing China's carbon footprint. But over the long term, an ETS has the potential to be the main driver of carbon reductions. The world has an enormous stake in China's success.