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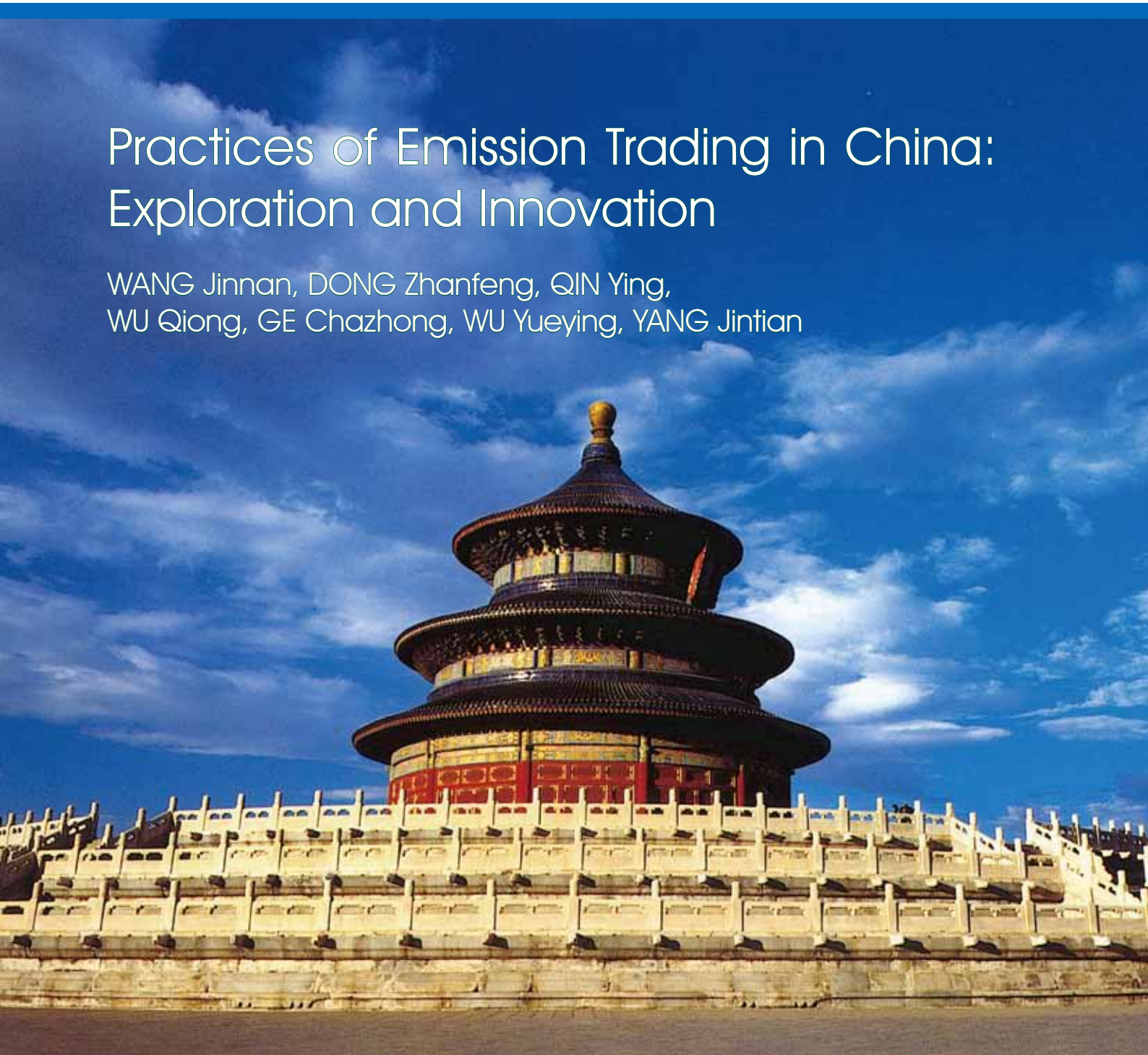

Practices of Emission Trading in China: Exploration and Innovation

WANG Jinnan, DONG Zhanfeng, QIN Ying,
WU Qiong, GE Chazhong, WU Yueying, YANG Jintian

Forword »

Editor in Chief: Prof. WANG Jinnan

Since its opening-up and reform, China has been in the process of rapid economic development with its people enjoying an increasingly improved standard of life. Meanwhile accompanying this dramatic economic growth is the degradation of environment which has, to some extent, damaged the gains of the opening-up and reform and prevented the economy from a healthy and sustainable development. The Chinese government is increasingly aware of that without addressing the environmental issues it is facing now will jeopardize its long term goal of the great rejuvenation of the Chinese nation. Given the magnitude and complexity of the environmental issues in China, there is no easy way in addressing them and the solution to them entails an equal priority being given to environmental protection, ecological conservation and economic development or even higher than the latter by mainstreaming the former into the overall socio-economic decision-making process. As a matter of fact, China has been in the struggle against environmental pollution since the very beginning of its economic take-off and trying to explore a pathway that could help address China's environmental issues in the way most suitable to China's specific circumstances.

In recent years, especially since the 12th Five-Year Plan period, the enhanced measures including legislation, policy, regulatory and economic means have been taken by the Chinese government in dealing with environmental problems, of which environmental policies have played an important role in this regard. Corresponding to this situation and in meeting the demand of governments at different levels for environmental policy tools, the environmental policy research projects on topics of a wide range have been conducted by some Chinese environmental research institutions including the Chinese Academy for Environmental Planning (CAEP).

CAEP founded in 2001 is a research advisory body supporting governments in the

development of key environmental planning, national environmental policies, and major environmental engineering projects. In the past more than 10 years, CAEP accomplished the development of the overall planning of national environmental protection for the 10th, 11th and 12th Five-Year Plan periods; water pollution prevention and control planning for key river basins; air pollution prevention and control planning for key regions; soil pollution prevention and control planning; and some regional environmental protection plans. In the same period of time, CAEP also actively engaged in research on such topics as green GDP, environmental taxation, emission trading, ecological compensation, green financing, etc. By so doing, CAEP has become an indispensable advisory body in the environmental decision-making in mainland China. According to *2013 Global Go To Think Tanks Report and Policy Advice* published by University of Pennsylvania, CAEP was ranked 31 in the field of environment in the world. Many of CAEP's research results and project outcomes regarding environmental policies have drawn great attention of decision makers and international institutions, and have been utilized to contribute to the formulation of national environmental policies concerned. *The Chinese Environmental Policy Research Working Paper (CEPRWP)* is a new internal publication produced by CAEP for the purpose of facilitating the academic exchange with foreign colleagues in this field, in which the selected research papers on environmental policies from CAEP are set out on the irregular basis. It is expected that this publication will not only make CAEP's research results on environmental policies be known by foreign colleagues but also serve as a catalyst for creating opportunity of international cooperation in the field of environmental policies, and environmental economics in particular, with a view of both the academic research and practical policy needs.

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Practices of Emission Trading in China: Exploration and Innovation

WANG Jinnan*, DONG Zhanfeng, QIN Ying, WU Qiong, GE Chazhong, WU Yueying, YANG Jintian

Abstract:

In recent few years, market economy mechanism in China has gradually established, and market based policy tools were attached more importance than ever before. As China's economy has been growing fast in the past three decades with an annual increasing ratio greater than 8%, its environmental problems are mostly getting worse. In the future, more environmental restraints would be imposed on the economic development, and bigger pressures of major pollutants reduction will be ensued, so policy innovation of environmental pollution prevention and control should be expedited. Emission trading pilot projects has emerged in China since late 1980s, but advanced very slowly. However, with great efforts in environmental protection of the governments these years, environmental monitoring and supervision and management capacities have been greatly increased, in particular in some industrial sectors or regions, and with these years pilot projects exploration, lots of policy implementation experiences of emission trading also gained. Under such backgrounds, pollution emission trading programs developed rapidly especially since 2007, development trends of emission trading has become vigorous. Firstly, this paper reviewed systematically practices and progresses of international and domestic emission trading policy in China during the past two decades, and concluded that emission trading is broadly used in the air pollutants reduction in USA, and the global carbon reduction with better effects, the emission trading policy exploration in China could be roughly divided into three stages: Initial Development stage (1988-2000), Piloting exploration stage (2001-2006), Deepening Piloting stage (2007-). Secondly, nine characteristics of the current emission trading practice in China were concluded and six key issues influencing the advancement of emission trading piloting were identified and discussed. And lastly, the paper proposed the pilot roadmap for implementation of the emission trading, and pointed out that efforts in the near future should focus on the construction of "six systems", that are key technical supporting system, fair and reasonable allocation system of the emission permit, emission trading market system, laws and regulations system, pollution source monitoring and management system, and law enforcement and supervision system.

Keywords:
Emission trading, updated progress, Chinese features, key issues, strategic action routes

NOTE

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1. Introduction

Emission trading, that originated from some American economists' academic theory early in 1960s (Crocker, 1966; Dales, 1968), has been practiced and now evolved into an important environmental economic policy and an important approach to reducing pollution (David, 1997; UEPA, 1991; Reuters, 2007) in many countries and is also a part of the global cooperative scheme in greenhouse gas reduction (Stewart, 2007; Risa, 2008). As China continues with the construction of a market economy system, environmental policies and approaches are going through a gradual transition from a stage that features in the predominant application of administrative control measures to a stage that relies more on the market mechanism to achieve the goal of energy conservation and emission reduction. Thanks to the significant progress over the recent years in the implementation of the total emission control and energy conservation and emission reduction strategies, China has had in place the political and institutional circumstances required for the operation of the emission trading mechanism. Governmental authorities at all levels attach great importance to and launched emission trading programs to search for solutions to more effective configuration of environmental capacity resources at lower social costs.

2. The International Tendency of Emission Trading

The market mechanism-based emission trading policies have been widely employed to effectively control pollution in some developed countries, such as United States and Canada. In recent years, this kind of policies has been applied in the global strategic cooperation on emission reduction, particularly revealed great policy vitality in the field of climate change.

2.1 Emission trading for air and water pollutants

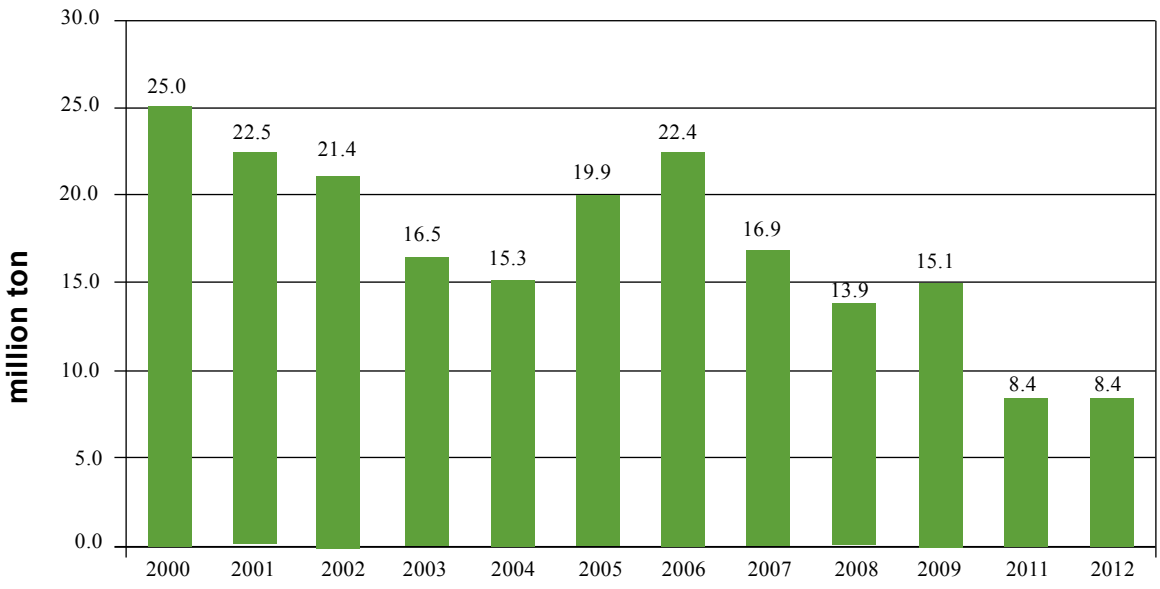
The emission trading system was originated from the United States, which implemented it as early as 1976 (National, 2001) to promote SO_2 emission reduction and speed up the technical innovation of the electric power enterprises. Generally, the course of emission trading in the USA (Wang, 2000) can be divided into two phases. The first phase from the mid-1970s to the early 1990s was an exploration course of emission trading, when some local or regional emission trading had been carried out under the government coordination. Such emission trading was performed on the basis of the Emission Reduction Credits (ERCs), which consists of four major policies of the "bubbles", "offset", "banking" and "netting". In general, the trading volume in this phase was much less; the actual effect of emission trading policy was less too. However, it was indicated from such practices that the emission trading policy was quite feasible for SO_2 emission reduction of the electric power industry; meanwhile the valuable experiences have been also provided to further expand application of emission trading policy. The second phase is marked as the Clean Air Act

Amendment passed and Acid Rain Program (Douglas, 2002) implemented in 1990 and lasted until today. The emission trading was legally institutionalized in the United States when the Clean Air Act was amended in 1990, in this phase it is featured as total quantity control, such policies have been successfully applied in this phase, and really formed the market-oriented emission trading mechanism, which has implemented all over the United States. The initial allocation of emission permits has three forms, including free distribution, auction and reward; among them, the free allocation is the main channel (Wu, 2008). The emission trading in this phase also entered the extension and all-round popularization stage, the subject of policies covered SO_2, NOx, Hg, ODS (Ozone Depleting Substances), etc.

The atmospheric emissions trading in the USA is the most extensive and successful international emissions trading practice by far, such policy significantly improved the atmospheric environmental quality, and also lowered the social cost for air emissions reduction. It is indicated from the statistics that total SO_2 and NOx emissions respectively decreased by 40% and 48% from 1990 to 2006 under the condition that the generating capacity of USA electric power industry increased 37% in the same period (Denny, 2003). Since emissions of major pollutants have experienced the significant reduction, wet sulfate deposition in most of Midwest and Northeast America fell by 25-40% compared with that in 1990. In 2012, the ozone trading volume through the CAIR of United States amounted to 318,000 tons, the trading NOx volume to 759,000 tons, and total trading volume of SO_2 through CAIR and Acid Rain Program reached to 8,446,197 tons. The SO_2 trading volume in recent years is shown as Fig. 1 below.

In addition to the atmospheric pollutants applied in the emissions trading, the water quality trading have been explored in some river basins in the USA with practices of point source - point sources, point source-non-point source and non-point source - non-point source trading available. These

Fig. 1 Tendency of SO_2 trading volume in the United States



trading cases are mainly distributed in the coastal areas and the Great Lakes region. Among them, the cases distributed in the eastern coast include nitrogen credit trading in Long Island (Connecticut), Wastewater Pretreatment & Trading Plan of the River Basin Commission of Passaic County (New Jersey), Neuse River Basin Nutrient-Sensitive Waters Management Strategy (North Carolina), Virginia Nutrients Credit Trading Plan (Virginia); the cases distributed in the western coast include Transaction of load between pasture (California), Boise River Emission Trading Demonstration Project (Idaho), Truckee River (Nevada), Clean Water Service (Oregon); the main trades taken place in the Great Lakes region include License of Rahr Malt Company (Minnesota), Southern Minnesota cooperation permit (Minnesota), Great River Basin trading pilot (Ohio), Red Cedar River Basin Nutrient Trading Pilot Project (Wisconsin) (EPA, 2009). These cases of water quality trade involved twelve categories of major indicators; such indexes for point source water quality trading involved total nitrogen, total phosphorus, Ca, Cu, Pb, Hg, Ni and Zn. Such indexes for non-point source water quality trading mainly include Se, CBOD, sediment and temperature (thermal load). Although the United States has conducted many pilot works at present, some states also issued relevant laws and regulations to standardize the emission trading; overall, the water quality trade is still in the exploratory stage in America, water emissions trading has many advantages in theory, but not completely put into practice. The trading volume of most transactions is still limited, and most of them are carried out under the

Table 1 Distribution of Water Emissions Trading Project

EPA zoning	State	Emission trading programs	Type of trade	Pollutants traded
1	Connecticut	Long Island Nitrogen Credit Trading Plan	Point source - point source	TN (total nitrogen)
2	New Jersey	Wastewater Pretreatment & Trading Plan of the River Basin Commission of Passaic County	Point source - point source	Ca, Cu, Pb, Hg, Ni, Zn
3	Virginia	Virginia Nutrients Credit Trading Plan	Point source - point source, point source - non-point source	TN, TP (total phosphorus)
4	North Carolina	Neuse River Basin Nutrient-Sensitive Waters Management Strategy	Point source - point source, point source - non-point source	TN
5	Minnesota	License of Rahr Malt Company	Point source - non-point source	Deposits, N, C, BOD
		Southern Minnesota cooperation permit	Point source - non-point source	TP
	Wisconsin	Red Cedar River Basin Nutrient Trading Pilot Project	Point source - non-point source	P
	Ohio	Great River Basin trading pilot	Point source - non-point source	N, P
9	California	Transaction of load between pastures	Non-point source - non-point source	Se
	Nevada	Truckee River	Point source - point source, point source - non-point source	TN, TP, TDS
10	Oregon	Clean Water Service	Point source - point source, Point source - non-point source	C, BOD, NH_3, temperature (thermal load)
	Idaho	Boise River Emission Trading Demonstration Project	Point source - point source, point source - non-point source	TP

government's intervention, the overall market size is small, therefore it doesn't related to the market manipulation, only water nutrient trading is more successful. It is indicated from the relevant studies funded by the USA Environmental Protection Agency that the nutrient emission trading is most promising in the United States in the near term, it is also possible for pathogens and chloride trading in the long run; however, there is little possibility of toxic material trading. The water quality emissions trading programs are shown in Table 1 below.

Except for the USA, the emissions trading practices are only carried out in some countries with developed market economy, such as Germany, Australia, Canada and the UK. Germany, Canada and the UK have learned from the emissions trading system in the United States to certain extents. For example, New South Wales, Victoria and South Australia have joined the Salt Reduction Credit Trading promoted by Murray-Darling Basin Commission to solve the regional salinization issue. In order to control acid rain and reduce ozone layer depleting substance, Canada introduced SO_2, NOx and CFCs trading. In addition, some countries, such as Australia, also carried out the water emission trading in the fields of river basin management. In general, the emissions trading system has become one of important measures to control pollutant emission in some developed countries.

2.2 Carbon Market Trading

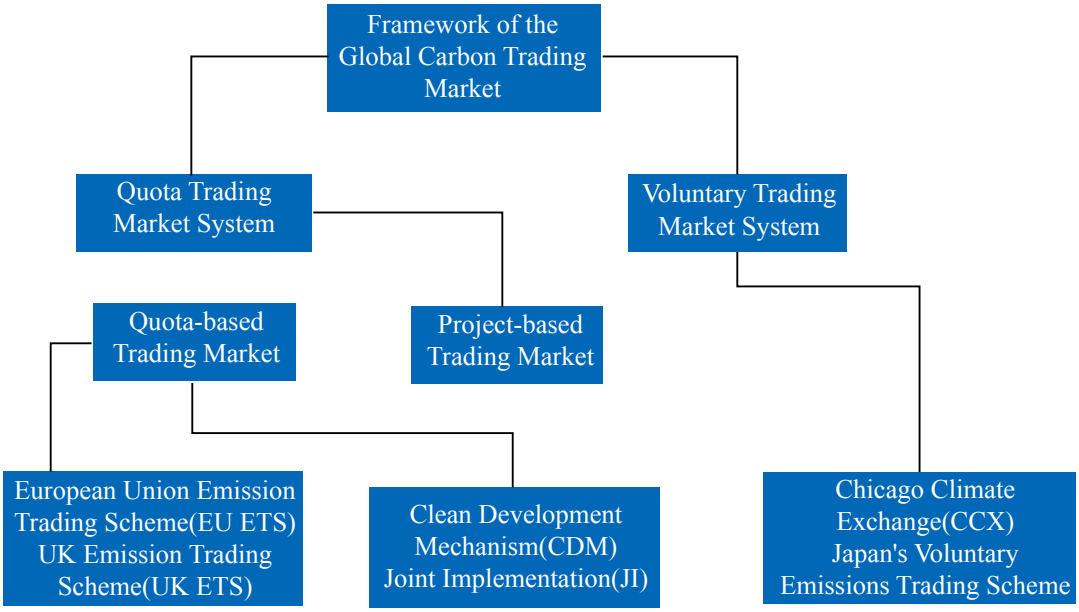
At the global level, the emission trading mechanism is mainly used for carbon emission trading. Currently, the global carbon market is divided into two basic types, the first type is based on project, such as the CDM (Clean Development Mechanism) and JI (Joint Implementation Mechanism) specified in *Kyoto Protocol*, mostly for fulfilling the emission reduction commitments and management requirements; the second is based on the quota, such as, some AAU (Assigned Amount Unit) transferred among the developed countries under the Kyoto Protocol, or EUAs owned by each member country under the EUETS (The EU Emissions Trading Scheme). The emission quota purchased by buyer is determined and allocated (or auctioned) by the management under the Cap & Trade System. Although some shortcomings still exist in these mechanisms, they still have played a great role in the global carbon emission reductions, and got rapid development.

In 2005, the European Union issued permits to the main enterprise with greenhouse gas emissions, which effectively reducing GHG emissions, such as CO_2. According to statistics of the World Bank, the trends in global carbon emissions trade increased rapidly from 2005 to 2011, the global carbon emissions trade volume reached $10.86 billion in 2005, $64 billion in 2007, and $143.7 billion in 2009, it kept a constant increase since 2010 (see Table 1). According to the latest report of World Bank, total amount of gross carbon market grew by 11% in 2011, up to $176 billion; hit a record of 10.3 billion tons of CO_2 equivalent volume. So far, the largest part of carbon markets is the EUAs, valued up to $148 billion. The market liquidity of certified emission reductions (CER) and new secondary emission reduction unit (ERU) is increased, also bringing the large volume increase of secondary Kyoto offset (increased by 43%, up to 1.8 billion CO_2

equivalent, valued at $23 billion). In 2011, the global carbon market continuously follows the same pattern with previous years, mainly promoted by the EU ETS (Emissions Trading System). The global carbon emission trading system has been formed preliminarily (see Fig. 2) (UN website, 2008).

scheme of third phase; to some extent, the EU has agreed that the international credits unit of emission reduction can be used in the EU's emissions trading mechanism prior to the end of third stage (before 2020). In view of the important position of the EU in the subsequent negotiations of Kyoto, the CDM will possibly continue to become the main tool of global carbon market.

Fig. 2 Global Carbon Emission Trading System Framework



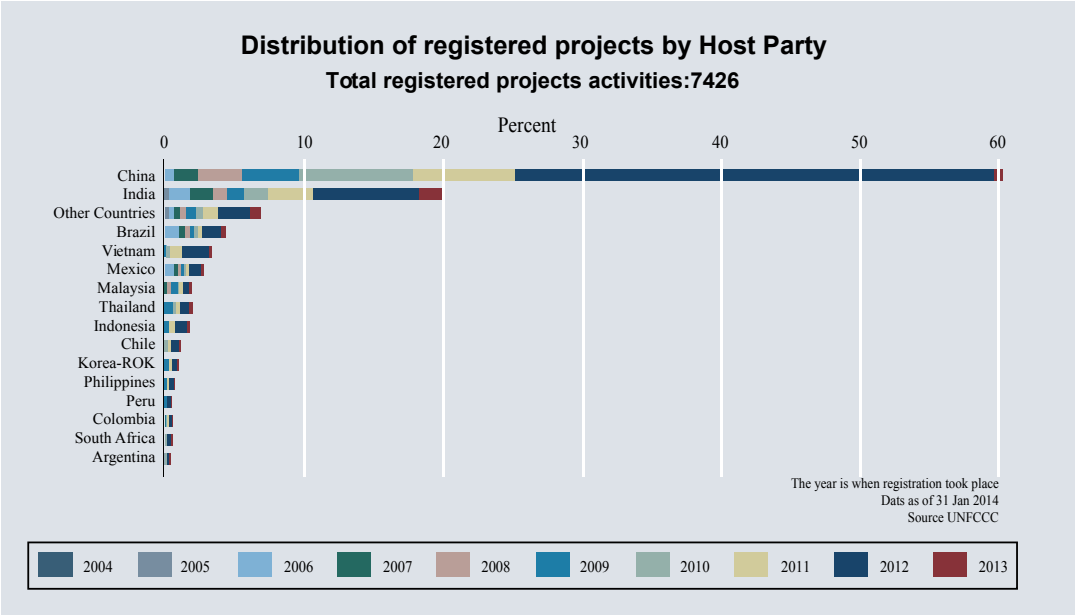
At present, the developed countries, such as Britain, Canada, Japan and Australia have established their domestic trading institutions to promote the GHG emission reduction. Many carbon trading market have been formed internationally, such as the EUETS, which is the biggest carbon market in world currently with trading volume accounting for over 3/4 of the global trading volume. As the EU is the largest buyer of the CDM project market, the progress of its trading scheme has great influence on the prospect of the CDM market. At present, the EU trading scheme has been introduced in the draft

As created in April 2002, the UKETS (UK Emissions Trading Scheme) is the first GHG emissions trading market in the world, and joined the EU Emissions Trading system in January 2007. The NSW (New South Wales) GHG emission reduction system in Australia was formally launched in January 2003 with the trading volume only followed the EU emissions trading system, which is one of the earliest compulsory emission reduction systems. In the same year, the CCX (Chicago Climate Exchange) was formed

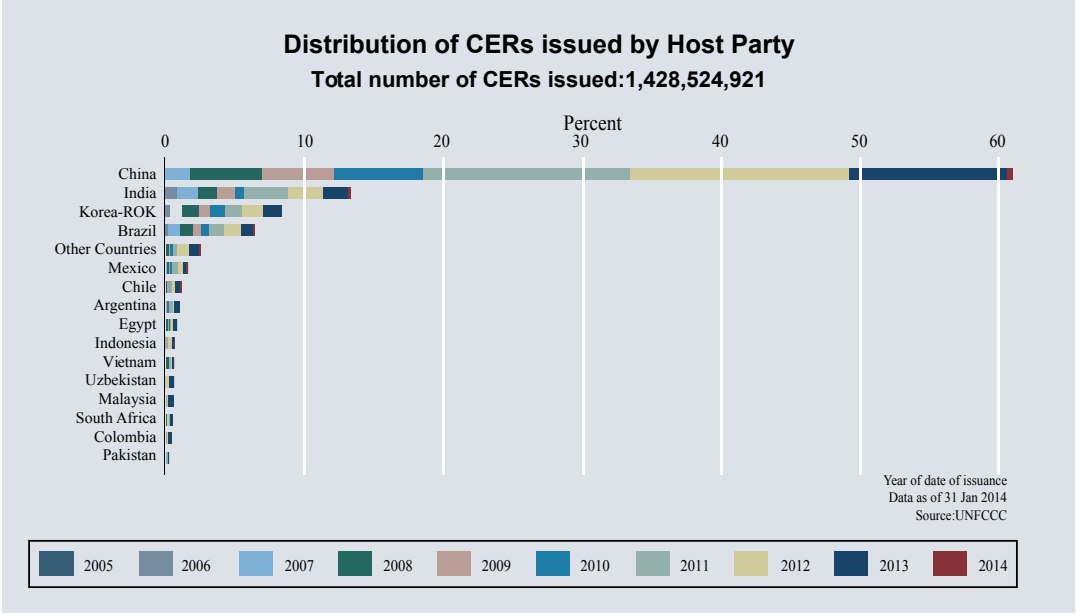
as the first climate exchange in the world with the goal to provide a flexible market mechanism, which is also a carbon trading platform beyond the Kyoto mechanism, mainly serving the domestic trading system of voluntary CO_2 emission reduction program of each state (UNFCCC, 2008). In 2004, the CCX established the ECX (European Climate Exchange) with held its share, and also set up the CCFE (Chicago Climate Future Exchange), which is the largest environmental derivative exchange in the world. In 2005, the CCX set up Tianjin Climate Exchange (TCX) jointly with CNPC and Tianjin City; on May 30th 2008, it formed Montreal Climate Exchange jointly with Montreal Stock Exchanges; and India Exchange is under preparation presently.

In addition, in July 2006, Montreal Climate Exchange is established in Canada; in the early of July 2008, Singapore Trade Exchange was established, Brazilian Mercantile & Futures Exchange was founded in succession; and in November of the same year, other environmental exchanges, such as the New Zealand Emissions System, also set up. In addition, the RG-GI (Regional Greenhouse Gas Initiative) was launched by George Pataki, former governor of New York George Pataki in April 2003 with ten states in the northeast America joined, such as Connecticut, Maine and New Jersey participated in. The RGGI was started on Jan 1st 2009 with goal that GHG emissions shall remain at the benchmark level before Dec 31st 2014 and lower than the benchmark by 10% before Dec 31st 2018. In September 2008, RGGI successfully auctioned the first emission project of all quotas, six of the ten states participated in the quota auction and bidding, and about 12.5 million quota was involved in the bidding, the tender amount accounts for about 300% of the auction quota quantity with unit price of $3.07. The revenue from the RG-GI has played a positive role in promoting integration of environmental protection with energy projects, energy efficiency and renewable energy use of each federal state. It is indicated from the statistics that it has increased by about 10-30%. The CDMS to promote the emission reduction of the developed countries are progressed quickly. According to the study of the World Bank, the scale of global CDM was reached about $6 billion in 2006, nearly $13 billion in 2007. China is the biggest seller in the global CDM market. According to the statistics of UNFCCC, there are totally 7,426 registered CDM projects in the world as of Feb 12th 2014; among them, China registered 3,739 projects, accounting for 50.35% of total amount, ranked first, India and Brazil are followed respectively. The EU is the biggest buyer of CDM and the joint performance market, holding about 86% of the market share. Japan holds roughly 7% of the market share. The fields of global CDM projects mainly cover 15 fields, such as the agriculture, afforestation & reforestation, waste treatment & disposal, solvent usage, production and consumption of halogen hydrocarbon and SF6 related to volatile emissions, fuel (solid fuel, oil and gas fuel) related to fugitive emissions, metal production, mining/mineral production, construction industry, transportation, chemical industry, and energy industry. There are different focuses of the packing and development of CDM industries when the developing countries are in different stages according to their actual national conditions. The key areas of CDM projects developed in China currently is mainly to enhance energy efficiency, develop and utilize new energy and renewable energy, as well as recycle methane and coal bed methane. Fig. 3 and 4 show respectively the latest progress of registration

■ **Fig. 3 Distribution of registered project by Host Party (2004-2013)**



■ **Fig. 4 Distribution of CERs issued by Host Party (2004-2013)**



and issuance of CDM projects in China and the world (until 2014) (EB of CDM, 2014).

On the Climate Change talks in Bonn on 10 March 2014, the United Nations stated that, there is a gap between commitment of each country and necessary level claimed by scientists, maybe 40% of such gap can be made up at a lower cost through cancelling the carbon credits under the CDM. The

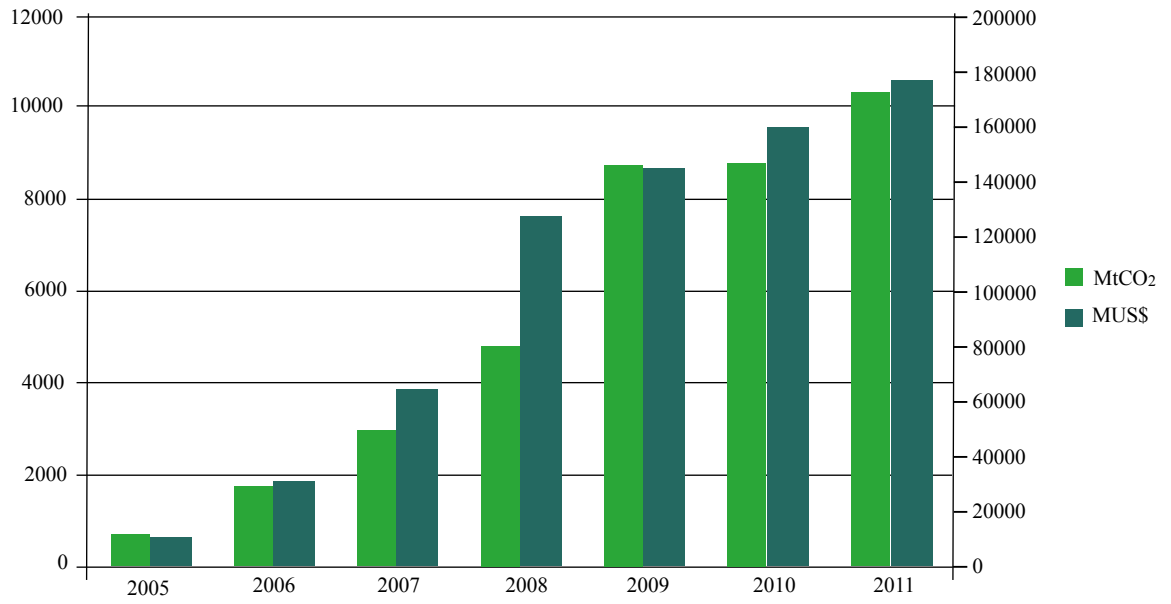
Table 2 2005-2011 Global Carbon Trading Market

Type of trade	2005		2007		2009		2010		2011	
	Trading volume $MtCO_2$	Turnover MUS$	Trading volume $MtCO_2$	Turnover MUS$	Trading volume $MtCO_2$	Trading volume $MtCO_2$	Trading volume MtCO	Turnover MUS$	Trading volume $MtCO_2$	Turnover MUS$
	Allowance-based market									
EU emission allowance	321	7,908	2,061	50,097	6,326	118,474	6,789	133,598	78,53	147,848
Emission allowance allocated by government	-	-	-	-	155	2,003	62	626	47	318
Remove Unit (RUM)	-	-	-	-	-	-	-	-	4	12
New Zealand Unit (NZU)	-	-	-	-	-	-	7	101	27	351
RGGI	-	-	-	-	805	2,179	210	458	120	249
Chicago Climate Exchange	1	3	23	72	41	50	-	-	4	63
Australia NSW emission reduction system	6	59	25	224	34	117	-	-	-	-
Others	-	-	-	-	-	-	94	151	26	40
Subtotal of allowance-based market	328	7,971	2,109	50,394	7362	122,822	7,162	134,935	8,081	148,881
	Project trading market									
Primary CDM market	341	2,417	551	7,426	211	2,678				
Secondary CDM market	10	221	240	5,451	1,055	17,543	1,275	20,637	1,822	23,250
Joint Implementation	11	68	41	499	26	354	-	-	-	-
Voluntary trade	20	187	42	265	46	338	69	414	87	569
Subtotal of project trading market	382	2,894	874	13,641	283	3,370	1,609	24,257	2,200	27,139
Type of trade	710	10,864	2,983	64,035	8,700	143,735	8,772	159,191	10,281	176,020

Source: State and Trends of the Carbon Market 2007-2012, World Bank•

CDM under the UN's Kyoto Protocol allows investors to gain from selling carbon credits, so as to help them achieve their overseas emission reduction targets. Presently, investment nearly $400 billion have flowed to the CO_2 emission reduction projects in developing countries through the mechanism. However, as various countries argued about the global agreement on climate change and new target to be developed, investment introduced through the mechanism has dried up. The price of carbon credits have fallen from over 20 Euros per ton in 2009 to less than 1 Euro now, which led to many projects unprofitable.

■ **Fig. 5 Global Carbon Emissions Trading Market Trading Volume and Turnover**



3. Practices of Emission Trading in China

To China, emission trading is a completely foreign imported environmental economic approach with an evolution of nearly 20 years. Evolution of emission trading in China can be roughly divided into three stages.

3.1 Stage of Start-up and Attempts (1988 --- 2000)

Practices of emission trading in China can be traced back to as early as late 1980's. In 1987, paid transfer of emission allowances between enterprises was practiced in Minhang District, Shanghai; On March 20, 1988, the State Environmental Protection Administration(SEPA) promulgated and enforced the Provisional Measures on Management of Water Pollutant Emission Permits, which stipulated in Article 21, Chapter IV that "the total emission allowances for water pollutants may be flexibly distributed among the emission entities in the same region"; in 1991, under the direction of SEPA, 16 cities were selected for the experimental practice of the air pollutant emission permit system followed by another 6 cities including Baotou, Kaiyuan, Liuzhou, Taiyuan, Pingdingshan and Guiyang that have piloted the trading of air pollutant emission rights since 1994 and gained some rudimentary experiences.

In 1996, the "National Plan for Total Emission Control of Major Pollutants during the "9th Five-year Plan' Period" (1995-2000) submitted by the State Environmental Protection Administration gained approval from the State Council, representing the official inclusion of the total amount control (TAC) policy of the major pollutants into the environmental protection appraisal objectives during the "9th Five-year Plan" period and

nationwide implementation of the emission permit system in Chinese cities. Nationwide enforcement of the total emission control and emission permit policies laid an institutional foundation for practice and provided the soil for the rooting of emission trading in China. The Law on Prevention of Atmospheric Pollution adopted by the 9th Session of the National People's Congress on April 29, 2000 provided legal assurance for the true transition of the focus of the national pollution control strategy from concentration control to total emission control and correspondingly defined the legal status of the emission permit system.

In this Stage, to sum up, documented policies and cases of emission trading implementation came into existence primarily thanks to the efforts of facilitation by the national environmental protection authorities; these efforts were focused on initial experiments and attempts in emission trading of air pollutants and some beneficial experiences were gained, laying a foundation for further development of emission trading in the following piloting stage. Major historical events and cases of emission trading in this period see Annex 1.

3.2 Stage of Experiments and Researches (2001 --- 2006)

During the "10th Five-year Plan" period (2001-2005), China fully shifted its focus of environmental protection efforts to total emission control. In order to better align the environmental protection efforts with the needs of economic development, SEPA proposed the enforcement of the emission permit system and emission trading pilot projects respectively to facilitate and improve the total amount control of the major pollutants.

In such a context, quite a few pilot projects were launched around 2001, such as the Sino-US Environment Partnership Projects of "Feasibility Study in Application of Market Based Mechanism in Reduction of SO_2 Emission in China" and "Study in Facilitating the Implementation of Policies on Total Emission Control and Emission Trading of SO_2 in China", the ADB pilot project of "SO_2 emission trading within the territory of Taiyuan City" and developed the "Management Methods of SO_2 Emission Trading in Taiyuan" with the aid of ADB, as well as "the emission trading pilot project in Nantong city" executed by U.S. Environmental Defense Fund (EDF). Driven by these projects, multiple cases of emission trading were carried out and rich practical experiences were gathered. In 2002, supported by U.S. Environmental Defense Fund (EDF), SEPA issued the "Notice on Implementation of the Demonstrative 'Study in Facilitating the Implementation of Policies on Total Emission Control and Emission Trading of SO_2 in China'" and launched pilot projects in 7 provinces and cities including Shandong, Shanxi, Jiangsu, Henan, Shanghai, Tianjin and Liuzhou. In May 2006, a joint study in emission trading was conducted by the Ministry of Finance (MF) and SEPA in some provinces and cities. Expert panel discussions were held and the financial and environmental protection authorities of Shanghai, Jiangsu, Zhejiang, Tianjin, Shanxi, Henan, Guangdong, Fujian and Guangxi and State Grid, China Southern Power Grid and the top five power group corporations and some local power companies were consulted. It was agreed that the electricity sector has clear emission performance and proven SO_2 treatment technologies and is suitable to carry out the nationwide pilot projects of emission trading.

Experiments in water pollutants emission trading also made some progress in this stage. In 2001, for example, Xiuzhou District of Jiaxing, Zhejiang promulgated its "Provisional Measures for Total Emission Control and Emission Trading of Water Pollutants" and started the paid use of the initial emission rights of water pollutants. In 2006, Jiaxing City started the citywide implementation of total emission control and emission trading. In Jiangsu Province, the Provincial Environmental Protection Commission issued in 2004 the Notice on Issuing the Work Program on "Experimental Study on Paid Allocation and Trading of Emission Rights of Water Pollutants in Jiangsu Province". However, the efforts on experimental research in emission trading for water pollutants are relatively weaker than those for air pollutant SO_2.

Generally speaking, emission trading in this stage was primarily operated with the "matchmaking" efforts from the governmental departments. However, the potential role of emission trading policies and mechanisms came to light as continuous efforts were made in such experiments and researches. Shown in Annex 2 are the major events and cases of emission trading in this stage.

3.3 Stage of Further Development of the Pilot projects (2007 ---)

Along with the shift of the National Environmental Protection Strategy from the traditional administrative control approaches to the integrated use of administrative, legal and market and voluntary approaches, governments at all levels attached greater importance to the fundamental role of the market in configuration of environmental resources over the recent years and the application of environmental economic policies received more attention. SEPA launched the pilot project of national environmental economic policies in 2007 to study and explore for policies of green credit, environmental insurance, green trade, environmental tax, ecological compensation and emission trading. Correspondingly, the local governments also showed special interests in the role of emission trading system in energy conservation and emission reduction.

Emission trading in this stage is obviously unique in that it received higher recognition by the National Government, voluntary and active explorations were conducted by the local governments, the connection between the upper and lower levels is consolidated, explorations were carried out in diversified trading models, the scope of trading objects was widened, the space level of the policy was promoted on a continuous basis (to four levels, namely, the national level, the basin level, the regional level and the local level), local laws and policies were issued at a greater frequency, cooperative efforts in scientific research were given prior attention and companies specialized in emission trading appeared. Annex 3 listed the recent events related to practices of emission trading. Regarding the cooperative projects of environmental protection, for example, the 3rd Session of Sino-US Strategic Economic Dialogue (SED) held at the end of 2007 identified the cooperative project of SO_2 emission trading in the electricity sector; Zhejiang Province adopted a "top-down" model in the exploration of new trading patterns and measures for the administration of emission trading of major pollutants were promulgated successively in Hangzhou, Shaoxing, Zhuji and Tongxiang; In Jiangsu

Province, however, a "bottom-up" model was adopted and emission trading was gradually implemented in the Tai Lake basin and some cities and prefectures under the guidance of the Provincial Environmental Protection Bureau.

Attracted by the business opportunities hidden behind the emission trading policies, companies engaged in commercial operation of emission trading emerged and active and cooperative efforts were made by the local governments to co-build emission trading platforms. The scope of trading objects is also wider and no longer limited to the major pollutants subject to the total emission control policy of the national government. It has been even expanded to all tradable objects involving environmental rights and interests. In May 2008, for example, Tianjin Property Rights Exchange, CNPC Assets Management Co., Ltd. and Chicago Climate Exchange (CCX) joined hands to prepare for the establishment of Tianjin Climate Exchange, which is engaged in trading of not only SO_2, COD and other traditional pollutants, but also the greenhouse gas emission permit, development technologies and other quantifiable, quota-based and standardized trading products. On August 5, 2008, China Beijing Environment Exchange and Shanghai Environment & Energy Exchange were established on the same day and the trading objects also cover a wide range of environment right products. On November 17, 2009, Asia Climate Exchange (AEX) was jointly established by Shenzhen International Energy and Environmental Technology Promotion Center, Shenzhen International Hi-Tech Property Exchange, and RESET (Hong Kong) Limited. It is the first Climate Exchange in Asia, the business focus on existing national emission quota trading license, emissions trading transactions between Shenzhen and Hong Kong , and other international tradings. Besides, other provincial and municipal emissions trading centers have also been established. October 21, 2011, Shanxi emissions trading center was officially established. October 9, 2013, Shijiazhuang emissions trading center was established. Although the operability of such platforms is yet to be verified in practice, experiments and explorations for emission trading in this stage have marched a large step forward compared with the previous stage when the experiments of emission trading were conducted under the guidance of the environmental protection authorities.

Since China has not yet undertaken the international carbon emissions responsibilities before 2011, most cases of domestic carbon trading are based on the voluntary. For example, on Aug 5th 2009, Tianping Auto Insurance Company Ltd. purchased 8,026 tons of carbon credits at the price of RMB 277,600 through the Beijing Environment Exchange platform for green travel activity during the Beijing Olympic Games, so as to offset carbon emissions of the company during operation from 2004 to the end of 2008; on Dec 17th 2009, Shanghai Runye Environmental Protection Technology Co., Ltd. successfully purchased 24,046 tons of voluntary emission reduction generated by Fujian Pingnan Tingtougang Hydroelectric Project through Shanghai Environment and Energy Exchange purchase, in order to realize its own carbon neutral, it is the largest domestic trade of carbon neutral. In March 2010, Wanxinda (Guangzhou) Technology Product Co., Ltd. (located in the Automobile Zone, Huadu District, Guangzhou) purchased 5000 tons of carbon credits of a hydroelectric project in Hunan Province at the price of

$10000 through the Beijing Environment Exchange platform, so as to offset its carbon emissions in 2009.

On Nov 28th 2011, the 17th contracting conference of the UNFCCC (United Nations Framework Convention on Climate Change) was held at Durban, South Africa. The 12th "Five-Year" Plan on GHG Emissions Control was released in China before the meeting, which pointed that China will start from voluntary CO_2 emissions trading to explore carbon emissions trading market. Over the same period, the General Office of the NDRC (National Development and Reform Commission) issued the Circular on Pilot Implementation of Carbon Emissions Trading to approve four municipalities directly under the central government, including Beijing, Tianjin, Shanghai and Chongqing, plus seven provinces and cities, such as Hubei (Wuhan), Guangdong (Guangzhou), and Shenzhen, to carry out the pilot work of carbon emissions trading; this was the first time that Chinese government launched the pilot work of emissions trading at the state level, which marks a new stage of carbon emissions trading in China. Since then, all pilot provinces or municipalities prepared for their work plan and released the related policies; actively pushing forward the pilot work. The local carbon trading pilot was gradually started since 2013. Beijing has issued the Circular on Carrying out the Pilot Work of Carbon Emissions Trading, Circular on Distribution of 2013 Carbon Emissions Allowance, and Circular on Issuance of 'Regulations on Curb Exchange of Carbon Emissions Allowance (for Trial)' in November 2013, the carbon emissions trading was officially launched on November 28. On the first day, Beijing's carbon emissions trading volume reached to 40800 tons with turnover of RMB 2.041 million. On Nov 25th 2013, Guangdong Development and Reform Commission issued by the Work Plan of Guangdong Province on the First Allocation of Carbon Emissions Allowance (for Trial), and the first bidding of 2013 annual allowance was completed on Dec 16th 2013, the emission allowance distributed in this time amounted to 3 million tons, the final bidding price was RMB 60/ton, and total turnover was RMB 180 million.

In addition to carbon trading pilot works carried out in five cities and two provinces, the voluntary emissions trading is also under exploration. The NDRC issued the Interim Measures for Voluntary GHG Emissions Trading Management to gradually explore path and accumulate experiences for establishment of carbon emissions trading market under total control and development of better carbon trading rules. Although the priority was given to the allowance-based trading in view of the current carbon trading pilots, less to the voluntary emissions trading, the threshold and cost for voluntary emissions trading are relatively lower in China in comparison with these of the international CDM projects, which can promote some small businesses to participate in emission reduction. It is noted that six provinces and municipalities, namely Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong, signed the regional cooperation agreement on carbon emissions trading on Nov 28th 2013, planning to carry out the joint study in aspects of accounting and auditing of CO_2 emissions, as well as allowance verification, which will lay the foundation for building the regional carbon trading market, and also explore the path to promote construction of the national carbon

trading market to a certain extent. Recently, the NDRC also put forward to strive for gradually establishing a national carbon trading market in the "13th-Five Year". Table 3 sees carbon emission trading pilots and trading status. Major historical events and cases of emission trading in this period see Annex 3.

Table 3 Coverage and Situations of Carbon Emissions Trading Pilot in China in 2013

Pilot	Industrial scope	Trading subject	Trading mode	Trading volume (ton)	Turnover (RMB)	Ceiling price (RMB/t)	Floor price (RMB/t)
Shenzhen	Industry (electric power, water affairs, manufacturing industry, etc.), and construction	Entities for emission control, other entities and individuals	Spot trading (originally fixed-price trading), electronic bidding, block deals	197,328	13,159,820	143.99	28
Shanghai	Industrial sectors: electric power, steel, petrochemical, chemical industry, nonferrous metallurgy, building materials, textile, paper making,rubber and chemical fiber; Non-industrial sectors: aviation, airport, port, shopping mall, hotel, commercial office buildings and train stations.	Entities for emissioncontrol, other entities and ndividuals; In 2013, only entities for emission control is permitted.	Public trade and protocol transfer	23,270	645,330	31.8	25
Beijing	Electric power, heating, cement, petrochemical and other industrial sectors and services.	The performance entity and non-performance entity, excluding natural persons temporarily; The registered capital of non-performance entity must reach up to RMB 3 million.	Public trade and protocol transfer (OTC)	42,600	2,133,200	55.1	50
Guang dong	Electric power, cement, steel and petrochemical	Entities for emission control, other entities and individuals; In 2013, only entities for emission control is permitted.	Public trade and protocol transfer	120,129	7,227,470	61	60
Tianjin	.Electric power, heating, steel, chemical, petrochemical, oil and gas exploration.	Domestic and foreign institutions, enterprises, social groups, other organizations and ndividuals; Foreign institutions must be a Chinese holding ompanies; Natural person must be aged from 18 to 60, one full year of life, and proof of financial assets no less than RMB 300, 000 must be provided.	Network spot trading, protocol trading, auction trading	62,200	1,741,048	28	26

4. Nine Features of Pilot Exploration on Emissions Trading Policy in China

How to play the role of market in allocating resources has become the basic direction of China economic system reform. With the rapid economic development and accelerated urbanization process in China, the emission reduction increasingly becomes a challenge, the market mechanism innovation, improving efficiency of pollution abatement, as well as giving play to the enthusiasm of market subject, have gradually become the important environmental tasks of Chinese Government, which is also an inevitable trend of China environmental policy. Under this context, China has carried on some positive exploration and attempts on emissions trading in recent years. However, it is still in the pilot phase on the whole, an effective environmental management system has not been formed yet. Meanwhile, as the market economy in China is still in the development process, the institutional and policy for environment management to explore the emissions trading in China is different from that in the United States and other countries, the exploration of emissions trading in China presented many unique features, these features also closely relate to the emissions trading still in a pilot exploration stage in China.

4.1 Government-leading is the major impetus

Chinese Government pushes the emission trading and explores new mechanisms for emission reduction at the national level, which is the institutional reason that quick important progress in China has been made during exploration of pilot emissions trading in recent years. Chinese Government increasingly values the emissions trading policy at the national level, the annual work reports of the Central Government have mentioned to expand the pilot emissions trading in recent years, and the guidance on paid use of emission rights and emission trading pilot has been studied and formulated. In 2011, the "12th Five-Year" National Plan stipulates to develop the emissions trading market and regulate behaviors of the emission trading. On the 7th National Conference on Environmental Protection in December of the same year, Vice Premier Li Keqiang pointed out that: it is necessary to improve the environmental protection law & regulation system and economic policy system with both incentive and constraint stressed, gradually promote on the basis of the pilot emissions trading. At present, the *Guidance on Advancing the Paid Use of Emission Rights and Emission Trading Pilot for Major Pollutants* and the construction scheme of the national emissions trading center have been completed, which are soliciting a wide range of advices for further improvement. The exploration of emission trading of major pollutants has been highly valued at national level. On the one hand, with increasing emission reduction pressure, some problems appeared gradually as the single administrative measures has been too stressed in the past environmental management, such as high cost for emission reduction and lower efficiency of policy tools, thus the gap between it and pollution mitigation demand was generated, which required to innovate the market mechanism, explore new and more

effective reduction mechanism, and further improve efficiency of pollutant emissions. On the another hand, in the view of the capacity needed, conditions for widely promoting the emission trading in many areas and specific industry have been in place, for example, the capability for pollution source monitoring and regulation in some areas of East China, such as Zhejiang and Jiangsu, can basically meet requirements for implementing the emission trading; many areas have also promoted the discharge permit. In Zhejiang, Jiangsu and North China, the online CEMSs (Continuous Emission Monitoring System) for SO_2 flue gas of the power industry have been preliminary built, which can ensure implementation of the emission trading in aspect of monitoring technology capability.

Many local governments have built the emission trading policy system. Compared with the lagged issuance of the related policies at the central governmental level, the local pilots is progressed rapidly, a lot of pilot provinces have issued related policies to promote the active exploration of paid use of emission rights and emission trading pilot, so as to provide the policy environment for the local practices. Such policies covers various aspects related to the paid use of emission rights and emission trading pilot, such as the initial allocation of emission permit, method of trading qualification examination, and usage management of the fund from the paid use of emission permit. The local policy systems of emissions trading are shown as Table 4. As one of leading province of the national emissions trading pilot, the pilot works in Zhejiang is in the leading position in China. It is indicated from the statistics, about 103 policy files have been promulgated at the provincial and city level; the system framework of policies and regulations have basically built for emission trading. Such policies covered the implementation rules for emission fees, paid use of emissions rights, emissions trading, initial emission permit allocation, etc., involved in each aspects of emission trading, which have provided the basis for the local exploration. Henan Province has listed the emissions trading as a special section of *Regulations of Henan Province on Emissions Reduction,* which has been approved on the fourth session of the Standing Committee of the 12th Henan Province People's Congress on Sep 26th 2013. Which means emission trading mechanism was brought into the local regulations, which provides the corresponding legal basis for the paid use of emission rights and emission trading pilot. In other pilot areas, the related policy files have been also enacted to promote local emission trading pilot exploration; for example, Jiangsu Province has issued the *Interim Measures of Jiangsu Province on Paid Use of Emission Rights of Major Water Pollutants at Tai Lake Basin and Subscription and Verification of Emission Permits at the Trading Pilots,* which defines means and methods of the paid use of emission rights for each emission entity. The distribution of current emission trading pilots in China is shown in Fig. 6.

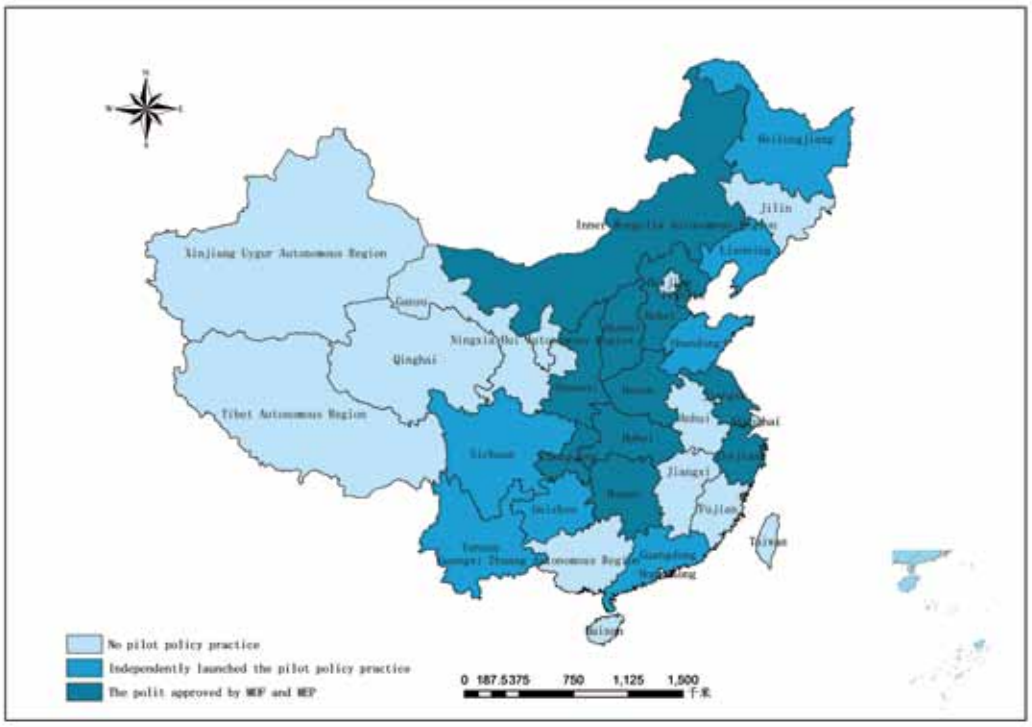
The trading behaviors are mainly promoted by the government sectors. At present, the emissions trading cases in China are mainly driven by the relevant government sectors. At the primary market of emissions trading, namely the initial emission permit allocation, the benchmark trading prices are set by the government; in addition, both release of relevant information and follow-up tracking management of the trading results are completed by the relevant

Table 4 Policy Matrix of the Pilot Emission Trading at the Local Level in China

Contents of policy files	Jiangsu	Zhejiang				Tianjin	Hubei	Hunan	Shanxi	Inner Mongolia	Chongqing	Hebei	Shaanxi
		Provincial level	Jiaxing	Shaoxing	Hangzhou								
Guidance/pilot scheme	√	√	√	√	√	√			√	√	√		√
Measures for trading management (and/or implementation rules)	√	√	√	√	√		√	√	√	√	√	√	√
Charge criterion/ benchmark price	√	√	*	*			√	√	√	√	√	√	
Fund use and management	√	√	*	√			√	√	√	√	*	√	√
Allocation and verification of the initial emission rights	√	√	√	*	*			√					
Measures for trading qualification examination	*	√	*	*	*		*	*	*	*	√		√
Working procedures for emission trading	*	√	*	*	*		√	√	*	*	√	#	*
Regulations on Emission Allowance Reserve and Management		*	*					*	*	√	√		√
Rules on the Electronic Bidding							√		√	√		√	√
Rules on emissions monitoring and accounting	√	√	*	√	*			*	√	*	*	*	
Regulations on function division of the related sectors	*	*	*	*	*			*	*	*	√		*
Management system of the trading center								*		*	√	#	*
Supporting normative files related to the trading implementation and management	#	#	#	#	#		√	#	#	#	#	#	#
Administrative measures for emission permit	√	√		√	√		√	√	√	√		√	
Measures for total amount access/ pre-audit		√					√			√			
Mortgage loan		√	#	√				√	√				
Lease/temporary/short-term trading		*	*	*				√		√		*	

√ means a separate policy file has issued; * means it is not been issued in a separated policy file but is reflected in other related policy files,; # means just the internal document, not open to the public

■ **Fig. 6 Existing Emission Trading Pilot in China**



authorities or some agencies related to the government (for example, a lot of local environmental protection departments set up their emission trading platform). At the secondary market, most cases of emissions trading between enterprises in China are successfully promoted with the active intervention of the government, the relevant government sectors or the trading intermediary with governmental background play an important role in such progress. Taken the largest SO_2 emission trading in China as an example, it was just based on the "matchmaking" of Shanxi Provincial Department of Environmental Protection, a SO_2 emission trading contract was successfully signed between State Grid Energy Development Co., Ltd. and three power generation enterprises, including, Shanxi International Energy Group Co., Ltd., Shanxi Jingyu Power Generation Co., Ltd. and Tongmei Guodian Wangping Power Generation Co., Ltd. with turnover of nearly RMB 90 million.

The basic conditions of emissions trading mainly rely on the governmental provision. Since the emission right is different from common rights, so its application is restricted by many factors, such as total regional discharge and environmental standards, the effective governmental monitoring and administration on pollution emissions by the enterprise is the premise of emissions trading system, which were provided by the governments. The social foundation for third party transactions has not spontaneously formed in China; although some professional agencies for market operations have been

established, such as Beijing Energy and Environmental Exchange, they haven't play any role in the emissions trading almost. The effective promotion in practice mainly comes from the emission trading platform set up by the government. At present, the emission right markets mainly is the primary markets, which are focused on the allowance indicator owned by the government and sold to the enterprises, however, the index amount is not determined according to demand of the enterprise, but determined by the government with full consideration of various factors, such as requirements for total amount pollutant control, how to allocate to the enterprise is also determined by the government unilaterally, the verification on the trading index of enterprise is performed by the government. The matters, such as establishment of emissions trading policy, provision of transaction information, supervision and management of trading process, purchase and reserve of temporarily idle emission allowances, are also carried out by the government, so the government is not only a participant, but also a supervisor of emission trading. In fact, it is impossible to form a stable and lasting trading market only with the governmental credibility as a guarantee. As the government controls the allocation of the emission allowances and trading means, once the power engages in resources allocation of during emission administration, the emission allowances will become the power resource of the authorities if there is no reasonable regulations, which will make the regulations on the emission trading based on the integrity and self-discipline of the relevant responsible person, and there is certainly a risk of corruption.

4.2 The paid use is mainly employed during the initial allocation of emission permit

The scarcity value of the environmental capacity resource is gradually recognized, which is the most important motivation for the initial paid allocation of emission permit implemented at the local level. In the United States, 95% of trading right adopts the free initial allocation of emission allowance, only 5% adopts the auction. There are great difference between situations in China and the United States. Among the pilot areas for emissions trading in China, only Hubei and Chongqing haven't adopted the paid allocation method, the rest pilots allocate the initial emission allowances to the enterprise with charge. After all, the comprehensive and composite problems are intensively appeared in China at the present stage, the competitive utilization of environmental capacity resources is increasingly intensified among the regions, industries or enterprises. Meanwhile, demands of people on better living environment are growing, and the scarcity value of environmental capacity resource is gradually and widely recognized, therefore Chinese Government is seeking more effective measures to solve such issues, its starting point is to promote the resource pricing mechanism, and implement the paid use of environmental resources and competitive utilization. Firstly, Chinese enterprises also gradually realize the environment capacity resource is valuable, it is necessary to pay certain fee to the owner obtain use rights of the competitive resources when they use the environmental capacity resources, so it is gradually recognized as a concept of productive resource element at the constant supply. Secondly, it is the important

reason to improve the externality cost of the enterprise environmental behavior that China local governments implement the paid allocation of emission allowances. Before Chinese Government implements the paid use of emission right and trade exploration, the policy for environmental externality cost of enterprises were mainly pollution charges; however, since the current pollution charge criteria were formulated in 2003, the charge rate is RMB 0.7/pollution equivalent for sewage, RMB 0.6/pollution equivalent for air pollution. Such rates are relatively low, it is difficult to externalize the environmental externality of enterprise, and the incentives to the environmental behaviors of the enterprises are also not effective. Meanwhile, as the charging items are not complete, coverage is not extensive (eg., no charge for ammonia nitrogen, total phosphorus and car exhaust), and the charge amount is no more than sum of three charge factor with the biggest pollution equivalent, the low level of sewage charge is asymmetrical to the negative environmental externalities caused by the enterprises during production and operation. Under this context, China local governments take the paid use of emission permit as an exploration to internalize the environmental cost externality. Thirdly, it is to increase the financial revenue and broaden the financing channels for environmental protection. In the current practice of the allocation of initial emission allowance with charge in China, the obtained capital is basically used by the local government as a special fund of environmental protection, namely the revenue from the initial allocation of emission allowance can only be used for environmental protection, it directly reflects the policy orientation of Chinese Government on the initial allocation of emission allowance, which is mainly to improve valuation of the environmental capacity resource scarcity and to raise environmental protection funds. In fact, although investment in the environmental protection is rising over the years in China, there is still a large gap between the input and demand to solve the environmental issues; it is also the main reason of paid use for initial allocation of emission allowance in various regions. In view of the policies about paid use of emission rights implemented in Zhejiang, Jiangsu and Shanxi etc., the fund from the paid use is partly used for acquisition of the emission allowance through trading platform, it also contributes to key environmental projects for the local pollution control, ecological restoration and environmental protection, so it can expand the financing channels for the environmental pollution control. In addition, some pilot areas, such as Zhejiang, Shaanxi and Hebei, have implemented the emission permit mortgages, which provide a new financing approach for the entities with pollution discharge, especially for the small and medium-sized enterprises (SMEs) through mortgage of emission allowances as property rights.

Initial allocation of emission allowance was mainly based on historical emissions, the fairness and efficiency is often hard to balance. Initial allocation of emission allowance has always been a political and technical difficulty, whether the emissions trading system can be smoothly implemented is based on the fairness and efficiency during initial distribution of emission allowances, it is also challenge faced by the current emissions trading policy. There was a lot of controversy on how to realize the fair initial allocation during development of the emissions trading in American, accordingly

three kinds of schemes have been designed, including the public auction, fixed price sale and distribution free of charge; ultimately the most feasible and cost-effective way was chosen in accordance with the "Grandfather Clause" that the hybrid distribution was mainly based on the free allocation, and then the paid allocation. However, this kind of allocation was still reviled, especially focusing on how to realize the fair allocation. Likewise, the emissions trading pilots in China haven't realized fairness and efficiency of initial allocation too. The initial allocation of emission allowances is mainly determined according to the forecast emission amount assigned or the actual emission amount inherited in China pilot regions. Among them, for the new-build, rebuild or expansion entities, the initial emission allowances is mainly determined on the basis of EIA forecast amount and the monitoring data of actual emissions during the "three-simultaneity"[1] acceptance; While for the existing enterprises, it shall be comprehensively determined with reference to two sets of data above, the verified data on actual emissions from the environmental statistics and pollution charge system. However, it is unfair for new polluters, as the old enterprises can obtain emission allowances free of charge, and even can sell or benefit from it. New enterprise must purchase it, so the cost is increased, profit is diluted, and obviously it is difficult to embody fairness. Table 5 below sees the determination means for initial emission allowances in main pilot areas in China at present.

Price criteria are quite different for the paid use of initial emission allowances in various regions. Each pilot area in China has formulated the price criteria for paid use as the basis for trading pricing of the emissions trading market during the early stage. Overall, except for the average cost for emission reduction of the industrial enterprises as the leading reference during the initial pricing of each region; such criteria shall be adjusted and finalized with considering the degree of environmental resource scarcity and regional economic development level. As such conditions are different, and a national unified guidance is not in place, the price and validity of allowance index are extreme different in various regions. For example, there are many valid terms, such as 1 year, 5 years, 20 years and unlimited duration for emission allowance; the annual price converted from the paid use are also quite different; for example, the price of paid use of COD permits is only RMB188/ (t•a) in Zhuzhou and Xiangtan, Hunan Province, whereas it is high up to RMB16000/ (t•a) in Jiangyin, Jiangsu province. Table 6 below sees the charge criteria and duration for paid use of main pollutants in the pilot areas.

[1] The "three-simultaneity" system is one of important environmental systems in China. The "three simultaneity" acceptance is applicable for the new-build, rebuild and expansion projects, technical transformation projects and regional development and construction projects of which pollution control facilities must be designed, constructed and put into production at the same time with the main works. The construction projects can be put into production or use only after the supporting environmental protection facilities are qualified through the acceptance.

Table 5 Determination of Initial Emission Allowances of each Pilot

Pilot	Paid use or not	Determination of initial emission allowance	
		New-build, rebuild or expansion entities	Existing enterprise
Hubei	No	EIA, "three-simultaneity" acceptance	No explicit provisions
Jiangsu	Yes	EIA, "three-simultaneity" acceptance	EIA, completion acceptance of environmental protection project, Environmental statistics and total emission reduction task
Inner Mongolia	Yes	EIA	Emission amount of emission permit, and requirements for total emissions control
Zhejiang	Yes	EIA, "three-simultaneity" acceptance	EIA, completion acceptance of environmental protection project, Environmental statistics and pollution census data
Chongqing	No	EIA, "three-simultaneity" acceptance	Emission amount of emission permit
Hebei	No	No explicit provisions	No explicit provisions
Henan	Yes	EIA, "three-simultaneity" acceptance	Inherit the emission amount of emission permit, free of charge
Hunan	Yes	EIA, "three-simultaneity" acceptance	subscribe emission permits from the trading agency of emission permits reserves according to the Notice on Payment for Paid Use of Major Pollutant Emission Permit,
Liaoning	Yes	No explicit provisions	No explicit provisions
Shanxi	Yes	EIA	Obtained freely
Shaanxi	Yes	Bidding transaction	No explicit provisions
Tianjin	Yes	EIA	No explicit provisions
Guangdong	Yes	Total quantity approval, EIA	Total quantity approval

Table 6 Charge Criteria and Duration for Paid Use of Main Pollutants in the Pilot Areas

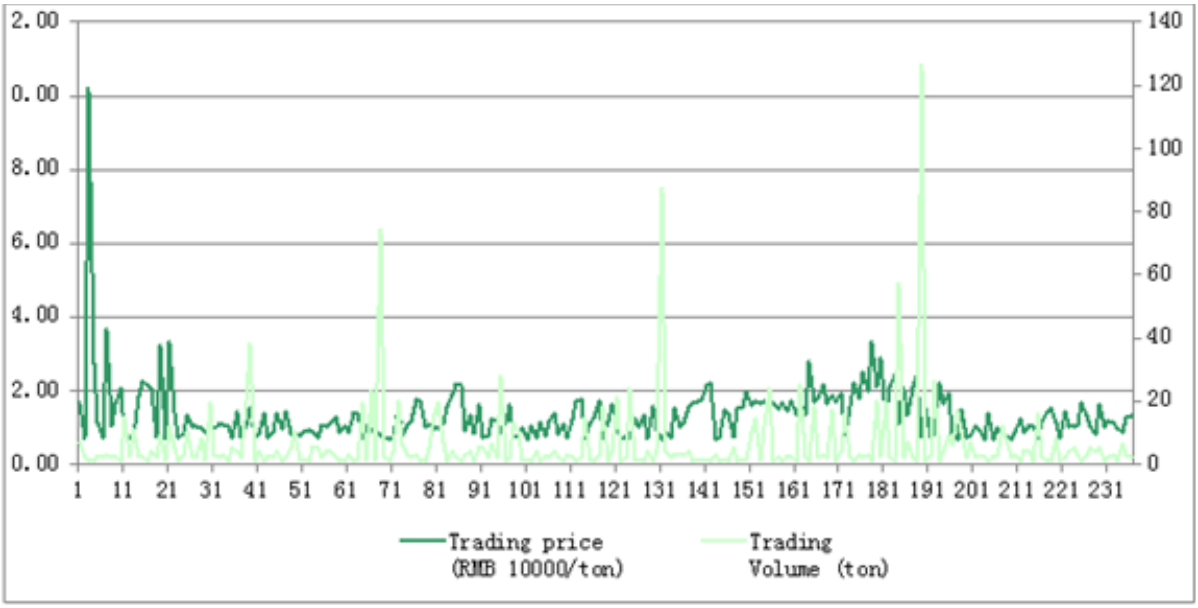
Pilot area	Paid use indexes	Charge criteria for paid use, RMB 188 / (t•a)	Duration
Jiangsu	COD	2600 (sewage treatment plant), 4500(special industry)	5 years
	NH_3-N	6000 (sewage treatment plant), 11000(special industry)	
	TP	23000 (sewage treatment plant), 42000(special industry)	
Zhejiang	COD	4000	5 years
	SO_2	1000	
Hunan	COD	210 (Changsha), 188 (Zhuzhou and Xiangtan)	5 years
	SO_2	180	
Chongqing	SO_2	976	5 years
Inner Mongolia	COD	1000 (2000 originally)	Charge by year (charge for 5 years once originally)
	NH_3-N	3000 (6000 originally)	
	SO_2	500 (1500 originally)	
	NOx	500 (1500 originally)	

4.3 The current exploration is mainly concentrated in the primary market, the liquidity of secondary market has not formed yet

At present, China pilot exploration is mainly concentrated in the primary market; the secondary market with stable spontaneous trades hasn't been formed. The primary market refers to a platform that the began to explore. There are total 236 trades completed from Dec 30th 2010 to Oct 31st 2012. The price is relatively fluctuated in early stage, and then leveled off gradually; the extent of variation is small between continuous time frames. The secondary market is relatively active in Chongqing, but the main driving force comes from the government, instead of market spontaneity.

In view of the institutional arrangements, the government transfers emission allowances, while new-build, rebuild and expansion entities purchase it. The secondary market transactions, namely transactions between enterprises, are mainly occurred in Jiaxing, Zhejiang Province and Chongqing. Taken Chongqing as an example, the construction of the secondary market is mainly promoted by the government. Since Chongqing is transferred from an old industry, the industrial structure is relatively complex; Chongqing Municipal Government avoids the conflict from the initial allocation of emission permits when the regional emission trading is secondary market of emission permits does have a lot of system superiority, which is helpful to arouse the enthusiasm of enterprise for pollution control. The enterprises with the pollution control cost lower than the price of emission allowances can benefit from sale of the redundant emission allowances. However in view of the current stage of emission trading in China, the exploration is mainly concentrated in the primary market, the liquidity of secondary market is far behind. The ideal situations of the secondary emissions trading market are: the transactions among polluters shall be carried out in the

Fig. 7 Relation between Transaction Quantity and Price of Emission Trading in Chongqing



secondary market; it is a sound market for free trading, and both its market price and trading rules shall be market-oriented. In order to enhance the allocation efficiency of emission allowances, the government shall gradually weaken its participation in the secondary market, mainly focusing on the effective supervision, cultivating the market, creating a good macro environment for emissions trading among enterprises and so on. From this perspective, there is a certain misunderstanding on emissions trading in practice in many regions of China. Most pilot areas took emission trading as an economic means of total quantity control and emission reduction, that is, emissions allowance is obtained for a new project through emissions trading under the certain total amount of emissions, and then the trading is completed, which is unable to form a continuous market transaction mode. In addition, the trades under the guidance of this thought can't get rid of governmental leadership. Secondly, the weak regulatory capacity for secondary market of emission allowances brought negative impact on the formation of the secondary market. Polluter is an acting subject to pursue benefit maximization, if the effective supervision is absent or inadequate, some polluters often avoid inspection by various means, such as compilation of pollution data at will and hidden the drainage outlets, the actual emission of such enterprise is likely to exceed the purchased emission allowance in event that the market can't oversight emission variation of enterprises, new companies entering the trading market will lose their confidences to the market, accordingly it is hard to promote the emission trading. In addition, the tracking system hasn't been established to supervise the emission trading, so it is impossible to collect and verify the accurate emissions data of enterprises, which increase difficulty during calculation of the enterprise pollution index, it is difficult to guarantee the authenticity and consistency during emission trading. Finally, the activity of secondary market trading closely depends on the good market environment, the developed market economy and perfect institutions are the prerequisite and basis for smooth implementation of emissions trading, therefore, it is necessary to improve the market economic system, continually establish and improve the policies and regulations for market economic development, so that the enterprises can decide their own production and environmental behaviors on a fair platform according to the market rules. However, it is relatively weak yet in view of the current progress of emission trading pilot in China.

4.4 Coordination of emission trading is ignored with the existing systems and policies

In view of the engagement between emission trading and China's current environmental management system, the emission trading is closely related to total quantity control, the EIA approval, and emission license management as well as pollution charges. It is known from implementation of the local policies, the single policy design for emission trading has been stressed too much in China, the understanding and emphasis is insufficient to the unity of policy system and coordination with other related environmental economic policies, the supporting policies are not enough, all of which brought negative impact on the emission trading policy, even hinder the policy proceeding.

The policy for total emission amount is inconsistent with the emission trading policy. In China, the policy for total emission amount is main means of pollution emission reduction policies of Chinese Government at present stage. Total quantity control refers to control sum of emissions within the certain region and term, and sum of an enterprise within a certain term. In the regions at the provincial level, the total emission target is usually set according to the economic development and environmental situations at certain stage, the total emission index is decomposed to the local governments step by step according to the "provincial, city and county" levels. Since the objective of emission reduction specified in the goal responsibility can't be adjusted, the rigorous situations increased the pressure of emissions reduction at the region of the acquirer. In order to complete the own total quantity target, some local governments haven't a positive attitude towards to the market behavior of purchasing emissions targets. In addition, the areas with remaining emission allowance don't sell such emission allowance for a development space reserved for new projects. Since the government is a dominant power at the current emission trading market, it can interfere with the trading behavior, causing some trans-regional emission trades at an impasse.

Emission permit license is inconsistent with emission trading policy sufficiently. The emission permit system is to specify the kind, quantity, rate and flow of the permitted emission from pollution sources on the basis of total emission amount control and industrial emission standards. The emission permit is not only a pass that a polluter discharges legally, but also main basis for the emission trading. The emission trading has an inseparable connection with the emission permit, both of them shall be an integrated policies of which shall complement each other. In the implementation of the paid use of emission rights, the allowance allocation shall be distributed to the enterprise in form of emission permit. When the allowance trading is conducted among the enterprises, the trading volume shall be reflected in the emission permit, which the permitted emission amount shall be determined by the owned annual emission allowances after accounting. However, the emission permit license and emission trading haven't been taken into full consideration yet. Taken both validity of emission allowances as an example, generally the valid term of emission permit is 3 years, but the most pilot provinces of emission trading such duration is 1 year, 5 years or 20 years; thus, a lot of technical work needs to do for inconsistent validity of emission permits.

As the initial emission allowance is determined through the EIA system for new-build, rebuild and expansion entities, the negative impact is brought on formation of emission trading market. In the pilot areas where paid use of emission rights and emission trading has been implemented in China, the emission trading is mainly promoted from the paid use of main pollutant emission indexes of new-build, rebuild and expansion entities, while the initial emission permits of new-build, rebuild and expansion entities are mainly determined on the basis of the estimated emission amount in the EIA. However, main emission trading in China is to purchase the initial allowance (also called transaction in many areas) by the new-build, rebuild and expansion projects through the government, in which the regional emission level is mainly based on the Total quantity control system, the initial demand of emission permits is determined by the EIA

system, and the price of paid use is set by the government without obvious market price leverage, which limits the trading activity to a great extent.

Table 7 Coordination between Emission Trading and the Related Policies

Name of policy	Engagement with emission trading	Principal contradiction
Total quantity control	Very strong	Pressure of total emission reduction is increasing, the enterprise is reluctant to sell out their emission allowance, and doesn't positively participate in the trading
Emission permit	Strong	Term of emission allowance shall be consistence with that of the emission permit, the emission permits as the basis of emission trading hasn't valued sufficiently
EIA	Very strong	Only limited to the initial allocation of emission permits for new-build, rebuild and expansion entities
Pollution charge	So so	There are same mistakes of cognition and practice for theory basis and objective of both policies, so the enterprises tend to think of the paid use of emission rights and pollution charge policy as duplicate charges

Insufficient theoretical basis for paid use of emission rights negatively impacts the policy promotion. China's pollution charge policy is to charge polluters who discharged pollutants to the environment or beyond the legal discharge standards in view of type, quantity and concentration of pollutants according to the statutory criteria. Pollution charge policy is the earliest environmental policy which is most widely used in China. With practices over years, some problems appeared in the system itself, especially the charge criteria is low, so the enterprises often prefer to pay such fees, so as to obtain more economic benefits to make up the charge paid for the excessive emission. As analysis above mentioned, the local pilots mainly focused on the primary market during development of emission trading, that is, the government allocates the environmental capacity resources to the enterprises. In the practices of the local pilots, the enterprises tend to think of there is duplicate charge between paid use of emission rights and pollution charge policy, although it is generally believed both theoretical basis and policy purposes are the same, the polluters pay for occupation of environmental capacity resources in the paid use policy of emission right, while they pay for the environmental damage caused by themselves in the pollution charge, two fees are levied on the different basis. However, this explanation is relatively fuzzy, also lack of complete theoretical basis. In addition, most of the pilot paid use price are set on the basis of the industrial average abatement cost, and extremely similar to the theoretical basis of charge standard, so a lot of polluters believe that the paid use of emission rights is double charge, and are unwilling even refused to pay such fees.

In view of the policy implementation, various related policy are connected and involved each other, the inconsistence and conflict among them will inevitably increase the cost of policy implementation, while the exploration of environmental & economic policy is relative less in China, the function segmentations also cause insufficient coordination and cooperation among each sector during formulation of various policies, which will inevitably increase difficulty of

policy implementation, accordingly influence the policy effects. Coordination between emission trading and related policies is shown as Table 7.

4.5 Progress of emission trading are mainly based on the "bottom-up" promotion

Although the emission trading attaches great importance at the national level, the Ministry of Environmental Protection (MEP) and Ministry of Finance (MOF) jointly promote the national pilot, the relevant regulatory opinions, technical guidance or administrative measures have not been promulgated to promote the emission trading at the national level; while many local governments are actively exploring the emission trading mode suitable for their regions in combination with the local actual situations, so the inconsistence is widely existed in the total quantity determination, initial allocation pattern, specific pricing, trading operation and so on. Many areas have carried out many fruitful explorations on a series of key technical issues and management problems in the emission trading policy design and implementation. In overall, the emission trading is mainly promoted from bottom to top.

As for the reason, emission trading is known as an introduced environmental economic policy from the foreign experiences, it is unknown whether it can be compliance with China's national conditions and its feasible, it is still to be checked and explored by means of the local pilot. Meanwhile, under the context of rapidly changing social and economic environments and the environmental protection demand in China, the relevant environmental economic policies need respond quickly. In the case that the effect of policy implementation is unknown, it is not suitable to widely promote the policy from top to down. Above all, it is necessary to explore its feasibility at the local level. Besides, China has vast territory with the quite differences among various regions, through the various and different forms of exploration practices at the local level, it can facilitate to summarize the pilot practices at the national level, learn the useful experiences and lessons, which creates the favorable conditions for the emission trading in a nationwide pilot. Therefore, the exploration mode of "bottom-up" emission trading system has distinct Chinese characteristics.

4.6 The piloting exploration modes of the local emission trading is diversified

Top-down administrative management mode. As a typical case, the local blue-green algae were broken out in Taihu Lake in Jiangsu Province at the end of May 2007, which caused Wuxi urban water crisis. The former Premier, Wen Jiabao particularly pointed out during an inspection on water pollution of Taihu Lake that: "it is necessary to promote reform of the environmental paid use system, and implement the compensatory transfer of emission indicators". Therefore, under the context of emergency management to reduce emissions, the initial prices of main water emission indexes were determined for each industrial sector in Taihu Lake Basin through improving the environmental price system of Jiangsu Province; the compensatory transfer of emissions indicators was implemented to set up the primary

market; the trading platform was established to carry out the exploration on emission trading through researching the supporting information management system and a series of measures. In addition, the scope of pilot and trading factors are all based on the actual pollution of Taihu Lake Basin; for example, total phosphorus is selected as an index of emissions trading. In view of pollution situations of Taihu Lake Basin, the paid use and trading exploration of emission rights in Jiangsu Province is featured as the strong administrative order with obvious characteristics of top-down administrative mode.

Table 8 Development Modes of Pilot Emission Trading in China

Modes	Typical region	Characteristics
Administrative development mode	Jiangsu, Hunan and Shanxi	Under the pressure from reduce emissions a top-down pilot model is carried out
	Zhejiang and Henan	Spontaneous exploration in a bottom-up pattern within the province
Market cultivation mode	Jiangsu, Shaoxing in Zhejiang, Tianjin, Shanxi, Hubei, Shaanxi, Inner Mongolia, and Hunan	The primary market moves first
	Zhejiang and Tangshan in Hebei	Focusing on the primary and secondary markets at the same time
Exploration mode focused on the secondary market construction	Jiaxing in Zhejiang, Chongqing	Moving the secondary market first

Focusing on the primary and secondary markets at same time. It is a mode implemented in Zhejiang Province. Zhejiang province implemented the emission trading pilots at the county and city level in Hangzhou, Shaoxing, Tongxiang and Zhuji in, and entitled a certain discretion, each pilot can give play to own initiative, and actively explore the experiences in total amount indicator management and emission trading. Zhejiang Province issued over 100 policy files related to the paid use of emission rights and emission trading, while the files at the county and city level are more than that at the provincial level. Zhejiang Province promulgated policies to promote the emission trading in whole province only after the pilot experiences of Jiaxing and Shaoxing, etc have been summarized, which implied that such development of trade pattern is featured as the "bottom-up". Though there are inconsistencies of all aspects, such as emission trade standard, determination of total amount of the traded pollutant, initial allocation mode and specific pricing among the emission trading pilot areas, Zhejiang Province can allow the differential emission trading, which widens the market operation mode of pollution control, exerts regional initiative, and provides the demonstration experiences for the exploration mode of "bottom-up" national emission trading.

Focusing on building the secondary market model. This typical case is the emission trading in Chongqing from which the secondary market is firstly began. The bidding mode is mainly used among enterprises aiming to increase the trading volume. The emission trading occurred more frequently in Chongqing, the larger demand of emission permits inspired the polluters to transfer their emission allowances; accordingly an active secondary market was formed. Although many problems still exist in market pricing mechanism in Chongqing with some

differences against the secondary market in essence, it is considered which has combined the government regulation and market effect well. It is a typical case in the current exploration stage of emission trading in China. Table 8 below sees the development modes of pilot emission trading in China.

4.7 Flourishing development of emission trading agencies

For facilitating the emission trading work in local areas, emission trading agencies have been set up successively in quite a few places. In terms of region, they include three types.

The first one is those which are oriented to the trading business across the country, such as Tianjin Climate Exchange, China Beijing Environment Exchange, Shanghai Environmental Energy Exchange, and Asia Climate Exchange (AEX). Among others, AEX, co-sponsored by Shenzhen United Property & Share Rights Exchange, Shenzhen International Technology Promotion Center for Sustainable Development and RESET (Hong Kong) Co. has radiated to South China and Southeast Asia, aiming at providing an international, market-oriented and professional emission trading service platform. The establishment of AEX indicated that the construction of primary emission trading market of Asia-Pacific Region with China at the center has been officially kicked off.

The second one is those which are oriented to the provinces, such as Hunan Province Environmental Energy Exchange, Shaanxi Environmental Rights Exchange, Chongqing Major Pollutants Emission Exchange & Management Center etc.;

The third one is those which gear to the needs of district/county level, such as Jiaxing Emission Quota Reserve & Exchange Center, Handan Environmental Energy Exchange etc.;

In terms of subject matter for trading, the emission trading agencies were initially

Table 9 Emission Trading Intermediary Agencies

Date	Agency	Remark
November 10, 2007	Jiaxing Emission Quota Reserve & Exchange Center was established by Jiaxing City	The first emission trading agency in China
August 5, 2007	China Beijing Environment Exchange was established	The business is oriented to the whole country
August 5, 2007	Shanghai Environmental Energy Exchange was founded	The business is oriented to the whole country
September 24, 2007	Tianjin Climate Exchange was founded and remaining quota of SO_2 was auctioned	The business is oriented to the whole country
November 28, 2007	Hunan Province Environmental Energy Exchange was established	It is temporarily set at Changsha Municipal Environmental Protection Bureau
March 18, 2008	Wuhan Optical Valley United Property Rights Exchange was officially initiated by Hubei provincial government	
March 27, 2008	Hubei Environmental Resource Exchange was established in Wuhan	
August 16, 2008	Kunming Environmental Energy Exchange was formally established	The first new energy technology and emission trading platform in southwest China was set up
November, 2008	The first emission trading center in Jiangsu Province was established in Changzhou City, Jiangsu	

May 5, 2009	Jiaozuo Public Resource Trading Center, Henan Province was officially established	
June 5, 2010	Shaanxi Environmental Rights Exchange was established	
July, 2010	Guiyang Environmental Energy Exchange	
September, 2010	Asia Climate Exchange (AEX) was established	Jointly established by Shenzhen United Property & Share Rights Exchange, Shenzhen International Technology Promotion Center for Sustainable Development and RESET (Hong Kong) Co., Ltd.
October, 2010	Guangzhou Carbon Emission Exchange	
November, 2010	Jilin Environmental Energy Exchange Co., Ltd.	
March 18, 2011	Qinghai Environmental Energy Exchange was established	
May 30, 2011	Hebei Province Pollutant Emission Exchange Service Center was established	
June, 2011	Chengdu Environment Exchange Co., Ltd. was established	
July 23, 2011	Xiamen Carbon & Emission Trading Center was established	
October 21, 2011	The inaugurating ceremony of Shanxi Emission Trading Center was held in Taiyuan, indicating the official founding of Shanxi Emission Trading Center	
December 18, 2012	Suzhou Environmental Energy Trading Center was officially established in Suzhou Industrial Park	The first environmental energy trading agency in Jiangsu
January 9, 2013	Handan Municipal Environmental Emission Trading Center, Hebei Province was established	
October 9, 2013	Shijiazhuang Municipal Emission Trading Center, Hebei Province was established	
December 23, 2013	Chongqing Carbon Emission Exchange was officially established	
December 20, 2013	Hubei Carbon Emission Trading Center was officially established	
December 26, 2013	Tianjin Climate Exchange was officially established	

targeted at SO_2, COD, ammonia nitrogen, nitrogen oxides and other traditional pollutants, which are in conformity with the national policies for total emissions of pollutants. Along with the deepening of pilot, the subject matters for trading have also expanded to carbon, amount of energy saving and other environmental right and interest trading products.

Judging from the functions of different type emission trading exchange agencies, the trading agencies of different levels play different roles. To take AEX with wide radiation in range for example, in 2013, it reached RMB13.16 million in carbon emission trading, providing a good platform for inter-regional wide-range trading. The emission trading platforms at provincial or municipal level are designed for meeting needs of the emission trading of local areas. For instance, the emission trading practice of Zhejiang Province mainly occurs on city level. The provincial environmental protection administration only makes a framework

regulation for coordinating the emission trading in various areas within the province; in this case, emission trading platforms are usually set up on city level. The emission trading intermediary agencies in China are shown as Table 9.

4.8 Deficiency of MRV system results in weak infrastructure of emission trading

MRV system (monitorable, reportable and verifiable) is a basis to sustain implementation of the emission trading. Whether the emission trading can be extensively popularized or not depends on the degree of maturity for MRV system. The success achieved for USA in advancing pollutant emission trading and Europe in carbon trading lies in their perfect MRV system. However, the building of MRV system is deficient in China on the whole presently; even this problem exists in Guangdong, Zhejiang, Jiangsu and other eastern coastal developed regions.

First, ensuring the accuracy of data on emission monitored for enterprises accessing into the trading market is a basic condition for launching emission trading. Presently, there are some enterprises in China which have installed automatic emission reporting systems, but, in fact, due to poor maintenance of lots of online systems and poor operating quality, they cannot ensure the monitoring quality of enterprises' pollutant emission data, seriously weakening the utility of real-time online monitoring systems. Generally, the state-owned large-sized enterprises perform better, however, for many other enterprises, especially medium and small-sized enterprises, even the online systems have been installed, the data quality is hard to secure. In this case, the measurement of total emission for non-state and provincial control enterprises are still assessed based on traditional indirect method and material balance method, which are not accurate and timely. Second, the subsequent supervision and verification of emission trading quota after emission trading is finished needs to be in place. However, quite a few areas fail to meet the requirements in such a capacity. Today, the emission trading pilots launched in various areas of China are mainly based on such three aspects as verification of trading quota source, accounting of trading quota amount and management of transaction process. The subsequent supervision and verification after quota transaction have not been initiated yet. After an enterprise acquired the emission quota, if the pollutant emission volume during actual production is consistent with the emission quota amount acquired from transaction, there is any emission beyond the quota or there is any surplus with the emission quota etc. have not been included into the range of subsequent supervision of emission trading. Moreover, the authoritative third party mechanism has not taken shape in the society. At present, there are some agencies in carbon trading verification field, which claim to be the sole or one of authoritative verification agencies in China, but no agency has been accepted by international authorized institutions. No relevant government departments in China have been involved in the accreditation work. In this case, it tends to result in difference between verification of emission trading quota and result of examination and poor persuasion etc. The examination and verification of third party shall be the core to safeguard the quality of emission trading system. The deficiency of MRV system as a support to emission trading has impeded the extensive implementation of

emission trading policy in China, which is also a critical basic issue to be firstly solved for further advancing the emission trading work across the country next stage.

4.9 Carbon and emission trading lacks systematic consideration

In China, though pollutant emission trading practice and carbon trading currently are carried out but separately pursued and lack systematic consideration. For both pollutant emission reduction and carbon emission reduction, the political basis, policy environment and technical condition for their implementation in China are available, that is to say, major pollutant emission trading and carbon trading can be incorporated into an integrated trading framework, however, in fact, they remain separate to each other on both national level and local level.

To take Guangdong Province in which emission trading and carbon trading are introduced, in July 2007, Guangdong Province was listed as a province of national low-carbon pilot. In 2011, it was approved by the National Development and Reform Commission (NDRC) to launch carbon emission trading pilot. In September 2012, Guangdong provincial government issued the Implementation Plan for Carbon Emission Trading Pilot in Guangdong Province, embarking on building of carbon emission trading market within the province progressively. Meanwhile, Guangzhou Carbon Emission Trading Exchange was officially established, making it be the first carbon emission trading exchange. In 2013, the carbon emission trading in Guangdong stepped into operation stage. By the end of 2013, the total carbon trading volume reached 120,129 tons, with turnover at RMB 7,227,470, making up 29% of carbon market across the country. A carbon emission trading system has been basically set up in Guangdong. Besides, major pollutant emission trading was officially kicked off on December 18, 2013. Though the Opinions on the Implementation of Compensated Use and Emission Trading Pilot has been released, it obviously lags behind the pilot of carbon emission trading. What is the most critical is that Guangdong Province has not considered two issues of carbon emission trading and major pollutant emission trading as a whole. The same situation exists in other provinces and municipalities such as Beijing, Shanghai etc. in which both emission trading and carbon trading are launched.

As a matter of fact, the major pollutant emission trading and carbon trading can be under coordinated control and incorporated into a united trading framework as a whole for carbon emission and air pollutant emission are both from the combustion of the fuel resources and could be controlled together. However, these two items is completely separated. On one hand, the management department of Chinese government has functional division. Ministry of Environmental Protection and National Development and Reform Commission push on major pollutant emission trading and carbon trading respectively from different angles; on the other hand, while different management departments are pursuing environmental policy, they lack communication and coordination, indicating the low efficiency arisen from “fragmentation” of environmental management system in China and shortage of systematic and optimized top-level design in policy.

5. Development trend of China in emission trading policy

To review the development of China in emission trading policy over the past two decades, we can find great progress in emission trading exploration with Chinese characteristics. The Third Plenary Session of the 11th Central Committee of the Chinese Communist Party clearly stated the implementation of resource compensated use system and clarify the further reform direction for deeply exploring how to achieve optimized allocation of increasingly scarce environmental capacity resources through emission trading policy. In general, over the past ten years, the emission trading clearly presents the features: increasingly importance attached by the state, active exploration made by local areas, intensified linking between upper and lower levels, diversified trading patterns explored, increasingly broad trading subject matters, continuously expanding level in policy space, frequent issuing of local regulations, policies and documents, emergence of professional emission trading companies etc. However, it deserves our attention that the emission trading market mechanism suiting the actual national conditions has not been formally established and the liquidity of secondary market has not formed yet. Judging from the trend of emission trading policy, in the coming period, the emission trading will move towards institutionalization, large-scale and diversification and present the following characteristics in trend of development: (1) The national policy pilot and institutional standardization will be further enhanced, the exploration of policy will find its way into deep water zone and great progress will be made in some key issues such as support from legislation and regulation, coordination between emission policy and relevant policies; (2) The voluntary exploration practice of local areas will have a trend of flourishing development, which is conducive to forming of secondary market and definition of price forming mechanism; (3) Some commercial companies with emission trading as business purpose have been successively established. Under the motive of pursuing profit, banking and financial departments will develop relevant financial products such as emission pledge etc. And further promote the development of emission trading secondary market; (4) The emission allowances shall be allocated and used primarily on a paid basis reflecting the scarcity and value of the environment capacity resources. However, it is still a problem as to how to define the price of the initial emission allowances in a reasonable way and with guaranteed fairness; (5) The range of trading subject matter will be gradually expanded, which is not only limited to traditional pollutants, but also include amount of energy saving, carbon emission right and water right trading and other environmental right and interest products; (6) The building of special pollution management system for emission trading policy will face a huge challenge. Among them, it is not only related with function positioning and policy selection of management department upon the policy itself, but also a tremendous test to management level of relevant government departments.

6. Six remarkable problems emerged in the pilot projects

Although emission trading is an excellent market economy policy and China has also gained some experiences in establishing management systems and operational mechanisms of emission trading after years of experiments in these aspects, obstructions from laws and regulations, administrative departments, enterprises and environmental concepts were felt and a large number of problems (Wang, 2008) were exposed in the course of further deepening and extending such experiments since the policy system itself is not fully reasonable and the supporting systems and mechanisms are not perfect. These problems are remarkably noticed in the six aspects described in the following paragraphs.

6.1 Supporting laws and regulations are inadequate

Both total emission control and emission permit policies are referred to in the "Law on Prevention of Atmospheric Pollution" and the "Law on Prevention and Control of Water Pollution" currently in force at the national level. Experiments on emission trading have been carried out successively at the local level for nearly 20 years. However, there is still not such a technical guidance on emission trading at the national level, let alone a national law on emission trading. Issues such as the contents of emission rights, rules of emission trading, responsibilities, rights and interests of the trading entities, settlement of trading disputes, tax preference and other trading incentives, mortgage of emission rights as assets, regulatory procedures, liabilities for breach of law, legal authorization in the policy of experimental emission trading, etc. still remain unsolved. To date, the only consents to experiments and studies in emission trading are expressed in the "Decisions on Implementing the Scientific Concept of Development and Strengthening Environmental Protection" promulgated by the State Council in December 2005 and the "Comprehensive Work Scheme for Energy Conservation and Emission Reduction" and the "10th Five-year Plan for Environmental Protection" issued by the State Council in 2007.

Weak and inadequate legal basis for emission trading, in particular, the paid acquisition of emission permits, is also a problem from the perspective of the practical implementation of paid use and trading of emission allowances in the provinces and municipalities at the local level. So far, only Jiangsu and Zhejiang provinces and some other regions and cities have carried out some experiments and formulated and introduced some local laws and regulations on emission trading. In the majority of the other experimental areas, the legal basis for emission trading does not exist and the experiments are carried out in a purposeless way to a large extent. Consequently, many policies become "lawless" operations. Provinces and cities that started earlier in the practice of emission trading expect timely enactment by the national government of specific rules and regulations on paid use and trading of emission permits.

6.2 The relationship with the existing environmental policies is not clear

There are a great deal of environmental policies regarding pollution source management, e.g. pollutant emission charges, wastewater treatment charges, environmental impact assessment, total emission control and emission permit. In order to enable the emission trading policies to be integrated into the environmental policy system, the impacts produced by such policies on other policies in force and the relationship between them shall be identified. So far, no in-depth study has been carried out in this regard and no evaluation has been carried out from the perspective of the environmental policy system on the position and function of emission trading policies. In many places, the experiments of emission trading mechanism were conducted on a "learn-as-we-go" basis without clear knowledge. Therefore, the relationship between emission trading and the existing environment management system must be figured out at the theoretical and operational levels to achieve the complementation goals between emission trading and the related environmental policies.

6.3 Methods for allocation of emission allowances and mechanism for initial pricing are imperfect

Despite some experiences obtained in the methods of allocation of emission allowances to enterprises and significant improvements made to the fairness and impartiality of such methods, the performance-based allocation method is not yet practiced locally, the method for obtaining the emission allowances of new pollution sources is not yet identified and no specific enterprise access standards and regulations are established. These problems will become the obstacles to the implementation of emission trading mechanism.

In addition, a scientific mechanism is not in place for initial pricing of tradable emission permits. Significant disputes still exist during the experiments over initial pricing of the environmental capacity resources adopting the mechanism of paid use to reflect the scarcity of which. Excessively low initial price fails to materialize the restrictive function of environmental capacity resources upon emission entities while excessively high initial price will overburden enterprises in the experimental areas and, consequently, lead to governmental rent seeking. The current practice in this regard is that the initial price for paid use of emission allowances is, in most of the cases, defined jointly by the authorities of environmental protection, price administration and development & reform committees. The low level of participation in the allocation of the initial emission allowances by the enterprises, as the objects of such allocation activities, has become one of the obstacles to policy enforcement.

6.4 Significant expansion of emission trading market is difficult to achieve in the short term

Most of the emission trading carried out in the past cannot be fully classified as a market based transaction because they were achieved with the coordination of the local environmental protection authorities. The environmental protection authorities are the maker of the trading rules and the

intermediary in these trading cases. So far, no enterprises or professional intermediaries are playing the role of a broker. Such an arrangement in which the government plays a "matchmaking" role carries a taste of "guiding price" under very strong administrative interferences and is not linked with the market price mechanism, resulting in the failure of the price leverage and competition mechanism and an unhealthy pricing mechanism for emission trading, which, consequently, fails to show the scarcity of the environmental capacity resources. Therefore, in fact, China still does not have in place an emission trading market in the true sense and enterprises still find an ambiguous future for the allocation of total emission allowances and trends of emission trading prices. This situation tends to lead to a problem, that is, enterprises in possession of the emission allowance incline to preserving for the good of their own business, the result is the emission permit buyer always on the market but no seller could be found. This is one of the important causes of the slow development and low trading volume of emission trading market in China.

In order to establish a market mechanism of emission trading, the national policies must be so established that incentives are provided to assure adequate circulation of residual emission allowances on market. This is essential to the establishment and sustainable operation of an emission trading market in the true sense. Otherwise, if there are very small quantities of residual emission allowances or emission reduction credits for sale on market, the emission trading market will fall into a trap of "zero supply" featuring in plentiful buyers but few sellers. The major factors affecting the growth of the trading market are: (1) The government enforces the inflexible "one-size-fits-all" emission reduction policy and a great majority of the enterprises have heavy emission reduction tasks to fulfill and find it very hard to make a flexible choice to sell or not to sell it's residual emission permits into market; (2) Since energy demand keeps soaring nationwide while the medium and long term objectives and policies of emission reduction remain ambiguous, electricity enterprises are not willing to sell and prefer preserving their residual emission allowances for their own good; (3) The local emission trading market is severely segmented administratively and the scale development of the trading market for emission allowances for cross-region trading, such as SO_2 in particular, will be badly hindered with emission trading platform set up by a single city or province.

6.5 The power of pollutant emission monitoring, supervising and management required for the implementation of emission trading are still inadequate

Accurate measurement and monitoring of the level of emission at the pollution sources and a powerful regulatory and law enforcement system become important assurance of the implementation of paid acquisition of emission rights. Presently, the infrastructures for measurement of pollutant emission are relatively underdeveloped and the regulatory ability of the environmental protection departments is inadequate. The monitoring conditions required for the enforcement of this policy are not available in many areas. As a result, the environmental protection authorities find it difficult to get the true emission data from the pollutant emission entities and track and verify transactions.

The effectiveness of policy enforcement is severely challenged.

How to achieve timely tracking and supervisory management of the paid use of pollutant emission permit, issuance of emission permit and status of emission trading remains one of the issues that the governmental authority needs to study and solve with great efforts. In addition, from the perspective of regulation and law enforcement, the emission trading policy requires the environmental protection authorities to have a relatively high level of competence to regulate the illegal acts of the pollutant emission entities. Slack law enforcement by relevant authorities brings high risks to the enforcement of the emission trading policies.

6.6 Emission licensing system as a basis of emission trading has not been built

The exploration of emission right compensated use and trading in different areas is adaptable to environmental management needs of total control in China. If the total emission cannot be under effective control, the emission trading system has lost its soil of growth. Over the past years, the insufficient management over total control from environmental protection department is attributable to the close connection between total emission and local development. If total emission is under rigorous control, some enterprises with high energy consumption and high pollution will not be able to run in many areas. In this case, the local governments will have more collision with total control and weaken the control power of environmental protection department over pollutant discharge. If enterprises can own emission quota at low cost or even free of charge, they are unlikely to be interested in both buying and selling. The relevant departments in pilot areas create the market by means of “matchmaking”, which is impossible to continue over and over again eventually.

7. Basic Thoughts on Establishment of Emission Trading System in China

Domestic and international experiences in emission trading reveal that emission trading is an approach with strong contribution to emission reduction. In face of the severe situation of emission reduction, China is in urgent need of an emission trading mechanism to achieve emission reduction at minimum social costs and establish a lasting and efficient mechanism of energy conservation and emission reduction. In addition, emission trading provides reserved policies for China to build its competence to cope with climate change. Therefore, the Chinese government must highly recognize the importance of the emission trading policies and design reasonable action roadmap to continuously advance the policy and make break-through progress in settlement of key problems. Supporting measures should be provided and greater efforts made in pilot projects of emission trading so as to build up and gradually shape an emission trading system that fits the specific situation of China.

7.1 The emission trading system shall be implemented in a phased and orderly way with break-through progress in key sectors and regions

Reasonably designed environmental policies shall be enforced on an experimental and demonstrative basis so that relevant experiences are gathered to facilitate extensive enforcement. This is an important "trump" for China to attain effective enforcement of its environmental policies. The order of priority of the experiments shall be arranged based on the finished activities as well as the level of urgency of the respective problems. Emission trading in the near future shall focus on SO_2 emission trading in the electricity sector nationwide and the experimental emission trading of COD in Tai Lake basin. Local experiments in emission trading for small basins shall be encouraged.

The electricity sector, known for its significant emission of SO_2 that accounts for more than 50% of the total SO_2 emission nationwide, is a major contributor to acid rain pollution in China. The electricity sector has had the conditions and infrastructures for efficient reduction of SO_2. For a power plant using fuel coal of different sulfur contents, its marginal cost difference for SO_2 treatment may be doubled or even larger and cost difference will become a major driving force for the electricity sector to carry out experiments in emission trading. In order to encourage the electricity sector to make more efforts in emission reduction and encourage enterprises to take incisive control actions to settle the conflicts between the development of electricity sector and the limited emission allowances, it is very essential to pilot SO_2 emission trading in the electricity sector. Besides, above 70% national controlled key pollution resources of the fire power generation plants equipped with the online Continuous Environmental Monitors (CEMs) at the bottom of 2008. Under such circumstances, both the MEP and MF have explicitly required the electricity sector to pilot SO_2 emission trading. Therefore, the "Measures for the administration of SO_2

Emission Trading in the Electricity Sector" should be issued at the earliest possible date, the policies and supporting measures for the SO_2 emission trading in the electricity sector should be improved and established and greater efforts should be made in the enforcement of the respective policies. Experimental ranges should be extended to other sectors when the conditions are mature; experimental ranges of emission trading shall be considered for chemical industry, construction materials and steel and iron and other sectors with relatively big proportion of SO_2 emission other than the fire power generation sector; "Guidance for SO_2 emission trading in non-electricity sectors" should be promulgated, greater research efforts should be made to explore for models of emission trading for NOx and Hg pollutants and study the feasibility and operating models for extending emission trading to greenhouse gases, land production equivalent quota, renewable energy quota, natural reserves (forests) quota and experimental projects should be carried out.

COD emission trading should be implemented in the Tai Lake basin in the near future under the guidance of the MOF and MEP. In the early stage, experimental areas may be conducted in a number of small basins or regions around Tai Lake in Jiangsu and Zhejiang that have a relatively sound basis of pollution source management. Then, based on the experiences obtained from these experiments, gradual improvements can be made to the management mechanism and methods for paid acquisition and trading of COD emission permits and the territorial scope of such experiments can be further expanded to get ready for nationwide implementation of emission trading policies for major water pollutants in small and medium-sized drainage areas. Meanwhile, experiments on emission trading of nitrogen, phosphate and other water pollutants may be conducted in Tai Lake area in parallel with the national key technology R&D program in prevention and control of water pollution, the national research and pilot program on environmental economic policies and other S&T programs.

7.2 Greater efforts shall be made in the construction of the six systems in emission trading

The key elements that affect the implementation of emission trading in China are multidimensional, including the fair allocation of the emission permit (primary market) and the trading efficiency of the permit trading market (secondary market), the correlated impacts and connection between the policy with the other related policies, as well as regulatory and law enforcement guarantees, competence building for technical staffs, supply of trading platform, readiness of laws and regulations and policies. These elements are sequentially dynamic and spatially heterogeneous. Therefore, efforts in the near future should focus on the construction of "six systems":

A key technical supporting system shall be developed to provide technical assurances needed for smooth policy enforcement. There are many technical difficulties to overcome to achieve effective implementation of the emission trading policy. These technical issues directly affect the effectiveness and impartiality of policy enforcement. Therefore, the R&D progress should be expedited and greater efforts should be made in the supply of key technologies for the effective enforcement of emission trading mechanism to provide technical supports to the

experimental and demonstrative projects and technical assurance for the enforcement of the policy. Areas in the key technology system that require break-through efforts include procedures and methods to assure the equality and fairness in the initial allocation of paid emission allowances, pricing mechanism for initial emission rights, emission trading platform, methods for eliminating trading asymmetry, trading ratio between different sectors and regions, schemes for increasing the cost of illegal acts at the pollution sources, solutions to taxation problems that might get in the way of emission trading, trading techniques for point sources and nonpoint sources, schemes for organic connection of emission trading and total emission control, emission charges, emission permits and environmental impact assessment and other relevant systems and policies. A reasonably constructed and continuously improved technical support system will be supportive to the implementation of the experimental projects at the national level and the experimental explorations at the local level so as to take the shortcut to and reduce the cost of emission trading.

A fair and reasonable system shall be established to assure effective allocation of the initial emission allowances. Fair allocation on the primary market where the government dominates the initial allocation of emission rights serves as an important basis and prerequisite for effective operation of the emission trading mechanism. Relevant policies should be enforced to regulate the property rights of the emission permits on the primary market, define the rights and responsibilities of the MEP and the local environmental protection bureaus as the responsible governmental department in determining the target quantities and allowances for initial allocation, reasonably design the conditions, procedures and time limits for paid acquisition of emission permits, initial pricing mechanism, equivalent coefficient or correction coefficient for different regions and sectors, exploitation and management of the funds from the initial emission allowances and so on. What is worth noting in particular is that the emission performance methodology should be adopted to allocate emission allowances to enterprises; the initial allocation price should be adjusted based on the supply-and-demand relationship on market and changes of the unit cost of pollution treatment; new and existing enterprises, as the objects of allocation should be treated in a differential way while bankrupt enterprises should have the emission permits returned; in terms of the design of the effective period of such allocation, it is recommended that five-year emission permits be designed in association with the five-year total emission control planning to enable the subject of the emission trading market to have definite expectation on the price of emission allowances; payments for emission trading may be conducted in both a single payment or installments; so far as fund management is concerned, earnings from the public sale of emission allowances should be incorporated into a special emission charge fund for centralized management and utilized to support the development of renewable energy and promote energy efficiency etc. With a reasonable allowance allocation system, the allocation activities shall be carried out by the governmental departments in an equal, fair and open manner, corruption and frauds arising from allocation of emission permits shall be prevented and a primary market for emission trading shall be constructed and improved continuously.

The emission trading market system shall be activated and the configuration efficiency of the environmental capacity resources shall be promoted through emission trading. Determination and allocation of total emission is only the first step and reallocation of the emission right (namely property rights of emission permit) among the emission entities shall be conducted on the emission trading market. The market system will not be activated and the role that the market plays in configuration of environmental capacity resources will not be brought into full play until emission trading is realized. In order to build a well-operating secondary market for emission trading, the following tasks should be carried out to a satisfactory level: the major objects and scope of the functions of the secondary market policies shall be defined; new enterprises shall be allowed to obtain emission allowances from the secondary market or from the preserved allowances of the government on a paid basis; in terms of the design of trading prices, a pricing mechanism that involves self-adjustment by the market under the guidance of the government shall be established; trading rules shall be formulated to prevent monopoly of trading prices; A trading information platform shall be set up to keep track of and supervise and manage the trading of emission allowances; trading of different space dimensions shall be regulated according to different standards and cross-region trading, in particular, shall be regulated to avoid "hot spot" pollution as a result of large quantity of pollution emissions; transfer of emission permits shall be incorporated into the EIA approval and management procedure after an application is submitted to the local environmental protection authority; misuse and illegal transfer of emission permits shall be effectively curbed by means of legislation or other actions; deliberate forestall and other trading actions that might disturb the market shall be eliminated; trading liabilities shall be defined and enterprises discharging noncompliant pollutants shall be heavily punished; Active financial and taxation policies shall be established and the subjects of market shall be encouraged to contribute to the configuration of environmental capacity resources driven by the pursuit of maximum self-interest. With these actions in place, normal trading of emission permits on the secondary market shall be assured and the emission trading market shall be activated in the true sense.

A system of laws and regulations on emission trading shall be built and the capability of law supply shall be strengthened to facilitate policy enforcement. Paid acquisition and trading of emission rights is an important attempt in the reform of environmental policies. Closer attention shall be paid to the legal competence building for the emission trading mechanism in order to assure powerful law supply and facilitate the enforcement of the policies and standardization of the entire process of emission trading.

The legal status of the paid acquisition and trading of emission permits shall be stipulated upon the revision of specific laws such as the "Environmental Protection Law", the "Law on Prevention and Control of Water Pollution" and the "Law on Prevention and Control of Atmospheric Pollution". Included in the "Law on Prevention and Control of Atmospheric Pollution" and the newly revised "Law on Prevention and Control of Water Pollution" (2008 edition) are only some

general provisions on emission permits and no legal supports are available for emission trading. In addition, laws and regulations should be enacted as soon as possible regarding the methods for implementation and management of total emission control and paid acquisition of emission permits, methods of regulating emission trading and methods for management of fund for paid use of emission permits. Responsibilities, rights and interests and liabilities for breach of law of the allocating subjects such as the government departments, enterprises and intermediaries as well as the trading entities in total emission control, initial allocation of emission permits and paid use of emission allowances and emission trading shall be further defined to provide rigid legal guarantee to the regulation of the primary and secondary market of emission trading and promotion of the operational stability of the emission trading market and to make sure that emission trading is conducted by law.

The pollution source monitoring and management system should be improved to reinforce the capability building of emission trading in the experimental areas and sectors. For the sake of full implementation of emission trading, stronger efforts are needed to strengthen the pollutant emission monitoring and supervising and management capabilities and extend the scope of emission entities that are required to install online monitoring devices so as to assure effective tracking and monitoring of the emission of various pollutants. In view of the fact that the emission trading mechanism is a complicated system involving multiple subjects, multiple sectors, multiple institutions and issues of multiple aspects, a well-integrated information exchange and coordination platform is essential to the actual promotion of the effectiveness of policy enforcement. More efforts should be extended to the construction of the pollution source database and information platform, the management platform for paid allocation of emission allowances, the monitoring and verification platform for pollution source emission level and the management platform for pollution source emission trading accounts, an emission account system shall be established for the enterprises to achieve comprehensive management of pollution sources participating in the system of paid allocation and emission trading, and make sure emission of pollutants of all types is under effective control.

A sound supervision system for enforcement of environmental laws shall be established to provide legal regulation for implementation of emission trading. Powerful supervision of environmental law enforcement is a baseline institutional assurance to the operation of the emission trading mechanism and also a basic approach to transition of the emission trading laws and policies from "what they ought to be" to "what they are". Without effective supervision of law enforcement, the executing force of emission trading will be greatly compromised, the laws and regulations will be nothing but a pile of waste paper and the functions of the laws in regulating trading activities will not be realized. Procedures for review and approval of emission trading should be strictly followed and more powerful supervision and inspection and administrative punishment and sanctions should be carried out to increase the cost of the illegal acts by the emission entities breaking the total emission limit.

7.3 The action roadmap for the advancement of emission trading

Presently, Chinese emission right compensated

use and trading institution still faces many difficult problems in policy, management institution and technology. Ministry of Environmental Protection, Ministry of Finance, State Development and Reform Commission and other relevant departments shall seize the good opportunities of current economic reform and transformation in China, combine the existing pilot basis and overseas experience, strive to make a key breakthrough in emission trading pilot of industries and regions with better conditions in the near future, arrange the implementation progress rationally, uphold the principle of progressive advance, stable progress and breakthrough in key areas in policy implementation in an effort to basically build an emission trading policy system in line with Chinese actual conditions before 2025.

In the coming period (2014-2015), the focus will be laid on intensifying the research on emission right compensated use and trading, construction of supervision, platform, organization, publicity and education; actively supporting third party profitable agencies with emission trading behavior as a main operating target; extend the pilot of major atmospheric pollutant SO_2 trading in national power industry to steel industry and other industries with high emission contribution and good monitoring condition appropriately; encourage other river basins and regions with relevant conditions to launch COD pilot synchronously based on strengthening Taihu Lake basin in launching COD trading pilot and actively push on the pilot attempt of nitrogen, phosphorus and NOx; continue to push on carbon trading pilot in seven provinces and municipalities. NDRC, MEP, MOF and other departments shall give an overall consideration of advancing emission trading and carbon trading in a united way; strengthen the development of CDM project operating platform, actively support CDM project in priority fields such as development of renewable energies, energy efficiency, recovery and utilization of methane.

In the medium term (2016-2020), the efforts will be made in pushing forward the issuing of relevant policies, extending and deepening the range of emission trading policies and promoting the expansion of emission trading in industry and space. On the state level, include power and non-power industries with heavy contribution of SO_2 into the SO_2 emission trading policy framework and actively carry out pilots for exploration; strive to introduce COD trading in key river basins across the country during this period if the polices are ready; meanwhile, expand the range of trading subject matters, actively push forward the emission trading pilot of nitrogen, phosphorus, NOx and mercury; carry forward the implementation of carbon trading in a coordinative way in pilot areas of emission trading, basically build a market of major pollutant emission trading and carbon trading, vigorously encourage the pilots based on voluntary greenhouse gas emission trading and other environmental right and interest product trading.

In the long term (2021-2025), efforts will be made in building national SO_2 and COD emission trading market mechanism; strengthening the driving force of supporting policies, deepening the emission trading pilot of nitrogen, phosphorus, NOx and mercury; carry out emission trading in key industries such as power, cement, thermal supply and steel-making etc. in an all-around way, with subject matters including major pollutants and greenhouse gases. In the meantime, actively improve the construction of emission trading market policy system and building of emission compensated use and trading policy system in line with actual conditions of China.

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Annex 1- Chinese Emissions Trading Practice Progress (First Stage)

Time	Events and Activities
1987	China started the experimental issuance of water pollutant emission permits. Transfer of pollution emission rights was carried out between Shanghai No. 10 Steel & Iron Plant and Tangwan Electroplating Factory in Minhang District, Shanghai. A compensation of RMB40,000 was paid per year to the Tangwan Electroplating Factory. Emission trading was carried out between the newly established Shanghai Yongxin Color Kinescope Co., Ltd. and Shanghai Hongwen Paper Mill, with the former buying an emission permit of 395kg COD per day from the latter.
1987 till now	Emission trading for water pollutants starts in Minhang District, Shanghai and 37 such deals have been fulfilled so far, involving the transfer of the rights to emit 1301kg of COD per day with a trading amount of RMB13,910,000 in total.
March 1988	SEPA promulgated the "Interim Measures on the administration of Water Pollutants Emission Permit".
June 1988	18 cities including Shanghai, Beijing, Tianjin, Shenyang, Xuzhou, Changzhou were selected by SEPA to pilot the application of water pollutant emission permits.
July 1989	It is stipulated in Article IV of the Detailed Rules of Implementation of the Law on Prevention of Water Pollution that enterprises and public utilities emitting pollutants to water bodies shall be managed using emission permits.
1990	SEPA began to select cities for pilot projects of the air pollutants emission permit system and 16 cities including Baotou, Liuzhou, Taiyuan, Pingdingshan and Guiyang were selected.
April 1991	SEPA started the pilot enforcement of the air pollutant emission permit system in 16 selected cities.
1993	The Municipal Government of Kaiyuan, Yunnan Province promulgated the "Interim Measures on the administration of Air Pollutant Emission Permits in Kaiyuan City" and the Municipal Environmental Protection Administration staged the "Methods for Management of Emission Trading for Air Pollutants in Kaiyuan" to practice total emission charge and emission trading of SO_2, flue gas and dust. Liaoning Province stipulated in its local laws that all pollutant emission entities should be subject to permit management.

1994	SEPA started pilot enforcement of emission trading for air pollutants in 6 cities of Baotou, Kaiyuan, Liuzhou, Taiyuan, Pingdingshan and Guiyang. SEPA announced the ending of the pilot enforcement of emission permit and started to enforce such permits in all the cities.
1995	The State Council promulgated the "Regulations on Prevention and Control of Water Pollution in Huaihe River", which stipulates in Article XIX that organizations holding an emission permit in Huaihe River Basin shall make sure that their total emission shall not exceed the total emission allowances specified in such permits.
September 1996	The State Council officially stated in the "National Plan for Total Emission Control of Major Pollutants during the '9th Five-year Plan' Period" that total emission control shall be an environment policy of China, laying an institutional foundation for the implementation of emission trading in China.
1997	Beijing Institute of Environment and Development and U.S. Environment Defense Fund launched an emission trading research project and Benxi and Nantong were selected as the candidate cities for Phase 1 to conduct case studies in city-level emission trading. In Xiuzhou District of Jiaxing, the authorities of environmental protection, price management and finance jointly promulgated its "Provisional Measures for Total Emission Control and Paid Use of Emission Rights for Water Pollutants". Xiuzhou District Wastewater Treatment Co., Ltd. is responsible for collecting operating charges for paid use of the emission rights and all the revenues shall be used in construction of township domestic wastewater treatment plants for the whole district.
August 1998	Taiyuan passed its "Management Methods of Total Emission Control of Air Pollutants", China's first local law on total emission control that contains provisions on emission trading.
April 1999	Mr. Xie Zhenhua, Director of the State Environmental Protection Administration, and Ms. Carol Brown, Administrator of U.S. Environmental Protection Agency, signed the Agreement on Cooperative "Feasibility Study in Application of Market Mechanism in Reduction of SO_2 Emission in China" during Premier Zhu Rongji's visit to the U.S and Nantong of Jiangsu Province and Benxi of Liaoning Province were defined as the pilot cities.
September 1999	SEPA and U.S. Environment Defense Fund signed a memorandum on the cooperative agreement on "a study in how to use market mechanisms to help local governments and enterprises achieve the total emission control targets set by the State Council".

November 1999	The "International Forum on Feasibility of SO_2 Emission Trading in China" was held at Beijing International Conference Center jointly by SEPA and U.S EPA.
March 2000	The revised "Rules for Implementation of the Law on Prevention and Control of Water Pollution" stipulated in Article X that local environmental protection authorities shall issue water pollutant emission permits based on the total emission control implementation plan.
April 2000	The revised "Law on Prevention of Atmospheric Pollution" stipulated in Article XV that areas with noncompliant air quality and subject to control of SO_2 and acid rain as defined by the State Council shall practice total emission control of major air pollutants and emission permits for air pollutants. This law provided the legal basis for the total emission control policy.
October 2000	A 15-people delegation sent by SEPA, the State Planning Commission, China Academy of Environmental Science and the environmental protection administrations of Benxi and Nantong cities took a study tour to the U.S.A for SO_2 emission trading and convened, together with U.S EPA, "the 2nd China-US Forum on Controlling SO_2 Emission through Market Mechanism".
November 2000	An agreement was secured between Dongyang and Yiwu in Jinhua Prefecture of Zhejiang Province on paid transfer of water right. According to the agreement, Yiwu paid RMB 200 million to buy the permanent right to use the water resources of 50,000,000m^3 in total in Hengjin Reservoir in the neighboring Dongyang. This is the first cross-city water right trading in China.
2001	A number of forums on SO_2 emission reduction and trading were held by SEPA, State Power Corporation and U.S EDF in Huangshan of Anhui Province and Beijing and Nanjing.

Annex 2- Chinese Emissions Trading Practice Progress (Second Stage)

Time	Events and Activities
September 2001	ADB and Shanxi Provincial Government jointly launched the Project of "SO_2 Emission Trading Mechanism". This Project was jointly executed by Resources for the Future (RFF), a U.S research organization, and the Environment Planning Research Institute under China Research Academy of Environmental Sciences (CRAES). Taiyuan was selected as the case city and 26 large enterprises participated in the demonstration project. With the aid of RFF and the Environment Planning and Research Institute of CRAES, Taiyuan issued its "Measures for the administration of SO_2 Emission Trading", China's first local regulation on SO_2 emission trading. A contract for paid transfer of the emission rights of 1,800 tons of SO_2 was signed between Nantong Tianshang Port Power Generation Co., Ltd. and Nanjing Acetate Fiber Plant. The contract is valid for 6 years.
2002	Taicang Huanbao Power Generation Co., Ltd. purchased the emission permit of 1700 tons of SO_2 per year from Nanjing Xiaguan Power Plant for the years from 2003 to 2005. A "Joint Declaration on Improving the Air Quality in Pearl River Delta" was made by the Government of Hong Kong SAR and the Government of Guangdong Province. According to the Declaration, SO_2 emission shall reduce by 30% in both areas by 2010 and emission trading shall become one of the main approaches to cut air pollutant emission in both places.
March 2002	SEPA issued the "Notice on Implementation of the Demonstrative 'Study in Facilitating the Implementation of Policies on Total Emission Control and Emission Trading of SO_2 in China'" and launched experiments in total emission control and emission trading of SO_2 in 7 provinces and municipals including Shandong, Shanxi, Jiangsu, Henan, Shanghai, Tianjin and Liuzhou, the largest demonstration on emission trading ever launched by the Chinese government.
May 2002	SEPA issued the "Notice on Plans for Demonstrative Enforcement of Policies on Total Emission Control and Emission Trading of SO_2" and launched, in partnership with U.S EPA, the Project of "Experiments on Total Emission Control and Emission Trading" in 7 provinces and municipals.
June 2002	Xiuzhou District of Jiaxing City pioneered the experiment on emission trading. All pollutant emission enterprises were required to buy "initial" emission rights and the emission trading mechanism was introduced.

July 2002	A meeting was held by SEPA on the experiments on "SO_2 emission trading" implemented in 7 provinces and cities. At the meeting, specific steps and plans for the implementation of such experiments were determined.
September 2002	The "10th Five-year Plan for Pollution Prevention and Control in the Acid Rain and SO_2 Control Areas" enforced at the approval of the State Council specifies that the system of SO_2 total emission control and emission permit shall be put into practice in such areas.
October 2002	The People's Government of Taiyuan Municipality staged its "Methods for Management of SO_2 Emission Trading" (Trial Version), the first such regulation issued at the city level.
	The Environmental Protection Department and the Economic and Trade Department of Jiangsu Province jointly established the "Interim measures for the administration of SO_2 Emission Trading in the Electricity Sector of Jiangsu Province".
October 2002	11 enterprises from Honghe and Wangdian townships of Xiuzhou District known for concentration of wool sweater dying firms attended the start-up ceremony of the paid use of emission rights as the first group of users in Xiuzhou District. These enterprises achieved a contract trading amount of 1,435,900 RMB in total.
2003	With the efforts of coordination by the Environmental Protection Bureau (EPB) of Henan Province, Yima Coal Gas Company of Sanmenxia City, Henan Province entered into a contract to buy the emission allowance of 900 tons of SO_2 from Zhongyuan Gold Smelting Plant. Guodian Changzhou Power Generating Co., Ltd. purchased, at a price of 3,000,000 RMB per year, the emission permit of 2,000 tons of SO_2 per year from Zhenjiang Jianbi Power Plant in Nantong for the years from 2006 to 2010.
March 2003	Xie Zhenhua, Director of SEPA, announced at the 11th Meeting of the 10th National People's Congress that China started to practice emission trading of SO_2 in some key areas.
April 2003	A cooperative training program on SO_2 total emission control and emission trading was jointly launched by SEPA and U.S Environmental Defense nationwide.
July 2003	Taicang Port Huanbao Power Generation Co., Ltd. buy the emission allowance of 1,700 tons of SO_2 per year from Xiaguan Power Generation Plant. Such allowances are to be used up within 2 years.

December 2005	It is stipulated in the "Decisions on Implementing the Scientific Development Outlook and Strengthening Environmental Protection" that a system of total emission control and emission permit shall be practiced and Pilot projects of emission trading shall be implemented.
March --- June 2006	Joint study in paid acquisition of emission permit and emission trading by the Ministry of Finance(MF) and SEPA
August 30, 2006	City University of Hong Kong hosted a Symposium entitled "Emission trading in China: from concept to implementation"
March --- June 2006	Joint study in paid acquisition of emission permit and emission trading by the Ministry of Finance(MF) and SEPA

Annex 3- Chinese Emissions Trading Practice Progress (Third Stage)

Time	Events and Activities
In 2007	
January 30	Governments of Guangdong and Hong Kong promulgated "Plan for Experiments in Emission Trading for Thermal Power Plants in Pearl River Delta"
March	"Technical Study in SO_2 Emission Trading in Electricity Sector", a study task under the National Key Technology R&D Program, was launched.
April 29	First SO_2 emission trading was carried out in Wuhan, Hubei Province
July 1	MF and SEPA decided to select the electricity sector and Tai Lake basin for experimental emission trading
June 7	State Council requires in the "Comprehensive Work Plan for Energy Conservation and Emission Reduction" that administrative rules and regulations regarding SO_2 emission trading be established at the earliest possible date.
Aug. 13	Zhuji of Zhejiang Province promulgated its "Temporary Provisions on Paid Use of Total Emission Allowances in Zhuji".
Aug. 29	Zhuji of Zhejiang Province promulgated the Detailed Rules of Implementation of the "Temporary Provisions on Paid Use of Total Emission Allowances in Zhuji".
September	"Regulations on Prevention and Control of Water Pollution of Tai Lake in Jiangsu Province" (Revision) was adopted by the Standing Committee of the People's Congress of Jiangsu Province stipulating that experiments shall be conducted to gradually enforce the mechanism of initial paid allocation and trading of emission allowances for major water pollutants in Tai Lake drainage area.
Sept. 27	Jiaxing Municipal Government promulgates "Measures on Implementation of the Methods of Emission Trading of Major Pollutants in Jiaxing" (Trial Version).
Nov. 10	Jiaxing established its Emission Allowance Reserve and Trading Center, China's first emission trading body.

Dec. 13	MF & SEPA granted approval of the experiment on paid use and trading of emission permits in Tai Lake drainage area.
End of December	Jiangsu, Zhejiang and Shanghai intended to jointly conduct experiments on paid allocation and trading of emission permits in the Yangtze River Delta.
End of December	Cooperative project on SO_2 emission trading in electricity sector was determined on the 3rd Session of China-US Strategic Economic Dialogue (SED).
In 2008	
Jan. 1	"Measures for the administration of Charges on Paid Use of Emission Allowances of Major Water Pollutants in Tai Lake Drainage Area in Jiangsu Province" (Trial Version) was put into implementation.
Jan. 1	"Measures for the administration of Charges on Paid Use of Emission Allowances of SO_2 in Jiangsu Province" (Trial Version) was put into implementation.
Jan. 23	"Measures for Implementation of Paid Use and Trading of Emission Permits in Shaoxing" (Trial Version) was approved by the Municipal Government of Shaoxing, Zhejiang Province
March	Wuhan Optics Valley Limited Property Rights Exchange plans to establish emission trading platform to introduce emission trading into the Exchange.
Mar. 17	State Electricity Regulatory Commission promulgates "Provisional Methods for the administration of Trading of Power Generation Right.
Mar. 25	"Methods for the administration of SO_2 Emission Trading of Taiyuan City" were officially put into force.
May	Tianjin Property Rights Exchange, CNPC Assets Management Co., Ltd. and CCX joined hands to prepare for the establishment of Tianjin Climate Exchange.
May 15	The Technical Team of National Environmental Economic Policy Study and Experimental Project conducted a study in emission trading in Jiangsu and Zhejiang.
May 15	"Methods of Emission Trading for Papermaking Industry of Mancheng County Hebei Province" (Trial Version) was put into implementation.

Jul. 3	Government of Haining, Zhejiang Province promulgates the "Notice on Circulation of the Methods of Emission Trading of Major Pollutants in Haining City" (Trial Version).
Jun. 11	China Academy of Environmental Planning (CAEP) under the Ministry of Environmental Protection(MEP) started the development of SO_2 emission trading management platform for fire power industry.
Jun. 12	Government of Pinghu, Zhejiang Province promulgates the "Notice on Circulation of the Methods of Emission Trading of Major Pollutants in Pinghu City" (Trial Version).
Jun. 17-18	CAEP convenes the Forum on Paid Use and Trading of Emission Permits for Water Pollutants in Jiaxing Zhejiang Province.
Jun. 30	"Work Plan on Experiments of Paid Acquisition and Trading of Emission Permits of Major Pollutants in Zhejiang Province" passed expert panel appraisal.
Aug. 5	China Beijing Environment Exchange and Shanghai Environment & Energy Exchange were established.
Aug. 6	"General Plan on Comprehensive Experiments of Emission Trading in Tianjin Binhai New Area" passed expert panel appraisal.
Aug. 14	MF, MEP and the Government of Jiangsu Province jointly staged in Wuxi City the start-up ceremony for the experiment on paid use and trading of emission permits of major water pollutants in Tai Lake drainage area.
Sept. 2	The People's Government of Nanhu District, Jiaxing City promulgated the "Methods for Management of Special Fund for Emission Trading in Nanhu District of Jiaxing City".
Sept. 10	The SO_2 Emission Trading Platform of Heilongjiang Province was established.
Sept. 24	Tianjin emission permit exchange was established and conducted the public sale of the residual emission allowances of SO_2.
October	"Methods for Trial Emission Trading of Major Pollutants of Hubei Province" (Draft) were adopted.
Oct. 8	MF and MEP agrees to the proposal of Tianjin on comprehensive experiment of emission trading.

Oct. 27	"Methods of Emission Trading for Pollutant Discharging Industries in Lixian County, Baoding of Hebei Province" (Trial) were promulgated.
Oct. 27	The Government of Hubei Province issued a Notice on Circulation of "Methods for Trial Emission Trading of Major Pollutants in Hubei Province".
Oct. 31	The Government of Huzhou City, Zhejiang Province issued the "Notice on Circulation of the Provisional Methods of Management of Paid Use and Trading of Emission Permit of Major Pollutants in Huzhou".
November	International Workshop on Emission Trading Programs:Policy Innovation and Business Opportunity was held in Nanjing University in Jiangsu Province jointly by CAEP, ADB, CCX among 10 organizations.
Nov. 20	The Environmental Protection Department of Jiangsu Province issued together with other organizations the "Notice on Circulation of the Detailed Rules of the Experiments on Paid Use and Trading of Emission Permits of Major Water Pollutants in Tai Lake Drainage Area in Jiangsu Province".
In 2009	
Jul. 20	Zhejiang Provincial Government issued the Guiding Opinions of Zhejiang Provincial Government on Launch of Emission Compensated Use and Trading Pilot; Zhejiang Province firstly launched a pilot on exploration of COD emission compensated use and trading in Taihu Lake basin and Qiantang River basin
Aug. 4	Environmental Protection Department, Development and Reform Commission, Finance Department and Price Control Administration of Heilongjiang Province issued the Measures of Heilongjiang Province on Management of Sulfur Dioxide Emission Trading (Trial). The sulfur dioxide emission trading was officially started on September 1, 2009.
Nov. 27	Henan Province, through the Regulation on Water Pollution Prevention and Control of Henan Province, prescribed that the remaining emission quota of polluting enterprises could be transferred with compensation. Henan Province also initiated the emission trading.
Dec. 14	Shanxi Province issued the Guiding Opinions on Launch of Emission Compensated Use and Trading Pilot in the Whole Province, initiating emission compensated use and trading across the province.

In 2010	
January	Finance Department and Environmental Protection Department of Shaanxi Province formulated and issued the Program of Shaanxi Province on Pilot of Sulfur Dioxide Emission Compensated Use and Trading (Trial) and the Measures of Shaanxi Province on Management of Sulfur Dioxide Storage, accomplishing the establishment of emission trading platform.
Mar. 1	Henan Provincial People's Congress promulgated and implemented the Regulation of Henan Province on Water Pollution Prevention and Control.
Apr. 27	Environmental Protection Department of Henan Province issued the Interim Measures of Henan Province on Management of Pollutant Discharge Permits
May 5	Jiaozuo Public Resource Trading Center, Henan Province was officially established
June	Ministry of Finance and Ministry of Environmental Protection approved Shanxi Province as a pilot area of national emission compensated use and trading
Jun. 5	Shaanxi Environmental Rights Exchange was established. The first sulfur dioxide emission trading was initiated, with the turnover up to more than RMB 9 million Vice minister Zhang Lijun chaired the semina for discussing the adoption of the Guiding Opinions on Accelerating the Emission Right Compensated Use and Emission Trading
August	Ministry of Finance and Ministry of Environmental Protection approved Inner Mongolia Autonomous Region as a pilot region of national emission right compensated use and trading
Aug. 25	Chongqing Municipal Government issued the Interim Measures of Chongqing Municipality on Management of Major Pollutant Emission Trading
Sept. 2	Under the support of project granted by Global Environment Facility, Shandong Province chose Weifang City as a pilot city of emission trading across the province
Oct. 1	Jiangsu started the implementation of the Interim Measures of Jiangsu Province's Taihu Lake Basin on Management of Water Pollutant Emission Trading, formally initiating the opening of emission trading in Taihu Lake of Jiangsu

Oct. 17	The General Office of Zhejiang Provincial Government issued the Interim Measures of Zhejiang Province on Emission Compensated Use and Trading Pilot
Nov. 26	Hunan Province issued the Implementing Regulations of Hunan Province on Emission Compensated Use and Trading for Major Pollutants (Trial)
Dec. 2	Leiwu City, Shangdong launched the pilot of emission trading
Dec. 28	Hebei Province issued the Measures of Hebei Province on Management of Pollutant Emission Trading (Trial)
In 2011	
January	Shanxi Province launched emission trading of such four pollutants as SO_2, NOx, COD and ammonia nitrogen in the province
February	Chongqing was officially approved by Ministry of Finance and Ministry of Environmental Protection as a national pilot municipality of emission trading
Mar. 18	Qinghai Environmental Energy Trading Center was established
Mar. 29	Franshion Properties purchased 16,800 ton voluntary carbon emission through China Beijing Environment Exchange, which was the first transaction achieved according to voluntary emission standard “Panda Standard” in China
Apr.6	Hunan Province initiated the pilot of emission trading of Hunan Province
May	Hebei Province launched a pilot of major pollutant emission trading in the province
May 30	Hebei Province Pollutant Emission Trading Service Center was established
May 31	The energy conservation and emission reduction working meeting for central enterprises was held, clearly defining the overall objective of energy conservation and emission reduction during the 12th Five-Year Plan period and proposing that the comprehensive energy consumption per RMB 10,000 output value (comparable price) will reduce by around 16% by the end of the 12th Five-Year Plan period.
Jun. 5	The State Council issued the Program for Comprehensive Work of Energy Conservation and Emission Reduction during the 12th Five-Year Plan Period, releasing tough target of energy conservation and emission reduction

June	Chengdu Environment Exchange Co., Ltd. was established
July	Hebei Provincial Environmental Protection Department and Price Control Bureau jointly issued Benchmark Trial Price of Hebei Province for Major Pollutant Emission Trading
July	Ministry of Finance and Ministry of Environmental Protection listed Shaanxi Province as a pilot province of national major pollutant emission compensated use and trading
July	No. 74 Decree of Jiangsu Provincial Government Measures of Jiangsu Province on Management of Water Pollutant Emission Permit was formulated and implemented, kicking off management of water pollutant emission permit in the province
Jul. 23	Xiamen Carbon & Emission Trading Center was established
August	Tianjin Municipal Government issued the Overall Program of Tianjin on Development of Emission Trading
Aug. 31	The Comprehensive Program of Energy Conservation and Emission Reduction issued by the State Council clearly stated the improvement of major pollutant emission compensated use and trading pilot, building and perfecting of sound emission trading market and research on formulation of guidance opinions on emission compensate use and trading pilot.
Sept. 23	Wuhan issued the first carbon emission standard in China
October	State Development and Reform Commission issued a circular on launch of emission trading pilot
Oct. 20	The State Council issued the Opinions of the State Council on Strengthening the Key Work in Environmental Protection, pushing on environmental tax reform and launching the pilot of emission trading
Oct. 21	The inaugurating ceremony of Shanxi Province Emission Trading Center was held in Taiyuan, indicating the formal establishment of Shanxi Province Emission Trading Center
Oct. 29	General Office of State Development and Reform Commission issued a Circular on Launch of Emission Trading Pilot, approving 4 municipalities directly under the Central Government Beijing, Tianjin, Shanghai and Chongqing plus 7 provinces and municipalities including Hubei (Wuhan), Guangdong (Guangzhou) and Shenzhen etc. to launch emission trading pilot.

November	Jiangsu Province Environmental Protection Department issued the Circular on Relevant Matters concerning Implementation of Water Pollutant Emission Permit Management in Jiangsu Province, clearly stating the specific matters on implementation of water pollutant emission permit
Nov. 1	National carbon emission trading pilot co-launched by China Green Carbon Foundation and East China Forestry Exchange was formally initiated in Yiwu , Zhejiang on November 1
Nov. 28	United Nations Framework Convention on Climate Change the 17th Conference of Parties was held in Durban, South Africa November. Before the meeting was held, Program on Control of Greenhouse Gas Emission during the 12th Five-Year Plan Period released by China pointed out, China would start from voluntary carbon emission trading for exploration of carbon emission trading market.
December	The General Office of the municipal government issued a Program for Compensated Use Pilot of SO_2 Emission Rights in Main Urban Areas of Chongqing Municipality
Dec. 2	Shanghai Hongtai Real Estate Co. Completed the first carbon transaction in domestic construction sector, which was the first “carbon trading” of Chinese Standard for Voluntary Carbon Emission Reduction.
Dec.23	Shanghai Environmental Energy Exchange was restructured into the first shareholding system environmental energy exchange.
In 2012	
March	Hubei Provincial Party Committee and Government issued the Opinions of Hubei Provincial Party Committee and Government o n Strengthening Environmental Protection and Promoting Scientific Development and Leapfrog Development, proposing to “develop emission trading market, perfecting emission right initial distribution, competitive bidding and market circulation mechanism and launch a pilot for emission right mortgage loan”
May	Qinghuangdao City and Cangzhou City initiated municipal-level emission trading successively and expanded the range to the county-level examination and approval projects progressively
Jun. 5	The first emission right mortgage loan contract in Hunan Province was signed between Hunan Hualing Xiangtang Iron & Steel Co., Ltd. and Industrial Bank

July	Shanghai municipal government issued the Opinions of Shanghai Municipal Government on the Implementation of Carbon Emission Trading Pilot
August	Hubei provincial government formally issued the Measures of Hubei Province on Major Pollutant Emission Trading
September	Hebei Provincial Environmental Protection Department and Price Control Bureau jointly issued the Circular of Hebei Province on Benchmark Trial Price for Major Pollutant Emission Trading
September	Guangdong provincial government issued the Implementation Plan for Carbon Emission Trading Pilot of Guangdong Province
October	Shenzhen Municipal People's Congress promulgated Certain Provisions of Shenzhen Special Economic Zone on Management of Carbon Emission
October	Hebei Province Environmental Protection Department issued the Circular on Implementation of Emission Trading in the Province
October	The formerly Hubei Environmental Resources Exchange was restructured into Hubei Environmental Resources Trading Center, which is composed of 3 shareholders, namely Hubei Academy of Environmental Sciences, Hubei Radiation Environment Management Station and Optical Valley United Property Rights Exchange.
Oct. 10	Ministry of Finance, Ministry of Environmental Protection and State Development and Reform Commission formally approved Henan Province as a pilot area of national emission compensated use and trading
November	Shenzhen Municipal People's Congress promulgated the Norm and Guideline of Shenzhen Municipality for Organizing Quantized Reporting of Greenhouse Gas Emission and Norm and Guideline of Shenzhen Municipality for Inspecting the Greenhouse Gas Emission
November	Hunan provincial government issued the Circular on Expanding the Emission Trading Pilot, proposing the thermal power, iron and steel plants in the province to carry out emission compensated use and trading policy
November	Inner Mongolia Autonomous Region Emission Trading Management Center initiated the building of two systems: emission right compensated use price estimation system and emission right on-site verification operation
Nov. 16	The General Office of National Inter-Departmental Joint Conference for Checking-up and Rectification of Exchanges informed Hubei Province that its work on checking-up and rectification of exchanges had passed the acceptance of the state.

December	Henan Provincial Finance Department approved Jiaozou Municipal Finance Bureau in the document YU CAI FEI SUI [2012] No. 29 that the emission compensated use belongs to state-owned resource compensated use. The revenue arisen from it shall be non-tax fiscal revenue and the revenue and expenditure shall be managed separately.
December	Shanghai Municipal Development and Reform Commission issued the Guideline on Accounting and Reporting of Greenhouse Gas Emission (Trial) and accounting and reporting methods for greenhouse gas emission in nine industries
Dec. 18	Suzhou Environmental Energy Trading Center was officially established in Suzhou Industrial Park, becoming the first environmental energy trading agency in Jiangsu
In 2013	
January	Guangdong Provincial Environmental Protection Department and Finance Department jointly issued the Opinions on Implementation of Emission Right Compensated Use and Trading Pilot in Guangdong Province
Jan. 9	Handan Municipal Environmental Emission Trading Center, Hebei Province was established
February	Zhejiang provincial government issued the Opinions on Strengthening the Quantized Management of Environmental Resource Allocation and Promoting Industrial Transformation and Upgrading, calling for building of major pollutant total quota quantized management system, base on basic account of emission quota in an effort to realize dynamic management of emission quota through emission right management platform.
February	Liaoning Provincial Environmental Protection Department, Finance Department and Price Control Bureau jointly issued the Implementing Plan of Liaoning Province on Emission Compensated Use and Trading for Major Pollutants (Trial)
February	Tianjin municipal government issued the Implementing Plan of Tianjin Municipality on Carbon Emission Trading Pilot
Apr. 16	Guizhou Provincial Environmental Protection Department issued the Plan of Guizhou Province on Emission Compensated Use and Trading for Major Pollutants (Trial)

June	Guangdong Provincial Environmental Protection Department completed the formulation of the Implementing Regulations of Guangdong Province on Emission Right Compensated Use and Trading, Regulation on Evaluation and Distribution of Total Amount Quota for Major Pollutants and Rules on Emission Trading of Guangdong Province
Jun. 18	Shenzhen carbon emission trading pilot was initiated
June	Shenzhen Emissions Exchange published the Rules on Spot Trading of Emissions for Shenzhen (Interim)
Jul. 4	Legislative Affairs Office of Guangdong Province released the Measures of Guangdong Province on Carbon Emission Management and Trading for seeking public opinions.
Jul. 12	Legislative Affairs Office of Shanghai Municipality released the Measures of Shanghai Municipality on Carbon Emission Management and Trading for seeking public opinions.
Aug. 8	Shenzhen Emissions Exchange was put into actual operation. The carbon trading price was set at RMB 30/ton.
Aug. 16	Legislative Affairs Office of Hubei Province released the Measures of Hubei Province on Carbon Emission Management and Trading for seeking public opinions.
Sept. 26	Regulation of Henan Province on Reduction of Pollutant Emission was adopted at the fourth session of the Standing Committee of Henan Province 12th People's Congress
Oct. 9	Shijiazhuang Emission Trading Center, Hebei Province was formally established
Oct. 29	Legislative Affairs Office of Shenzhen Municipality released the Measures of Shenzhen Municipality on Carbon Emission Management and Trading for seeking public opinions.
Nov.18	Shanghai mayor Yang Xiong signed the issuing of the Trial Procedures of Shanghai Municipality on Emission Management (Decree HU FU No. 10)

November	Beijing Municipal Development and Reform Commission issued the Circular of Beijing Municipal Development and Reform Commission on Launch of Carbon Emission Trading Pilot, Guideline for Accounting and Reporting of Carbon Dioxide for Enterprises (Organizations) in Beijing (2013 Edition), Procedures for Submittal of Greenhouse Gas Emission Reports in Beijing, Regulation on Management of Carbon Emission Trading Verification Authorities in Beijing (Trial) and Regulation on Quota Evaluation for Carbon Emission Trading Pilot in Beijing (Trial)
Nov. 22	China Beijing Environment Exchange published the Rules of China Beijing Environment Exchange on Carbon Emission Trading (Trial)
Nov. 25	Guangdong Provincial Development and Reform Commission issued the Circular of Guangdong Provincial Development and Reform Commission on Issuing of First Distribution of Carbon Emission Quota and Working Plan (Trial)
Nov. 26	Shanghai carbon emission trading pilot was initiated. Rules of Shanghai Environmental Energy Exchange on Carbon Emission Trading and regulation on relevant business were issued
Nov. 28	Beijing carbon emission trading pilot was initiated.
Nov. 28	Such six provinces and municipalities as Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong signed an agreement of joint study on inter-regional carbon emission trading, aiming at joint study in accounting, verification and quota evaluation of carbon dioxide emission.
November	Shanghai Municipal Development and Reform Commission issued the Plan of Shanghai Municipality on Carbon Emission Quota Distribution and Management in 2013-2015
December	Guangdong held the first quota auction
December	The executive meeting of Guangdong Provincial Government adopted the Provisional Regulations of Guangdong Province on Carbon Emission Management
Dec. 18	Guangdong Province launched the pilot of emission trading
Dec. 19	The pilot of emission trading was initiated in Guangdong
Dec. 20	The General Office of Tianjin Municipal Government issues the Circular of the General Office of Tianjin Municipal Government on Issuing of Interim Measures concerning Carbon Emission Trading Management of Tianjin Municipality

Dec. 20	Hubei Carbon Emission Trading Center was established
Dec. 23	Chongqing Carbon Emission Trading Center was established
Dec. 26	Tianjin carbon emission trading pilot was initiated. Rules of Tianjin Emission Exchange on Carbon Emission Trading (Trial) was issued.
Dec. 27	Beijing Municipal People's Congress adopted the Decision of the Standing Committee of Beijing Municipal People's Congress on Implementing Carbon Emission Trading Pilot under the Premise of Strictly Controlling the Total Carbon Emission in Beijing
In 2014	
January	Guangdong provincial government issued Trial Measures of Guangdong Province on Carbon Emission Management (decree YUE FU No. 197)
Apr. 2	Hubei Carbon Emission Trading Center was established