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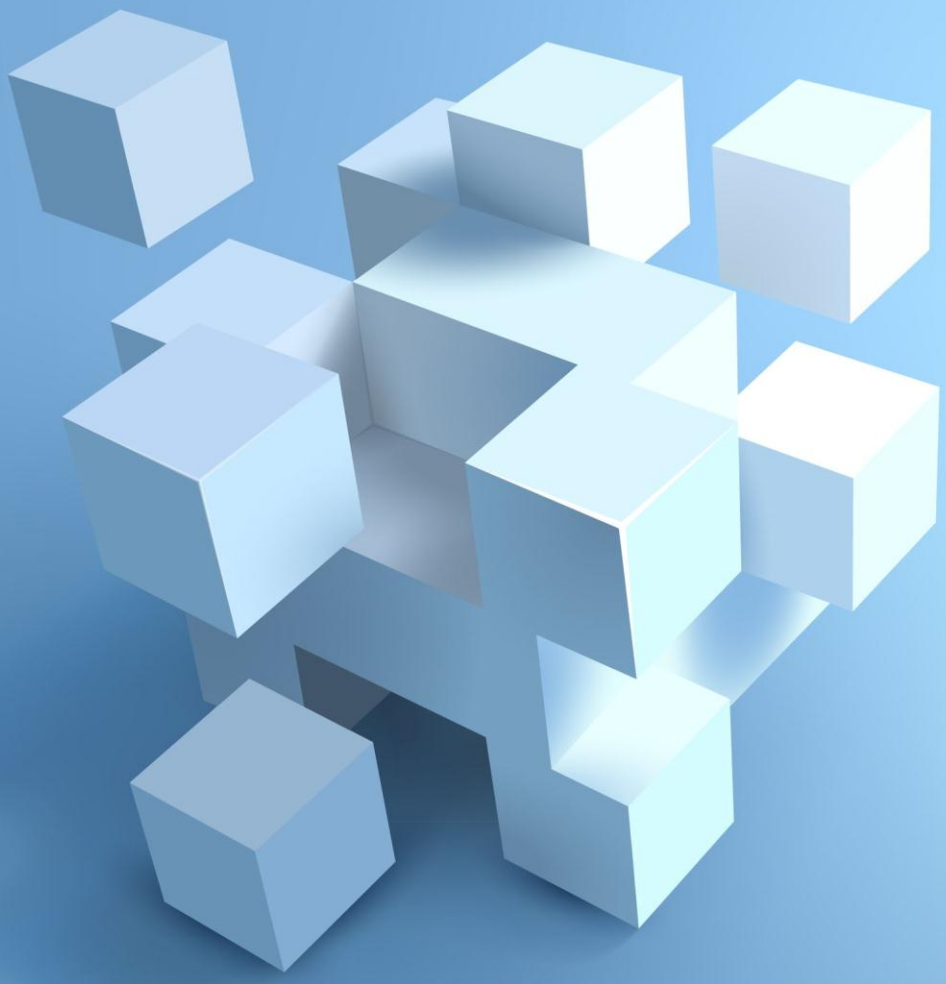
Environomist

China Carbon Market Research Report



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2° Investing Initiative

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Preface

A mismanaged opportunity is a material risk, but a risk overcome presents an opportunity

The newly released *National Measure on the Chinese ETS* marks a major milestone for China's low carbon development, confirming China's role as pioneer among the world's developing countries and emerging industries. Many of my friends were excited over the weekend after the official text was posted on the NDRC website on Friday December 12th, 2014.

Though time has passed quickly, I can still feel the excitement in my coffee when I sat in my office 10 years ago. At that time I was newly graduated from my chemical engineering and environmental economics degree at university. I was very lucky to be hired by a US consulting firm working on environmental financial products in North America. Back then, my father did not even know what environmental financial products were. I joined the company with the hope that the US and Canadian government would develop their own version of an ETS, along the lines of the EU ETS. After several months working on wetland credits in the US, which was a very small and niche market, I finally realized that I was naive to believe that a carbon ETS would be introduced in North America because it went against the core interests of political parties. Thus, I decided to acknowledge my opportunity costs and moved to Europe where the world's largest carbon market was already operating. Luckily, I was hired by a very fast growing company providing advisory work on the EU ETS and CDM projects. During that period, the EU ETS was very active, with major cash in-flow into the market. It was the last Friday of April, when the market suddenly realized the initial allocation of allowances was too "long". I, along with my colleagues, witnessed the first sharp price drop for carbon: 40% in a single day. Though we were shocked and scared, we did learn the lessons of risk management. Thanks to sensible design for the bankability of allowances, the price drop only affected 2005 to 2007 vintage allowances. The market continued to grow rapidly after

that until September 2008, when the nightmare occurred. The EU ETS and its dependents, i.e. the CDM, saw over 60% of their value evaporate by the end of the year. I still remember a colleague of mine telling me with a trembling voice that he could not send his son to a private school anymore because he had been laid off by his company which was a major financial player in the carbon market. That was how "fear" really educated me - the word my university professor brought up when I asked him what could hold "greed" in check. With my personal belief that only economic tools can solve the problem of climate change and other environmental issues, in 2009 I decided to quit my job and study the technicalities of tradable environmental permits. Luckily again, I was offered a part time research job in Australia, where legislation for its ETS package had just passed. While working in Australia, I also enrolled in the Crawford School of Economics at the Australian National University, where many authors of the Australian ETS package taught. I felt that academic researchers in Australia utilized their observer's edge and thoroughly studied the lessons learned from the EU ETS. In addition, they brought different perspectives on international trading, FDI, legal, financial engineering, etc. which I myself had never previously considered. I have to say, this was really stimulating period of time.

At that time, I had already come to the conclusion that China would possibly, perhaps probably, become the largest environmental market in the world. Considering the promising news that the Chinese NDRC had announced the formation of regional carbon ETS pilots, I kindly refused a job offer from a major multilateral organization in Canada and joined the ranks of a newly created carbon market consulting firm in China, Environomist Ltd. Since then, I have been actively engaged in the preparation of the Chinese ETS by providing consultancy services to government bodies at different levels as well as international development agencies. Now, the Chinese national ETS is finally upon us. I am quite excited, just as I was 10 years ago. However, I also worry about the beloved ETS, especially when looking at the painful experiences I have had in the past. Many questions come to my mind that I cannot answer. Is the central government ready to address major market instabilities like the ones I experienced in the EU ETS? Do the local governments have enough capacity to

manage the process? Do they have the tools needed for monitoring and administration? Do the compliance companies and financial players have the right analytics and tools to play their role? Are they aware of the risks and do they have appropriate tools for managing these risks?

With the hope of healthy market development, I worked with my team and partners to produce this year's annual report. I truly wish that readers of this report will understand the development of the Chinese carbon market in 2014 while objectively keeping both risks and opportunities in mind. This is not only important for one's job performance but also for the future of China and the world. If the Chinese ETS is successfully implemented and provides the desired impulse for China's low carbon transition, China could become a role model to other developing countries who want to decarbonize their economies while giving confidence to international policy makers in using economic tools for managing environmental issues.

Finally, but most importantly, I would like to share this thought with our readers: a mismanaged opportunity is a material risk, but an overcome risk presents an opportunity.

Richard Yang Mao

Executive Director

Product Officer

Environomist Ltd.

January 2015

Introduction

This report is based on information and legal documents made publicly available prior to December 31st, 2014, some of which may be out of date by the publication date.

This report was conducted by Environomist Ltd. with co-author efforts made by 2° Investing Initiative, and it shall not be held liable for any damage, loss and/or claim that arises from the use of any information, in full or in part, presented in this report.

The working group has drawn on expertise from the following professionals:
Team leader: Mr. Richard Mao
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Editor: Mr. Huw Slater
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The United Nations Development Program
International Finance Corporation
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Central University of Finance and Economics
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Mr. Xing Xuefei, Dr. Hou Shibin, Dr. Yi Tu, Mr. Ye Ju, Mr. Yu Cui, Mr. Liang Liu, Mr. Hui Bin, Mr. Chenyu Zhang, Dr. Lei Bi, Mr. Yanshu Wang, Mr. Jackie Cheng, Mrs. Maria Chen, Mrs. Samantha Anderson, Mr. Jiang Yantong.

We are grateful to receive feedback and comments from our valuable readers

Please feel free to contact: richard.mao@environomist.com

Environomist Ltd.

Environomist Ltd. was established with the vision of facilitating the low carbon economic transition and promoting carbon management capacity in the public and private sectors. Over the past several years, we have become the most reputable professional carbon consulting company, with rich experience in the area of carbon management in China.

The company has a wide range of backgrounds, both Chinese and western, and is familiar with international carbon market rules while also deeply understanding the unique characteristics of carbon management in China. Different from other consulting firms, we serve our customers with a set of carbon management solutions, which includes both planning and execution, to achieve the desired goal.

Our team members include registered financial professionals, certified GHG auditors, international carbon asset managers, registered engineers, carbon management experts and other senior professionals.

With many high quality service solutions successfully completed, we have developed a rich network with international organizations, government bodies and private companies. Since our establishment, we have provided large-scale CDM carbon asset development and management services to regional governments, a series of training workshops to national-level ministries, product carbon inventory projects to large state-owned enterprises and low-carbon development planning and carbon trading rules consulting to several local governments.

South Pole Carbon Asset Management Ltd.

South Pole Group is a sustainable solution and service provider with a global team and proven impact.

- With over 100 enthusiastic climate professionals from many different countries, we span 6 continents with our experience on the ground.
- Since 2006, we have measured the climate impact of countless companies and products worldwide. We have screened USD 30 bn+ of investments for their climate impact and we have developed 270+ projects in renewables, forestry, agriculture, industry and households. Through our efforts, 50 million tonnes of CO2 have been saved, almost as much as the annual CO2 emissions of Portugal. We have enabled the production of 35,000 GWh of renewable energy (more than the annual electricity consumption of Denmark), and mobilized over USD 6 bn for clean energy investments in emerging markets. In total, our projects have helped create almost 20,000 jobs in developing countries and we saved 17,000+ hectares of forest from deforestation, about the size of 24,000 soccer pitches.

International Finance Corporation.

Global

Climate change is not just an environmental challenge – it is a fundamental threat to development in our lifetime. The World Bank Group has made confronting climate change a top priority in our push to eradicate extreme poverty and boost shared prosperity. As the World Bank Group's private sector arm, IFC is stepping up the investments in climate change mitigation and adaptation and helping our clients understand and manage the risks and opportunities climate change presents.

Since 2005, IFC has invested more than $11 billion in 600 climate-related projects that have helped developing countries meet their energy needs while supporting a green growth path. IFC made its first investment in renewable energy in 1989 and is now one of the world's largest financiers of wind and solar power for emerging markets.

In fiscal 2013, IFC invested a record $2.5 billion in climate-related projects, up 50 percent from the year before. This funding supported new solar power technology for South Africa, energy efficiency gains in Cote d'Ivoire, water conservation in Turkey and green buildings in India, plus innovative financing for renewable and clean power through commercial banks. IFC is also working to leverage new sources of funding for green growth through its green bonds program that raised $2 billion in 2013 alone, as well as through the Catalyst Fund and its co-investments with governments through its blended finance work.

China

In 2011, the National Development and Reform Commission, NDRC, announced that China would introduce the use of emissions trading on a pilot basis in order to put a price on carbon, thus leveraging private sector forces to reduce future growth in carbon dioxide (CO2) emissions from the power, industry, and manufacturing sectors. Seven emission trading pilots are being implemented during 2013-2015 across the provinces of Guangdong (GD) and Hubei, and in the cities of Beijing, Shanghai, Shenzhen (SZ), Chongqing and Tianjin. These pilots will provide the groundwork for a mandatory nationwide emissions trading scheme expected to be rolled out in 2017.

Current regulations only allow for spot trading of allowances so it will be important that futures contracts and other types of derivatives become available in the market. In the European carbon market, over 90% of volume comes from non-spot products. NDRC and China Securities Regulatory Committee (CSRC) are jointly analyzing such products, with emphasis on futures, and are interested to collaborate with IFC and IBRD in this area.

IFC is keen to work, in collaboration with IBRD, to promote a robust and sustainable carbon market in China. IBRD's intervention is primarily focused on working at the national level on framework formulation, monitoring and verification system design and other systemic issues. IFC proposes to complement this at the local level, beginning with pilot exchanges. Stakeholder platforms will be established at the local level to support further development of the emissions trading pilots, through access to global best practices, opportunities for learning and experimentation, and stakeholder dialogue provided or supported by IFC.

2 °Investing Initiative.

The 2 ° Investing Initiative (2 ºi) is a multi-stakeholder think tank working to align the finance sector with 2 °C climate goals. Our research seeks to:

- Align investment processes of financial institutions with 2 °C climate scenarios;
- Develop the metrics and tools to measure the climate performance of financial institutions;
- Mobilize regulatory and policy incentives to shift capital to energy transition financing.

The association was founded in 2012 in Paris and has projects in Europe, China, and the United States. Our work is global, both in terms of geography and engaging key actors. We bring together financial institutions, issuers, policy makers, research institutes, experts, and NGOs to achieve our mission. Representatives from all of the key stakeholder groups are also sponsors of our research.

Our upcoming research

- Developing 2 °C investing metrics

2 ° Investing Initiative is leading a European research consortium currently pursuing a three-year, $3 million research program with the objective to develop 2 ° investing metrics. The project involves a range of research partners and has received support letters from all relevant stakeholders (German Environment Ministry, French Prime Minister's Office, BNP Paribas, Allianz, Axa, KfW, AFD, MSCI, Bloomberg, Oxford University, Cambridge University, IEA, UNEP, etc.). The research outputs will include the development of 2 ° C financing roadmaps, climate performance assessment frameworks for financial assets and portfolios, as well as associated turnkey tools.

- Analysis of energy transition risks for the finance sector

The 2 ° Investing Initiative will be developing an extended research programme around energy transition risks to the finance sector. The project will help financial regulators and financial institutions develop new stress-testing models and risk management approaches to reduce the uncertainty associated with these risks. The project will deliver two research outputs. The first output will be designed as a specific technical guidance on managing energy transition risk – focused at financial institutions. The technical guidance will include guidance on data relevant for risk metrics, the current state-of-the-art of energy transition risk methodologies, covering every stage of the capital allocation chain. Based on this analysis, the research will provide guidance on how these risks can be managed. The second output will constitute a focus report on the issue of time horizons in the finance sector. The report will be a key component in helping to develop the guidance to frame the issue of the time horizons of energy transition risks and the time horizons in the investment chain – from the physical asset to the ultimate asset owner.

Glossary

CCER：China Certified Emission Reduction

CDM：Clean Development Mechanism

CER：Certification Emission Reduction

EUETS：European Union - Emission Trading Scheme

ERU：Emission Reduction Unit

NAP：National Allocation Plan

MRV：Measurement, Reporting and Verification

GCG：Green Credit Guidelines

DCF：Discounted Cash Flow

CBRC：China Banking Regulatory Commission

EBIT：Earnings before Interest and Taxes

CTI：Carbon Tracker Initiative

EBITDA：Earnings Before Interest, Tax, Depreciation and Amortization

Catalogue

1. Carbon Emissions Trading Policy

1.1. Carbon Market Background

In recent decades, extreme weather and natural disasters resulting from global climate change have become increasingly frequent. An important cause of this situation is the increase in carbon dioxide and other greenhouse gases (GHG) in the atmosphere due to human activity. The international community increasingly hopes to use mechanisms such as emissions trading schemes (ETS) in order to eventually reduce the level of GHGs in the atmosphere and curb global warming. Referring to the relevant section of the United Nations Framework Convention on Climate Change (hereinafter referred to as the Convention), the ultimate goal of the international community is "to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."[1]

Since the first Conference of the Parties (COP) in Berlin in 1995, the parties to the Convention have convened every year. In November 2013, the Convention's 19th COP and the Kyoto Protocol's 9th CMP, was held in Warsaw, Poland.[2, 3] The Warsaw Climate Change Conference had three key achievements: "Firstly, it emphasized that the Durban Platform for Enhanced Action fundamentally reflects the principle of 'common but differentiated responsibilities'; Secondly, developed countries reaffirmed the need for finance supporting developing countries to tackle climate change; Thirdly, a preliminary agreement on a mechanism for loss and damage was reached, with agreement to start associated negotiations."[4]

The United Nations held a climate change summit in New York on September 23rd, 2014 in order to complement the 2015 Paris climate conference, which must reach a new global post-2020 emissions agreement. This meeting did not belong to

the COP process, but its significance was profound. There were five key outcomes: "Firstly, world leaders made strong commitments to reach a meaningful and universal climate agreement at the Paris climate conference in 2015; Secondly, the public and the private sectors made clear commitments to climate finance; Thirdly, government and business leaders supported the implementation of carbon pricing mechanisms through a variety of means; Fourthly, it stated that strengthening the ability to cope with climate change is a wise and necessary investment; Fifthly, new alliances should be established to tackle the range of climate change challenges."[5]

In December 2014, the Lima Climate Conference was held over two weeks, with five further key outcomes: "Firstly, various countries need to formulate and submit post-2020 nationally determined contributions (NDCs) by early 2015, and details of their commitments; Secondly, adaptation was given recognition within the NDCs, and countries could include adaptation in their NDC voluntarily; Thirdly, a draft of the Paris agreement was generated at this conference as a basis for drafting the text of the Paris agreement."[6]

1.1.1. International Background

At present, the main ETSs internationally are the European Union Emissions Trading Scheme, the Switzerland Emissions Trading Scheme, and the California Cap-and-Trade Program, among others. Of these, the most comprehensive is the European Union Emissions Trading Scheme (EU ETS). According to a report released by the World Bank, *State and Trends of Carbon Pricing 2014*, the EU ETS was the largest ETS in the world in 2014, and the total allowances covered was more than half of the world's total. The carbon emissions of the facilities under the cap were about 45% of the total carbon emissions of the European Union, and the allowances for these facilities covered more than two billion tons of carbon dioxide equivalent.[7]

In October 2014, the two-day EU Autumn Summit took place in Brussels, and one of the key issues was climate and energy policy. The European Council declared on October 24th that they had agreed on a 2030 Framework on Climate and Energy Policy. According to the targets set by the framework, GHG emissions within the EU

area in 2030 should be at least 40% lower than the 1990 level, renewable energy should account for at least 27% of total energy use in the EU, and energy efficiency should improve by at least 27%.[8] The establishment of the Framework will contribute to the effort of keeping the global temperature rise to less than 2 degrees Celsius within this century, and support the negotiations in Paris in 2015.[9]

Table1-1 Timeline of the EU ETS

Time	Content
1992	United Nations Framework Convention on Climate Change
1997	Kyoto Protocol
2000	Green Paper On Emissions Trading
2001	Proposal for a Framework Directive for GHG emissions trading within the EU
2003	Directive（2003/87/EC）
2004	Directive（2004/101/EC）
2009	Directive（2009/29/EC）

As the first international conference to address global warming in 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was adopted, establishing the basic framework for international cooperation on the problem of global climate change.

In 2000, the EU launched a comprehensive Climate Change Program, including the release of its Green Paper on Emissions Trading. During the next 10 years, the EU formulated a series of policy documents in order to fulfill the emissions reduction requirements of the Kyoto Protocol. In 2003, the EU released the Emissions Trading Directive (2003/87/EC), then spent nearly two years preparing for the formal execution of the EU ETS in 2005.

As shown in Table 1-2, the EU ETS has had three phases: Phase I, between 2005-2007, was referred to as ‘learning by doing’. The experience accumulated in this phase was helpful for the following phase; Phase II, 2008-2012, coincided with the Kyoto Protocol's first commitment period, and set a goal for GHG emissions in 2012 to be 8% lower than the 1990 level. This phase adopted an auctioning mechanism in order to solve the problem of surplus allowances during Phase I.

Table 1-2 Characteristics of each phase of the EU ETS

	Phase I：2005-2007 (Experimental)	Phase II：2008-2012 (Kyoto Protocol)	Phase III: 2013-2020
Goal	Preparation for the upcoming operation	To achieve the emission reduction target of 8% under the Kyoto Protocol	To reduce emissions by 20% by 2020, compared to 2005
Member States	25 member states	25 member states, plus Iceland, Norway and Liechtenstein	
Cap	45% of the commitment under the KP	Reduction of 6.5% on the basis of 2005	Annual reduction of 1.74%; No more National Allocation Plans (NAP)
Allowance Allocation	5% at most to be auctioned	10% at most to be auctioned	Gradually moving to 100% auctioned allocation
Monitored GHGs	CO_2	CO_2, N_2O	6 GHGs
Scope	Combusting installations	Around 11,000 installations, which cover almost half of the total emissions in the EU	Extending coverage to aviation, petrochemicals, aluminum, covering more than 60% of the EU's GHG emissions
Trading Mechanism	Allowance trading, CDM	Allowance trading, CDM, JI	Allowance trading, CDM, JI
Banking	Allowances cannot be used in Phase II	Allowances can be used in Phase III	
Fines	40 Euro/ton	100 Euro/ton	100 Euro/ton

Data Source: Environomist China Carbon Market Research Report 2014

At present, the EU ETS is in its 3rd Phase (2013-2020), with the following goals: emissions in 2020 should be 20% lower than 1990; in relation to allowance allocation, free allowances should account for not less than half of the total from 2013, moving gradually towards 100%. All six GHGs under the Kyoto Protocol are to be controlled within this phase: carbon dioxide, methane, nitrous oxide, fluorocarbons, perfluorocarbons, and sulfur hexafluoride. National Allocation Plans have been canceled during the third phase and the total allowances are distributed uniformly by the European Commission, reducing linearly by 1.74% annually. Issued allowances

should be registered. The European Union Transaction Log (EUTL) established for the EU ETS will record the allocation, holding, transferring and abandonment of allowances, and if anomalous events occur, the EUTL cannot continue operation before the issues are solved. In Phase II, operators were required to pay 100 Euros per ton if they were unable to surrender sufficient permits before April 30th, and these fines will increase in accordance with the European Consumption Index from January 1st, 2013. These operators also have to surrender the missing allowances in the following year in addition to allowances for that year's emissions.[10]

1.1.2. Domestic Background

1.1.2.1.National Level

China has become home to the second largest carbon market in the world, with allowances covering 1.115 billion tons of carbon dioxide equivalent, a little less than the EU ETS, which covered 2.084 billion tons in 2013. This has come about because both the central and the provincial/city levels have continuously promoted their development.

The Kyoto Protocol came formally into effect in 2005, marking the first time that the international community had limited GHG emissions using international law. The Protocol provided that developed countries should undertake the responsibility to reduce carbon emission from 2005, while the developing countries should do so from 2012.[11] Although China is a developing country, it is faced with a huge level of carbon emission as well as increasingly serious environmental problems. As a responsible stakeholder, China has through its own initiative worked to meet its obligations and responsibilities in safeguarding the global environment. In 2007, China's State Council published a National Climate Change Program. The Program put forward goals that by the end of 2010, the energy consumption per unit GDP should be 20% lower than in 2005 and that the rise in carbon dioxide emissions should be slowed.[12] In 2009, the State Council published a goal that by 2020, carbon dioxide emissions per unit GDP should be 40%-45% lower than 2005.[13]

In October 2011, the National Development and Reform Commission (NDRC) published a Notification on the Implementation of Carbon Emissions Trading Pilots, in order to establish a sound system for China's carbon market as soon as possible and to avoid future costly obligations. At the same time, the NDRC aimed to promote low carbon development and encourage an emerging carbon-related service industry. Thus, the development of carbon trading markets formed part of the government's development strategy.[14]

The trading platforms are being built step by step and the top-level design has basically taken shape. At the same time, with the publication of guidance and specifications on accounting, monitoring, reporting and verification, norms have been established so that the various provinces and cities have a reference point when they develop their policy documents in their respective administrative areas.

1.1.2.2.Provincial Level

In 2011, the National Development and Reform Commission agreed to Guangdong, Hubei, Shanghai, Tianjin, Shenzhen, Beijing, and Chongqing carrying out ETS pilot schemes.

On January 8th, existing environmental trading institutions in places such as Beijing, Tianjin, Shanghai, Chongqing, Guangdong, Hubei, Shenzhen, Hebei, Shanxi, Inner Mongolia, Liaoning, Sichuan, Guizhou, Yunnan and Qinghai, co-founded the China Environmental Trading Institution Cooperation Alliance. The main purpose was to strengthen mutual communication and promote cooperation, in order to advance the development of environmental markets.[15] Thus, the dynamics of the seven ETS pilots in 2014 are as follows:

On March 1st 2014, Guangdong implemented its Interim Measures for an Emissions Trading Pilot Scheme. The Measures established requirements in relation to carbon emissions data reporting and accounting, allowance issuing and transaction management, market supervision and management, etc.[16] Later that month, the Guangdong government published more detailed regulations and guidance on reporting, accounting, and allowance management, expanding on the content of the

'Measures'. On October 11th, the provincial government published its 2014-2015 Guangdong Action Plan for Energy Conservation, Emissions Reduction and Low-carbon Development, which set a goal that energy consumption per unit GDP would decline 3.4% in 2014 and 2.32% in 2015, and carbon dioxide emissions per unit GDP would decline at least 3.5% year by year during these two years.[17]

On April 2nd, Hubei province launched its ETS, with 138 enterprises brought into the scheme. Hubei's Interim Measures on Carbon Emissions Permit Management and Trading was implemented from June 1st. The Measures put forward relevant requirements for allowance allocation, management and trade, and stipulations about carbon emissions monitoring, reporting and verification.[18] The 2014-2015 Hubei Action Plan for Energy Conservation and Emissions Reduction and Low-carbon Development was published on October 27th, setting a goal that provincial energy consumption per unit GDP would decline 3% and carbon dioxide emissions per unit GDP would decline 3.4% in 2014. This would help to ensure that the relevant goals within the 12th Five Plan could be achieved in 2015.[19]

In 2014, one hundred percent of the companies under the cap in Shanghai's ETS surrendered their full allowance liability before the deadline of June 30th. On September 15th, the municipal government issued a document outlining its views on Further Promoting the Healthy Development of Capital Markets, which established the ambition to launch commodity index futures, explore the application of trading tools like commodity futures and options, and realize the function of a futures market including price discovery and risk management. These requirements could promote the interactive development of both a carbon futures market and the carbon spot market, making Shanghai's carbon finance instruments richer and more diversified.[20]

In 2014, Tianjin's Measures on Carbon emissions permit management and trade is the same as the relative files in 2013. On August 15th, the Tianjin Development and Reform Commission published an Announcement on the List of Covered Enterprises for 2013 Compliance Under the Tianjin Pilot ETS. This document highlighted the attention paid to compliance of the enterprises under the cap, and as a form of

publicity of the potential reward and punishments measures. Just 4 of the 114 enterprises under the cap did not surrender allowances before the deadline, representing a compliance rate of 96.5%.[21]

On March 19th, the Shenzhen Interim Measures on Carbon Emissions Trading was officially published, clarifying some relative regulations of the principle aspects on allowance management, carbon emission quantification, reporting, verification and compliance procedures, and provisions for permit registration and trading. On June 4th, Shenzhen Emissions Exchange introduced Bank of China as a third-party depository bank, followed on November 20th by China Citic Bank. There are currently five third-party depository banks: China Construction Bank, Industrial Bank, Shanghai Pudong Development Bank, Bank of China, and China Citic Bank.[22] The healthy competition and product differentiation between depository banks are conducive to the healthy functioning of the ETS, enriching depository choices for trading participants.

Beijing's first market compliance period ended on June 15th 2014. More than half of the enterprises under the cap had not surrendered allowances, prompting the municipal government to issue a Notice on Ordering Regulated Units to Launch Carbon Dioxide Emissions Compliance Work within Deadline.[23] On November 17th, the government issued a Call for Comments on the Beijing Carbon Emission Monitoring Guidelines. Attached to this notice were guidance documents on carbon emission data accounting, third-party verification, monitoring, and other relevant documents. These documents addressed policy and operational issues that may be encountered in the ETS.[24]

On April 26th 2014, Chongqing published a Notice on Interim Measures of Carbon Emissions Permit Trading Management. The Measures put forward requirements for allowance allocation, management and exchange, as well as provisions for carbon emissions monitoring, reporting and verification.[25] In addition, on May 28th, Chongqing published relevant detailed rules, norms, and guidelines for carbon emissions reporting, verification, and allowance management in order to

clarify the original 'Measures'. Chongqing Carbon Emissions Exchange started trading on June 19th, with 145,000 tons, amounting to 4,457,300 RMB, traded on the first day. Since that time, no trading has occurred.

The current carbon market situation and the progress of the policy will be detailed in sections 1.2 and 1.3.

1.2. Overview of Carbon Market Policy at National Level

This section deals with carbon emission policy documents published during 2007-2014 at the national level. Chapter 21 of the 12th Five-Year Plan, published in 2011, proposed to explore the establishment of low-carbon product standards, labeling and certification schemes, in order to establish a sound GHG statistical accounting system, to gradually establish a carbon emissions trading market, and to promote low-carbon demonstration pilots.[26] Since then, a series of policy documents have been published in order to guide and promote the development of the carbon market, including: the 12th Five-year Work Plan on Controlling GHG Emissions[27], Interim Measures on Voluntary GHG Emissions Reduction[28], Accounting Methods and Reporting Guidance on GHG Emissions (Trial) for the first batch of 10 industries, Notice on Organizing and Implementing GHG Emissions Reporting for Carbon-intensive Enterprises and Public Institutions[29], State Council Opinions on Further Accelerating the Healthy Development of Capital Markets,[30] and Interim Measures on Carbon Emissions Trading.

Table 1-3 Overview of National Level ETS-related policies

Year	Date	Main Content
2007	**6/03**	NDRC issued National Climate Change Program
2008	**10/29**	Information Office of the State Council issued first White Paper on China's Policies and Actions on Climate Change; the same year, Tianjin, Beijing and Shanghai established carbon trading platforms
2009	**11/27**	Executive Meeting of the State Council decided that, the CO_2 emissions per unit GDP should decline by 40%-45% from 2005 levels by 2020
2010	**7/19**	NDRC Notification on Carrying out Low Carbon Province and Low Carbon City Pilots

2011	**3/16**	12th Five-year Plan requires the establishment of a carbon market; Carry out low carbon provinces and cities
	10/29	NDRC General Office Notification on Carrying out ETS pilots in Beijing, Shanghai, Tianjin, Chongqing, Shenzhen, Guangdong, Hubei
	12/01	NDRC Notification on 12th Five-year Work Plan for Controlling GHG Emissions
	12/31	State Forestry Bureau Notification on Action Points for the 12th Five-Year Plan to Respond to Climate Change in Forestry
2012	**3/18**	The People's Republic of China Climate Change Law (draft exposure)
	5/04	Notice on Climate Change Technology Development Plan for 12th Five-year period (MOST)
	6/13	NDRC Notice on Interim Measures for GHG Voluntary Emission Trading Management
	11/21	Information Office of the State Council issues Report on China's Policies and Actions for Addressing Climate Change
	12/31	Joint MIIT NDRC MOST MOF Notice on Industry Climate Change Action Plan
2013	**2/18**	The State Council approves the country's Second National Communication on Climate Change
	5/2	NDRC NBS Notice on Strengthening Statistical Work in relation to Climate Change
	10/15	NDRC General Office Accounting Methods and Reporting Guidance on GHG Emissions for initial batch of 10 industries
	10/24	NDRC Climate Department Training Material on Low Carbon Development and Provincial GHG List Compilation
2014	**1/06**	NDRC Notice on Interim Measures for Energy Conservation and Low Carbon Technology Promotion
	1/13	NDRC Notice on Organizing and Implementing GHG Emissions Reporting Work for Carbon-intensive Enterprises and Public Institutions
	3/21	NDRC Notice on Carrying out Low Carbon Community Pilots
	5/15	General Office of the State Council Notification on Action Plan for Energy Conservation, Emissions Reduction and Low-carbon Development for 2014 and 2015
	5/29	MIIT NDRC Publication of initial list of National Low Carbon Industrial Park Pilots
	8/06	NDRC Notice on Responsibility Assessment Approach for Emissions Intensity Reduction Goal
	9/19	NDRC Notice on Tackling National Climate Change Plan (2014-2020)
	11/12	Sino-US joint statement on climate change
	11/21	Call for Comments on proposed 10 National Standards for GHG Accounting Methods and Reporting Guidelines in the Power Sector
	11/26	Guidance on Innovation in the key fields of investment and financing mechanisms for encouraging social investment
	12/12	NDRC Climate Department Interim Measures on Carbon Emissions Trading

Data source: desk research by Environomist

In order to prepare for the 2015 Paris Climate Summit and the upcoming national ETS, the government has recently published a large number of inter-ministry and cross-cutting policies on GHG emissions management and promoting the development of the carbon market.

In October 2013, in order to help achieve the goals of both the 12th Five-Year Plan[31] and the specific Five-Year Plan Work Program to Control GHG Emissions,[32] the NDRC published its Accounting Methods and Reporting Guidance on GHG Emissions (Trial) for an initial batch of 10 industries.[33] This provided reference for the pilot ETSs in establishing the GHG emission reporting system and improving the GHG emission statistics accounting system.

On May 8th, 2014, the State Council published Opinions on Further Accelerating the Healthy Development of the Capital Market. Article 15 encouraged the development of the futures market. This reform will promote the capability of the carbon-related service industry and enhance the resource pricing mechanism. As a result, a range of futures products will continue to be developed. Developing trading tools like share options, commodity indexes, and carbon emissions trading tools is important, giving full play to the role of futures in market price discovery and risk management. The futures market's capability for serving the real economy would also be strengthened. Eligible institutional investors will be permitted to use futures derivative tools to hedge risk, and previous unnecessary limits on using risk management tools will be eliminated.[34] The concept of emissions futures proposed in this document has profound significance for the fledgling carbon market, as it will promote the healthy development of ETS and a robust multilevel carbon market. In the futures market, if the financial instruments are allowed to discover market price and locate risk, it would promoted activity in the ETS well and accelerate the development of the property value of carbon assets.

On May 15th, 2014, the General Office of the State Council published notice of its 2014-2015 Action Plan for Energy Conservation, Emissions Reduction and Low-Carbon Development, which reiterated the need to establish carbon emissions

permits, energy conservation, and emissions trading mechanisms. It plans to advance the regional ETS pilots and research the establishment of a national ETS.[35] Given that establishing a national ETS is an important element in the national development strategy, relevant enterprises and government institutions, individuals, and financial institutions should be familiar with the rules of the ETS in order to benefit from it.

On November 10th and 11th, the 22nd APEC Economic Leaders' Meeting was held in Beijing. Following the meeting, President Xi Jinping and US President Obama made a joint Sino-US statement on climate change. The two heads of state announced their respective action on climate change beyond 2020. For China, this involved a plan that carbon dioxide emissions will peak around 2030 and that China would try to reach this peak as early as possible. In addition, non-fossil energy would be increased to 20% of total primary energy consumption.[36]

On November 21st 2014, the National Carbon Emissions Management Standardization Technical Committee issued a notice calling for comments on the Guidelines for Accounting and Reporting GHG Emissions by Power Companies.[37] These guidelines built on the Guidelines for Accounting and Reporting GHG Emissions for 10 industries published on October 15th 2013, and drawing on the experience of the pilot schemes and third-party verification institutions. Experience indicated that there could be more scientific and rational accounting and reporting methods for these industries.

On November 26th 2014, the State Council issued Guidance on Innovative Investment and Financing Mechanisms for Encouraging Social Investment, requiring authorities to actively carry out the ETS pilots (including both general emission trading and carbon emission trading). Specifically, it promoted payment for pollution permits as well as trading, regulation pollution trading markets, encouraging social capital to participate, acceleration of the pilot carbon emissions trading schemes, exploring forest carbon trading, development of the carbon trading market, encouraging and supporting social investors to participate in carbon allowance trading, adjusting incentives for different economic entities and allowing for price discovery

through functioning financial markets in order to effectively promote environmental protection, energy conservation and emission reduction.[38] Emissions trading have been seen as a key focus at the national level and in the future more and more interested parties will contribute investment to the market. Social capital is conductive to making the ETS operate effectively and develop more quickly. Social capital can also alleviate financial pressure on government and help break through technology barriers.

Table 1-4 China carbon market elements

Emission Reduction Target	Monitored GHGs	Starting Time	Authorized Transaction Platform	Trading Products	Trading Modes
Carbon emissions intensity: 2015 should be 17% lower than 2010[1], 2020 should be 40%-50% lower than 2005[2]	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 (based on the situation of enterprises)[3]	2016 in planning[4]	Unknown	Allowance, CCER (initial stage)[5]	Unknown
Trading Participants	**Compliance Coverage**	**Reporting Obligations Only**			
Key entities and other institutions or individuals according with trading rules[5]	Unknown	Legal entities whose GHG emissions reached 13 kt CO_2e in 2010 or whose total energy consumption reached 5 kt standard coal[3]			
Allowance Allocation		**Allowance Reserve and Banking**			
Free allocation will be the main approach to allocate emissions allowance in initial stage and compensation allocation should be introduced at the appropriate time, whose proportion would be increased gradually[5]		A certain amount of total emissions allowance should be reserved in advance for compensation allocating, market regulation, and key construction projects. The earnings obtained from compensation should be used to accelerate the construction of relevant national abilities, such as decarbonized ability[5]			
Offset Mechanisms					
Key emissions units could use CCER to offset a part of verified carbon emissions, according to relevant regulations[5]					

[1] The State Council Notification on 12th Five-year Work Plan for Controlling GHG Emissions
[2] NDRC Notice on Tackling National Climate Change Plan (2014-2020)
[3] NDRC Notice on Organizing and Implementing GHG Emissions Reporting Work for Carbon-intensive Enterprises and Public Institutions
[4] official comment of NDRC Climate Department
[5] NDRC Climate Department Interim Measure on Carbon Emissions Trading Management

MRV	Incentives and Non-compliance Fines		
Accounting Methods and Reporting Guidance on GHG Emissions for initial batch of 10 industries (trial)[3]	Key emissions units breaking the law should be ordered to correct within limited time or accept administrative penalty, which would depend on unlawful act. Key emissions units who didn't implement on time should be ordered to implement responsibility or accept administrative penalty[5]		
CO2 Reporting Date	**Surrender Date**	**Total allowance**	**Amount of key units**
Mar. 30th (to competent provincial department)[3]	Unknown	Unknown	Unknown

In order to promote the development of national carbon market, the NDRC Climate Change Department published NDRC Government Decree No.17 on December 12th, 2014, which consisted of Interim Measures on Carbon Emissions Trading, including several aspects such as allowance management, emissions trading, verification and implementation, monitoring management, legal liability, etc.[39] The carbon market elements involved in this Measure are presented in Table 1-4, which corresponds to the elements of pilot regions shown in Table 1-6. As a framework document, six elements were mentioned, without specifics, meaning that subsequent detailed rules and regulations and relevant laws still need to be published. However, it has provided national guidance to provinces and cities for establishing future carbon trading schemes, and allowed greater decision-making power for local governments.

Guest Comments

New Challenges and Opportunities Coming with National ETS

On December 12th, National Development and Reform Commission (NDRC) published Interim Measure on Carbon Emissions Trading Management, which provided basic system framework of national ETS. By the look of basic thoughts, the initial pattern of national ETS was: local government was on initiative status on allowance allocation, and NDRC reserved the power of assigned carbon exchanges. However, this Measure remained a lot of detailed problems to be confirmed, of which the three key problems determining the development approach of national ETS were that: establishing allowance management system that center to cooperate with local governments; establishing national third-parties market; the approach of central enterprises to participate in ETS.

1.Allowance management system will be mainly dominated by local self-government

The Measure put forward the basic framework of our country's allowance management system: provincial carbon trading competent departments proposed the list of all the regulated units up to standards of administrative regions to NDRC, and NDRC confirmed the total emissions allowance amounts of the state and provinces, municipality regions and municipalities by comprehensive consideration of the GHG emissions, economic gain, industrial structure, energy structure, and the situation of regulated units brought into at these levels.

Observed from this stipulation, China adopted the allowance allocation methods of EU ETS. That was local government submitted allocation and center adjusted, examined and approved. The advantage of this method was local interest demand could be balanced, and the disadvantage was regional protectionism could result in the serious surplus of allowance allocation. Based on the experience of our country's Unit Energy Consumption Index, the latter problem more likely occurred. In order to avoid this problem, the measures should be adopted as follow angle:

(1) Deal with the relationship between stock and increment well. The economic situation of our country in recent years fluctuated largely, structure adjustment policy was stronger, there were huge uncertainty in the development of each industry, and all of these things resulted in prodigious uncertainty in ensuring emissions datum line and emissions reduction goals. These uncertainties would finally reflect as market price fluctuation through ETS. The increment part hah prodigious uncertainty compared with stock, and it was an important project that tackling the paid allocation of increment part and stock part. Here were some suggestions that local government should be based on GHG lists, economic growth data, and development plan to establish a national allowance allocation model to guide the work of formulating and allocating total national allowance amount, and the relationship of stock and increment could be adjusted macroscopically.

(2) Encourage local government to carry out allowance auction work. As allowance auction could bring in fiscal revenue, encouraging local government to auction could reduce the intrinsic motivation of excessive allocation. The design of redistribution of auction income mechanism should be paid attention to for promoting local auction activities

2.The national third-parties market having internal driving force should be established.

The credit base was determined by third-parties market (MRV). At present, in our country, the admittance criterion of third-parties in each pilot was quite different, meanwhile the supervision measures and management regulations of third-parties both lacked, all of these made larger uncertainty exist in emissions data, limited the entrance of financial institutions, and affected the credibility of carbon market in a certain extent, hindered the financialization process of carbon emissions permit, and limited the development of carbon financial market fundamentally.

A good third-market should have internal driving force and promote the quality and credibility of data continually, which required to bring in incentive and punishment mechanism to make it evolve automatically. The existing MRV system was lack of reliability, and still unable to support the development of carbon financial market. Here were suggestions that departing from the angle of financial institutions, putting forward uniform regulation standard or technical manual for third-parties market, and bringing reasonable incentive and punishment mechanism, to promote the quality of data to improve continually and support the development of carbon financial market.

3.The approach of central enterprises participating in ETS

Because of the limit of realistic condition, allowance initial allocation power was mastered in local governments, if wanted to obtain stronger voice, NDRC had to take the initiative on responsibility main body, and central enterprises were an important sally port. Central enterprises were the important brace of economic and social development of our country, also the important GHG emissions units, so there were more responsibilities in the aspects of energy conservation, emissions reduction and controlling GHG emissions, and played the exemplary role. Compared with the other enterprises, the central enterprises had many characteristics, including complex organization system, numerous management levels, complex management network, wide geographical distribution, many energy consumption varieties and large amount of consumption, many GHG emissions varieties and large amount of emissions, etc. More than half of the emissions in ETS pilots were contributed by central enterprises. So the form of national ETS in the future largely depended on whether NDRC established the market system aiming at central enterprises. This point was considered in top-level design to some extent.

Profile

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1.3. Progress of Policies in Pilot ETS Regions in 2014

From June to December 2013, Shenzhen, Shanghai, Beijing, Guangdong, Tianjin launched their pilot ETSs in succession. Then April and June 2014 respectively, Hubei and Chongqing followed. For the policy documents prior to January 1st 2014, refer to the *Environomist China Carbon Market Research Report 2014*. Table 1-5 shows the key policy documents published by local governments, Development and Reform Commission branches and exchanges in 2014. While reading the documents listed in this Table, note that you can see the domestic ETS elements in Table 1-6 in section 1.4 below, in order to understand the domestic ETS more clearly.

Table 1-5 Policy documents for each pilot region in 2014

	Time	Content
Guangdong	2014/01/15	Guangdong Interim Measures on Emissions Trading Pilot
	2014/03/18	Guangdong DRC Notification on Guangdong Enterprises Carbon Information Reporting and Verification Enforcement Regulation
		Enforcement Regulation on Guangdong Enterprises Carbon Information Report and Verification (trial)
		Guangdong Enterprises CO_2 Information Report Guidance (trial)
		Guangdong Enterprises Carbon Emissions Accounting Specification (trial)
	2014/03/20	Guangdong Carbon Emissions Allowance Management Enforcement Regulation (trial)
	2014/06/09	Notice for Regulated Entities to Accelerate the Completion of Allowance Surrendering
		Plan on Emissions Adjustments in 2013
	2014/08/06	Announcement on Carbon Trading Non-surrendering Allowance Enterprises in 2013
	2014/08/18	Guangdong Implementation Plan on Emissions Allowance Allocation in 2014
		Guangdong List of Regulated Entities for 2014
		Guangdong List of Enterprises with Newly-Developed Projects (involving Extension and Reconstruction)
		Guangdong Computing Methods on Allowance of Enterprises under the Cap in 2014
	2014/09/05	Guangdong Recommendation List of the First Batch of Carbon Emissions Verification Institutions
	2014/10/11	2014-2015 Guangdong Action Plan for Energy Conservation and Emission Reduction and Low-carbon Development
Hubei	2014/03/26	Hubei DRC Notification on Carbon Emissions Permit Allowance Allocation
		Hubei Plan on Carbon Emissions Permit Allowance Allocation
		Hubei List of Enterprises under the Cap

	2014/04/04	Hubei Interim Measures on Carbon emissions permit management and trade
	2014/10/27	Hubei Implementation Plan on Energy-Conservation Emission-Reduction and Low-Carbon Development
	2014/12/08	Hubei Carbon Emissions Exchange Carbon Emissions Trading Rules (Trial)
	2014/12/11	Allowance Custody Business Enforcement Regulation (Trial)
Shanghai	2014/01/10	Shanghai Interim Measures on Carbon Emissions Verification Third-parties Management
	2014/03/12	Shanghai Regulation on Carbon Emissions Accounting (Trial)
	2014/05/28	Notification on Completing Surrender of Emissions Allowance Work in 2013
		Notification on Volume of Business Examination and Approval of Carbon Emission Trading Enterprises Pilots
	2014/05/30	Notification on Volume of Business Examination and Approval of Pilot Enterprises with Baseline-Method
	2014/06/13	Shanghai DRC Announcement on Adjustment of Issued Allowances for 2013 Compliance Period
	2014/06/16	Shanghai Environmental and Energy Exchange Notice on the Issue of Auctioning of 2013 Allowances
	2014/09/03	Shanghai Environmental and Energy Exchange Notice on Revised Emissions Trading Rules and Member Management Measures
		Shanghai Environmental and Energy Exchange Emissions Trading Rules (Revised Draft)
		Shanghai Environmental and Energy Exchange Member Management Measures (Revised Draft)
		Shanghai Environmental and Energy Exchange Notification on Declaring Carbon Emissions Trading Institutional Investors
		Interim Implementation Measures on System for Institutional Investors in Carbon Emissions Trading
		Open Accounts Guidance for Shanghai Environmental and Energy Exchange Institutional Investors
	2014/09/15	Shanghai Implementation Opinions on Further Accelerating Healthy Development of the Capital Market
	2014/09/30	Notification on New-construction Protects' Allowance Declaration Work about Carrying out Carbon Emissions Trading Industrial Enterprises
Tianjin	2014/01/03	Tianjin Emissions Exchange Member Management Measures (Trial)
	2014/05/21	Notice on Carrying out Emissions Accounting Work for ETS Pilot Enterprises in 2013 Compliance Period
	2014/07/08	Tianjin Emissions Exchange Notification for Enterprises under the Cap on Surrendering Allowance in Time
	2014/07/09	Tianjin Announcement on Trading Listing Allowance in 2014
	2014/07/28	Announcement on Surrendering Allowances by ETS Pilots Enterprises in 2013 Compliance Period
	2014/08/15	Announcement on List of ETS Pilots Enterprises to Surrender Allowances in 2013 Compliance Period

Shenzhen	2014/02/28	Notice on Submitting Emissions Reports for 2013 Compliance Period
	2014/03/19	Formally Issued and Implemented Interim Measures on Shenzhen Emission Trading Management
	2014/04/11	Published List of Initial Emissions Verification Institutions
	2014/05/07	Shenzhen Notice on Carbon Emissions Permit Trading Related Matters
	2014/06/04	Shenzhen Emissions Exchange Announcement on Adding the Bank of China as a Third Party Depository Bank
	2014/06/09	Shenzhen Announcement on Trading Listing Allowance in 2014
	2014/06/12	Notice on Issues Related to Punishing Enterprises under the Cap Failing to Surrender Allowances in Time
		Notice on Issues Related to Actual Allowance Amounts of the Enterprises under the Cap
	2014/07/03	Published the List of Enterprises under the Cap Surrendering Allowances in Time
		Published the List of the Enterprises under the Cap Surrendering Allowances Late
	2014/11/20	Shenzhen Emissions Exchange Announcement on Adding China Citic Bank as a Third Party Depository Bank
	2014/12/12	Enforcement Regulation on Exception Handing (Trial)
		Enforcement Regulation on Violation and Default Handing (Trial)
		Management Regulation on Hosting Members (Trial)
		Management Regulation on Broker Members (Trial)
		Settlement Regulation (Trial)
		Management Regulation on Risk Controlling (Trial)
	2014/12/17	Shenzhen Emissions Exchange Announcement on Opening Carbon Emissions Hypothecated Loan Application
Beijing	2014/03/07	Notice on Completing Submission of Emission Reports for Accounting Related Issues
	2014/04/29	China Beijing Environment Exchange Carbon Emissions Trading Rules and Supporting Details (Trial)
	2014/04/30	Notice on Publishing Carbon Emissions Intensity Advanced Value
	2014/06/10	Management Measures on Public ETS Operation (Trial)
	2014/06/11	Notice on Supervising and Urging Carbon-Intensive Entities to Accelerate Surrendering of Allowances
	2014/06/19	Notice on Ordering Carbon-intensive Entities to Surrender Allowances
	2014/09/02	Notice on Emissions Offset Management Measures (Trial)
	2014/10/15	Notice on Promoting Thousands of Enterprises in Beijing and Accessing Carbon-Intensive Energy Consuming Entities Energy-Management System and Carbon Emissions Management System
	2014/11/17	Notice on Publicly Collecting Relevant Documents Opinions of Emissions Monitoring Guidance
		Beijing Enterprises CO_2 Emissions Verifying and Reporting Guidance (2014 edition)
		Beijing Emissions Monitoring Guidance

		Beijing Emissions Report Third Party Verification Procedure Guidance
		Beijing Emissions Third Party Verification Report Writing Guidance
	2014/12/31	Notice on Publishing Recommendatory List of Energy Management System and Carbon Emissions Management System Third-parties Evaluation Agencies
Chongqing	2014/01/28	Interim Measures on Promotion of Energy Conservation Low-carbon Technologies
	2014/04/23	Chongqing Carbon Emissions Exchange Notice on Establishing Emissions Trading Register, Account Book and Trading Account
	2014/04/26	Chongqing Interim Measures on Carbon Emissions Trading Management
	2014/05/16	Publication of List of Emissions Accounting Institutions
	2014/05/28	Specification on Enterprises Emissions Accounting Work (Trial)
		Notice on Issuing Emission Allowances for 2013 Compliance Period
		Notice on Guidance for Industrial Enterprises Emissions Accounting and Reporting (trial)
		Notice on Industrial Enterprises Carbon Emissions Accounting Reporting and Verification Rules (trial)
		Detailed Regulations on Emissions Allowance Management (Trial)
	2014/06/03	Chongqing Carbon Emissions Exchange Measures on Carbon Emissions Trading Violation and Default (trial)
		Measures on Carbon Emissions Trading Information Management (Trial)
		Measures on Carbon Emissions Trading Risk Management (Trial)
		Measures on Carbon Emissions Trading Settlement Management (Trial)
	2014/07/18	Notice on Organizing Implementations of Regulated Entities Carbon Emissions Reporting for 2013 Compliance Period
	2014/08/22	Guidance on Institutional Investors Opening Carbon Emission Trading Accounts
	2014/09/02	Notice on Regulated Entities Emissions Verification Work for 2013 Compliance Period
	2014/10/10	Notice on Implementing Regulated Entities Emissions Re-verification Work
	2014/12/11	Chongqing Notification on Declaring Carbon Emissions in 2014
		Notification on Issuing Approval Emissions and Allowance (Adjusted) in 2013

Data: desk research by Environomist

1.4. General Situation of China's ETS Pilots

China plays an important role within the international community in the process of tackling the threat of anthropogenic climate change. Since 2005, China has successively issued many important policy documents in order to better undertake its responsibility in controlling and slowing global warming. The specific policy documents are described in section 1.2. Since 2013, seven regional ETS pilots have successively been launched.

These ETSs are characterized by 16 main elements: an emissions reduction target, compliance coverage, monitored GHGs, reporting obligations, allowance allocation, allowance reserves and banking, starting time, authorized transaction platform, trading products, trading modes, trading participants, offset mechanisms, incentives and non-compliance fines, MRV, reporting date, and surrender date. Table 1-6 shows the main 16 elements of the seven ETS pilots. The last two columns of this Table are the total allowance and the amount of enterprises under the cap. These two columns clearly show the current situation of the ETSs. The text after the Table shows which policy documents the content can be obtained from.

Table 1-6 Elements of China's Pilot ETSs in 2014

Pilot Region	Emission Reduction Target (2015)	Monitored GHGs	Starting Time	Authorized Transaction Platform	Trading Products	Trading Modes
Guangdong	19.5% (Compared to 2010)	CO_2	Dec.19th 2013	China Emissions Exchange (Guangzhou)	Allowance, CCER	Public bidding, Negotiated transfers
Hubei	17% (Compared to 2010)	CO_2	Apr.2nd 2014	Hubei Carbon Emissions Exchange	Allowance, CCER	Electric bidding, Online matching
Shanghai	19% (Compared to 2010)	CO_2	Nov.26th 2013	Shanghai Environmental and Energy Exchange	Allowance, CCER	Listed trading, Negotiated transfers
Tianjin	15% (Compared to 2010)	CO_2	Dec.26th 2013	Tianjin Emissions Exchange	Allowance, CCER	Online spot, negotiated transfers, auctions
Shenzhen	15% (Compared to 2010)	CO_2	Jun.18th 2013	Shenzhen Emissions Exchange	Allowance, CCER	Spot trading, Electric bidding, Fixed price, Block trades, Negotiated transfers
Beijing	18% (Compared to 2010)	CO_2	Nov.28th 2013	China Beijing Environment Exchange	Allowance, CCER	Public trading, Negotiated transfers, OTC
Chongqing	17% (Compared to 2010)	CO_2	Jun.19th 2014	Chongqing Carbon Emissions Exchange	Allowance, CCER	Public bidding, Negotiated transfers

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Pilot Region	Trading Participants	Compliance Coverage
Guangdong	Companies under the cap and other institutions, enterprises, organizations, and individuals	Companies emitting more than 20,000 tons CO_2 in power, iron and steel, petrochemical, and cement sectors
Hubei	Companies under the cap, corporations or other organizations holding CCERs	Industrial companies consuming more than 60,000 tons of standard coal in 2010 or 2011, involved 12 industries such as power, iron and steel, cement and petrochemicals
Shanghai	Companies under the cap, other organizations and individuals	Companies emitting more than 20,000 tons CO_2 in industries including iron and steel, petrochemicals, non-ferrous metals, etc. and 10,000 tons in the non-industrial sectors of aviation, ports, etc.
Tianjin	Companies under the cap and other institutions, enterprises, organizations, and individuals	Carbon-intensive industries such as iron and steel, chemical, power, heating, petrochemical and exploitation and those of civil buildings, which emit more than 20,000 tons of CO_2 annually.
Shenzhen	Companies under the cap, other organizations and individuals	Companies emitting more than 3,000 tons CO_2; Owners of large public buildings and state organ office buildings that area bigger than 10,000 square meters; Carbon emission units voluntary and approved by the competent departments; Other units designated by government.
Beijing	Companies under the cap, reporting companies voluntarily participating, and other institutions; natural person according with criteria	Enterprises, institutions, state organs and other institutions registered within the territory of China emitting more than 10,000 tons of CO_2 annually, both direct and indirect.
Chongqing	Companies under the cap, other organizations and individuals	Industrial companies emitting more than 20,000 tons CO_2; Carbon emission units voluntary and approved by the competent departments; Other units designated by government.

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Pilot Region	Reporting Obligations Only	Allowance Allocation	Allowance Reserve and Banking
Guangdong	Individual companies emitting more than 5,000 tons but less than 10,000 tons of CO_2.	The method in 2014 is baseline and historical emissions; some are free and some need to be purchased. 95% free allowances in the power sector; 97% for iron and steel, petrochemicals and cement. Paid allowances are issued by bidding, and companies can decide whether to buy or not.	Allowance reserve and banking is 38 million tons in 2014, including new project allowance and market regulation allowance
Hubei	Companies consuming more than 8,000 tons of standard coal per year.	Allocation for free. Exploring allocation of paid allowances.	8% set aside from total cap with initial annual quota, surplus reserved for new entrants.
Shanghai	Other companies emitting more than 10,000 tons of CO_2.	The method of baseline and historical emission. During the pilots, Emissions issued freely.	Government sets aside a portion by regulation.
Tianjin	Industries such as iron and steel, chemical, power, heating, petrochemicals and extractive industries as well as civil buildings, which emit more than 10,000 tons of CO_2 annually.	Based on industrial emissions, mainly issued for free with partial allowance allocation drawing a charge	N/A
Shenzhen	Companies emitting more than 1,000 but less than 3,000 tons of CO_2 annually.	Based on historical emissions, allocation for free or against a charge. Free allowances are not lower than 90%. Charging for allowances includes both fixed price sales and auctioning.	The competent department reserves 2% of the total allowance as a new entrants allowance reserve.
Beijing	Enterprises, institutions, state organs and other institutions consuming more than 2,000 tons of standard coal per year.	Manufacturing, other secondary and service industries receive allowances based on historical emissions; power and electricity industries based on historical carbon intensity.	No more than 5% of total allowance.
Chongqing	Companies under the cap.	Based on historical emissions and industrial emission potential, issued allowance by register.	N/A

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Continued

Pilot Region	Offset Mechanisms
Guangdong	Use CCERs to offset enterprises' actual emissions; not more than 10% of the total emissions, and at least 70% of it should be within the province. CCERs generated within the enterprises' emission boundary cannot offset enterprises' emissions in the provincial area.
Hubei	CCERs should be in the provincial area; not more than 10% of the initial allowance.
Shanghai	CCERs not more than 5% of the total allocated allowance; allowance that enterprises owned every year in the future couldn't be less than 50% of corresponding allowance every year received by allocating.
Tianjin	CCERs not more than 10% of the actual emissions.
Shenzhen	Entities can use CCERs to offset emissions up to 10% of their annual emissions. CCERs generated in Shenzhen cannot offset emissions in Shenzhen ETS. Specific management measures on emissions offset will be formulated by competent department separately, and be implemented later with government permission.
Beijing	CCERs produced after Jan. 1st 2013. Not more than 5% of the allowance allocation. CCERs obtained from Beijing area should be more than 50%, from outside the area should be less than 2.5%; CCERs produced from projects under cooperation agreement signed with Hebei and Tianjin for tackling climate change, ecological construction, atmospheric pollution governance are preferential. Energy performance contract projects signed after Jan. 1st 2013 in Beijing area or energy conservation and technology reform projects after Jan. 1st 2013; energy conservation projects should produce actual emission reductions; should verify the actual emission reductions produced by energy projects operated continuously and steadily in a year; carbon sink projects in Beijing area; the land used by carbon sink afforestation project should be non-forest land at Feb. 16th 2005; forest management carbon sink projects should be started after Feb. 16th, 2005.
Chongqing	CCERs, but the amount should be less than 8% of certified emissions. Emission projects should be put into operation (carbon sink projects are not included), and should be one of the following types: energy conservation and energy efficiency promotion; clean energy and non-hydro renewable energy; carbon sinks; energy activities, industrial producing procedure, agriculture, waste disposal, etc.

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Pilot Region	MRV
Guangdong	Mar. 1st, 2013, Guangdong Interim Measures on Emissions Trading Pilot; Mar. 18th, Enforcement Regulation on Guangdong Enterprises Carbon Information Report and Verification (trial), Guangdong Enterprises CO_2 Information Report Guidance (trial); Guangdong Enterprises Carbon Emissions Accounting Specification (trial)
Hubei	Jun. 1st, 2014, Hubei Interim Measures on Carbon emissions permit management and trade
Shanghai	Published One plus Eight GHG Emissions Accounting and Reporting Guidance; Jan. 10th 2014, Shanghai Interim Measures on Carbon Emissions Verification Third-parties Management; Mar. 12th, Shanghai Work Regulation on Carbon Emissions Accounting (trial)
Tianjin	Dec. 24th, Enterprises Report Compiling Guidance and Five Industries Accounting Guidance
Shenzhen	November, 2012, Organizations GHG Emissions Quantification and Reporting Specification and Guidance, Organizations GHG Emissions Verification Specification and Guidance; April, 2013, Structure GHG Emissions Quantification and Report Specification and Guidance (trial), Structure GHG Emissions Verification Specification and Guidance (trial); Mar.19th, 2014, Shenzhen Interim Measures on Shenzhen Emission Trading Management
Beijing	November 2014, Beijing Notification on Publicly Collecting Relevant Documents Opinions of Emissions Monitoring Guidance, Beijing Enterprises (Units) CO_2 Emissions Verifying and Reporting Guidance (2014 edition), Beijing Emissions Monitoring Guidance, Beijing Emissions Report Third-parties Verification Procedure Guidance, Beijing Emissions Third-parties Verification Report Writing Guidance
Chongqing	May 28th, 2014, Chongqing Specification on Enterprises Emissions Accounting Work (trial management), Chongqing Notification on Issuing Emission Allowance in 2013, Chongqing Notification on Industrial Enterprises Emissions Accounting and Report Guidance (trial), Chongqing Notification on Industrial Enterprises Carbon Emissions Accounting Report and Accounting Detailed Regulations (trial), Chongqing Detailed Regulation on Emissions Allowance Management (trial)

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Pilot Region	Incentives and Non-compliance Fines
Guangdong	If the company didn't fulfill its compliance responsibility, it will have twice the level of non-compliance deducted from the next year's allowance, and fined 50,000 RMB; for making a false or incomplete report, or refusing to surrender allowances, as well as for hindering verification organizations or refusing to supply evidence, fines are 10,000 RMB to 30,000 RMB; in cases of gross violation, fines are 50,000 RMB; for not publishing trading information, not establishing or implementing risk management systems as ordered by provincial DRC, fines are 10,000 RMB to 50,000 RMB.
Hubei	If enterprises are non-compliant, they will be fined 1 to 3 times the balance, but not more than 150,000 RMB, and double the allowances deducted from next year's allowance allocation.
Shanghai	Failure to surrender allowances, providing false documents or hiding important information, fines from 10,000 RMB to 30,000 RMB; unreasonably refusing and hindering verification institutions, fines from 30,000 RMB to 50,000 RMB; not surrendering allowance, fines from 50,000 RMB to 100,000 RMB.
Tianjin	Order to correct; non-compliance represents criminal responsibility.
Shenzhen	Unsatisfactory verification report: 10,000 RMB to 30,000 RMB for incorrect or overdue; 50,000 RMB to 100,000 RMB for serious circumstances. Failure to submit sufficient allowances or CCERs: deducted forcibly, directly deduct the insufficient portion from next year's allowance, and fines three times the average price of last six months' allowance price. Failure to surrender allowances before transfer, dissolving or bankruptcy liquidation, deducted forcibly, fines for insufficient portion three times the average price of the last six months' allowance price.
Beijing	Failure to submit report and not corrected, fines the enterprises under the cap not more than 50,000 RMB. Discharge more than allocation, based on the emissions balance, fines 3 to 5 times of average price.
Chongqing	Failure to submit report and not corrected, fines from 20,000 RMB to 50,000 RMB. Allowance management units not surrendered or incomplete, fines three times of the average price of the last month before the surrendering allowance date.

To be continued

Continued

Pilot Region	Reporting Date	Surrender Date	Total allowance	Amount of key units
Guangdong	Mar.15th	Jun.20th	388 million tons in 2013	184
Hubei	Last working day in February	Last working day in May	324 million tons in 2014	138
Shanghai	Mar.31st	Jun.1st to Jun.30th	160 million tons in 2013	191
Tianjin	Apr.30th	May 31st	160 million tons in 2013	114
Shenzhen	Mar.31st	Jun.30th	3.05 million tons actual allowance in 2013	635
Beijing	Apr.15th	Jun.15th	50 million tons in 2013	415
Chongqing	Feb.20th	Jun.20th	125 million tons in 2013	242

End

Guangdong's 12th Five-year Work Plan on Controlling GHG Emissions specified that CO_2 emissions per unit GDP in 2015 should be 19.5% lower than 2010.[40] The Guangdong Interim Measures for Emissions Management specified that industrial enterprises discharging emissions between 5,000 tons and 10,000 tons CO_2 are required to report; the amount of CCERs surrendered shall not be more than 10% of the actual emissions of the previous year, 70% of which should be from within the province; regulated entities should surrender allowances based on the actual emissions of the previous year before June 20th; trading participants include regulated entities, new entrants, and other organizations and individuals that meet the requirements; trading may involve public bidding, negotiated transfers, and other methods approved by government.[41] The 2014 Guangdong Implementation Plan on Emissions Allowance Allocation specified that the total allowances for 2014 would cover 408 million tons. This includes regulated entities allowances of 370 million tons, with a reserve quota of 380 million tons. The methods for allocating allowances are baseline and historical emissions. Some will be free while some need to be purchased. Free allowances of the power sector will cover 95%, and 97% for the iron and steel, petrochemical and cement sectors. Purchased allowances will be issued by bidding, with companies deciding whether to buy or not.[42]

The Hubei Low-carbon Development Plan (2011-2015) specified that CO_2 emissions per unit GDP before 2015 should be 17% lower than 2010. Total allowances in 2014 would be 324 million tons; regulated entities include industrial enterprises consuming more than 60,000 tons. This covers a total of 138 companies from 12 industries including the power, iron and steel, cement, and chemical industries. Allowances will be freely allocated. Hubei's Work Plan for Emissions Trading Pilot Scheme specified that trading products would include both allocated allowances and CCERs produced within the province (including carbon sinks). Pricing will be by supply and demand through requisitioning parties' fixed price transfers and negotiated price. Industrial enterprises, which consume more than 8,000 tons of standard coal annually, will conduct independent accounting, to submit

emissions reports to the competent department by the first quarter of each year.[43] Hubei's Interim Measures on Emissions Management and Trading specified that enterprises should surrender allowances and/or CCERs equal to last-year's actual emissions by the end of May each year. Trading participants may include regulated entities, the legal representative, other organizations and individual voluntary participants. Trading products involve allowances and CCERs. Trading may be by public bidding in specified trading institution. Before the end of February, regulated enterprises should summit last-year's emissions report, and before the end of April they must submit a verification report.[44]

In Shanghai, a document outlining the government's Views on Implementing Pilot Emissions Trading specified that carbon-intensive industries including iron and steel, petrochemicals, chemicals, nonferrous metals, electric power, building materials, textile, paper making, rubber, and chemical fibers would be covered. For these sectors, a threshold of more than 20,000 tons of CO_2 emissions would apply (including direct emissions and indirect emission). Other industries such as aviation, ports, airports, railways, finance, business, and hotels, would also be covered, with a threshold of 10,000 tons CO_2 emissions. Other enterprises CO_2 emissions of more than 10,000 tons should implement an emissions reporting system. Trading participants are the pilot enterprises, though some other actors may also be eligible.[45] The Shanghai Emissions Management Trial Implementation Measures specified the method of historical baselines to determine emissions quotas. Regulated units should surrender allowances between June 1st and June 30th.[46]

Tianjin's Notice on Implementing an Emissions Trading Pilot Scheme specified that the regulated entities would include carbon-intensive emissions industries including iron and steel, chemicals, power, heating, petrochemicals, oil and gas exploitation, and civil construction with emissions of more than 20,000 tons.[47] The Tianjin Emissions Trading Interim Measures specified that allowance allocation would mainly be free, supplemented by auctioning or fixed price sales. Regulated entities should surrender allowances before May 31st annually. CCERs are allowed for

not more than 10% of the actual emissions. Allowances not cancelled may be carried over to the next year. Regulated entities should summit emissions reports and verification reports to the municipal Development and Reform Commission.[48] The Tianjin Emissions Exchange Emission Trading Rules (trial) specified that emissions trading could use online spot trades, negotiation, and auctions. Domestic and overseas institutions, enterprises, communities, and individuals may all participate in emissions trading.[49]

The Shenzhen 12th Five-year Plan specified that CO_2 emissions per unit GDP should achieve a cumulative total decline of 15%. The Shenzhen Interim Measures on Emission Trading Management specified the regulated entities as follows: companies emitting more than 3,000 tons of CO_2, owners of large public buildings and government office buildings with an area bigger than 10,000 square meters, voluntary and approved companies involved in carbon emissions management, and other emitting companies designated by the government. Companies emitting more than 1,000, but less than 3,000 tons of CO_2 annually must submit a report to the competent department. Allowance allocation involves both free allocation and purchased permits. Free allocation includes pre-allocation allowances, a new entrants reserve, and adjusted allocation allowances. Purchased allowances may be sold by auction or at fixed price. The competent department should reserve 2% of total allowance for new entrants. Allowances sold by auction should be not less than 3% of total allowances. Regulated entities compile emissions reports based on GHG emissions quantification and reporting standards, and submit them to the competent department via the municipal GHG emissions information management system before March 31st. Regulated entities should engage carbon verification institutions to verify their emissions report after submission and submit verified emissions reports before April 30th. Regulated entities should summit allowances or CCERs to authorities before June 30th. Entities should use CCERs for not more than 10% of their total emissions. Trading products include allowances, CCERs, and other approved products. Trading methods involve spot trading, electronic bidding, fixed price, block trades, and

negotiated transfers.[50]

Beijing Emissions Offset Management Measures (trial) specified carbon-intensive entities may use CCERs to offset not more than 5% of their total allowance. CCERs produced outside Beijing may not be more than 2.5% of the total allowance.[51] Beijing Emissions Trading Management Measures (trial), specified an adjustment amount not more than 5% of the total allowance used for allowance adjustment and market regulation. Trading participants are carbon-intensive entities and other voluntary participants. Trading products include emissions allowances as well as verified emission offsets.[52] The Notice on Implementing the ETS Pilot, authorizing a cap-and-trade mechanism for Beijing, specified that the scheme would only cover CO_2, with CO_2 emissions allowances as the main commodity, although CCERs would be allowed to offset a certain proportion of emissions. Entities with CO_2 emissions of more than 10,000 tons units are required to control their CO_2 emissions through trading. Other entities which consume more than 2,000 tons of standard coal may participate voluntarily and be managed like regulated entities. The previous year's emissions report must be submitted before April 15th and the verification report before April 30th. CCERs may not account for more than 5% of allowances and at least 50% should be produced within the Beijing municipal area.[53]

Chongqing's 12th Five-year Plan on Controlling GHG Emissions and Low-carbon Pilots Work specified that CO_2 emissions per unit GDP in 2015 should be 17% lower than 2010. The Chongqing Emissions Allowance Management Detailed Rules and Regulations (trial) specified that industrial enterprises with annual emissions of more than 20,000 tons CO_2 equivalent during the period 2008-2012 should be involved in allowance management. Entities' allowances will be calculated from the year with the highest emissions during 2008 and 2012 as the base year. The total allowances will then be reduced by 4.13% annually. Covered entities must surrender allowances during two periods, the first before June 20th 2015 and the second prior to June 20th 2016. CCERs shall account for not more than 8% of verified emissions in each period.[54]

1.5. Suggestions for Non-pilot Areas

1.5.1. General Situation in Non-pilot Areas

Since 2013, several regions, such as Jiangsu Province, Hebei Province, Jilin Province, as well as some cities like Zhaoqing, Hangzhou, Weifang, Hefei, and Lanzhou, have expressed that they would implement carbon emissions trading to control the amount of GHG emissions in their own administrative region. Subsequently, Jiangsu Province has taken the lead in preparations for establishing an ETS. This section, therefore, introduces the relevant policy documents on ETS in Jiangsu.

On April 8th 2011, in response to the China's 12th Five-Year Plan requesting the establishment of a carbon emission trading system in China and the development of low carbon pilot provinces/cities, Jiangsu Province released Suggestions on Reducing the Carbon Emissions in Jiangsu Province. According to this report, obstacles regarding the low-carbon technology and market are the main challenges. In this case, the establishment of local carbon funds can be attempted, so that a commercialized operation mechanism would be induced sooner. In addition, the synergy between the low carbon economy and the development of CDM projects should be closely monitored. The introduction and transfer of advanced international technology and capital need to be accelerated as well. At last, a carbon emissions trading platform will be explored in Jiangsu Province, which will allow more international investments in the context of a low carbon economy. Concrete political documents and event progresses in major cities and the overall Jiangsu Province during 2012-2014 are shown in Table 1-7.

Table 1-7 Progress of Jiangsu low carbon pilots policy from 2012 to 2014

Region	Main Content				
Province	Date	2013.2.25	2013.7.17	2014.9.19	2014.11.14
	Event	12th,Five-year Controlling GHG Emissions Work Plan	Opinions on Deepening Economic System Reform Key-points Work	14－15 Energy-conservation Emissions Reduction Low-carbon Development Action Implementation Plan	Opinions on CPC Decision about Comprehensively Promoting the Rule of Law Some Major Issues
	Key Content	emissions statistical accounting, area ETS	Trading Platform, South of Jiangsu Area Emissions Trading	Provincial ETS, Carbon-financial Products	Emissions Trading Local Legislation
Nanjing	Date	2013.3.28	2014.1.22	2014.2.12	2014.6.27
	Event	Nanjing Atmosphere Pollution Prevention Regulation	2014 Work Plan	Phase II General Reform Promoting Plan	Opinions on Comprehensively Deepen Financial Reform innovation Development
	Key Content	Initially Put forward Emissions Total Allowance Trading	Emissions Statistics, Monitoring, Examination, ETS Construction	Constructing ETS before 2015	Promoting ETS Pilots
Huai'an	Date	2013.6.19	2013.9.3	2014.9.1	2014.11.26
	Event	Low-carbon Cities Pilots Work Implementation Plan Report	12th Five-year Controlling GHG Emissions and Low-carbon Cities	Leading the GHG report work in the whole province	Launch several cooperation on carbon emissions trading with Shenzhen
	Key Content	Financial System like Green Credit and Loan, Security, Insurance, Trust	CCER, ETS connecting Shanghai and Shenzhen Trading Platform	85 key energy-consuming enterprises	to establish ETS before the end of 2016
Zhenjiang	Date	2013.2.22	2013.7.2	2014.2.25	2014.4.10
	Event	Zhenjiang low-carbon urban construction work plan in 2013	Test carbon platform this month	Efforts to create a national low carbon demonstration cities	Key carbon enterprises online monitoring platform phase II construction

	Key Content	carbon emissions accounting and management platform, ETS	carbon accounting and management, three systems (collecting, accounting, management)	peak carbon, carbon platform, carbon evaluation, carbon assessment innovation work	the 48 enterprises emitting more than 25,000 tons of carbon emissions
Suzhou	Date	2012.12.19	2013.6.19	2013.10.25	2014.3.12
	Event	The first environmental energy trading center of Jiangsu was established in Suzhou	Low carbon pilot cities implementation plan report	Suzhou 12th five-year plan outline interim report	Suzhou low-carbon development plan
	Key Content	carbon trading channel	regional ETS, carbon emissions reporting and verification	carbon emissions trading platform	carbon trading platform, carbon allowance system, CCER, ETS pilots

Observing the Table 1-7, the key events classified by administrational area and dates are clear, identifying the order or progress. For example, after the Notice on Implementing the Second Batch of Low-carbon Provinces and Cities Pilots, Jiangsu Province and Suzhou, Huai'an and Zhenjiang Municipal governments issued several relevant policy documents in order to promote low-carbon development. Meanwhile, the capital of Jiangsu, Nanjing, is exploring the potential for ETS. On December 19th 2012, the first Environmental Energy Exchange was established in Suzhou, providing a channel to the carbon market for the whole province. In the future, Zhenjiang, Nanjing and Huai'an also plan to put establishing a carbon trading market on the agenda. Since June 2013, these cities have gradually improved MRV systems, which is a basic, but critical element for developing an ETS. On June 19th 2013, Huai'an proposed to establish a financial system including green credit and loans, insurance, securities, and trusts, in order to broaden access to finance channels for low-carbon enterprises. On February 12th 2014, Nanjing also planned to establish fundamental elements of an ETS prior to 2015. On April 10th 2014, Zhenjiang began the second phase of online monitoring of emissions from key companies, selecting 48 enterprises that emit more than 25,000 tons of CO_2, in order to establish a real-time monitoring

and emissions management system. On November 14th 2014, Jiangsu government implemented the CPC Central Committee Decision on Comprehensively Promoting the Rule by Law, by proposing legislation on pollutants discharge permits, environmental monitoring and inspection, and emissions rights, as well as water rights trading.

1.5.2. Suggestions for Non-pilot Regions

Although only seven regions have been currently listed as pilot sites for carbon trading in China, there is a clear trend towards establishing a carbon trading system at the national level in the future. Both opportunities and challenges exist simultaneously, meaning that sound preparation is necessary in the transition to low carbon economy.

Several suggestions, which referred to the situation of pilot areas and the carbon market establishment evolution of non-pilot areas, can be provided to non-pilot areas:

- Research relevant emissions trading policy documents from different levels and regions domestically, as well as overseas. Market reports from dedicated professional institutions are helpful in this regard.

Domestic and international policy documents and problems encountered are good reference points. Regions should make adjustments accordingly when formulating policy in order to avoid these problems.

- Relevant enterprises, government institutions, and financial institutions, should conduct thorough market research.

Theory should be linked with practice. After all, each region features a different economic, social, and cultural background. Direct duplication is not feasible, and regions should find the most reasonable solution for their circumstances.

- Organize preparatory research and policy development teams in order to design local emissions management measures.

After conducting theoretical studies and market research, policy makers can set up a special team to discuss management practices or norms and develop guidelines.

- Promote social awareness, using various methods to publicize and educate.

Actions depend on awareness. Potential participants should know about the importance and significance of a low-carbon environment. This can be encouraged through guided participation.

- Establishing effective trans-department coordination and communication
- Domestically, there is insufficient inter-departmental coordination of information communication especially on policy issues. Establishing effective mechanisms to improve the efficiency and depth of communication is important. Improve the financial policy system

The carbon trading market is a policy-driven industry. CO_2 has no inherent commodity value. Currently there is a lack of a financial policy system in this area and some local governments lack the willingness to develop green finance. It can be difficult to take the initiative to lead the market allocation of resources.

- Government should help design the trading mechanism and construct the trading platform

Government should be involved in the process of developing a carbon trading platform. Policy makers are also the coordinator of the various stakeholders. Governments should take full advantage of this position to promote the sound development of carbon trading mechanisms.

- Develop specialized professional skills by training relevant enterprises and government institutions.

Domestic enterprises and institutions are not actively engaged with these issues, which is a considerable part of the reason for the lack of expertise. Some entities do not understand the issues while some do not want to. Cultivating professionals and professional organizations should therefore begin as soon as possible.

- Strengthen emissions trading institutions and qualified third-party verification and certification bodies. Establish strict approval conditions and procedures, strengthen supervision and management and capacity building.

2. The Challenge for Regulated Entities

Chapter 1 presents the regional plans for implementing ETS pilot schemes. In order for enterprises to successfully meet the requirements of the ETS, they will need to gain a good background knowledge of the ETS, the relevant policies and improve their operational capacity. In the early stages of establishing the ETS, businesses may face several challenges, including finding channels to expand the market, carbon asset management, and trading of allowances. This chapter will firstly present the enterprises, which are meeting the requirements of the domestic ETS pilot programs, and secondly examine the reasons why some companies do not fulfill the ETS requirements. Environomist completed a questionnaire survey in order to research the needs of market participants.

2.1. Performance Results of ETS Pilot Schemes

This section outlines the current situation regarding domestic ETS pilot schemes, and also discusses why companies in some pilots have not been compliant. Finally, it provides a statistical analysis of the capacity of controlled entities in the pilot areas.

2.1.1. General Outline of China's Developing ETS Pilot Schemes

In this section, Figures 2-1, 2-2, and 2-3 present an overview of the trading volume, the trading value, and the settlement price within each ETS Pilot; Table 2-1 provides the developing profile of China's ETS Pilots in 2014.

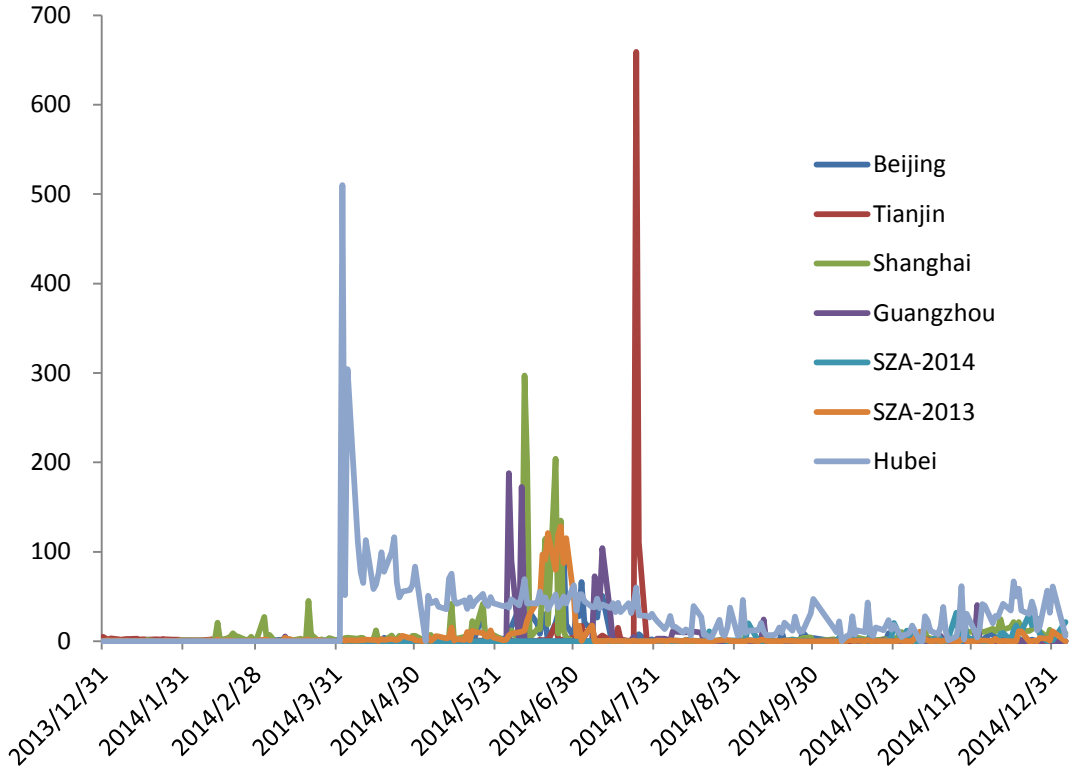


Figure 2-1 ETS pilots daily trading volume during 2014 (thousand tons)

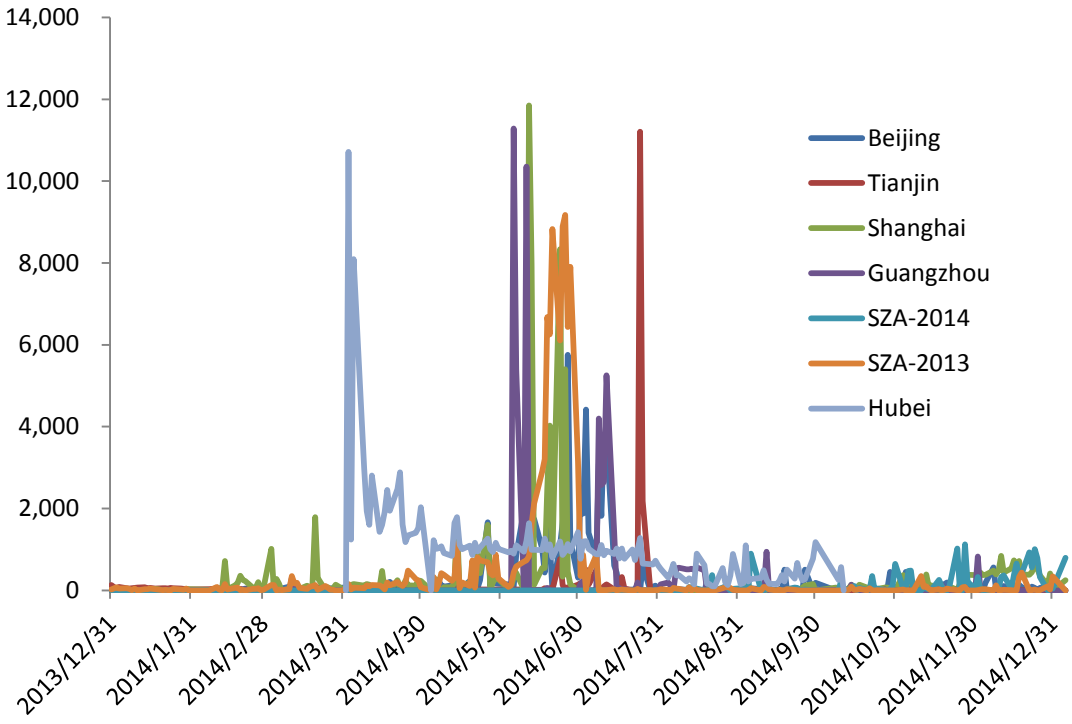


Figure 2-2 ETS pilots daily trading value 2014 (thousand RMB)

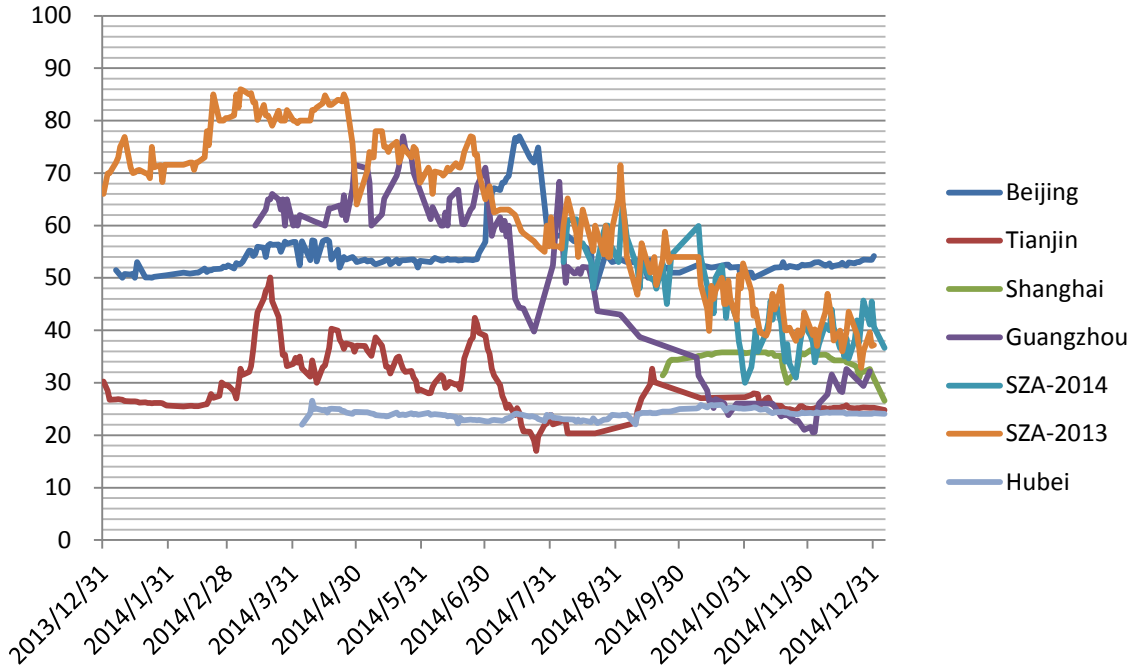


Figure 2-3 ETS pilots daily settlement price 2014 (RMB/Ton)

Note：For Beijing, Tianjin, average price used instead of settlement price.

Table 2-1 China ETS Pilots Developing Profile in 2014

Pilot Region	Opening Date	Exchange Quantification (10,000 Ton)	Exchange Volume (10,000 RMB)	Average Price (RMB)	Exchange Intensive Degree	
					Trading volume degree of concentration[6]	Trading value Degree of concentration[7]
Guangdong	2013/12/19	95.35	5154.72	54.06	99.89%	99.90%
Hubei	2014/4/2	700.11	16737.80	23.91	42.93%	54.73%
Shanghai	2013/11/26	196.97	7535.64	38.26	86.24%	86.52%
Tianjin	2013/12/26	101.12	2050.78	20.28	93.43%	90.27%
Shenzhen	2013/6/18	181.29	11222.30	61.90	87.01%	87.27%
Beijing	2013/11/28	107.51	6386.94	59.41	88.08%	89.18%
Chongqing	2014/6/19	14.5	445.73	30.74	100.00%	100.00%

Data: desk research by Environomist

Note: Data used in the table above were gathered through daily monitoring of published data of each trading platform by Environomist ltd. Data currently up-to-date at Dec.31st 2014, Data of Guangdong before 30th, April, obtained from www.taipaifang.com

[6] Firstly sort Daily Trading Volume, secondly select the former 20%, thirdly, summation, fourthly, divide the total Trading Volume.

[7] Firstly sort Daily Trading Value, secondly select the former 20%, thirdly, summation, fourthly, divide the total Trading Value.

On June 19th 2014, Chongqing opened its ETS, however since then no formal deals have been put in place. Therefore, the results for Chongqing have not been included in the comparative analysis.

Total trading volume of Guangdong was approximately 953.5 kilotons. However, the Trading Volume degree of concentration was 99.89%, and the trading value degree of concentration was 99.99%, both the highest of all the pilots. So in terms of liquidity, Guangdong is not high given that nearly half of the time no transactions take place during trading days. Further, on days when trading does occur, volume and value are concentrated within a handful of days.

Hubei opened its ETS later. However, the trading volume and value of Hubei were both biggest, 7.0 million tons, 167.4 million RMB respectively. The trading volume degree of concentration was 42.93%, the trading value degree of concentration was 54.73%, with both values lowest of all the pilots. As its demand for carbon credits is steady rather than volatile, Hubei's trading activity appears quite balanced. As a result, the Hubei ETS allows for more reliable prediction as well as decision-making.

Shanghai's carbon trading volume reached 1.97 million tons, while trading value reached 75.36 million RMB. The average price in the market was 38.26 RMB. The trading volume degree of concentration and trading value degree of concentration were both more than 86%. Therefore, Shanghai's exchange activity is high and quite volatile.

Tianjin's trading value was about 20.5 million RMB, and trading volume was 1.01 million tons. Tianjin's average price was 20.23 RMB/ton, the lowest of all the pilots. The trading volume degree of concentration was 93.43% and trading value degree of concentration was 90.27%. The trading activity was smaller than other pilots and exchanges occurred mostly during several intensive days, showing that Tianjin's ETS is relative "quiet".

The trading volume of Shenzhen was approximately 1.8 million tons, equivalent with Shanghai, and Trading value was approximately 112.2 million RMB, following

Hubei. The settlement price was the highest of all the pilots, namely 61.9 RMB/ton. As the allowances allocated in the Shenzhen ETS were less than the demand for carbon credits, regulated entities had to pay a higher price for allowances to offset their emissions. Observed from exchange intensive degree indices, both were at approximately 87%. Exchanges happen intensively and on almost all days that the market is open.

Finally, trading on Beijing's exchange had reached 1.08 million tons, which was more than Tianjin and Guangdong. Benefiting from a higher average price of 60 RMB per ton, the trading volume had reached 63.87 million RMB. The trading value degree of concentration was 88.08% and trading volume degree of concentration was 89.18%, so trading happened relatively intensively.

2.1.2. Overview of the Compliance of the ETS Pilot Regions

At present, a total of seven domestic ETS pilot regions are in operation, including Hubei and Chongqing which have not yet received surrendered permits. Therefore, this section focuses instead on the remaining five regions - Shanghai, Guangdong, Shenzhen, Tianjin and Beijing.

Table 2-2 2014 overview of pilots that have completed compliance

Pilot Region	Compliance Period	Actual Compliance	Regulated Entities	Compliant Entities	Surrendered Ratio
Shanghai	6/1-6/30	6.3	191	191	100%
Guangdong	6/2	7.15	184	182	98.91%
Shenzhen	6/2	6.3	635	631	99.37%
Tianjin	5/31	7.1	114	110	96.49%
Beijing	6/15	6.27[8]	415	403	97.10%[9]

Data: collected from pilot regions, DRCs and desk research by Environomist

Shanghai and Shenzhen completed compliance on time and have the highest compliance rates of all the pilot areas. Guangdong and Tianjin postponed their compliance deadlines to July. The overall compliance results were good, although a

[8]6.27 this date is the regulated surrendered date in BDRC (2014) NO.1300 Document, but actually many units surrendered after 6.27, detailed surrendered time no formally declare.
[9]97.1% this data publicized on BDRC website on Sep.25th, 2014, without detailed list of units didn't surrender.

few individual enterprises did not comply with the ETS requirements. Similarly, Beijing also postponed its deadline, issuing a new June 27th compliance deadline. The official date for full compliance has not been announced, however, as several companies completed their performance after June 27th. This can be partly explained by the fact that Beijing's ETS features a number of large and unique regulated entities. This will be further explained in section 2.1.3.

2.1.3. Reasons for Non-Compliance of Regulated Entities

2014 marked the first year for pilot provinces to meet the requirements of the ETS regulations. As a result, regulated entities may have had limited relevant experience in working under such regulations. There are also additional reasons for the non-compliance of regulated entities.

Table 2-3 Enterprises failing to meet compliance and reasons why

Pilot Region	Non-compliant enterprises	Reasons for non-compliance
Shenzhen	Jianxin Electron (Shenzhen) Ltd.	Allowances were not sufficient but hadn't bought in secondary market[55], detailed reason unknown.
	Xincheng Plastic Electrical (Shenzhen) Ltd.	
	Shenzhen Ximan Plastic Package Ltd.	
	Yunfeng Electronics Technology (Shenzhen) Ltd.	
Guangdong	Huazhou Darong Cement Ltd.	Unknown
	Lechang Changxin Wear-resistant Material Ltd.	1、Relative lack of business capital 2、Principal thought enterprise did not meet the standard for control 3、Lack of environmental awareness 4、Knew little about the ETS 5、Disagreed with the method for purchasing allowances[56]
Tianjin	Tianjin Daqiang Iron and Steel Ltd.	Unknown
	Tianjin Qunxin Iron and Steel Ltd.	Stopped production during the year, on the verge of bankruptcy, had no resources to consider ETS
	Tianjin Jinhua Chemical Plant	1、Small-scale, no specialized post and professional 2、Blind to emissions procedures 3、Principal thought enterprise did not meet the standard for control

		4、No material punishment, indifference[57]
	Tianjin Qinmeida Industrial Ltd.	Unknown
Beijing	Twelve Units, no lists	1、No fixed staff participating in training, didn't convey upward, principal didn't grasp the issues 2、Enterprise leaders indifferent[58] 3、Covered too many government institutions, facing many demands on limited budget[59]

Data: desk research by Environomist

2.2. Enterprises Carbon Trading Capacity Survey

2.2.1. Pilot Region Survey Results

This survey was completed using the online questionnaire platform "Diaochapai", operated by Environomist. The areas covered included: Basic Information of Enterprise (1 - 5), Carbon Asset Management Ability (6 - 13), Trading Ability (14 - 22), Trading Market (23 - 36), and Carbon Trading Outcomes (37 - 43). There were 99 enterprises participating in this survey from December 24th, 2014 to January 19th, 2015. There were 43 questions in the questionnaire, included as an Appendix to this report, and the results will be summarized and analyzed in this section. In Table 2-4, questions and their requirements or introductions are highlighted in green, while the frequency and ratio of responses are colored gray (question 43 only lists elements and their average score). Questions 15, 17, 18, 23, 36, and 38 – 42 were multiple choice, so the sum of answer frequencies is not equal to 99, and the sum of answer ratios is larger than 100%.

Table 2-4 Quantity and ratio of answers in questionnaire responses

1. Enterprise Type		
Private	44	44.44%
State-owned	20	20.20%
Collectively-owned	20	20.20%
Joint venture	12	12.12%
Other	3	3.03%
2. Established Period		
5-10 years	45	45.45%
More than 10 years	32	32.32%
3-5 years	20	20.20%
0-3 years	2	2.02%
3. Staff Size		
100-300	30	30.30%
More than 500	28	28.28%
300-500	26	26.26%
Less than 100	15	15.15%
4. Industry		
Non-metallic mineral products	35	35.35%
Petrochemical	16	16.16%
Futures company	10	10.10%
Consulting company	8	8.08%
Spinning, papermaking	5	5.05%
Iron and steel	5	5.05%
Security company	5	5.05%
Electricity, heat production	4	4.04%
Nonferrous metals	4	4.04%
Bank	2	2.02%
Tourist hotels, market, realty business and financial office buildings	2	2.02%
Air transport	1	1.01%
Private equity financing	1	1.01%
Investment management	1	1.01%
Transportation station	0	0.00%
Trade	0	0.00%
5. Engagement with ETS		
Regulated enterprise	53	53.54%
Voluntary enterprise	46	46.46%
6. Established carbon management department?		
None	29	29.29%
Set up carbon management department under the environment department	26	26.26%
Other	16	16.16%

Set up carbon management department	14	14.14%
Set up carbon management department under development planning department	14	14.14%
7. Function of carbon management department (multiple choice)		
Responsible for analyzing the carbon policy and standard	72	72.73%
Responsible for carbon emissions projects management	71	71.72%
Responsible for carbon finance and carbon trading	56	56.57%
None	22	22.22%
Other	0	0.00%
8. Equivalent level for position of carbon management department director		
Department head	43	43.43%
Above deputy general manager	36	36.36%
Chief inspector	20	20.20%
Chief engineer	0	0.00%
Other	0	0.00%
9. Number of staff in carbon trading department		
Less than 3	59	59.60%
More than 5	26	26.26%
3, 4, 5	14	14.14%
10. Carbon trading personnel arrangement situation		
By the agent of other jobs	66	66.67%
Dedicated part-time jobs	23	23.23%
Dedicated full-time jobs	10	10.10%
11. Whether carbon trading personnel have experience of carbon trading or other environmental financing?		
(If more than one carbon trading personnel, the longest experience should be chosen)		
Less than 1 year	58	58.59%
1-3 years	24	24.24%
More than 5 years	8	8.08%
3-5 years	6	6.06%
None	3	3.03%
12. Whether senior management or board has set a carbon management strategy for the enterprise?		
Yes, senior management	92	92.93%
Yes, board	4	4.04%
None	3	3.03%
13. When encountering a problem of deviation from the plan in the process of trade implementation, are there any regulations on the responsibility and authority of traders?		
Need to ask for instructions to general manager when meeting problems	39	39.39%
Need to ask for instructions to the department manager when meeting problems	34	34.34%
There is no clear system	23	23.23%

Traders have biggest permissions	2	2.02%
Need to ask for instructions to the top manager for each trade	1	1.01%
Need to ask for instructions to the board when meeting problems	0	0.00%
14. Whether carbon trading staff understand carbon trading policy to a high degree?		
No	59	59.60%
Yes	40	40.40%
15. What channels does the enterprise use to understand carbon trading policy? (multiple choice)		
Government documents	95	95.96%
The third party service agency	92	92.93%
Convention and exhibition forum	50	50.51%
Competitors	21	21.21%
Website	8	8.08%
Other	0	0.00%
16. How many times a year does the enterprise train carbon trading staffs?		
1-2 times	57	57.58%
3-5 times	19	19.19%
More than 5 times	13	13.13%
0	10	10.10%
17. Content of training for carbon trading staff (multi-choice)		
Carbon trading policies and regulations	87	87.88%
Carbon trading theory	79	79.80%
Carbon emissions measurement	66	66.67%
Procedure of accepting verification	59	59.60%
Carbon emissions monitoring	58	58.59%
Emissions reporting	57	57.58%
Carbon trading operating system	54	54.55%
Emissions data registering system	50	50.51%
Carbon assets management	48	48.48%
18. Training method used to train carbon trading staffs (multi-choice)		
Domestic specialists training on location	90	90.91%
Self-study	36	36.36%
Foreign specialists training on location	6	6.06%
Other	3	3.03%
Training online	1	1.01%
19. Performance indicator of carbon trading management		
None	79	79.80%
Carbon emissions reduction of enterprise this year	8	8.08%
Trading profit and loss of enterprise this year	7	7.07%
Other	5	5.05%
20. What relevant reward measures are used in carbon trading management? (If none, jump to 22)		
None	88	88.89%
Material reward	9	9.09%

Non-material reward	2	2.02%
21. Who are the beneficiaries of reward measures in carbon trading		
Both	10	10.10%
Relevant department manager	1	1.01%
Relevant department general staff	0	0.00%
22. Does the enterprise designate a certain amount of funds for carbon trading?		
No	85	85.86%
Yes, proportional annual earnings	13	13.13%
Yes, fixed amount	1	1.01%
23. The aim of the enterprise participating in carbon trading (multiple choice)		
An investment consideration	72	72.73%
Just implement emissions goal	64	64.65%
Improve enterprise social image	15	15.15%
Other	2	2.02%
24. Has the enterprise formulated carbon emissions reduction goal for 2014-2015?		
No	47	47.47%
Just participate in trading, need not reduce emissions	35	35.35%
Yes	17	17.17%
25. The allowance volume held by enterprise in 2014 implementation period		
Shortage, the insufficient need to buy	38	38.38%
Non-regulated enterprises, just participate in trade	37	37.37%
More than needed, the redundant can be sold	24	24.24%
26. The allowance volume held by enterprise for compliance period 2015 to 2017		
More than needed, the redundant can be sold	47	47.47%
Non-regulated enterprises, just participate in trade	31	31.31%
Shortage, the insufficient need to buy	21	21.21%
27. Does the enterprise need a tool which would predict allowance holding situation automatically?		
No	63	63.64%
Yes	36	36.36%
28. Does enterprise formulate a budget in relation to carbon trading?		
Trading budget: capital for trading		
No	56	56.57%
Fixed amount	32	32.32%
Proportional annual earnings	11	11.11%
Compliance budget: capital outside trading, such as carbon accounting, software tools, panel, outsourcing service, etc.		
No	56	56.57%
Fixed amount	39	39.39%
Proportional annual earnings	4	4.04%
29. Does your enterprise intend to sign a contract with specialized institutions or agents for allowance management by consignment or outsourcing?		

Yes, enterprise need large amount of specialized professional, financial resources, material resources and time to establish a carbon management department	48	48.48%
No, but enterprise could communicate with carbon management Service Company to seek consulting services	48	48.48%
No	2	2.02%
Temporary not decided	1	1.01%
30. Please indicate the costs of the main elements for the enterprise in carbon trading		
Allowance that enterprise holds		
1-5 million tons	38	38.38%
Less than 1 million tons	26	26.26%
More than 10 million tons	19	19.19%
5-10 million tons	16	16.16%
Trading costs (including handling charge or agency charge)		
Less than 10 thousand RMB	33	33.33%
10-50 thousand RMB	25	25.25%
None	20	20.20%
More than 100 thousand RMB	17	17.17%
50-100 thousand RMB	4	4.04%
Certification costs		
None	39	39.39%
10-50 thousand RMB	34	34.34%
50-100 thousand RMB	14	14.14%
More than 100 thousand RMB	9	9.09%
Less than 10 thousand RMB	3	3.03%
Other relevant consultant costs		
More than 100 thousand RMB	38	38.38%
10-50 thousand RMB	33	33.33%
50-100 thousand RMB	21	21.21%
Less than 10 thousand RMB	5	5.05%
None	2	2.02%
31. Does the enterprise conduct full accounting of costs associated with carbon trading?		
Government authorities haven't informed of the accounting methods	90	90.91%
Government authorities have informed of the accounting method	9	9.09%
32. Frequency of enterprise assessing or predicting allowance holding amounts before next implementation period?		
Once a year	57	57.58%
Never	26	26.26%
Once a month	7	7.07%
One time every half year	5	5.05%
One time each season	3	3.03%
Once a week	1	1.01%

33. Will the enterprise be willing to sell or buy the residual allowance quantity got from assessing or predicting?		
Yes	95	95.96%
No	4	4.04%
34. Does the enterprise need a tool which could lock the price and amount of future allowance?		
Yes	97	97.98%
No	2	2.02%
35. Do you worry about a situation where there is not enough transaction parties when you carry out allowance trading?		
Yes	96	96.97%
No	3	3.03%
36. Does your enterprise participate or intend to participate in bulk commodity trading?		
None	52	52.53%
Coal	28	28.28%
Heavy metal	25	25.25%
Crude oil	21	21.21%
Natural gas	21	21.21%
Agricultural products	14	14.14%
Other	14	14.14%
37. Have carbon emissions reduced year-to-year after participating in carbon trading?		
No	52	52.53%
Non-regulated enterprise, participate only in trading	33	33.33%
Yes	14	14.14%
38. What advantage could be obtained from carbon trading? (multiple choice)		
Selling surplus allowance to obtain profit	94	94.95%
Reduce enterprise's emission reduction cost	64	64.65%
Contribute to obtain green financing	59	59.60%
Improve enterprise image and popularity	10	10.10%
Other	0	0.00%
39. What difficulties the enterprise is faced with? (multiple choice)		
Difficult to predict development tendency on allowance price	95	95.96%
No specialized professional understanding carbon asset management and carbon trading	90	90.91%
Policy is not bright and clear, lack of relevant information	84	84.85%
Unfamiliar with the trading regulations and strategy of carbon market	75	75.76%
Difficult to predict future carbon emission situation and carbon emission reduction potential	73	73.74%
Economic cost of energy consultation and emission reduction is too high to undertake	27	27.27%
Other	1	1.01%
40. What lessons does the enterprise expect to learn? (multiple choice)		
Strategy and experience of carbon emissions trading	91	91.92%

Well practice and experience of carbon asset management	81	81.82%
Preparation work of participating in carbon trading	79	79.80%
Experience of international carbon market	68	68.69%
Policies and regulations of carbon trading	61	61.62%
Function and operation method of exchange trading system	60	60.61%
None	3	3.03%
Other	0	0.00%
41. What approaches does the enterprise expect to obtain relevant information? (multiple choice)		
Domestic experts training on location	92	92.93%
Foreign experts training on location	48	48.48%
Online training	5	5.05%
Other	3	3.03%
Telephone counseling	2	2.02%
42. What methods does the enterprise use to publish carbon trading outcomes and other relevant information?		
Participant in relevant questionnaire	51	51.52%
Other	43	43.43%
Annual report	9	9.09%
Social responsibility report	7	7.07%
Environmental report	3	3.03%
Sustainable development report	1	1.01%
43. Please choose the operating complexity of each element during the compliance period		
Designing trading plan	9.3	10 (very hard)
Allowance allocation and management	8.6	
Accepting compliance examination and verification	4.8	
Procedure of accepting verification	4.0	
Carbon emission monitoring	3.8	
Carbon emission report	3.7	
Registration system	3.5	
Trading operation system	3.0	1 (very easy)

2.2.2. Analysis of Questionnaire Results

The following analysis derives from the results presented in Table 2-4. Given the sample size, the full picture for enterprises around China is not represented here, and the range of experts consulted for this research is limited. This analysis, therefore, can serve only as a reference for assessing the capacity for carbon trading in each region

at the current time.

2.2.2.1.Enterprise Basic Information

Question 4 in Table 2-4 showed that enterprises in the non-metallic minerals and petrochemical industries, the traditionally energy-intensive sectors, respectively accounted for 35.35% and 16.16% of the enterprises participating in this survey, or 51.51% overall. There were 19 enterprises in the financial industry, accounting for 19.19%. The development of the carbon market was reflected to some degree in the enthusiasm that financial institutions placed on carbon trading.

Figure 2-4 shows the distribution of enterprises. Enterprises in the major pilot regions of Shanghai and Guangdong were best represented, together accounting for 41% of the enterprises that participated in the survey. 27% of the enterprises surveyed were from non-pilot regions, including 6% from Shandong.

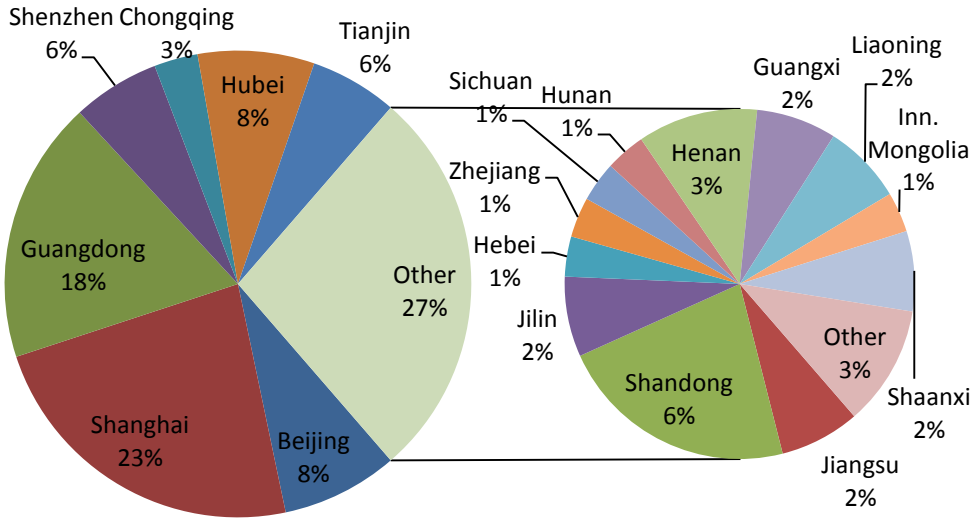


Figure 2-4 Distribution of enterprises participating in the survey

The number of ETS regulated enterprises was 53 and the number of voluntarily participating enterprises was 46. Their distribution is shown in Figure 2-5. The region with the most voluntary enterprises surveyed was Shanghai (14). The highest number

of regulated enterprises participating in the survey was in Guangdong (18). Enterprises from non-pilot regions were mainly voluntary participants (26).

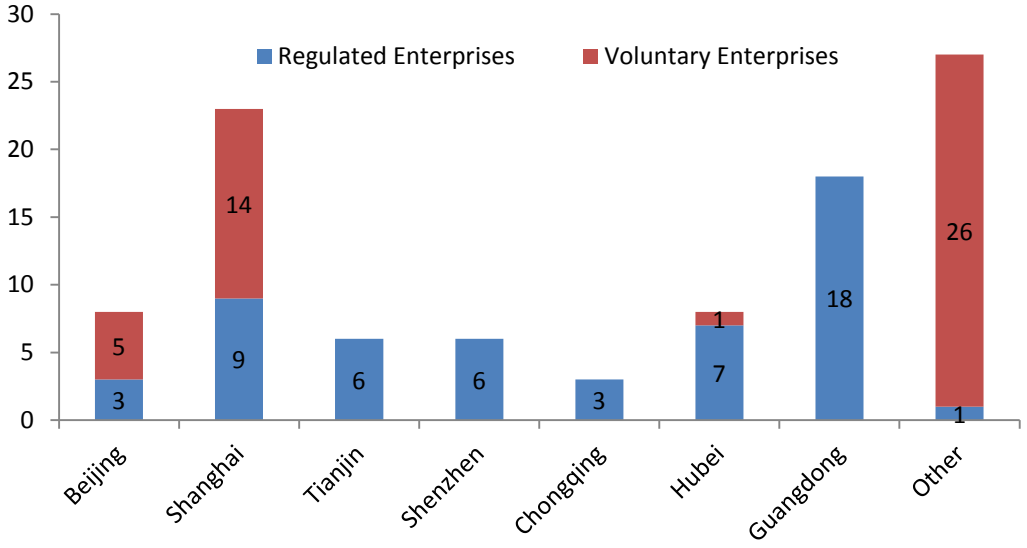


Figure 2-5 Distribution of enterprises in each region

2.2.2.2. Carbon Management Capability

Twenty-five percent of enterprises participating in this survey had not established carbon management departments, while the main functions of carbon management departments that were established was analyzing carbon policies and standards as well as management of carbon emissions reduction projects. Enterprises with full-time carbon trading personnel accounted for just 10% of the total, and enterprises employing personnel with more than 3 years of experience only accounted for 15%. Senior management of almost all enterprises had formulated macroscopical carbon management strategies, however the duties and authority of traders had not been supported sufficiently.

In summary, while preliminary plans for carbon management had been made, the establishment of carbon management departments and professional carbon trading

personnel was still at an early stage, meaning that the autonomous capabilities for carbon management were not mature.

2.2.2.3.Carbon Trading Capability

The channels for these enterprises to understand carbon trading policies were primarily through either government documents or third-party service agencies. Carbon trading personnel from 40% of enterprises surveyed understood carbon trading policies very well. 67.68% of all enterprises trained their carbon trading personnel less than 3 times a year. The main training approach used was domestic specialists training on location and the content primarily involved relevant knowledge on carbon trading policies, regulations and carbon trading theories. About 80% of enterprises did not set carbon trading performance indicators, 85% had no rewards for carbon trading, and 85% did not designate a certain budget for carbon trading.

In summary, carbon trading personnel mostly understood the basic knowledge needed for the early stage of the carbon market. However, they were still not familiar with detailed operational processes, and indicators for performance appraisal and financial support were insufficient, meaning that carbon trading personnel were yet to be motivated to fully carry out their role.

2.2.2.4.Trading Market

Enterprises participating in the survey saw carbon trading as an investment consideration, and they assumed that emissions goals are simply a compliance requirement. 17% of enterprises had formulated an emissions reduction goal for 2014-2015. In the next 3 years, according to the results, the enterprises whose allowances will be in surplus and could be sold will increase by about 23%, and those whose allowances will be in shortage, requiring purchasing, will decrease by about 17%. Almost all enterprises would like to cooperate with specialized carbon asset management agencies, of which half could be escrow and another half could be

consultants. The main expenditure for enterprises was generated on consultant services and trading expenses, while verification expenditure were relatively less. Enterprises were unaware, however, of how to manage expenditure through accounting treatment. About 83% enterprises barely assessed their allowance holding quantity and almost all enterprises wanted a tool which could help them to predict carbon price and allowance quantity. Almost all enterprises would like to trade residual allowances, but worried that there were not enough counterparts. Enterprises which had experience in staple commodity transactions were less than 50% of the total.

In summary, almost all enterprises hope to earn economic benefits through carbon trading, but they had no microscopical plan on carbon management and carbon trading. A possible cause of this phenomenon is a lack of carbon management and carbon trading capabilities, meaning that enterprises hope to cooperate with third-party service agencies or adopt professional tools in order to realize their intentions. Third-party service agencies could assist enterprises in understanding the carbon market, as well as to promote carbon management and carbon trading capacity through training. However, the more important thing could be the establishment of perfect carbon trading system, responsibility for which rests with the government. If the appropriate accounting methods can be established, the risks that enterprises face in the future could be reduced.

2.2.2.5.Carbon Trading Outcomes

Less than 15% of enterprises' carbon emissions decreased after participating in carbon trading and 95% of enterprises believed that carbon trading could result in profits, as well as reduce the cost of emissions reduction and help to obtain green financing. The main difficulties for enterprises were: predicting allowance price trends, unclear policies, and lack of carbon management and trading talents. During the compliance period, designing a carbon trading plan and allocating and managing

allowances were the most difficult aspects for enterprises.

In summary, profit maximization was the key motivation that enterprises identified, which is a constant consideration for companies, so the corrective mechanism of a carbon market could accelerate the reduction of carbon emissions. Third-party agencies should grasp the opportunity of the early period of the carbon market and urge enterprises to build capacity for carbon trading, then help to train a group of carbon management and trading professionals for enterprises. There will inevitably be a great many policy documents published in the preparatory stage of the national carbon market during 2015, so enterprises should consistently pay close attention to policy trends and make appropriate preparations for a national carbon market during the 13th Five-Year Plan period.

Guest Comments

Development of IT for Carbon Management

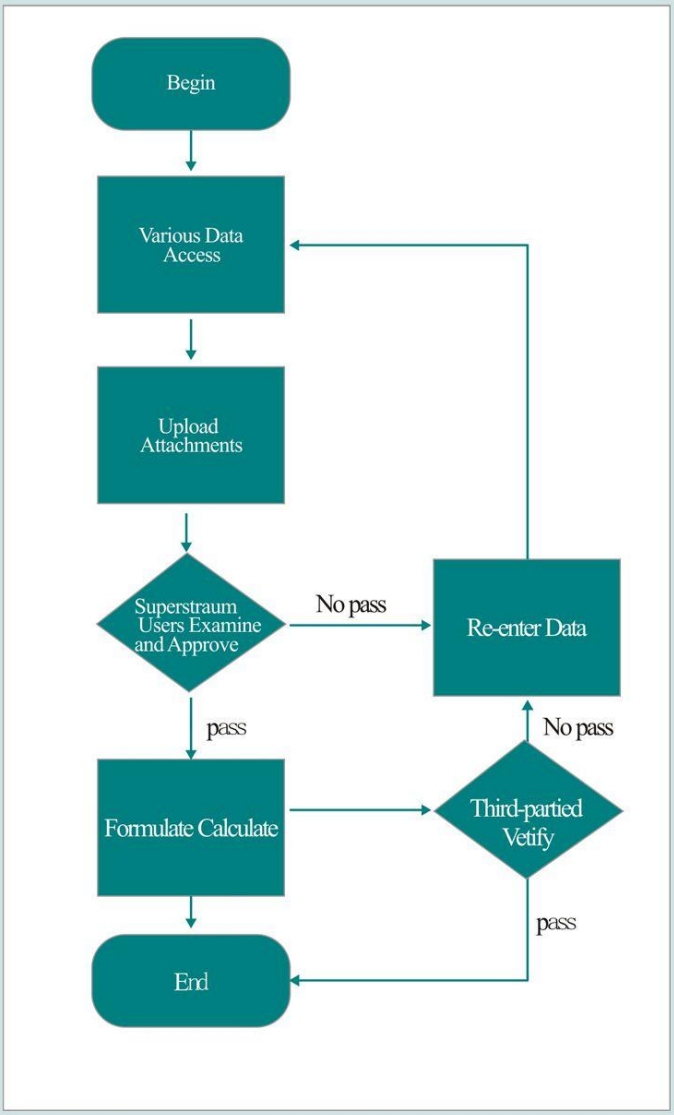
So far, on the global enterprise and government level, IT technology development for carbon management relatively lags behind. Even now most carbon data interrogation and examination still relies on Excel. This situation means that enterprises encounter problems in carbon management, such as high costs and low efficiency. In the future, therefore, development of IT in carbon management will directly influence the speed of society-wide low-carbon development.

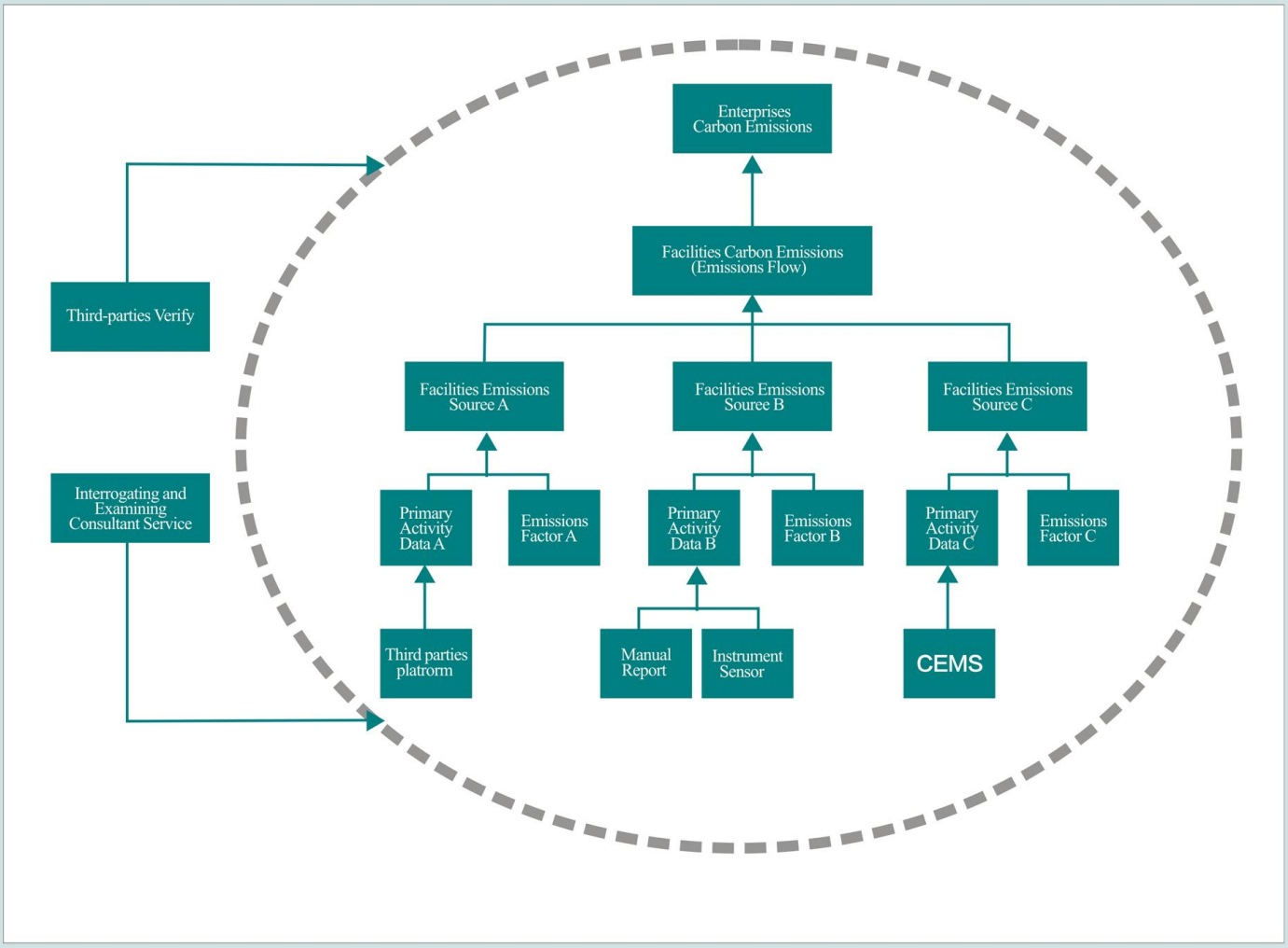
Firstly, IT can help solve all of the demands of MRV. That's the whole procedure of terminal data input – sourcing data to calculate carbon emissions – calculation and results verification – reporting verified results. At present the software in the market often only satisfies the demands of one of these links. So, if an organization requires high-level analysis (for example a local government needs to manage the region's entities, or a bank wants to follow its carbon loan portfolio), the complex statistics, classification, display and other functions are still lacking.

Software system design should simple, convenient and safe for businesses to use, while more professional operation allows higher-level users or professional consultants to conduct deeper analysis. This caters to each user's advantages, improving efficiency. Letting such software systems reach their potential for saving labor costs will help create safe and efficient low-carbon industries. The following is a summary of the ideal carbon management IT system framework in practice.

Procedure Management

Software system operation should conform to a low-carbon industry work procedure: ①enterprises user collect emissions data ②high-level users examine and approve data ③third parties provide verification.





Consolidated Access

Software systems provide access to various data, such as third party platforms, instrument sensors, CEMS (Continuous Emission Monitoring System), and manual reporting. You can collect original information on various regulations, and produce a final calculation of CO2 equivalent emissions.

Dispersed Work

Use the software can provide a year-round digest for MRV (Monitoring Reporting and Verification), not just for an intensive one or two month period.

Profile

Mr. Lang Jian now is Senior Consultant of IT Group of Environomist, meanwhile he is IT Technical Director of Environomist ECMS.

Mr. Lang Jian have more than ten years professional experience on using charging, statistical IT technologies in financial and educational field. Before joining Environomist, he exploited and carried out dozens specialized system as main technical director. After joining, he brings his experience in low-carbon management IT system, and leads exploit the global first MRV system satisfying whole standards. Mr. Lang Jian graduated from Software Engineering Major of Jilin University.

2.3. Recommendations for Resolving Challenges Facing Regulated Entities

By analyzing the reasons for non-compliance in section 2.1.3, as well as the carbon trading capabilities of enterprises participating in the questionnaire, several pertinent suggestions can be put forward as follows:

- Carbon management consciousness should be promoted at the management level of enterprises and carbon management strategies should be formulated in advance.
- Specialized carbon management departments should be established and relevant functions and authorities should be delegated.
- Professional carbon trading personnel should be fully equipped and training should be provided to them at regular intervals, so they can absorb the necessary knowledge and trading abilities can be strengthened.
- The enthusiasm of carbon management and carbon trading personnel should be promoted according to performance and with relevant reward measures.
- Carbon management service companies should be consulted or carbon assets could be managed by outsourcing or consignment if there are insufficient professional personnel in the enterprise at the time.

  The carbon management and carbon trading capabilities of enterprise should be promoted quickly, so that policy trends can be focused on and enterprises can develop their awareness of energy-conservation, emissions-reduction and de-carbonization.

3. The Role of Financial Institutions in the Present and Future ETS

Observing the performance of the ETS pilots in 2014, it is clear that the carbon market in China requires further promotion. Learning from successful cases in establishing carbon markets internationally, the involvement of financial institutions is

necessary throughout the carbon trading cycle. This will increase the liquidity of the carbon market and allow for better price discovery. This chapter introduces the role of financial institutions in the present carbon market and predicts its changing role in the future. It concludes by suggesting a role for Public Private Partnerships (PPP) and analyzing its application within low-carbon development.

3.1. The Role of Financial Institutions in the Present Carbon Market

Currently, financial institutions usually participate in the carbon market by establishing partnerships with carbon trading platforms. Meanwhile, in order to promote their own carbon finance businesses, the institutions develop carbon market oriented financial instruments.

3.1.1. Cooperation between Financial Institutions and Trading Platforms

The cooperation between financial institutions and trading platforms can be divided into the following three categories: Firstly, financial institutions act as depositary clearing banks for trading platforms, providing a service for depositing and clearing carbon trading capital; Secondly, financial institutions and trading platforms sign cooperation agreements, including letters of intention on providing credit support; Thirdly, financial institutions are trading platform members, mainly working on product trading as brokers.

Table 3-1 Cooperative agreement between financial institutions and trading platforms

Financing Institutions	Beijing	Guangdong	Shenzhen	Tianjin	Shanghai	Hubei	Chongqing
China Everbright Bank	Strategic Member						
China Construction Bank	Escrow Bank		Cooperation Agreement, Escrow Bank	Member	Escrow Bank	Escrow Bank, Credit Agreement	
Bank of Communications					Carbon Trading Member		
China Minsheng Banking Corp, Ltd.	Strategic Member					Escrow Bank, Credit Agreement	
Shanghai Pudong Development Bank	Strategic Cooperation Agreement	Intention Credit Agreement, Escrow Bank	Strategic Cooperation Agreement, Escrow Bank	Strategic Cooperation Agreement, Escrow Bank	Strategic Cooperation Agreement, Escrow Bank	Credit Agreement	Strategic Agreement
Industrial Bank Co, Ltd.		Intention Credit Agreement, Escrow Bank	Cooperation Agreement, Escrow Bank	Strategic Cooperation Agreement, Escrow Bank	Strategic Cooperation Agreement, Escrow Bank	Escrow Bank, Credit Agreement	Cooperation Agreement
China Merchants Bank							Escrow Bank
Bank of China			Escrow Bank		Carbon Trading Member		
China Citic Bank			Escrow Bank		Strategic Cooperation Agreement		

Data: desk research by Environomist

Guest Comments

IFC's Approach to the Carbon Market in China

IFC has more than a decade of experience with the global carbon market as a fund manager, equity investor, innovator of carbon instruments, and advisory engagements. The healthy development of the carbon market in China is a high priority of IFC and World Bank Group (WBG) who can assist China in establishing the necessary market infrastructure and enabling policy frameworks and regulations. The IFC approach to the emerging carbon market in China is strategic and complementary to the efforts of the World Bank, other IDIs, the EU, and bilaterals.

China needs a vibrant carbon market, enhancement of market liquidity, and markets for Futures, Options, and Spot products. This, in turn, requires:

⊙enabling financial, regulatory and policy frameworks;
⊙active market aggregators, Financial Institution intermediation, professionalized exchange platforms;
⊙strategic international partnership and access to world-class experiences and experts to leapfrog market development.

The primary focus of IFC in the regional ETS pilot and national ETS preparatory phase of the market (2013-2015) is on overcoming barriers to trading. IFC will initially support market-building though advising and partnering with select local emissions trading pilots and emissions trading exchanges. In the next market phase (2016-2018), as market momentum continues to grow in China, IFC's engagement will primarily provide investment products and solutions tailored to the market and market players.

Phase I: Capacity-Building and Technical Assistance to Select ETS Pilots and FIs

Currently, the ETS pilot exchanges in China may only offer Spot transactions. Emissions trading will remain severely limited if regulation only allows Spot trading to occur. IFC finds that gaining real and actual experience with derivative products during the pilot phase will be fundamentally important and is working closely with the China Emissions Exchange in Shenzhen (CEEX) and 1-2 banks to develop emissions trading products that will further mature this carbon market pilot. Based on international experience, non-Spot products are critical to market volume and liquidity, which in turn are two critical factors in ensuring a robust market. Specifically, it will be important to gradually move towards a Futures market in order to increase liquidity and transactions volume in a carbon market. IFC is working with CEEX to review, design, test, and evaluate 1-2 innovative trading products to that end, and to prepare the consolidation of the pilot schemes into a national market later.

It is to be expected that the majority of Chinese companies will trade with the help of intermediaries; only large emitters will trade directly at an exchange. Financial institutions (FIs) therefore will be in a position to offer trading-related services to clients, as well as advisory service products subject to mandatory CO2 regulation. As the market matures, IFC will also aim to build the capacity of 2-3 FIs to manage CO2 price risks to their portfolios, and to offer carbon advisory, brokerage and potentially risk management products and services to their clients.

Phase II: Investment Support to Increase Trade, Liquidity and Efficiency

As momentum continues to increase around ETS in China, liquidity and market efficiency will become increasingly important. IFC investment opportunities will emerge from a mature and well-defined Chinese carbon market following successful market-building in Phase I. Four areas of opportunities may emerge as potentially attractive for investment: (i) equity investments in environment and energy exchanges; (ii) FI funds and facilities to provide loan capital to climate-smart investments to meet companies' compliance needs; (iii) carbon funds to invest in projects that generate offsets eligible for compliance under a Chinese ETS; and (iv) tailored carbon delivery guarantee products. If necessary and justified, investment products may be combined with risk-sharing facility structures, concessional financing, etc.

Profile

Lasse Ringius: IFC Senior Carbon Finance Specialist

Lasse Ringius has more than 20 years of global experience across a range of carbon, climate and clean energy sectors. Since 2009, Senior Carbon Finance Specialist in the Climate Change Group at IFC where Lasse leads IFC's emissions trading advisory work, products to mobilize climate finance resources, investments in programmatic vehicles for carbon credit generation, and the energy access space. Prior to this assignment, transactions team leader for CDM projects at the World Bank; Senior Researcher at UNEP Center on Energy and Environment, Denmark; and Research Director at CICERO, Norway. Ph.D. obtained from the European University Institute, Florence Italy, and visiting scholar at Massachusetts Institute of Technology, USA.

3.1.2. Financial Instruments

China's carbon market progressed steadily during 2014. Since carbon trading was initiated in the pilot areas, trading platforms and financial institutions have been further exploring their own carbon market products and developing various trading and financial instruments. The financial instruments existing in the current carbon market mainly include: green credits, carbon funds, carbon bonds, and carbon finance structured deposits.

Table 3-2 Financial instruments in emissions trading

Financial Instruments		Financial Institution	Signed Date	Signatory	Key Content
Green Credit	Carbon Asset Collateral Loan	Industrial Bank Co, Ltd.	Sep.9th, 2014	Hubei Yihua Group Co., Ltd.	40 million RMB, no other collateral condition
		China Construction Bank	Nov.26th, 2014	Huaneng Wuhan Power Generation Ltd.	300 million RMB, some allowance and most enterprises fixed assets
		China Everbright Bank	Nov.26th, 2014	Hubei Jin'ao Technology Chemical Ltd.	100 million RMB, 10% is Carbon asset collateral
		Bank of Shanghai	Dec.11th, 2014	Shanghai Baotan New Energy Environmental Protection Science and Technology Ltd.	5 million RMB, pledge guarantee was CCER, no other condition, which was the first CCER hypothecated loan in China
	International Carbon Factoring Business	Industrial Bank Co, Ltd.	N/A	N/A	No published
		Shanghai Pudong Development Bank	May 14th, 2012	Yunnan a Hydroelectric Project	30 million RMB, emissions reductions

	Green Credit Card	Industrial Bank Co, Ltd.	Jan. 28th, 2010	China Beijing Environment Exchange	China Low-carbon Credit Card (Windmill Edition)
			Jun. 1st, 2010	Shanghai Environmental and Energy Exchange	China Low-carbon Credit Card (Greenery Edition)
		China Everbright Bank	Mar. 2nd, 2010	China Beijing Environment Exchange	Green Carbon-free Credit Card
Carbon Funds		Shenzhen Jiatan Capital Management Co., LTD.	Oct. 11th, 2014	Shenzhen Emissions Exchange	The first Private Placement Carbon Fund in our country; Jiatan KaiYuan investment fund, trading object was CCER, scale was 40,000 thousand RMB, operation deadline was 3 years, investing on CCER projects of new energy and environmental protection; Jiatan KaiYuan Balance Fund, allowance, 10,000 thousand RMB, ten months, allowance special private placement fund, earnings by buying low selling high.
		Lion Fund Management Co., Ltd.	Nov. 26th, 2014	China Huaneng Group	30,000 thousand RMB, Carbon Emissions Special Assets Management Project Fund
Carbon Bonds		Shanghai Pudong Development Bank	May 12th, 2014	Shenzhen Emissions Exchange and China Guangdong Nuclear Power	CGNPC wind power additional carbon earnings medium-term notes, 1 billion RMB, 5 years
		China Development Bank			
		Industrial Bank Co, Ltd.	Sep. 16th, 2014	Industrial International Trust Co. Ltd.	2014 XingRMB Second Stage Green Financial Credit Assets Backed Security
		China Minsheng Banking Corp, Ltd.	Nov. 26th, 2014	Huadian Hubei Power Generation Co. Ltd.	2 billion RMB Carbon Bonds Intension Credit Agreement

Carbon Financial Structural Deposits	Industrial Bank Co, Ltd.	Nov. 27th, 2014	Kehui Electronics (Shenzhen) Co., Ltd.	On due date, beside interest income, not less than 1 thousand tons Shenzhen Carbon emissions allowance
Buy-back Financing	CITIC Security	Dec.30th, 2014	Beijing Huayuan Thermal technology co., LTD	The first buy-back financing agreement, financing total scale reached 13,300 thousand RMB.

Data: desk research by Environomist

3.2. Role of Financial Institutions in Future ETS

Domestic emissions trading schemes have only been operating since 2013 and experience with financial instruments in the carbon market is at an early stage. ETSs have been operating internationally, however, for about ten years. China's domestic schemes can look to successful international experience as a reference point in this regard.

3.2.1. Carbon Funds

Carbon funds, in this report, refer to specialized funds working on carbon asset trading, including both profit-driven and development funds. The concept of carbon funds was first proposed by the World Bank based on the need to develop the CDM. In 2001 the CDM implementation framework was identified in the Marrakesh Accords. Prior to this, in 1999, the World Bank launched the first global carbon fund with the goal of developing global carbon trading - the World Bank Prototype Carbon Fund (PCF). At that time, policy risk was still very high, and the investors were mainly the leading developed countries. Under the influence of the PCF, the structure of carbon funds invested through multilateral cooperation developed over subsequent years. Following the Marrakesh Accords in 2001, carbon funds gradually came to be dominated by individual national governments. The Kyoto Protocol became formally effective in 2005, and the CDM could be fully implemented. Private capital under the

premise of risk control began to flow and the market developed capital strength. Figure 3-1 presents the amounts and trends of carbon funds since 1999[10].

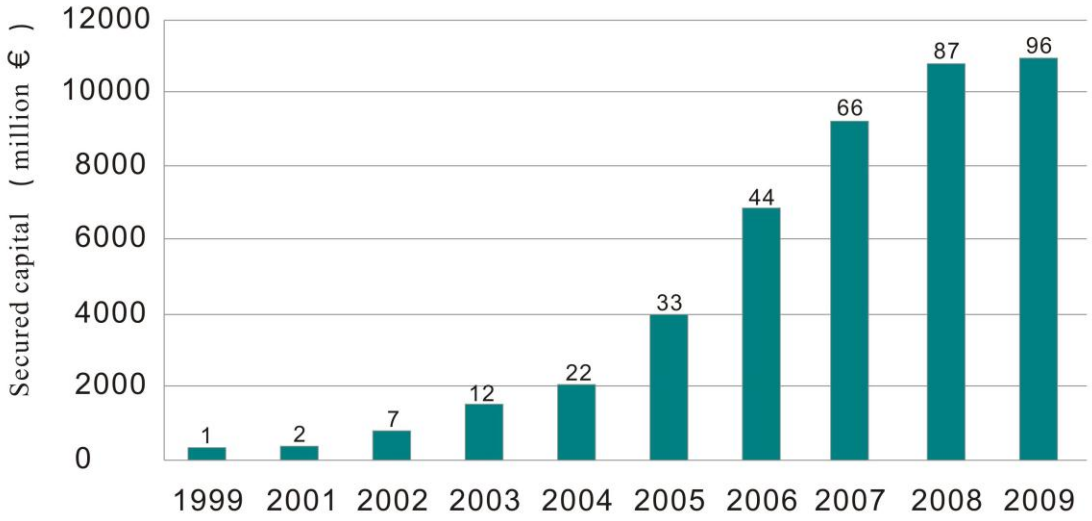


Figure 3-1: Annual volume of carbon funds in the market

Although there are quite a number of carbon funds in the global carbon market, most of their business models have been limited to CDM related business (see Further Readings), including CER trading and CDM project equity investment. But this kind of trading experience can be replicated in other areas, for example funds resulting from China's first published 'carbon emissions specialized assets management plan' (see Table 3-2).

In the next few years, China will inevitably see a period of rapid development of carbon funds, but not all will feature the same rules as in the early development of global carbon markets. Because they are not influenced by international law and domestic carbon-related professionals are relatively more abundant than in the early international market, China's carbon funds are likely to feature both state-owned capital and private capital developing at the same time. In view of their different resources and social advantages, it is state-owned capital rather than private capital that is likely to take the lead in large assets. This includes large power companies

[10] CDC Climate Research, based on data from Environmental Finance 2010, Point Carbon and funds' websites

buying CCER assets from new energy (especially wind and solar power). Meanwhile, private capital has advantages in flexibility, so it will be more focused on distributed energy and medium-sized CCER carbon assets.

Although the current conditions for the development of China's carbon funds are better than in the early international carbon funds markets, there are still some challenges that need to be overcome, including:

- The domestic legal framework is relatively loose. The legal basis for property rights of allowances or CCERs needs the support of legislation by the National People's Congress and local People's Congresses.
- Supportive finance and taxation policies, accounting standards for carbon assets and regulation of supporting policies remain to be proposed.
- There is an extreme lack of high-level professionals. Professionals with several years of carbon commodity trading and specialized industry knowledge need to be recruited and trained vigorously.
- There is a lack of risk control tools. Large amounts of capital entering the market need the support of risk control tools, which presently need to be developed, especially for data management and hedge trading.

Further Readings

The Major Carbon Funds of the World Bank before 2012

Major carbon funds involving the World Bank up to 2012. Most of these carbon funds are limited to the CDM.

Carbon Fund		Starting Time	Funders
The World Bank Prototype Carbon Fund (PCF)		2000	Canada, Finland, the Netherlands, Norway, Sweden, Japan International Cooperation Agency, and 17 companies
The World Bank Community Development Carbon Fund (CDCF)		2004	Australia, Brussels of Belgium, , Wallonia of Belgium, Canada, Denmark, Italy, Luxembourg, the Netherlands, Spain, and 15 companies
The World Bank Bio Carbon Fund (BioCF)	The first share	2004	Canada, Italy, Luxembourg, Spain, the French Development Agency, and nine companies
	The second share	2007	Ireland Environment, Heritage and Local Government, the Spanish Environment and Rural and Marine Affairs, the French Development Agency, and the four companies
The World Bank Netherlands the CDM carbon fund (NCDMF)		2002	Dutch Housing, Spatial Planning and the Environment
The World Bank Netherlands European carbon fund (NECF)		2004	The Dutch Ministry of Economic Affairs
The World Bank Italy carbon fund (ICF)		2004	Italian Environment, Land and Sea, and six companies
The World Bank Denmark carbon fund (DCF)		2005	Intergovernmental Panel on Climate and Energy of Denmark, and four companies
The World Bank Spain carbon fund (SCF)		2005	Spanish Environment and Rural and Marine Affairs, and the 11 companies
The World Bank umbrella carbon fund (UCF)		2006	Danish Carbon Fund, Italian Carbon Fund, the Prototype Carbon Fund, the Netherlands Clean Development Mechanism Fund, Spanish Carbon Fund, and 11 companies
The World Bank European carbon fund (UCF)		2007	Ireland Environment, Heritage and Local Government, the Belgian Flemish district government, the Government of Luxembourg, Portugal Carbon Fund, and a company
German Renaissance credit bank carbon fund (KfW)		2005	KfW of Germany and the Government of Germany jointly funded
Japan Carbon Fund (JCF)		2005	Japan Bank for International Cooperation and the Development Bank of Japan, and 31 companies

3.2.2. Carbon Emissions Linked Financial Products

When investing in low-carbon businesses, mainstream international banks mainly set up a fund to invest in low-carbon environmental projects or companies. These funds are mainly involved in funding companies' low-carbon consumption performance, participation in the carbon trading market, catastrophe bond market, or weather derivatives market, as well as alternative energy performance. Examples are provided in Table 3-3.

Table 3-3 International banks carbon-related financial products

Fund Type	The example of main participating funds
Low-carbon consumption performance	Dutch banking group linked to "ABN AMRO climate change and environment index" fund
	Dutch banking group launched the "ABN AMRO carbon accelerator" fund
	Deutsche Bank linked to "Deutsche Bank Climate Protection Fund" fund
	Deutsche Bank linked to "Deutsche Bank DWS Global Climate Change Fund" fund
Participation in carbon credit trading market	Barclays linked to "Barclays Global Carbon Index" fund
	The UBS Kelalideng People's Bank linked to "UBS Kelalideng CO2 emissions certification" of the fund
Participation in catastrophe bond market	UBS Bank Leu launched linked to catastrophe bonds market fund
	JPMorgan Chase linked to "Morgan environment index" fund
Participation in weather derivatives market	UBS linked to "global warming index" fund
Alternative energy performance	Credit Suisse Group launched linked to "Credit Suisse Global Alternative Energy Index" fund
	Linked to "UBS launched CS future energy fund" fund
	Dutch banking group linked to "ABN Amro Biofuels Index" fund

Data source: Wangyao. Carbon Finance Global Perspective and China Distribution [M]. China economic publishing house, 2010, 111[60]

3.2.3. Carbon Derivative Financial Instruments

With the expansion of ETS internationally, financial institutions have put forward various carbon trading-based financial derivatives including forwards, futures, options,

and swaps. Details are shown in Table 3-4.

Table 3-4 International carbon market financial products

Area	Name	Carbon Financial Products
Europe	London ICE[11]	EUA, ERU, CER futures options products
	European EEX	Power Spots, Power, EUAs
	Northern Europe NP	Power, EUA, CER
	BlueNext	EUA, CERs spots and derivative
	Climex	EUAs, CERs, VERs, ERUs, AAUs
America	Green Exchange	EUAs, CERs, RGGI, CCAS, VER/VCU, RECs
	Chicago CCX	Six kinds of GHG credit trading of compensation projects
	Chicago CCFE	Emissions allowance and relevant futures contract
Oceania	Australia ACX	CERs, VERs, RECs
	Australia ASX	RECs
	Australia FEX	Environmental Trading Products OTC service
Asia	Singapore SMX	Carbon Credit Futures and Options
	Singapore ACX-change	CERs, VERs auction
	India MCX	CERs, CFIs
	India NCDEX	CERs
	Brazil BM&F	CERs auction

Data source: 2012 China Climate Financing Report: Climate Capital Flow Research. Central University of Finance and Economics Climate and Energy Finance Research Center[61]

[11]Its predecessor is ECX, which was purchased on Apr.30th, 2010

Guest Comments

China learning from EU ETS's leadership

When the EU began its ETS in January 2005, I was working for 4 months with Dr Richard Sandor and Neil Eckert for the European Climate Exchange (ECX) that had just launched. Before that I was MD of Fortis Carbon Bank, a virtual carbon bank within Fortis.

As co-founders of ECX, we had to convince the European compliance and trader community that a carbon futures contract was the best choice to hedge price and manage risk. Due to the lack of an operational registry, the EU ETS could not start with spot contracts but instead with futures contracts for delivery in December 2005, with the hope that the registry could be established as soon as possible and support physical delivery. The EU Registry and the allocation of EU Allowances opened later in 2005, making spot trading possible. A long low-carbon journey started.

In China, the seven ETS pilots have started better than the EU ETS did. There was spot trading on a daily basis. Now the next step shall be the launch of non-spot products and the launch of China's national ETS in 2016 or 2017. Five ETS pilots had very high compliance rates for the 2013 period, allowing the market to continue to move forward. The basis for a National ETS is solid and a start in 2016 seems likely. The NDRC has learned positive lessons from Europe's mistakes and a solid Chinese ETS can help the EU regain confidence in carbon trading. Protecting China from an overload of cheap CERs has been facilitated by the NDRC introducing CCERs that make it possible to have a controlled inflow and usage for compliance.

The global carbon market must take actions to "clean" up the oversupply of the CDM to the EU ETS. If they fail, China, hopefully, will stay inside its own market to create a low carbon economy of its own without distortions from abroad. The lesson learned from the EU ETS is that Chinese futures markets demand very strict rules. A constant awareness of "who is trading what" by a governmental watchdog should guarantee the status and quality of the exchange(s).

Profile

Albert de Haan

He is MD Carbon Rooster Advisory Services BV and Co-founder of ECX. He has 35 years trading experience. He was advisor to UNESCO MAB division, advisor to Dutch Government on Carbon Auction, member of Dutch Carbon Advisory Board, ECX representative in EU ETS review 2007 for EU DG Climate. He was senior consultant for IFC in Chinese carbon pilot, Shenzhen Province Guangdong. He was co-structuring consultant in EFET biomass standard contract, used for wood pellets global trading. He was coach in Turkish Midseff EBRD program training Turkish banks in carbon trading. He was MD and owner European Milk Exchange (2009-2010).

3.3. PPP in Low-carbon Development

Public Private Partnerships (PPP), are an increasingly popular way to "allow specialists to specialize", improving efficiency and allowing all parties to benefit (including the public). Governments at all levels can free themselves from cumbersome management, allowing them to focus on matters such as the development and supervision of relevant rules. Industry, on the other hand, can play to its initiative and creativity. This arrangement is far preferable and also fits with low-carbon development given the specialized knowledge required. Making use of

PPPs in this field will benefit both government and industry.

International Case Study:

Morocco's use of a public-private partnership (PPP) to electrify rural households by using solar energy

Since the early 1990s, the Moroccan government has sought to provide electricity to all of its citizens. However, the national grid of Morocco is centralized at the cities, making it difficult and also costly to connect rural households to the grid system. As part of the effort to electrify rural households, the Office National d'Électricité (ONE) – the Moroccan state-run operator in the electricity supply sector and the entity that oversees the government rural electrification project – entered into a PPP with a private company in 2002 to electrify rural households using solar energy, because the solar programme required investments beyond the capabilities of ONE.

The primary objective of this solar programme is to provide photovoltaic (PV) kits to over 58,000 households in the rural areas of Morocco in order for them to meet their basic energy needs. Rural electrification would then in turn produce local development benefits in terms of health, education, employment, and economic development. By the end of 2011, the programme had brought solar power to over 163,000 people in rural Morocco.

Business model and partners

With viability and sustainability of the solar programme in mind, the Government and the private operator opted for a fee-for-service business model, instead of a sale-of-equipment model that has been adopted in other countries. Customers have to pay an initial connection fee and a monthly service fee, with the fee level hinging on the type of services that they choose to receive. When a household decides to install a solar home system, it signs a contract with ONE and the private operator.

The private operator is a renewable energy service company (RESCO) comprised of a French oil company, a French electricity company, and one of their joint subsidiaries that is responsible for design, production, installation, and operation of PV solar power systems. Following a call for tenders in 2002, the private operator was selected through a competitive process to install 16,000 solar home systems in Moroccan households. Another international tender was issued in early 2004 by ONE and the same operator again won a contract to further electrify 37,000 households by the end of 2007.

The company is in charge of implementing the solar programme, managing the technical and financial aspects of the programme. It is also responsible for maintenance of the installed systems, replacement of equipment, and collection of user fees.

However, it should be noted that once the solar equipment is being installed and proven to be operational, ownership of the equipment is transferred to ONE. Consumers are considered customers of ONE even though the private operator is responsible for managing the technical and financial aspects of the solar programme.

On the other hand, ONE manages the overall coherency of the government's rural electrification project. ONE defined the specification of the project and selected the operator of the solar power systems. After the initiation of the solar programme, ONE is responsible for ensuring that the operator maintain its commitments and measures the satisfaction of the operator's customers. The agency also provides subsidy, which allows the operator to provide the service at a price that is more affordable for the customers. The subsidy is made possible through grants and loans from bilateral development agencies.

Financial agreement

By 2008, the total investment budget of this solar programme was $35.5 million. An equipment grant from ONE covers 66 per cent of the costs. As mentioned, the equipment grant was largely financed by bilateral development agencies, including grants from the German development bank KfW and the French Fund for the World Environment (FFEM), and a soft loan from the French Development Agency (AFD).

The private operator contributes 24 per cent of the project cost. A total of $1.5 million came from self-financing, while $2.5 million were borrowed in the form of loans. The company's shareholders provided $4.5 million in additional financing. Monthly fees collected by the private operator allow it to cover the amortization of its initial investment and the cost of running and replacing equipment.

Customers cover 10 per cent of the initial financing through connection fees. However, the actual payments from the customers are considerably reduced because of subsidy from ONE. In the end, rural customers receive a 40 per cent subsidy, which makes the electricity cost closer to what the urban residents pay.

Contract provisions

The monthly service fee that customers pay provides them with annual routine system maintenance and breakdown service within 48 hour after a maintenance call is placed. The equipment is dismantled if the customer fails to pay the monthly fee for three consecutive months. The operator also guarantees the solar equipment for 10 years after purchase, so the company is also responsible for equipment replacement (including light bulbs). Replacement costs are built into the initial connection fees. The State is able to collect revenue from the project through taxes. A 20 per cent value-added tax (VAT) is placed on service charges, income taxes are collected on salaries and benefit taxes are

Lessons learnt

A major barrier to large-scale solar power system adoption in the rural areas of Morocco was economic consideration. The cost of installing and maintaining a PV kit is considerably more expensive than connecting a household to a mini-grid supplied by a diesel generator system. In other words, without the subsidy from ONE, the solar programme would not have been implemented in a desirable scale. The subsidy certainly provided incentives for households that were not sure about the effectiveness of the solar home system. Moreover, households connected to the national grid are asked to pay a tax of 2 per cent of their monthly electricity bill, which is used to sustain the subsidy that helps to promote rural access to solar power.

Another lesson to be learnt from the Moroccan experience is the implementation of studies and pilot projects operated by ONE prior to the introduction of the large-scale solar electrification programme. These studies and pilot projects provided technical, social and economic data validation on concerns such as climatic conditions, needs of the rural households, their purchasing power and geographical distribution. These information help to inform the government's decision of choosing the fee-for-service model over the sale-of-equipment model. On the other hand, the private operator also used such information to develop its marketing campaign for the solar programme.

A final lesson is that cash flow is critical to the smooth running of the private operator's operations. In the solar programme, the RESCO is obliged to advance money for the solar equipment before being reimbursed through ONE's subsidy. There were notable delays in payment from the installation of the equipment, which led to major cash-flow issues for the operator at one point. In this light, ensuring regular, timely payments of external subsidies by the government would be crucial to projects that adopt similar approach.

Unless otherwise noted, details about the case study are extracted from Sharing Innovative Experiences Volume 15: Examples of Successful Public-Private Partnerships, The Special Unit for South-South Cooperation, United Nations Development Programme (2008).

The national low-carbon development strategic plan plays a significant role in promoting GHG emissions mitigation. While in the process of promoting infrastructure in recent decades, all levels of local government have generated large amounts of debt. The latest local government debt data published by the Audit Office showed that, by the end of June 2013, the scale of debt liability of local governments reached 10.89 trillion RMB. Traditionally, in the process of construction and operation, the government has invested capital in state-owned enterprises to conduct the whole process, with low efficiency.

On December 27th, 2014, a conference on researching PPP models was held at the National Financial Work Conference. Several problems in the provision of public products and services have been identified, such as "high debt from existing financing platforms for the private sector, low efficiency in public supply, and difficulty in private capital entry. The Ministry of Finance hoped to promote PPP

(Public-Private-Partnerships) in order to relieve these problems. In December 2014, the Ministry of Finance established the Government and Social Capital Cooperation Center, which aims to promote the work of PPPs and provide necessary technical support and organizational guarantees for the healthy development of PPPs.

Table 3-6 Encouraging social capital to participate in construction and operation

Publishing Institution	Publishing Date	No. of Projects	No. of Low-carbon Projects	Key Words
NDRC	5/18/2014	80	35	Hydro power, wind power, photovoltaic
Hubei DRC	7/22/2014	95	6	Hydro power, wind power, photovoltaic
Yichang DRC	8/18/2014	56	2	Renewable energy sources, village clean energy sources, photovoltaic
Qinghai DRC	8/15/2014	80	1	Wind power
Jilin DRC	10/21/2014	36	2	Hydro power, hear source reformation
Shaanxi DRC	6/13/2014	39	8	wind power, photovoltaic, biomass, terrestrial heat
Xian DRC	10/11/2014	41	1	Heat supply reformation

Data: from relevant DRC website, collected by Environomist

On May 18th 2014, the NDRC website issued a list of the first batch of 80 PPP projects, involving hundreds of billions of dollars of capital, many of which were clean energy projects: a total of 35 (including 30 for demonstration zone for the large-scale application of distributed photovoltaic solar).

On Nov. 26th 2014, the State Council website issued its *Guidance on Innovative Investment and Financing Mechanisms for Encouraging Social Investment.* This document encouraged social capital to participate in clean energy projects in five areas. Part IX requires the establishment of sound PPP mechanisms, and its active promotion.

Case Share

Shanghai Huadian Xinzhuang Industry Park CCHP Transformation Project

Shanghai Huadian Xinzhuang Industry Park CCHP (Combined Cooling, Heating and Power) Transformation Project is in a narrow-sense a PPP Project, in that the Public Infrastructure Franchise project received support from the China CDM Fund in 2014. The project is developed on the basis that Shanghai Xinzhuang Industry Park granted China Huadian Corporation a 30 years franchise (including two year construction period). The proposed project adopts a Design-Build-Finance-Operate (DBFO) model. China Huadian Corporation established Shanghai Huadian Minhang Energy Ltd. (SHMEL) to be responsible for purchasing existing heating facilities and building CCHP facilities in other places to supply heat, power and cooling for Xinzhuang Industry Park.

Date	Project Progress
05/2009	China Huadian Corporation learned of Xinzhuang Industry Park's need for coal fired heating supply system
06/2009	China Huadian Corporation signed Letter of Intent (LOI) with SIPAC
01/2010	Feasibility *Study Report* of the proposed project was submitted
08/10/2010	China Huadian Corporation signed *Cooperation Framework Agreement* with Xinzhuang Industry Park Administrative Committee
17/08/2011	China Huadian Corporation initialed *Heat and Cool Supply Franchise Agreement* with Xinzhuang Industry Park Administrative Committee
17/10/2013	Commencement of the proposed project

Before the implementation of the proposed project, Shanghai Xinzhuang Industry Park Heating Ltd. (135 t/h) and 25 sets of captive boilers (51.5 t/h) in 12 enterprises supplied all the steam for the Park. The disadvantages of the existing coal fired boilers include: heating inefficiency, low management effectiveness, poor control and high pollution.

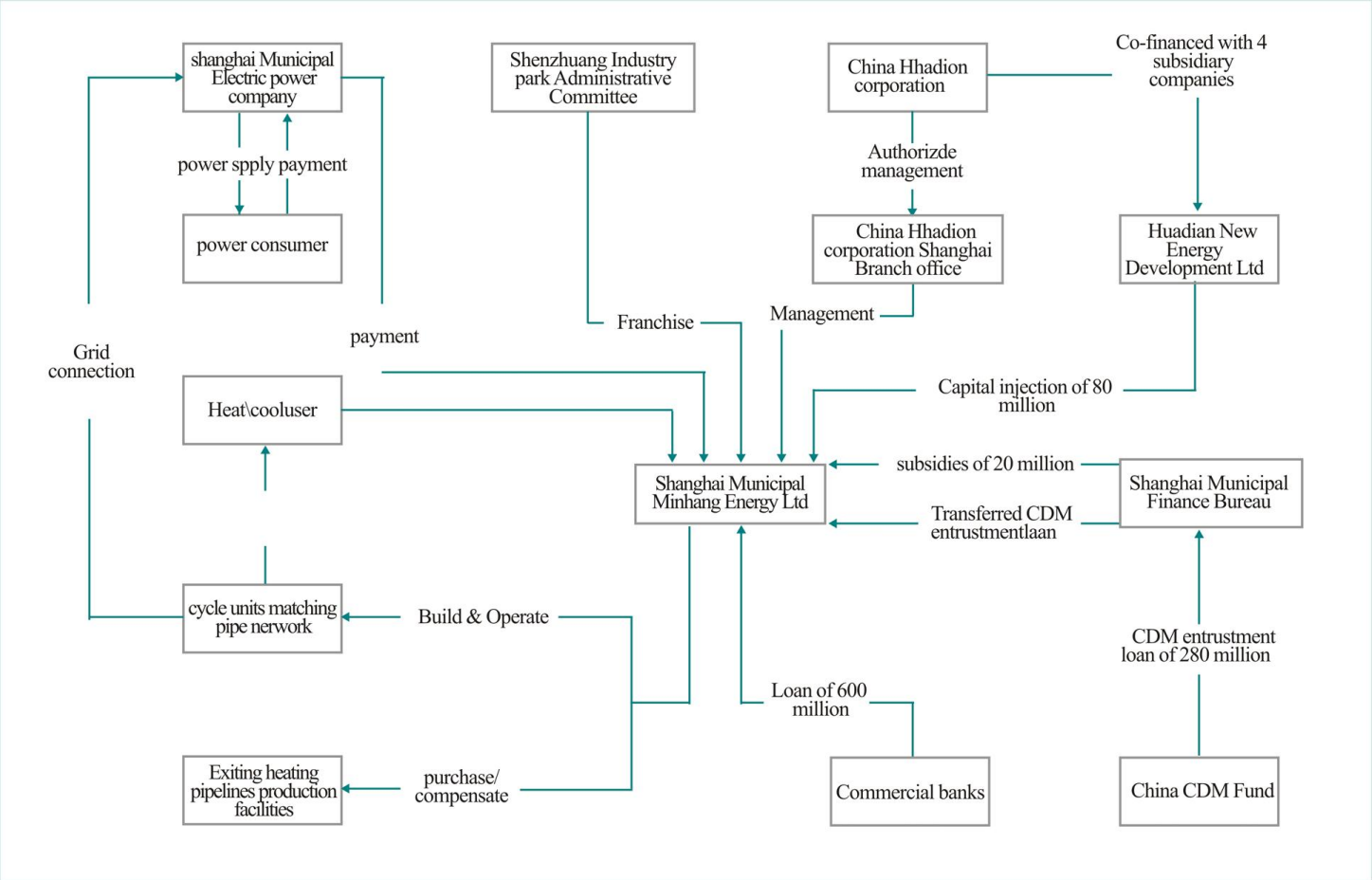
The proposed project will install 2 sets of 60MW gas-steam combined cycle units in Xinzhuang Industry Park. The static total investment of the proposed project is 981.57 million RMB and the dynamic total investment is 100.516 million RMB. Considering the government subsidies, NPV of the project is 10.491 million RMB and the FIRR (after tax) is 8.91%, which indicates that the project has positive economic benefits.

China Huadian Corporation Shanghai Branch office proposed the Xinzhuang CCHP project to the Xinzhuang Industry Park Administrative Committee (SIPAC) by way of unsolicited proposal and made preparations at the same time. SIPAC chose China Huadian Corporation as the franchise from three candidates through competitive negotiations and signed Cooperation Framework Agreement on Oct. 8th, 2010.

According to the Agreement, SHMEL will supply heat to the original users and the new users in the west district with the steam price at which Xinzhuang Industry Park Heating Ltd. will supply heat at that time. The price will not adjust until the government publishes new steam price policies. For those steam consumers who are newly added to the heat supply, the steam price shall not be higher than government guidance price of that time and enjoy a favorable discount of 5%. To make up for inadequacies of charging the end users, local government provides a series of supportive policies: e.g. investment subsidies and land directed tender/auction/listing.

The Viability Gap Funding/Subsidy (VGF) sources of the proposed project are as follows: RMB280 million soft loan by China CDM Fund, RMB20 million in investment subsidies by Shanghai Municipal Finance Bureau, directed land tender/auction/listing and corresponding supportive policies by SIPAC, including protected preferred gas supply, preferential gas price, gas price applying upstream and downstream price linkage, discounted gas and grid access fees and so on.

The total investment of the proposed project is RMB980 million, including RMB300 million VGF, RMB80 million cash injection by Huadian New Energy Development Ltd., RMB600 million in bank loans, which leads to an investment budget reduction of RMB960 million. The PPP model turns the original investment, which the government couldn't afford in the short term, in to a private capital investment and long term payment by the government or te end users, alleviating the governmental financial burden. Since the proposed project involved unsolicited proposal, China Huadian Corporation participates fully in the preparation work for the CCHP project, guaranteeing the technology and economic feasibility. This overcomes the poor cost management from the budget deficiency under the government's offering and lowers the project life cycle cost overall. In addition, Huadian as builder, investor, and operator of the proposed project takes most of the risk under the PPP model. Local government, as regulator, stands from the view of protecting and promoting the public interest and provides credit for risk reduction on the project.



4. Carbon risks for financial institutions

Carbon price and financial risk. This chapter will explore the potential implications of trends in carbon markets for financial institutions. Specifically, it will look at the extent to which carbon prices, and climate policy more broadly, can create risks to financial assets. These “climate policy risks”, or “carbon risks”, are notably different from the traditional type of risks usually associated with climate change. They are risks associated with the politically driven transition to a low-carbon economy – thus climate policy risk.

Like in the context of any significant upheaval to an existing economic model, carbon risks can become significant for financial institutions, as old modes of value

creation are no longer viable, even as their financial liabilities – in the form of stocks and debt – are still owned by capital market actors, notably financial institutions. A changing economic environment then leads to significant value destruction, which in turn may create risks for the owners of the associated liabilities – in many cases financial institutions. The objective of this chapter is to analyze this type of risk in the case of carbon risk and explore the implications for financial institutions in China.

Organization of chapter. The chapter is organized as follows. First, the analysis will specify the nature of carbon risks, in particular the source of carbon risk and its potential iteration. The discussion will then explore which types of sectors are likely to be affected in which way. The discussion will then look at how this risk can be measured and 'tested', beginning at the risks to physical assets and ending with methodologies to 'stress-test' risk at financial institution level. Based on this analysis, the discussion will explore the data needs associated with these methodologies. The chapter will conclude by providing a perspective on the way forward for financial institutions in terms of managing this risk.

4.1. Defining carbon risks

Defining carbon risks. Carbon risks can be defined as the family of risks correlated with the GHG-emissions associated with an asset.[62] In other words, assets are at risk if the threat of climate change gives rise to policy responses that specifically impact assets that have an impact on climate change. The financial risk can be conceptualized as the probability of changes in risk-adjusted return profile of the asset. This could be due to changes in the demand / price / competition for the various entities that derive profits from activities releasing GHG-emissions (including companies, banks, asset-owners). In some cases this may be due to directly assuming at least a part of the related *social cost.*[12] Or it may be due to other factors such as air quality standards, which act as a proxy for carbon measures.

Risks for whom. Most risk factors that have materialized to date concern

[12] The social cost of carbon emissions is defined as the present net cost of adaptation and damages related to global warming. According to the US government, the social cost per metric ton of CO_2 ranges from $20 to $60.

emitters, their clients, and their suppliers. However, a forward looking analysis suggests that financiers and owners might also directly face risk factors related to their 'financed emissions' via an evolution (real or perceived) of investment regulatory frameworks. In other words, as climate policies directly target financial institutions, an example being the Green Credit Guidelines, they may also give rise to carbon risks insofar as they are material for those financial assets in a portfolio that are in some form connected to GHG-emitting physical assets (such as the bond of a company that owns coal-fired power plants).

While the analysis seeks to identify different groups affected by carbon risks, it should be noted that the risks to one actors can be 'transferred' to another actor. Thus, the 'external costs' associated with GHG-emissions will ultimately become real costs to an economy, costs that can in the first instance be allocated simply to 'society'. Equally, 'society' can decide to pass these costs on in a 'boomerang' effect to those companies that originally signed responsible for these external costs. In this way, the risks to one group are transferred to another group. Globally, five groups of actors can be identified that may be subject to GHG-emissions risk, the last three of which are the main focus of this chapter:

- *Society / taxpayers:* The first and most prominent 'risk' correlated with GHG-emissions relate to their external cost. Based on IPCC report, the existence of a cost is almost certain. The main uncertainties relate to magnitude and burden sharing.
- *Investees:* For carbon-intensive companies the risks will materialize in the form of increased costs, reduced revenues, and impairments related to 'stranded assets' (this term will be elaborated further in the last section). These risks can be calculated through an adjustment of valuation (Discounted Cash Flow, market value) based on an alternative scenario (e.g. reduced demand and/or prices aligned with a 2 °C goal[13]).

[13] A 2° C goal is the goal of limiting average global temperature increase to 2° C. A « 2° investment roadmap » directly derives from the IEA's ETP 2DS scenario, a scenario which describes an energy system consistent with such a goal.

- *Banks:* The risks faced by the investees are partly transferred to lenders via losses at default in an adverse scenario or a rise in the cost of capital if the credit rating of the asset is downgraded. In turn, these risks are transferred to the bank's shareholders and financiers, or investors in case the loan is securitized.
- *Investors:* Institutional investors hold securities (equities, bonds, ABS) and therefore face credit and market risks in case future cash flows and credit worthiness of the investees are significantly altered by the introduction of new constraints during the holding period. These risks are transferred to other investors when the security is traded.
- *Ultimate asset owners:* The ultimate asset-owners are those at the end of the investment chain, who hold the security or have their benefits hit "when the music stops" (i.e. the carbon risks materialize). Depending on the magnitude of the impact, they might (or might not) be able to transfer the cost to tax payers if "too big to fail" institutions are in the front line (a.k.a. moral hazard).

Choosing a broad or narrow definition of carbon risk. Depending on the perspective and the groups included / excluded from the carbon risk analysis, the definition of carbon risks can be specified. Thus, carbon risks can be defined based on a *narrow* definition, where it only includes the risks faced by the investees (companies) and credit and market risk faced by the lenders (banks) and investors during the holding period. This narrow definition would also include regulatory risks related to investment frameworks. A *broader* definition then also includes the risks for the ultimate asset owners, based on the idea that the ultimate loss of value will appear at some point on the balance sheet of an investor. Finally, an *extended* definition includes the social cost of emissions assuming that this 'off-balance sheet' liability will at some point become 'on-balance sheet' and be paid by those 'responsible' for those off-balance sheet costs.

Distinguishing carbon and climate risks. It is important at this stage to distinguish 'physical' and 'carbon risks'. Traditionally, risks associated with climate

change are usually grouped into a category of physical risks to assets that arise out of climate events, such as a drought or a flood. There is increasing evidence of these physical impacts on the planet and – by extension – on assets in the real economy, productive or otherwise. Over the next century, it is these types of events that will likely be the most prominent when thinking about the risk associated with climate change. Despite the significant rise of these impacts, they are not the focus of this chapter.

Instead, the chapter seeks to understand the potential risks specifically associated with assets that emit GHG. Whereas physical impacts relate to the *social costs* discussed above, they appear as carbon risks only to the extent that their costs are ultimately in a 'boomerang' effect passed on to these actors, based on the historical GHG-emissions. The issue of historical and annual GHG-emissions accounting will be returned to later in the chapter in the discussion of data needs associated with these risks.

4.2. Typology of carbon risks

The following section tracks the different types of risk factors and their materiality for financial intermediaries. The discussion is based on the mapping and typology of carbon risks in Dupré et al. (2014). Thus, carbon risks can be grouped into five categories (Fig. 4-1).

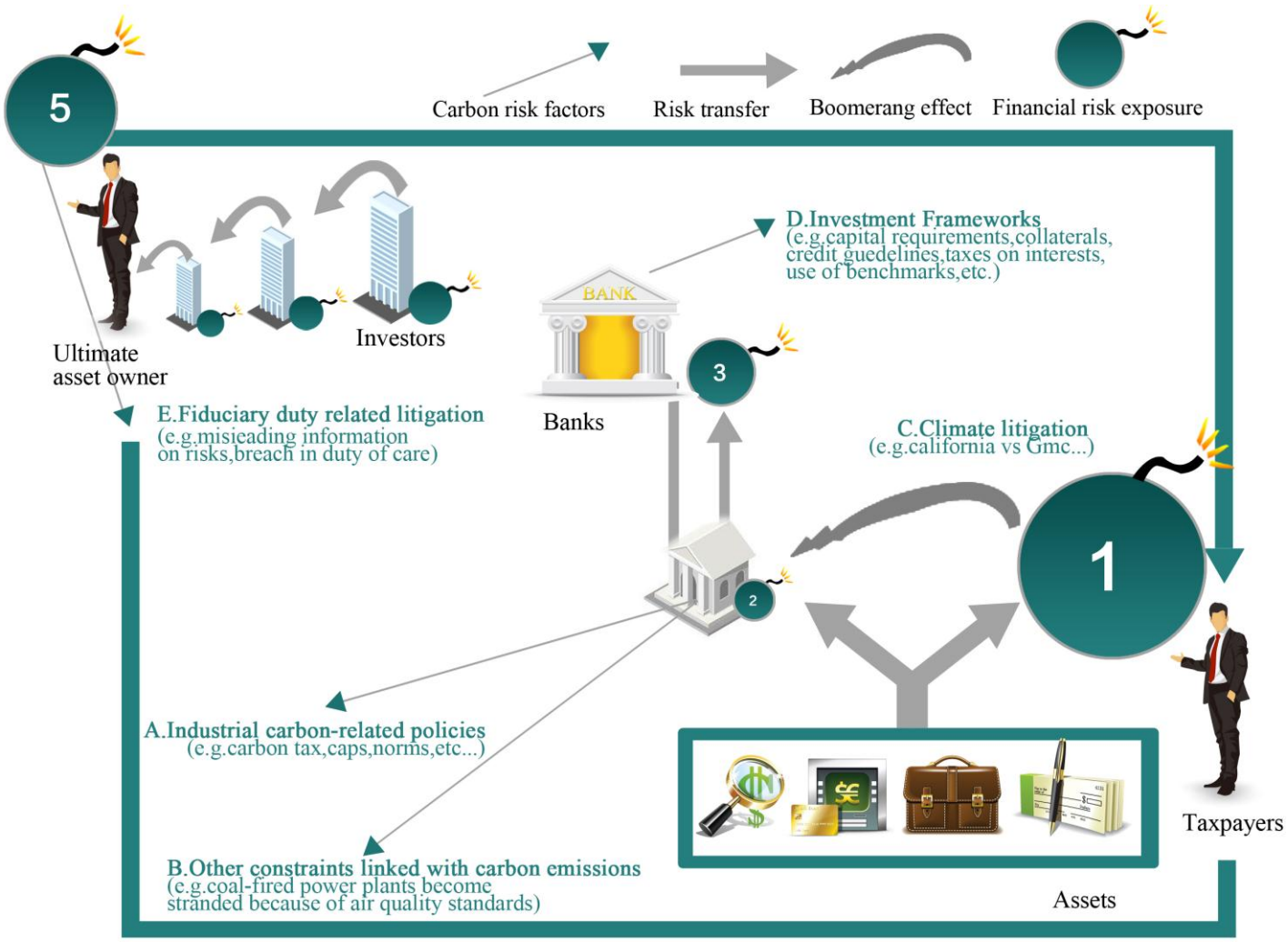


Figure 4-1: The carbon risk landscape for financial intermediaries (Source: 2 °Investing Initiative 2013)

A. **Industrial carbon-related policy risks.** The most prominent and original source at least in the short- and medium-term for carbon risks are industrial carbon-related policy risks. They include for instance caps on GHG emissions, ETS (or Carbon tax), and norms regarding vehicles emissions. For financial intermediaries, the risk relates to a sharp and unanticipated change (real or perceived) in public policies at global or national during the holding period. Whilst measures labeled as carbon are the most obvious risk, fossil fuels are already facing increasing uncertainty, which leads to consideration of other market factors under B. in the next paragraph. In the context of this report, this type of risk also includes the risk from changes in prices on carbon

markets. While these are 'market based' risk in the technical sense, carbon markets are clearly a function of industrial carbon-related policy.

B. **Market constraints linked with carbon emissions**. An energy transition will see changes in the demand and prices for different energy options. This could be linked to a range of factors including falling prices for alternatives, economic slowdowns, technological advances, efficiency measures, etc. Carbon emissions are also highly correlated with other impacts such as resources depletion, local air-pollution, local environmental impact of extractive activities, water consumption, etc. Carbon intensity can therefore be used as a proxy for risk exposure to other environmental and energy efficiency policies (e.g. air quality and mpg standards for cars), contested operation licenses (e.g. for fracking), and increasing market prices (e.g. energy). For financial intermediaries, the risk relates to a sharp and unanticipated change in national public policies or changes in global market prices (e.g. oil) during the holding period.

C. **Climate litigation.** This is the long-term risk that lawsuits targeting companies with high cumulated past emissions create liabilities, based on the company's 'share of responsibility in the cost of global warming. It is not limited to direct emissions and likely to occur in countries where extra-territorial jurisdiction and class action lawsuits exist. To date all cases are pending or have been dismissed. For financial intermediaries, the risk relates to a first wave of prejudices or settlements occurring during the holding period and turning the cumulated emissions of their investees into liabilities. In an alternative scenario, financial intermediaries can directly face claims based on their 'financed emissions'. To a certain extent, reputational risks faced by banks today can be seen as a first step towards these new types of claims.

D. **Investment regulatory frameworks.** Investment regulatory frameworks include all 'top-down' mechanisms that directly or indirectly impact the cost

and availability of capital for financial intermediaries, including: capital requirements, eligibility of collateral, taxes on capital, interest and transactions, credit guidelines, etc. To date, these investment frameworks only include climate goals in a positive way (i.e. incentives for investments in green mortgages) and at a very limited scale. No disincentive for fossil fuel and carbon-intensive investment has been implemented yet. But recent developments, including the regulatory debate on long-term financing at European level, and the introduction of reporting of loans on environmental risks to China Banking Regulatory Commission (CBRC) in China suggest a mentality change among regulators. For financial intermediaries, the risks relate to incentives and/or disincentives potentially directly linked with a 'climate-friendliness' indicator (e.g. "Is my lending and investment in line with a 2°C investment roadmap?").

E. **Fiduciary duty related litigation.** Scanning the investment process of many institutional investors, one comes up with a series of questionable practices that seem fundamentally inconsistent with the pursuit of the best financial interest of beneficiaries (for pension funds, life insurance) and ultimate asset-owners (for mutual funds) over the long-term. They include: the 'artificial shortening' of investment horizons, the lack of long-term risks assessment to inform strategic asset allocation, the alignment of sectorial exposure on the most widely tracked global equity or bonds benchmarks (e.g. MSCI World for equities or Barclays Global Aggregate for bonds) without questioning the impact on diversification, etc. These practices seem to partly result from principal-agent concerns and a narrow short-term focused interpretation of trustees' duty of care. As a result, if the 'carbon bubble' bursts (i.e. massive write-offs and/or provisions at investee level related to the materialization of risks A, B or C), institutional investors might face claims for negligence. While this litigation may primarily affect institutional

investors, they can in turn file suits against banks and investees, based on their lack of disclosure of tail risks (e.g. Rico lawsuits in the US, case).

4.3. Typology of sectors at risk

What sectors are affected? To understand carbon risks for financial institutions, the first step is to map the sectors that will be likely be particularly affected by the trends highlighted above. The analysis here builds on the work of Coeslier (2014)[63] and the 2 °Investing Initiative (2014)[64]. According to their analysis, sectors at risk can be grouped into five categories

- *'Fossil assets'* are activities that should be almost phased out in climate scenarios.[14] They can still expect growth or returns in the short and medium term, and the related companies can prosper by diversifying their activities, but the core business will not be viable in the very long-term. Sectors that fall in this category are 'fossil-fuel extraction sectors, notably coal mining, as well as the oil & gas sector (upstream, midstream, and downstream refining). Potential implications of scenarios include drop in demand due to carbon constraints on consumption, as well as reduction of subsidies and increase in taxes on products/production. These companies are also usually the primary targets of campaigns and activist lawyers involved in climate litigation. The exposure of typical diversified portfolios of global investors to these sectors is 10% for equities and 8% for corporate bonds.[15]
- *'Fossil-fuel dependent infrastructure'* is a category of long-term assets that depend on accessible and low-cost fuels (notably gasoline and jet fuel). Key assets include airports, airlines, shipping, highways and suburban real estate with limited access to mass public transportation. The changes expected in these sectors are not explicitly described in climate scenarios, but the level of

[14] The time frame is 2014-2100. We specifically refer the RPC3PD scenario used in IEA roadmaps, under which the global economy reaches carbon neutrality in 2070, and has negative net carbon emissions afterwards.

[15] We took the MSCI World as a proxy for equity portfolios exposure and the Barclays Global Aggregate for bonds portfolios, assuming that on average the sector exposure mimic the indexes weighting.

investment in these sectors is de facto managed in several countries as part as the climate and energy policies. There is no consensus on the mix between evolution of technologies (switch to electric cars and jet biofuels), likely to have little impact on the infrastructure value, and changes in transportation patterns (modal switch, limitation of growth in transportation) likely to have more significant impact on the infrastructure value. The main avenue for a drop in valuation relates to the increase of taxes on either fuels or the infrastructure itself. The potential impact on the related companies largely depends of their business model (owning or only operating, contract length, etc.).

- *'High-carbon assets facing shift to low-carbon technologies'* are sectors in which low-carbon alternative technologies exist and are expected to develop at the expense of established high-carbon technologies. Companies can therefore adapt, but their technology bets will lead to different risk profiles in climate scenarios. Key sectors in this category notably include electric utilities, car and trucks manufacturers, road logistics, pulp and paper, fertilizers, and low-energy efficiency real estate. These sectors are likely to be affected by direct ETS (or Carbon tax), Carbon tax on energy consumption and more stringent energy efficiency norms. The exposure of typical diversified portfolios to these sectors is 10% for equities and 3% for bonds. Banks are also exposed to real estate through mortgages.
- *'High-carbon assets without low-carbon competitors'* are sectors that are expected to deliver emission reductions in climate scenarios, but for which no mature alternative low-carbon technology exists today. Given the fact that climate policies are usually based on the streamlining of best-available technologies, these sectors are somehow 'protected'. However the introduction of ETS (or Carbon tax) or the late emergence of alternative technologies can still impact their value. Key sectors include cement, steel, aluminum, glass, ceramics, short haul aviation and related aircraft

manufacturing. These activities are usually not specific sectors in equity and bonds classification. Their weight in bonds and equity portfolios is respectively 1.8% and 3.9%.

- *Financial institutions* at first glance appear perhaps as a strange addition to this list, given the focus on actual GHG-emitting sectors. However, given the exposure of financial institutions to these sectors, it is appropriate to include them in a list of sectors potentially affected by carbon risks. In the first case, financial institutions may be affected by carbon risks using a *narrow* definition of carbon risk, in particular through the liabilities of the companies in the sectors highlighted above. Beyond, regulatory frameworks and the exposure of financial institutions using a *broader* and / or *extended* definition of carbon risk is worthwhile to highlight in this regard. Given this discussion however, it is important to review the actual ability by financial institutions to measure the materiality of this risk. Indeed, this is similarly relevant for the companies in the other sectors highlighted in the discussion here. The next section will review the current state-of-the-art in terms of methodologies to measure carbon risk.

A Case Study for Investors

Managing Climate-Resilient Portfolios

The combined effects of severe weather fluctuations and risks to natural resources pose a severe economic threat- one that has not gone unnoticed by investors. This year marked a dramatic shift in investor action towards climate change, driven in part by pressure from public figures like Christine Lagarde, managing director of the IMF, and UN General Secretary Ban Ki Moon.

Days before the UN Climate Summit in New York was convened in September, nearly 350 global institutional investors representing over USD 24 trillion in assets signed the Investor Statement on Climate Change, intended to spur climate action and facilitate a global climate agreement. A few days later, Swedish pension giant AP4 was in the lead in announcing the Portfolio Decarbonization Coalition, a multi-stakeholder initiative committed to decarbonizing USD 100 billion of institutional equity investments. Similarly, the Montreal Carbon Pledge, a parallel initiative, was also announced in September. Signatories of the initiative, which include some of the world's biggest institutional investors, commit to measure and publicly disclose the carbon footprint of their investment portfolios until the COP climate conference in Paris next year.

Understanding carbon risk exposure

Investment carbon footprinting enables quantification and management of greenhouse gas emissions and is the first step towards understanding an investor's impact on climate change. This is done by measuring and/ or estimating the quantities and assessing the sources of various greenhouse gas emissions that can be directly or indirectly attributable to the activities of the invested organization.

The exercise reveals the invested organization's carbon footprint and breaks it down to the investment level. This is a measure of the impacts of the organization on the environment in terms of the GHG volume produced in its everyday operations, expressed as tons of carbon dioxide (CO2) equivalents emitted, usually on an annual basis. The exercise provides the basis for constructing, optimizing or de-risking an investment portfolio based on climate impact, as well as reporting and positioning of an investment product or house towards stakeholders.

Acting on climate impact assessments

One way investors can reduce their exposure to carbon-risks is to divest from emission-heavy sectors or companies with poor climate policies. Norway's largest manager of pension funds ($84bnAuM), KLP, has decided to sell off all its investments in companies that derive 50 per cent or more of their revenues from coal based operations. South Pole Carbon assisted in calculating these coal-based related revenues and provided further company-specific analysis. Upon divesting, KLP will instead invest half-a-billion kroner (around USD 75 million) in renewable energy ventures.

For many of our clients, divesting from companies that derive a significant portion of their profits from unsustainable business practices is a matter of ethics. For all investors, however, investment climate impact constitutes material performance risk: An increasing amount of companies globally, including in China, are being forced to pay for their greenhouse gas emissions, which impacts company value and hits investments.It is, however, not all about risk but also about investment opportunities.When done well, an investment impact assessment helps investors pick those companies that will likely outperform their peers in times of climate change and increased environmental legislation.

The threat of divestment builds up pressure on carbon–intensive sectors and companies. The decision of the heirs of the Rockefeller oil fortune for example to divest from fossil fuels over climate change gained substantial public recognition. At this stage however, many investors shun divestment, and for the time being prefer to hold their assets. They use the institutionalized power of their ownership to engage with companies in order to encourage positive change within the organization. The combination of divestment coupled with parallel engagement efforts by fund managers like SkandinaviskaEnskildaBanken(SEB, a Swedish Bank)have put climate change on the corporate agenda. South Pole Carbon is pleased that its services have helped the Swedish Bank identify targets for engagement.

We believe, whether investors choose to divest, engage, or hedge their investments in renewable energy, the important thing is that they act—the sooner the better.

Profile

Maximilian Horster, Partner atthe South Pole Group, has worked with many of the signatories of the Montreal Carbon Pledge, Portfolio Decarbonisation Coalition and Investor Statement on Climate Change to help measure and reduce their investment climate impact.

4.4. Measuring carbon risk at physical and financial asset level

From risk identification to risk measurement. The discussion so far has been limited to a definition and typology of carbon risk, as well as a qualitative review of the typology of sectors that will likely be impacted by carbon risk. The discussion now turns to the methodologies in the market that can help measure this risk. In particular, this section will focus on the methodologies that financial institutions can utilize to measure carbon risks for specific assets. It builds on both the previous work of the 2 ° Investing Initiative and the carbon asset risk guidance developed by the GHG-Protocol / UNEP-Fi[65], in partnership with JP Morgan Chase. The following section will then look more specifically at the existing frameworks to measure carbon risk at portfolio level. Thus, as this discussion demonstrates, carbon risks can be addressed through metrics and tools as part of a 'bottom-up' approach or a 'top-down' approach. Finally, the discussion will conclude on the potential to address these risks at 'financial system level'. The following figure outlines this logic.

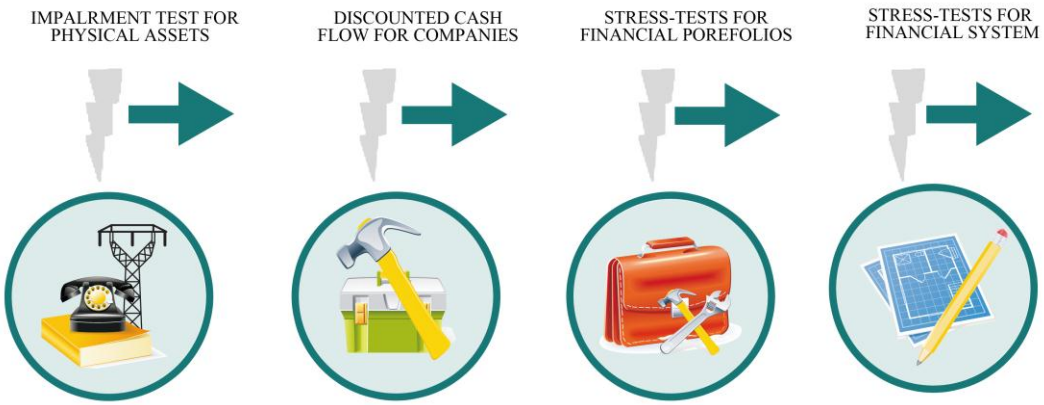


Figure 4-2: Risk tests throughout the investment chain (source: 2 °Investing Initiative)

Impairment tests and stranded assets. The discussion will begin with impairment tests for physical assets. Impairment tests for physical assets are usually

associated with the concept of stranded assets. While the idea of 'stranded assets' is not specific to climate change, the term has gained particular currency in the course of the transition to a low-carbon economy.[16] The Carbon Tracker Initiative, credited with introducing the term to the climate change debate, defines stranded assets as "fuel energy and generation resources which, at some time prior to the end of their economic life, are no longer able to meet the company's internal rate of return, as a result of changes in the market and regulatory environment associated with the transition to a low-carbon economy."

Stranded assets for fossil fuel reserves. The first work on stranded assets and impairment tests associated with physical assets in the fossil fuel sector is by the Carbon Tracker Initiative, which demonstrated the extent to which, under various scenarios, fossil fuel reserves are 'unburnable' (Fig. 4-3). This work uses the concept of a 'carbon budget' associated with a scenario as the benchmark.

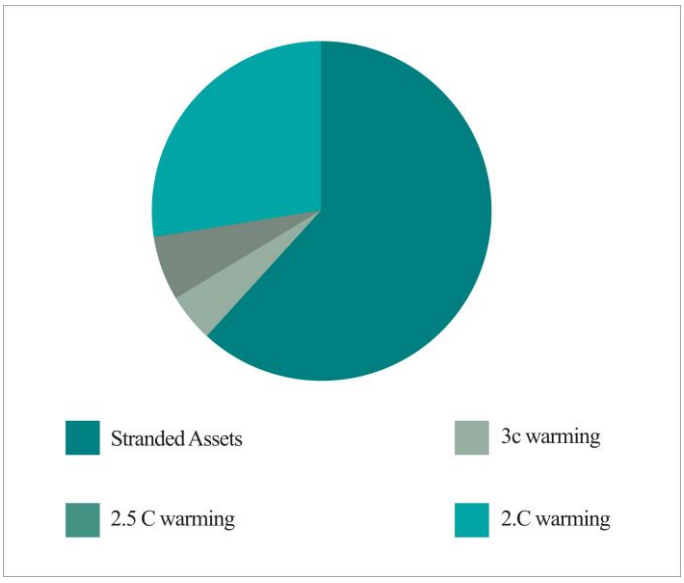


Figure 4-3 Stranded Fossil Fuel Reserves under Various Climate Scenarios (Source: CTI 2013)

Stranded assets in the utility sector. Arguably the most prominent example of existing stranded assets is in the European utility sector, where between March 2012 and December 2013, over 8000 MW of power plants that were 10 years or younger were either closed or where the closing of the plant was announced, over 40% of all

[16] There are 'stranded utility' bonds for example, whose economics are entirely disconnected from climate change

closures. While not all related to climate policies, this shows the potential scope of stranded assets.

Other sectors. While usually connected to the fossil fuel and power sector, stranded assets may also apply to other sectors, such as transport and real estate. The Chinese case of over-investment in real estate and the associated "ghost towns" and auxiliary transportation infrastructures is an example of this (although not climate change related). In the future, this analysis related to climate change may become more relevant.

Measuring carbon risk for financial assets. Currently, carbon risk measurement at financial asset level mainly relies on adjusting Discounted Cash Flows (DCF)[17] and/or forecasted earnings of companies to account for higher direct or indirect prices of CO_2 emissions and the impacts of a carbon-constrained economy on demand for high-carbon products. Crucially, all of this analysis hinges on the answer to four key questions: i) understanding the types of risk that should be integrated into the scenario, ii) the time horizon of these risks, iii) the way they are expected to impact the analyzed high-carbon industries, iv) and the extent to which they will impact the equity valuation (or risk of default on credit and bonds) for these industries.

Impact on market capitalization. The first studies in this regard by Carbon Trust / McKinsey (2008)[66] showed the impact of a 2°C scenario on companies' valuations can reach up to 35% for oil companies, 44% for pure players in coal mining, and 65% for car manufacturers and aluminum producer. This analysis, however, is at sector level and not company specific. A subsequent company by company analysis is provided by HSBC (2012)[67], specific to the oil and gas sector. Their results suggest that a 2°C scenario, with the associated 'stranded assets' and price effects, will impact European oil and gas companies across the board with over 40% reduction in market capitalization (Fig. 4-4).

[17] See § on adjusted DCF and company valuation

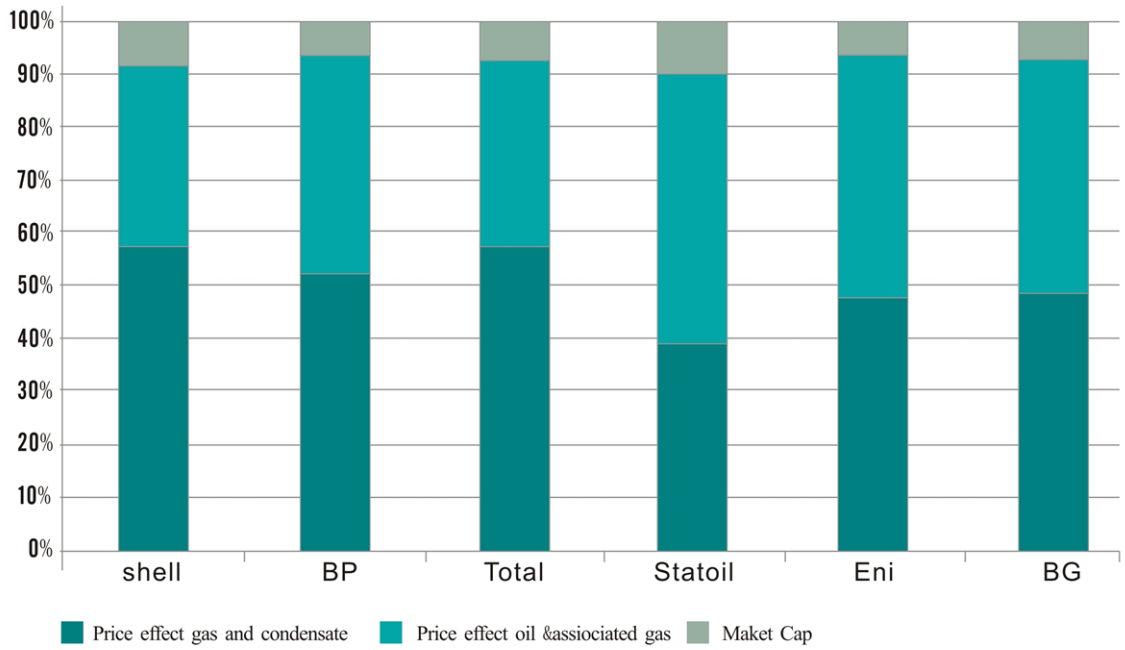


Figure 4-4: Impact of "unburnable reserves" and price effect on market capitalization (Source: HSBC 2012)

From studies to tools. The transition in carbon risk assessment is slowly being made from studies and research analysis to tools for investors. Bloomberg launched a *Carbon Risk Valuation Tool* to measure the potential impact on market capitalization of five different climate-related scenarios, including scenarios related to oil prices, and direct changes in EBIT.

Impact on revenues. Whereas the HSBC analysis focuses on market capitalization, work by Kepler Cheuvreux (2014)[68] focuses on revenues. According to a recent report, Kepler-Cheuvreux estimates potential lost revenues of $28 trillion for the oil, gas and coal sector until 2035 under the IEA 450 scenario (Fig. 4-5). These lost revenues are calculated relative to the benchmark IEA New Policies Scenario.

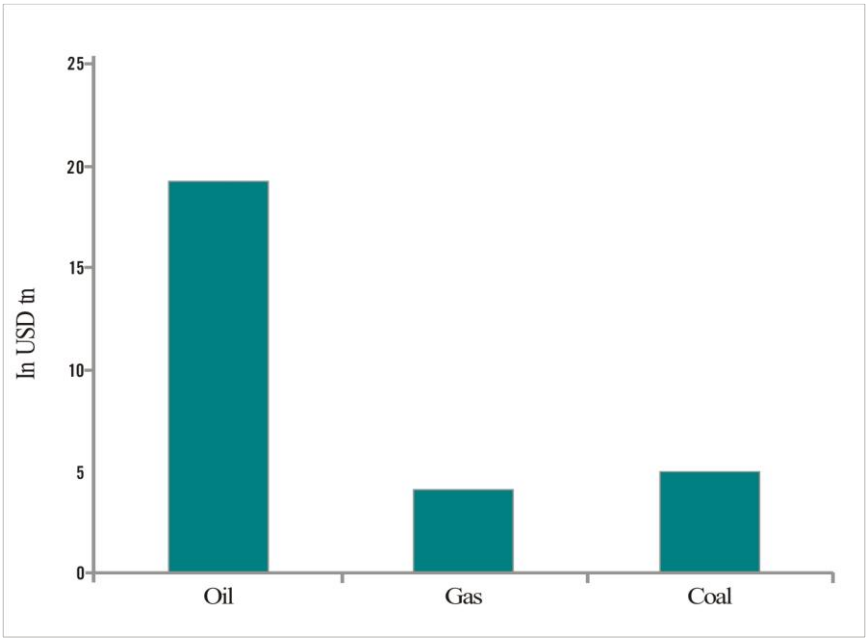


Figure 4-5 : Lost revenues under a 2 °C scenario until 2035 (Source ; Kepler Cheuvreux 2014)

Distribution of risks within sectors. A key question in terms of risk is the distribution of risks within sectors. While this work is improving with regard to the oil and gas sector, notably through the analysis of HSBC and recent studies by the Carbon Tracker Initiative on the cost curves of the oil and coal sector (with a similar study planned for gas), there are significant question marks with regards to the distribution of risks in the utility sector, with a significant divergence in terms of different fuels in the power generation mix.

Stress-testing methodologies at portfolio level. Stress-testing carbon risks at portfolio level remains a challenge. There is no comprehensive method that currently allows for the application of these stress-tests and the existing practices are limited. The limited examples in this regard include the work of Mercer[69], the French investor FRR[70], and the Green European Foundation (GEF) partnership with Profundo[71].

Mercer assessed the potential impact of climate policies and change on various parameters including GDP, investment flows, cost of mitigation and adaptation, etc. They then modeled the impact on the risk-return profile of each asset class (equities, sovereign fixed income, corporate bonds, cash) and some specific sub-categories (renewable equities, agriculture, etc.) to come up with an optimal allocation strategy

for each scenario. Mercer concluded that climate policy risks account for about 10% of total risk exposure of an average portfolio (Fig. 4-6).

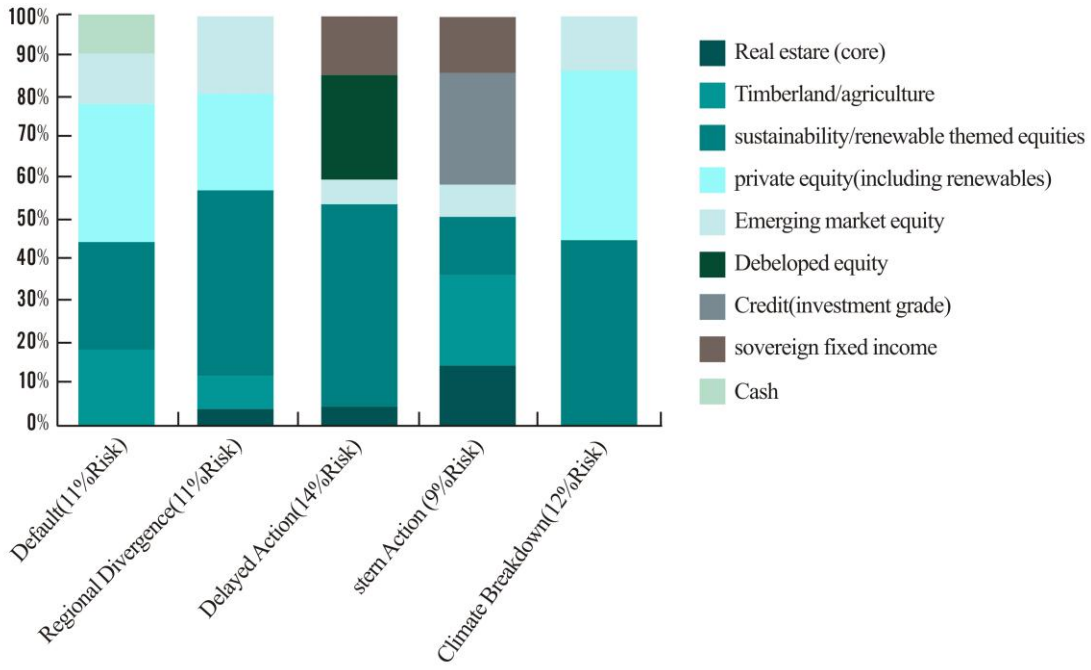


Figure 4-6: Climate stress test for an institutional investor (Source: Mercer 2010)

The FRR project launched in 2008 a similar project targeting the definition of investment strategy, with a wider perspective (environment: climate, fossil resources, biodiversity and water). The report (self-labeled as preliminary) proposed to investigate several ways to integrate environmental issues in strategic allocation, on the basis of four (climate) scenarios. For each, risk/return ratios are built for different asset classes, and discussed in terms of geographic and sectorial impacts. Till now, the FRR did not publish its subsequent study results of integrating environment and climate change in its allocation strategy.

The Green European Foundation in turn sought to assess the carbon risks for the European banking and pension fund sector. The results showed a limited impact, specifically a 0.4% loss of total assets in the European banking sector and 2.5% for the European pension fund sector. Interestingly, there was a significant European variation among institutional investors, with losses of slightly more than 7% for the

Universities Superannuation in the UK.

It should be noted that, relative to the stress-testing frameworks used in mainstream stress-tests by regulators and banks, the frameworks described here are limited. Thus, the Mercer analysis only looks at risks at the first sector level and thus does not distinguish risks between assets in a brown / green sector such as the utility sector. Moreover, the analysis does not take time horizons into account. On the other hand, the analysis by GEF is limited to the fossil fuel sector and does not explore carbon risks in other affected sectors, notably the transport, utility, and real estate sector. In addition, the estimated fall in value is uniform among assets in the analysis, without further methodological insight into the choice behind the estimated loss. There is no consideration of the different ways individual companies can be affected.

4.5. Data needs for measuring carbon risks

Beyond methodologies, a key question associated with carbon risks relates to data. Managing carbon risk will require relevant data – both to feed the methodologies and to measure the carbon risk exposure of a portfolio more generally. This section addresses this question.

Current carbon footprinting data. The GHG-emissions of companies has been the primary metric explored to measure carbon performance. Similarly, the first type of carbon performance methodologies developed for financial institutions used a similar approach – GHG-emissions accounting for the finance sector, also known as financed emissions. The GHG-Protocol has developed the standard around GHG-emissions accounting. The accounting framework involves three ‘scopes’. Scope 1 refers to direct GHG emissions that occur from sources that are owned or controlled by the company. Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the company. Scope 3 is an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. An example for Scope 3 emissions are product use, such as the emission of a car. Financed emissions also count as Scope 3

emissions.

Until recently, carbon footprinting has largely been limited to Scope 1 and Scope 2 emissions. In the past year however, there has been a significant push to expand carbon footprinting to Scope 3. From a risk perspective, Scope 3 emissions are likely to be key, as for many sectors they sign responsible for over 80% of the GHG-emissions of a company (ex. automobile sector and banking sector). For instance, the Shanghai ETS pilot from China adopted the similar accounting framework to cover Bank of Shanghai as a regulated emitter.

In addition to Scope 3 accounting, from a risk perspective forward-looking, 'locked-in' emissions will become a key data need in the future. 'Locked-in emissions' refer to the emissions already on the balance sheet of a company in some form – for example the carbon reserves of a fossil fuel company, the future GHG-emissions of power plants, the airplane fleet of an airline, or the high-carbon manufacturing technology in high-carbon sectors. While this data is not currently collected in this form, the majority of this type of data is publicly available and thus a key element here is tracking this type of data and making it available in relevant databases.

Beyond carbon foot printing. Easily available data for investors can help tackle the issue of time horizon in the measurement of carbon risk. Data such as the EBIT Margin, assets lifespan and carbon intensities at sector level can help prioritize sectors when running a company-per-company comparison analysis. This ensures a better understanding of the potential impact of potential carbon risks on different types of assets and can help investors integrate forward-looking data in the carbon risk analysis. Figure 4-7 below provides an overview of the three key metrics mentioned above, which are easily available for investors and relevant to inform risk analysis: carbon intensity, EBIT Margin and assets lifespan.[18] The figure yields a number of conclusions:

- Coal mining, oil & gas, electric utilities and air transport have very high carbon intensities as well as long-term assets.

[18] For statistical reasons and to illustrate this metric by sector, we take the median asset lifespan over 10 years.

- Paper & forest products as well as automobile manufacturers combine significant carbon intensities with very low EBIT Margins and long-term assets.
- Highways and rail tracks have the longest asset lifespan combined with low carbon intensities.

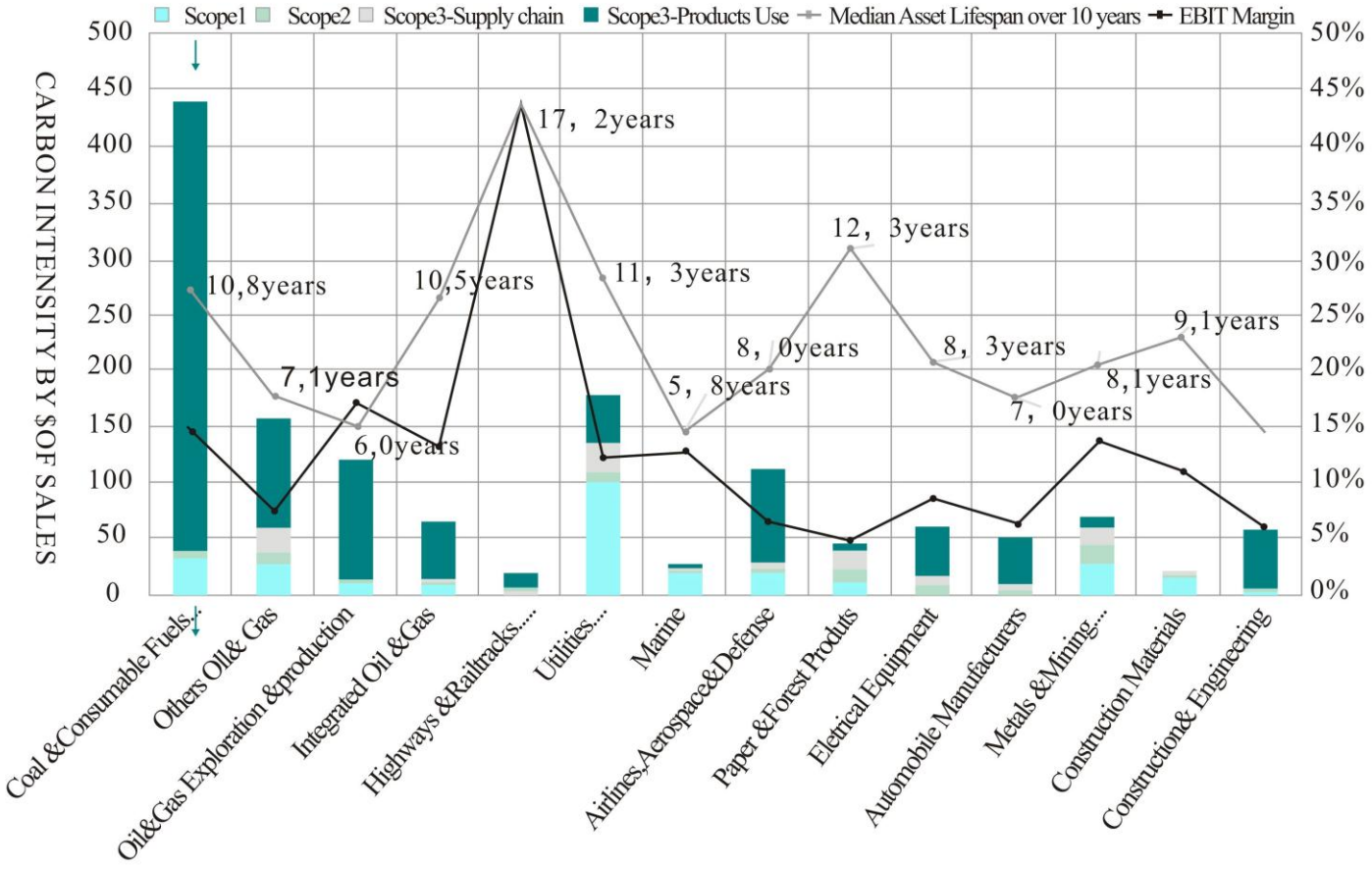


Figure 4-7: Carbon Intensity, asset lifespan and EBIT Margin of key sectors exposed to climate scenarios. Source: Coeslier (2014) based on Inrate/Cross-asset footprint and Datastream data

EBITDA Exposure and costs pass-through capacity. Even though integrating scenarios and carbon constraints in the estimation of future cash flows or directly in the cost of capital represent major improvements, additional information needs to be considered to properly integrate carbon risk. Soci ét é G én érale Cross Asset Research[72] highlights the importance of the ability for a company to pass costs onto stakeholders. Table 4-1 shows how much this ability has an influence on the EBIDTA exposure to carbon risk for companies. Airlines, for example, experiment low-margins and a high

costs pass-through capacity regarding fluctuation in oil prices[73]. Finally another key dimension relates to the elasticity of demand (i.e. the impact of higher prices on demand). This dimensions being highly product and region-specific, the lack of financial data readily available in financial databases makes it difficult to draw conclusions at sector level.

Table 4-1: Impact of carbon scenarios on EBITDA exposure after passing on costs for selected sectors

	EBITDA margin	Cost CO2 (€/t)	Cost transfer capacity (0.1)	Free allocation (0.1)	Carbon intensity (gCO_2/€)	Max turnover exposure (%)	Max EBITDA exposure (%)	EBITDA exp. After passing on % cost
Automobiles & Components	14.00%	180	0.2	0.79	2,583	8.10%	58%	46%
Real Estate	88.30%	50	0.5	0.9	4,131	2.10%	2%	1%
Energy	29.90%	50	0.8	0.9	5,391	2.70%	9%	2%
Utilities	32.80%	50	0.5	0.9	5,431	2.70%	8%	4%

Source: Société Générale Cross Asset Research

Capital and R&D expenditures[74]. Carbon risk materializes in the future. Thus, investors need further forward-looking indicators. The breakdown of capital expenditures by sector and energy-technology as well as investments in R&D can be considered as a proxy for the energy-technology exposure of companies in the future. However, this kind of data doesn't exist in financial databases and only sometimes in annual reports (Figure 4-8).

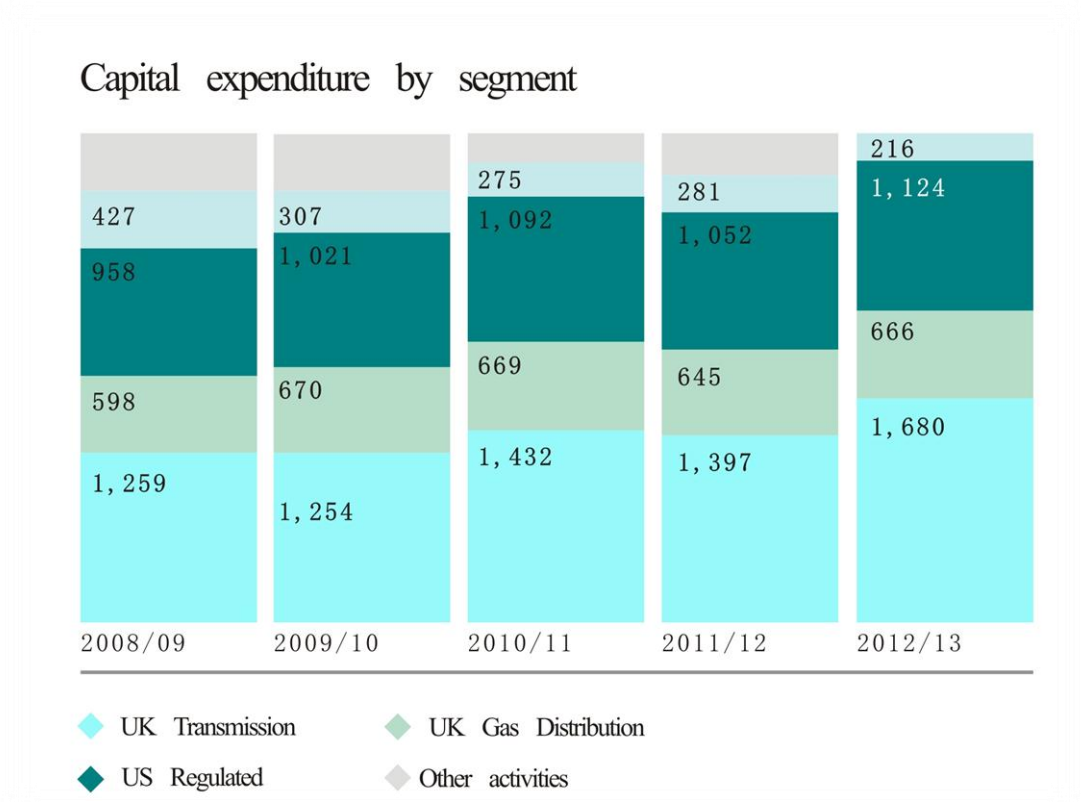


Figure 4-8: Example of capital expenditure reporting by segment.

Source: National Grid annual report 2013

Gaps on data availability:

- The business segmentation of companies is key. Current sector classification system, even if very granular and specific,[19] don't address the issue of companies with diversified activities. This information being highly sensitive, it is very often not available, whether in annual report or in financial databases.
- Capital or R&D expenditures are key to understand future exposure of companies to carbon risk. However, this data faces the same problem of availability for investors.

To conclude, activity data is a major concern when attempting to measure carbon risk. Breakdowns of capital expenditures, R&D expenditures and fixed asset across

[19] The Standard Industry Classification (SIC) has more than 1000 industries in its most granular level.

business segments would allow a deeper analysis of the different implication of climate scenarios at portfolio level. It would enables to precisely inform on locked-in emissions of assets as well as potential risks of impairment under several scenarios (e.g. drop in demand, CO_2 prices etc.).

4.6. Way forward for measuring carbon risk by financial institutions in China

As outlined above, carbon risk is emerging as a new type of risk for financial institutions. The analysis suggests that this type of risk is somewhat dissimilar to traditional risks. Many risks associated with the energy transition will be policy and not market driven, are likely to appear as gradual risk factors as opposed to tradition economic 'shocks', limited to a specific part of the portfolio, and difficult to hedge. By extension, traditional risk management tools and practices will either have to be expanded or supplemented with new types of risk management in order to properly manage this risk.

The urgency to manage this risk is likely to be particularly pronounced in China. As shown in a study by the Oxford University (2014), stranded assets are likely to be a particularly prominent problem in the next years. A big driver in this regard is naturally the launch of the nation-wide ETS and the seven ETS pilots.

While carbon risk is becoming a growing issue for financial institutions in China, tools to manage this risk are limited. Indeed, financial institutions worldwide face similar challenge. Equally, while there are gaps financial institutions can already start to manage this risk. A framework in this regard relates to managing the potential sources of risk, such as the impact of ETS on the viability and return on investment – this naturally also by extension frames the sectors at risk.

In terms of broader risk management, two approaches appear interesting to explore. The first relates to integrating climate impacts into discounted cash flow models (the 'bottom-up' approach) and exploring, at a company-by-company or

asset-by-asset basis, the potential impact of the transition to a low-carbon economy on financial assets in China. In addition, or alternatively, carbon risks for financial institutions can be managed from a top-down approach. Here, risk management does not seek to identify risks for individual assets but rather analyses the broader exposure of a loan book or portfolio to carbon risks. Here the approach resembles an alignment indicator and seeks to provide an answer to the question as to what extent financial portfolios or loan books are misaligned with the Chinese policy roadmap. Whereas current metrics cannot necessarily translate misalignment into a direct financial loss, they provide a good indication for the potential carbon risks a portfolio more generally faces and, in a second step, suggests the pathway to reducing these risks (through aligning portfolios with Chinese policy roadmaps). Here, the investment vehicles discussed in Section 3 of the report may become relevant. While not a hedge for a specific risk at asset level, they may ensure broader diversification of a portfolio.

5. Conclusion

In the year 2014, China, as a developing nation, has accelerated its domestic policy development in the area of Carbon Markets. It has become clear that the market based policy tool has gained momentum at policymaking level. From strengthening implementation measures of regional ETS pilots to the launch of National ETS Measure, a huge step from “Zero” to “One” has been made. It is no doubt a great and promising start. However, the long march has just started and many aspects must be thought through very carefully by all stakeholders in the market to make it work. In our opinion, the further works carried out in 2015 by market stakeholders will not only be decisive to a healthily operated Chinese ETS, but also affect the policymakers’ confidence level at both national and international scale.

With this consideration in mind, the working team of this report carried out this year’s market research with focuses of the development of ETS policy, ETS pilots operational performance, investment and risk aspects of financial institutions within the policy framework of carbon. At the end of this report, we truly wish the Chinese

ETS will be a major milestone of mankind's efforts in reducing our own effects on the wonderful living environment that offered us comfort for millions of years. We strongly encourage the stakeholders to digest the key recommendations made below and benefit from the features of carbon market.

- Policymakers at central government level shall be prepared for any mistakes and market instabilities during the next years. Lessons learnt from these would improve the policy design over time.
- Officers responsible for the implementation cycle of ETS policy shall further improve its administrative capacity to ensure the ETS policy is implemented as it designed for.
- Financial institutions interested and affected by carbon market need to consider the carbon market from both investment opportunity and risk management sides. The risks involved in aggressive strategy must be addressed to manage the risks and limit exposures.
- Compliance entities, including the ones covered by the National ETS, would have to be better prepared and equipped. The ETS policy you are facing is quite different than the traditional environmental policies you have used to deal with. It would at least require technical and financial capacity to economically fulfill the compliance needs. Many capacity building programs, financial services and IT tools offered by the market are ready for you to reach your goals.

References

[1]UNFCC：http://baike.baidu.com/view/89815.htm?fr=aladdin

[2]Xinhua Net：http://news.xinhuanet.com/video/2013-11/12/c_125687476.htm

[3]China News Net：http://www.chinanews.com/gj/2013/11-20/5522352.shtml

[4]Renmin Net：http://world.people.com.cn/n/2014/0923/c1002-25713767.html

[5]Xinhua Net：http://news.xinhuanet.com/2014-09/24/c_1112604769.htm

[6]China Climate Change Information Net：
http://www.ccchina.gov.cn/Detail.aspx?newsId=50091&TId=58

[7]World Bank Group.State and Trends of Carbon Pricing 2014

[8]Xinhua Net：http://news.xinhuanet.com/world/2014-10/24/c_1112969860.htm

[9]Hexun Net：http://news.hexun.com/2007-11-30/101896751.html

[10]Environomist Ltd. Environomist China Carbon Market Research Report 2014

[11]Kyoto Protocol：http://baike.baidu.com/view/41423.htm?fr=aladdin

[12]The State Council. National Program on Tackling Climate Change.2007

[13]China News Net：
http://www.chinanews.com/cj/cj-hbht/news/2009/11-26/1986490.shtml

[14]NDRC. Notification on Implementing Carbon Emissions Trading Pilots Work.

[15]Beijing Environmental Exchange：
http://www.cbeex.com.cn/article//zxdt/bsdt/201401/20140100049342.shtml

[16]Guangdong Government. Guangdong Trial Implementation Measures on Carbon Emissions Management.

[17]General Office of The State Council. Notification on Publishing Energy-conservation Emission-reduction Low-carbon Development Action Plan, 2014-2015.

[18]General office of Hubei provincial government. Interim Measures on Carbon Emissions Permit management and Trading.

[19]General office of Hubei provincial government. Notification on Publishing Hubei Energy-conservation Emissions-reduction Low-carbon Development Implementation Plan 2014-2015.2014

[20]Shanghai Government. Issuance of views on further promoting the healthy development of capital markets

[21]Tianjin DRC：http://www.tjdpc.gov.cn/dtzx/tzgg/201407/t20140728_51892.shtml

[22]Shenzhen Emissions Exchange：http://www.cerx.cn/Portal/home.seam

[23]Beijing DRC. http://www.bjpc.gov.cn/tztg/201406/t7863548.htm

[24]Beijing DRC：http://bjeca.org.cn/tztg/201411/t8468630.htm

[25]Chongqing Government. Notice on Interim Measures of Carbon Emissions Permit Trading Management. 2014

[26]Xinhua Net：http://www.gov.cn/2011lh/content_1825838.htm

[27]General Office of the State Council. http://www.gov.cn/zwgk/2012-01/13/content_2043645.htm

[28]Baidu: http://baike.baidu.com/link?url=AUoK3uZgWTUxE3SfIkjFhHPqjlEjEjvzUw4M9VdFEl0T46H_NiGUbesAIhPEjThIpDccqYHacheECLatWTIKnq

[29]NDRC. http://www.sdpc.gov.cn/zcfb/zcfbtz/201403/t20140314_602463.html .2014

[30]The State Council. http://www.gov.cn/zhengce/content/2014-05/09/content_8798.htm .2014

[31]Xinhua Net：http://www.gov.cn/2011lh/content_1825838.htm

[32]General Office of the State Council: http://www.gov.cn/zwgk/2012-01/13/content_2043645.htm. 2011

[33]DNRC: http://www.ndrc.gov.cn/zcfb/zcfbtz/2013tz/t20131101_565313.htm .2013

[34]The State Council. http://www.gov.cn/zhengce/content/2014-05/09/content_8798.htm .2014

[35]General Office of the State Council. Opinions on Further Accelerating the Healthy Development of the Capital Market. 2014

[36]Xinhua Net：http://news.xinhuanet.com/energy/2014-11/13/c_127204771.htm

[37]China Standardization Research Institute：http://www.cnis.gov.cn/wzgg/201411/t20141121_19619.shtml

[38]The State Council. Guidance on Innovative Investment and Financing Mechanisms for Encouraging Social Investment. 2014

[39]NDRC Climate Department. Interim Measures on Carbon Emissions Trading. 2014

[40]Guangdong Government. Guangdong's 12th Five-year Work Plan on Controlling GHG Emissions. 2012

[41]Guangdong government. Guangdong Interim Measures for Emissions Management

[42]Guangdong DRC. Guangdong Implementation Plan on Emissions Allowance Allocation. 2014

[43]Hubei DRC. Hubei's Work Plan for Emissions Trading Pilot Scheme

[44]General Office of Hubei Government. Interim Measures on Emissions Management and Trading

[45]Shanghai Government. Views on Implementing Pilot Emissions Trading. 2012

[46]Shanghai Government. Shanghai Emissions Management Trial Implementation Measures

[47]Tianjin DRC. Tianjin Notice on Carrying Out Emissions Trading Pilot Scheme. 2013

[48]General Office of Tianjin Government. Tianjin Emissions Trading Interim Measures. 2013

[49]Tianjin Emissions Exchange：http://www.chinatcx.com.cn/tcxweb/pages/news/news_info.jsp?article_id=2119

[50]Shenzhen Government. Shenzhen Interim Measures on Shenzhen Emission Trading Management

[51]Beijing Government. Beijing Emissions Offset Management Measures (trial)

[52]Beijing Government. Beijing Emissions Trading Management Measures (trial). 2014

[53]Beijing DRC. Notice on Implementing the ETS Pilot. 2013

[54]Chongqing DRC. Chongqing Emissions Allowance Management Detailed Rules and Regulations (trial). 2014

[55]Renmin Net：http://sz.people.com.cn/n/2014/0703/c202846-21568000.html

[56]China Carbon Emissions Trading Net：http://www.tanpaifang.com/tanjiaoyi/2014/0808/36418.html

[57]China Carbon Emissions Trading Net：http://www.tanpaifang.com/tanguwen/2014/0828/37300.html

[58]China Carbon Emissions Trading Net：http://www.tanpaifang.com/tanjiaoyi/2014/1017/39244.html

[59]Shuijin Tantou Double-week Market Information 9.1-9.12

[60]Wang Yao. Carbon Finance Global Perspective and China Layout [M]. China Economic Publishing House，2010，111

[61]China Climate Financing Report 2012：Climate Capital-Flow Researce. CUFE Climate and Energy Finance Research Center

[62] 2° Investing Initiative 2013

[63] Coeslier, M., *How to improve corporate carbon/climate reporting to better inform investment decisions?* , 2014

[64] 2 °Investing Initiative, *Landscaping carbon risk for financial intermediaries*, 2014

[65] WRI & UNEP-FI, *Carbon Asset Risk Guidance*, 2014

[66] Carbon Trust and McKinsey, *Climate Change – a business revolution?* , 2008

[67] HSBC Global Research and HSBC Climate Change, *Coal and Carbon, Stranded assets: assessing the risk*, 2012

[68] Kepler Cheuvreux, *Stranded assets, fossilised revenues*, 2014

[69] Mercer (2010) "Climate change scenarios – implications for strategic asset allocation

[70] FRR (2009) "Comment prendre en compte l'environnement dans la politique d'investissement du FRR ?" [in French]. See http://www.fondsdereserve.fr/documents/Rapport_FRR_environnement_30septembre2009-2.pdf

[71] GEF / Profundo (2014) "The Carbon Bubble: The Price of Doing Too Little, Too Late"

[72] Société Générale Cross Asset Research, *CREAM-ing carbon risk*, 2007

[73] Toru, T., *How do sustained changes in cost of airlines influence air traffic*, 2012

[74] Carbon Tracker Initiative, *Carbon supply cost curves: evaluating the risk to oil capital expenditures*, 2013