ENVIRONOMIST
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Environomist China Carbon Market Research Report 2017

south pole group

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Acronyms and abbreviations

ANU	Australian National University
APEC	Asia-Pacific Economic Cooperation
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine
BAU	Business as Usual
BJ	Beijing
bln	billion
CaCO3	Calcium carbonate
CaO	Calcium oxide
CBEEX	China Beijing Environmental Exchange
CCEP	Centre for Climate Economics and Policy
CCER	China Certified Emissions Reductions
CCF	China Carbon Forum
CCICED	China Council for International Cooperation on Environment and Development
CCPG	Central China Power Grid
CDM	Clean Development Mechanism
CEEX	China Emissions Exchange
CEMS	Continuous Emissions Monitoring System
CER	Certified Emission Reduction
CFDAM	Climate financing demand analysis model
CGN	China General Nuclear Power Corporation
CGNPC	China General Nuclear Power Group
CH_4	Methane
CNEEEX	Shanghai Environment and Energy Exchange
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CSPG	China South Power Grid
CQ	Chongqing
CUFE	Central University of Finance and Economics
DG	Directorate General
DRC	Development and Reform Commission
EA	Emission Allowance
EB	(CDM) Executive Board
EBRD	European Bank for Reconstruction and Development
ECMS	Environomist Carbon Management System
ECPG	East China Power Grid
ECX	European Climate Exchange
EE	Energy Efficiency
EFET	European Federation of Energy Traders
ESG	Environmental, Social and Governance
ETF	Exchange-Traded Funds
EU	European Union
EU ETS	European Union Emissions Trading System

EUA	European Union Allowance
EUCCC	European Union Chamber of Commerce in China
EY	Ernst & Young
FNI	Fridtjof Nansen Institute
FTZ	Free Trade Zone
FX	Foreign Exchange
G8	Group of Eight
GD	Guangdong
GDP	Gross Domestic Product
GHG	Greenhouse gases
GSP	Generalised System of Preferences
ha	Hectare
HFC	Hydrofluorocarbon
HB	Hubei
IBRD	International bank for Reconstruction and Development
ICF	International
IOSCO	International Organization of Securities Commissions
Kg	Kilogram
Kt	kilotonne
LLGHG	long-lived greenhouse gases
MgCO3	Magnesium carbonate
MgO	Magnesium oxide
MRVA	Monitoring, reporting, verification and accreditation
MWh	Megawatt hour
N2O	Nitrous oxide
NCPG	North China Power Grid
NCSC	National Centre for Climate Change Strategy and International Cooperation
NDC	Nationally Determined Contribution
NDRC	National Development and Reform Commission
NEPG	Northeast China Power Grid
NGO	Non-governmental Organisation
NHDR	National Human Development Report
NPK	Nitrogen, Phosphorous and Potassium or Potash
NRDC	Natural Resources Defense Council
NSC	National Standards Commission
NWPG	Northwest China Power Grid
OECD	Organisation for Economic Co-operation and Development
OTC	over-the-counter
PFC	Perfluorocarbon
PLN	Perusahaan Listrik Negara
PoA	Programme of Activities
RCCEF	Research Center for Climate and Energy Finance
RGGI	Regional Greenhouse Gas Initiative
SF6	Sulphur hexafluoride

SH	Shanghai
SZ	Shenzhen
t	tonne
tCO_2e	tonnes carbon dioxide equivalent
TJ	Tianjin
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VER	Verified Emission Reduction

Preface

"Enabling conditions for a successful national ETS"
United Nations Development Programme

民强国盛

The fourth edition of the Environomist's *China Carbon Market Research Report* examines the outlook for China's carbon market on the eve of the launch of the national emissions trading scheme. The previous three reports have documented the early developments of the Chinese market through the seven ETS pilots, national and non-pilot area policies, and a description of various types of financial services available to facilitate greenhouse gas (GHG) reductions and participation in the carbon markets. This report expands on this work discussing the performance of and policy developments in China's carbon markets in 2016. As well, Environomist's annual survey of stakeholders in the carbon market provides a snapshot of attitudes towards and experiences with China's carbon markets.

Although there is a growing body of international and Chinese experience with emission trading schemes to draw on, the development of a robust carbon market involves multiple government, private sector and civil society stakeholders, and requires detailed technical support and policy regulations in many areas such as accounting, allocations, submissions, registration, monitoring and verification, market exchange and management. UNDP and the Norwegian Government have been working with the National Development and Reform Commission (NDRC) since 2012 to support critical technical work on GHG registration, accounting, pricing and capacity building that will provide a solid basis for the success of China's national ETS. Expert teams from Tsinghua University, the National Centre for Climate Change Strategy and International Cooperation (NCSC), and SinoCarbon in China and the Norwegian Environment Agency in Norway are providing technical inputs.

The *"Establishment of the National Registry System for Domestic Emissions Trading Scheme and Voluntary Carbon Emission Reduction"* Project was initiated in July 2012. The project objectives were to establish a national registry system for a domestic emission trading scheme and voluntary carbon emission reduction projects as well as to design the reporting templates and management workflows for enterprise greenhouse gas emissions data management and emissions reporting.

With the emergence of a project-based voluntary emissions reduction (VER) market in 2007 and the launch of the ETS pilots in 2010, it was apparent that preparations for the eventual launch of a national ETS would need to be begun a soon as possible. Since for both the national VER market and a national ETS, the authorities would need to effectively document, monitor and manage every unit of allowance and China Certified Emission Reductions (CCER- used for off-set projects), and ensure their ownership and quantities at any given time point, it was essential for the Central Government to establish an official operational platform, linked with the trading platform. This platform would help all participants in the markets to conduct transactions in a lawful, fair and

transparent manner, and ensure that transacted products were in compliance and legally transferred. In line with the practice of carbon markets in other countries and ETS pilots at the provincial level in China, an electronic registry system, which is similar to the electronic billing system employed by banks, was developed to provide documentation, tracking, management and transaction of allowances and CCERs, compliance and information inquiry. In addition, this project established an enterprise GHG data management and reporting system for Jiangsu, Henan and Shandong. As a result of this project, the national emission trading registry system was established in January 2015, providing the foundation for the national launch of the ETS in 2017.

Another linked project, "*Provincial GHG Emission Inventory Capacity Building and GHG Emissions Accounting Methodology for Enterprises of Key Industries*", was also launched in June, 2012. This project developed guidelines and methodologies for the accounting and reporting of GHG emissions from key sector industries. In the methodologies, direct, indirect and mobile emissions are included. The methodologies also distinguish between combustion emissions and process emissions. Altogether, 18 guidelines on GHG monitoring and reporting methodologies were developed in the following sectors: Iron and steel; Chemicals (including methanol, calcium carbide, ammonium, ethylene); Non-ferrous metals (aluminum, magnesium); Building materials (flat glass, cement); Power (thermal power plant and grid company); Aviation; Transportation; Building construction; Machinery and equipment manufacturing; Papermaking; Food manufacturing; Mining (except for coal mining); and, Other sectors (common guideline; fuel emissions). The guidelines are available on NDRC's web page. Enterprises covered by the Chinese ETS use these guidelines when monitoring and reporting their emissions.

Now a second phase of the national ETS registry project has been launched. The second phase will develop an effective tool to monitor and evaluate the process and the impact of allocations. Allocations need continual adjustment to ensure that carbon pricing is appropriate to the ultimate goal of incentivising emission reductions. This tool will help to improve the quality of the initial allocations as well as improve the allocation process over the coming years. As well, the project will support implementation capacity at the local level, as local governments will play significant roles in administering the ETS within their regions. It will also build reporting capacity within the public and private sectors and develop a unified and user-friendly information disclosure platform for the effective operation of the ETS. This project will create the necessary enabling conditions for the operation of the national ETS in its infant stage.

China has ramped up the development of its national ETS, both national and provincial GHG inventory capacities, putting in place the systems needed for the successful operation of a carbon market in a very short time. There are still significant capacity gaps, particularly at the enterprise and local government levels in non-pilot areas. This is why reports such as the *China Carbon Market Research Report* and knowledge exchange platforms enabled by such research, is needed to enhance the successful operation of the ETS. As China emerges as a global leader in the implementation of the Paris Agreement, national and international stakeholders are eager to support China's effort to fight global climate change and make the transition to more sustainable development.

Introduction

This report is based on information and legal documents made publicly available prior to 31 December 2016, some of which may be out of date by the publication date.
This report was conducted by Environomist Ltd. who 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
Key experts: Mr. Caspar Chiquet, Mr. Xuan Yang, Dr. Long Chen, Ms. Ariana Xiao, Mr. Bo Gao, Mr. Nan Ma
Data controller: Mr. Wei Chang, Mr. Ming Zhou
Editor: Mr. Wei Chang, Ms. Mandy Wu
Reviewer: Mr. Richard Mao, Mr. Huw Slater, Mr. Nan Ma

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The United Nations Development Programme
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Mr.Peter Reitz, Mr. Caspar Chiquet, Mr.Albert de Haan, Mr XiaoDi Cai, Mr. Simon Chen, Mr. Min Fang, Ms. ShiYang Shao, Mr. MingZhe Yu, Ms. Kathy Hung, Ms. Chao Cai, Mr. Bo Chen, Ms. Yao Wang, Mr. Richard Mao, Mr. Xuan Yang, Dr. Long Chen, Ms. Ariana Xiao, Mr. Bo Gao, Mr. Nan Ma, Mr. Wei Chang, Ms. Mandy Wu, Mr. Ming Zhou, Mr. Huw Slater

We are grateful to receive feedback and comments from our valued readers
Please feel free to contact: richard.mao@environomist.com

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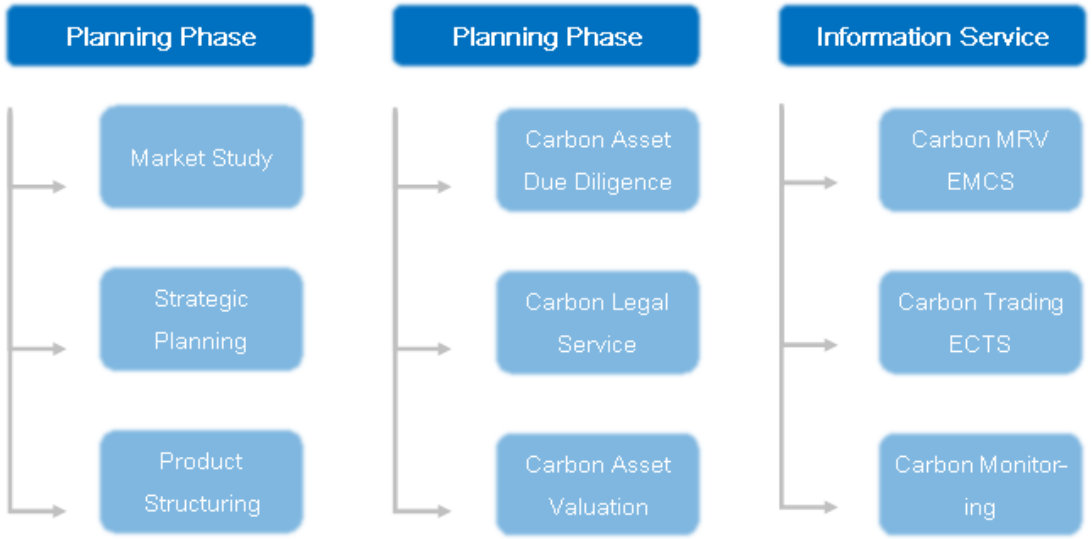
Environomist Ltd.

Environomist Ltd. (www.environomist.com) 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's employees have a wide range of backgrounds, both Chinese and Western, who are familiar with international carbon market rules while also deeply understanding the unique characteristics of carbon management in China. We differ from other consulting firms in that we serve our customers with "interest neutral principle" and a set of carbon management solutions, which include both planning and execution methodologies, to best achieve the desired goals.

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



South Pole Group Asset Management Ltd.

South Pole Group (www.thesouthpolegroup.com) is a leading developer of Certified and Voluntary Emission Reductions projects (CERs and VERs) and a provider of specialised consultancy and carbon IT services.

South Pole's carbon project portfolio focuses on high-quality carbon emission reduction credits for a wide range of sectors. The advisory and consulting services span from GHG accounting and carbon foot-printing to project and sector level Measuring, Reporting and Verification (MRV), carbon credit issuance and transaction services, capacity development for project partners and policy advice to governments and international institutions, including reform of the CDM and the design and piloting of New Market Mechanisms (NMMs), including: bilateral sectoral crediting, domestic emission trading schemes, Nationally Appropriate Mitigation Actions (NAMAs), and their integration into Low Carbon / Low Emission Development Strategies (LCDS/LEDS).

South Pole is consistently rated among the most successful carbon companies. The company's current portfolio includes more than 400 emission reduction projects (CERs, VERs and Programme of Activities - PoAs) in over 25 countries, totalling more than 100 million tonnes carbon dioxide equivalent (tCO2e) expected to be issued up until 2020, and more than 55 million tCO2e already issued and delivered in less than six years, making South Pole one of the leading market players worldwide. In particular, the company is a world-leading project developer and seller of Gold Standard CDM and voluntary emissions reduction credits.

Since its inception in 2006, South Pole has grown very rapidly and now has offices covering all regions of the world. South Pole is headquartered in Zurich and has offices in Bangkok, Beijing, Hanoi, Hong Kong, Jakarta, Kampala, London, Medellín, Mexico City, New Delhi, Stockholm and Taipei, as well as a representative office in San Francisco, Addis Ababa, São Paulo, Sydney and Melbourne. The company is privately owned and employs more than 130 carbon market experts from over 20 countries.

Ant Financial Services Group

Ant Financial Services Group ("Ant Financial"), was officially founded in October 2014 and originated from Alipay which is the world's leading third-party payment platform founded in 2004. With its vision of "bringing small and beautiful changes to the world," Ant Financial is dedicated to creating an open ecosystem, enabling financial institutions and partners to make rapid progress towards "Internet+" goals through its "Internet Booster Plan," and providing inclusive financial services to small and micro enterprises and individual consumers.

Ant Financial runs Alipay, Ant Fortune, Ant Financial Cloud and other financial services. Ant Financial's invested companies and affiliates also work with these businesses units and support Ant Financial's ecosystem. The services provided by Ant Financial and its affiliates cover payment, wealth management, credit reporting, private bank and cloud computing.

Ant Financial: Outlook of Internet + Green Finance

Ant Financial Service Group (hereinafter referred to as Ant Financial) has long been committed to the practice of green finance to unleash the strength of financial science and technology companies for active innovation and cultivate a “green finance that is somewhat different”.

The green financial strategy of Ant Financial includes three levels: first, developing new finance in a green way, so that Ant Financial can become a model of green financial enterprises. Second, developing financial tools to promote green economic development, support green production and consumption and promote the popularization of green awareness. Third, mobilize the general public to pursue a low-carbon lifestyle so as to promote green education and encourage public involvement.

Today, Ant Financial has covered hundreds of cities, providing various services, allowing users to enjoy convenience by just moving their fingertips at home, greatly saving the travel costs and reducing carbon emissions. On August 27 in 2016, Ant Financial launched personal carbon accounts for the 450 million Alipay users, which is the largest personal carbon account platform in the world so far.

“Carbon account” is an innovative carbon financing tool. The first phase of the “carbon account”, as one of the three accounts of Ant Financial, is used to measure the amount of a user’s carbon emission reduction in daily activities. In the Alipay client, the first phase of the “carbon account” concept highlights the service value of users’ carbon emission reduction and was designed into an “Ant Forest” game for public welfare: if users travel by walking or subways, pay public utility fees online, pay traffic citations online, make an appointment with a doctor online or buy tickets online, some amount of carbon emissions will be reduced and the reduction can be used to raise a virtual tree in Alipay. When the tree grows up, non-profit organizations, environmental protection enterprises or other eco-partners of Ant Financial will “buy” the “tree” from the user and plant a real tree in a region.

The "personal carbon account" initiative of Ant Financial is the first large-scale attempt (targeting nearly 1/3 of the Chinese population) of China to encourage low-carbon behavior among the public.

It, for the first time ever, recognizes and grants tangible values to the public for their low-carbon behavior through scientific measurement in a large scale.

In the first phase, the public welfare funds will buy the “green energy” accumulated in personal carbon accounts and transform the green energy into tree planting. In the future, the Voluntary Emission Reduction (VER) trading mechanism commonly adopted in the world will be used as a reference to encourage enterprises and individuals with social responsibilities to buy the “green energy”, so that a closed loop can be formed. In the next step, if the individual carbon emission reduction activities can be recognized by a nationally accepted methodology and incorporated into the China Certified Emission Reduction (CCER) catalog, it will further promote the realization of the value of personal carbon accounts.

Ant Financial hopes that the carbon account can not only record the individual’s green and low carbon activities in future, but also become a carbon account for the individual to conduct carbon trading and investment in the carbon market.

1 Global response to climate change

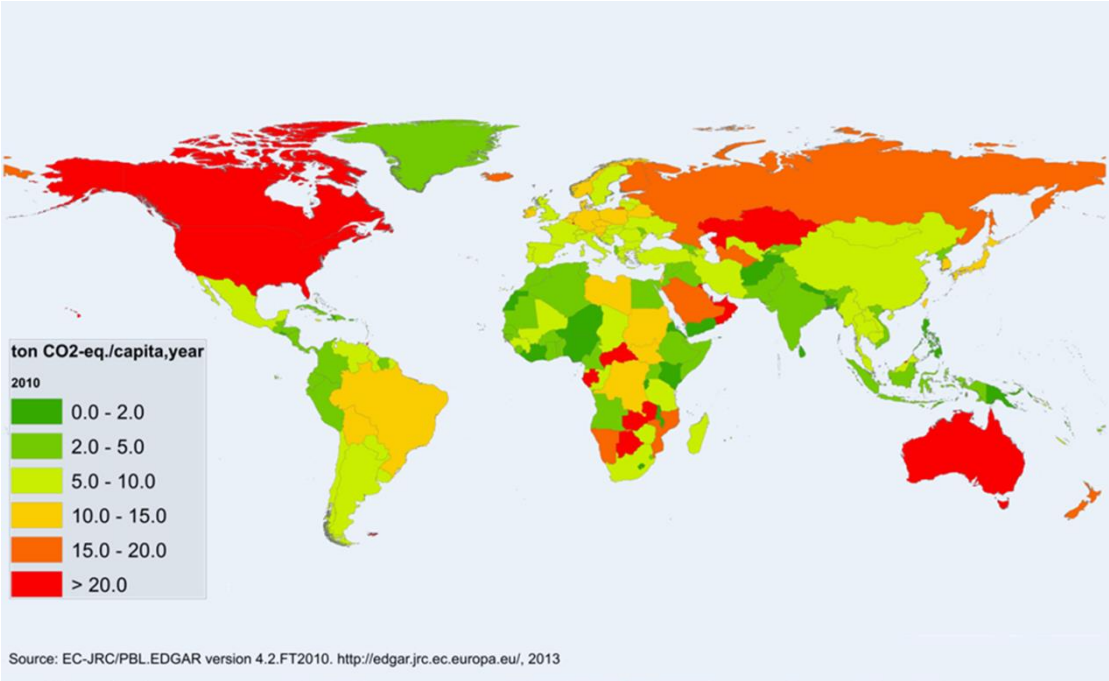


Figure 1: Carbon emission intensity global distribution map

On December 12, 2015, about 200 parties to United Nations Framework Convention on Climate Change (UFNCCC) negotiated for 13 days and finally reached a new climate agreement, the Paris Agreement. Under the agreement, they agreed/committed to put forward their best efforts to control carbon emissions, limit global temperature increase to well below 2 degrees Celsius and achieve zero emissions by the second half of this century.

The Paris Agreement (United Nations, 2015) contains 29 articles, includes clauses on goals, mitigation, adaptation, loss and damage, finance, technology, capacity building, transparency and a global stock take. The agreement reflects a balance between mitigation and adaptation, matching actions and support, obligations in accordance with responsibilities, a balance between ambition and space for development, and a link between strengthened efforts before 2020 with even stronger actions after 2020. The clinched agreement means that the use of fossil fuel may end, and world investment will be in favor of green energy, low-carbon economy, and environment improvement and so on. This agreement will chart a fundamentally new course in the post-2020 global climate effort.

On April 22, 2016, 175 countries formally signed the Paris Agreement in New York and more than 60 heads of state and government attended the signing ceremony. Vice Premier Zhang Gaoli, as special envoy of President Xi Jinping, attended the high-level signing ceremony of the Paris Agreement on Climate Change at the UN headquarters in New York. The Paris Agreement was open for signing from April 22, 2016 to April 21, 2017.

For the treaty to enter into force, a minimum of 55 parties to the UNFCCC whose greenhouse gas emissions account for more than 55 percent of the global total need to submit their ratification, acceptance and approval or accession documents. The agreement will become fully effective 30 days after these procedures are complete.

Chinese President Xi Jinping, U.S. President Barack Obama and Secretary-General of the United Nations Ban Ki-moon attended the deposit of instruments of joining the Paris Agreement in Hangzhou on September 3, 2016. The Presidents of China and the United States handed over their countries' instruments for joining the Paris Agreement separately to Secretary-General of the United Nations Ban Ki-moon, and on the same day the Standing Committee of China's National People's Congress (NPC) ratified the Paris Agreement, becoming the 23rd party to ratify the agreement. The European Parliament overwhelmingly backed the ratification of the Paris Agreement deal, which meant it meets the prerequisite to come into effect. Secretary-General of the United Nations Ban Ki-moon declared on October 4 that the Paris Agreement was above the two thresholds needed for implementation and would take effect from November 4. So the historic Paris Agreement, one of mankind’s most significant efforts to combat climate change, came into force. Australia ratified the Paris Agreement on November10, following Japan which delivered instruments of joining the Paris Agreement to the United Nations on November 8, and brought it to160 parties, which accounted for 75% of global GDP and 55% of global GHG emissions. Up to November15, 189 parties in the world have ratified the Intended Nationally Determined Contributions (INDCs) and promised to reduce GHG emissions and take steps to adapt to changing climate. The implementation of INDCs depends on a series of policies and planning, among which carbon pricing mechanism will play an increasingly important role.

In general, it takes years for such a complicated and controversial international agreement as the Paris Agreement to complete ratification and take legal effect. The Kyoto Protocol took 7 years to become effective, while the Paris Agreement has taken only 11 months to come into effect----- an unprecedented speed, which showed that the international community had sufficient political consensus and positive willingness to act to cooperate to combat climate change.

The twenty-second session of the Conference of the Parties (COP 22) to UNFCCC was held in Marrakech, Morocco from 7-18 November 2016 and began the implementation of the Paris Agreement. The participants from more than 190 countries and regions in the world discussed the technological details of implementing the Paris Agreement and promoted the implementation of the Paris Agreement during the 12-day session. The Marrakech Action Proclamation was published on November17, which reiterated supporting Paris Agreement and emphasized that each party should make the greatest political commitment to putting the agreement into action. The developed countries reaffirmed the $100 billion mobilization goal in the proclamation. During the session, the 12th Session of the Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol, and the 1st Session of the Conference of the Parties serving as the Meeting of the Parties to the Paris Agreement were also held. These commitments confirm a positive resolve to enact and accelerate the response to global climate change.

2 International status of carbon pricing

Up to October 2016, approximately 40 countries and more than 20 cities, states, and regions, have implemented a carbon pricing system. These carbon pricing systems cover 7 billion tons of CO_2e, or 13% of global GHG emissions. In the past decade, the global emissions covered by the carbon pricing systems has tripled. In 2016 two new carbon pricing plans were published: British Columbia in Canada priced the emissions from liquefied natural gas, and Australia introduced a set of security mechanisms for an Emissions Reduction Fund, requiring large emitters above the threshold to offset their extra emissions.

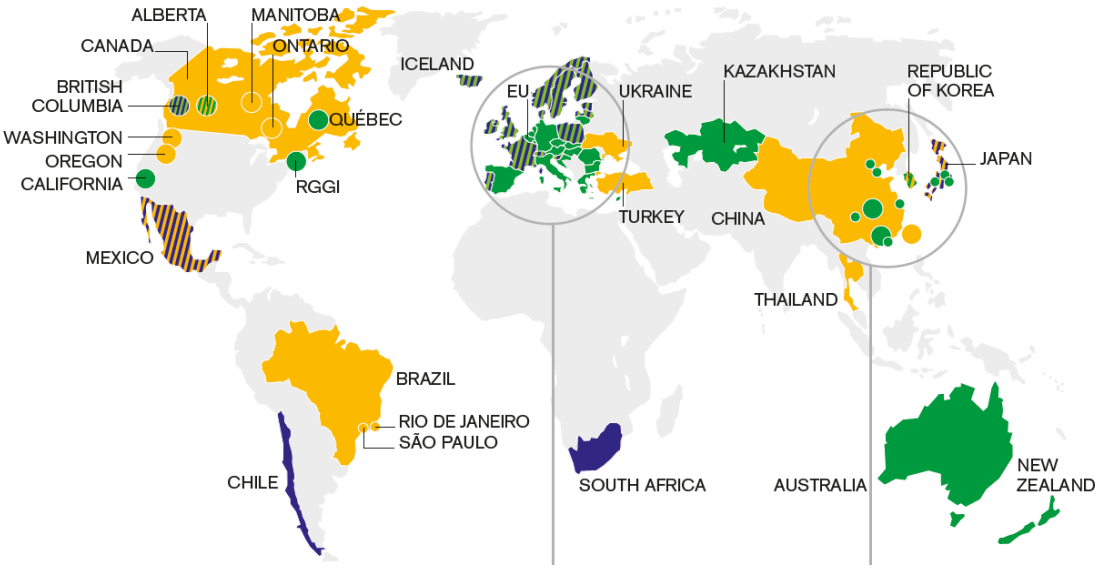


Figure 2: Carbon pricing schemes globally

Source: (World Bank and Ecofys, 2016)

Among the existing mechanisms, carbon price varies within a great range. In 2016, the price per ton of CO_2e of the world emissions ranged from less than US $1 to $13, of which about 3/4 is valued at less than $10/t CO_2e.

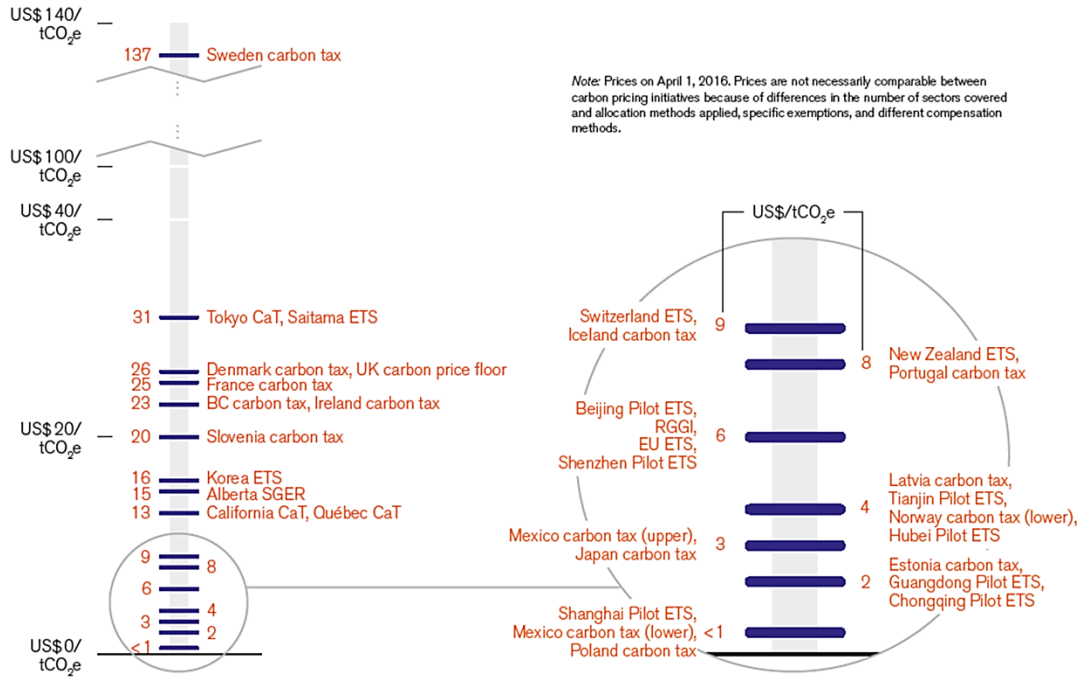


Figure 3: Global carbon price map

Source: (World Bank and Ecofys, 2016)

Besides addition of mandatory carbon pricing mechanisms, the CDC reported that enterprises which implement internal carbon pricing in 2016 has also risen to 2 times more than in 2014. The carbon prices used within the enterprises ranges from US $0.3 to $893 per tone of CO_2e, of which 80% is valued between US $5 to$50/t CO_2e.

The global emissions covered by carbon pricing mechanisms is expected to increase by an even greater margin. If China can complete the construction of a national emission trading scheme, the global emission share covered by carbon pricing mechanisms will rise from the current 13% to 20~25% according to the original informal estimate. The other plans to start in 2017 include the following: in Canada, Ontario province will introduce an emission trading scheme and Alberta province plans to implement a carbon tax with the existing ETS; Chile and South Africa will launch carbon taxes; France is to introduce the lower limit of carbon pricing.

The scope covered by carbon pricing mechanisms has expanded notably. To get the political support, a few policymakers have promoted a low carbon price. The achievement of the policy framework and institutional structure of carbon pricing lays foundations for future emission reduction ambitions.

More than 90 of the countries which have submitted INDCs mentioned carbon pricing measures, including carbon trading schemes and carbon taxes. These countries are planning or considering adopting a domestic or international carbon market in their INDC declaration, which accounts for 61% of global emissions. Most of these countries demand financial and technological support from international carbon market. Of the countries which are planning or considering adopting market mechanisms, 3 countries are TOP 5 emitter economic entities in the world.

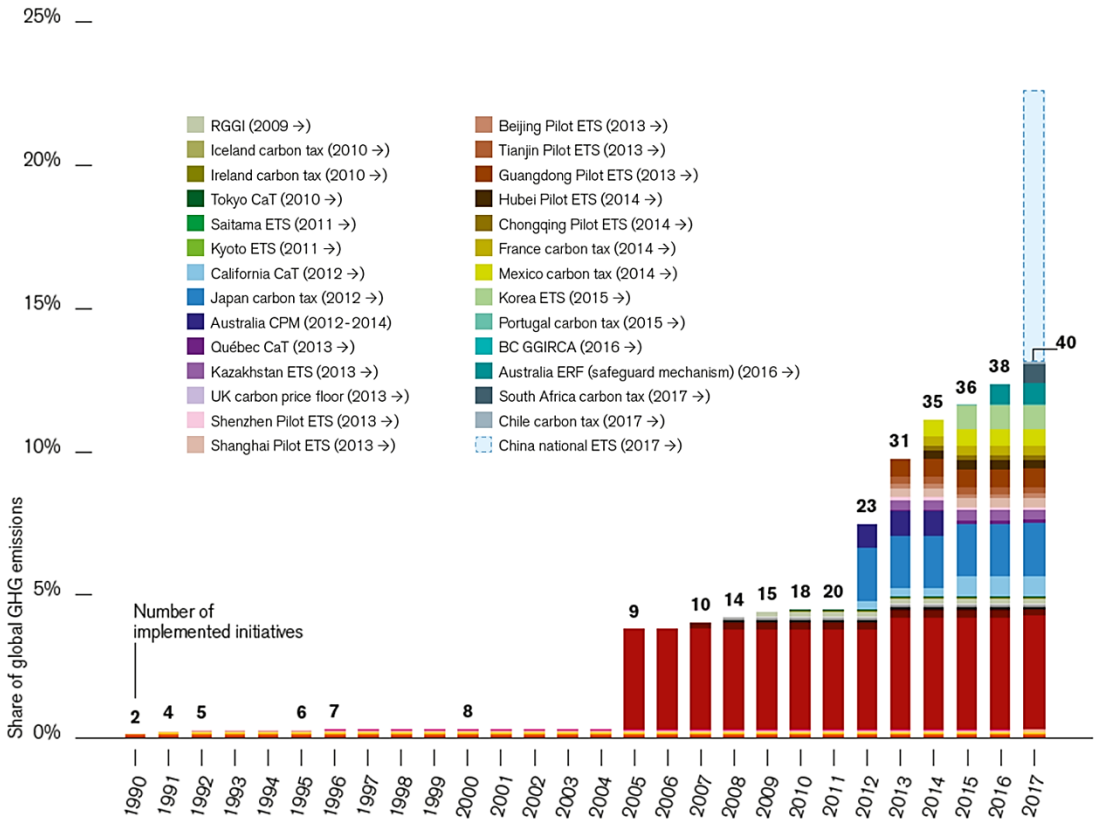


Figure 4: Major carbon pricing mechnisms after 2000

source：(World Bank and Ecofys, 2016)

According to the World Bank, the global CO_2 trading demand is estimated at 0.7~1.3 billion tons annually, thus an international GHG trading market with the trading value of US $14~65 billion is possible. As a developing country, China is one of the biggest emission reduction markets, of which annual carbon trading volume in the next 5 years will amount to over 200 million tons. By 2020, the global carbon trading value is expected to reach US $3500 billion and become the first energy trading market outstripping the oil market, of which China is expected to become the biggest carbon trading market. It can be seen that the carbon trading market both in the world and in China will become a new finance and trading field of opportunity with tremendous potential and opportunities and challenges.

Ahead of the COP in Paris, an unprecedented alliance of Heads of State, city and state leaders, with the support of heads of leading companies, joined forces to urge countries and companies to put a price on carbon. In addition, Paris saw the launch of the Carbon Pricing Leadership Coalition (CPLC). The CPLC brings together governments, business and non-government organizations (NGOs) that seek to take action to accelerate the global uptake of carbon pricing.

The International Civil Aviation Organization (ICAO) issued an aviation draft carbon emission solution for aviation emissions, a revised draft of the Global Market-Based Measures Program (GMBM) Scheme (Lin Chiheng, 2016), which aimed at global aviation industries becoming carbon neutral, to offset CO_2 emissions by planting trees or other environmental projects. The draft proposes that global GMBM should be divided into two stages. In the first stage of 2021-2026, countries should be encouraged to participate; in the second stage of 2017-2035, this scheme

should be imposed. If a country doesn't participate in this scheme, it will get a small place in international aviation fields. Under the unified aviation emission solution, aviation enterprises with emissions exceeding the increase rate of global carbon emissions should purchase a carbon emission quota from environmental projects designated by ICAO. ICAO estimated flight enterprises should use 0.2-0.6% of revenues to purchase a carbon emission quota in 2025, and the proportion should rise to 0.5-1.4% in 2035. These measures lay foundations for countries' adopting carbon pricing measures and addressing climate change.

Commentary 1: Global emission trading

Guest commentator: Peter Reitz，Chief Executive Officer of EEX

World climate negotiations rely on the market

There are moments in history which you simply do not forget. One such moment was the conclusion of the COP21 world climate conference which was held in Paris in December 2015. For the first time in history, governments worldwide committed to the long-term aim of limiting global warming to 2°C higher than in the pre-industrial age.

What is particularly positive is that the world climate treaty recognizes the importance of markets for the attainment of climate protection targets. In fact, it goes further than this – by calling for the expansion of the use of market mechanisms.

The attainment of these targets will require the greater expansion of pricing of greenhouse gases (first and foremost CO_2), and emissions trading systems have certainly evolved into the most efficient market-based instrument to achieve this. Within the European Union it is the main instrument for climate protection – with an ever-increasing number of countries worldwide adopting this approach.

By determining a price for carbon worldwide, emissions reductions can be achieved in the most cost-efficient way. Moreover, an increasingly global approach to carbon pricing will also help to level the playing field for industries that are in international competition.

Europe and China – building a bridge towards a global emissions trading system

The launch of the national trading system in China in 2017 represents an important milestone towards a global emissions trading system. With an annual volume ("cap") of approximately 4 billion tons of CO_2 – more than double the size of the European scheme – China will create the biggest emissions trading system in the world. This means that the most significant producer of greenhouses gases will rely on a market-based solution for limiting its emissions.

China and Europe combined represent more than 40% of the world's total CO_2 emissions. When applying an economy-wide ETS in China from 2017 onwards, a major share of these emissions will be capped and subject to carbon pricing. This fact already highlights the great relevance of both regions' action towards mitigating climate change and will lift the use of emissions trading to a whole new level.

At the same time, a close coordination between both systems in China and Europe will be crucial. This is because, from the perspective of market participants, both carbon markets already have close interconnections – and many companies will be covered by the emissions trading system in both regions as a result of their business activities.

EEX taking responsibility – in Europe and beyond

EEX is an exchange with a long experience in facilitating carbon markets. Our commitment dates back to 2005 and is also reflected in impressive figures. So far, more than 3,500 million emission allowances have been traded on EEX. We have carried out more than 1,150 auctions for 27 countries. More than 150 participants are licensed to trade on our market. This does not only testify to our experience but also to the trust which the market and our customers place in us – and this is something we very much appreciate.

EEX's long-standing experience also means that we have a special responsibility for the further development and integration of emissions trading worldwide as a means to ensure the urgently needed pricing of emissions. Given its specific area of expertise, EEX has supported the development of market infrastructure for emissions trading in different countries worldwide. For instance, in the past, EEX has performed several consultancy mandates with different Chinese carbon exchanges.

Building on this involvement, in 2017 EEX plans to offer its own products for the national Chinese emissions trading system. In doing so, we will not only offer market participants trading instruments for the European emissions market but also for the Chinese market via one central platform. This is explicitly intended as a supporting measure for, and not as an alternative to, the China carbon market domestically. In fact, we want to gradually expand this offering in cooperation with Chinese partners and, through this, link the EU ETS with the Chinese ETS.

The climate conference in Paris has shown us that the world is determined to limit global warming. Pricing of CO_2 and in particular emissions markets, are prevailing as the means of choice to ensure the required restriction of greenhouse gas emissions. We should continue this course and, at the same time, expand the links between the trading systems. EEX is certainly ready and willing to make its contribution to this historic development and we look forward to continuing steadfastly on this course - together with you

Mr. Peter Reitz has been chairman of the EEX Management Board since August 2011. After gaining a degree in mathematics, he started his career as a product manager at Deutsche Börse AG in Frankfurt. From 2000 to 2001, he worked at Dow Jones Indexes in New York before he became a member of the Eurex Management Board. Since 2007, he has overseen the development of the EEX as a member of the EEX Supervisory Board.

Commentary 2: International Compliance for China's MNCs

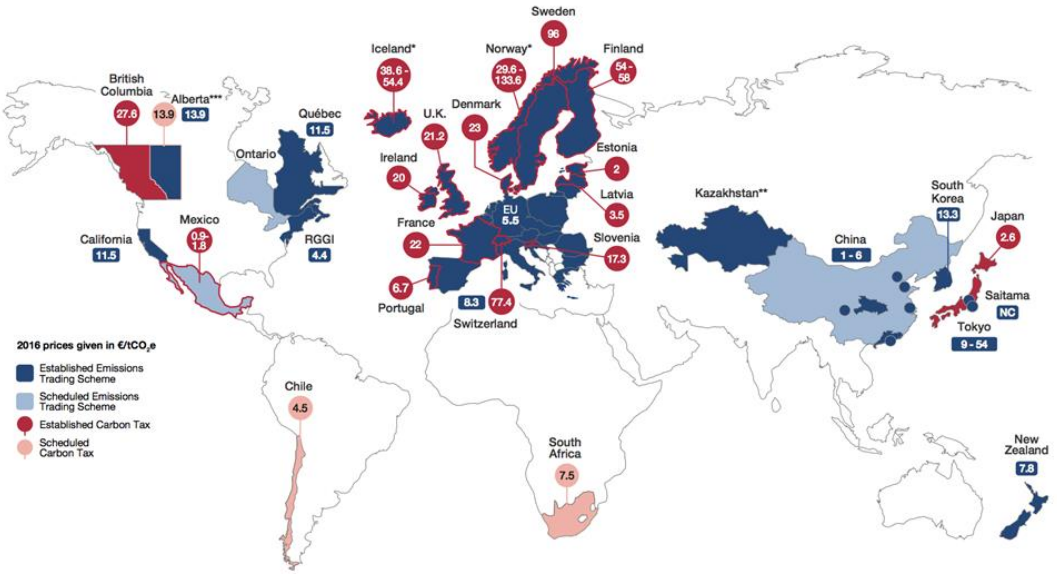
Guest commentator: Caspar Chiquet, south pole

International Compliance for China's MNCs

China's multinational corporations are increasingly active in geographies and sectors that are exposed to environmental regulation, disclosure requirements and carbon pricing. At the same time, they face pressure from clients, consumer groups and competitors to meet environmental, social and governance best practices that may exceed domestic requirements. In the case of a majority stake, Chinese MNCs need to build up technical expertise and management capacity to implement measures addressing these risks. Without a controlling stake, they still may want to hedge the risk exposure of their overseas investment portfolio. This article summarizes the most common compliance requirements and associated risks, as well as some ways to address them.

Explicit carbon pricing regimes

By early 2017, a large part of the global economy is already subject to explicit carbon pricing, be it in the form of emission trading schemes, carbon taxes, or a combination of both.



Source: I4CE - Institute for Climate Economics, September 2016

This exposes operations and investments of Chinese MNCs to various risks associated with carbon pricing regimes, including compliance risks and price risks. Unfamiliarity with compliance requirements can lead to high costs, even if fines for non-compliance can usually be avoided by buying last minute on the spot market. Nevertheless, unhedged carbon positions can be very costly, especially for resource-intensive industry. As a famous saying among carbon traders goes, "Not taking a position is also taking a position". The complexity of operating across multiple jurisdictions with differing policy requirements, as well as the combination of trading and tax regimes, calls for a well-managed approach at group level. Depending on the nature, size of engagement, and wether or not a Chinese MNC is acquiring controlling stakes in oversea corporations, it may make sense to build up capacity inhouse with a dedicated carbon compliance and trading desk, or to outsource it to external specialists with a mandate to manage carbon risks on behalf of the MNC.

The first step is recognizing and quantifying these risks, as they may be hidden in supply chains, in minority stakes, or affect investments of an MNC in other unexpected ways. A good first step is a top-down assessment of all carbon footprints and associated risks, which can

often be done based on already available data and with comparably little effort. Based on the outcome of such assessment, a more thourough analysis for certain risk hotspot can be undertaken.

Based on the outcomes of such analysis, the MNC can then develop a targeted hedging strategy for its different risk exposures. Luckily, most existing carbon pricing mechanisms offer standardized products and tools to hedge carbon positions and pricing risks in a simple way and at low costs.

Mandatory disclosure requirements

Chinese MNCs may already be familiar with another form of increasingly common compliance requirement: the mandatory listing requirements for various stock exchanges. Oversea IPOs (or nearshore, in the case of the Stock Exchange of Hong Kong), are a popular avenue for Chinese corporations to raise capital directly in foreign currency, sidestepping currency exchange restrictions for RMB-based outbound investments. More and more stock exchanges include as part of their listing criteria the requirement to disclose an accurate carbon footprint. Other exchanges allow exceptions, but they need to be justified in an official statement from the listed company. Mandatory disclosure requirements have had a significant impact on disclosing practices of MNCs, with a full 100 percent of the FTSE 100 disclosing their carbon footprint, and 64% of the CDP's close to 2,000 analyzed MNCs report and independently verify their emissions. This compares to only 2 out of 9 responding companies listed on the Shanghai Stock Exchange. Disclosure in China is still at its early stages.

Chinese MNCs looking to raise capital abroad are therefore subject to a much stricter disclosure environment and need to build up corresponding compliance capacity to ensure they meet those standards. Again, depending on readiness of the overall group, disclosure can be managed at the group level, if capacity already exists or the capacity gap is rather small. Other MNCs lack the required expertise at group level, since reporting requirements in China differ to a significant extent, and many industries are not subject to public disclosure at all. In those cases, it makes more sense to ensure compliance with local mandatory reporting requirements at the level of the listed company, or outsource the mandate to specialists who do it on behalf of the MNC at the portfolio level.World climate negotiations rely on the market

Mr. Caspar Chiquet is Head of Implementation for the Advisory Unit and manages the MRV practice of South Pole. He is responsible for monitoring and certifying emission reductions for 100+ installations throughout Greater China and providing consulting services in the field of monitoring, reporting and verification. Prior to joining South Pole, Caspar worked for UBS Wealth Management in the Key Clients Solutions Group with a focus on ultra-high net worth individuals (UHNWI) in the Greater China area. He is an expert on IT questions and holds an M.A. from the University of Zürich in Chinese Studies and International Law and is business fluent in Chinese.

3 Construction progress in China's carbon market

In October 2011, the National Development and Reform Commission (NDRC) published the "Notice on Carbon Emissions Trading Pilots", in which Beijing, Tianjin, Shanghai, Chongqing, Shenzhen, Guangdong and Hubei, totaling seven provinces and cities, were assigned to develop ETS from 2013 to 2015. Since then the NDRG has published the 'Interim Measures for the Management of Carbon Emissions Trading' in December 2014 which is the basic law of the carbon market to ensure active, smooth ETSs with clarity of responsibilities and good compliance performance, which provides valuable experience and solid foundations for national ETS.

In January 2016, the NDRC issued "On the effective implementation of the National Carbon Emissions trading market", and made unified deployments in building the national carbon market to ensure that the national ETS is to start in 2017. In March, the draft National Carbon Emissions Trading Regulations was submitted for approval and was listed by the General Office of the State Council as one of legislative plans. On June13, Liu He, deputy director of NDRC presided over the NDRC reform seminar, and proposed to accelerate the progress of the carbon emission trading system, thus the national ETS building was speeding up. It follows that the year 2016 is the key period during which the carbon market goes from pilots to national scheme.

Much experience has been gained since the seven carbon pilots were launched, while the carbon market has played a positive role in energy structure transition. This supports carbon emissions trading mechanism building and provides experiences and lessons for building the national ETS, which gives the policy makers the experience and confidence to launch the national ETS in 2017 and fully implement the national ETS by 2020. In 2017 China will operate carbon emission trading mechanisms on a national scale, and fully boost its positive impact on controlling GHGs emissions and promoting energy transition.

3.1 The preparation of national ETS

At the end of September 2015, President Xi Jin Ping declared in the "Sino-US Joint Presidential Statement on Climate Change" China would launch national ETS in 2017. The national ETS covers the petrochemical, chemical, building materials, iron and steel, non-ferrous metal, papermaking, power generation and aviation industries, and businesses with an annual energy consumption of more than 10,000 tons of standard coal, in building materials, iron and steel, non-ferrous metal, paper, electricity, civil aviation, coal and chemicals. According to allowance allocation estimates, the total allowance of the 8 key industries is about 5 billion tons of total emissions, accounting for almost 50% of the national overall emissions. Thus, China will be the biggest carbon market in the world.

Jiang Zhao Li, Deputy Director of the Department of Climate Change in the NDRC pointed out the construction of the national carbon market was divided into three stages in chronological order: during 2014-2016, the first stage, the main work shifted from launching national ETS research to completing the preparation for a national carbon market, including laws and regulations for a national ETS and supporting rules and technology standards, which are needed to meet carbon market starting conditions; during 2017-2020,the second stage, namely the launching stage, from 2017 to 2018 every element should be in place, allowance allocation starts, and after 2018, national ETS should cover more industries in 31 provinces, and Xinjiang Production and

Construction Army Corps are to ensure smooth operation of allowance management and trading, looking to continuous improvement; post- 2020, the third stage, namely the polishing stage, expanding the scope of businesses and products involved, and diversified trading models should be developed to evolve a stable and active market. At the same time, the market capacity and activity should be promoted and the feasibility of linking to international carbon market should be explored. (NDRC, 2016).

3.1.1 Elements of carbon market

Based on the pilot experiences, there are some common problems and drawbacks of two sorts: Firstly, in institution building. The legal support for carbon trading is generally weak; allowance allocations are mainly based on historical data, which the enterprises fear is unfavorable to future allowance allocation; the carbon trading data base is poor and the improvement of the MRV systems through trial and error is a concern for the future. Secondly, most of the pilots showed low liquidity and weak activity; the market-based pricing mechanism has not yet been completely developed; and low transparency in the carbon market leads to a lack of confidence from enterprises and investors (Peasants and workers democratic party committee, 2016). Chairman and CEO of the International Emissions Trading Association (IETA), Dirk Forrister, commented that China's national ETS needs a unified and clear policy environment, with a modest tightening of carbon emission quotas, flexible scheme design and providing regular and transparent trading information (China Securities Journal, 2016). At present the elements of national ETS are as follows:

Table 1: 2016 carbon market policies at nation level

Elements	Main content	Source
Emission reduction target	Carbon emissions intensity: 2015 should be 17% lower than 2010, 2020 should be 40-50% lower than 2005, emissions should peak in 2030 or earlier and should be 60-65% lower than 2005	12th FYP on controlling GHG emissions; National Climate Change Plan (2014-2020); INDC
Regulated gases	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 (based on the enterprise's situation)	Notice on the Organization of GHGs Emission Reporting by Key Enterprises
Market opening date	National ETS should be launched in 2017 and a sound, well supervised, open and transparent ETS should be established by 2020	U.S. - China Joint Presidential Statement on Climate Change
Department in charge	NDRC and province DRCs	Interim Measures for the Management of Carbon Emissions Trading
Regulation system	ETS: 2 level (state and province) management MRV: 3 level (state, province and enterprise)	13th FYP on controlling GHG emissions
Compliance coverage	8 industries: petrochemicals, chemicals, building materials, iron and steel, non-ferrous metals, papermaking, power generation and aviation. The threshold for enterprise entry is annual	13th FYP on controlling GHG emissions

	energy consumption of more than 10,000 tons standard coal in any year during 2013-2015 period	
	Captive power plants with installed capacity of more than 6 MW in any year during 2013-2015 period	NDRC's Notice on further Standardize Reporting national ETS covered entities list.
The number of controlling units	First batch is 7000~8000	7th Low Carbon Forum
Allowances amount	4~5 billion tons annually	7th Low Carbon Forum
Allowance allocation	Allocation is initially based on free allocation and then a timely introduction of paid allocation of which the proportion is to rise gradually	Interim Measures for the Management of Carbon Emissions Trading
	Allowance allocation for different enterprises is based on benchmark method.	China-EU Emissions Trading Capacity Building High-level Forum, October 2016
Allowance reserve	A certain amount of total emissions allowance should be reserved in advance for compensation allocation, market regulation, and key construction projects. The earnings obtained from compensation should be used to accelerate the promotion of relevant national activities, such as decarbonization and related capacity building.	Interim Measures for the Management of Carbon Emissions Trading
Offset mechanism	Key emissions enterprises could use CCER to offset a part of verified carbon emissions, according to relevant regulations.	Interim Measures for the Management of Carbon Emissions Trading
Emission verification	GHG emissions accounting and reporting rules for industrial enterprises in 24 industries (DR Office Climate (2013) No. 2526, DR Office Climate (2014) No. 2920 and (2015) No. 1722)	NDRC
DOE for Verification	DOE's internal management, capacity and quality and personnel will be comprehensively and systematically evaluated and some unqualified DOE will be eliminated	China Carbon Emissions Trading High-level Forum
Reporting date	Mar. 30th (to provincial department)	Notice on the Organization of GHGs Emission Reporting by Key Enterprises
Trading platform	China Certified Emissions Reductions (CCER) National voluntary emission reduction trading registry system	China certified emission reduction exchange info-platform
	Trading platforms in seven carbon pilots	China-EU Emissions Trading Capacity Building High-level Forum, October 2016
	Sichuan United Environment Exchange, Haixia Equity Exchange	

Trading products	Products are mainly allowances and CCER at the initial stage, and other products will be added at the appropriate time.	Interim Measures for the Management of Carbon Emissions Trading
Trading participants	Key entities and other institutions or individuals, in accordance with trading rules	Interim Measures for the Management of Carbon Emissions Trading
Compliance period	National ETS' compliance may be complemented in batch and in industries. Allowances allocation and corporate compliance checks are to happen monthly	7th Low Carbon Forum
Incentives and non-compliance fines	Key emitting companies breaking the law should be ordered to comply within a limited timeframe or accept an administrative penalty. Key emitting companies that don't implement changes on time should be ordered to fulfil their obligations or accept an administrative penalty	Interim Measures for the Management of Carbon Emissions Trading
Carbon trading accounting treatment	Key emitting companies should set the following subjects: Code #1105 carbon emission allowances and Code #2204 carbon emission allowances payable.	Interim Regulation on accounting treatment in carbon trading pilots (Exposure Draft)
Training centers	The seven carbon trading pilot areas	NDRC
	National carbon market capacity building (Chengdu) center	

Source: Environomist China carbon market database

Commentary 3: EU ETS compared to China ETS

Guest commentator: Albert de Haan, Chairman of Carbon Star Group

In 2003 and 2004 I was MD of Fortis Carbon Bank and in September 2004 I became co-founder of European Climate Exchange.

In 2013 I started to work for Shenzhen China Emissions Exchange as a consultant hired by IFC/World Bank. The goal was to design non-spot products for the new Chinese carbon market. The IFC carbon team and the business development team of Shenzhen CNEEX worked hard to develop new carbon products.

What I try to explain in this observation is to give my view on what is happening in the markets as a veteran of the EU ETS but also as a true believer in the global carbon market. Being involved in the early years of the Chinese carbon market has inspired me to contribute this article.

I realize that I am not fully conversant with Chinese carbon market developments so I need to be modest in my comments, but still, these are my observations after 21 visits to mainland China in the last 3 years.

Recently I have been active in China promoting EEX Leipzig, the second largest carbon exchange in the world after ICE/ECX. EEX plans to launch an offshore carbon futures contract that will reflect China's onshore traded CCERs.

In China, I am chairman of Carbon Star Group, a dedicated carbon abatement and management company and recently launched a survey of new energy products sponsored by Shanghai Clearing House.

Table 2: Comparsion between EU ETS and China national ETS at their beginning

CHARACTERISTICS	EU ETS	CHINA ETS
Political decision	Yes	Yes
Mandatory	Yes	Yes
Market acceptance	No	Yes
Number of starters	15-20	85-100
Banks active	Very	Hardly
Compliance and traders active	Some	More
Funds active	No	Yes
Large Volume traded	No	No
Number of platforms	7	8
Regulator	DG Clima and member states	NDRC and regional and local DRCs; CSRC

Political decision: Both systems start with political decision to design market based environmental/financial product to fight climate change.
Mandatory: Both systems are designed for high emitting economic sectors.
Market acceptance: The EU ETS was faced with many law suits against ETS, dominated by chemical, steel and cement sectors.
The China ETS seems to have much more acceptance in the mandatory sectors.
Number of starters: EU ETS starting number were 5 banks and 10 utilities. Banks saw “new money”. Utilities saw cost that could very easily be passed on to retail market
The China ETS start is more difficult as power prices are set and no direct way to pass on compliance cost. Recent Shanghai Clearing House/Shanghai Environment & Energy Exchange’s simulation of cleared OTC forward contract transactions had 87 active participants.
Banks active: The EU ETS saw some very active banks at the start. They traded to hedge carbon portfolio risk but also as an aggregator for the compliance of smaller companies. Banks play an important role in informing their customers about carbon risk management.
The China ETS is accepted by some clearing members but there is not much involvement from the commercial banks. They seem to want to wait and see. SPDB was the only bank with bond issue, with coupons linked to Shenzhen carbon price. Banks do not seem to realize the impact of this new market on their loan portfolio.
Compliance and traders active: In the EU ETS only the public sector were active at the start, with some banks and commodity traders participating in the first 2 years.
For the China ETS, in recent simulations, we have seen carbon funds being relatively active, few clearing banks and some compliance companies. The largest proportion were carbon funds acting also as aggregator for smaller companies who want to trade and learn.

Funds active: In the first two years of EU ETS we only saw some hedge funds entering the market. The most active ones were linked to international commodity markets.

The China ETS seems to have begun with more funds active, special carbon funds but also GTJAS and Citic are actively trading and presenting their experiences to the market. Looks like they take over the EU ETS bank role in China.

Large volume traded: The EU ETS had no big volume in 2005 and 2006 compared to other commodity markets.

The China ETS will probably not start with larger volume than the pilots, BUT potentially more active players now funds are in the market.

The EU ETS took 3 years to have a significant rise in volume and it took 4 years to see new products like options bringing annual traded volume above the initial 2 billion EUA level.

Number of platforms: People seem to forget that EU ETS started with 7 platforms in the first 2 years. From 2005 ECX had the largest volume, and there are now only two left: ICE/ECX and EEX.

In 2005 there was no spot market because European registries were not established by May 2005. The EU ETS was the only market starting with an ECX futures contract. At the time, it was uncertain if the first settlement could take place by December 2005.

In the China ETS, the market will apparently start with 8 exchanges. Time will show if they all play a major role in national allowance trading. A cleared product will attract most business as risk is lowest by using futures or forwards. I expect that major volume will land at 1 or 2 exchanges supported by the Shanghai Clearing House as the Central Counterparty (CPP) for all participants.

Regulators: In the EU ETS, DG Clima sets to rules after EU Commission and Parliament agreed. In the EU, the team of Jos Delbeke is the very prominent with a strong team with impressive experience over a decade. Under EU rules, local regulators and registries are responsible for implementation. The biggest drawback is the lack of political courage in the committees and parliaments, jeopardizing the success of the first two phases. The delay was particularly unfortunate.

For the China ETS, NDRC has gained lots of confidence during the carbon pilot developments. Although the 1 year delay worried the market, 2017 will be the first year of National ETS. After years of monitoring there are still some worries that the system may be “short-lived”. On the other hand the 7 pilots showed they can work well and make their compliance markets work. Volumes are relatively small but that is no surprise after EU ETS and other schemes like RGGI and California. The market must have time to learn and adapt.

China may face some difficulties with the futures market as that is not regulated by the same body. I believe time will solve this especially now that recently held simulations of cleared forwards at Shanghai Environment & Energy Exchange seems to be a success.

Normally the market will move from spot and forwards into an exchange traded futures contract, but should take time as capacity building is still needed.

Conclusion: China’s national ETS is ready to go, via spot trading and forwards, to a bright and successful future, leading the global carbon market into a new era.

Mr.Albert de Haan, MD Carbon Rooster Advisory Services BV
35 years trading experience in FX, interest rate products and energy related commodities. Co-founded the European Climate Exchange in September 2004, the largest global trading platform in carbon and carbon related contracts.
Albert de Haan has a long track record in the market for energy related commodities, amongst which wood pellets and wet chips, and is familiar with all the major potential markets for the products.
His past and present assignments include:

- 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.
- senior consultant for IFC in Chinese carbon pilot , Shenzhen Province Guangdong
- co-structuring consultant in EFET biomass standard contract, used for wood pellets global trading.
- coach in Turkish Midseff EBRD program training Turkish banks in carbon trading.
- MD and owner European Milk Exchange (2009-2010).

3.1.2 Working divisions of departments in charge

Jiang Zhaoli, Deputy Director of the Climate Change Division of the NDRC, said that a two-level management structure needed be deployed in the carbon market. He pointed out central and local governmental management should both operate in the carbon market: allowances management should make clear what trading products, trading principals, trading agencies and trading modes mean in trading management; verification and allowances submission should follow the related GHG emissions accounting and reporting rules or standards published by the state. (Energy News, 2016). The working divisions are as follows:

Table 3: The working divisions

Working divisions	NDRC	Provincial DRC
Carbon accounting and reporting and verification	Identify the technology standard and answer for DOE's qualification management;	In charge of reporting, verification of key enterprises within the jurisdiction and DOE's performance.
Coverage	Identify the threshold of the key enterprise covered by national ETS	Identify the key enterprises list according to the appointed standard and expand the coverage scope
Total allowances	Identify the total amount of the	-

amount	state and local provinces	
Allowances allocation	Identify free allocation method and standard	Allocate the free allowances according to the appointed standard and strictly complete paid allocation
Allowances submission	Responsible for publishing allowances submission information	Responsible for managing allowances submission of key enterprises within the jurisdiction
Registry system	Responsible for building and managing the system	Manage the allowances allocation and submission within the jurisdiction using the provincial administrator
Carbon trading	Identify trading agencies	Manage the trading within the jurisdiction

Source: Environomist China carbon market database

3.1.3 Other market schemes related to ETS

Energy conservation and emission reduction is a long-term international strategy and at the same time also a basic state policy for China. From 2015 Energy conservation and emission reduction has been the fixed content of each FYP conference and put into action and strengthened year by year. The carbon market has entered a new stage, from the beginning of seven carbon pilots to the launching of a national ETS. At the same time, there are a certain number of trading schemes related to the carbon market, of which some have thrived, some have just begun. With the keynote of energy conservation and emission reduction, each trading scheme interrelates, and may be connected in the future to other schemes.

3.1.3.1 New energy vehicles allowances market

On August 2nd, 2016, the General Office of the NDRC issued measures for the management of carbon allowances for new energy vehicles. Apart from the price of carbon allowances, there was limited other guidance. The article on quotas stipulated the application scope and applicable models. It also required a written reply from automobile manufacturers and industry associations. (NDRC, 2016)

The newly published carbon allowances program just points in the direction of including new energy vehicles, and the object is to assess the emission reductions from new energy vehicles relative to conventional ones. The plan evaluates diverse vehicle products and technology paths from the perspective of carbon emissions and aims to lower the emissions of vehicles and the auto industry, and in turn of the country.

The policy introduction has two objectives: Firstly, large-scale financial subsidies policies are difficult to continue with the growing production and sales of new energy vehicles; secondly the structural surplus problem of oil-fueled vehicles has appeared, as well as the need to reduce fuel consumption.

The plan promotes automobile manufacturer's investment in new energy vehicles by controlling automobile's carbon emissions. Moreover, the plan allows trading between enterprises to subsidize new energy automobile manufacturer. The plan is to be formally promulgated and

implemented in 2017. In the context of the reduction of financial subsidies policies, the measurements for the management of carbon allowances are regarded as a stronger management measure.

3.1.3.2 New energy vehicles points market

On September 22nd, 2016, the Ministry of Industry and Information Technology issued Interim measures for the concurrent management of enterprises average fuel consumption and new energy vehicles points (exposure draft). According to the draft, minus fuel consumption points of the enterprises can be offset with positive points of new energy vehicles while minus points of new energy vehicles can only be offset with positive points of new energy vehicles from other enterprises (MIIT, 2016).

According to the draft, the average fuel consumption and new energy passenger vehicles production are separately assessed to concurrently manage average fuel consumption and new energy vehicles points. The positive fuel consumption points are transferable to other production and can be banked for the next year, while the positive new energy vehicles points are only allowed to be transferred and not banked. The negative fuel consumption points and new energy vehicles points must be offset with the positive new energy vehicles points. The enterprises which reach the standard of the average fuel consumption will produce positive points, otherwise, negative points will be produced. If the enterprises import new energy vehicles, they will gain certain positive new energy vehicles points, which can be used to offset the negative traditional vehicles points. Thus, the consolidation of management of average fuel consumption and carbon points is achieved.

This plan will strengthen the new energy vehicles points' utility to a certain extent, which can be used to offset not only negative new energy points but also negative fuel consumption points. This will lead automobile manufacturers to develop new energy vehicles or purchase new energy points from new energy automobile manufacturers.

It is understood that the plan will not assess new energy point proportion in 2016 or 2017. From 2018 to 2020, the proportion of new energy to be required is 8%, 10% and 12%. The proportion of requirement after 2020 is to be made separately.

Thus, this plan's demand on new energy points proportion adopts a method of advancing gradually in due order, which complements the reduction of new energy subsidy policies. According to the related regulations, new energy subsidy policies will fall off from 2017 and end in 2020.

3.1.3.3 Energy quota market

On September 21st, 2016, the NDRC issued measures for an energy consumption quota trading pilot scheme, which will start in Zhejiang, Fujian, Henan and Sichuan. These provinces can launch the scheme province-wide, or start in some prefecture or cities at first and then enlarge the pilot zone step by step (NDRC, 2016).

Energy quotas are issued for all kinds of direct or indirect energy consumption by enterprises, including for power, coal, coke, steam and natural gas. Purchased energy permits means that enterprises get energy quotas through a one-off payment on the premise of management of an energy consumption budget. Energy quota trading means that enterprises can trade the energy

quotas within the cap for energy consumption of the region.

The subjects of energy use trading are major energy consuming enterprises, especially key energy consumption ones in pilot regions. Trading participants are generally energy consuming enterprises in the pilot regions, but they can also choose to adhere to other energy consumption or control targets in order to fulfil their responsibility. The plan demanded that pilots should complete top-level design and preparation in 2016 and begin in 2017. By 2019, on the basis of interim results, the formation of replicable experiences, practices and systems could take shape; in 2019, pilots performance should be assessed and the experience should be summarized and disseminated.

3.1.3.4 Energy saving market

Two sessions held in 2013 emphasized the transformation of government functions and decentralization to the market, seeing energy saving develop rapidly. Such large economic provinces as Shandong, Jiangsu and Fujian have issued measures for the management of energy saving, deepened the reforms to build long-range mechanisms of energy saving, which help to strengthen responsibility of saving energy and improve saving performance (SDEITC, 2013).

Energy savings is the reduced energy consumption to meet the same need or achieve the same goal. It includes two kinds: Firstly, energy-saving of key energy consumption enterprises. The energy consumer which signs energy saving goal responsibility with the government, completes energy savings which are verified by the government within the time specified. Secondly, energy saving by projects. Energy service company or energy consumer completes energy saving with energy-saving technological transformation and improving energy efficiency, rather than by enlarging production capacity or adjusting product construction.

Energy saving trading mechanism, namely adopting capping and trading mechanism is to cap energy consumption, then allocate the allowance among the participants and allow the allowances trading between the parties which consume excess energy and the parties which have surplus allowances.

3.1.3.5 Power market

On March 15th, 2015, the state council issued a document on deepening the reform of power system (Document No.9) which means the tough reform began. So far more than 10 supporting documents have been published. The pilot regions' reform of the electric industry and the reform of power sales parties progressed hand in hand, pilots programs have impacted more than 90% of their region and thousands of power sales companies have been set up across the countryside according to incomplete statistics. The issuance of Document No.9 means the power market is undergoing its Spring (State Council, 2015).

The approach of power market construction is as follows: to orderly abandon the control over the power development and utilization, develop competitive power prices, enlarge the trading participants' scope and scale up the trading power, and gradually build trans provincial market-based power trading mechanisms. To choose qualified pilots, build a complete power market including mid-long term and spot markets; enlarge pilots' scope after summing up experience, improving the system and product varieties; build power market scheme suitable to

national features.

In addition to the power trading market, there are power-internet market. On February 29, 2016, the NDRC, National Energy Administration and Ministry of industry and Information Technology jointly published *Guiding opinions of promoting Internet+ smart energy development* to point out a roadmap of China energy internet development in the next 10 years (NDRC, 2016).

Energy internet is a new form of the energy industry in which internet and energy production, transmission, storage, consumption and energy market are deeply integrated with the following features: smart equipment, multi energy coordination, information symmetry, scattering supply and need, flat organization and open trading. With the rapid growth of internet+, the three ministries have high expectations of energy internet. Energy internet is one of strategic support to promote China's energy revolution, and of great significance to increase renewable energy proportion, boost fossil fuels clean and efficient utilization, maximize overall energy efficiency, promote an open energy market and industrial upgrading, become the new economic growth point and enhance international cooperation.

3.2 China Certified Emission Reduction trading scheme

China Certified Emission Reductions (CCERs) are issued by the relevant national institution for voluntary carbon emissions management. CCERs, as a supplementary mechanism of the emission trading market, is a kind of accredited carbon asset and can be used for companies' compliance as well as for a company's or personal voluntary emission reduction. Companies or individuals purchase carbon emission reductions to reduce carbon footprint and promote the low carbon concept, at the same time helping to develop environmental industries and improve the enterprise's social responsibility (21st Century Business Herald, 2015).

Healthy and orderly CCER trading can provide a degree of regulation of quota trading needs and prices, and is an important complement to allowances trading. To guarantee healthy development of the allowances market, appropriate carbon emission offset polices should be made.

Commentary 4: CCER trading historic development under current polices and trading strategies analysis of CCER in national market

Guest commentator: XiaoDi Cai, Deputy General Manager of Zhaojinyingtan No.1 Carbon Emission Fund

The key points of CCER trading are as follows:

In June 2012, the NDRC issued Interim Measures for the Management of Voluntary Emissions Reductions of Greenhouse Gases (Fagai Qihou (2012) No. 1668), which formally recognized CCER as a priced carbon assets with national creditability and that CCER can be traded in exchanges approved by the state department in charge.

In June 2013, Shenzhen Emisisons Exchange launched, as the first approved trading platform for carbon allowances and CCER trading, which laid the foundation for CCER trading.

In January 2015, the NDRC made an announcement on the operation and account management of the national voluntary emission reduction trading registry system, after which the registry started operation. CCER's then started to enter the pilot carbon markets as a trading product.

By the end of 2016, there are 9 approved exchanges for CCER trading, including 7 pilots' carbon emission exchanges, Sichuan United Environmental Exchange and Haixia Equity Exchange, the latter two were approved separately in May and July 2016.

CCER, ahead of allowances, realized transactions at national level and are circulated in pilots' market and bonds of national unified carbon market. In most pilots, CCER can be used to offset emission allowances and the ratio is 1:1. Considering the effect of CCER trading on allowances trading market and supporting local CCER clean-up projects, the pilots set limits on CCER's use of quota offset.

CCER offset proportion in pilots is 1%-10%, among which Shenzhen, Guangdong, Tianjin and Hubei CCER can be used to offset up to 10% allowances. Shanghai allowances in 2016 headed lower to about ￥4/t. Shanghai authorities in charge of the carbon market adjusted the CCER offset proportion from 5% to 1% in case of a major influx of CCERs into the carbon market.

Some pilots limit CCERs by geographic source, in order to retain local control of CCERs for compliance reasons. Beijng and Guangdong require that part of CCER for offset should come from the local region; Hubei's limit is stricter and requires that only CCER generated in contiguous areas of Hubei province can be used. The price of 2016 allowances in Beijing and Guangdong remained stable. For Hubei, the CCER limit polices have changed annually and the current polices are strict, to keep carbon price fluctuations within a reasonable range.

In addition, pliots have a limit on CCER type and generation time. All the pilots forbid hydropower CCER projects to enter the market and Shanghai, Beijing and Tianjin allow CCERs generated only after January 1, 2013.

To sum up, during the pilot phase the authorities are cautious about CCERs. For example, Shanghai and Hubei introduced tougher limits on CCER admission when the carbon price went down noticeably.

The the pilots restrictions lower the demand for CCER, and at the same time CCER price is restricted by the quota price. CCER is a transaction validated and verified by NDRC, and the project owner of CCER needs to cover project development costs. If allowances price is too low or allowances supply exceeds demand, CCER project owners may not make a profit from CCER trading, and will postpone issuance or take a wait-and-see attitude. Since project development cost is based on project numbers not on issued emission reductions, large CCER projects have an edge and receive more profits.

After the national carbon market's launch in 2017, CCER demand will increase significantly. Considering policy continuity, the national carbon market will still limit the admission of CCERs. National ETS is a two-tier system, provinces or municipalities may come up with limitation measures to encourage local low carbon projects and increase the income of rural residents. At present policies of national carbon market remains unclear, so participants can consider scattered purchase of CCER in advance and keep away from CCER types limited by pilots. Moreover, emission volumes of each province are also an important reference for the CCER purchaser.

Mr. XiaoDi Cai, started GHG Emission Reduction Management in 2008，with rich experience in development and management of multi-industry emission reduction projects. Now General manager of Karbon Xin Carbon Assets Management(Beijing) Co., Ltd., and investment advisor of Zhaojinyijingtan No.1 Carbon Emission Fund, advisor of CITIC Carbon Assets Management Ltd.

Chief representive of carbon market of Voest Alpine in China; participated in China-Danmark biomass CDM provincial capacity building, Henan Luohe GHG inventory program and Inner Mongolia Hulunbuir GHG inventory program; developed dozens of CDM/VCS/CCER projects.

Zhuhai Zhaojinyijingtan No.1 Carbon Emission Fund

Zhuhai Zhaojinyijingtan No.1 Carbon Emission Fund was established at the beginning of 2015, under the parent company Shenzhen Zhaoyinguojin Investment Ltd., and with the investment advisory company, Karbon Xin Carbon Assets Management (Beijing) Co., Ltd. As the first bank trust carbon emission investment fund, the fund focuses on investment, trading and management in China's carbon allowance and CCER market, and provides compliance products of optimal value to enterprises with equity gains for investors. Since the fund was established, the trading has covered the major carbon trading regions in China, and it has made innovative advances in carbon finance fields: the first carbon investment instituition for allowance custody/hosting and CCER swap/trading in the Shenzhen carbon market; the first carbon investment instituition for CCER trading and swaps in the Hubei carbon market; the first instituition in the Beijing market to invest in allowances repo, and to sign an OTC options agreement for the purchase of forestry carbon sinks.

3.2.1 CCER project type limit

Among seven pilots' CCER project limits, Shanghai's limits are the lowest, followed by Tianjin and Beijing. There are relatively more limits for Guangdong, Shenzhen, Hubei and Chongqing carbon market. Except for Shanghai, the other 6 pilots all exclude hydropower projects and Hubei only retained one small scale hydropower project. The main reason for this is the high development cost of hydropower and possible ecological impacts of hydropower projects.

Table 4: Project type limit for offset

Pilots	Project type limit for offset
Beijing	Non HFCs, PFCs, N2O, SF6 and Hydro CCER.
Tianjin	Emission reduction projects from CO_2, excluding hydro power projects
Shanghai	None
Guangdong	(1) Emission reduction projects mainly from CO_2 or CH_4, which means these two GHGs emission reductions should be more than 50% of all GHG emission

	reductions; (2) Non-hydro CCER, non-electricity generation, heat addition and complementary energy (include heat, press and gas) CCER projects from coal, oil and natural gas (except coal bed gas); (3) Non CDM projects whose emission reductions were generated before they were registered with the UN CDM EB.
Shenzhen	(1) Some renewable energy and new energy projects like wind power generation, solar power generation and waste incineration power generation, village biogas and biomass power generation; (2) Clean transportation emission reductions; (3) Ocean carbon sequestration; (4) Forestry carbon sink; (5) Agricultural emission reductions.
Hubei	Non-large-scale or middle-sized hydroelectric CCERs
Chongqing	Only (1) EE, (2) clean energy and non-hydro (3) carbon sink (4) energy activity, industrial process, agriculture, waste handling CCERs can be used

Source: Environomist China carbon market database.

3.2.2 CCER project geographic limit

In respect of CCER project geographic limits, except for Chongqing and Shanghai, the other pilots have geographic limit on CCER projects source region. But most pilots make priority of CCER projects from protocoled cooperation zone to improve the liquidity of carbon markets rather than use projects only within the jurisdiction, which to some extent increased participation in non-pilot zones in carbon emissions trading.

Table 5: Project geographic limit for offset

Pilots	Project geographic limit for offset
Beijing	CCERs, generated outside BJ, shall not exceed 2.5% of its annually issued allowances.
Tianjin	CCERs generated within the Beijing-Tianjin-Hebei region should be given preference. CCERs generated by compliance enterprises in Tianjin and the other pilots should not be used.
Shanghai	CCERs, generated within emission boundary of pilot enterprises in Shanghai, shall not be used for implementation in Shanghai
Guangdong	CCERs used to offset emissions shall be at least 70% generated within the provincial boundary
Shenzhen	Article 6: Wind power, solar power and waste incineration CCERs should be generated in following provinces or regions: (1) Some cities like Meizhou, Heyuan, Zhanjiang, Shanwei in Guangdong; (2) Some provinces like Xinjiang, Tibet, Qinghai, Ningxia, Inner Mongolia, Gansu, Shaanxi, Anhui, Jiangxi, Hunan, Sichuan, Guizhou, Guangxi, Yunnan, Fujian, Hainan;

	(3) Other provinces or regions which have signed a carbon trading regional strategy cooperation agreement; Article 7: Village biogas and biomass power generation CCERs should be generated within Shenzhen and the provinces or regions which have signed carbon trading regional strategy cooperation agreements. Article 8: Clean transportation emission reduction and ocean carbon sequestration emission reduction CCERs should be generated within Shenzhen and the provinces or regions which have signed carbon trading regional strategy cooperation agreements. Article 9: Forestry carbon sink and agriculture emission reduction CCERs nationwide could be used to fulfil compliance. Article 10: In principle, CCERs generated within the provinces or regions which have signed carbon trading regional strategy cooperation agreements could enter the market in preference. Article 11: Enterprises are encouraged to invest in emission reduction projects in Shenzhen to generate CCERs.
Hubei	CCERs, generated within provincial boundary, or generated within the provinces signed carbon market cooperative agreement with Hubei (including Shanxi, Hunan, Jiangxi, Henan, Anhui and Shandong) and registered by NDRC, but CCERs used for offset should not be more than 50,000 tons
Chongqing	None

Source: Environomist China carbon market database

3.2.3 Other CCER project limits

Except for Tianjin and Chongqing, other pilots restrict the use of CCERs within the emission boundary of pilot enterprises.

Table 6: Other CCER project limits

Pilots	Other CCER project limits
Beijing	Not CCER generated from fixed facilities of key emission enterprises in this administrative region
Tianjin	None
Shanghai	CCERs, generated within emission boundary of pilot enterprises in Shanghai, shall not be used for compliance in Shanghai
Guangdong	CCERs, generated within emission boundary of pilot enterprises in Guangdong, shall not be used for compliance in Guangdong
Shenzhen	CCERs, generated within emission boundary in Shenzhen, shall not be used for compliance in Shenzhen
Hubei	Outside the organizational boundary of enterprises covered by ETS
Chongqing	None

Source: Environomist China carbon market database

3.2.4 Forestry carbon sink projects

So far Beijing has gone furthest in forestry carbon sink projects among seven pilots.
In Beijing, key emission enterprises can use the emission reductions from forestry carbon sink projects which simultaneously meets the following requirements: (A) afforestation and forest management carbon sink projects in the administrative regions; (B) afforestation carbon sink land should be non-forest land since February 16,2005; (C) forest management carbon sink projects should be implemented after February 16, 2005; (D) the project owner should have evidence of land ownership or land use certificate, for example land ownership certificate or other documents issued by the district government; (E) the projects should get approval from municipal garden and greening agency.

In December 2014, the project “Fengning County Songba Forest Farm” was listed and traded at ￥38/t with 3450 tons, which became the first inter-regional carbon sink project traded, also the first deal carbon sink project in Hebei province. In the end, the projects traded 69 thousands of emission reductions at price ￥36~48/t with revenues of 2.54 million (China GreenTimes, 2015).
In January 2016, two carbon sink projects completed transaction in Beijing Environmental Exchange with value of 88 thousand, which will be used to development and management of carbon sink forest. The price is ￥36 /t and ￥30/t. This became the first carbon sink deal from Beijing (China Youth Daily, 2016).

3.2.5 CCER against allowance

CCER quota offset ratios were the same in all seven pilot areas: One tone of CCERs can offset one ton of CO_2 emissions. But the 7 pilots have different proportions of CCER usage and limits on the time of permit generation.

Table 7: CCER proportion and permit generation time limits

Pilots	CCER proportion	Generation time limit	Other limit
Beijing	Key emission can use accredited emission reductions to offset part of emission which should not exceed 5% of the assigned allowances.	Generated after January 1, 2013	Main ETS covered entities can use emission reductions generated from accredited CCERs, energy saving projects and carbon sink projects
Tianjin	No more than 10% of the practical emissions	Generated after January 1, 2013	None
Shanghai	No more than 5% of the assigned allowances of that year	Generated after January 1, 2013	None
Guangdong	No more than 10% of the practical emissions of last year.	None	None
Shenzhen	No more than 10% of the	None	None

	covered unit's emissions		
Hubei	No more than 10% of the covered unit's initial allowances	Unrestrained verified emission reductions; for those awaiting verification, the crediting period should be January 1, 2013 to May 31, 2015	CCER projects should have registered in CCEREI. Verified emissions reductions can offset with 100% effectiveness while non-verified emissions reductions generated during the crediting period January 1, 2013 to May 31,2015 can offset with no more than 60% effectiveness
Chongqing	Before 2015, no more than 8% of the annual verified emissions	Project should have operated after December 31,2010（not applicable to carbon sink projects)	None

Source: Environomist China carbon market database

3.2.6 Uncertainties

According to Shanghai Securities News, CCER Trading Management Measures were expected to be released in July 2016. As supplement to obligatory emission reduction measures, these measures are one part of the preparation for building national ETS in 2017, to lay technological and regulatory foundations for gradual build up a national carbon market. As of December, there has been no official announcement, so there is uncertainty with the admission requirements and registration process of CCER projects.

3.2.6.1 Admission

On July 12, 2016, Guodian Daduhe Carbon assets management center disclosed that the NDRC would tighten CCER projects admission requirements.

The project's construction should begin after January 1, 2015, and validation and verification should be completed during two years after the construction starting date; agriculture and forestry carbon sink projects should begin after January 1, 2013, and validation and verification should be completed during the 3 years after the starting date; the emission reduction projects in facilities covered by national ETS should not apply for CCER projects.

And based on the China Carbon Institution, for the projects which have registered before the issuance of the Measures, they should apply for emission reduction registration in accordance with the new Measures.

3.2.6.2 Registration process

According to China Carbon Institution on July 31, 2016, the CCER projects registration process would be adjusted significantly: NDRC would simplify CCER projects registration process based on the principle of streamlining administration, delegating power and strengthening regulation.

The past process includes 6 steps: Project design document completion, project validation, project registration, project implementation and monitoring, emission reduction verification and emission reduction issuance. After this revision, the registration process may become the following: DOE should send all the project documents to public mailbox, DOE send the project documents to the mailbox of a panel of experts, the panel of experts send the application documents to experts for review, experts' review and review comments, project owner revises the documents based on comments, DOE send the revised documents to panel of experts for second review, panel of experts issue approval to DOE, and at last the project owner submits the documents of the final version to Government Service Hall Climate Change Division. This revision demonstrates the Climate Change Division's intention to reform management, simplify registration processes, improve information disclosure and social supervision after registration, and highlights the importance of panel of experts.

3.3 Analysis of policy documents during 3-year pilot period

2013-2015 was the 7 carbon pilots programs 3 years of carbon market operation, during which all pilots explored market scheme construction, allowances allocation and management, carbon emissions measurement, reporting and verification, and gained rich experiences for national ETS. The policies design in the 7 pilots have both common and local characteristics, both successful experiences and lessons to be learnt. This part will summarize the similarities and differences in 7 pilots' policies and regulations and organizational structure, scope of system design, allowances amount and composition, allowances allocation mechanism and offset mechanism and the performance of the carbon market and compliance.

3.3.1 Carbon market covered scope

Carbon market coverage is one major element of carbon market design and construction, which directly affects emission reduction potential and costs. The more gases covered by the carbon market, the more participants and emission sources, the more liquidity in the carbon market, the greater emission reduction potential, the more diversities in emission reduction cost, and the less overall emission reduction cost.

Table 8: Carbon market covered scope

Pilots	Target	Covered scope	Covered emissions	Reporting scope	Compliance units
Beijing	0.18	Fixed facilities and mobile facilities with annual CO_2 emissions (direct and indirect) ≥5,000 tons within the Beijing administrative area	0.45	Units with overall energy consumption ≥2,000 tons of standard coal within the Beijing administrative area	947
Tianjin	0.19	Industrial enterprises	0.6	Industrial enterprises	112

		and civil buildings with annual carbon emissions ≥20,000 tons		and civil buildings with annual carbon emissions ≥10,000 tons	
Shanghai	0.19	Industrial enterprises with annual emissions ≥20,000 tons and non-industrial enterprises with annual emissions ≥10,000 tons	0.5	With annual CO_2 emissions ≥10,000 tons over the other enterprises	191
Guangdong	0.195	Industrial enterprises with annual emissions ≥20,000 tons or with overall energy consumption ≥10,000 tons standard coal	0.6	Industrial enterprises with annual emissions between 5,000-10,000 tons	218
Shenzhen	0.21	Industrial enterprises with annual carbon emissions of ≥3,000 tons; large public buildings and office buildings with floor area ≥10,000 m2	0.45	Enterprise with emissions between 1,000-3,000 tCO_2e in any year	824
Hubei	0.17	Industrial enterprises with overall energy consumption ≥10,000 tons standard coal	0.8	Industrial enterprises with overall energy consumption ≥8,000 tons standard coal	166
Chongqing	0.17	Enterprises with annual overall energy consumption ≥10,000 tons standard coal	0.4	Allowance management units	254

Source: Environomist China carbon market database

3.3.2 Carbon emission allowances

Pilots' experience indicates that the allowances cap and allocation methods are crucial. Western carbon trading history provides such lessons as too high cap and too many allowances which caused negative effects and allowances oversupply.

Table 9: Allowances cap and allocation methods

Pilots	Allowances Allocation	Allowances	Cap

		Reserve	
Beijing	Allowances allocation in production and other and service industries is based on historic emissions; allowances allocation in heating and fossil fuel fired power plants is based on historic emission intensity	No more than 5% of annual overall allowances	About 47 million ton
Tianjin	Allowances allocation is based on historic emissions for each industry, the allocation methods is mainly free and complemented by paid methods, for example, auctioning or selling at a fixed price.	None	About 160 million tons
Shanghai	Historic emission method and benchmark method. Compliance enterprises are assigned once-and-for-all allowances for 2013-2015. Implementation of auctions and other payments at the appropriate time.	The government can set aside part of allowances for market regulation	155 million tons
Guangdong	Historic emission and benchmark methodologies. Free allowances for the power industry account for 95% of the quota; free allowances for the steel and iron, petrochemical and cement industries account for 97% of the quota. Paid allowances are allocated by auction and enterprises can decide whether to buy or not.	Reserve allowances in 2014 is 38 million ton, including allowances for newly built enterprises and market regulation.	About 370 million tons
Shenzhen	Both free and paid allowance allocation is used, based on historic emissions of each industry. Free allowances must exceed 90% of the total amount and paid allowances can be assigned by fixed price, auction (less than 3% of the total allowances), and other ways.	2% allowances are set aside as a reserve for new entrants.	About 30 million ton
Hubei	During the pilot phase, allowances are allocated free to compliance enterprises. Paid assignment can be explored based on the actual situation.	After reserve allowances (8% of the total) and initial allowances of the year are deducted from the total, the remainder are reserved for new entrants.	About 324 million tons
Chongqing	Based on historic emissions and industry emission reduction potential. Allowances are assigned by registry.	None	About 106 million tons

Source: Environomist China carbon market database

3.3.3 Rule of carbon allowances transactions

Trading products of the 7 pilots includes local allowances, eligible CCER or forestry carbon sinks. Transaction modes are similar, most of which are online transactions and transfer protocols. In relation to market participants, Beijing is cautious of allowing investment institutions and Shanghai has no admission for individual investors. Reasonable rules have a marked impact on liquidity and

activity of the carbon market and it is beneficial for the carbon market to ease the control over investors while controlling trading risk.

Table 10: Rules of carbon allowances transactions

Pilots	Trading products	Transaction mode	Participants specified in pilot management measures	Market openness progress
Beijing	BEA, CCER, forestry carbon sinks	Open trade, transfer protocol	Compliance enterprises, non-compliance institutions and individual participants	Open for individual investors and non-compliance institutions without limit for scope of business
Tianjin	TJEA, CCER, forestry carbon sinks	Online spot transactions, Transfer protocol and auctions	Compliance enterprises, domestic and overseas Institutions, enterprises, social organizations, other organizations and individual	Open for individual investors and investment institutions
Shanghai	SHEA, CCER, forestry carbon sinks	Procurement by Open Tender, transfer protocol	Compliance units and other organizations and individuals specified in carbon trading rules of this municipality	Open for investment by institution, not for individual investors
Guangdong	GDEA, CCER, forestry carbon sinks	Open auction and transfer protocol	Compliance enterprises and units, enterprises with newly built projects, other organizations and individuals meeting the rules	Open for individual investors and investment institutions
Shenzhen	SZA, CCER, forestry carbon sinks	Spot transactions, electronic auctions, selection with fixed price, block transaction and transfer protocol	Compliance units and other organizations and individuals specified in carbon trading rules of this municipality	Open for individual investors and investment institution (including overseas)
Hubei	HBEA, CCER, forestry carbon sinks	Electronic bidding, network matching	Compliance enterprises and institutions which voluntarily participate in carbon trading, other organizations and individuals	Open for individual investors and investment institution (including overseas)
Chongqing	CQEA,	Open auction	Compliance units and other	Open for individual

	CCER, forestry carbon sinks	and transfer protocol	qualified main body and natural person	investors and investment institution

Source: Environomist China carbon market database

3.3.4 Monitoring, reporting and verification

During the pilot phase, key emission units should submit reports before April and complete compliance by the end of July. For the third party verification institutions, each institution has to verify 10-30 key emission units during the compliance period. Except for Beijing and Shenzhen, other pilot governments bear verification cost.

Table 11: Monioring, reporting and verification

Pilots	CO_2 emission reporting deadline	Verification institutions	Verification expenses
Beijing	April 15	19	The enterprise pays the expenses and chooses verification institutions
Tianjin	April 30	4	The enterprise pays the expenses and chooses verification institutions
Shanghai	March 31	10	The enterprise pays the expenses and chooses verification institutions
Guangdong	March 15	16	The enterprise pays the expenses and chooses verification institutions
Shenzhen	March 31	21	The enterprise pays the expenses and chooses verification institutions
Hubei	The last working day of February	3	The enterprise pays the expenses and chooses verification institutions
Chongqing	February 20	11	The enterprise pays the expenses and chooses verification institutions

Source: Environomist China carbon market database

3.3.5 Incentives and penalties

At present the penalties for non-compliance in the 7 pilot programs vary widely. Non–compliance enterprises in Shenzhen should pay the penalty (the product of the gap by thrice the average market price of last 6 months) or a certain amount of allowances (equivalent to the non-compliance gap) of the next compliance period should be confiscated. Non–compliance enterprises in Tianjin needn't pay the penalty but are disqualified from other preferential policies. The three-year pilot experience shows that stringent control has an an obvious effect on compliance performance.

Table 12: Incentives and punishment

Pilots	Incentives and	included in the credit scope

	punishment	
Beijing	Fine	None
Tianjin	Ordered to make correction, criminal responsibility	None
Shanghai	Fine	Municipal public information service platform should record illegal behaviors and other discredit of compliance units, verification institutions and participants in MRV, settlement and trading
Guangdong	Ordered to make correction, a certain amount of allowances deduction, fine	Provincial DRC builds credit files of compliance enterprises, reporting enterprises and verification institutions and bring them into social credit system and financial credit system.
Shenzhen	A certain amount of allowances deduction, fine	Municipal DRC provides information of non-compliance enterprises to social and financial credit management organizations
Hubei	A certain amount of allowances deduction, fine	Provincial government provides information of non-compliance enterprises to social and financial credit management organizations, and non-compliance enterprises noted on blacklists.
Chongqing	Fine	None

Source: Environomist China carbon market database

3.4 Pilots' trading performance and compliance performance

National ETS building is divided into 3 stages: 2015-2016 is the preparation stage, of which the major task is to complete the basic building of the carbon market. National ETS launch in 2017. Among 7 pilots, five have completed 3 compliances and the other two have completed 2 compliances. The operational experience is useful for national carbon market building.
All the data in this section is provided by Environomist and collected by December 15, 2016.

3.4.1 Carbon trading performance

There are 2391 compliance enterprises and units covered by the 7 pilot carbon trading exchanges with a total allocation of 1.2 billion ton of carbon emission quotas. According to data released by the 7 pilot carbon trading exchanges, the trading volume in 2015 was about 101 million ton, of which online trading volume was 25 million ton, allowance block trading volume was33 million ton, and complemental mechanism trading volume was 43 million ton. The China carbon market has become the world's second largest ETS, although there is still a small gap compared with EU ETS of ten billion tons of trading volume.

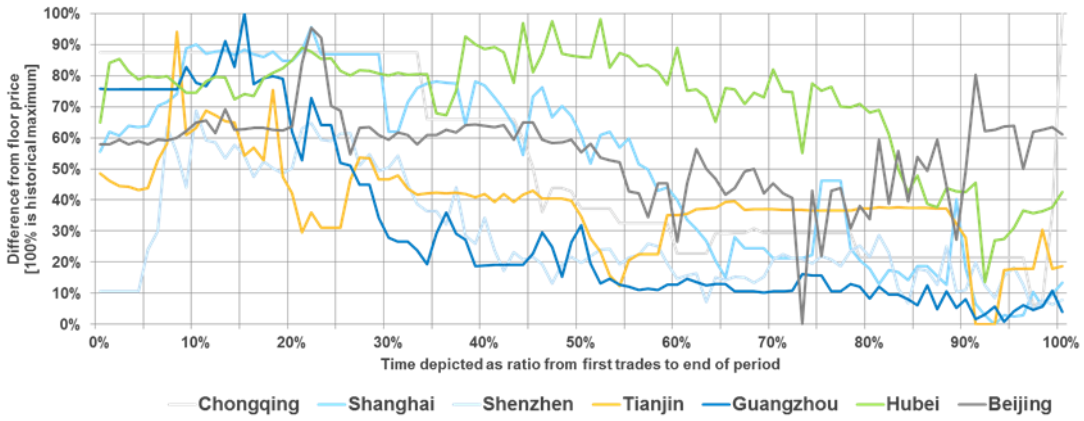
Commentary 5: ICIS's comments on the pilot trading since 2014 and outlook to China's National ETS

Guest commentator: Simon Chen, Lead Analyst China Carbon Markets/ICIS

Since the commencement of the first pilot scheme in Shenzhen in 2013, China has experienced three years of emissions trading. Chinese carbon markets have matured quickly and the upcoming National ETS also has been attracting attention.

Pilot trading

Figure 1: Price variation pattern in the 7 pilots



Source: ICIS

Figure 1 shows price volatility during the pilot period where we can see an overall drop on the prices. In the beginning of these pilots, almost all of them have witnessed different degrees of price surges. The most dramatic rise occurred in Shenzhen. It commenced trading at around CNY30/tone in June 2013 and the SZEA price more than tripled in less than three months, but with very limited traded volume due to absence of the demands from short companies and no transparency in the market.

In some pilots, we also see some seasonal price spikes around the compliance date. In their first compliance period, Shanghai (June 2014), Beijing (July 2014) and Hubei (July 2015) saw the allowance prices increasing between 30% and 60% respectively as compared to the carbon price at the start date. Carbon prices then quickly fell right after the compliance deadlines. Based on our observation, we find that Chinese companies tend to cover their short positions late and just get active close to the compliance deadline. This is partly due to the lack of derivatives (i.e. futures and options) in the market, but probably the more important factor is Chinese companies' inexperience in carbon trading. However, we expect companies, in particular companies with short positions, to understand and learn the need of hedging and hence begin to hedge their open positions early on as they progress, and intend to alleviate the liquidity risks around the compliance date.

After the 2014 compliance, a declining price trend can be observed in many pilots. Some pilots even recorded their lowest price ever. For example, the Shanghai ETS experienced six consecutive days of price drops, starting from CNY10.80 on 25 March 2016, declining all the way down to early April's record low of CNY5.40. This is only 20% of the opening price at its start date on 26 November 2013. Admittedly, over allocation leads to an excess supply of allowance, putting downward pressure on the carbon prices, similar to the trial period of the EU ETS. Besides, a huge amount of CCER supply also draws down allowance prices, though all

pilot markets put restrictions on the use of offset. What's more important in understanding the reason for the price decline in the Chinese pilot markets is the lack of confidence in the pilot allowance due to the uncertainty of the transition from pilots to a National ETS. As the decision-making process in the NDRC is opaque, both compliance companies and institutional investors were very cautious of holding pilot allowances.

However, a very strong price recovery has been recently witnessed, for instance in Hubei, Shanghai and Guangdong during Q4 2016, even though those pilots are still fundamentally long. Firstly, the market sentiment has significantly changed since 2015, compliance has given more confidence on banking the pilot allowances in the national market. And secondly, position wise, pilot compliance companies might have more concerns over their short positions due to tighter allocation and more stringent CCER limits for 2016 compliance year.

Outlooks to the National ETS

China has been committed to launching its national emissions trading system in 2017. The program would enroll key industry sectors such as iron and steel, power generation, chemicals, building materials, paper-making, and nonferrous metals, covering approximately 6.5bn tons of emission per year. During the first phase of the National ETS, the market is expected to rely much more on free allocation as compared to auctions. Futures probably would not be introduced into the market at the early stage, but we expect other derivatives like forwards and options to be popular in the over-the-counter market.

Based on our understanding and experience from the pilots, ICIS would highlight tight allocation as the most significant factor for a successful national market. We believe that short positions of enrolled companies matter more than the long positions, simply because a carbon market in general should be fundamentally long to ensure compliance, which makes it a demand driven market. We expect that the national allowance allocation would not be as loose as the pilots, as benchmarking would be widely adopted, though the allocation guidelines have not been released yet.

Price wise, ICIS released an updated national allowance price forecast in October 2016. In our base case scenario price simulation, we expect CNEA price to start trading at around CNY40 in Q3 2017 and gradually rise to almost CNY60 in Q2 2021 due to NDRC's gradual tightening of the allowance allocation.

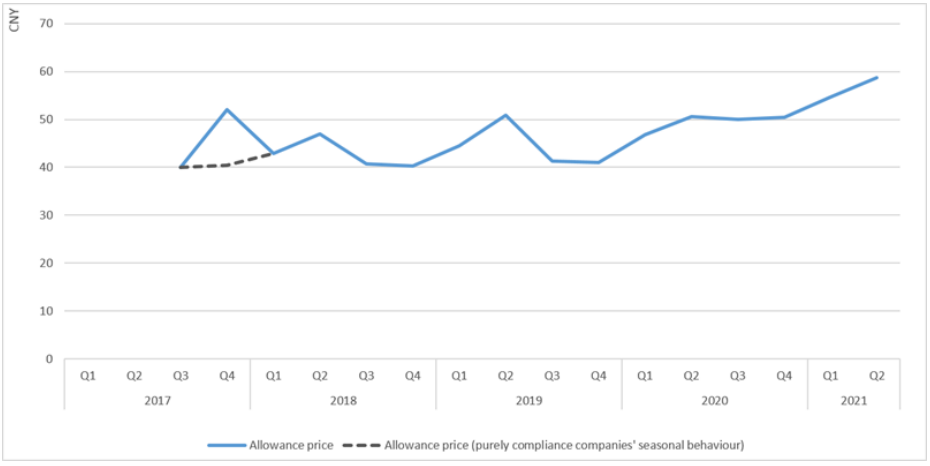


Figure 2: National allowance price forecast – base-case scenario (Source: ICIS)

Conclusion

ICIS has always been confident of the commitment and determination of China to fight climate

change through the emissions trading system. There is no doubt that the national market would not run perfectly at the very beginning but it could achieve great success, provided that there is no significant allowance surplus.

Mr. Simon Chen, Lead Analyst Chinese Carbon Markets, is one of the founding members of ICIS China Carbon Team. Simon Chen is leading the team on market analysis and price forecasting of China's emissions allowance markets, as well as the CCER market. Simon is regularly invited by different carbon exchanges and compliance companies to share knowledge on carbon price analysis and forecasting using ICIS's "Timing Impact Model" as well as carbon management.

Before joining ICIS, Simon worked for Hanergy Holding Group. He was a project manager in charge of trading carbon offsets in the CDM and CCER markets. Simon graduated from Nottingham University with a Bachelor Degree of International Studies and King's College London with a MA in Environment, Politics and Globalization.

ICIS is a division of Reed Business Information, part of RELX Group. RELX Group is a world-leading provider of information solutions for professional customers across industries. ICIS is the world's largest petrochemical market information provider and has fast-growing energy and fertilizer divisions. ICIS's carbon team provides carbon price forecasting and analysis for major ETSs around the world. ICIS products include weekly and monthly updates/reports, carbon allowances price forecasts, in-depth analysis of the carbon market and development. We currently cover: EU-ETS, Australian-ETS, Californian-ETS, Chinese-ETS and the Regional Greenhouse Gas Initiative (RGGI).

Business area:

- Price forecast and assessment
- Market analysis
- CCER database
- Consultancy

3.4.1.1 Online allowances trading

3.4.1.1.1 Trading volume and trading value

- Trading volume

Online allowances trading volume of 2016 is about 25 million ton CO_2, which is on a par with that of 2015, and twice that of 2014. In 2016 the total trading volume of Hubei, Shenzhen and Tianjin fell, compared with 2015 and increased for the other four pilots .

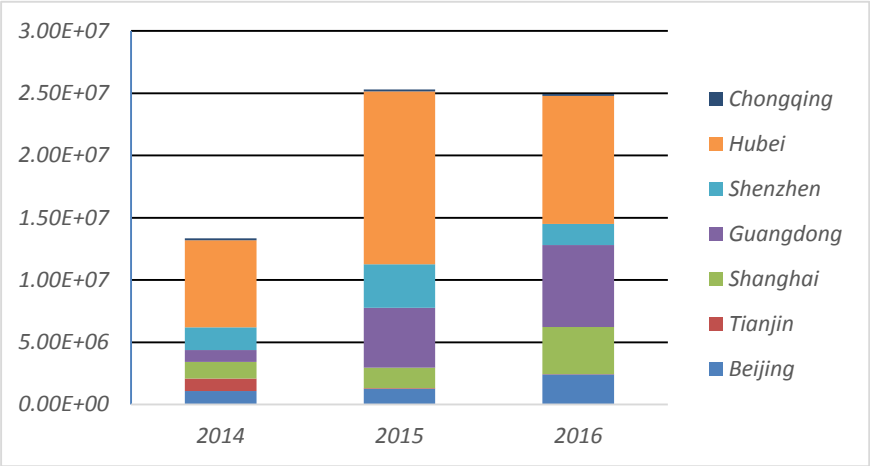


Figure 5: 2014-2016 trading volume

For 2016, the Hubei carbon market was relatively stable with an even trading distribution; centralized trading in Guangdong carbon market is more obvious, and trading volume reached a peak especially during the last month before the compliance deadline; the transactions in Beijing and Shanghai carbon market are also more concentrated during the last two months before the compliance deadline, but without the centralized trading noted with Guangdong; other pilots' carbon markets were not active.

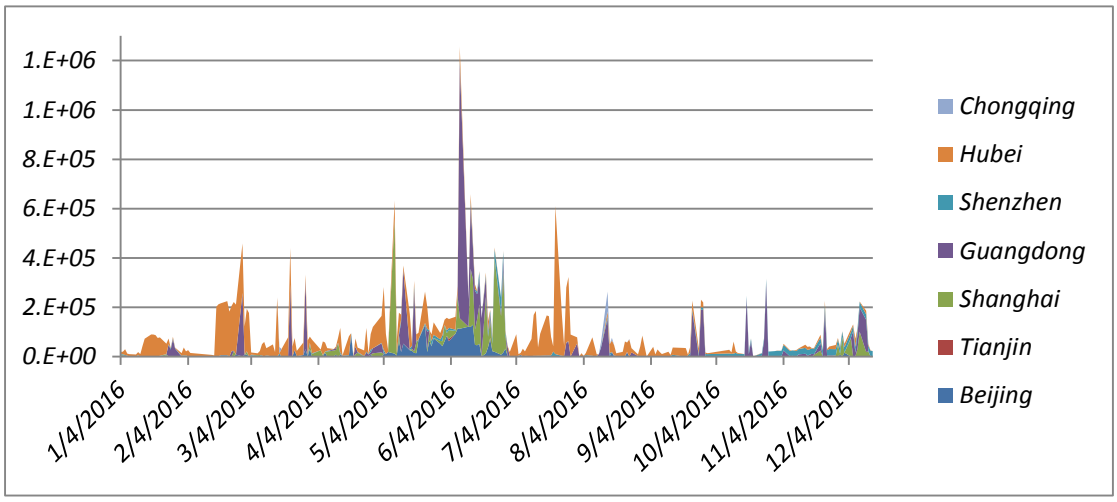


Figure 6: 2016 trading volume for each pilot

- Trading value

In total, trading value of the Hubei carbon market accounts for the highest proportion, followed by Shenzhen, Beijing, Guangdong, Shanghai, Tianjin and Chongqing. Trading value in each pilot showed a significant growth rate in June and July of each year. Trading value of the Hubei carbon market has shown the fastest growth rate over the three years.

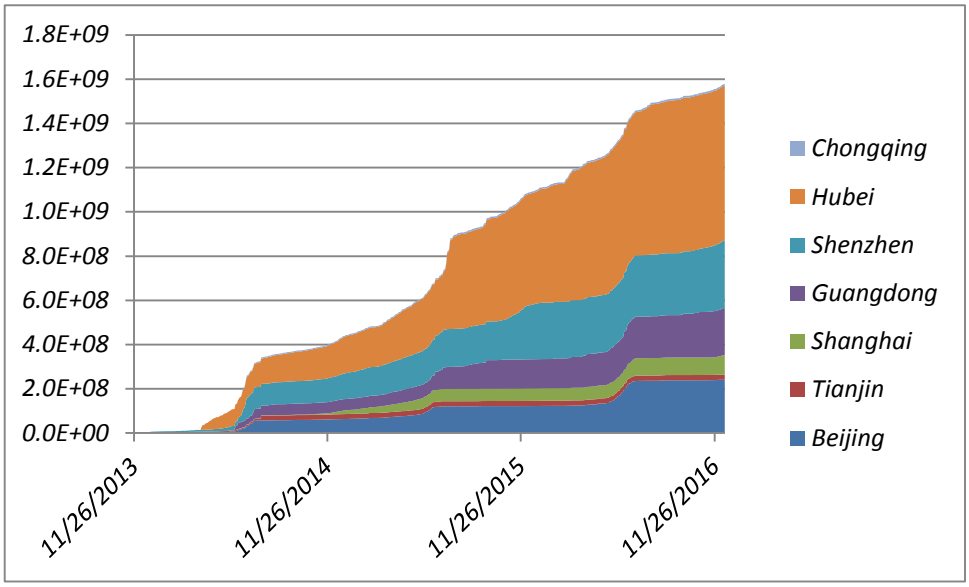


Figure 7: Cumulative trading value from 2014 to 2016

At a national level, 2015 trading value is the highest and rises at the fastest rate, especially during the last month before the compliance deadline. The trend in 2016 is similar to 2014.

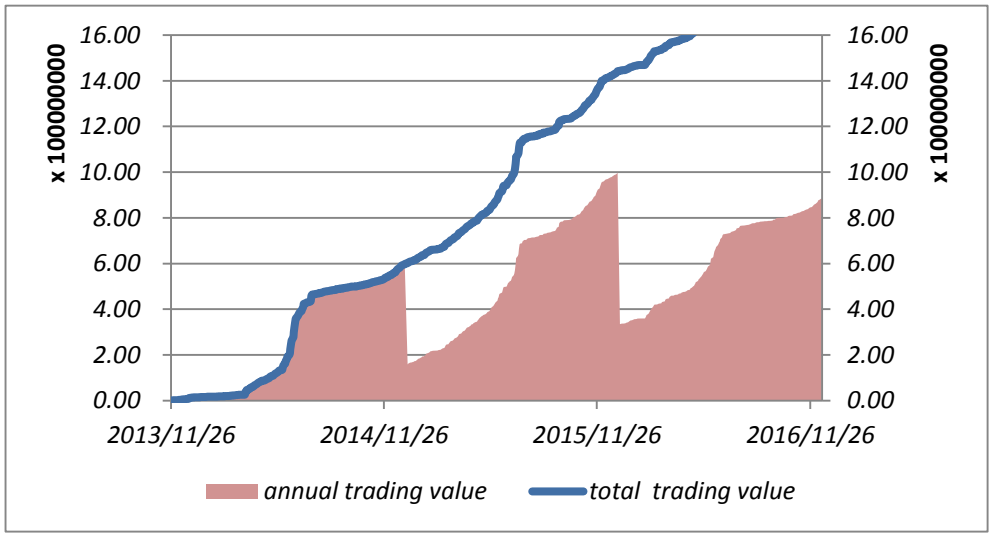


Figure 8: 2014-2016 national trading value from 2014 to 2016

3.4.1.1.2 Trading concentration degree and activity level

Among the 7 pilots, the lowest concentration of trading (65%) is in the Hubei and Shenzhen carbon markets, while it exceeds 90% in other pilots. The Beijing carbon market has the highest overall level of trading activity, followed by Hubei and Shanghai, while Tianjin and Chongqing have the lowest.

Table 13: Trading concentratin degree and activity level for pilots

	Estimated allowances (10^8 tons)	Total trading volume (tons)	Trading concentration degree	Trading vitality degree
BEA	0.47	2,425,010	93.24%	5.16%
TJEA	1.6	19,580	95.61%	0.01%
SHEA	1.55	3,784,321	97.34%	2.44%
GDEA	3.7	6,576,946	96.44%	1.78%
SZA	0.3*3	1,706,550	63.59%	1.90%
HBEA	3.24	10,290,866	67.50%	3.18%
CQEA-1	1.06	140,321	100.00%	0.13%

According to carbon prices in 2016, the 7 pilots divided into two camps. The first camp includes Beijing, Shenzhen and Chongqing with the price level of ￥30-50/ton; the second is Shanghai, Guangdong, Hubei and Tianjin with the price level of ￥10-20/ton. Except for Chongqing, there is an overall decline in carbon prices, especially after the end of compliance period in June.

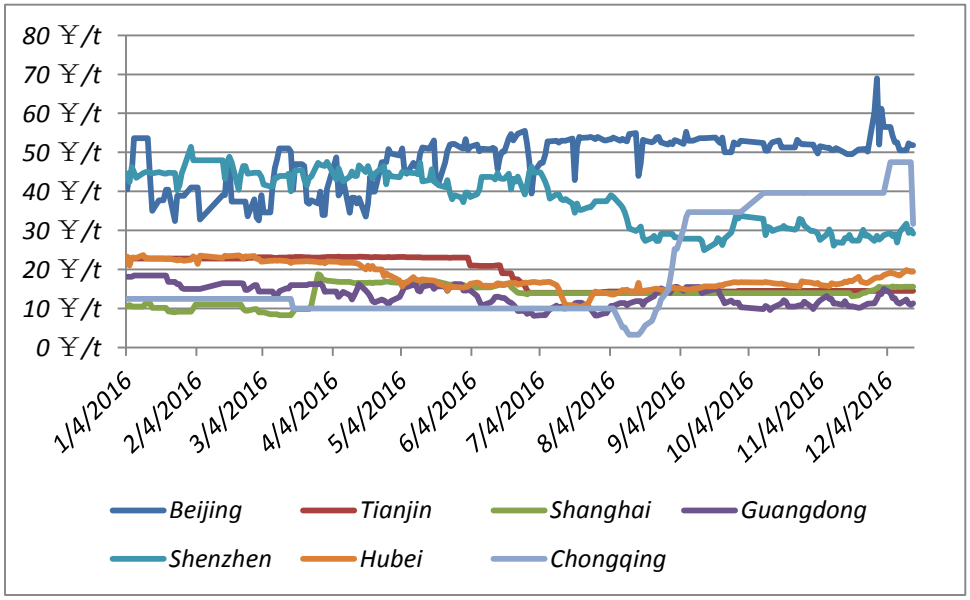


Figure 9: Settlement price trend

3.4.1.1.3 Volatility of carbon prices

Table 14: Volatility of carbon prices

	Mean (daily)	Variance (daily)	Volatility (daily)	Volatility (yearly)
Beijing	-0.10%	0.66%	8.10%	58.47%
Tianjin	0.19%	0.02%	1.38%	9.96%
Shanghai	-0.16%	0.18%	4.27%	30.86%

Guangdong	0.20%	0.32%	5.69%	41.07%
Shenzhen	0.18%	0.21%	4.55%	32.87%
Hubei	0.08%	0.12%	3.49%	25.21%
Chongqing	-0.40%	0.44%	6.62%	47.79%

The higher the volatility, the more financial assets fluctuate, the more uncertainty of return on assets; the lower the volatility, the less financial assets fluctuate, the more certainty of return on assets.

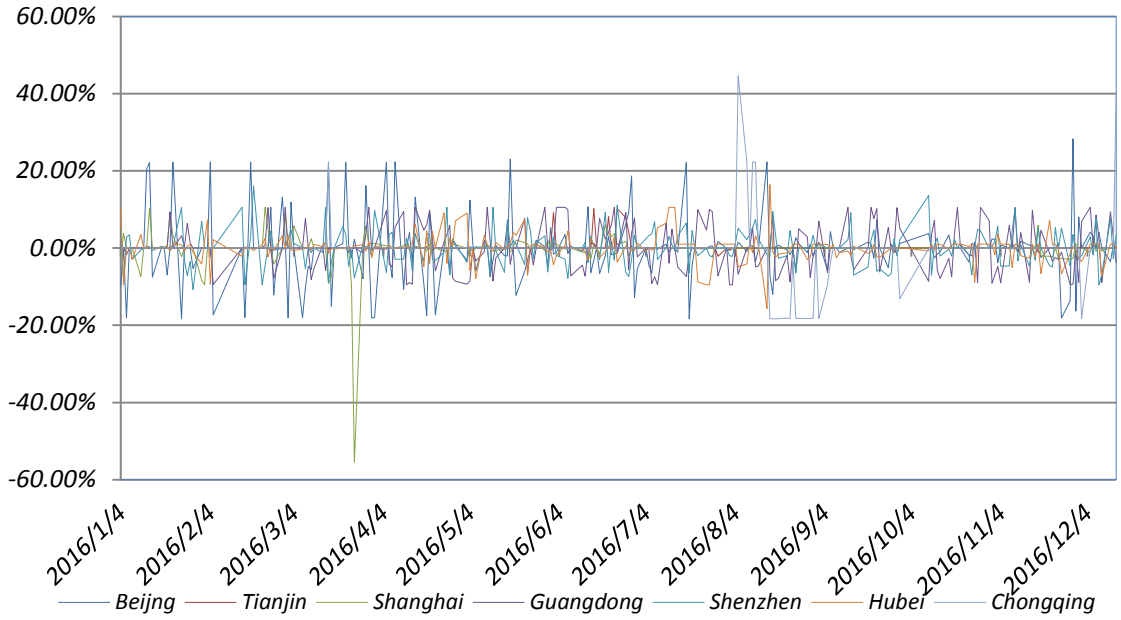


Figure 10: Volatility of carbon prices distribution diagram

3.4.1.2 Allowance block trading

Relatively speaking, the Shenzhen carbon market has higher trading volume and higher concentration in block trading; Shanghai carbon market has a more balanced trading volume distribution and longer duration. Most block trading in Guangdong and Beijing occurred in the last month before the compliance deadline.

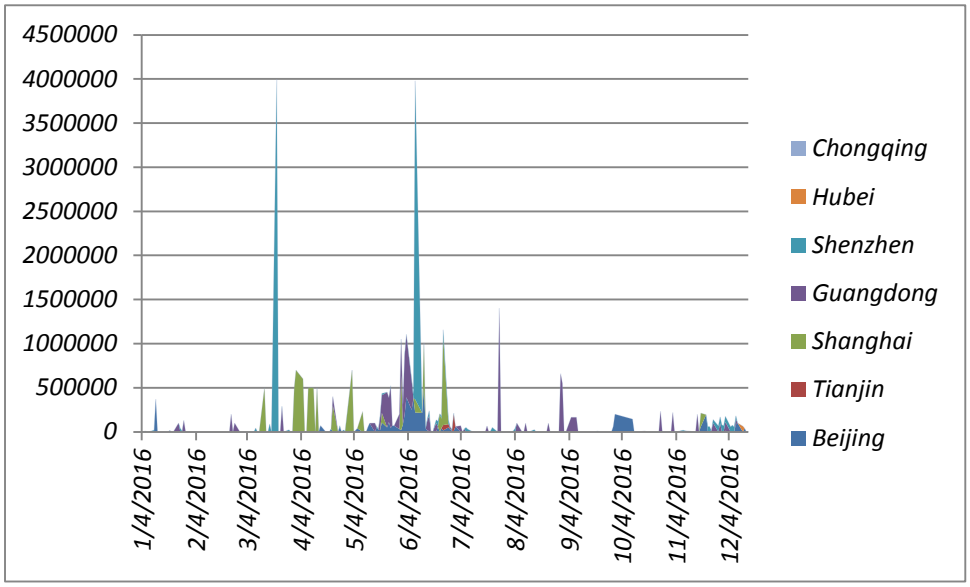


Figure 11: Allowance block trading distribution

3.4.1.3 Complementary mechanism transactions

In general, complementary mechanism trading in the Guangdong carbon market is more prominent, and most occurred within two months before the compliance deadline; complementary mechanism trading in Hubei carbon market occurred within one month after the compliance deadline; complementary mechanism trading in Shanghai carbon market took place in the first half of 2016.

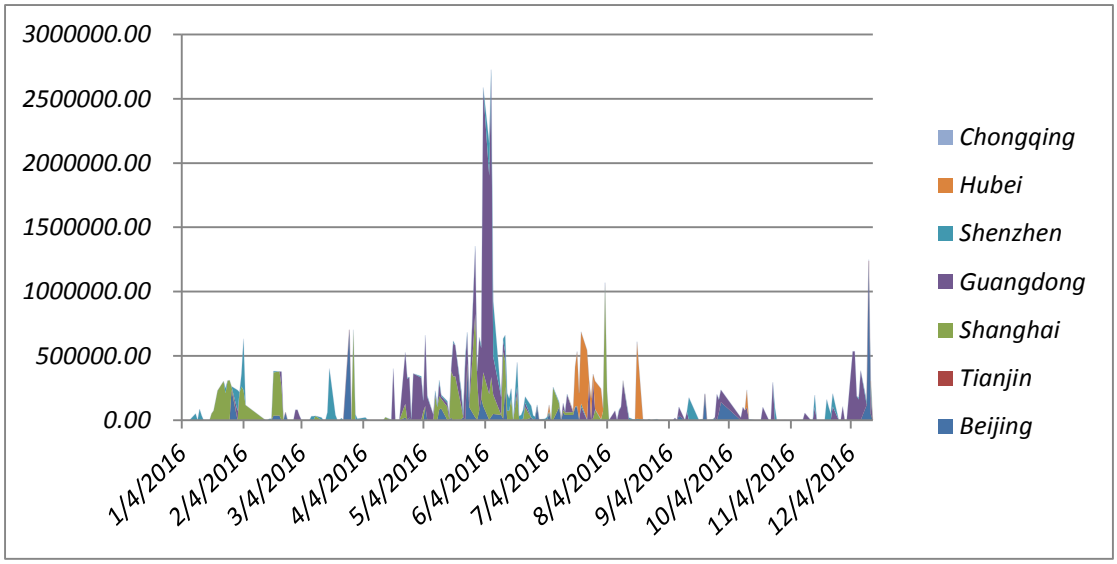


Figure 12: Complementary mechanism trading distribution diagram

3.4.1.4 Hubei Forwards trading

At the end of April 2016, Hubei carbon market started forward transactions. In terms of trading volume, the end of June is a turning point, before which the forwards trading volume increased greatly and after which the degree of the trading volume greatly reduced; in terms of the settlement price, the turning point occurred in mid-August, before which the price stayed above ￥24/t, after which the price level fell to ￥17/t.

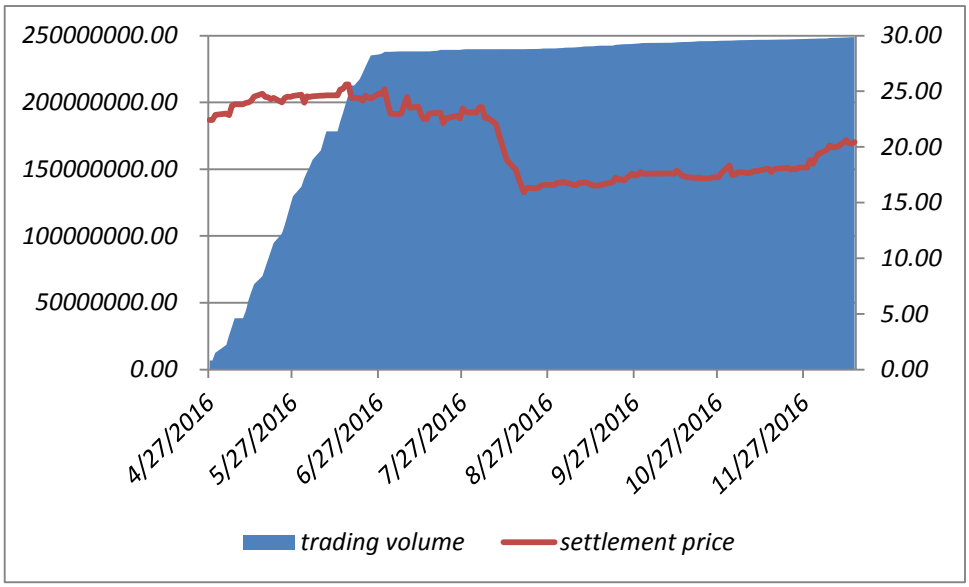


Figure 13: Hubei Forwards trading volume and settlement price trend

3.4.2 Compliance

From the end of June 2016, annual compliance of the 7 pilots successively started. Guangdong, Shanghai and Tianjin first completed compliance, and Shanghai's compliance has been 100% for three years in succession. In 2015, only 1 of 636 regulated entities in Shenzhen failed to complete compliance, 109 regulated entities in Tianjin all completed compliance with 100%performance. Hubei and Chongqing's compliance performance is unavailable.

Table 15: Compliance performance

Pilots	Compliance deadline	Regulated entities	Entities with compliance	Compliance performance
Beijing	6.30	551	466	84.57%
Tianjin	6.30	109	109	100.00%
Shanghai	6.30	191	191	100.00%
Guangdong	6.20	186	186	100.00%
Shenzhen	6.30	636	635	99.84%

Hubei	7.25	166	Unavailable	Unavailable
Chongqing	6.20	254	Unavailable	Unavailable

3.5 Transition from pilots to national ETS

2016 is the transition period from regional pilots to a national ETS, and the experience of the 7 pilots helps to build the national ETS. The 7 pilots' carbon market construction in 2016 are as follows:

Table 16: Carbon market preparation in pilots

	Beijing	Tianjin	Shanghai	Guangdong	Shenzhen	Hubei	Chongqing
Carbon trading management	√		√		√	√	
Trading system perfection			√	√	√	√	
Key emission companies	√	√		√	√		
Carbon emissions verification			√	√			√
Allowances allocation	√		√	√			
Carbon finance attempt	√		√	√		√	
Complement mechanism				√	√	√	
Capacity building		√	√	√			√
Regional carbon market building	√	√	√	√	√	√	

3.5.1 ETS improvement

ETS improvement includes improvement in carbon trading management and trading rules. In 2016, Hubei made great adjustments to the trading system while Guangdong and Shenzhen also reinforced theirs.

For better transition to a national ETS, the executive meeting of Hubei provincial government on August 8, 2016 approved the amendment of Article 5 item 1 of Hubei interim measures of carbon management and trading, "enterprises covered by ETS within the administrative region of this province should apply related regulation issued by state and provincial government". The amendment came into effect on November 1, 2016.

Hubei Carbon Trading Exchange Ltd. and Shenwu Environmental Technology Co., Ltd. signed an agreement on increasing the capital and share of Hubei Carbon Trading Exchange Ltd., in which

Hubei Carbon Trading Exchange Ltd would increase registered capital from 100 million to 500 million, and had intention of inviting Shenwu to participate in this increase in capital and share; Shenwu promised to purchase 50 million shares at ￥1.1per share. This would enhance the vitality of the carbon market.

On October 26, 2016, Shenzhen Emission Exchange disclosed that it and Price Waterhouse, the biggest professional services firm in the world, jointly launched the building of a complete internal control system, enhancing risk management in the trading system to reduce risk, build investor's confidence and prepare for national ETS.

Guangzhou Emission Exchange declared that institutional and individual investor in Guangdong carbon market can hold up to 8 million tons, which is 5 million more than before. In addition, non-corporate organizations including fund and trust can open accounts in Guangzhou Emission Exchange. Permission for non-corporate organizations opening accounts and increasing investor's open interest is expected to cultivate a multi-layer market system and promote an active and healthy carbon market.

3.5.2 Carbon finance innovation

Carbon financial innovation will help to develop green and low carbon industries, and encourage more investors in the carbon market. In 2016, Beijing, Shanghai and Hubei made carbon financial innovations: carbon futures, carbon insurance and carbon funds will broaden the enterprises' financing channels for energy conservation and emission reduction.

On April 27, 2016, Hubei launched emission spot forwards as the first emission spot forward product in the market, with 6.8022 million trading volume/day and 0.15 billion trading value/day.

On July 12, 2016, Beijing Environmental Exchange published three carbon financial innovation product contract templates for reference, including emission repo financing, OTC swap trading and OTC option trading. This will encourage enterprises to strengthen carbon assets management and make carbon financial innovations.

On September 28, 2016, Shanghai Environment and Energy Exchange (SEEE) and Shanghai Clearing House jointly had a "Shanghai carbon finance development and allowances forward product road show". Shanghai allowances forward product is SEEE's key innovation in carbon finance this year, and a simulation operation ran from November 21 to December 2. Shanghai allowances forward trading began on December 19. This development in Shanghai carbon financial options, helps to promote multi-layer carbon financial market.

On November 18, 2016, Huaxin Cement Group and Pingan Insurance signed the first carbon insurance product intention agreement in China, in which Ping An Insurance would customize products for Huaxin Group's 13 subsidiaries in Hubei province and would sign a formal insurance services contract soon. Carbon insurance is one means for enterprises to manage risk and carbon assets, and provide safeguards for enterprises failure to reach emission reduction targets. At the same time, Shenwu Environmental company signed a low carbon industry fund agreement with Hubei Emission Exchange, in which both the parties should set a low carbon industry investment fund based on reallocating resources in each professional field.

3.5.3 System platform support

According to the feedback from the pilots' three years of operation, carbon trading systems in the pilots need to be updated and refined. The carbon trading systems in Shanghai and Shenzhen have completed this work.

At the request of the Shanghai DRC, the Shanghai Information Center started working to improve the direct reporting of carbon emission, and allowance registry systems on July 20, 2016. These improvements of the quota system are in order to adapt the allowance allocation approach and methodology, the offset product types and proportion, and to connect the market with carbon derivatives such as borrowing, securities and forwards. Improvement of the direct reporting system will allow for carbon accounting and reporting methodology for newly covered enterprises and industries, and updates the modules of monitoring plans, historic data tables, and formation of carbon emission reports.

The Shenzhen DRC started improvement of the carbon trading GHG emission information system on September 5, 2016, to prepare for the national ETS launch, and to support the GHG management system.

3.5.4 Development process of regional carbon market

Focusing on pilots and exploring cross-regional carbon emission trading is a beneficial exploration for national carbon market building, and also on the major operational mode of domestic carbon markets, before the national ETS's launch. At present, China's three most important economic zones are: the Beijing/Tianjin/Hebei region, the middle and lower reaches of the Yangtze River, and the Pearl River Delta region. These regions have been actively exploring the possibility of regional carbon markets. From 2013, major provinces have cooperated to make preparations for the national ETS.

Table 17: Regional carbon market progress

Regional carbon market	Date	events	Cooperating parties
Jing-Jin-Ji Region (Beijing, Tianjin, Hebei)	2013/11/28	Framework agreement for the development of cross regional carbon trading and cooperation	Beijing and Tianjin, Hebei, Inner Mongolia, Shaanxi, Shanxi, Shandong, etc.
	2014/12/18	Beijing and Hebei were the first to announce the initiation of a cross regional carbon emissions trading pilot	Beijing and Chengde, Hebei
	2015/5/19	Beijing and Tianjin high-level meeting on coordinated environmental development	Beijing and Hebei, Tianjin
	2016/5/4	The 2nd general conference of Beijing Environmental Exchange	Beijing and Inner Mongolia
Middle and	2014/4/2	Carbon emissions trading, cross regional	Hubei province and

lower reaches of the Yangtze River		cooperation and exchange framework agreement	Shanxi, Anhui, Jiangxi, Guangdong and so on
	2014/7/28	Executive meeting of the Shanghai municipal government	Shanghai, Jiangsu, Zhejiang and so on
	2015/4/16	Carbon market of the city district in the middle reaches of the Yangtze River region	Hubei, Jiangxi, Hunan
Pearl River Delta region	2015/1/29	Cross regional carbon market in Guangdong and Hong Kong	Guangdong, Hong Kong
	2015/7/24	Carbon trading pilot links and regional carbon market cooperation seminar	Shenzhen, Guangdong
	2015/9/9	Baotou carbon emissions trading market system construction initial meeting	Shenzhen, Baotou
	2015/9/16	Sino-US Climate Leaders Summit	Shenzhen, Jinchang
	2016/6/17	Shenzhen and Baotou carbon market link launch ceremony	Shenzhen, Baotou

3.6 Non-pilot region preparation for carbon market launch

To make the national ETS effective in allocation of GHG resources, and promoting industry construction, energy consumption construction and economic development to transfer from high-carbon to low-carbon, non-pilot regions should make preparations for the national ETS through policies and regulations, technological specifications and capacity building based on the needs of the competent department, participants and carbon market management. The progress of non-pilot regions carbon market is as follows:

Table 18: Non-pilot region preparation for carbon market kick-off

Carbon market plan regions	Carbon market plan	Measures of carbon trading management	Third party institutions (DOE)	Carbon emission management platform
Jiangsu	√		√	√
Zhejiang	√	Hangzhou	√	√
Anhui			√	√
Jiangxi	√		√	Xinyu
Shandong			√	Qingdao
Fujian	√	√	√	
Shanxi			√	√
Hebei			√	
Inner Mongolia			√	
Hunan			√	√
Henan			√	

Guangxi			√	
Hainan	√		√	
Sichuan		√	√	Chengdu
Guizhou			√	
Yunnan	√			√
Xizang			√	
Shaanxi			√	
Gansu	√		√	Jinchang
Qinghai			√	
Ningxia			√	
Xinjiang	√		√	
Heilongjiang				Ha'erbin
Jilin			√	
Liaoning				√

3.6.1 Carbon market plan

To implement the national ETS's unified deployment, allow the market to decide the allocation of resources, and accelerate carbon market building. Jiangsu, Gansu, Fujian, Zhejiang, Jiangxi and Fujian have announced carbon market plans successively from 2015.

In October, 2015, general office of Jiangsu provincial government issued an implementation plan for a carbon emission trading market in Jiangsu province. This plan made clear the major target of building a carbon emission trading market, required that basic preparation for emission trading should be completed in 2016, and market management should be resolved and carbon emission trading market schemes matching with national ETS should be built from 2017 to 2020. This plan defined five important tasks including carbon reporting, allowances allocation, carbon inventory verification, management platform and market cultivation, proposed four measures of safeguard including building process mechanism, responsibility allocation, increasing capital support and capacity building.

On June 24, 2016, the general office of Gansu provincial government issued the Gansu implementation plan for carrying out the national ETS (2016-2018). This plan noted that Gansu province should make preparation for national ETS launch in 2016-2017, find out basic data of key enterprise emissions, list key enterprises covered by the national ETS to ensure Gansu incorporates smoothly into the national carbon emission trading market. By 2018 a fair and practical carbon emission trading operating and management mechanism should be built, allowances allocation, such as registry, trading, compliance and supervision should be built.

On June 28, 2016, Xinjiang issued plans for implementing the national ETS. According to the plan, GHG emission reports and carbon inventory verification by a third party should be implemented and a national ETS covered enterprises list should be confirmed for 2015-2016; in 2016-2017, a key emission enterprises monitoring, reporting and verification system should be set up, and related support scheme should be perfected, and allowances allocation system and allowances registry, trading and supervision schemes should be built.

On July 12, 2016, Zhejiang carbon emission trading market implementation plan was issued. The

plan noted that Zhejiang should complete basic preparation for carbon emission trading and launch carbon trading before 2017; build mature carbon trading market systems before 2020. The plan defined overall requirements, major targets, key tasks and safeguard measures for an emission trading market in Zhejiang province. Trading participants should be enlarged to other industries based on carbon market operation status.

On July 27, 2016, Jiangxi DRC issued Jiangxi implementation plan for carrying out the national ETS. This plan's target was to form the mechanism at all levels of government, and enterprise linkage with technology supporting institutions, complete preparatory work for the national ETS to ensure Jiangxi enterprises participate in the national carbon emission trading in 2017.

On September 30, 2016, Fujian government issued Fujian carbon emission trading market implementation plan to build a carbon emission trading system and reduce emissions. The plan proposed that by the end of 2016 a carbon emission trading market should start and join the national ETS in 2017, and build a carbon trading market covering all industries within Fujian.

3.6.2 Carbon trading management measures

Among non-pilot regions, Sichuan and Fujian have published measures for carbon trading management. By December 2016, there were 9 exchanges nationwide which have qualification for CCER trading, including the 7 pilot exchanges, Sichuan United Environmental Exchange and Haixia Equity Exchange. Sichuan United Environmental Exchange and Haixia Equity Exchange were approved for CCER trading qualification separately in May and July 2016 and have not started trading.

In June 2016, the NDRC approved Sichuan, through the Sichuan United Environmental Exchange, to set up a national carbon market capacity building center in Chengdu, which was the first such center approved in a non-pilot region. Also in June, a central leading group for strengthening overall reform approved a national ecological civilization pilot zone implementation plan for Fujian, within which the carbon market is an important component.

Major advances in the carbon trading management framework include the following:

On August 9, 2016, Sichuan DRC issued Interim Measures of Sichuan Carbon Emission Trading Management, which applies to supervision of carbon emission allowances, CCER and other products trading. These measures involve allowances management, trading, verification and compliance, CCER projects management and trading, information disclosure and supervision and administration, legal responsibility and so on.

In September 2016, Fujian government issued Interim Measures of Fujian Carbon Emission Trading Management. The measures are comprised of 40 articles, dealing with application scope, definition and principle of carbon emission trading, management responsibilities and division, allowances management, carbon emission trading, carbon emission reporting, verification, allowances submission and legal responsibilities of participants.

3.6.3 Carbon emission reporting and verification

To ensure the national ETS to launch in 2017, the NDRC general office issued a notice on earnestly implementing the key work of the national carbon emission trading market in January 2016, which said that all provinces should submit emission reports required by the national ETS by

June 30th.

By the end of 2016, all provinces or municipalities have completed carbon emission verification before the launch of the national ETS.

After the NDRC published Notice on the implementation of the relevant work arrangements for the construction of the national carbon emissions trading market, non-pilot regions began to choose third parties for carbon emission verification. According to the climate change division of the NDRC, the national ETS covers 7000-8000 enterprises in the first stage. 20 non-pilot provinces or municipalities (Except Hong Kong, Macao and Taiwan) and 7 pilots have selected 350 third party institutions for verification. Among the 6 provinces waiting for third party institutions selection results, Shanxi, Qinghai and Henan have issued the notice of selection, and Heilong, Jilin and Liaoning have less information for disclosure. The published third party institutions consist of CCER validation and verification institutions approved by the NDRC, registered institutions in pilots, research institutions, carbon assets management companies, engineering consulting companies, and energy conservation and emission reduction technology companies.

In addition, more and more energy conservation supervision organizations, started to undertake work related to carbon emission verification. The Beijing Energy Conservation Supervision Team performed well in promoting compliance; the Shanghai Energy Conservation Supervision Center and the Shanghai Energy Efficiency Center made a significant contribution in constructing the foundation of carbon emission verification; Hebei Energy Conservation Supervision Center listed carbon verification as the prime task; and Xi'an Energy Conservation Supervision Center set the stage for carbon verification.

4 Survey of China's ETS operation

In order to more objectively understand the various stakeholders' appeals for the construction of China's carbon market, Environomist Ltd. carried out research on 2017 China carbon market. This questionnaire based survey was completed via the online survey platform "Diaochapai" and the media partners included: www.tanjiaoyi.com and its WeChat account, and the WeChat account of www.ideacarbon.org. The main contents/areas of the survey include basic information, business ability, market development, and carbon finance/carbon market. The six kinds of respondents were financial institutions (including carbon asset management, fund companies, banks, securities companies, futures companies), technical support units (including consulting companies and third-party agencies), regulated enterprises, voluntary emission reduction and carbon trading enterprises, research institutions or administrative institutions, and enterprises interested in and learning about the carbon market. Each kind of respondent answered a specific set of questions. From 16 November 2016 to 15 December 2016, a total of 341 respondents participated in the survey. This chapter presents the results of the analysis and the qualitative and quantitative summary of the questionnaire survey.

4.1 Survey

- Nature of the business

Institutions involved in this survey are mainly private enterprises (39.88%) and State-owned enterprises (30.21%).

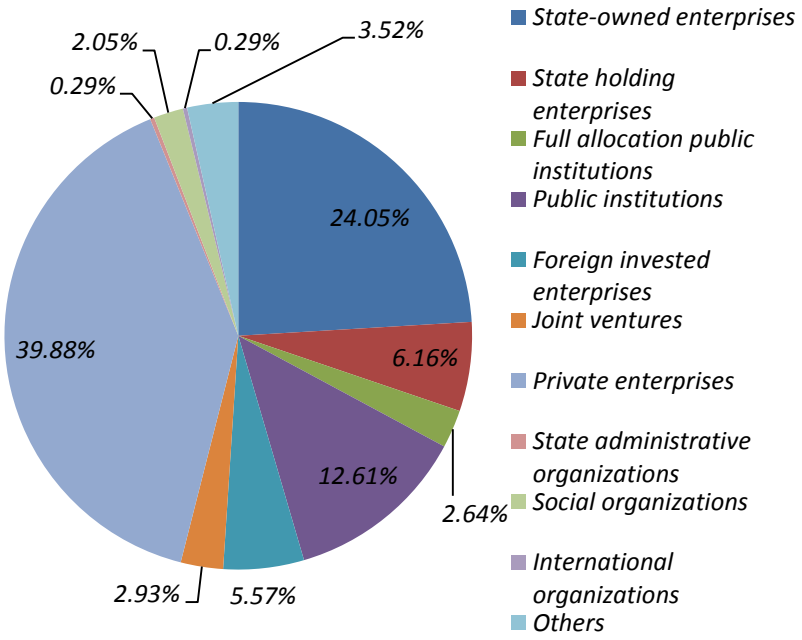


Figure 14: Nature of the business

- Time of establishment

The younger institutions are more interested in the carbon market survey, which indicates that the

China carbon market is an emerging market, and many institutions are interested in its development.

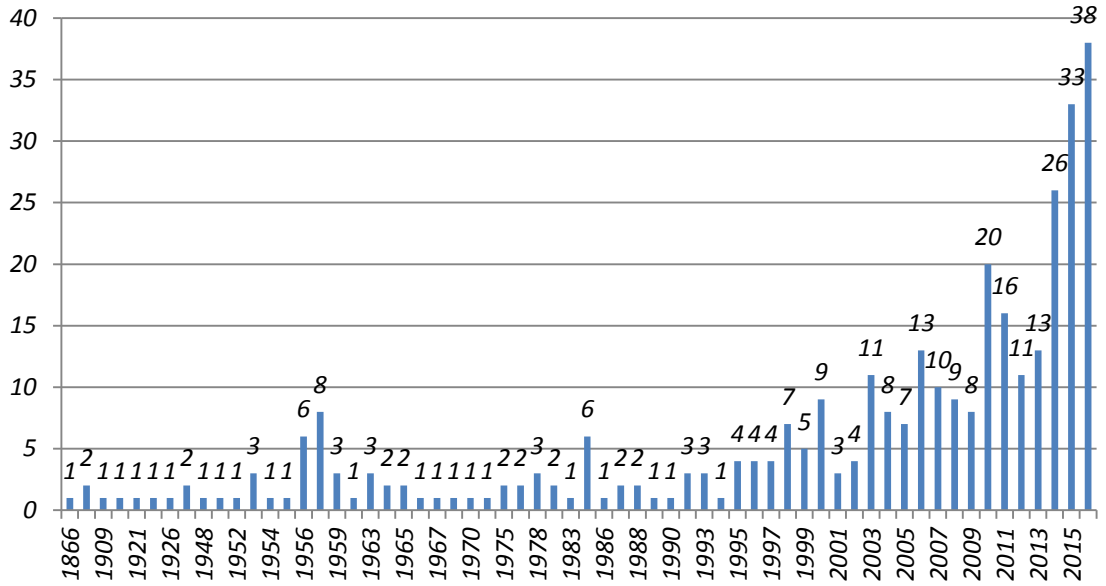


Figure 15: Time of establishement

- Surveyed areas

Most surveyed institutions are from the pilots, especially Beijing, Shanghai and Guangdong. Among non-pilot regions, surveyed institutions in Shandong, Sichuan and Zhejiang are more interested in carbon market.

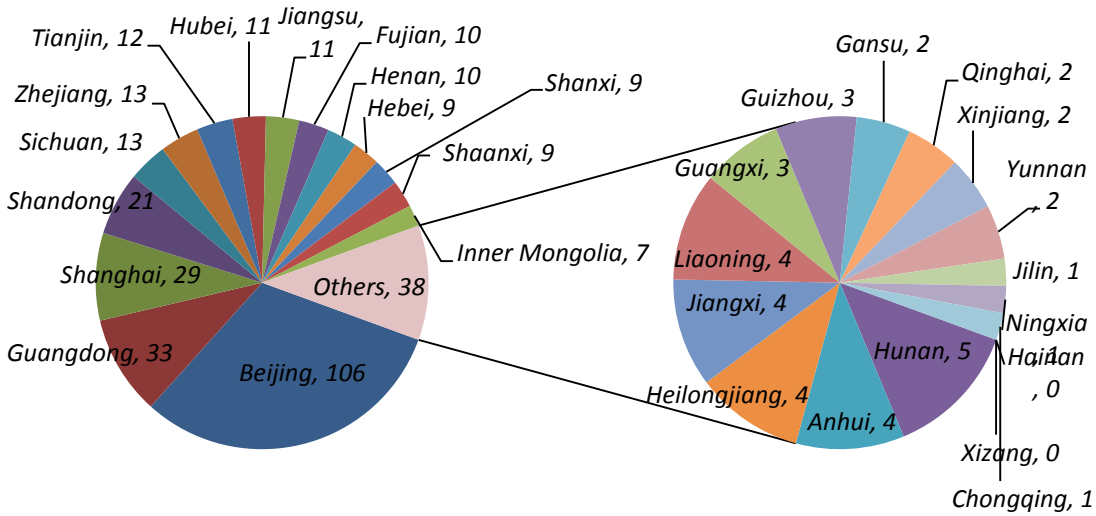


Figure 16: Surveyed areas

- Business types

Among the surveyed institutions, major proportions are as follows: technical support units (30.21%), research institutions or administrative institutions (17.3%), financial institutions (15.84%) and enterprises interested in and learning about the carbon market accounts for 20.23%.

Regulated enterprise participants are relatively low, which demonstrates that the major bodies do not have the same enthusiasm and confidence as other service providers and practitioners.

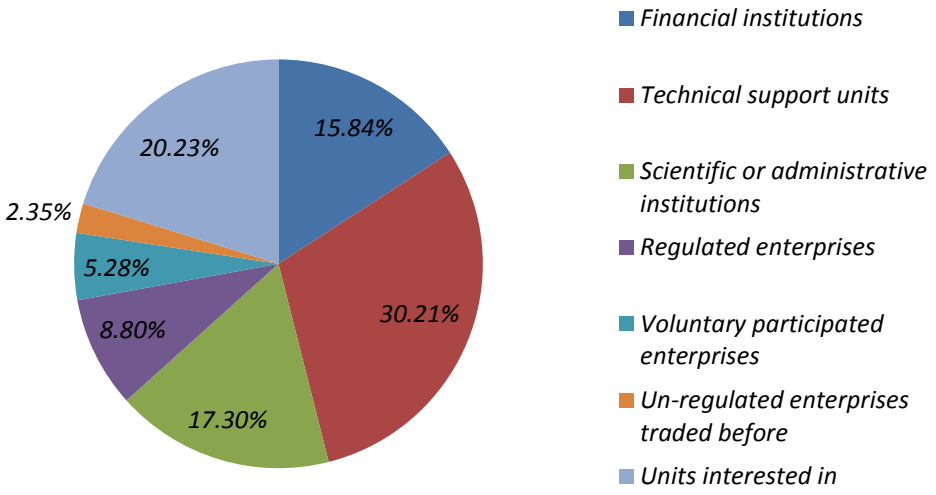


Figure 17: Business types

- Surveyed industries

Assets management in financial institutions was best represented, accounting for 5.87% of the total. Power industry in regulated enterprises was best represented, accounting for 8.21% of the total. Respondents of two industries in technical support units accounted for about 30% and respondents of others made up close to 20%.

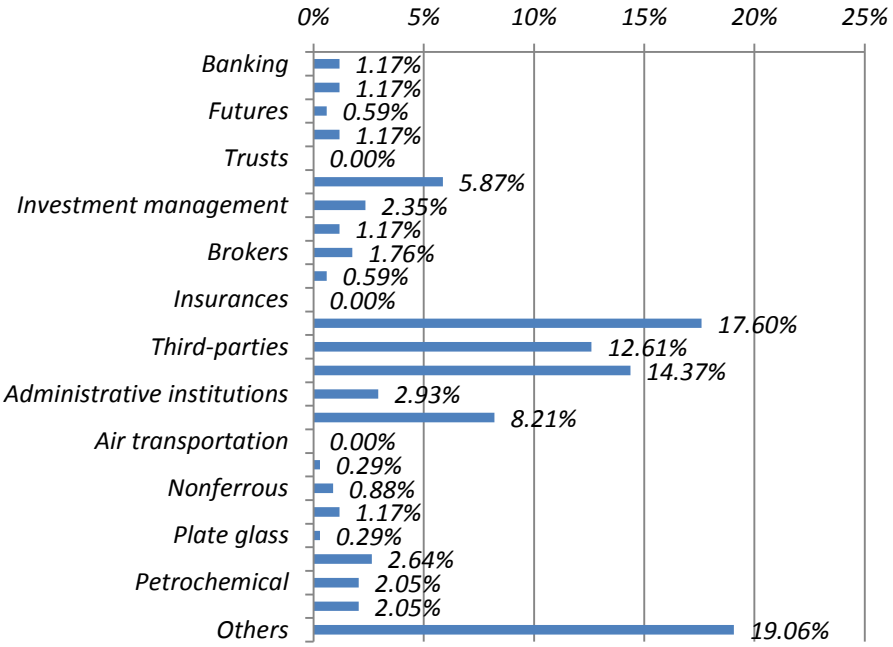


Figure 18: Surveyed industries

4.2 Carbon market

- In your personal view, what's the purpose of the establishment of China's carbon market?

The respondents think China is building a carbon market to promote energy structure adjustment (84.1%), Industrial upgrading transition (77.7%) and environmental domestic demands (83.8%).

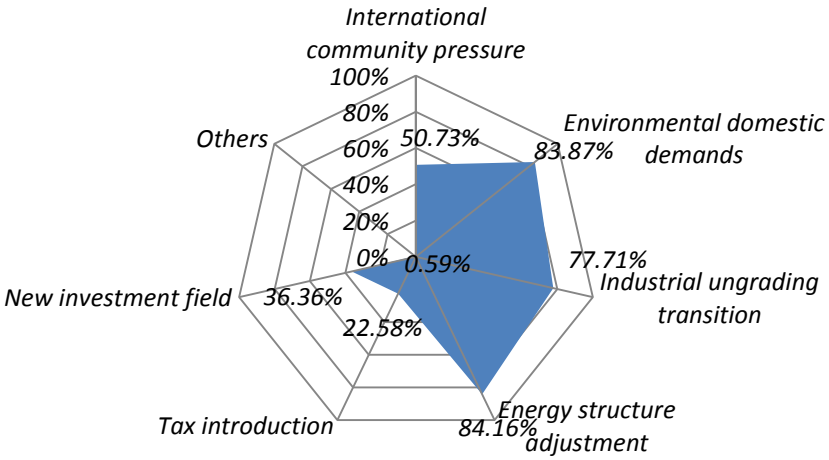


Figure 19: Purpose of the establishment of China's carbon market

- In your estimate, what's the contribution of the carbon market to achieving national GHG emission control goal?

More than 1/3 of the respondents believe that the carbon market's contribution to the control target is between 5% and 20%, nearly 1/2 of the respondents believe that the contribution is between 20% and 50%. So, researchers have high expectations for the carbon market.

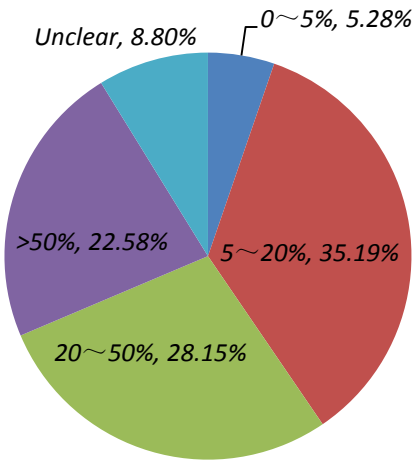


Figure 20: Contribution of carbon market to achieving national GHG emission control goal

- For the national ETS to launch in 2017, do you expect the rules to take into account the inequality between national and regional carbon allocations due to industry and regional differences?

More respondents think it is necessary to consider unequal quality issues caused by the difference among both industries and the regions (73.16%).

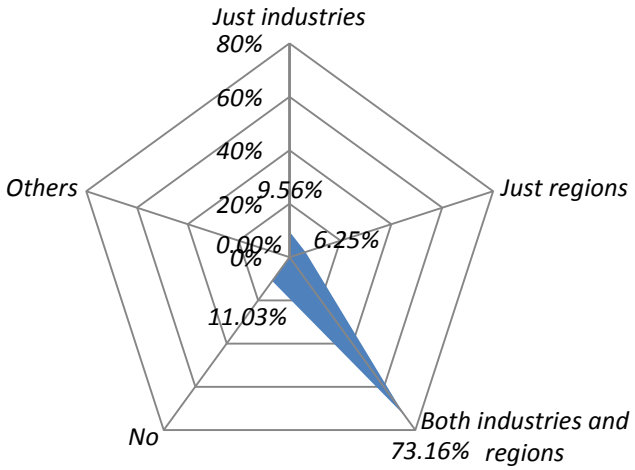


Figure 21: Allowances with unequal quality caused by the difference among industries and the regions

- For the national ETS to launch in 2017, do you expect the rules to take into account the difference in allowances circulation due to differences among industries and the regions?

More respondents think allowances can flow freely through a certain ratio in future national market (54.04%).

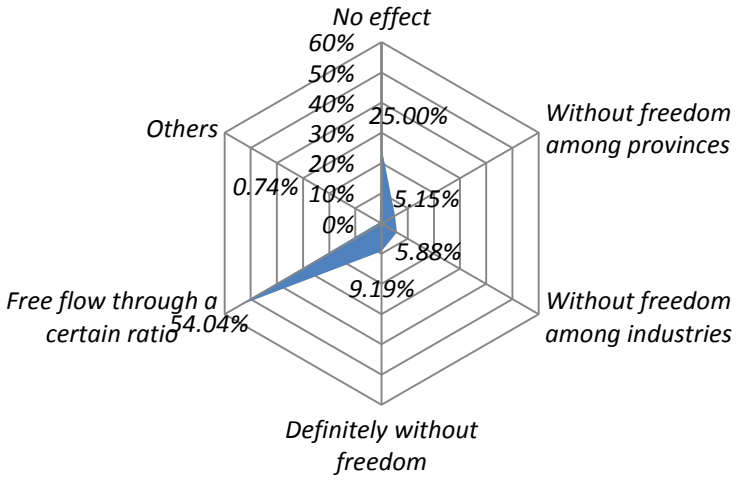


Figure 22: The effect of allowances with unequal quality caused by the difference among industries and the regions on allowances circulation

- At present, which fields of domestic the carbon market need strengthening? (multiple choice)

Relatively speaking, the respondents are satisfied with registration system, and direct reporting platform with the proportion of less than 40%; on the contrary, the investigators believe what needs strengthening most is information transparency in addition to introduction of policy documents.

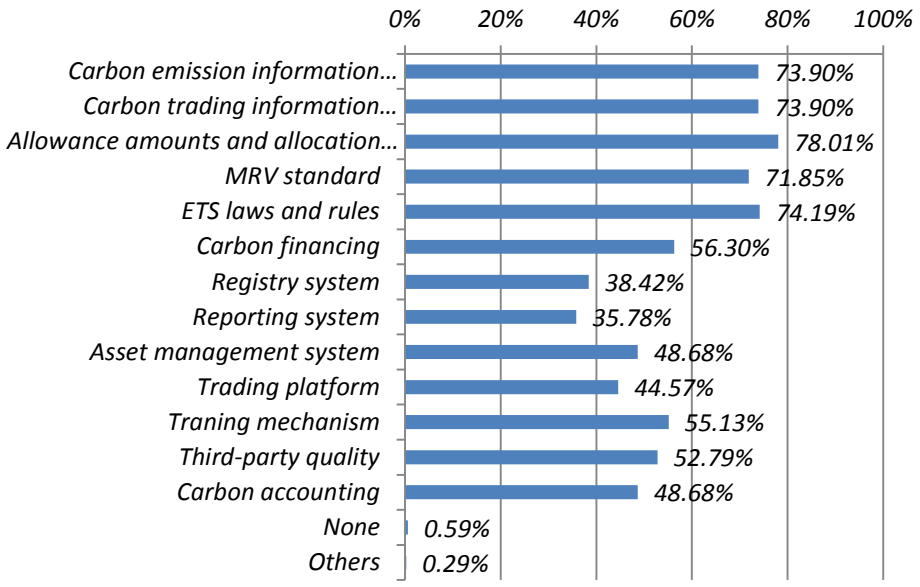


Figure 23: Which fields of domestic carbon market need strengthening

- What's the proportion of CO_2 emissions calculated under carbon verification guide in the total carbon emissions?

More than 60% of respondents believe that the current carbon emissions calculated under the guide can account for more than 70% of the total emissions

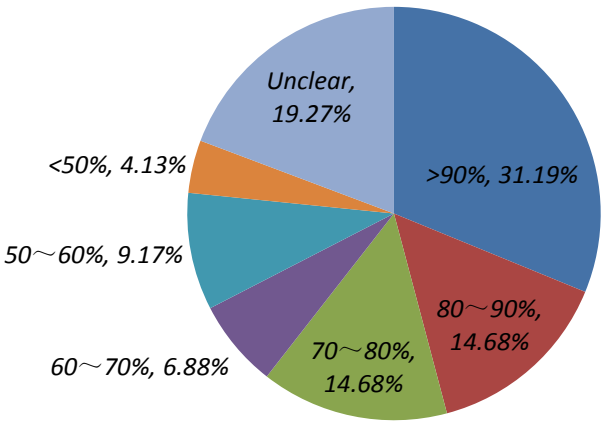


Figure 24: Proportion of CO2 emisisons calculated under carbon verification guide in the total carbon emissions

- In the next decade, China is most likely to adopt energy conservation and carbon reduction measures, which measures are most likely to be adopted? (multiple choice, up to 3 choices)

Investigators believe that ETS (80.06%) will be the energy saving and carbon reduction measures that China is most likely to adopt; followed by green finance (36.07%) and carbon tax (29.03%).

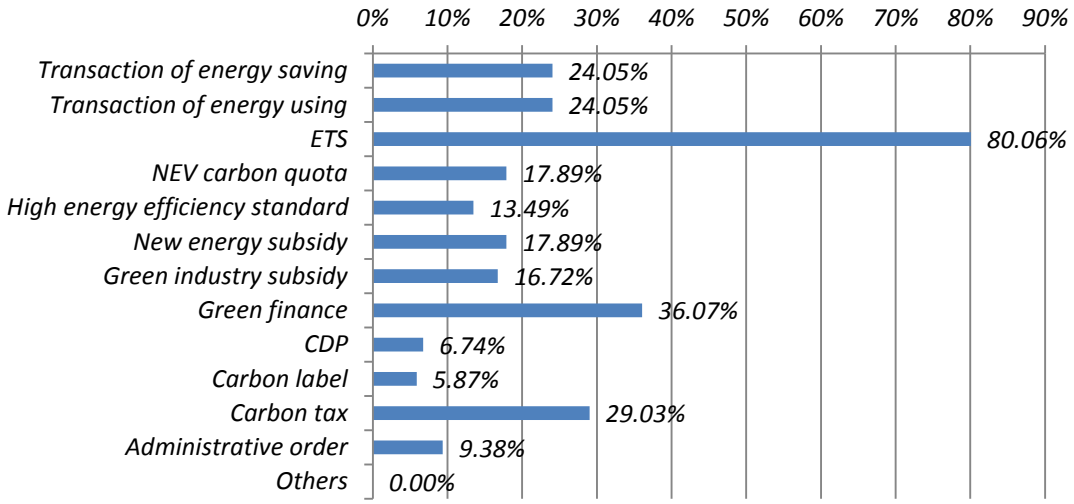


Figure 25: China is most likely to adopt energy conservation and carbon reduction measures

4.3 Carbon trading

- If your unit is in a pilot region, what do you expect the price level of the carbon allowances to be by the end of July 31, 2017?

Most of the respondents think carbon price in pilots will go up, 56.89% of respondents believe that the carbon price will rise by July 31, 2017.

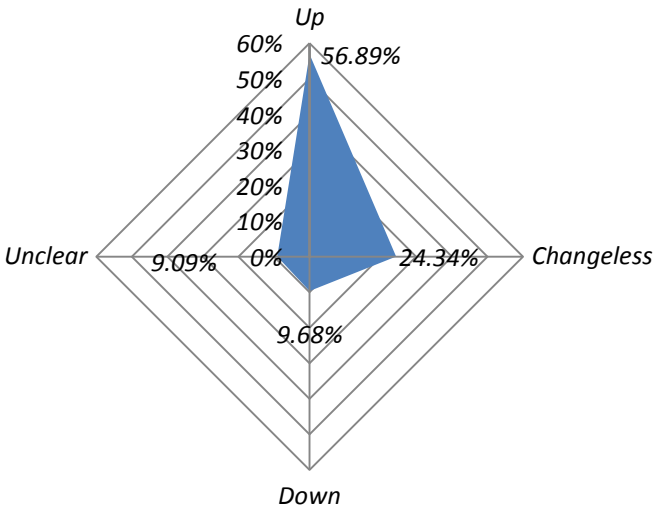


Figure 26: The price level of carbon allowances

- What do you expect the median allowances price level in national carbon market to be during the 2017-2020 period?

Most of the respondents believe that during 2017-2020 period the price will be ￥20-50/t,

accounting for about 65%. Compared with the price expectations disclosed by some media or institutions, the respondents' estimates are relatively conservative.

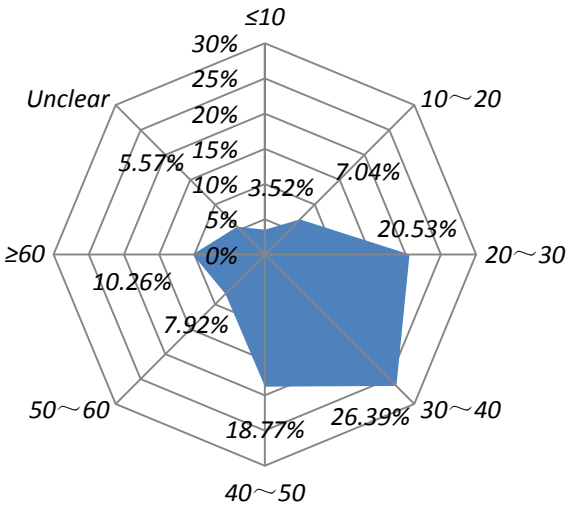


Figure 27: Median allowances price level

- • What do you think the median price of the complemental offset mechanism (CCER, carbon sink, etc.) issued will be?

Most of the respondents think that the median carbon of CCER/ carbon sink will be ￥10-30/t, accounting for about 54%.

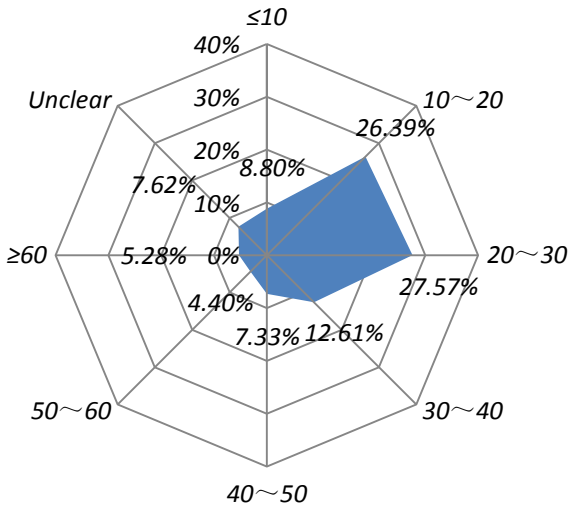


Figure 28: Median price level of complemental offset mechanism (CCER and carbon sink）

- What are the barriers your units face to enter carbon trading market? (multiple choice)

The main barriers to carbon market entry are unclear policies and regulations (58.72%), lack of market information (44.04%), low market liquidity (44.5%)

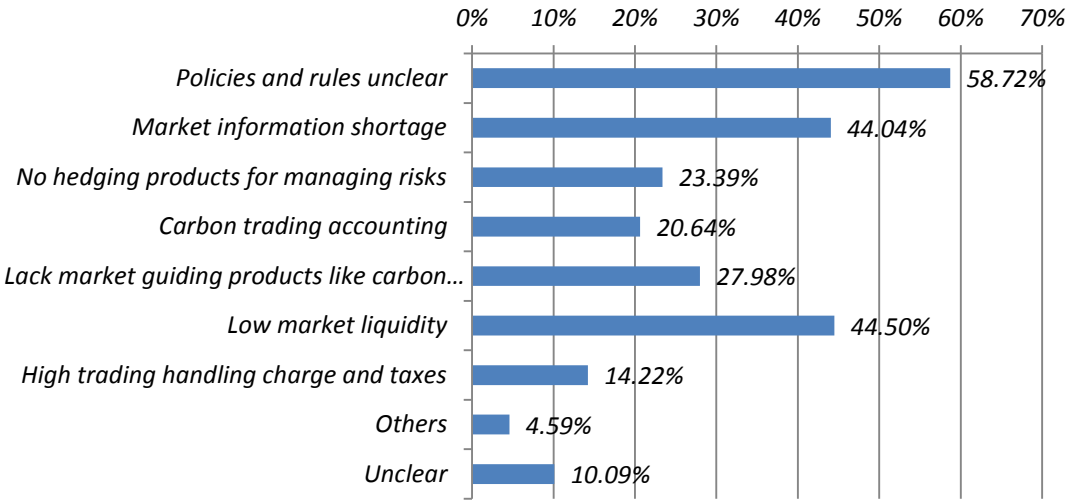


Figure 29: Barriers your units face to enter carbon trading market

- What forms of access to relevant carbon market data or information do you favor? (multiple choice)

Investigators are more likely to obtain carbon market data or information from third party platforms (74.78%), followed by government agencies (66.86%) and the exchange (63.05%).

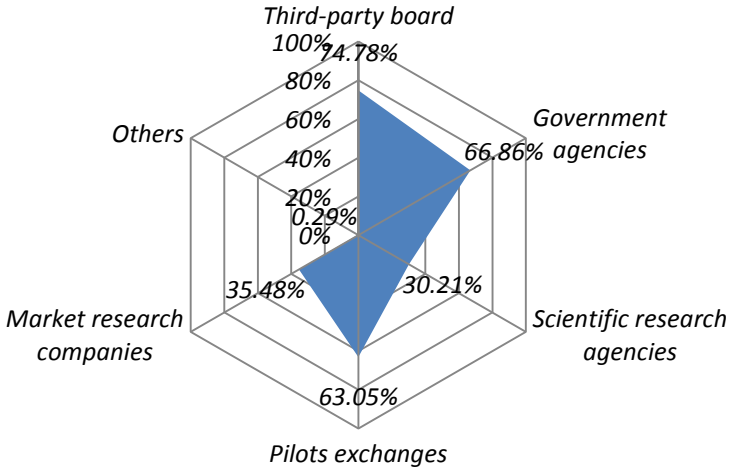


Figure 30: Access to relevant carbon market data or information

- How do you prefer the release of carbon trading results and other relevant information to be presented?

Respondents hope that the trading results and other information are released through annual report (69.21%), followed by the environmental report (53.96%), social social responsibility report (50.15%), sustainable development report (53.96%).

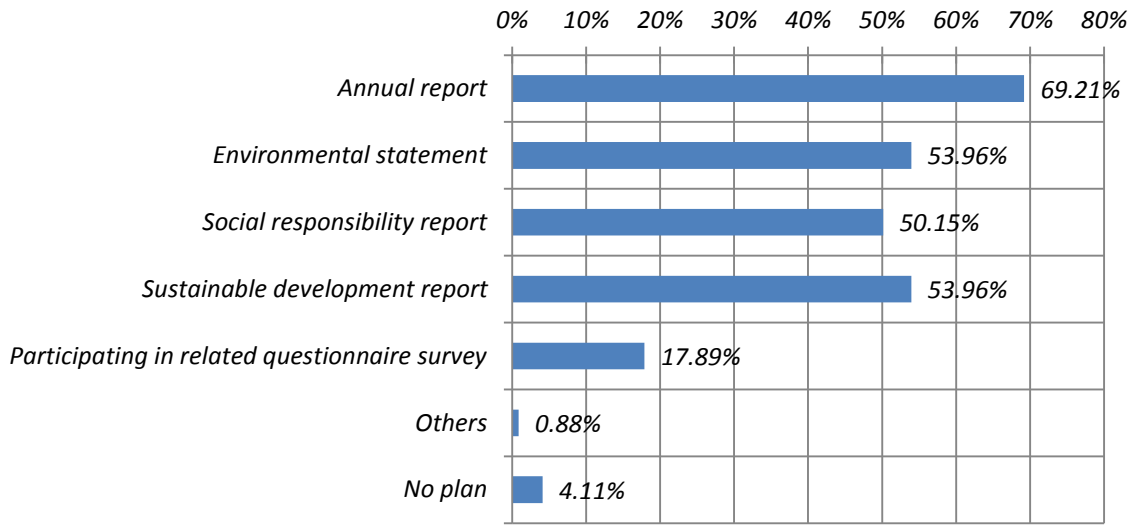


Figure 31: Release of carbon trading results and other relevant information

- Does your unit worry that there are not enough counterparties in implementing allowance trading?

77% of the respondents are worried that there are not enough carbon trading counterparties

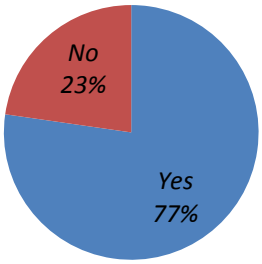


Figure 32: Enough counterparties in implementing allowances trading

- What are the goals of your unit to participate in carbon trading?

The respondents believe that the main purpose is that carbon trading is a financial means of profit (56.42%), and profit can be made in carbon market.

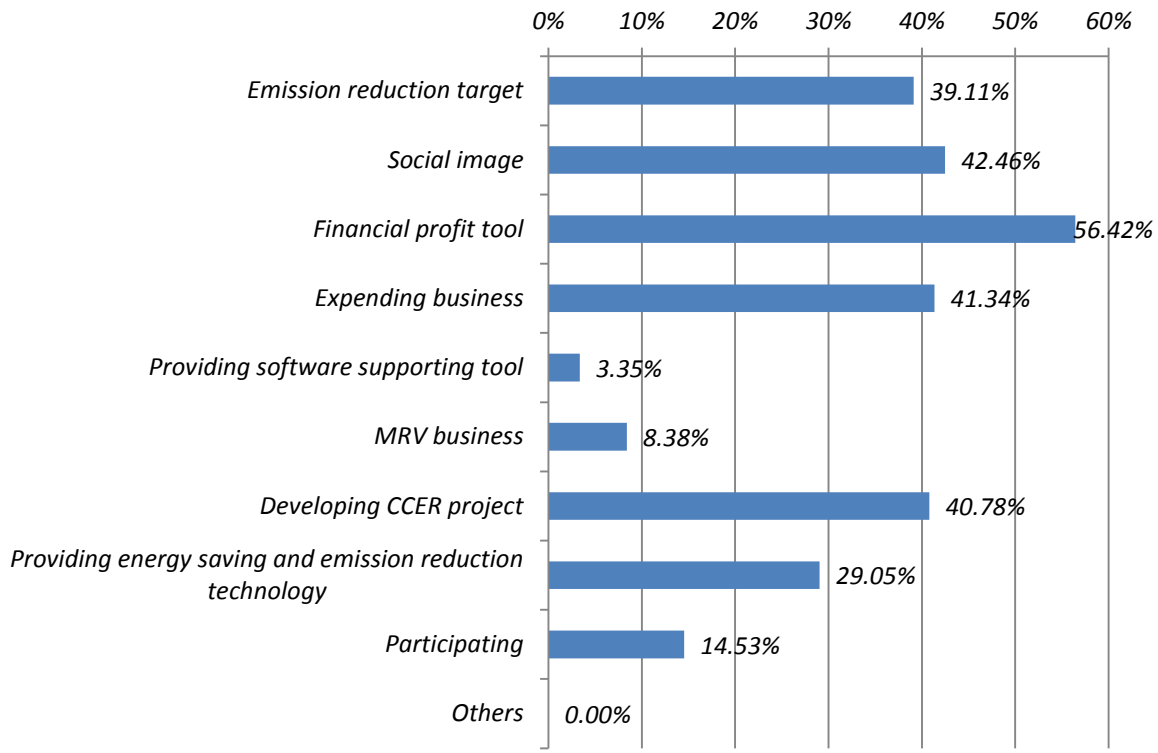


Figure 33: The purpose to participate in carbon trading

- Does your unit plan to increase investment in carbon market by July 31, 2017?

64% of respondents unit plan to increase investment in carbon markets by July 31, 2017

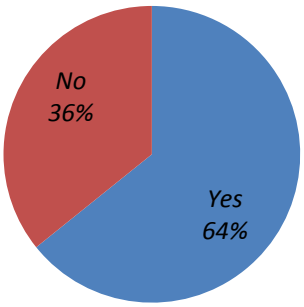


Figure 34: Planning to increase investment in carbon market

- Is your unit prepared to set aside a certain budget or funds for carbon trading?

Less than 1/3 of the respondents do not set aside a certain amount of budget or funding on carbon trading.

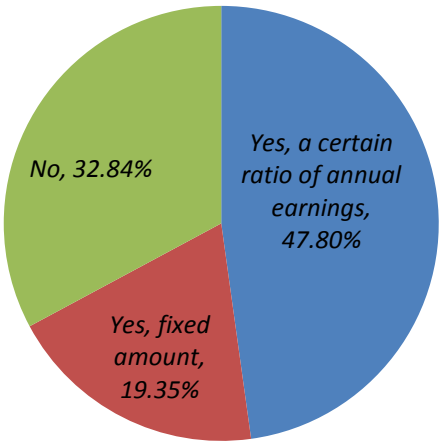


Figure 35: Setting aside a certain amount of budget or fund on carbon trading

- How does your unit make budget allowance for carbon trading?

More than 40% of the respondent's units have not made a budget for carbon trading

Figure 36: Budget for carbon trading

- Have you or your unit participated or intend to participate in commodity trading in the following areas?

Nearly 60% of respondents or their institutions do not have experience of commodity trading.

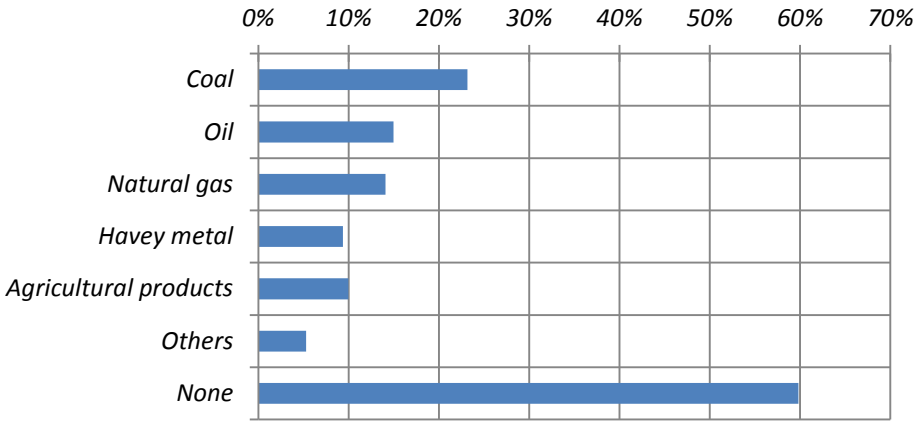


Figure 37: Participated or intending to participate in the commodity trading

- What are the maximum number of carbon assets you or your unit has held or developed?

Only about 1/4 of the respondents or their units have carbon assets management experience of more than 1 million tons of carbon assets.

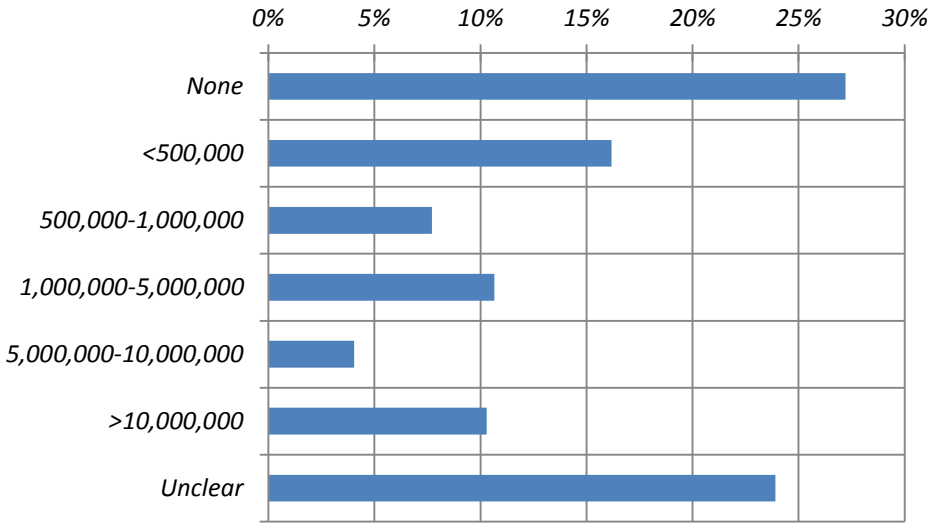


Figure 38: The maximum number of carbon assets held or developed

- What is the revenue scale of your unit in carbon business?

Less than half of the respondents' units makes profit in carbon business.

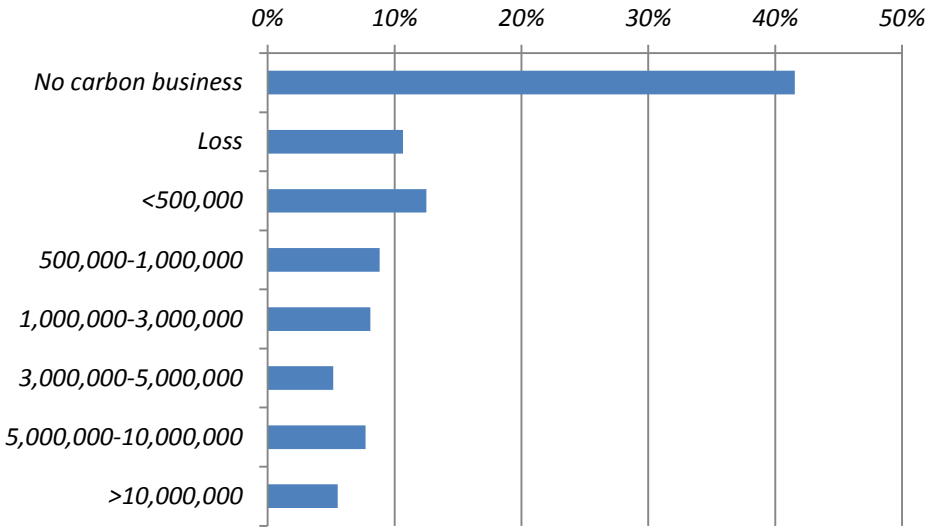


Figure 39: The revenue scale in carbon business

- What is the staff size of your unit?

About 45% of the respondents' units are below 50.

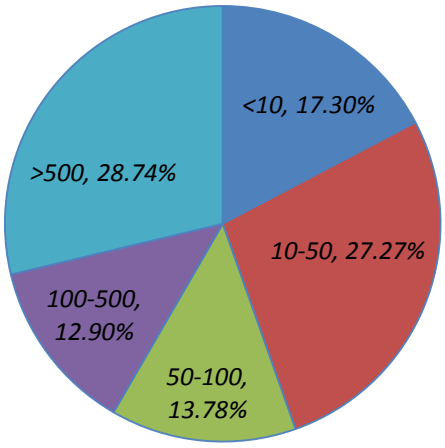


Figure 40: Unit staff size

- Do your carbon managers understand carbon trading policies of pilots and national levels?

The carbon managers in more than 40% of the respondents units are not aware of the carbon trading policies.

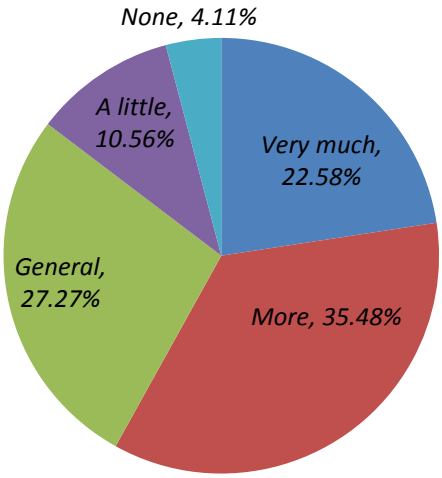


Figure 41: Understanding carbon trading policies of pilots and national levels

- What are the training courses in your unit for carbon managers?

The training in surveyed institutions focused on carbon trading policies and regulations (73.31%) and carbon trading principles (59.53%), and only less than 1/4 of the institutions have training about the trading operation or using software tools training.

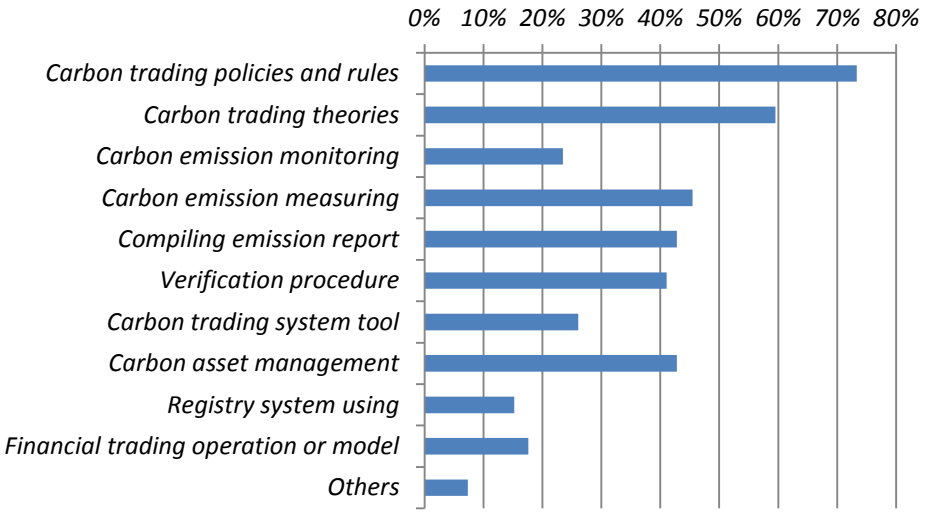


Figure 42: Training course for carbon managers

- If professional institutions hold staff training, which of the following content do you want to have?

The respondents would most like to have the training on carbon trading financial operations (67.45%) and carbon asset investment and financing operations (67.45%).

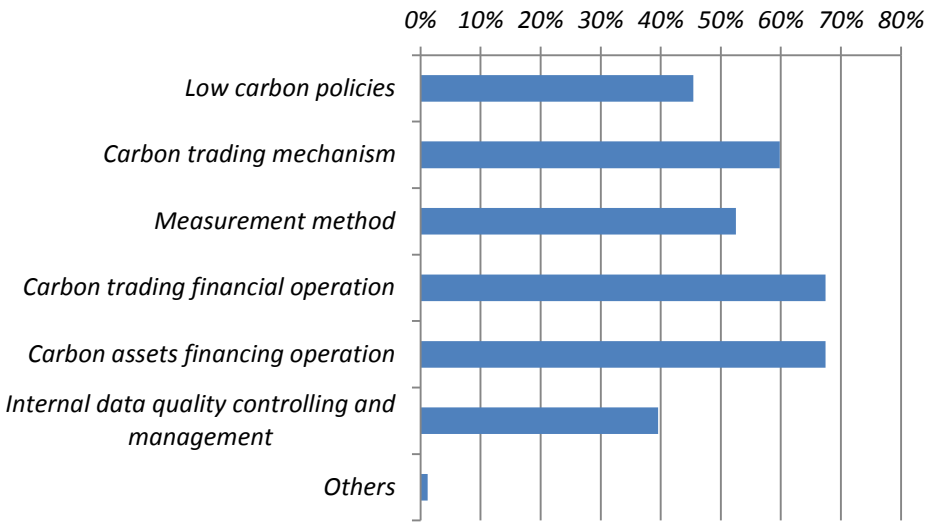


Figure 43: Training courses for staff

- What accounting treatments of expenses associated with carbon trading does your unit use?

More than half of the respondents do not know how to deal with expenses associated with carbon trading.

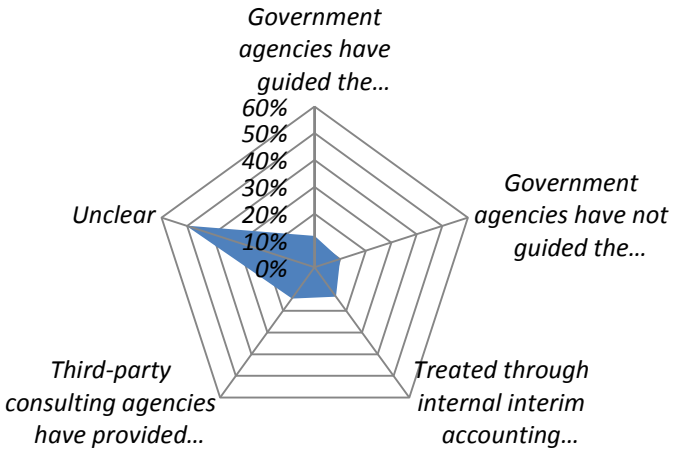


Figure 44: Accounting treatments of expenses associated with carbon trading

4.4 Carbon - financing

- Which carbon financial innovation products business do you want to utilize?

The surveyed respondents who want to engage in carbon funds, are the best represented, accounting for 63.89%, followed by carbon asset assessment (52.78%) and carbon asset custody (51.39%).

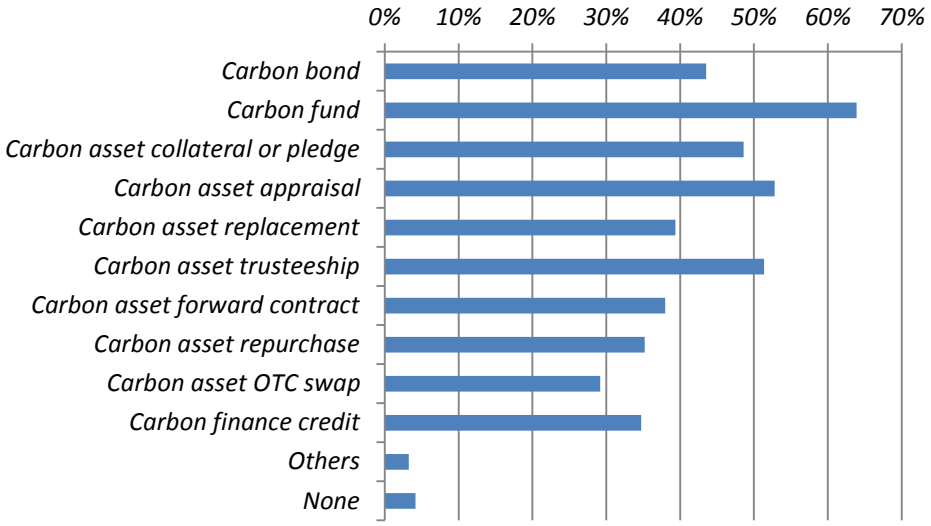


Figure 45: Carbon financial innovation products business

- Which carbon financial innovation products business do you want to have access to?

Most of the respondents want to engage with the following three carbon financial innovation products business: carbon assets pledge or mortgage (59.2%), carbon asset assessment (56.8%), carbon fund (51.2%)

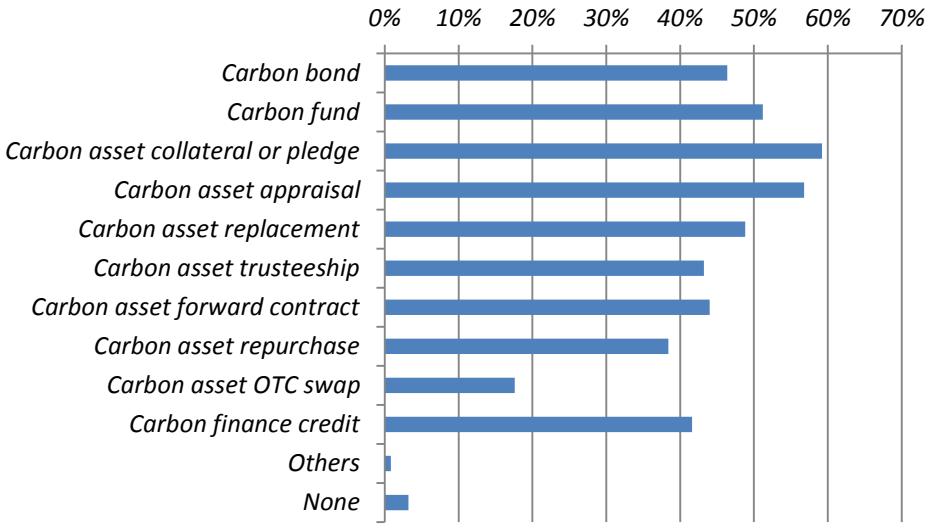


Figure 46: Carbon financial innovation products business to get in touch with

- Which existing domestic carbon financial products do you appraise?
- The respondents appraise domestic carbon fund (46.32%) and carbon asset mortgage or pledge (45.22%) products relatively.

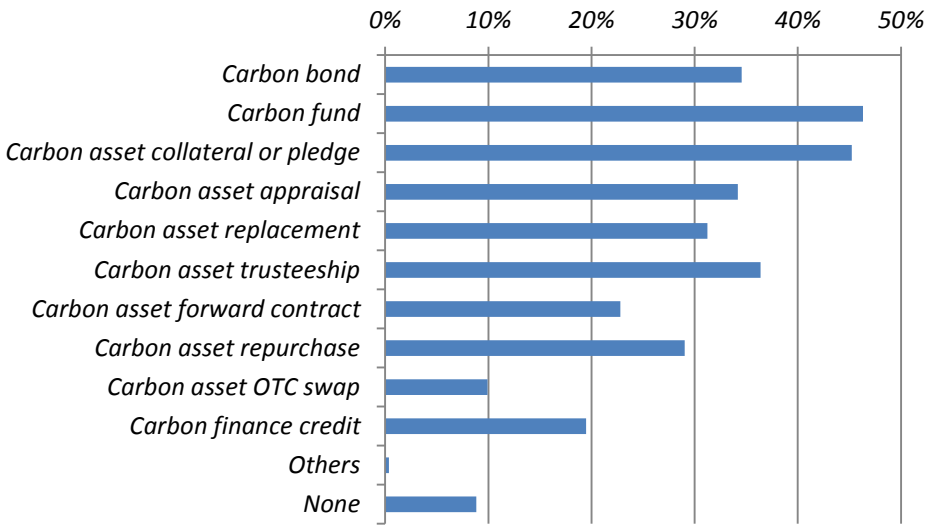


Figure 47: Appraised domestic existing carbon financial products

- Which new product do you expect in secondary carbon market?

Respondents expect CCER/allowances futures or options products in secondary carbon market, accounting for 84.56%.

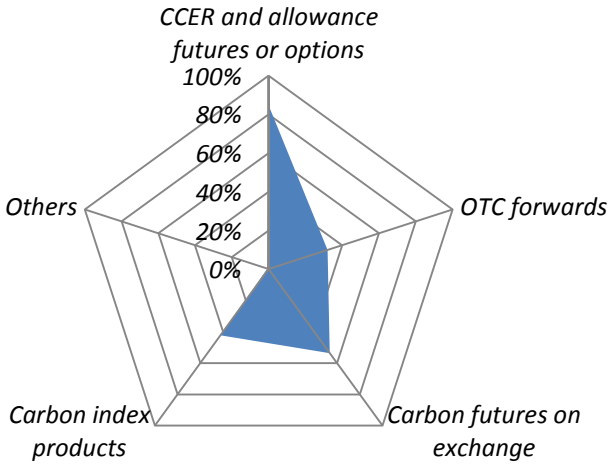


Figure 48: New products in secondary carbon market

- What barriers do financial institutions face to enter the carbon trading market?

Investigators believe that the barriers for financial institutions to enter the carbon market are unclear policies and regulations (72.22%), low liquidity (72.22%).

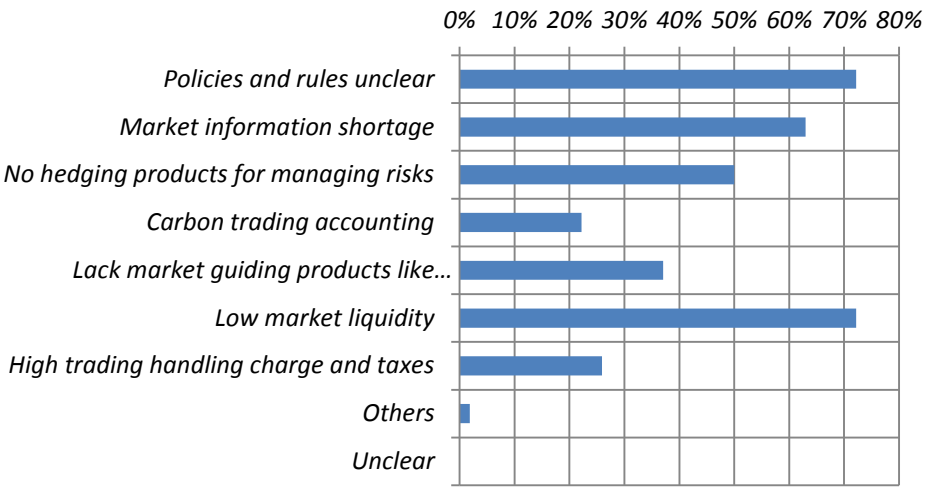


Figure 49: Barriers financial institutions face to enter the carbon trading market

- Do carbon managers have experience in carbon trading or other environmental finance? (e.g., more than one carbon asset manager, with the highest level of experience)

Less than a year experience in carbon management or environmental finance of the investigators' units accounted for nearly 45%.

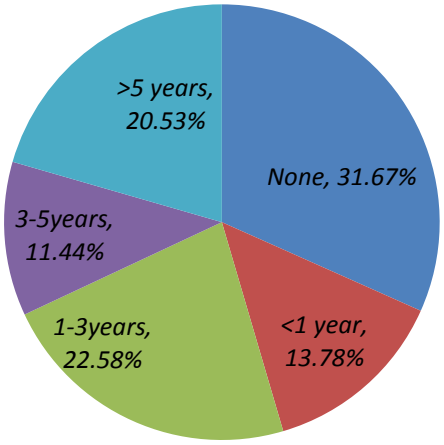


Figure 50: Experience in carbon trading or other environmental finance

4.5 Carbon - management

- Do you think it is helpful for the development of enterprises to be familiar with the strategy of climate change?

63.34% of respondents believe that familiarity with the strategy of climate change is of great help to the development of enterprises.

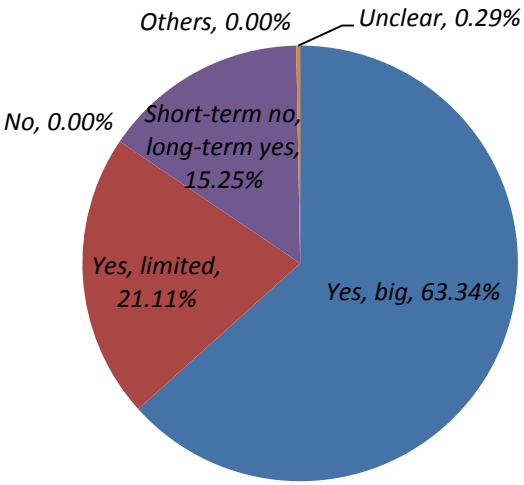


Figure 51: Familiarity with the strategy of climate change and the development of enterprises.

- What is the feasibility of overall compliance after the national carbon market is built, of allowances transfer between the branches of your business?

The investigators believe that the most likely scenario is that allowances internal transfer and overall compliance is implemented only if the subsidiaries/branches are under the same transaction platform.

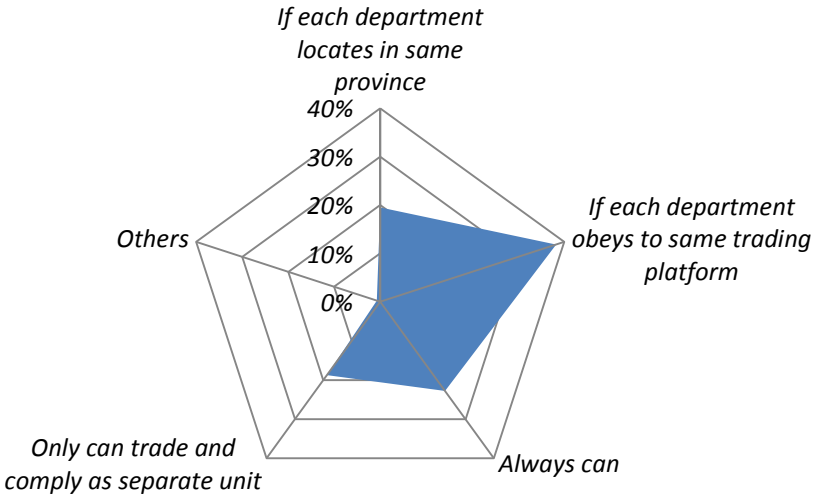


Figure 52: Allowances internal transfer and overall compliance between the branches

- Does the carbon market need a tool to predict the allowances held by enterprises?

86% of respondents believe that the carbon market needs a tool which can automatically predict the allowances situation held by enterprises

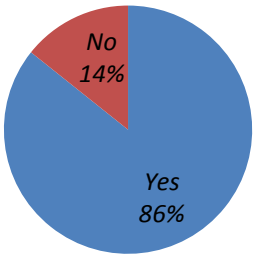


Figure 53: Need a tool to predict the allowannces situation held by enterprises

- Does the carbon market need a tool that can lock down future carbon allowances, prices and quantities?

89% of respondents believe that the carbon market needs a tool that can lock down future carbon allowances prices and quantities.

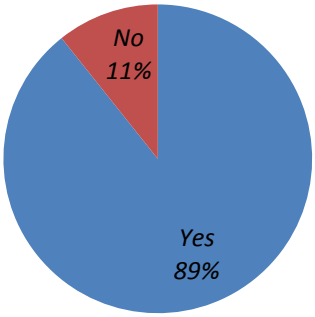


Figure 54: Need a tool that can lock down future carbon allowances prices and quantities.

- Do you consider you would use information technology tools to manage your own enterprise's carbon emissions?

Nearly 70% of respondents will not use information technology tools to manage carbon emissions of the enterprises.

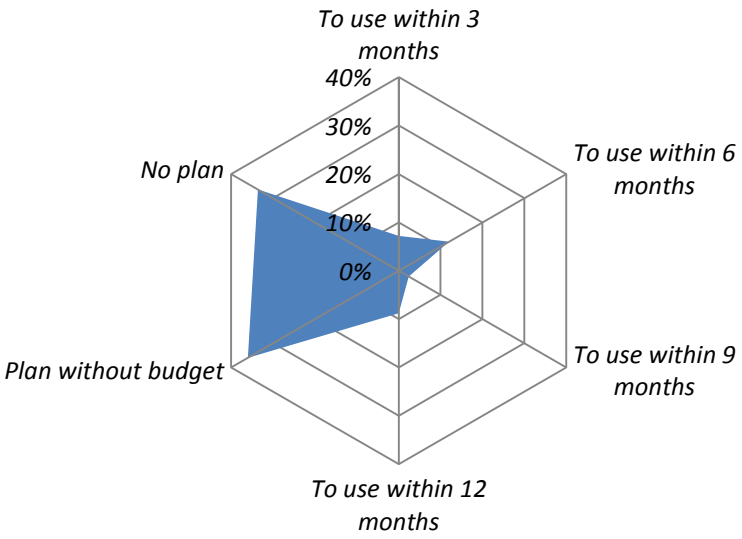


Figure 55: Using information technology tools to manage carbon emissions of the enterprises

- In your mind, are you more willing to use energy consumption and carbon emissions management system with certain features?

Researchers think carbon accounting function should be the primary function of carbon management system, and that the supporting carbon emissions report generation and technical and economic sources of carbon emissions reduction analysis is more icing on the cake.

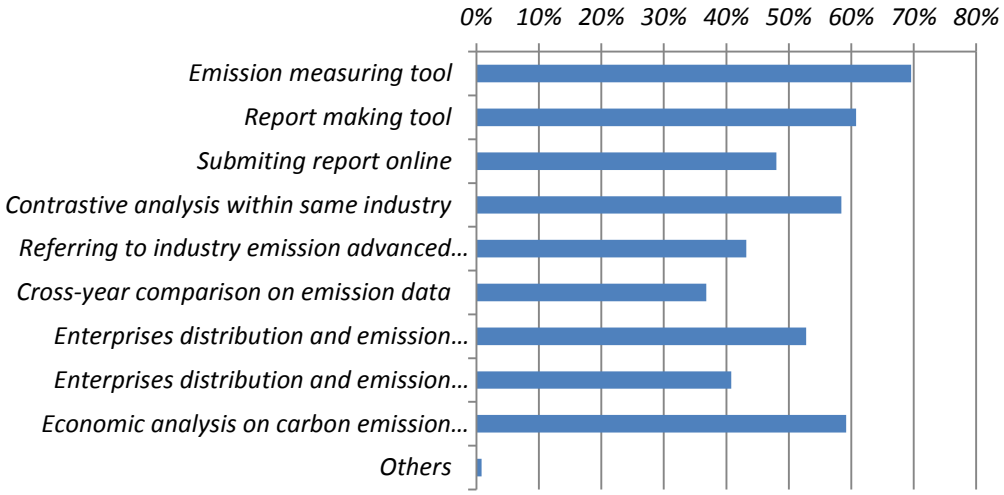


Figure 56: Features of energy consumption and carbon emissions management system

- What frequency for the carbon and energy management systems do you think is appropriate?

Researchers believe that artificial operation frequency should be weekly or monthly.

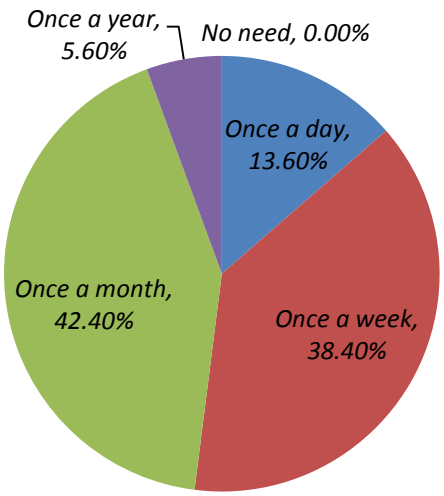


Figure 57: Artificial operation frequency of the energy consumption and carbon emissions management system

- Do you you want to fill in the activities data in detail or roughly, if data is not required to be mandatorily released?

Less than 4.59% of the respondents want to fill in the data roughly.

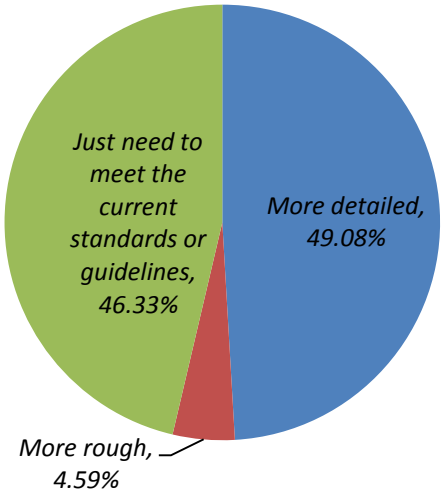


Figure 58: Filling in the activity data in detail or roughly

- What do you think the most economical cycle of energy consumption and carbon emissions management?

The investigators believe that the most economical cycle of energy consumption and carbon management is once a month (61.11%), followed by once a year (26.54%).

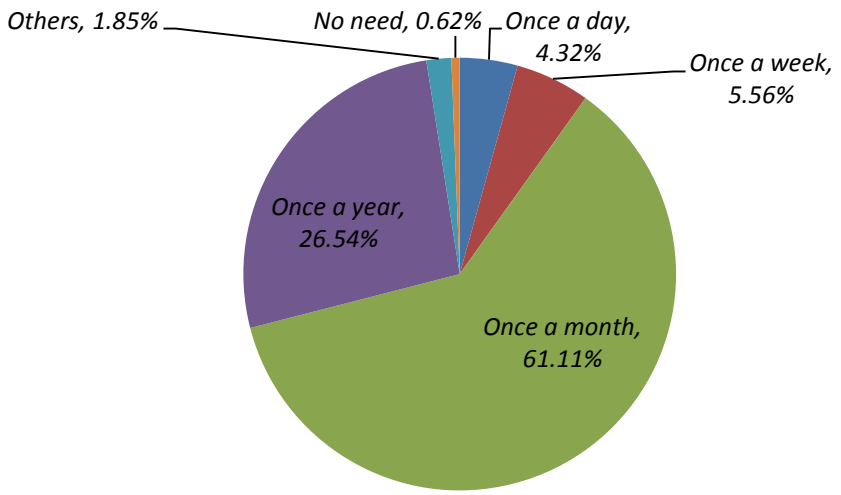


Figure 59: Cycle of energy consumption and carbon emissions management

- Do you consider adopting carbon emissions management systems to assist or supplement your current business?

Nearly 40% of the respondents expect to use carbon management systems to assist or supplement the current carbon business in the future.

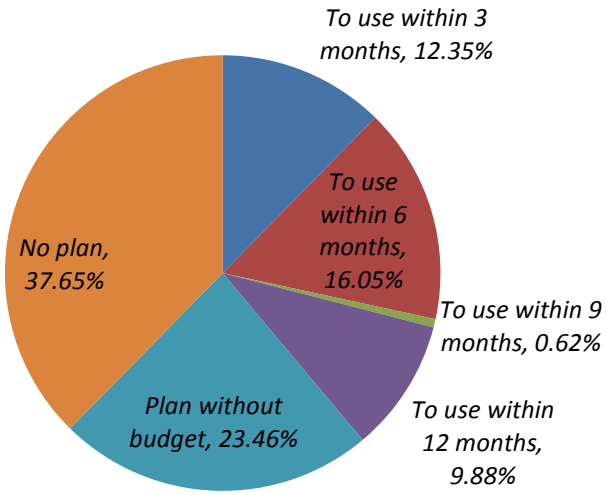


Figure 60: Adopting carbon emissions management systems to assist or supplement current business

- In your view, what is an appropriate cost for verification? (￥/enterprise/year)

39.72% investigators believe that ￥20000~50000/enterprise/year as verification expenses is appropriate, 23.69% believe that ￥10000~20000 /enterprise/year is appropriate.

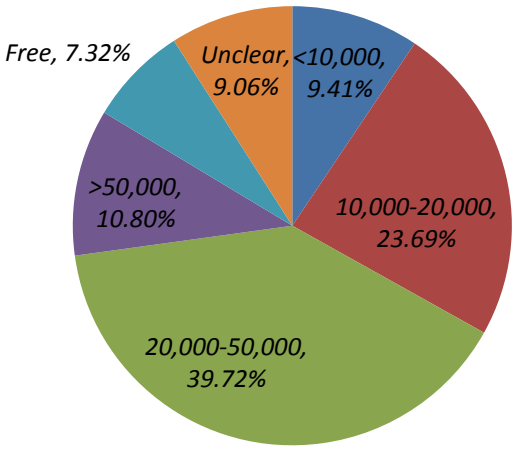


Figure 61: Approapriate verification expenses

4.6 Carbon - outlook

- With the start of the national ETS in 2017, what is the likely carbon market position in the future?

The investigators believe that after the start of the carbon market in 2017， what's likely is the development of the financial market to attract more investors (70.67%), followed by the coexistence of carbon tax and carbon carbon market after the carbon price is found through the carbon market (59.53%).

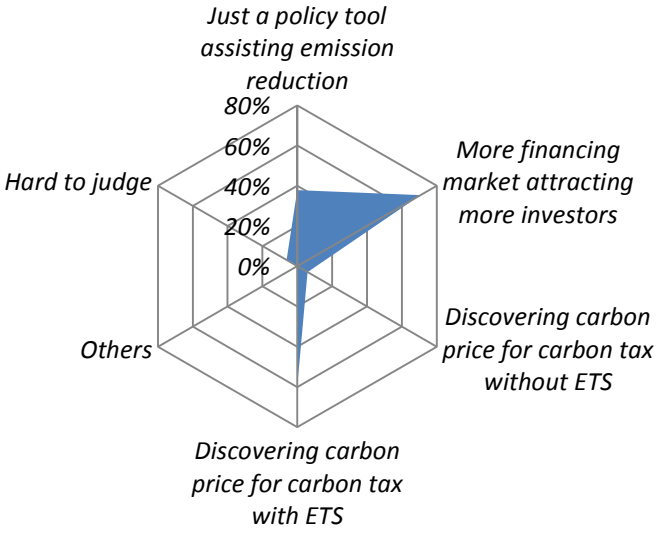


Figure 62: The likely carbon market position

- Which of the following scenarios are most likely in 2017-2020 during the transition from pilot to national market?

52.79% of the respondents believe that the most likely scenario from 2017 to 2020 is that a unified

national carbon market will cover all provinces, but some areas will continue to be excluded in the scope of the national ETS. Another 33.43% of respondents believe that a unified national carbon market will cover all provinces once the pilots are abolished.

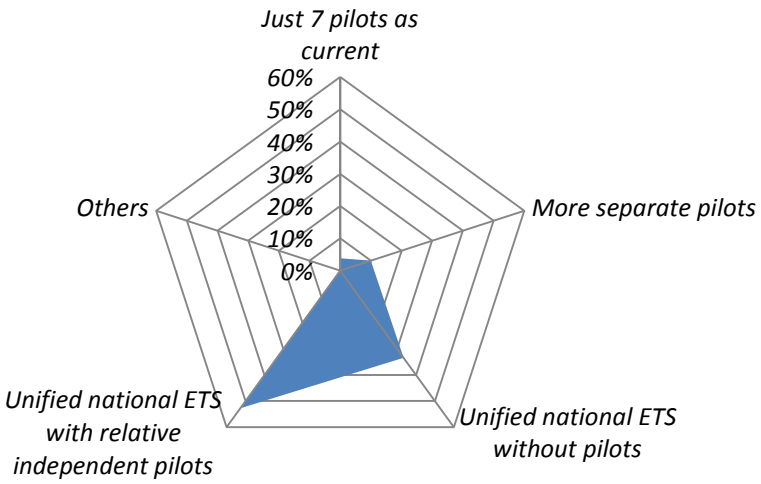


Figure 63: Scenarios during pilot transition to national market

- What are the possible relationships between enterprises and the trading platforms after completion of the national carbon market?

51.03% of respondents believe that in national ETS from 2017 to 2020, enterprises in all provinces can choose freely trading platform for transactions, but compliance can only be carried out on the designated platform.

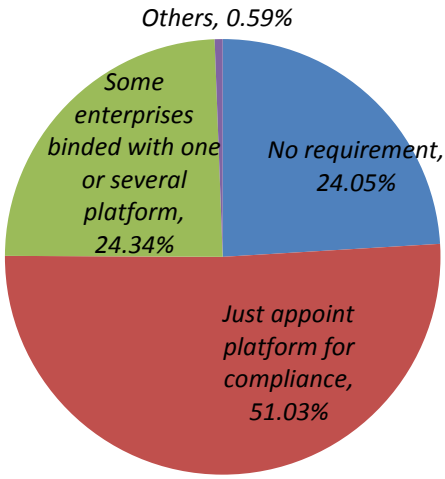


Figure 64: Possible relationship between enterprises with the trading platform

- What are the possible relationships between enterprises and verification institutions during 2017-2020, after the completion of national carbon market?

55% of respondents believe that in the national ETS from 2017 to 2020, enterprises in all

provinces will be able to freely choose a verification organization from anywhere within the country.

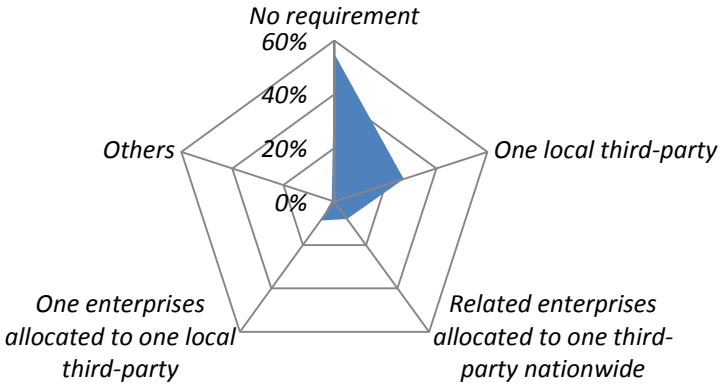


Figure 65: Possible relationship between enterpreises and verification institutions

- What will be the relationship between local direct reporting systems and national direct reporting systems during 2017-2020, after the implementation of the national carbon market?

45% of respondents believe that in national ETS from 2017 to 2020, all provinces adopt national systems uniformly. Another 41% of respondents believe that each province can have their own direct reporting system, just docked with the national system port.

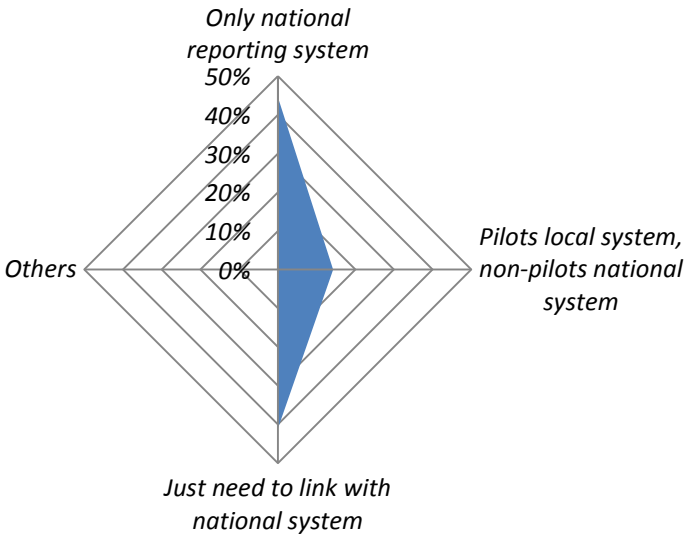


Figure 66: Possible relationship between local direct reporting systems and national direct reporting system

- When will the road transportation industry be covered by the national ETS?

46% of respondents believe that road transport industry is likely to be covered by national ETS between 2021 and 2025, and 33.33% believe between 2017 and 2020.

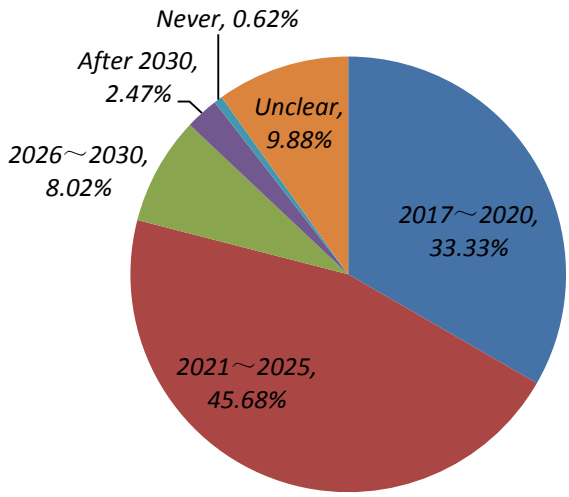


Figure 67: Road transport industry covered by national ETS

- When may the new energy vehicle carbon credit system connect with the national ETS?

41% of respondents believe that new energy automobiles carbon points trading system may be connected with national ETS between 2021 and 2025, 37% of respondents believe that it will be between 2017 and 2020.

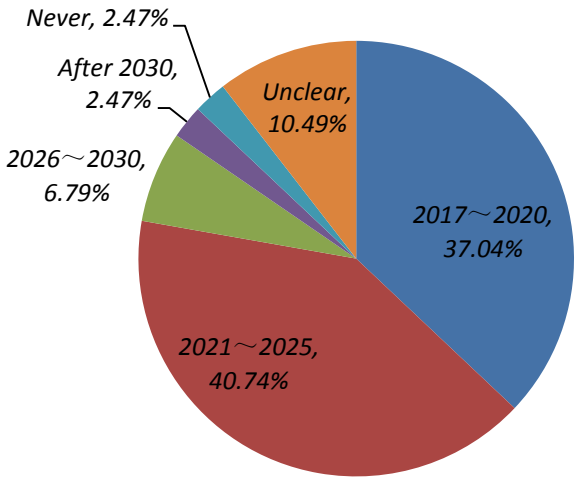


Figure 68: New energy automobiles carbon points trading system connectting with national ETS

- When may the building industry be covered by national ETS?

44.44% of respondents believe that the building industry may be covered by the national ETS between 2021 and 2025, and 35.8% of respondents believe that it will happen between 2017 and 2020.

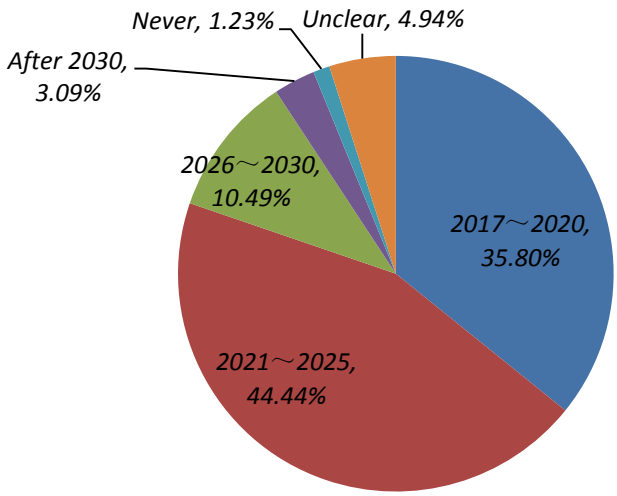


Figure 69: Building industry covered by national ETS

- Do you expect China's ETS to be repealed in the future?

43.7% of respondents believe that China's ETS will not be canceled, while 18.18% of respondents believe that it will be canceled after 2035.

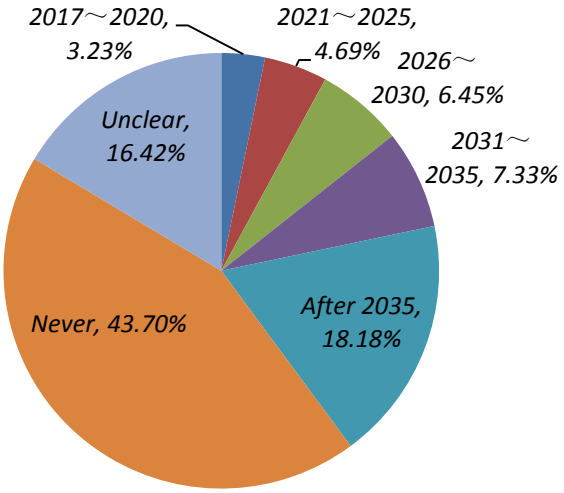


Figure 70: China's ETS to be canceled in the future

- When might non-CO_2 industrial and energy GHG emissions (there are 6 kinds of greenhouse gases, including CO_2) be covered by national ETS?

43.21% of respondents believe that non-CO_2 GHG may be covered by national ETS between 2021 and 2025.

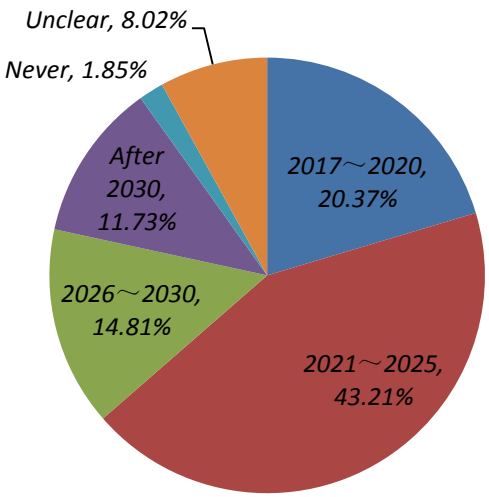


Figure 71: Non-CO_2 industrial and energy GHG emissions covered by national ETS

- For the third-party verification process in the national ETS, which party do you expect the verification institution should be?

For the verification expenses of the third party, about half each of respondents believed that either the government or enterprises should take it on, though 3% more think it should be the government's responsibility.

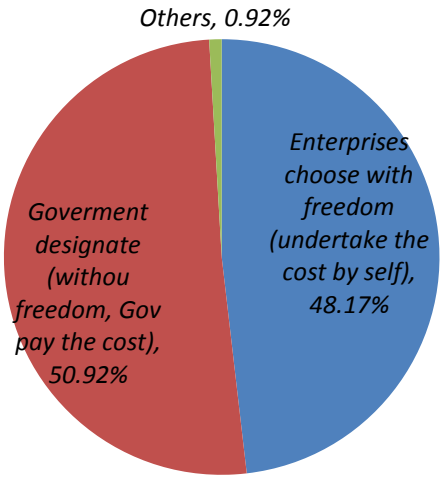


Figure 72: Relationship between verification institutions and enterprises

5 Carbon finance innovation

During the process of tackling global climate change and environment problems, as well as the transition from a high-carbon economy to a low-carbon one, the important issue of environmental finance and carbon finance have received extensive attention. (Liu Liwei, 2013) Carbon finance refers to the various finance arrangements and financial trading activities formulated or adopted to facilitate reducing GHG emissions, which includes carbon emissions quota trading and financial derivatives trading related to carbon emissions, as well as direct investment and financing of activities for GHG emission reduction and financial intermediary services provided by enterprises or institutions to reduce GHG emissions.

This chapter focuses on carbon asset management, starting with each element of carbon finance throughout the industry chain, introducing the segments of carbon finance, what can be done through the carbon industry chain, the definition of each segment, what can be provided to each participant, etc. Carbon trading services will be introduced respectively from the primary market and secondary market. In China's carbon market in the future, the primary allowance market will gradually transition from being dominated by free allocation, with supplementary auctioning, to being dominated by auctioning, with supplementary free allocation. Meanwhile, the secondary market will gradually transition from the current spot-trade dominated market to a more thorough carbon finance market.

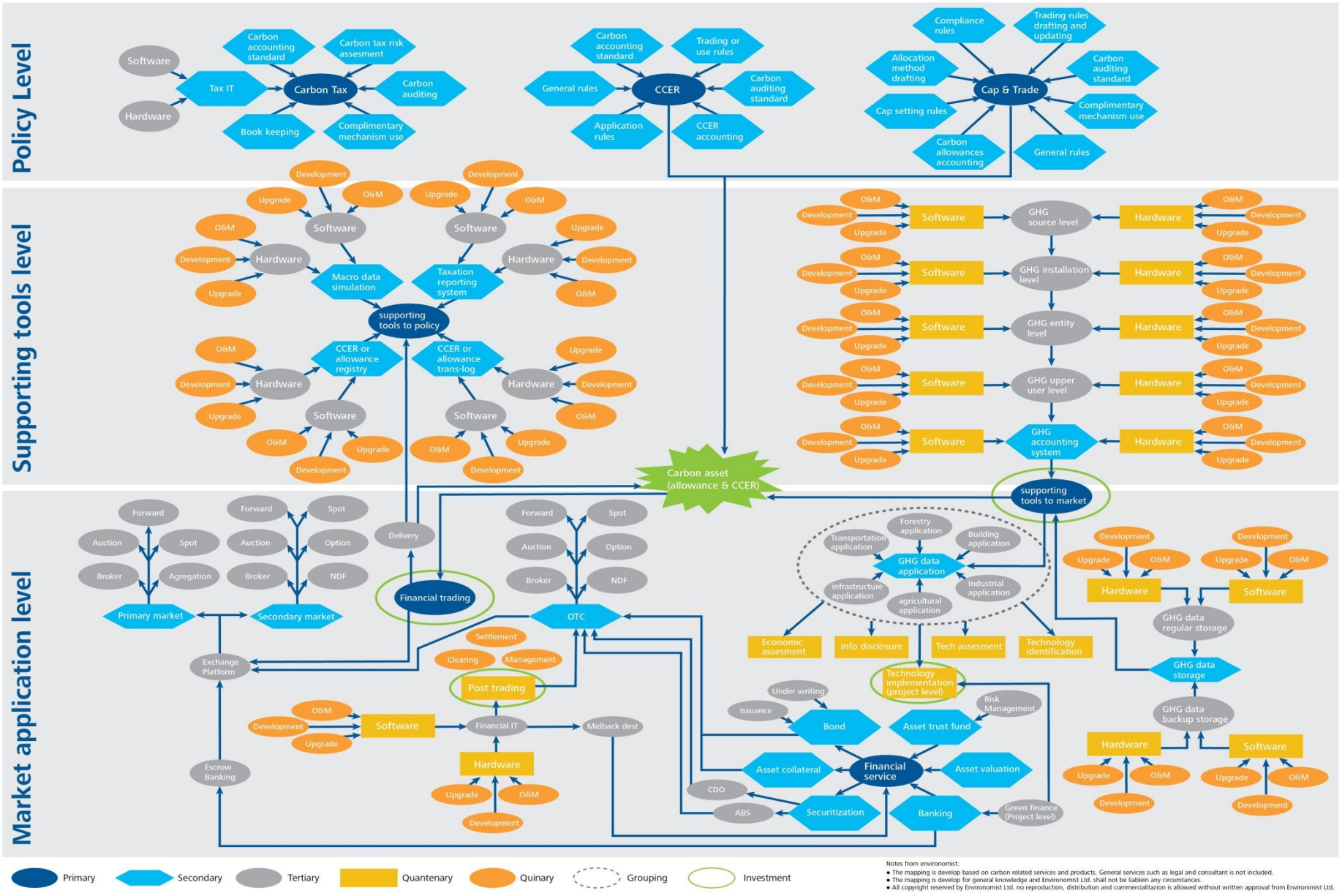


Figure 73: Carbon value chain mapping

5.1 Carbon finance services

Carbon finance services relate directly to carbon asset management (including carbon allowances and CCERs) and technological application on the project level of energy saving and emission reduction. He Jiankun said that, according to rough estimates, the demand for capital in new energy investment by 2030 will be more than 10 trillion Yuan. (Observer net, 2015) If coupled with energy conservation, forest carbon sinks and other measures, the total demand for funds could be about 40 trillion. It's clear to see that capital involved in carbon financial services is huge, so quality carbon finance services will directly influence the realization of China's emission reduction plan for 2030.

Commentary 6: Turning carbon into gold – Shanghai Pudong Development Bank financial innovation products and services

Guest commentator：Shanghai Pudong Development Bank head office

2016 is the critical year before establishment of a unified national ETS, the starting year of the green "13th Five-Year" and ecological civilization building and green development is specially emphasized: green finance as an important issue was written into the G20 communique; following China's ratification of the Paris climate change agreement, the relevant departments have introduced a series of innovative regulations and policies, guiding financial institutions to serve green industries.

Shanghai Pudong Development Bank (SPDB), as the first domestic commercial bank to release a corporate social responsibility report, has been concerned in actively developing its green finance business and issuing a comprehensive green credit service plan since 2008. After years of innovation and practice, such green financial services as "energy efficiency financing", "clean energy financing", "environmental finance", "carbon finance" and "green equipment supply chain financing", as well as ten major green products, including "AFD intermediate credit", "ADB building energy conservation", "energy management contract financing", "green debt financing instruments" and so on, have covered both the upstream and downstream of the low-carbon industry. It is the only Chinese bank to have substantive cooperation in the green finance field with the World Bank, the Asian Development Bank, the French Development Agency, and the International Financial Corporation (IFC) in the domestic financial industry. In the past, by highlighting the "green credit" guidance from government, establishing a professional team, and actively innovating, SPDB has achieved a number of industry firsts and implemented many innovative products. SPDB issued the first green financial bond, worth 50 billion, in 2016, and won the award for best carbon financial innovation at the first green carbon summit.

As early as 2008, SPDB paid attention to international carbon market development, accumulated leadership and brand influence in the carbon finance field, with parallel planning and practice. SPDB successfully launched the first CDM financial advisory business, CDM accounts receivable pledge financing business, international carbon factoring financing, provided project development, transaction, follow-up management and other one-stop financial services for domestic owners of energy saving and emission reduction projects,

maximizing the value of carbon assets.

Synchronized with the preparation for domestic carbon trading pilots and the national ETS, in 2013 SPDB and the pilot exchanges established comprehensive strategic cooperation, reinforced carbon market infrastructure and set up the third party custody account for hundreds of central enterprises, state-owned enterprises, listed companies and all kinds of private enterprises as well as individual customers, landed the country's first single NRA account carbon trading settlement business in Guangzhou, loading group cooperation, cash management, investment banking, trading finance, etc. based on meeting customer transaction funds settlement.

Regulated enterprises can complete compliance in three ways: the first is to increase investment in energy saving and emission reduction, reducing their emissions; the second is purchase of surplus allowances from other enterprises; the last is purchase of CCERs to offset actual emissions. From the perspective of banking financial institutions, SPDB believes that the core value of carbon trading is giving allowances asset attributes, which performs price discovery function through market transactions, optimizing the allocation of resources, minimizing enterprise abatement costs, guiding carbon emissions of enterprises into the overall cost accounting, helping industry structure adjustment and energy consumption structure reform, minimizing enterprise cost of emission reduction. Therefore, carbon trading is not an additional burden to enterprises, and should not be restricted to the regulated companies, but rather combine low-carbon and sustainable development with more traditional financial instruments applied in the carbon market, filling on the gap between carbon asset management and financing. This will help to effectively meet the needs of regulated enterprises, new energy enterprises, carbon asset management companies and professional investors to participate in managing and revitalizing the carbon assets, diversifying financing and hedging market risk. SPDB takes this on as a significant responsibility.

In 2014, SPDB successfully issued the first single medium-term notes with additional carbon gain ("carbon bonds") in the interbank market, the first domestic direct financing products linking bond yields with carbon price in the pilot carbon market, dispersing carbon gains risk for issuers through the capital market, and achieving immediate future realization of carbon trading gains, implementing the dual purpose of promoting development of domestic carbon trading market and cross market bonds innovative.

In the same year, through in-depth study on relevant laws and regulations of carbon emissions and in cooperation with the China Emissions Exchange in Guangzhou, SPDB landed the country's first single carbon mortgage financing in Guangdong, filling the gap in domestic of financial institutions' supporting carbon asset management financing through standardized management of carbon assets, and finally achieved a profit from the carbon market.

In 2015, SPDB completed the first domestic CCER financing business in Shanghai after the national carbon trading registry system was launched, completing transfer of ownership, confirming the quota and pledge process in CCER trading. Considering CCER market liquidity, legal compliance and operational convenience, based on enterprises' demands on fractional drawing, circular credit the business is designed with a dynamic pricing scheme, enabling enterprises to enjoy collateral pricing more close to the market value.

In 2016, SPDB became the first centrally-approved agent bank for settlement of Shanghai carbon allowance forwards, and participated in scheme design, development and business

promotion with Shanghai Clearing House and the Shanghai Environment and Energy Exchange, testing provisions for risk hedging and investment tool innovation for carbon trading enterprises. At the same time, SPDB has also established lists of enterprises with scarce allowances, institutional investors and the third party cooperation agencies, focusing on characteristics of green assets, vigorously tapping into carbon trading financial advisers and supporting financing opportunities, carrying out carbon fund, carbon asset management planning, carbon repo financing and other asset securitization innovation through establishment of institutional cooperation platforms. At present, these innovative businesses have formed a preliminary business model or specified intention party of the first business.

2017 is the countdown to the national ETS. According to forecasts, the future of China's carbon market trading volume will be between 3 billion and 40 million t/y, involving an amount of 1.2-8 billion￥, and if carbon futures trading is involved, the national carbon market will be as high as 400 billion￥, becoming the third commodity trading market in China after the securities trading and treasury bonds. Therefore, in general, although the domestic carbon market has such problems as uncertain policies, relatively homogenous investors and products, secondary market trading activity and trading volume to be further enhanced, from the strategic level SPDB has great confidence of the positive impact of future market of carbon on emission reduction and even attracting capital. It will be the cutting-edge of business exploration, based on the carbon market development stage, effectively promoting prosperous carbon financial products and projects, meeting the demands of customers in the carbon finance industry chain, creating "carbon bank financial services" with low carbon investment and financing, trading agents, advisory and asset management.

5.1.1 Carbon bond underwriting

Carbon bonds refer to debt obligations, issued by the government and enterprises to raise funds for low carbon economy projects from investors, to whom they give a commitment to pay interest and principal repayments in a certain period of time. (Jiansheng, 2009) Carbon bonds are an important branch of carbon finance, whose essence is a bond that, according to the main issuing body, can be classified as either national carbon bonds or corporate carbon bonds.

The core feature of carbon bonds is bond interest rates linked with the CCER revenue from low carbon projects. Distinctive characteristics include their focus on investing in renewable energy, they can include fixed rate and floating interest rate products, CCER income for a certain proportion of floating interest payments, the realization of CCER revenue sharing by the project investors and bond investors. With the inclusion of carbon bonds in the CCER trading market, including a new virtual trading market will have an expansionary effect. Their large-scale release will ultimately help promote the entire financial system and capital market to transform in a low carbon direction.

The main functions of carbon bonds include: meeting the investment and financing demand of both sides; helping the government promote a demand-oriented, low carbon economy; meeting the demand of project investors to make up for the lower rate of return than the average level of the traditional market; meeting the demand of bond buyers who take the

initiative to accept responsibility for tackling global environmental change.

Table 19: Existing carbon bonds products

Issuing place	Shenzhen	Hubei
Date of signature	8/5/2014	26/11/2014
Signatories	Shanghai Pudong Development Bank, China Development Bank, China Guangdong Nuclear Power Group (CGNPC) wind power, CGNPC finance and the CEEX	Huadian Hubei Power Generation Co. Ltd. and the Wuhan branch of China Minsheng Bank
Product name	China Guangdong Nuclear Power Corporation (CGN) wind power medium-term notes added carbon earnings	Carbon bond intention cooperation agreement
Monetary value of business	One billion Yuan	Two billion Yuan
Business term	Five years	N/A
Investment objective	The bond will be used to install 49500 kilowatts of capacity in Shangdu, Inner Mongolia, a project in Jimunai, Xinjiang, salt water wells project and in the second phase to install 35700 kilowatts of wind farms in Taishan, Guangdong (Wen Cun).	N/A
Expected yield	The bond interest rate has two parts – a fixed rate and floating rate, of which the floating rate has a positive correlation of carbon (CCER) trading gains of the 5 traditional power projects under issue implemented in the duration of the bond, and floating interest rate interval is set to 5bp (BPS) to 20bp. Issuing interest rate is 5.65%.	N/A
Remarks	The first single carbon bonds in China issued in the CEEX.	These are the first carbon bonds issued in Hubei; is currently the country's largest contract scale carbon bonds.

Source: Environomist China carbon market database

Commentary 7: Combination of carbon finance and non-standard business

Guest commentator: Mr. Min Fang，Deputy general manager of Jiangsu Zhuozhengyingtai Equity Investment Fund Management Ltd.

Carbon finance, a very popular word in recent years, involves public interest in environmental protection and finance. Carbon trading in Europe brought substantial revenues for a number of CDM projects in China, and this also made carbon trading and carbon financial institutions objectives for further research.

Non-standard business is also a hot term in domestic financial fields in recent years, bank financing, non-standard investment, beneficial right transaction and other terms frequently appeared in various types of public WeChat. Non-standard creditor's right assets refers to creditor assets without trading in the inter-bank market and stock market, including but not limited to credit assets, trust loans, entrusted loans, acceptances, letters of credit, accounts receivable, various subject (received) benefit rights, back to the stock right financing enough terms etc. Non-standard is essentially an investment path for banks in order to avoid capital investment and regulation.

Through the analysis of market capacity, capital investment and other issues, I think there is still a lack of a bonding between non-standard business and carbon finance.

As of the first half of 2016, the balance of non-standard assets is more than 10 trillion￥, increasing by 10% from the end of 2015, accounting for about 6% of M2. Market capacity of carbon finance can be roughly calculated as follows: it is expected that in the future the threshold of the national carbon market is the annual consumption of more than ten thousand tons of standard coal, and annual allowances is about 6 billion tons. At present, average turnover rate of the seven pilots is 1%-5%. If only spot trading is involved, and the trading price is ￥20-30/t, the turnover is expected to reach 1 .2-9 billion RMB; if futures trading is also involved, the transaction activity will rise and the trading value will reach 60 billion to 400 billion RMB. In view of market capacity of the two industries, the current market of carbon finance is too small, far from supporting the huge capital capacity of non-standard market.

From the non-standard asset investment field, local financing platforms and the real estate industry are the two largest industries, and most non-standard products rarely invest in the real economy, which is determined by the properties of non-standard products avoiding regulation. Because of the high degree of professionalism in the carbon market, there are no cases of non-standard assets involved.

But at the same time, with the establishment of national unified carbon market in 2017, there will be a substantial increase in market capacity and market participants and more players in the game will bring fresh ideas for the market. On the capital side, public financing as the main capital source of non-standard business also needs new sense of social responsibility, investor's acceptance of products with environmental protection, energy efficiency will gradually increase. The story between real estate and the platform is more difficult to interpret in the current deleveraging background.

As practitioners in the non-standard, asset management industry, we will remain involved in the carbon market, to find more project sources for own business, and as well to carry out the action in the domestic field of energy saving and emission reduction.

Mr. Min Fang, deputy general manager of Zhuozheng Fund, interested in environmental protection, clean energy and energy efficiency management. About 20 years' experience in commercial banks. Before joining Zhuozheng Fund, Mr. Fang has worked in the Business department in the head office of Jiangsu Bank, participating in forming the department of green finance and PPP. Previously worked in the China Construction Bank. Mr. Fang also an expert in the banking services of multilateral international financial institutions energy efficiency projects

Zhuozheng fund founded in 2015, is a fund management institution with an experienced core team, mainly focusing on four industry sectors including urban construction, real estate development, capital markets, and green development. The fund relies on professional ability and is committed to integrate quality resources for investors to achieve capital preservation and appreciation, and ultimately realize the value for each participant of win-win. Zhuozheng Fund currently manages a total of four urban and industrial development funds and one acquisition funds, with a value of more than 8 billion RMB.

Business types

- As partner of a number of financial institutions, the fund is dedicated to the management capital for the development of the city. Urban development funding managed by Zhuozheng mainly invests in urban infrastructure projects. Through Zhuonzheng's close ties with the government, strict risk control measures, financial security can be guaranteed with higher returns.
- For financing and acquisition demands of large and medium-sized enterprises, adopting trust, asset management, limited partnership and other financial tools for customer equity acquisitions, project development and asset securitization provide creditor's rights, equity and debt stocks combined with other financing services.
- Participating in the capital market operation to seek higher returns for investors on the basis of sound investment. Currently, Zhuozheng has covered the acquisition of listed companies, Pre-IPO equity investments, exchangeable bonds and other segments of the issue, to get a huge return for investors.
- Participating in green finance projects to provide funding and project integration in clean energy, energy efficiency, environmental protection and other areas to provide financing services for energy conservation and emission reduction projects.

5.1.2 Carbon investment adviser

Carbon investment adviser refers to professionals or agencies engaged in providing paid advice for carbon asset investment management. (MBAlib, 2015) Carbon investment

advisers, in the process of providing services to customers, need to provide adequate expertise and meet their customers' needs. A good carbon investment adviser should be familiar with carbon finance products, and fully grasp the application of relevant laws and regulations. Only with considerable expertise, keen insight, and continuously updating their knowledge, can carbon investment advisers provide valuable information for customers. Excellent carbon investment advice should use strong data and the supporting policy platform, to ensure that the formulated plan avoids potential risk for customers.

5.1.3 Carbon funds or structured product sales

Carbon funds invest in climate change-related projects and activities, aiming to promote the development of a low carbon economy. (Chengcheng, 2015) In the narrowest sense, carbon fund investment is a way for investors to obtain carbon credits or cash earnings through voluntary carbon emission reduction projects or equity investment. Essentially these are individual investors. In the broader sense, carbon fund investment is aimed to promote the development of a low carbon economy along with financial benefits. These investors are mostly international organizations and governments.

The carbon fund is an important tool of investment and financing of the international carbon market, and has played a very important role in the global market over the past ten years for energy-saving and emission-reduction. In China, the development of carbon funds is still in the initial exploration stage. At present, carbon funds have not been given full play to promote the development of a low carbon economy, but that should not impede financial institutions with long-term vision to take advantage of innovative carbon funding.

Table 20: Existing carbon fund products 1

Issuing place	Shenzhen	
Date of signature	11/10/2014	
Signatories	Shenzhen Jiatan asset management Ltd. and CEEX	
Product name	Jiatan KaiYuan investment funds	Jiatan KaiYuan balance funds
Business amount	40 million Yuan	10 million Yuan
Operation period	3 years	10 months
Means of investment	Invest CCER projects in the field of new energy and environmental protection, produce the standardized carbon assets for the transaction. CCER project source mainly divide into two channels-direct purchase and open investment. The project side can pre-empt AAAA level issued CCERs in the primary market, or choice of a large number of high-quality CCER development	Three markets, Shenzhen, Guangdong, Hubei, as investment markets, buy cheap carbon credits and sell at high price, earn price difference.

	projects. The fund's exit and realization takes a 'swap' model, namely the CCERs obtained exchange for corporate carbon emissions allowance, then sell assets, or direct sale or auction CCER, to realize guarantees a minimum income.	
Expected yield	Conservative revenue rate is 28%. In terms of swaps in exchange for allowances sold, according to the allowance price of 50 Yuan/ton, optimistic revenue rate reaching 45%.	Conservative annualized yield of 25.6%, an optimistic estimate of 47.3%.
Subscription starting point	0.5 million	0.2 million
Trading subject	CCER	Allowance
Remarks	China's first private carbon fund was released on the trading floor of the China Emissions Exchange.	Private equity based funds were successful in the pilot trading market, buying low and selling high was profitable.

Source: Environomist China carbon market database

Table 21: Existing carbon fund products 2

Issuing place	Shanghai	Zhejiang
Date of signature	30/12/2014	19/3/2015
Signatories	Haitonneg Information Management Co., Ltd. and Shanghai Bao Carbon New Energy Environmental Protection Technology Co., Ltd. (Shanghai Environmental Energy Exchange)	Shenzhen Zhaoyinguojin Investment Ltd., Beijing Karbon Energy Consulting Co. Ltd.
Product name	Haitonneg Bao Carbon 1 Collection of Asset Management Plan	Zhongjiantou Trust - Yongquan Capital Trust Scheme No. 1 (Zhaojinyingtan)
Business amount	0.2 billion Yuan	Not more than 50 million Yuan, of which the ratio of priority funding and inferior grade funds is 3 (37.5 million): 1 (12.5 million). Priority funding raised from JIC Group; inferior grade funding raised by CMB Sinolink Investment.
Operation period	Null	Not more than 18 months

Means of investment	Haitonneg Baotan fund owned by Haitonneg to issue foreign, Haitonneg new energy and Shanghai Bao carbon as investors and managers, invest in nationwide CCERs.	Establish a limited partnership, to carry out the spread of arbitrage between the allowance and the state certified voluntary emission reductions.
Expected yield	Null	Priority beneficiaries expected basic income 9.5% years, there is a floating income.
Subscription starting point	Null	One million
Trading subject	CCER	CCER and allowance
Remarks	Haitong Baotan fund is the largest CCER carbon fund so far.	Product team: Hangzhou Trust Business, Department Five.

Source: Environomist China carbon market database

Table 22: Existing carbon funds products 3

Issuing place	Hubei	Hubei
Date of Signature	26/11/2014	8/4/2015
Signatories	China Huaneng Group and Lion Asset Management Co	Zhaoyinguojin
Product name	Lion Information Management - the record win No. 1 Carbon Special Asset Management Plan	Zhaojinyingtan No.1 Carbon Emission Investment und
Business amount	30 million Yuan	The first phase funds scale is 50 million Yuan. The second phase, 60 million Yuan, is expected to issue in May this year.
Means of investment	Null	Focus on carbon trading pilots allowance and CCER primary and secondary market, the fund will actively participate in the transactions of the carbon market.
Trading subject	Null	CCER and allowance
Remarks	The country's first carbon fund supported by regulatory authorities issued at CHEEX.	This is the first domestic Carbon Trust Investment fund raised publicly.

Source: Environomist China carbon market database

Commentary 8: Carbon trading: the next frontier of capital

Guest commentator: Ms. ShiYang Shao, founding partner of Goolun Capital

China is to launch unified national carbon trading market in 2017. According to the NDRC plan, a unified national carbon market will cover 2 billion -30 million tons of carbon dioxide emissions and China will replace the EU to become the world's largest carbon market. I can see the next year for China carbon market will be crucial with opportunities and challenges. This time, eager for a fight comes from not just carbon ring buddy, capital is also ready. Eco capital, and Rushan venture capital and other private equity investment fund, has been paying close attention to the carbon market. Is carbon trading the next frontier of capital?

First of all, the capital lies in the direction of policy. The trend of the new round of reform and transformation with clean low-carbon as the mainstream is the fundamental direction of economic development in the future. President Xi Jinping at the G20 summit in Hangzhou stressed jointly building a green and low-carbon global energy governance pattern, promoting global green development cooperation". The United Nations announced the "Paris climate change agreement" came into effect in early November this year, specifying global common hard index addressing climate change, which is the average global temperature pre-industrial levels control at 2 degrees Celsius. China is one of the contracting parties to the agreement, and has promised to reach the absolute emission peak before 2030, most likely picking up the banner of global GHG emissions reduction leader after Trump formally assumes U.S. President. The wind of polices has been blowing, and the greater the blow, the more the more real, capital in pursuit of political correctness will not be indifferent.

Secondly, China's carbon market has become mature. For layman, carbon trading is a new thing, but for insiders, carbon trading in China has started for more than a dozen years. We will divide development of China carbon trading into 3 stages: the first stage is 2002-2012 years, China started carbon trading because of the clean development mechanism (CDM). In this stage China was simply the seller, but the developed countries in Europe, Japan and other developed the first of China's carbon market practitioners with their money and experience; the second stage is 2013-2016 years, the domestic carbon emissions trading pilots. The death of "Kyoto Protocol" in 2012 gave birth to China's establishing own cap and trade system. The policy of "crossing the river by feeling the stone" guides the domestic market begin from 7 pilots and total 7 provinces and municipalities including Shanghai, Beijing, Shenzhen, Guangdong, Tianjin, Hubei and Chongqing started local carbon trading successively. There are both similarities and characteristics of each pilot, which provide useful experience and effective capacity building for national ETS; the third stage of national ETS beginning from 2017, owing to cultivation, accumulation, attempt and brewing of the first two stages, the system and mechanism guarantee for China to launch comprehensively carbon are basically put in place, and can be regarded as a "standard", "standard" model compared to the other spot market with frequent chaos. There is a certain historical evolution and international reference, and relatively mature market system, the investment institutions can have confidence to set foot.

Again, imagination space of carbon market is large enough. In the equity investment

community, there is a fashionable argument: to invest on projects in the track, and it is difficult for small track to breed a small Unicorn enterprise (unlisted companies over 1 billion U.S. dollars). It is expected in 2017, annual allowances reaches about 3-4 billion tons, CCER issued annually reaches about 10 million tons, and if the carbon price is ￥20-50 / ton, the national spot trading volume is up to 1.2-8 billion RMB according to NDRC. After 2020, the enterprises threshold will lower from 10,000 to 5,000 tons' standard coal, and more than 100,000 enterprises will participate in the carbon market, covering the industries in addition to current eight high emission industries, and futures and other financial derivatives will be introduced (the process is likely to advance) with more active carbon trading market and enlarged trading scale with 60- 400 billion RMB. Clean energy, energy conservation, air pollution control and other related concepts can be linked with carbon market, even low carbon economy may affect all walks of life, to bring enough space for carbon market expansion. Therefore, although the carbon trading industry is still small, and even cannot be called a track, but in terms of capital its development prospects in the future is of imagination space.

Finally, the characteristics of the securities market in our country, such as the rotation and chasing hot spots, are also one of the factors that must be considered. At the beginning of March 2015, the viral video "Under the Dome" triggered the so-called "Chai Jing concept stocks", brought environmental protection plate wave limit; on the polling day of 2016 United States presidential election, Chuandazhisheng (002253) rose more than 6% in A share market reproducing the strange logic; and in the first half of this year a new hot spot - "block chain" concept was born, and even forced investment institutions to pay attention. The trends that pursuit of the market hot reversely conducts to first market shows that the interaction between the first and secondary markets can be very quick and effective with rich and transparent information today. If one day carbon trading stocks appears in A shares market, capital does not get excited over a little thing.

The above analysis shows that carbon trading is likely to attract capital. So will the market gain momentum? We forecast that 2017 will be the first of three stages in China's national carbon trading development. This year will see the carbon trading market gradually find its feet: equity investment in the carbon trading industry will take shape, some institutions will begin to take positions in the sector, industry consolidation will begin, listed companies will focus on merger and acquisition opportunities. But the emergence of a healthy market will require time, much activity at the beginning of the scheme may lead to a slow market during 2017-2018, which will be an improvement and implementation stage for the national ETS. During 2019-2020, however, facing the government's 2020 carbon emission target, and with two years of experience, a unified national carbon market will emerge on the right track. The carbon price is likely to be close to "200-300 RMB/t" – the ideal value of future carbon trading according to Jiang Zhaoli Deputy Director of the Climate Change Division of NDRC, then it may be a really slow period for carbon trading.

Ms. ShiYang Shao, founding partner and CEO of Goolun Capital Ms. Shao is a senior energy environmental experts, has many years of experience and investment practice in the low-carbon development, clean energy and energy conservation and environmental protection industry. Worked carbon trading pilot research in specific industry and specific region department of Beijing environmental exchange specific, Beijing Green Finance Association, American clean energy investment company and Crystal Vision Energy Limited, published more than 20 articles related to low carbon in well-known journals, newspapers, and co-author of " Chinese Road of carbon emissions trading: international experience and China practice", " international carbon fund research" and other books. Ms. Shao, currently also serves as Chinese and globalization think-tank (CCG) director, CO chairman of independent power producers Federation (IPPF) and renewable energy committee, deputy secretary of energy development center of Chinese Investment Association, visiting research fellow of environment and resources law research center of Shanghai Academy of Social Sciences.

Goolun equity investment fund management (Shanghai) Co., Ltd. (hereinafter referred to as " Goolun"), founded in July 2014, with registered capital of 30 million yuan, is headquartered in Shanghai Internet financial wealth world, with offices or partner organizations in Beijing, Hong Kong, Seoul, Melbourne and California in USA and other places. Goolun capital is a professional equity investment fund management institutions, registered in China Securities Investment Fund Industry Association as private equity fund managers in 2015 and successfully issued fund investment products. The company's main business for securities investment, equity investment, fund management and asset management, and to provide private equity investment, investment and financing consulting, enterprise value added services and other professional services for start-up companies.

Goolun capital currently manages funds including securities investment funds market, a number of equity investment funds and a structured carbon funds, existing investment projects covering smart energy, entertainment, carbon trading, block chain, advanced smart production, including all stages from angel investment to Pre-IPO until the two grade market the.

Structured financial instruments: financial instruments that share the common attribute of repackaging risks. (CFA Institute, 2015) Structured financial instruments include asset-backed securities, collateralized debt obligations, and other structured financial instruments such as capital protection, yield enhancement, participation and leveraged instruments. Structured deposits refer to a higher income financial product based on some degree of risk that depositors should bear, which is a kind of financial derivative tool (mainly various types of options) linked with interest rate, exchange rate, index, commodity price, fluctuation or linked with an entity credit. (MBAlib, 2015) Carbon finance structured deposits are a financial product

that are linked to repayment of principal and (or) payment of interest of product with carbon emissions trading price fluctuation through financial derivatives products. Meanwhile introducing carbon allowances as a new payment standard, the investment enterprise would bear some degree of risk to obtain higher income (Si, 2015).

Table 23: Existing structured carbon finance products

Financial products	Carbon finance structured products
Issuing place	Shenzhen
Date of signature	27/11/2014
Signatories	Industrial Bank Shenzhen Branch and Hui Electronics (Shenzhen) Co., Ltd.
Means of investment	The products are mainly for enterprises participating in the Shenzhen carbon market. Shenzhen carbon allowances are creative payment subject through a structured design. The profits are rearranged on the basis of conventional deposit. At the deadline of structured deposit, the profit would be not only general deposit interest but also not less than 1000 tons Shenzhen allowances.
Expected yield	Expected rate of return of 4.1%, of which 1.9% is a fixed interest rate, with no time limit and 2.2% rate for floating income, mainly from the revenue arising from transactions.

Source: Environomist China carbon market database

5.1.4 Carbon asset collateral or pledge

Carbon asset collateral credit business is a carbon financial product providing short-term liquidity loans for customers, based on the collateral of CCERs or carbon emission allowances. (Songtao, 2012) Carbon emission rights mortgage financing is a product where the financing is achieved with CCERs or carbon emission allowances as a mortgage. (Southern Daily, 2015) The proceeds of mortgage financing not only can be used for purchases in the carbon trading market, enterprises can also deposit their own energy-saving, emission-reduction efforts. The fundamental difference between the collateral and the mortgage is that the, mortgagor is still responsible for guarantee of custody.

Therefore, carbon emissions mortgage financing not only increases financing channels for regulated enterprises to participate in carbon trading, but encourages regulated enterprises to manage the carbon asset more scientifically, and short-term idle carbon allowance will be revitalized to ease the financial pressure on carbon trading. The behavior of enterprises in energy-saving, emission-reduction becomes a favorable condition for financing, which is an encouragement to the enterprise to carry out green production, as well as providing new ideas for the development of green finance in China.

Table 24: Existing carbon asset collateral or pledge 1

Issuing place	Hubei	Hubei	Hubei	Hubei
Date of signature	9/9/2014	25/8/2015	26/11/2014	26/11/2014
Signatories	CIB Wuhan branch and Hubei Yihua Refco Group Ltd.	Chinese Import and Export Bank branch in Hubei province and Hubei Yihua Refco Group Ltd.	Hubei branch of Construction Bank and Huaneng Wuhan Power Generation Co., Ltd.	Everbright Bank Wuhan branch and Hubei Jin Ao Science and Technology Chemical Co., Ltd.
Business amount	40 million	100 million	300 million	100 million
Investment object	All funds will be used for the enterprise's energy saving and emission reduction activities	Null	Saving enterprises' energy and reducing consumption	Saving enterprises' energy and reducing consumption
Collateral	Simply using Yihua group's own carbon emissions allowance as a pledge	Null	Collateral includes all of its own carbon emissions allowances and part of the enterprises' fixed assets, which accounted for the vast majority of collateral.	Collateral in the mortgage of carbon emissions allowance of about 10% of all collateral.
Remarks	Null	China's largest single amount of carbon emission rights pledge loan agreement was signed in Wuhan.	Null	Null

Source: Environomist China carbon market database

Table 25: Existing carbon asset collateral or pledge 2

Issuing place	Guangdong	Shanghai	Shanghai
Date of signature	25/12/2014	28/5/2015	11/12/2014
Signatories	Huadian New Energy Company and Shanghai Pudong Development Bank	Shanghai Pudong Development Bank and Shanghai Zhixin Carbon Asset Management Ltd.	Shanghai bank and Shanghai Baotan new energy environmental protection technology Co., Ltd.
Business	10 million Yuan	Null	5 million Yuan

amount			
Collateral	Huadian new energy company in Guangdong obtained 10 million Yuan of carbon allowance mortgage financing and control of corporate account overdraft credit.	National CCER pledge financing loan.	Simply CCER as a pledge of security.
Remarks	China's first single carbon emissions mortgage financing business. The business by the Guangdong DRC issued by Guangdong carbon allowance ownership proof, by China Emissions Exchange (CEEX) for mortgage registration, freezing, publicity, Shanghai Pudong Development Bank in the loan after a week were staring at the city management.	The carbon asset pledge financing business is a national carbon trading system with online registration, which registered the country's first CCER.	China's first CERs CCER loans.
Issuing place	Guangdong	Shanghai	Shanghai

Source: Environomist China carbon market database

5.1.5 Carbon asset valuation

Because the carbon asset is a new kind of asset, we can use asset valuation methods to evaluate them. At present, there is no authority of a third party for the relevant business in China. Assets valuation refers to the assessment and estimated behavior of an asset, using scientific methodology and following statutory and fair procedure, to make an equity value calculation at a particular point in time. Valuation by asset-based approach: An asset-based approach values a company based on the value of its underlying assets less the value of any related liabilities. (CFA Institute, 2015) In effect, this approach arrives at the value of the company to the equity holders. This approach assumes that the value of a company is equal to the sum of the values of a company's assets minus its liabilities.

In the new environment of low carbon development, carbon assets will become a new asset that enterprises pay attention to, so there is a rare opportunity for development of the carbon asset valuation business. Carbon asset are not only assessed as traditional assets are, i.e. general assets, intangible assets, or enterprise valuation, but they also have some unique aspects in terms of object definition, selection of methodology, determination of parameters, use of the assessment conclusions etc. (Xiaohu, 2012) Carbon asset valuation cannot exist outside of the market, because the value of carbon assets exists because of transactions in the market (Liu Hejuan, 2015). Carbon assets are not used for one-time consumption in the carbon market, but have the effect of continuous trading and creation of profits, so carbon asset valuation follows the most important assumptions of asset valuation, that is, trading assumptions, open market assumptions, and assumptions of sustainability.

In the face of the rising global green revolution, there is vital significance in the reasonable application of carbon assets, giving play to carbon asset value. (Sheng, 2015) We should

make full use of carbon assets on the basis of reasonable assessment of the carbon asset value.

Commentary 9: Carbon accounting and its influence on Enterprises

Guest commentator: Ms. Qian Wu, senionr manager of PricewaterhouseCoopers Consulting

With the maturing of the carbon trading market, increasing volume of carbon transaction activity, and diversified transaction types, companies need to invest more in their own carbon emissions accounting. Due to the complexity of carbon emissions trading, international consensus has not yet formed on accounting for carbon-related transactions. Most international organizations have recognized that carbon emission permits should be recognized as an asset, the core challenge is mainly the recognition and measurement of carbon assets. The international mainstream view is that carbon emissions be measured either as intangible assets, financial instruments, or as a separate item listing carbon emissions and related subjects. Views on measurement methods are divided between “fair value” and “historical cost”, as well as for whether carbon allowances allocated for free should receive accounting treatment or not.

In September 2016, the Accounting Policy Committee of the Ministry of Finance issued draft interim accounting provisions for the carbon pilots (hereafter "draft"). According to the draft, regulated enterprises (hereafter "enterprises") shall set carbon assets and compliance requirements as items for accounting. This can then be used to calculate the value of their allowances and compliance obligations. The draft also gives corresponding recommendations on the measurement of assets and liabilities, which lays a good foundation for companies’ carbon accounting standards.

A focus of the draft is whether carbon allowances received free from the government should receive accounting treatment. Recognizing it as an asset at fair value will be more in line with the trend of modern accounting practice. This wil reduce the potential for off-balance sheet assets, and at the same time eliminate inconsistencies with international standards. In addition, allowance allocation, both domestic and internationally, will see a gradual increase in the proportion of paid allowances. The valuation and recording methods for paid allowances provides a reference for free allowances.

Improving carbon accounting standards can help the business manage and record their carbon allowance balance and related transaction status, while making their corporate financial statements more complete, fair and accurately reflecting their assets, liabilities and profitability. In terms of corporate finance and taxation, the development of carbon accounting standards will help companies to assess and record their carbon assets or liabilities, and confirm their relevant costs on the day of compliance. On the one hand, according to the above guidelines, companies can capitalize their carbon-related costs, including the optimization of earnings per share, return on investment and other business indicators and asset liability structure. On the other hand, the unified accounting-related transactions between enterprises is conducive to improve the comparability of financial statements, facilitating external supervision and improving the level of standards compliance. In addition, the formulation of the carbon accounting standards will also promote the establishment of relevant tax policy, with implications for company tax and corporate income tax.

Since the development of carbon trading pilots, traditional financial products have not been able to meet the actual needs of enterprises for emission reduction activities or transactions in relation to their assets and cash flow. Financial innovation related to carbon assets including carbon bonds, asset-backed loans, and repo financing have begun to take shape. In this context, promoting unified carbon accounting standards, accounting methods and related asset valuation standards, can promote the development of carbon financial products and establish sound verification standards for financial auditing, broaden the financing channels for enterprises and promote an active carbon trading market.

Ms. Qian Wu, senior manager of climate change and sustainable deveoplment in PWC Management Consulting and concurrently co-chair of China working group of IETA. She has rich experience in policies and industries analysis in climate change fields as well as energy fields. From 2008, she has been serving the government, research institutes and business customers including power plants, steel and petrochemical enterprises and engaged in consulting in carbon market, renewable energy and industrial energy efficiency. She has been tracking China's incentive mechanisms on energy conservation and industrial CO2 reduction, for example, carbon emission trading mechanism, and developing and designing low carbon polices research and capacity building. She began her career in 2003 and once financial consultant. She also accumulated experience in research on international development issues.

PWC Management Consulting is one of the earliest in China to form a sustainable development and climate change team of the company, we focus on providing professional consulting services to meet customer needs, team members have been following domestic and international carbon markets and clean energy over the past ten years.

Business types**:**

In the carbon market, we are committed to providing low-carbon strategic consulting services for all kinds of enterprises, including the comparative analysis of marginal abatement costs, investment strategy based on a carbon budget, internal control system and carbon accounting, and have served many domestic and foreign energy companies and financial institutions.

5.2 Carbon finance trading services: Primary market

Carbon trading services will be discussed for both the primary market and secondary market. In China's carbon market, the primary allowance market will gradually transition from being

dominated by free allocation, with supplementary auctioning, to being dominated by auctioning, with supplementary free allocation. Meanwhile, the secondary market will gradually transition from the current spot-trade dominated market to a more comprehensive carbon finance market.

5.2.1 Carbon brokering

The business of the carbon market broker can typically include brokerage, brokerage services and other senior professional services (Dechun, 2014).

The typical brokerage business can include two parts: one is to find suitable buyers for developers of carbon credits. These developers include project developers in the voluntary emission reduction field. Carbon brokerage businesses can provide them with services and help to find suitable carbon credit buyers. The other is to help or act on behalf of the buyer in buying carbon credits. Carbon brokerage businesses can help or act on behalf of the mandatory emission reduction enterprises, investors and the enterprises with voluntary hedging requirements to purchase carbon credits.

Senior professional brokerage services for two target customers. The first is carbon traders, which require services including carbon credits and carbon credit portfolio structured transactions based on the counterparty network. The other is any enterprise which owns carbon assets. Carbon asset risk assessment, risk hedging strategies, including comprehensive utilisation of spot, futures and options for comprehensive risk avoidance strategies, as well as advising on different trading strategies, can be provided to these enterprises.

As brokers in the carbon market, carbon brokers can profit through charging a commission for helping or acting on behalf of clients in a deal.

Commentary 10: A preliminary study on legal issues associated with carbon emissions

Guest commentator: Mr. MingZhe Yu, experienced laywer

In the process of developing carbon market professional capacity and assets, an account for carbon allowances needs to be established. Like a bank account or a securities account storing capital and stock, a carbon account stores allowances that can be used for trading. The issue of ownership of carbon allowances in carbon accounts will be explored here. The normal operating mode in current market is that a carbon asset management company opens an account in a pilot area carbon exchange, the initial allowances of regulated enterprises are entrusted, by agreement, to the asset management company for management and carbon trading. Carbon accounts are opened by a carbon asset management company in its name, but the allowances stored in the accounts for transaction belong to regulated enterprises. According to the guidelines of Guangdong province on allowance custody: "within the term of entrustment, transferring allowances from the grantor’s account to the trustee’s does not change the ownership of allowances." Although the guidelines are only rules issued by the exchange, and do not have the legal effect of ownership of judgment, as the enterprises on the

exchange must accept the guidance of the rules, so there is a constraint on the behavior of parties. For example, the strict prohibition on trading between an Escrow account and the original account, to avoid the risk of fraud in carbon asset management companies, or for them to trade in their own interests to the detriment of the enterprises. It is necessary to make such a distinction on the principle of law.

On the basis of the ownership of the carbon account, we will further discuss the nature of the legal relationship of cutody. In essence, entrustment legal norms are more applicable to the carbon entrustment legal relationship. Regulated enterprises through carbon integrated management agreement, commissions a professional carbon asset management company engaged in allowances entrustment and independent transactions. The model is similar to the investors handing over to the professional securities brokerage. The two sides form a similar legal relationship of entrustment financing. The biggest difference in law is that the commission only applies to "general regulations on contracts in contract law", without a number of departments are lack of rules Securities Commission issued to regulate the entrusted finacing, for example:

1. The client may terminate the contract at any time; regulated enterprises may terminate the contract at any time; it is disadvantageous for carbon asset management companies to host accounts and trade in a fixed period, so restrictions on the right to rescind the contract shall be imposed on the carbon entrustment contract, such as the provision of a reasonable or full compensation can be arbitrary dissolution behavior of the breach, in order to curb the exercise of right of rescission of key emissions;

2. The property acquired in handling the entrusted affair shall be transferred to the principal. Because the carbon management through its professional trading, makes the carbon carbon allowances in escrow account increase, which wins the carbon asset investment revenues. For distribution of this revenues mentioned above, if there is no clear agreement, it shall be transferred to enterprises in accordance with the provisions of contract law. Therefore, it is particularly important that the two parties agree to obtain carbon emissions in the proportion of newly added assets in the contract. Otherwise, the default value is added to emission enterprises;

If two or more trustees jointly handle the entrusted affair, they are jointly and severally liable to the principal. If carbon Asset Management Company has cooperation with other companies to carry out carbon comprehensive services, with no clear agreement on on the rights of specific boundary between the two parties, then the carbon emission enterprises should bear joint liability based on contract law. This is easily overlooked, when the comprehensive service contract need more than two companies together, it shall specify the respective responsibilities of the boundary in the contract in case that after bearing joint liability, one party cannot recover to other responsible party.

4. If the principal fails, the contract of entrustment shall be terminated, unless otherwise agreed upon. Where the trustee is bankrupt, the legal representative and the liquidation organization of the trustee shall take necessary measures. Carbon asset management companies should focus on enterprise bankruptcy, still fulfill carbon management obligations, take necessary measures to protect the rights and interests related to carbon emissions quotas, transferred to the liquidation organization after the termination of the commission contract, in order to maximize the protection of the interests of key enterprises. If the carbon

Asset Management Co went bankrupt, the liquidation group shall take good care of the escrow account, the account of the quota of carbon emissions, should not be included in the bankruptcy property, and should be completely transferred to the carbon emissions of enterprises, not without serious punishment, or should bear the liability for breach of contract. The two sides agreed to be settled at this time.

In short, according to the provisions of the law, shall be detailed agreement on the rights and obligations in the "carbon comprehensive management contract", to supplement the legislation deficiencies and defects, make agreement in line with the provisions of the nature and characteristics of the carbon asset management.

Since the carbon storage and carbon account assets attribution is clear, that is the ownership of the account is the carbon asset management company (the trustee), while the ownership of the carbon assets in the account is the emitting enterprise (the entrusting party), then we move to another core issue of this article: as a guarantee of carbon asset financing, can carbon assets and accounting rules be enforced by the court? If they can be enforced, then carbon assets would have a similar fundamental guarantee as with other mortgage credit relationships or pledge of assets. This is a cornerstone of the foundation of carbon finance. If the emitting enterprise, as the financing entity, ultimately does not fulfill the obligations of repayment, then can investors apply to the court to enforce the carbon emissions quotas in the account managed by the asset management company? To date, this problem has not been dealt with through the courts.

However, if arbitration could be applied to business practices in the carbon industry, it could provide a better solution to this problem. The biggest difference between arbitration and courts, is the experts from related industries act as an arbitration tribunal. Therefore, in terms of applicable laws and industry practices, arbitration has more flexibility compared to the courts. Especially in the case where a certain industry’s laws and regulations are imperfect, transactions may be prone to risk, and the advantages of arbitration are unique. After confirming carbon emissions as a property right, the arbitration tribunal may on the basis of a financing contract and commercial practices in the carbon industry, rule that a party has the obligation of repayment, and that its carbon quota account can act as security; in case carbon emitting companies have transferred their allowances to a third party carbon management company, the allowances escrow account could be used for collateral execution accout with written consent from the carbon management company. To ensure that the ruling is made, it also requires a comprehensive agreement between the emitting company, the carbon asset management company, and the sponsor. The agreement should also have an arbitration clause. Of course, you can also choose to have a reputable expert in the carbon industry to act as an arbitrator in the hearing of the case. The general procedure of arbitration shall be governed by three independent arbitrators in the final decision of the case, in which the opinion of the presiding arbitrator is the most critical. If the parties have not agreed to a presiding arbitrator, the arbitration organization should choose an appropriate industry expert from its roster. Compared with the court, arbitration has the characteristics of high efficiency and conclusiveness, making it more conducive to the protection of the interests of both parties, and promoting carbon finance cooperation generally. Once the verdict has been reached, and begun implementation through the courts, the Executive Board of the court shall, based on the award, send a letter to the carbon exchange to force the disposal of assets and cash in the

carbon account in order to repay the award debt, interest, overdue interest, liquidated damages, permit fees, lawyer costs, etc.

Mr. MingZhe Yu is a lawyer and former official of Guangzhou Arbitration Commission and China Securities Regulatory Commission. He is currently the responsible person and arbitrator of the financial arbitration tribunal of Guangdong Financial High Tech Industrial Service Area (Zhanjiang International Arbitration Institute), and has a focus on arbitration and legal services in the capital market. He is a former member of the rectifying exchanges team, and core investigation group capital market case auditing of the China Securities Regulatory Commission. He has unique insights in arbitration, litigation, capital market and carbon trading products operations in the capital market.

5.2.2 Carbon spot trading

Spot trading is a general designation of products related to futures, options and swaps and other derivatives. (MBAlib, 2015) Spot trading refers to a trading activity which requires that the trading time, place, method, quality, quantity, price, etc., should be confirmed in the agreement by both sides of the transaction, before a deal is reached. (Carbon trading net, 2015) With the transfer of emission rights, the exchange and circulation of carbon emissions is completed. Spot trading can avoid high risk caused by manipulation of the market and can also save a lot of negotiating, contract disputes, capital settlement, delivery, marketing and other issues. It minimizes transaction costs and the utilization ratio of the funds will be increased. Meanwhile, many other matters such as facilitation time and costs, taxation and quality inspection, amongst others, will be eliminated.

At present, the trading products in the domestic pilot markets are spot trades. The primary market traders are regulated enterprises, owners of CCER projects, and first-time buyers of allowance or CCERs.

5.2.3 Carbon auctioning

Carbon auctioning involves carbon emissions exchanges selling to regulated enterprises through public auction. (Carbon emission trading, 2015) Many companies bid until no higher bid is made, then the purchase is settled. Carbon auctioning is considered to be the most conducive allocation manner in order to find the market carbon price. At the same time, the auction revenue can be invested into the low-carbon field, so as to bring about a "double dividend". (Yitanjia, 2014) As a result of auctioning, however, the compliance costs of enterprises in submitting allowances will increase, so market participants will resist this

method at the early stage of ETS development.

At present, Guangdong and Hubei have established an auctioning mechanism. Guangdong features a mixed model, where free allocation is the main instrument. The object of Hubei's auction is for a government quota reserve, rather than for allowance allocation. At the same time, the market is open to institutions and individuals, and Hubei auction bidders can also be social investors, not limited to regulated enterprises.

In addition, Shenzhen and Shanghai have tried to promote compliance via auctioning. Shenzhen even uses a reserve price which is nearly half of the market price. However, the intervention caused heated debate between insiders. The intervention resulted in a strange phenomenon that early compliers had higher compliance costs, contradicting participants' expectations of market supply and demand and price, causing some losses. Therefore, we have gained valuable experience that reducing government intervention and respecting the laws of the market is important for future carbon auctioning. In addition, in relation to the use of auction revenues, although the Shenzhen and Shanghai pilots have indicated that the revenue should be used to support enterprises' carbon emission reduction, regulation and development of the market, the specific ratio, areas of support, technology and enterprise thresholds have not yet been detailed. Therefore, open, transparent, and reasonable use of auction revenues should also be explored further in Shenzhen and Shanghai.

5.2.4 Carbon aggregator

The main existing forms of aggregator in the carbon market are carbon funds, carbon assets managers, or large scale projects developers, etc. Aggregators can deploy a series of strategies for small to medium-sized carbon market participants, such as banking and borrowing, buying and selling futures, hedging transactions, managing and operating a diversified portfolio of different projects, engaging in primary and secondary markets etc. With their rich experience, professional teams, necessary management attention and access to buyers and risk-sharing mechanism, aggregators will amplify the effect of economies of scale and extraneous earnings.

5.3 Carbon finance trading services: Secondary market

Carbon credit trading is the primary product in an ETS. Derivative carbon financial instruments are based on the primary carbon credits, and include forwards, options, futures, swaps and structured products. (Wang, 2010) The value of derivative carbon financial instruments depends on the prices of related primary carbon financial products. The main function of derivative products is not transferring the surplus and deficiency of funds and directly promoting savings to transform into investment, but managing risk exposure related to primary carbon financial instruments. Varied carbon trading tools can greatly invigorate the carbon financial market, which would help to meet the different needs of enterprises and investors.

5.3.1 Carbon forward trading

A carbon forward contract is a business contract in which the two sides of the contract agree to

trade a certain amount at a certain time in the future at the agreed sale price. (CFA Institute, 2015) The attributes of non-standardised forward contracts make them especially suitable for hedging. In addition to hedging, forward contracts can be used for speculation. Different from standardized futures contracts, forward contracts can be customized into contracts with any commodity, arbitrary number and arbitrary date of delivery. The forward contract settlement can be done in the form of cash or credit delivery. Forward contracts are not in the form of centralized trading, so it can be regarded as an OTC tool. The attribute of OTC transactions makes it easier to customize the terms of the contract. The lack of a centralized clearing house also involves a greater risk of default. Therefore, forward contracts are not as easy for retail investors to use as futures contracts.

At present, CCERs in the domestic market have the characteristics of forward contracts. The specific operation method of carbon forward trading is that, both the buyer and the seller according to the needs of the contract, agree to trade a certain amount of carbon emissions in the future at a particular time, at a specific price. The pricing of carbon credit forward contracts mainly includes two methods - a fixed price and floating price. The former means that in the future carbon emission would be delivered at a specific price, and the latter means that the delivery price of carbon emission in the future is not fixed. Alternatively, on the basis of a minimum guaranteed price, floating prices linked to allowance prices could be added, then the basic price and reference price should be listed in the contract at the same time.

Carbon forward trading contains carbon repurchase and OTC swaps. Carbon repurchase is a carbon market innovation design where companies can obtain short-term funding through trading. Carbon allowance holders act as transferors and other trading participants as transferees, both sides sign repurchasing agreements to detail related matters like selling amounts, repurchasing date and price. Transferees can dispose of carbon allowances at will within the validity period of agreement.

Carbon OTC swaps means the OTC contract trading that the subject matter is carbon credits whose price difference between fixed price trading and floating price trading is settled by cash. Both trading sides sign an agreement by fixed price trading and appoint to complete reverse trading corresponding to fixed price trading at a time in the future. The two trading parties just need to settle the price difference by cash at final settlement.

Commentary 11: Comparison of carbon allowances forward products in Shanghai and Hubei

Guest commentator: Ms. Mandy Wu, Environomist Ltd.

Among the seven pilots, only Shanghai and Hubei have introduced carbon forward products. Shanghai carbon forwards trading started formally on December 19, 2016, after a period of simulation. Hubei issued carbon spot forward products on April 27, 2016. The two products are compared in the following table.

	Hubei	Shanghai
Name	Carbon allowances spot forward	Carbon allowancs forward
Transaction target	Carbon allowances which are issued by NDRC and Hubei DRC and can be circulated in the market	Shanghai carbon allowances registered in Shanghai carbon allowances registry system.

	and used for compliance for that year.	
Issuance Date	April 27, 2016	December 19, 2016
Transaction time	AM 09:30—11:30, PM 13:00—15:00 from Moday to Friday	From 10:30 AM to 15:00 PM from Monday to Friday.
Special regualtions	Hubei Emission Exchange carbon allowances spot forwards trading rules; Hubei Emission Exchange spot forwards trading settlement rules; Hubei Emission Exchange spot forwards trading compliance rules; Hubei Emission Exchange risk control measures of spot forwards trading. Notice on the adjustment of carbon trading products HBEA daily range limit.	Shanghai Environmental Exchanges Shanghai carbon allowance forward trading rules.
Pariticipants	Domestic and overseas institutions, enterprises, organizations and individuals (except for the third-party verification institutions and settling bank).	Enterprises or other organizations covered by Shanghai ETS or conforming to the relevant regulations of implementation measures of institutional investors' appropriateness system in carbon trading of Shanghai environmental and energy exchange.
Trading mode	Negotiated quotation	Inquiry trading
Scale	100 t/hand	100 t/protocol
Minimum price fluctutation	0.01 RMB/t	0.01 RMB/t
Delivery methods	Electronic compliance/breaking	Psysical delivery/delivery in cash
Transaction fee	0.05% of the order value The compliance fee is 0.45% of the value of the subject matter for compliance.	Two-way charged at 0.08% of transation amount.
Protocol period	May in year**	Monthly protocols of February, May, August and November in the next year from the present month.
Last trading day	The 10th trading day of compliance month.	The fifth countdown working day of expiration month.

Preference scheme		Transation fee is free in the first six months and half off in the second six months.
Limitation fluctuation	Original: 4% of settlement price in the last trading day Present: Upper limit of +10% unchanged, the lower limit of -1%	
Risk control	The margin system, price limit system, position limit system, reporting system for large traders, forced transfer system and risk warning system.	Shanghai clearing house implements central counterparty clearing Clearing limits, position limits, margin, day tolerance, real-time monitoring, forced liquidation, multilateral net termination, termination of the distribution of the settlement, risk reserves.
Clearing/settlement method	Clearing house is set up in exchagea for unified settlement.	Shanghai clearing house implements the central counterparty clearing.

5.3.2 Carbon spot trading

At present, spot trading in the carbon market includes listed selection trading and block trading etc. Spot trading and CCER transactions in the seven pilots this year are detailed in section 3.4.

Explicit constraints on trading are detailed in the decision on rectification of all types of trading venues to effectively guard against financial risks, document no. 38, issued by the State Council in 2011, as well as State Council “implementation opinions on the clean-up and rectify all types of trading venues implementation opinions”, document no. 37, issued in 2012.

Document no. 37 does not allow the use of continuous auctions, electronic matching, and other forms of centralised trading. Specifically, in the spot market, for trading participants, the supply and demand of commodities is not always the same, with personalised and non-standard features. So commodities in spot trading should also belong to non-standardized products, which means it is not suitable to conduct centralised trading. The seven carbon trading pilots’ online trading is therefore completed via listed selection mode, which means that, in order to make a deal, the user should submit an independent trade declaration and then wait for the counterparty’s response, or the user should select the intended transaction from the list. What calls for special attention is that, for a less liquid carbon market, the manner of listed selection would easily cause drastic volatility of the clearing price in the carbon market (Zhang Qing, 2014). The listed selection trading cannot guarantee the market trading is at the highest and most efficient price. Under the listed selection mode, before the end of closing, market

participants can trade at the lowest cost within the scope of the ups and downs, or deliberately choose a very high price on sell orders, to violently push the closing price upwards.

For the pilot carbon market exchanges, there is no doubt that policy restrictions will reduce the activity of the carbon market to some degree. In particular, from the perspective of price risk control, for the listed selection trading mode, the possibility of market manipulation will rise and the difficulty of monitoring will increase.

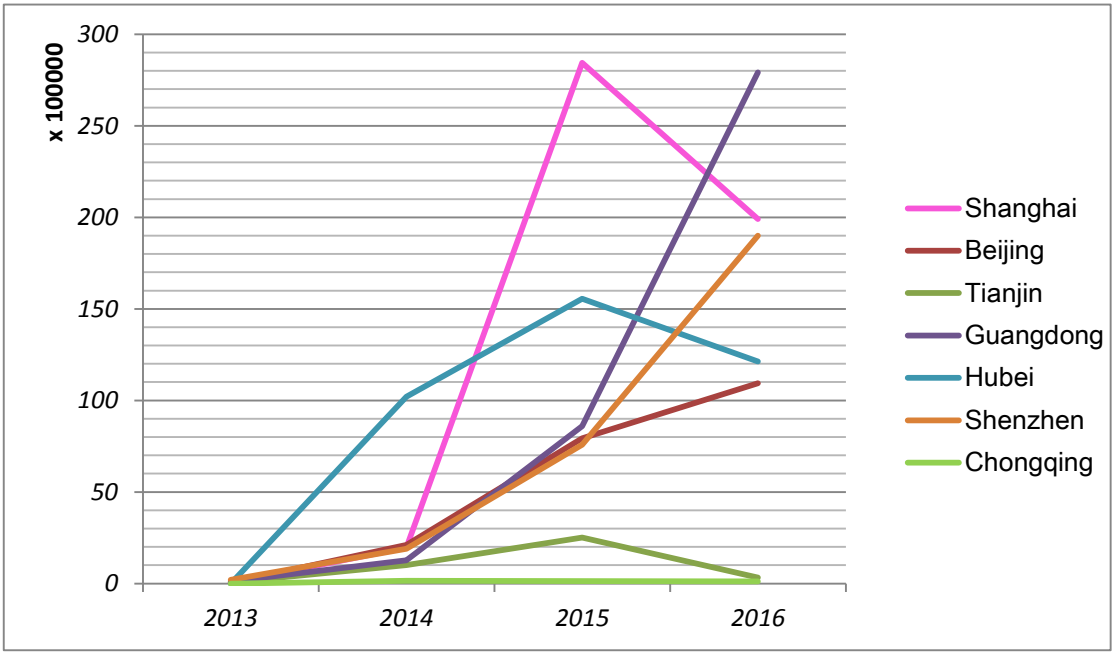
Commentary 12: Changes of spot market in the past pilot years and prospects in national carbon market

Guest commentator: Ms. Kathy Hung, CEO of Timing Carbon Asset Management Co., Ltd

Part I: Changes in the spot market

Spot trading volume is gradually increasing

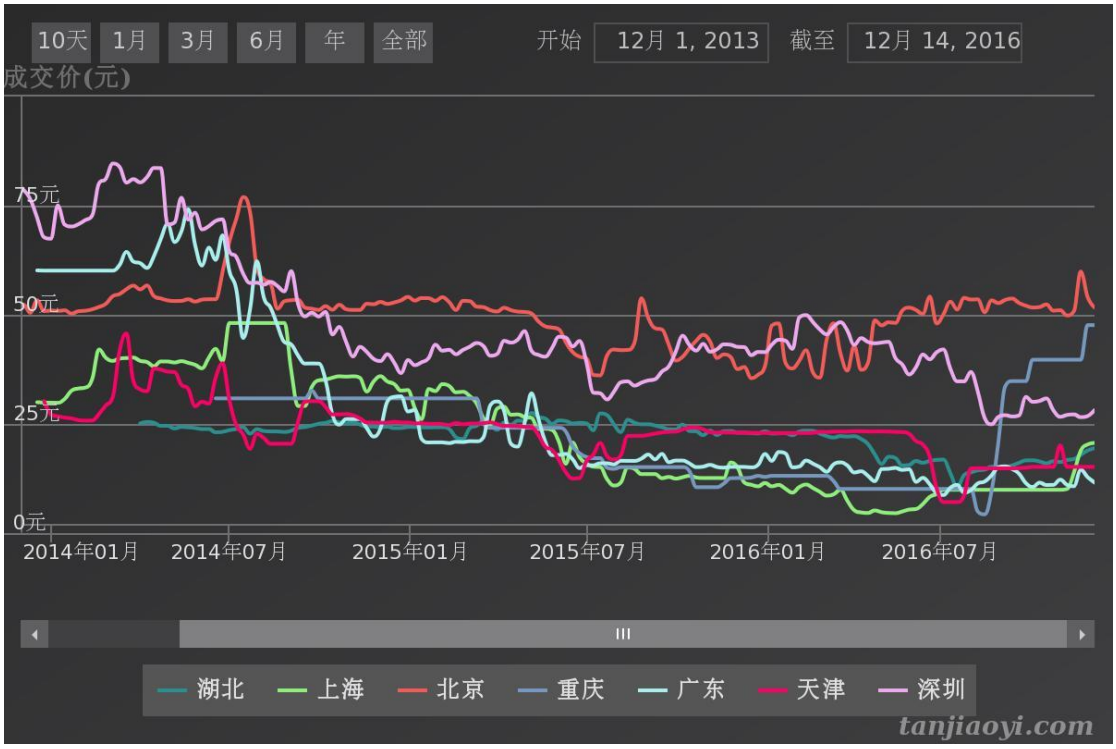
The spot trading volume of allowance has been gradually increasing since the market opened at the end of 2013. It can be seen from the figure below that the trading volume in 2015 increased by approximately 50 percent compared with that of 2014. Moreover, for the first half of 2016, the trading volume caught up with that of both 2014 and 2015.



The spot trading price has been declining

Due to the surplus supply, the price of allowances has been declining during the pilot period. The government has generally issued surplus allowances in the past three years. It is estimated that the highest proportion of surplus issuance could be up to 20% in recent years. Additionally, the fact that more and more CCERs have been issued could lead to a surplus offsetting supply in the market. It is estimated that approximately 100 million tons of CCERs will be issued and enter the market for compliance year 2016. Moreover, policy regarding the carrying forward of pilot allowances to the national scheme has been delayed. The policy uncertainty dramatically reduces the time value of pilot allowances, which led to a declining

price in the first half year of 2016 as well. To deal with it, certain pilot area governments (e.g Shanghai) published affirmative policies in order to rescue the market. Meanwhile, institutions have an incentive to actively participate in the low-price market, to invest in a certain amount of allowances for carrying forward to the national scheme. The price, then, showed an increasing trend in the second half of 2016.



Source: www.tanjiaoyi.com

Participants are varies

At the very beginning of the pilot markets, participants were limited mainly to compliance entities and professional carbon service firms. With improved recognition of carbon credits during these years, various participants including investment institutions, financial institutions, CCER project owners and individuals, entered the market and played different roles within it.

Price changes moderately

The following two factors lead to moderate changes of price. First of all, different participants have different trading purposes, such as profit seeking, carbon reductions, etc, while at the beginning of pilot market, trading was only for compliance purpose, which mainly occured close to the deadline. Secondly, compliance companies increased their awareness of carbon asset management so that they were more sensitive to price changes. They aim to plan their purchasing schedule in advance or try some allowance-CCER swap transactions in order to lock their expense of compliance.

Increased allowance trading volume; reduced CCER trading volume

In 2016, some pilot governments, for example Hubei and Shanghai, adjusted the CCER offsetting policy. There was a trend of CCER offsetting policy became stricter, which greatly limited market demand for CCERs in terms of type and volume. On the contrary, the strong government credit increased the price of allowances. Thus, more investors believed that investing in allowances could be a less risky alternative than investing in CCERs.

Part II: Prospects in National Carbon Market

With an increasing number of policy statements being released, market participants expect an increasing price for allowances and CCERs. Meanwhile, it is repeatedly emphasized by the government that lessons of the EU ETS and China's pilot market should be learned carefully. A general market expectation has formed that the allowance issuance will be tightened gradually, which was reinforced by the wide adoptione of the benchmarking allocation method. On the other hand, the revised policy of CCER registration and issuance will limit the supply of CCERs in the market.

It is expected that the lack of liquidity will still be a major problem in the beginning years of national market. Similar with the pilot period, newly regulated compliance companies will maintain a conservative attitude towards participating in the carbon market, focusing their attention on compliance. Thus, spot trading will be the main purchasing activities of newly regulated compliance companies, with small amounts of swap selling. Companies with surplus allowances will prefer to keep them in hand for following years.

Additionally, it could lead to a fragmentation of the trading market due to different provincal policies and administrative measures, since the central government has decentralized the right of allowance allocation to provinces. It can be estimated that the cost and volume of allowances gained by a company will vary due to different local allocation methods. It is predicted that local government will issue protective CCER offsetting policies, which would aggravate the fragmentation effect. The price of allowances and CCER will vary geographically.

Finally, the existing nine exchanges are implementing different trading regulations. At the beginning of the national market, compliance companies are supposed to choose the closest exchange for trading activities. Different regulations could adversely affect their judgment on trading decisions and limit the price discovery function.

Ms. Kathy Hung, Founder and CEO, Timing Carbon Asset Management Co., Ltd

Master of Science in Management

More than 10 years' experience in the carbon field.

Carbon trading and carbon finance expert, co-founder of Arreon.

Former Director of Low Carbon Economy Institute of International Cooperation Center of NDRC, presided over low-carbon research.

Timing Carbon Asset Management Co., Ltd, founded in 2007 in Beijing, has offices in Beijing and Shanghai, is a leading firm focused on integrated carbon asset management, devoted to identifying international and national market opportunities, establishing carbon asset managing strategies, developing CCER projects, participating in carbon trading and carbon financing activities. With sufficient capital resources, rich experience in carbon trading and technology promotion, and a professional business and legal team, Timing works closely with our clients to ensure the security of carbon trading business, and help them realize the maximum value of their carbon assets.

Achievements
Carbon Trading: Timing has a proven track record in trading emission allowances and CCERs in domestic pilot trading markets, working jointly with several large finance institutions in developing carbon finance derivatives and structured products.
CCER project development: Timing has developed and managed more than 50 CCER projects with variable types including renewable energy, land fill gas, bio-energy, CMM and waste heat recovery.
Carbon neutral activities: Timing has supported China Beijing Environment Exchange, Industrial Bank and Shanghai Metro on public good activities to promote low carbon life.

5.3.3 Carbon futures trading

Compared with traditional futures contracts, the only difference for carbon futures contracts is the underlying asset. Futures are defined as standardized contracts traded in the exchange, where a certain amount of commodity is traded at a specific time in the future at an agreed price. (Kexijia, 2014). The meaning of "standardized" is that the provisions of contracts for buyers and sellers are established by the exchange. The "contract" is a contract for the future, which agrees on the price of a certain subject matter traded (delivered) in the future. In order to prevent a breach of the contract, both parties have to pay a deposit.
It should be noted that futures are traded in a formal exchange, and domestic futures exchanges include the China Financial Futures Exchange and the Shanghai Futures Exchange. There is no formal exchange in the carbon trading area, however the State Council said in a notice on the pilot Guangdong free-trade area that it "will study and establish an innovative Futures Exchange, and carbon emission futures will be the first variety". If this exchange is established, China's carbon market may develop very significantly.
A carbon emissions futures market is a low-cost means to achieve emissions reduction in both Europe and the United States. From the point of view of international experience, carrying out carbon emissions futures and derivatives trading can have a huge role in promoting energy-saving and emission reduction. Liu Yunfeng, the Deputy Inspector of the SFC Futures Supervision Department thinks that carrying out carbon emissions futures has two connotations: on the one hand, an efficient information exchange platform could be provided, and the trading price would be open and transparent; on the other hand, an effective hedging tool can be provided for related spot trading enterprises. (Carbon trading net, 2013)

5.3.4 Carbon options trading

An option is a financial instrument that gives one party the right, but not the obligation, to buy or sell an underlying asset from or to another party at a fixed price over a specific period of time, also referred to as a contingent claim or option contract. (CFA Institute, 2015) The option is called the right of choice, which is a kind of derivative financial instrument. The option means

a trading right within a certain period of time in the future. Specifically, the buyer pays a certain amount (premium) to the seller, then obtains a right to buy or sell a certain specific amount of commodity, during a period of time in the future (American option) or on a specific date in the future (European option), at a pre-agreed price (the strike price), without bearing the obligation to buy or sell.

Option trading complements the shortcoming of forward trading where forward trading only maintains the present value but not the future value. Option trading has greater flexibility. The holder of the contract, when the price is favorable, could take the measure of non-delivery, so that the price risk loss is less than or equal to the premium.

- The option is an effective kind of risk management tool. The subject matter of options is future contracts, and therefore can be said to be a derivative of derivatives. Therefore, the option can be used for spot hedging, as well as maintaining the value of the futures business.
- The option provides more investment opportunities and investment strategies for investors. In futures trading, the market would have investment opportunities only if the direction of price changes. If the price fluctuations are small during a period, the market would lack investment opportunities. In options trading, futures prices in either bull or bear markets or consolidation could provide the opportunity for investors to profit.
- The option can provide more leverage for investors. Compared with the futures margin, options with fewer rights can control the same number of contracts.

5.3.5 Carbon Brokers

The business and function of carbon brokers has been introduced earlier in relation to the primary market, and will not be repeated here. Currently in the secondary market, carbon brokers mainly participate in the form of exchange broker members or comprehensive members. Brokerage (Agency) members refer to institutions, enterprises, or organizations providing carbon trading brokerage or agency service business in exchanges. Comprehensive members refers to institutions, enterprises, or organizations obtaining exchange membership, fully participating in carbon emissions trading in exchanges, and that can carry out self-service, brokerage (agency) business, services business and exchange-designated business.

Commentary 13: Carbon asset custody and its market demand analysis

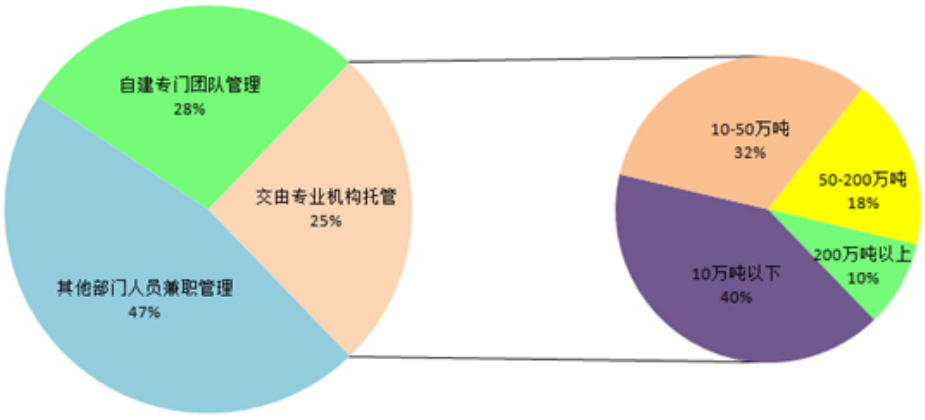
Guest commentator: Ms. Chao Cai, Director of Carbon Assets, Dept. Guangzhou Vcarbon Investment Co., Ltd.

Since 2012, China has established a number of pilot carbon markets, carbon asset custody as a carbon financial innovation tool began to appear in the market, and was gradually recognized by enterprises. Carbon asset custody refers to enterprises entrusting their carbon assets to professional institutions for management, and receiving revenues according to the agreed revenue sharing. Its core is to help enterprises outsource market risk, achieving carbon asset value maintenance and appreciation. For carbon asset management institutions, carbon custody is actually a kind of carbon collection tool, therefore, in some pilot carbon markets, the

carbon allowance custody business is also known as borrowing carbon.

For regulated enterprises, those willing to use the carbon asset custody model are divided into two kinds. One is a large regulated group with a large amount of allowance assets and with no additional demand, or small demand, so the compliance pressure is limitied, while carbon asset management involves many departments with relatively complex and lengthy decision-making processes. For this type of enterprise, their motivation for participating in carbon trading is low and they are typical risk-averse traders. They are mostly state-owned enterprises, and the primary consideration in the carbon business is stability and risk-aversion, followed by revenue. The other kind is small regulated enterprises, with a small carbon quota, but facing a significant deficit. They are more sensitive to price, they hope to reduce the cost of purchasing allowances for compliance as much as possible, while the enterprise's own carbon management capacity is weak, and it is unlikely to establish their own professional carbon management team to obtain sufficient market information for a considerable period of time after the establishement of the carbon market. These enterprises are mainly small and medium private enterprises and they have a strong demand for professional institutions to carry out carbon allowance custody in order to achieve revenue. No matter what type of business, the core demands of carbon asset custody are to provide services for the outsourcing of risk, help enterprises to avoid the cumbersome decision-making process, and to achieve carbon asset value maintenance and appreciation when the enterprise does not have an effective carbon management system.

Vcarbon carried out a survey of nearly 100 regulated enterprises and it shows the enterprises which have completed or prepared for carbon asset custody accounted for 25%. Among them, 72% of the enterprises have carbon assets of less than 500,000 tons, and more than 28% have more than 500,000 tons of carbon assets. This shows that small and medium sized enterprises have a higher demand for carbon asset custody. Taking into account the unity and expansion of China's carbon market, as well as enterprises' lack of carbon asset management capacity during the initial period of the market, the market space for carbon asset custody is broad.



Ways for regulated enterprises to prepare for and be involved in carbon asset custody

Guangzhou Vcarbon Investment, as an important trading institution and the first comprehensive member of the Guangdong carbon market, provides carbon asset custody business for a number of enterprises. In the first half of 2016, Guangzhou Vcarbon Investment and two subordinate power companies of Shenzhen Energy Group (Shenzhen Guangshen

Shajiao B Power Company, Shenneng Hehe power (Heyuan) Co., Ltd.), reached an agreement in the China Emissions Exchange (Guangzhou) for carbon allowances custody services, which was the first carbon allowances custody in Guangdong and the largest nationwide, with 35 miilon tons of allowances. So far, the cumulative carbon assets entrusted to Guangzhou Vcarbon is nearly 5 million tons, involving enterprises in a number of industries. Carbon asset custody services enrich enterprises' carbon asset management, reduces their carbon management costs, helps enterprises to avoid risks, and achieves the goal of stable carbon value assets. Guangzhou Vcarbon's successful cooperation with regulated enterprises also is a good demonstration, and more and more enterprises are exploring their options through this channel. Guangzhou Vcarbon is also constantly innovating, trying to meet the business needs of the trusteeship to serve more customers, to promote more enterprises to actively use carbon market innovation mechanisms, and to improve market participation.

However, the risk of this business model can not be avoided. Based on the inherent risk aversion of regulated enterprises, the risk in the custody model is often undertaken by the trustee (generally institutional traders in the carbon market). In other words, the custodian needs to ensure the absolute safety of the escrow allowances "principal", and get a certain amount of revenue. Due to the lack of risk hedging mechanisms in China's current pilot carbon market, the operation of custody institutions is mainly concentrated on spot market trading and carbon allowances swaps with CCERs. In the current market with limited liquidity and unclear CCER offset rules, custody institutions accordingly need to bear higher risk, and this puts higher requirements on the custodian's professional ability and market judgment.

Ms. Chao Cai, Director of Carbon Assets Dept., Guangzhou Vcarbon Investment Co., Ltd, and team member of the National Carbon Market Capacity Building Center (Guangdong).

Bachelor of Economics, Peking University; Master of Environmental and Sustainable Development, University College London (UCL).

Has worked for a large number of international institutions and international projects related to the environment for many years, has a solid theoretical foundation and extensive cross-domain, cross-sectoral practical experience in environmental protection, climate change and carbon finance. Leads the Vcarbon team to serve a number of industrial enterprises in Guangdong Province.

Guangzhou Vcarbon Investment Co., Ltd. was founded by a group who are interested in improving the regional environment, advocating low-carbon development with rich experience in the field of low-carbon environmental protection. The company's main business includes carbon asset development and management, and carbon finance innovation. It is also a leading carbon asset trading and management institution, and won the first China Green Carbon Award – "best carbon trading practice award".

The company has registered capital of 50 million, is the first comprehensive member of the Guangdong carbon market, a strategic partner of the China Emissions Exchange (Guangzhou), a member of the Shanghai Environment and Energy Exchange, and the

China Beijing Environment Exchange. As the largest trader in the Guangdong market and largest carbon asset management institution, Vcarbon's Trading traded volume in the Guangdong secondary carbon market is by far the largest, with rich experience in carbon asset management services, serving different sized industrial enterprises in Guangdong, making advances in the carbon market, forwards trading and custody business. The company has a vibrant, interdisciplinary and talented team, has key members from Zhongshan University, Peking University, South China University of Technology and other high-level domestic universities, with professional background covering environmental engineering, geochemistry, computer science, economics, business management and other fields. We are committed to the promotion of the low-carbon concept, to provide enterprises with a wide range of low-carbon energy-saving, emission reduction consulting and management services to help them reduce the cost of environmental and energy management, and enhance the value of green products.

5.3.6 Exchange-Traded Funds (ETF)

Exchange-Traded Funds (ETF), is an exchange-traded, open-ended fund with variable shares. (Lan, 2014) In China, they is called exchange-traded index funds. ETF combines the various advantages of open-end funds and closed-end funds, and is a passive index fund. (CFA Institute, 2015) Compared to the traditional type of index funds, ETF has better a replicating effect, is cheaper, more mobile and has simple modes of sale. In addition, it also has an arbitrage mechanism, which traditional index funds lack. Therefore, it is more attractive for investors. For investors, the first advantage of holding ETF is that you can get a variety of index funds, and the ability for short selling, short purchase, and buying just a share (no prepaid minimum deposit requirements) can be obtained at the same time. Another advantage is that the majority of ETFs expense ratio is lower than the average mutual fund. When selling the ETF, investors have to pay the same commission to the broker, but also periodically.

5.4 Carbon Financial Services for Individuals

Individual's involvement in carbon market had been seen in two alternatives, one bring direct trading in the secondary market, another one being investments in carbon Funds or Asset Management Products. It has been showed in the European past practices that Carbon Funds or Asset management Products are more adequate options for interested individuals.

The Report Working Group has noticed that Ant Financial Group (a major Spin Off of AliBaba Group and owns 100% AliPay) launched a carbon product called Ant Forest in Aug 2016. The China-made product approach, Ant Forest, is aimed at enhancing individual's awareness in climate change and mobilizing individuals'' efforts in reducing carbon emissions by materialize

individuals' low carbon actions. As shown in the Figure below, this Individual focused carbon product has achieved a tremendous growth in the past year, namely accumulated over 57 million users accounts, of which over 31 million are active accounts.

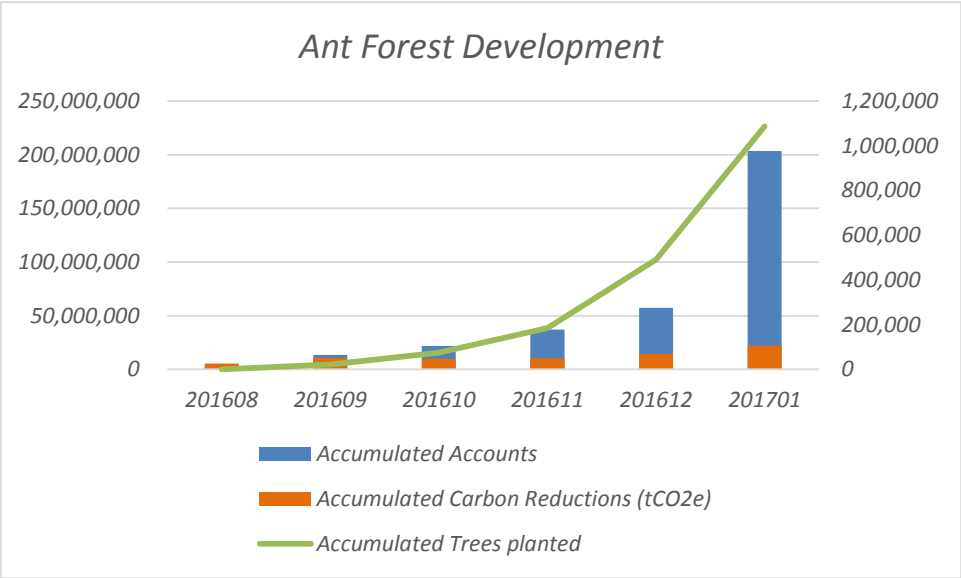


Figure 74: Ant Forest Product User development

(Source: Desk Research and Ant Financial Group)

Since this first of its kind individual focused carbon product is the largest one in the world, the Report Working Group has conducted a special research on it to identify where this product is situated in the carbon value chain. Though Ant Forest is still in the phase of attracting users, it is noted that the current product is positioned in the voluntary market side of the global carbon market value chain. It attracts users by quantifying users' carbon emission reductions via low carbon behaviors (Carbon Accounting) and then created a social network features to maintain individuals interests. On the other hand, the current product materializes the quantified emission reductions through forestation programs (Carbon Asset).

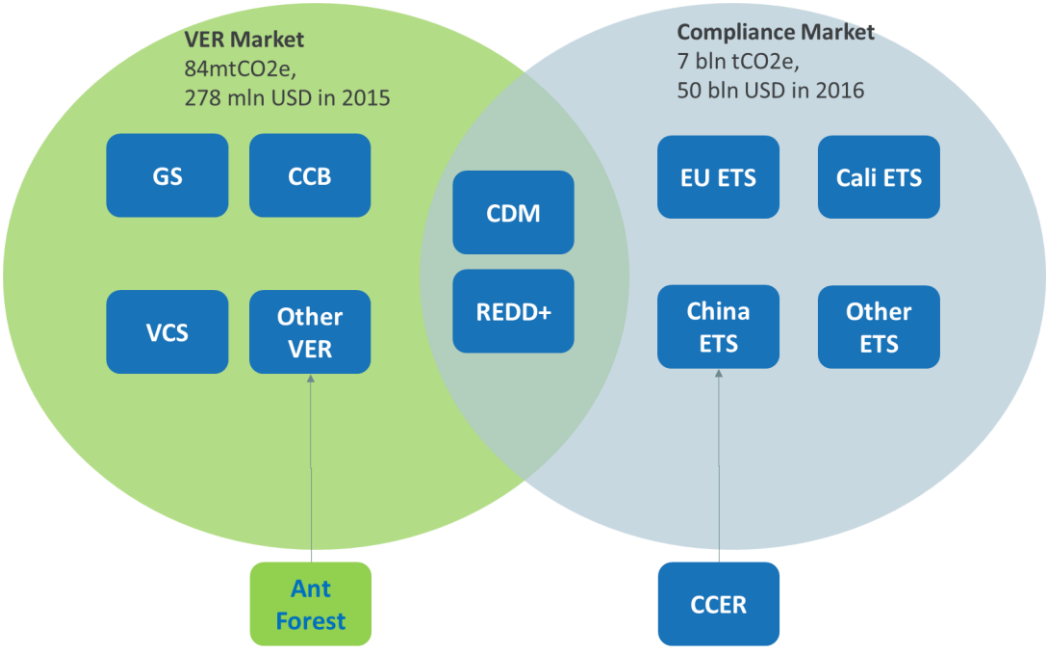


Figure 75: Ant Forest Product in the carbon Market

Commentary 14: Ant Forest: Digital Finance Promotes Green Development

Guest commentator: Ms. WANG Yao, Professor & Director General, International Institute of Green Finance, Central University of Finance and Economics; Deputy Secretary General, Green Finance Committee, China Society for Finance and Banking

"Creating a Community of Shared and Win-win Future for Mankind", Chinese president Xi Jinping proposed Chinese approach for world development during his visit to Switzerland in mid-January 2017. Meanwhile, Ant Financial Services Group (AFSG) and UNEP launched Green Digital Finance Alliance and promoted innovative carbon finance products represented by Ant Forest. This product provides a detailed approach for green development of socio-economic by making use of the power of technology and public.

The improvement of environment and the sustainable green development of socio-economy ultimately rely on the progress of technology. Ant Forest is a good example for technical and financial innovation. In many countries, the emerging Climate Finance, Carbon Finance, and Green Finance practices have promoted green transition of socio-economy and tackled some environmental problems by reallocating financial resources among developed countries, developing countries, environmentally-friendly firms, and polluting firms in recent years. However, how to create new value in the green industries in addition to reallocating resources from non-green to green industries, still challenges green finance. Obviously, the combination of technology and finance could realize this. For example, the technical innovation represented by digital finance which is developed by AFSG provides a solution. By developing smartphone game under Ant Forest, the digital finance project, AFSG has encouraged low-carbon consumption using its product and planted trees for consumers. This not only realized great new business value, but also promoted environmental improvement without crowding-out

resources in other industries. This kind of green promotion for socio-economic development owes much to the power of technology.

Public awareness and participation is another important factor for improvement of environment and sustainable development of socio-economy. Ant Forest has inherent ability and good operation model for public mobilization. Public awareness largely determines public sector's concern on and investment in environmental problems. Policy responses like the environmental pollution controls enforced by UK and US government since half century ago and Chinese government's action on smog, all derived from public awareness on environment and health, and subsequent appeal for them. Meanwhile, extensive public participation promotes the change of conception and the formation of green development model, reduces damage to nature brought by consumers. By making use of great user base, AFSG promotes Ant Forest, the green financial product, among one-third Chinese population. This naturally popularizes green conception extensively and increases public environmental awareness gradually. The game design of Ant Forest encourages low-carbon practices like walking and public transportation, which promotes public participation directly. So, the power of public on environmental improvement and sustainable development has been excavated and utilized deeply by Ant Forest.

Any product could survive and develop only if it has business application and value. With subtle business model design, Ant Forest has successfully merged commercial interest with green development. By wisely using a user's credit system, it encourages eco-friendly behavior, cultivates user loyalty, derives user's behavioral data, and establishes individual carbon accounts. This not only promotes green development, but also accumulates user volume for AFSG, collects big data that will be useful for future financial businesses, and prepares for individual carbon trading and management that may be prosperous in the future. The cultivation of public's green awareness by AFSG will in turn promote future business model to come true earlier.

In the future, there should be some more innovations like Ant Forest to be developed. For instance, while western countries mainly concern on climate change and low-carbon development problems today because other environmental problems have already been solved, China needs to concern on various environmental problem not limited to carbon reduction or climate change since industrial pollution in China still serious now. So AFSG may develop more green-related digital financial products in addition to carbon account.

Dr. WANG Yao, Professor, Director General of International Institute of Green Finance (IIGF) and Director of Research Center for Climate and Energy Finance (RCCEF) within Central University of Finance and Economics (CUFE), Deputy Secretary General of Green Finance Committee under the leadership of People's Bank of China. Dr. Wang is also an adjunct professor at the University of Southern Queensland and the University of Victoria.

From 2010 to 2011, she was a post-doctoral researcher at the Department of Economics at Harvard University, as well as a visiting scholar under the Harvard Economic Environment Project and the Harvard China Project. From 2008 to 2010, she did post-doctoral research

in Bank of Beijing. Dr. Wang has over 7 years of experience in investment banking. Her research interests include green finance and climate finance. She is author of four books and several prestigious journal articles.

International Institute of Green Finance (IIGF), Central University of Finance and Economics, was founded in Sept. 2016, and it grew out of the Research Center for Climate and Energy Finance (RCCEF), which is founded in Sept. 2011. IIGF is one of the standing members of the Green Finance Committee (GFC) of China Society for Finance and Banking, and has built an academic relationship with the Ministry of Finance. The mission of IIGF is “Environment Protection, Production and Finance Interconnection, Collaborative Innovation and Service to Society”, the principle is “High Quality Achievement, Independent Research, Extensive Influence and Public Welfare Education”, and the goal is to cultivate the economic environment and social atmosphere with the spirit of green finance and to build the domestic first-class, the world's leading financial think tank with Chinese characteristics. The main research directions include climate finance, environmental economy and green finance, energy finance, and there are green financial innovation laboratory, PPP laboratory and carbon finance laboratory.

Business area: Research, Consultant, Exchange, Talent Cultivation, Spread.

- Business description

IIGF focus on:

1. Research. To do in-depth research on climate finance, green finance and energy finance.
2. Consultant. To provide policy advice, product innovation research for various governments, financial institutions, enterprises, etc.
3. Exchange. Through all kinds of academic activities, to cooperate and exchange with related institutions.
4. Talents Cultivation. To cultivate compound talents on green finance.
5. Spread. Using precision flexible means of transmission and all media channels, to promote related outstanding research results at home and abroad.

As the two main components of Ant Forest, it is believed that Carbon Accounting and Carbon Asset will be upgraded in the future. Possible upgrades are a) Carbon Accounting aligned with internationally recognized principles (even at standard level), b) Carbon Asset focus shifting from voluntary market to the main stream compliance market to explore the financial values. It is foreseen that Ant Forest will be the globally largest and dominated individual focused carbon financial product once it entered into the main stream carbon asset class.

6 The economic impact on listed companies in China's carbon pilots

Since the Shenzhen carbon exchange first began trading allowances in June 2013, China's carbon trading pilots have run for 3 years. Over the past 3 years, media reports commenting on carbon trading have often worried about its negative economic impact. The logic is that emitting enterprises will be required to make additional investment in carbon allowances, thereby increasing costs, reducing profits and affecting competitiveness.

With regard to this issue, the report's working group studied the earnings of all listed companies in the Beijing, Shanghai, Tianjin, Guangdong, Hubei and Shenzhen pilots, with in-depth analysis of the economic effects on the listed company in the past pilot phase.

6.1 2013-2015 listed companies carbon-related financial information

Due to limited information disclosure in the Chongqing pilot, the working group chose to exclude Chongqing from the study. The number of companies covered by these pilots during 2013-2015 was 2391[1], among which listed companies (including listed companies with the right to operate) was 221, accounting for 9.3 % of all regulated enterprises and 7.4% of domestic listed companies (as of October 12, 2016).

For the convenience of analysis, the working group divided information disclosure of listed companies into two types: "mentions carbon emissions" and "mentions carbon revenues", while also referring to the calculated earnings, inclusive of carbon revenue.

Table 26: Listed company disclosure of relevant information during carbon pilot period

	Enterprise in 2015	Listed companies	Mentions carbon emissions	Mentions carbon revenues	Total earnings*
Beijing	981	74	8	4	33,551,306
Shanghai	312	77	4	1	4,799,322
Tianjin	109	5	4	0	-
Guangdong	186	7	1	1	14,943,240
Shenzhen	636	42	4	2	5,019,160
Hubei	167	16	4	3	12,488,794
Total	2391	221	25	11	70,801,822

*part is calculated as ending balance of allowance

Source: earnings of listed companies, Environomist China carbon market database

As shown in the above table, most listed companies covered by ETS pilots are concentrated in the three municipalities of Beijing, Shanghai and Shenzhen, of which Shanghai has the highest concentration of listed companies, accounting for nearly 25% of the regulated enterprises. However, the proportion of listed companies in these three municipalities that mention carbon

[1] The pliots adjust regulated enterprsies annually, so the number fluctuated.

emissions in their annual reports is far less than in Tianjin, Guangdong and Hubei. Among a total of 25 companies that mention carbon emissions in the six pilots, a total of 11 companies announced their earnings in the carbon market. The proceeds of all the 11 companies are positive, with total revenues of about seventy million RMB.

6.2 The economic impact on listed companies in China's carbon pilots

- Beijing has a total of 981 regulated enterprises, of which 74 are listed companies, 8 companies mentioned carbon emissions in their annual reports, 4 companies made a profit of more than 33 million RMB through the carbon market. Since industrial enterprises accounted for only a small proportion of regulated enterprises covered by the Beijing ETS, carbon emissions for these companies should be low, and their carbon management and allowance compliance costs should be small, making it less likely to receive attention for separate disclosure in the annual report. Nevertheless, the working group noted that the ratio of Beijing listed companies mentioning carbon emissions is higher than that of Shanghai. This includes two companies which earned more than 10 million RMB in the carbon market. The reason is probably as follows: these are Beijing's largest industrial enterprises, with a large amount of carbon allowances. Beijing's allowances in the secondary market also have the second highest price in the country, giving them with high yields in the Beijing carbon market.
- Shanghai has a total of 312 regulated enterprises, of which 77 are listed companies, 4 companies mentioned carbon emissions in their annual reports, and one company made a profit of more than 4.8 million RMB through the carbon market. The Shanghai carbon pilot included the largest number of listed companies both in absolute number and by proportion, but only 5.2% mentioned carbon emissions in the annual reports. The working group believes that this resulted from over-allocation of allowances in the Shanghai pilot. Enterprises' cost of carbon management and allowance compliance may therefore be too small to be regarded by listed companies due to loose allocation, not because their carbon emissions are small.
- Tianjin has a total of 109 regulated enterprises, of which 5 are listed companies, and 4 companies mentioned carbon emissions in the annual reports. No company mentioned profits through the carbon market, which may relate to Tianjin's underperforming secondary market.
- Guangdong has a total of 186 regulated enterprises, of which 7 are listed companies, one company mentioned carbon emissions in their annual report and made profit of about 15 million RMB from carbon trading. The regulated enterprises covered by the Guangdong ETS are all large industrial enterprises, so in theory they should be holding a large number of allowances in theory. But in fact, only one company disclosed its earning in the carbon market, which demonstrates that the effect of carbon trading policies on these enterprises is too small, both in cost and revenues, to be regarded as significant for the annual financial reports.
- Shenzhen, has a total of 636 regulated enterprises, of which 42 are listed companies, 4 companies mentioned carbon emissions in their annual report, and two companies made

profit of more than 5 million RMB. Similar to Beijing, the industrial enterprises in Shenzhen are few, so allowances held by these enterprises should theoretically not be high, and the corresponding cost and revenues should be small. But nearly 10% of Shenzhen's listed companies mentioned carbon emissions in the annual report, higher than for Shanghai.

- Hubei has a total of 167 regulated enterprises, of which 16 are listed companies, 4 companies mentioned carbon emissions in their annual report and 3 companies made profit of more than 12 million RMB from carbon trading. The working group believes that because the threshold for regulated enterprises in Hubei is the highest nationwide, representing the highest number of allowances, so the impact is also the largest. This can be confirmed by the proportion of listed companies referring to carbon emissions: 25% of listed companies mentioned carbon emissions in their reports.

Although the overall proportion of listed companies that mention carbon emissions is not high, only 11.3%, the working group still found some insights.

a) There is no positive correlation between whether the listed company announced its carbon emissions and returns in the carbon market, and its carbon allowances held. In theory a large volume of carbon allowances should be held by large power companies, but we found that no listed power companies published any carbon information in their annual reports.

b) No listed company mentioned allowance compliance costs in their annual report. For the listed companies that mentioned carbon emissions, none were in accordance with the requirements of the stock exchange, referring to Obligated Alarm Disclosure to Investors of being affected operation capacity due to additional high costs for carbon compliance. The working group believes that this is because compliance costs are not large enough to greatly impact on enterprises' operating costs. In fact, it is even not significant enough to make the enterprises to put forward an early warning in their annual report.

c) All carbon market balances mentioned by listed companies are positive earnings, and a total of 11 listed companies mention gains from the carbon trading market, with total revenue of over 70 million RMB, accounting for about 6% of annual turnover on the spot carbon market in 2016 (including online allowance trading, block trading, and supplemental mechanism trading). However this does not include listed companies with unpublished carbon market profits, especially listed company affiliated to the big electric power companies. On average, each listed company received carbon revenues of about 6.38 million RMB. This may mean that most regulated enterprises benefit from carbon trading, rather than imposing an additional cost.

Based on the results of this study, regardless of cost or benefit, China's listed companies are not concerned about carbon trading. At the beginning of the national carbon market, it is suggested that China's listed companies should better focus on the carbon allowance trading market. This is not only for large carbon allowance holders in the electricity, chemicals, steel and cement industries. To take Tesla for example, an internationally renowned company, carbon trading revenue can occupy a very important share in the operating income of listed companies.

Commentary 15: Analysis of Tesla's financial performance in the carbon market

Special commentator: Mr. Richard Mao, Environomist Ltd**.**

The carbon revenues of Tesla, Inc. once accounted for up to 43% of total revenues in international carbon markets. Through the study of Tesla, using financial indicators from the beginning of the carbon pricing system in 2009, I hope to show the reader how low-carbon companies can profit in carbon markets.

Tesla's headquarters is in California. The low emission vehicle (LEV) project in California has been implemented by the California Air Resource Board (CARB) since 1990, regulating the emission of conventional air pollutants as part of a program called Zero Emission Vehicles (ZEV), requiring that 2% of vehicles must be ZEV by 1998, with the proportion increasing annually. In 2009, CARB conducted a redesign of the LEV project and added greenhouse gases within the regulation, in addition to conventional air pollutants. In 2010 CARB launched LEV III, in which LEV and ZEV are better integrated and coordinated in implementation.

Table 27: Comparison of data of Tesla ZEVs and Ford ZEVs from 2009[2]

	2009	2010	2011	2012	2013	2014	2015
Tesla ZEV Balance	0	0	31.605	276.08	221.55	4,988.00	3,530.00
ZEVs transferred by Tesla	0	0	0	1311.52	650.195	1554.805	80,227.00
Ford ZEV received*	0	0	3.959	0	0	665	35,000.00

* All other data retrieved from Tesla

Source: https://www.arb.ca.gov/msprog/zevprog/zevcredits/archive/archive.htm

From the official website of CARB, we can see that Tesla is only involved in the production of electric vehicles, and has long been the largest seller in the ZEV market.

Due to the relatively small number of enterprises involved in California's ZEV program, the ZEV secondary market is not an open market. But looking at Tesla's earnings, we can see that Tesla focused on ZEV transactions at the beginning. From 2012, Tesla's car production soared, which led to a substantial increase in its ZEV holdings, thus pushing up its ZEV revenues. In 2013, Tesla ZEV revenues reached its highest proportion, accounting for 43%!

Although Tesla's ZEV revenues are no longer included in the total profit from 2015, due to changes in accounting standards, according to publicly available data, , ZEV revenue for Tesla in 2016 Q3 was still $139 million!

According to a former colleague of the author, a broker in the California carbon trading market,

[2] CARB LEV III system includes many differenet classifications, including ZEV, NEV, PZEV and so on. The author just lists ZEV for easy understanding.

at present Tesla attaches great importance to ZEV revenues in its internal operations, with an independent team, statistics and data to directly inform the ERP, PLM and BOM systems, annual trading strategies which set the level of market trading according to the rules of CARB, and authorization for independent trading in each quarter, allowing for changes in trading strategy adjustment according to the market. In the secondary market, Tesla not only trades ZEV credits with automobile enterprises, but also maintains daily contact with OTC broker and trading institutions to maintain active trading, and maximize profits.

Table 28: Comparison of Telsa revenue from ZEV and gross profit from 2009[3]

	Tesla revenue from ZEV and GHG credits sales (USD)	Tesla Gross Profit (USD)	Share of ZEV revenue (%)
2009	NA	NA	NA
2010	2,800,000	NA	NA
2011	2,700,000	NA	NA
2012	40,500,000	NA	NA
2013	194,400,000	456,300,000	43%
2014	216,300,000	881,700,000	25%
2015	NA	923,500,000	NA

Although the change of CARB standards in 2015 will affect the volume of ZEV credits that Tesla models will receive in the future, I believe that Tesla has accumulated carbon management capacity and trading strategies in the carbon market which will help it achieve better economic returns given the trend towards promoting carbon pricing systems globally.

Tesla may also participate in China's new energy vehicle allowance trading in the future. Are China's national automobile enterprises ready to address China's carbon trading policy? If Tesla gains market share in China's electric automobiles market, will it also be selling your company its carbon allowances?

I am very delighted to find that China's new energy enterprise, BYD, appears in the 2015 CARB data. Not only can BYD vehicles get access to the U.S. market, but carbon management can also become a source of revenue for BYD rather than a cost!

[3] From Telsa's published financial report. Note: the end of the financial year for Telsa is December 31 of every year, the date for CARB is September 30 of each year.

7 National carbon market outlook

The general view is that the reduction of carbon emissions requires tightening of belts, but in fact, it can create enormous economic value. The Paris Agreement is bound to bring great opportunities for the carbon emission reduction market, and accelerating China's implementation of a carbon finance strategy is an urgent priority.

Allowances in eight industries, including the petrochemicals, chemicals, building materials, iron and steel, nonferrous metals, paper, electricity and aviation industries, are estimated to be as high as 5 billion tons, accounting for 50% of the China's total emissions, making it the world's largest market. Of course, a number of insiders have admitted that the next two years is more for perfecting the design and getting the national market up and running, so the real benefits will take time. At present, the pilot scheme carbon price is about 15-30 RMB/t. For the national ETS, the initial carbon price should not be too high. With the average price of the existing 7 pilots for reference, and preliminary estimates, the spot trading volume should be 1.2-8 billion RMB/year.

Jiang Zhaoli, Deputy Director of NDRC's Climate Division, said that the next step should be the comprehensive assessment and filing of internal management and personnel qualifications of the third-party verification institutions. It is expected some of the verification agencies will be sifted out, to ensure third-party verification institutions are qualified and capable when the national carbon market starts.

At the same time, there will be seven or eight trading institutions at the national level in the future, undertaking market transaction services for the unified national market. The trading institutions will adhere to unified transaction rules, patterns and management requirements, and an enterprise will be able to choose from any trading institutions. Moreover, the central government is actively preparing the allowance registry which will be hosted by local governments.

According to NDRC's preliminary estimate, in the long run, a carbon price of 300 RMB/t will help to guide the shift to a low-carbon, green economy. While trading in the carbon market is currently based mainly on the spot price, this will be gradually improved with the timely introduction of futures products with a certain degree of leverage. According to the four core indicators of power, demand, risk and maturity, the introduction of such financial products as carbon futures, carbon forwards, carbon bonds and carbon funds, are basically mature. However, the large-scale introduction of hedging products should of course wait until after 2020.

By 2020, the introduction of futures will further expand the carbon market. At present, the seven pilots have issued allowances of about 1.2 billion tons of carbon dioxide equivalent (CO_2e), and online trading volume is about 200 million tons, with an overall turnover rate of less than 20%. This compares with the European carbon market (EU ETS), where the spot trading turnover rate is more than 500%. Considering the carbon market in Europe, China's carbon market transaction scale will likely be enlarged to 60-400 billion RMB if carbon futures are included in the carbon market. Previously, the carbon finance working group of China's Green Finance Committee issued its "China Carbon Financial Market Research Report", which estimates the scale of China's carbon finance market in the future. The preliminary

analysis shows that after 2017, if carbon trading tools are established, a conservative estimate of the scale of transaction is 60-80 billion RMB, with a median estimate of 417-556 billion RMB; after 2020, the scale of transactions may reach at least 100-120 billion RMB, with an optimistic range of up to 3,750- 4,500 billion RMB.

In addition, offset mechanisms are also important, effectively connecting the carbon market, renewable energy and industrial emissions, etc. This is an important area for reducing emissions. Of course, in the early stages of the carbon market, the main bodies involved in transactions and regulation are enterprises, with allowance trading as the main object.

Of course, China's carbon market is mainly a factor market and the market is a tool to achieve emissions reduction, so it is not comparable to a stock market or bond market. The carbon market should be developed step by step, implementing price guidance by controlling the equilibrium between supply and demand, and ultimately playing a positive role in promoting economic restructuring and transformation of the energy system.

Commentary 16: The latest progress in the development of the national ETS and prospects for the next year

Special commentator: Mr. Bo Chen, Associate Professor, Central University of Finance and Economics (CUFE).

The national carbon market is expected to be officially launched in 2017. Given the coexistence of multiple pilot markets, the shape of the national carbon market is an issue to be resolved. The Carbon Finance Lab Research Group believes that the construction of a national carbon market should comply with the laws of the market, and in particular respect the needs of investors. Early participants in the pilot markets have formed short-term, medium-term and long-term judgments and consensus on the national carbon market, and these valuable experiences should be integrated into the design of the national carbon market. Therefore, the carbon finance laboratory has compiled the China Carbon Market Confidence Index (CMCI), to track and evaluate the expectations and confidence of market participants for the development of China's carbon market

In 2016, the CMCI asked 17 questions looking at the carbon market from multiple dimensions, including price fluctuations, demand, risk perception and investment confidence in the market. This allows us fully understand the main market participants' confidence and expectations. We also asked 5 additional questions in relation to price expectations and factors influencing the national carbon market. Based on these 22 questions, the CMCI index system was developed, including an overall index and four sub-indices (price index, demand index, risk index and investment index).

The 2016 CMCI overall index was 61.2, slightly higher than the average (50), while the price index was 55.4, the demand index was 54, the risk index was 58, and the investment index was 77.6, all higher than the average. 2016 CMCI index reflects the following circumstances:

(1) Cautious optimism in the short term

Due to the lack of liquidity in the market, the overall scale of the market is small, and the volatility is irregular, resulting in the market environment not being ideal and limited enthusiasm from market participants. However, these problems have not yet brought significant systemic risk, the balance of risk and return is within a reasonable range, and there

are still some investors trying to find opportunities for profit.

(2) Increasing value of investment in the long term

The investment index indicates that the decision-makers have successfully given robust policy expectations to the market. Most participants have formed a strong consensus: the carbon market is likely to become an emerging commodity market worth more than 10 billion RMB, and a new field for social investment. This has created the necessary conditions for institutional investors.

(3) Consensus on price has not yet formed in the market

Less than half of the market participants believe that the price level in the pilot regions is within a reasonable range. This conclusion brings great challenges for the effectiveness of the pilot markets, and a credible price benchmark for the national carbon market is yet to be identified. In contrast, CCERs are widely believed to be priced too low. In the short term, the allowance price will show a stable trend, with expected volatility of less than 20%.

(4) Lack of liquidity difficult to resolve in the short term

The price index and the demand index are both low, indicating that the market has displayed a stable pattern of low liquidity. We should be wary of this risk of market failure. The main reason for the liquidity dilemma is the lack of investors' expectations of rising prices and confidence in profits from trading. The downturn in the price index shows that policy makers have significant work to do in order to create the expectation of price increases.

Unfortunately, the optimistic long-term view of the value of the carbon market has not completely translated in to market participants' short-term investment plans. This is mainly because the liquidity downturn and weak price has led to weak trading motivation for investors. This poses a significant challenge for the construction of the national carbon market. The national carbon market is an iterative process of continuous gaming between stakeholders. However, due to the existence of the pilots, it does not need to be built from scratch.

The 2016 CMCI index essentially draws a picture of investor expectations of the national carbon market. Although the information is still not comprehensive and precise, for some basic issues, consensus in the market has formed, with profound implications for the national carbon market. This consensus includes price range and volatility, market scale, risks and factors influencing prices. The CMCI index indicates that the national carbon market is expected to reach a scale of 20-50 billion RMB, allowance prices are expected to be 20-30 RMB/t, and CCER prices are expected to be 8-15 RMB/t.

Mr. Bo Chen, Associate Professor, International Research Institute on Green Finance, Central University of Finance and Economics (CUFE)
Chief of the Carbon Finance Lab

The Institute of Green Finance at the Central University of Finance and Economics is a leading international think-tank on green finance, actively participating in policy making and product development including green bonds, green finance pilots and the carbon trading

market, and has a good reputation in the development of the domestic market.

8 List of policy documents

Table 29: 2016 polices in the carbon market

Administrative regions	Issuance time	Document name	Document number
Central	2016/4/13	Notice of general office of the State Council on issuing 2016 legislative work plan	Guoban Fa〔2016〕No.16
Central	2016/7/18	Notice of the office of the State Forestry Administration on issuing action plan for forestry adaptation to climate change (2016-2020)	Banzaozi〔2016〕No.125
Central	2016/8/3	14 departments issued Interim measures of public resources trading platform administration	No.39
Central	2016/11/4	Notice of State Council on issuance of the 13th Five-Year plan for controlling greenhouse gas emissions	Guo Fa〔2016〕No.61
Beijing	2016/1/4	Notice of new selection and registration of the third party verification institutions and verifier for 2016 carbon emissions trading	Jing Fagai〔2016〕No.3
Beijing	2016/1/11	Publicity notice of new seletion and registration results of the third-party verification agencies and verifiers for 2016 Beijing carbon emissions	
Beijing	2016/1/21	Notice of publishing the list of the third-party verification institutions and verifiers for 2016 Beijingcarbon emissions	Jing Fagai〔2016〕No.105
Beijing	2016/3/15	Notice of Beijing DRC on releasing new regulated units list in 2015 after the expansion of the carbon market	Jing Fagai〔2016〕No.393
Beijing	2016/3/24	Notice of Beijing DRC, Inner Mongolia DRC, Hohhot Municipal overnment and Ordos Municipal Government of jointly developing Beijing-Inner Mongolia cross-regional carbon emissions trading.	Jing Fagai〔2016〕No.395
Beijing	2016/9/23	Notice of Beijing DRC, Beijing Municipal Bureau of statistics, on publishing 2016 Beijing key emission units and reporting units list	
Beijing	2016/9/28	Notice on key emission units checking 2016 CO2 allowances	Jing Fagai〔2016〕No.1639
Tianjin	2016/3/19	Notice of the municipal DRC on implementing enterprises carbon emissions report and verification	
Tianjin	2016/7/1	announcement of Municipal DRC on 2015 compliance of Tianjin enterprises included in carbon emissions trading pilot	
Shanghai	2016/2/22	Shanghai DRC issued Shanghai shipping industry GHG emissions accounting and reporting method	Hu Fagai Huanzi〔2016〕No.10

Shanghai	2016/2/24	Notice of issuing the list of units (2016 Edition) included in Shanghai carbon emissions trading	Hu Fagai Huanzi〔2016〕No.9
Shanghai	2016/3/25	Notice on the organizing Shanghai key units 2015 energy utilization and GHG emissions reporting	Hu Fagai Huanzi〔2016〕No.19
Shanghai	2016/8/8	Announcement of Shanghai environment and energy exchange on suspending CCER transactions	Hu Huangjiao〔2016〕No.27
Shanghai	2016/11/16	Notice on the opening of trading account and special fund account of enterprises included in Shanghai carbon emission trading	Hu Huangjiao〔2016〕No.42
Shanghai	2016/11/16	Notice of Shanghai DRC on issuing Shanghai 2016 carbon allowances allocation scheme	Hu Fagai Huanzi〔2016〕No.138
Shanghai	2016/12/15	Notice on carrying out filling 2017 carbon emission monitoring plan	Hu Fagai Huanzi〔2016〕No.157
Guangdong	2016/1/8	trading rules of Guangzhou emissions exchange	
Guangdong	2016/2/1	Notice of the general office of Guangdong Provincial People's Government on issuing implementation plan of integration and establishment of unified public resource trading platform in Guangdong province	Yuefu Ban〔2016〕No.7
Guangdong	2016/2/18	Notice of Guangdong DRC on promoting 2015 enterprises carbon emissions report verification and allowance compliance	Yue Fagai Qihou〔2016〕No.664
Guangdong	2016/2/29	Notice of the supplementary information on the Guangdong guidelines for enterprises carbon emission information reporting and verification standards	Yue Fagai Qihou〔2016〕No.793
Guangdong	2016/3/25	Notice of Guangdong DRC forwarding green financial bonds guidelines issued by Shanghai Pudong Development Bank	Yue Fagai Qihou〔2016〕No.1266
Guangdong	2016/7/8	Notice of Guangdong DRC on issuing the implementation plan of Guangdong province 2016 carbon emission allowances allocation	Yue Fagai Qihou〔2016〕No.430
Guangdong	2016/7/21	Notice of Guangdong DRC on verification of history GHG emission information report of enterprises to be included in the national carbon trading market	Yue Fagai Qihou〔2016〕No.3393
Guangdong	2016/11/4	Announcement on permitting the fund and other non-corporate bodies to open an account and increase investors' position	
Shenzhen	2016/3/2	Announcement on the repurchase of carbon assets trading business without price limit	
Shenzhen	2016/9/18	Notice of Shenzhen Municipal DRC on carrying out 2016 carbon emissions trading	
Hubei	2016/3/11	Hubei DRC publicity of Hubei carbon emission verification institutions list (second batch)	
Hubei	2016/3/18	Notice of the office of the provincial DRC on the establishment	E Fagaiban Fa

		of Expert Committee on carbon emission trading	〔2016〕No.32
Hubei	2016/4/22	Announcement of carbon allowances forwards products listing	
Hubei	2016/4/22	Hubei emissions exchange carbon allowance spot forward trading rules	
Hubei	2016/7/8	Notice of provincial DRC on 2016 Hubei carbon emission offset mechanism	E Fagaiban Fa 〔2016〕No.322
Hubei	2016/7/15	Announcement on adjustment of carbon emissions trading product HBEA daily range limit	
Hubei	2016/7/18	Proposal for participants in Hubei carbon market	
Hubei	2016/10/20	Decision on Amending the first item of article fifth of the Interim Measures for carbon emissions management and trading in Hubei	Zheng Ling No.389
Hubei	2016/12/8	Notice of the provincial people's Government on the issuance of Hubei province13th Five-Year plan in addressing climate change and energy conservation planning	E Zheng Fa 〔2016〕No.62
Chongqing	2016/2/22	Notice of the Chongqing Municipal DRC on the list of enterprises to be included in the national carbon emissions trading system	Yu Fagai Huan 〔2016〕No.173
Chongqing	2016/6/14	Notice of Chongqing Municipal DRC on the verification of enterprises carbon emissions	
Chongqing	2016/11/11	Notice of Chongqing Municipal DRC on reporting 2016 carbon emissions	Yu Fagai Huan 〔2016〕No.1317

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