THE CHINESE ENVIRONMENTAL POLICY RESEARCH WORKING PAPER

Issue 11 Volume 4 No.1 April 2017

Chinese Academy for Environmental Planning
http://www.caep.org.cn

China's Green Financial Policies 2016

GE Chazhong, CHENG Cuiyun, WENG Zhixiong, DONG Zhanfeng, WU Bo

Forword

Editor in Chief: Prof. WANG Jinnan



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

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

CAEP founded in 2001 is a research advisory body supporting governments in the development of key environmental planning, national environmental policies, and major environmental engineering projects. In the past more than 10 years, CAEP accomplished the development of the overall planning of national environmental protection for the 10th, 11th and 12th Five-Year Plan periods; water pollution prevention and control planning for key river basins; air pollution prevention and control planning for key regions; soil pollution prevention and control planning; and some regional environmental protection plans. In the same period of time, CAEP also actively engaged in research on such topics as green GDP, environmental taxation, emission trading, ecological compensation, green financing, etc. By so doing, CAEP has become an indispensable advisory body in the environmental decision-making in mainland China. According to *2013 Global Go To Think Tanks Report and Policy Advice* published by University of Pennsylvania, CAEP was ranked 31 in the field of environment in the world. Many of CAEP's research results and project outcomes regarding environmental policies have drawn great attention of decision makers and international institutions, and have been utilized to contribute to the formulation of national environmental policies concerned.

The Chinese Environmental Policy Research Working Paper (CEPRWP) is a new internal publication produced by CAEP for the purpose of facilitating the academic exchange with foreign colleagues in this field, in which the selected research papers on environmental policies from CAEP are set out on the irregular basis. It is expected that this publication will not only make CAEP's research results on environmental policies be known by foreign colleagues but also serve as a catalyst for creating opportunity of international cooperation in the field of environmental policies, and environmental economics in particular, with a view of both the academic research and practical policy needs.

Green finance has exerted a wide range of influence in China and attracted great attention of the international community. Both policy breakthroughs and in-depth practices have been made with the introduction of policy measures, such as the design by the State Council and inclusion into the G20 Hangzhou Summit. This report is prepared to help the public better understand the policies related to green finance in 2016. The task of the Green Finance Committee of China Society for Finance and Banking (GFC-CSFB) received strong support from all sides, noticeably, Ministry of Environmental Protection, Research Bureau of the People's Bank of China (PBOC), Research and Development Department of China Beijing Environment Exchange and China Bond Rating Co., Ltd.

Contents 》

1. TOP-LEVEL DESIGN AND POLICY DEVELOPMENT

Breakthroughs have been achieved in green financial policies. "Green finance" has been for the first time included in the five-year plan for national economic and social development and the programmatic document for ecological civilization construction and thereby upgraded from conceptual idea to national strategy. Fully recognizing the significance and role of green finance, the CPC Central Committee and the State Council have highlighted the development of green finance in various forms towards a new chapter. A green financial policy system and government-led policy framework, which is the first of its kind in the world, have been established. Green finance regulations and supporting rules and measures are gradually in place and inject an impetus to the implementation of green financial policies.

1.1 Attached great importance by high–level green finance

Green finance is an important measure to achieve green development and a major component of the supply-side structural reform. The leaders of the CPC Central Committee, State Council and relevant ministries have elaborated the importance of green finance in diverse forms on different occasions.

Xi Jinping, General Secretary of the CPC Central Committee, State President, Chairman of the CPC Central Military Commission, shared his ideas on the development of green finance in the 27th meeting of the Central Leading Group for Deepening Overall Reform chaired and led by himself on August 30, 2016. The meeting examined and adopted the Guideline for Establishing a Green Financial System (hereinafter referred to as the "Guideline"), recognizing green finance as an important pathway to green development and an important part of the supply-side structural reform. According to the statement, innovative financial mechanisms will be introduced to guide and stimulate social capital to green industries while effectively curbing polluting investment. A wide range of financial instruments and relevant policy incentives will be leveraged to serve for green development, covering green credit, green bonds, green stock indices and related products, green development fundVGFGFVs, green insurance and carbon finance. The meeting also required strengthening the regulation of green financial business and products by improving rules and standards. From the perspective of national strategy, Xi made a systematic exposition of green finance which provides a top-level design and strategic plan for promoting green development.

The leaders of relevant ministries and commissions stressed on different occasions the development of green finance in different forms. On April 16, 2016, Zhou Xiaochuan, PBOC Governor, called on nations to develop green finance and contribute to sustainable global green economy at a seminar co-sponsored by the Paulson Family Foundation and Green Finance Committee of China Society for Finance and Banking (GFB-CSFB) in Washington. In August 2016, Chen Yulu, PBOC Vice Governor, said at the Tianjin Green Finance Forum that China needs to press ahead with institutional framework and policy system, product innovation, concept popularization and extension in the infancy of green finance despite a noticeable pace of development. He emphasized efforts in four aspects to boost green finance: (a) improve positive incentives that enable governmental functions without undermining the market's decisive role; (b) actively beef up capacity building through technical improvement and business training, so that financial institutions can be more capable of green financial product development, environmental risk management, green sustainable investment and cultivation of green financial professionals; (c) deepen international cooperation; and (d) let the local governments play their indispensable role in promoting green finance. In March 2016, Li Ganjie, former Vice Minister of the Ministry of Environmental Protection (MEP) and Secretary General of the China Council for International Cooperation on Environment and Development (CCICED), called for innovative green financial policies to attract social capital, including international capital, into the field of ecological environment and accelerate the formation of new economic growth points while attending the CCICED 2016 Roundtable Meeting.

1.2 Top–level policy support for green finance

Adopted at the 5th Plenary Session of the 18th CPC Central Committee, the Proposal of the CPC Central Committee on Formulating the 13th Five-Year Plan for National Economic and Social Development puts forward the groundbreaking principles of innovative, coordinated, green, open and shared development, wherein "green" is considered the bottom color of social and economic development in the five years. The outline of the national economic and social development for the first time proposes to develop green finance and establish green development funds. Green finance has become an important direction to deepen the financial reform in the 13th Five-Year Plan (FYP) period.

The Opinions of the CPC Central Committee and the State Council on Accelerating the Construction of Ecological Civilization (hereinafter referred to as the "Opinions"), printed and distributed by the CPC Central Committee and the State Council on April 25, 2015, makes important arrangements to promote ecological progress, including market-oriented mechanisms in favor of development in fields related to green finance. The measures include establishing the energy savings and emissions trading systems, deepening the pilot and forming the national market; speeding up water rights trading pilot and nurturing and regulating the market; expanding the scope of payment-based use and trade pollution rights and developing the market. As far as green finance is concerned, the Opinions focuses more on the trading of environmental rights and further deepens the markets of pollution rights and emissions rights, thereby guiding the market development of environmental rights in China.

The Integrated Reform Plan for Promoting Ecological Progress (hereinafter referred to as the "Plan") provides the top-level design and deployment of reforms that outline the basic institutional framework for promoting ecological progress. It is conducive to earlier formation of a full-fledged ecological civilization system characterized by clear property rights, multi-party participation and incentive-restraint combination. The Plan makes it clear "to establish a green financial system": (a) green credit will be promoted, with research being undertaken into adopting methods such as government interest subsidies to boost the level of support. All types of financial institutions are encouraged to step up grants of green loans. Requirements for the due diligence of borrowers as well as their legal responsibilities concerning environmental protection will be clarified; (b) efforts will be stepped up to further develop the systems related to capital markets. Research will be conducted to explore the establishment of a green stock index and the development of relevant investment products, and studies will be undertaken to explore the issuance of green bonds by banks and enterprises, encouraging the securitization of green credit assets; (c) support will be given for the launch of multiple types of green development funds, the operations of which will be market-based. A mechanism will be established for the mandatory release of environmental protection information by listed companies; (d) guaranty mechanisms for energy-efficient, low-carbon, and eco-friendly projects will be improved, and the level of risk compensation increased; (e) compulsory liability insurance system for environmental pollution will be established in sectors involving high environmental risks; (f) a green rating system as well as a non-profit system for calculating environmental costs and evaluating environmental impact will be established; and (g) cooperation of all types with other countries will be promoted in green finance.

The Plan further details the trading of environmental rights. On the whole, the content covers three aspects: (a) promote the trading of energy-use rights and carbon emissions rights. Combined with efforts to see that major energy-consuming organizations increase energy efficiency and to subject new projects to energy reviews, the trading of energy saved on projects will be allowed and will progressively move toward the trading of energy-use rights based on the cap system for energy consumption. A trading system and a measurement and verification system for energy-use rights will be established. Energy performance contracting will be promoted. Trials of carbon emissions rights trading will be deepened, a national exchange for carbon emissions rights will be progressively created, and a national plan for setting the total trade and quota allocation of carbon emissions rights will be formulated. The carbon trading registration system will be improved and a regulatory system will be established for the carbon emissions rights exchange; (b) promote the trading of pollution rights. On the basis of the cap system for enterprise pollution emissions, improvements will be made as quickly as possible to the granting of initial pollution rights, and coverage will be expanded to include more pollutants. Working from the foundations provided by the current mechanism for granting pollution rights to administrative regions, and on the basis of the best industry-wide levels of pollution emissions, the mechanism will be gradually strengthened to ensure the cap system for enterprise pollution emissions is implemented and the trading of pollution rights creates incentives for emissions reductions at the level of the individual enterprise. In key river basins and key areas for air pollution, implementation of pollution rights trading across administrative regions will be carried out as appropriate. Trials for the payment-based use and trading of pollution rights will be expanded to include more areas where conditions are appropriate. Efforts will be stepped up to improve the pollution rights exchange. Regulations will be developed on granting pollution rights, collecting and using pollution rights use fees, and setting trading prices; (c) promote the trading of water rights. Combined with efforts to establish an effective mechanism for compensating the expenses of water ecosystem protection and conservation, water-related rights will be appropriately defined and allocated and ways of trading water rights between regions, between river basins, between the lower and upper reaches of rivers, between industries, and between water users will be explored. Research will be conducted into formulating regulations concerning the trading of water rights, to clearly define the scope and types of tradable water rights, the trading entities and time frames, the mechanisms for determining trading prices, and the rules for the operation of the exchange. An exchange for water rights will be developed.

1.3 Initial policy framework for green finance

On August 31, 2016, the Guideline for establishing a green financial system, which elevates the green financial system to the national level, was jointly printed and distributed by MEP, PBOC, Ministry of Finance (MOF), National Development and Reform Commission (NDRC), China Banking Regulatory Commission (CBRC), China Securities Regulatory Commission(CSRC), and China Insurance Regulatory Commission (CIRC). The document forms the world's first relatively complete government-led policy framework for green finance, covering connotation, incentive mechanisms, supporting mechanisms, modes and instruments. It not only further deepens the top-level design for green finance, but also builds a practicable element system that enables the public and private sectors to provide different varieties of green financial products and tools.

(1) Clearly define green finance. For the first time, the Guidance clearly explains the meanings of green finance and green financial system. Green finance refers to financial services provided for economic activities that are supportive of environment improvement, climate change mitigation and more efficient resource utilization. These economic activities include investment and financing, operation and risk management for projects in areas such as environmental protection, energy savings, clean energy, green transportation and green buildings. Green financial system refers to the institutional arrangement that utilizes financial instruments such as green credit, green bonds, green stock indices and related products, green development funds, green insurance, and carbon finance, as well as relevant policy incentives to support the green transition of the economy.

(2) Integrate incentive mechanisms to boost green finance. To support green credit, the Guideline put forward "exploring re-lending operations and establishing specialized guarantee mechanisms", "exploring ways to incorporate green credit into macro-prudential assessment framework", "using key indicators of green credit performance and green banking evaluation results as important

references" and "allowing projects supported by green loans to apply for fiscal subsidies on interest payments in accordance with regulations". These mechanisms are expected to reduce the financing costs of enterprises and strengthen systemic risk regulation of the financial system. "Local governments and market institutions can support green bond issuance through specialized guarantees and credit enhancement mechanisms", and this provides policy support to reduce the financing costs of green bonds. The Guideline "explores supportive measures to promote green finance at the local level, such as re-lending operations, macro-prudential assessment framework and capital market instruments" and "encourages and supports social capital investment in green industries by such measures such setting up specialized green guarantee programs and establishing green development funds".

(3) Highlight independent third-party rating agencies and environmental information disclosure. The Guideline explains the role of third parties in green finance in two aspects. (a) It has for the first time clarified in a document the role of third-party institutions in the green bond rating, proposing to "formulate standards for third-party green bond verification and green credit rating and standardize the quality requirements for third-party verification of green bonds", "encourage rating agencies to evaluate, in their rating exercises, the green performance of the issuers, the greenness of the projects, as well as the impact of environmental costs on creditworthiness". (b) It make it clear to "cultivate the capability of third-party professional organizations to provide environmental information disclosure services for listed enterprises and bond issuers and encourage third-party professional organizations to participate in the collection, research and release of corporate environmental information and analytical reports". This gradually establishes and improves the mandatory environmental information disclosure system for listed companies and issuing enterprises.

(4) Establish green development funds to deepen the public-private partnerships (PPPs).

The Guideline supports the establishment of three kinds of green development funds: (a) "set up a national-level green development fund by integrating the central finance with existing special funds, such as energy conservation and environmental protection funds"; (b) "encourage local governments and private capital to launch regional green development funds"; (c) "encourage private capital and foreign capital to set up all kinds of private green investment funds". These green development funds will provide guidance and policy signals for green investment. The PPP model is favored in green industries. The Guideline encourages the bundling of energy saving and emission reduction projects, environment protection projects and other green projects with related higher-return projects and supports a green service charge mechanism for projects with a "public goods" nature.

(5) Improve the environmental rights trading market and diversify innovative financing tools. According to the Guideline, it is necessary to develop different kinds of carbon financial products. A unified national emissions trading market and a globally influential carbon pricing center will be built

and carbon financial products and derivatives developed, such as carbon forwards, carbon swaps, carbon options, carbon leases, carbon bonds, carbon asset backed securities and carbon funds. Markets for environmental rights, including pollution rights, energy use rights and water rights, will be established, and inter-regional trading of pollution rights will be promoted in key basins and key areas of air pollution. Financing instruments based on environmental rights will be developed, with a view to expanding the green financing channels for enterprises.

1.4 Joint efforts of ministries and commissions to promote policy implementation

As green finance has risen to the national strategy, the regulations and measures in related fields are gradually in place and put into practice and especially the green bond policy system is maturing. PBOC, NDRC and securities exchanges have rolled out a series of policies that guide the issuance of green bonds by defining green projects, standards, entities and ways of issuing green bonds, and fund raising and use.

(1) Major policy breakthroughs achieved in green bond market. Green bond market policies are mainly sourced from PBOC, NDRC and securities exchanges. The PBOC announcement on issuance of green financial bonds which defines green financial bonds marks the official launch of the green bond market in China. The Green Bond Guidelines issued by NDRC provides policy support for the development of green bonds. By introducing policies on green corporate bonds, the Shanghai Stock Exchange and the Shenzhen Stock Exchange open up new lower-cost financing channels for financial institutions and green companies.

(2) Parallel work to develop the green bond market. (a) On December 22, 2015, PBOC issued the announcement to allow financial institutions established in accordance with the law, such as development banks, policy banks, commercial banks and finance companies of enterprise group, to apply for the issuance of green financial bonds, marking the green bond market officially started in China. Prepared by GFC-CSFB, the concurrently issued Green Bond Endorsed Project Catalogue (2015) clearly defines green financial bonds and green projects and stipulates the administrative measures for funds raised in the duration of bonds and the standard information disclosure mechanism, taking into account multi-dimensional environmental efficiency standards. (b) At the end of December 2015, NDRC released China's first Green Bond Guidelines significant for promoting green development, energy conservation and emissions reduction, addressing outstanding environmental problems and climate change, and driving economic restructuring. The document clarifies the applicable scope of green bonds and priority support for 12 types of projects, including technological transformation projects for energy conservation and emissions reduction, green urbanization projects and clean and efficient energy utilization projects. It brings forward green bond approval requirements that adjust the prevailing policies for corporate bonds; supports the issuance of green bonds to optimize the debt structure by allowing enterprises to use not more than 50% of raised funds for the repayment of

bank loans and replenishment of working capital; encourages enterprises to adapt the green bond issuance program to the return of project funds; and encourages third-party pollution treatment companies to issue a collection of green bonds. The relevant policies are also clearly put: to encourage the local governments to support the issuance of green bonds by way of investment subsidies and guarantee subsidies and encourages "bond-loan" credit enhancement for green projects and integrated management of bonds and loans by commercial banks. (c) In March and April 2016, the Shanghai Stock Exchange and the Shenzhen Stock Exchange issued the Notice on the Pilot Issuance of Green Corporate Bonds and the Notice on the Pilot Business of Green Corporate Bonds respectively to encourage institutional investors to invest in green corporate bonds. Green corporate bonds are brought under the current framework of corporate bond rules, and targeted requirements reflecting international green bond principles are set out for the use of raise funds and information disclosure. Third-party professional verification is favored to ensure that funds raised through green bonds are invested in green industries. The dedicated channels for green bond application and review will be established to improve the efficiency of pre-examining green bonds or listing conditions.

2. Market-oriented active practice

It is market players that practice green finance while the government formulates green financial policies. China has made a step forward in many aspects of green finance, such as green funds, green stock indices, green bond indices, green debt certification and disclosure, green rating methods, environmental stress test, carbon financial products and international cooperation. The market is growing where players are diversified and green financial products and derivatives become more innovative.

2.1 Developing green bond market

Driven by the PBOC announcement, the NDRC guidelines and the exchanges' pilot rules, the green bond market in China has been continuously developed and expanded with a continued rise in the number and scale of issued green bonds. The appearance of "green financial bonds" and "green corporate bonds" has injected a powerful impetus to the development of green finance in the country.

Expanding issuance. A rich variety of green bonds have been issued, covering financial bonds, corporate bonds, medium term notes, asset-backed securities, panda bonds and non-public directional debt financing instruments. At the end of 2016, the issuance of labeled green bonds on the Chinese bond market amounted to RMB 205.231 billion, involving 33 issuers and 53 types of bonds, such as financial bonds, corporate bonds, medium term notes, international agency bonds and asset-backed securities. The types and places of green bond issuance are as shown in Table 1 and Table 2 respectively.

Table 1 Green bond issuance by types

Type	Amount (RMB 100 million)	Number of issues	Average issue size (RMB 100 million)
Financial bonds	1,550.00	21	73.81
Enterprise bonds	140.90	5	28.18
Corporate bonds	182.40	14	13.03
Medium term notes	82.00	8	10.25
International agency bonds	30.00	1	30.00
Asset-backed securities	67.01	4	16.75
Total	2,052.31	53	38.72

Source: Annual Summary of China Green Bond Market 2016, Institute of International Green Finance, Central University of Finance and Economics.

Table 2 Green bond issuance by places

Place	Amount (RMB 100 million)	Proportion	Market share	Number of issues	Proportion	Market share
Inter-market	140.90	7.10%	4.69%	5	10.20%	4.61%
Shanghai	182.40	9.19%	10.49%	14	28.57%	10.43%
Shenzhen	0.00	0.00%	3.76%	0	0.00%	3.70%
Interbank	1662.00	83.72%	81.02%	30	61.22%	81.26%
Total	1985.30	100.00%	100.00%	49	100.00%	100.00%

Source: Annual Summary of China Green Bond Market 2016, Institute of International Green Finance, Central University of Finance and Economics.

Single issuers from diverse industries. The 29 issuers of green bonds (credit bonds) in 2016 came from 8 industries, including finance, mining, power and energy, water, manufacturing, transportation, business services and goods, and integrated industries. Noticeable is that in the banking sector, a total of 11 banks participated in the issuance. These issuers include 17 central or local state-owned enterprises (SOEs) and a few private enterprises, as shown in Table 3 and Table 4 below.

Table 3 Green bond issuance by industries

Industry	Number of issuers	Number of issues	Amount (RMB 100 million)
Materials II	2	2	8
Diversified finance	1	1	5
Utilities II	7	12	256.4
Automotive and automotive components	1	1	25
Business and professional services	2	2	13.9
Banking	11	22	1,580
Transportation	1	1	20
Capital goods	4	8	77
Total	29	49	1,985.3

Table 4 Green bond issuance by issuers

Corporate nature	Number of issuers	Number of issues	Amount (RMB 100 million)
SOEs	17	28	526.4
Public enterprises	5	14	1395
Private enterprises	6	6	33.9

Source: Annual Summary of China Green Bond Market 2016, Institute of International Green Finance, Central University of Finance and Economics.

China's first green financial bonds. On January 27, 2016, Shanghai Pudong Development Bank issued China's first green financial bonds worth RMB 20 billion at a coupon rate of 2.95% annually. The three-year bond attracted orders twice the size of the offer. Compared with ordinary bonds, green financial bonds give rise to a green financial development mechanism that provides policy guidance and incentive in a government-led, market-oriented approach and reflects social reputation and market constraints. This will effectively stimulate the commercial Banks to enhance the determination and capacity of green development.

China's first green corporate bonds. On April 21, 2016, Haitong Securities and Industrial and Commercial Bank of China (ICBC) co-underwrote and successfully issued China's first green corporate bonds 2016 BAIC Group Green Bonds (01) at a coupon rate of 3.45%. A total of RMB 2.5 billion was raised from the seven-year bond, of which RMB 1.5 billion will be used for technical renovation and capacity expansion of Zhuzhou Base of BAIC Group and RMB 1 billion for working capital replenishment.

Chinese institutions have successfully issued large-scale green bonds abroad. From the beginning of the year to now, China issued RMB 200 billion labelled green bonds at home and aboard. On July 5, 2016, the Bank of China (BOC) successfully issued green bonds worth USD 3 billion in US dollars, Euros, and Chinese Yuan at fixed and floating coupon rates. It marks the largest-ever most diverse issuance of green bonds in the international market. The two-year, three-year, or five-year bonds were simultaneously issued by its Luxembourg Branch and New York Branch and listed on Luxembourg Stock Exchange and Hong Kong Stock Exchange. The Euro denominated bonds are the first green bonds issued by Chinese institutions and listed on the European continent. The RMB denominated bonds are the first and largest-ever offshore bonds issued by Chinese institutions in the United States.

China published its first criteria for green bonds endorsed projects. On December 13, 2016, China Bond Rating Co., Ltd announced the green bond assessment and certification methodology, setting standards for rating green bonds endorsed projects. According to the innovative criteria and methods, the environmental benefits of projects are quantitatively assessed and rated as dark green, green, light green or non-green, ensuring that the funds raised are used for green projects to reduce the risk of greenwash.

2.2 Advancing green credit market

Green credit issued by banks continues to expand in China. A number of policies concerning green credit management have been introduced and significantly stimulated green credit business. The Green Credit Statistical System printed and distributed by CBRC, for example, requires 21 major banking institutions to collect green credit statistics every six months, covering loans of enterprises with risks in backward production capacity, environment and safety and green credit of banks. At the end of June 2016, the green credit balance of 21 major banking institutions reached RMB 7.26 trillion, accounting for 9.0% of the total loans, compared with about RMB 8 trillion in 2015. To break it down, RMB 1.69 trillion came from strategic emerging industries, such as energy conservation and environmental protection, new energy and new energy vehicles, and RMB 5.57 trillion from energy conservation and environmental protection projects and services, as shown in Fig. 1.

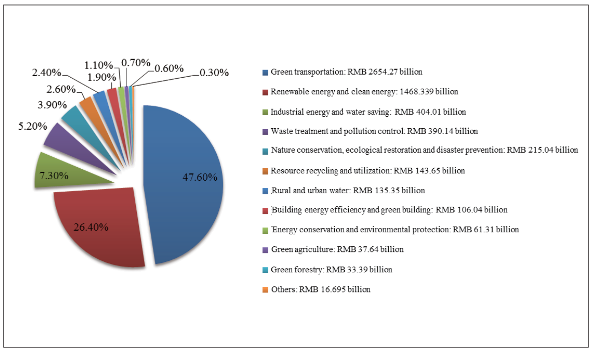

Fig. 1 Balance of loans to energy conservation and environmental protection projects and services Source: CBRC (data as of June 2016)

2.3 Green funds

PPPs promote green fund development. PPPs have risen as a major model of cooperation to develop green industry funds. Table 5 shows the investment of environmental protection PPP projects by provinces (cities) in China, according to the websites of local development and reform commissions and financial bureaus. Evidently, there is a large regional difference in the number of projects. Guizhou boasts the most projects which number 444 and involve RMB 194.627 billion. Beijing and Guangdong, among the listed provinces (cities), are in the bottom and have only one such project.

Table 5 Investment statistics of environmental protection PPP projects by provinces (cities)

Province (city)	Number of projects	Investment (RMB 100 million)	Field
Beijing	1	2.47	Garbage disposal, etc.
Fujian	58	550.455	Sewage treatment, waste incineration, etc.
Gansu	156	951.613	Sewage treatment, garbage disposal, river regulation, etc.
Anhui	175	1,429.446	Sewage treatment, waste incineration, etc.
Jiangsu	28	280.963	Sewage treatment, waste incineration, etc.

Zhejiang	101	779.861	Sewage treatment, renewable water plants, waste incineration, etc.
Guizhou	444	1,946.271	Sewage treatment, water supply works, garbage disposal, etc.
Xinjiang	112	440.302	Water supply network, recycled water projects
Guangdong	1	0.798	Sewage treatment, etc,
Qinghai	73	338.83	Sewage treatment, landfill, etc.
Hubei	33	230.670	Water supply network, sewage treatment, garbage disposal, etc.
Shaanxi	35	181.308	Sewage treatment, underground pipe gallery, etc.
Jilin	20	196.133	Water supply network, sewage treatment, etc.
Hebei	60	145.212	Sewage treatment, waste incineration, etc.
Liaoning	22	193.358	Waste incineration, sewage treatment, etc.
Heilongjiang	17	160.242	Reservoir construction, water supply works, etc.
Shandong	15	135.09	Pipeline construction, sewage treatment, etc.
Guangxi	23	142.99	Food waste, water supply works, waste incineration power generation, etc.
Sichuan	44	214.567	Solid waste treatment, sewage treatment, etc.
Inner Mongolia	65	276.337	Water supply network, water supply works, waste incineration, etc.
Yunnan	55	252.318	Garbage disposal, sewage treatment, etc.
Shanxi	62	92.816	Sewage treatment, waste incineration, etc.
Ningxia	38	47.771	Garbage disposal, garbage treatment, etc.
Jiangxi	14	45.523	Sewage treatment, garbage disposal , etc.
Hunan	9	37.265	Garbage disposal, sewage treatment, etc.
Tianjin	6	49.908	Sewage treatment, etc.
Hainan	31	204.049	Waste incineration, water supply works, etc.

Source: PPP project summary, E20 Environment Platform Http://zt.h2o-china.com/meeting/newsTeam/ppp/.
Note: The above data are soured from E20 Environmental Platform on the basis of the first and second batches of PPP projects in 2015 published by NDRC, PPP projects jointly advocated by NDRC and All-China Federation of Industry & Commerce (ACFIC), as well as PPP projects in 2016 published on the website of local development and reform commissions and financial bureaus.

Provincial and municipal green development funds have sprang up. [1]In January 2016, the Inner Mongolia Environmental Protection Fund was launched by the Inner Mongolia Autonomous Region Government Guidance Funds and four corporate partners, namely Baotou Commercial Bank, Inner Mongolia Communications Investment Co., Ltd., China State Construction and Shuangliang Group. The Environmental Protection Parental Fund has an initial contribution of RMB 4 billion and will be scaled up to RMB 20 billion after 1:5 absorption of private capital. It is mainly invested in environmental pollution control projects. Guangdong, Xinjiang, Guizhou, Shandong, Zhejiang, Chongqing, Guangxi and Shaanxi are also actively promoting green funds. As of the end of June 2016, Shaanxi Financial Holding Group has contributed to the establishment of 14 funds with a total size of RMB 42.66 billion, including 10 venture capital funds worth RMB 2.656 billion. These funds have invested in 34 projects, covering circular economy, modern energy, energy conservation, new materials and new energy vehicles. At the same time, municipal green industry funds are gradually maturing. In April 2016, the RMB-5-billion Pu'er Green Economic Development Fund, which is China's first green economic development fund, was jointly established by Pu'er People's Government and Yunnan Branch of China Development Bank. Green funds at the city level also include the Xin'an River Ecological Protection and Industrial Development Fund, CECEP-Haiyan Green Development Investment Fund, Dabie Mountain Green Development Fund, Yichang Green Development Investment Fund, Zhangjiakou Green Development Industry Fund, Xindu-Qianhai-ABC Green Development Fund, SPDB-Xindu Green Development Fund.

Green private equity funds and listed environmental protection companies actively drive the development of green funds. Listed environmental protection companies play an active role in setting up green funds and currently serve as the main initiators. More than 35 listed companies announced the establishment of environmental M&A funds with a total size of over RMB 7.662 billion, including CNP Environmental Science and Technology M&A Fund, GEM Smart Environmental Protection Cloud Industry Fund, ZISUN Energy Conservation and Environmental Protection M&A Fund and Panlin Gaoneng Environmental Protection Industry Investment Fund. Green private equity funds contribute to the development of green industries by investing in such fields as energy conservation and environmental protection. Especially, large enterprises are actively involved in the establishment and operation of green funds. For example, China Energy Conservation and Environmental Protection Corporation (CECEP) has joined hand with banks, insurance companies, industrial and commercial enterprises to establish green funds of more than RMB 5 billion. CCB International (Holdings) Limited and Shanghai Municipal Investment (Group) Corporation jointly set up CCB Environmental Protection Fund. Yili Resources Group, Fanhai Group, Chint Group and Huiyuan Group jointly established the Green Silk Road Fund.

[1]Data source: Case Studies of China Green Fund Development, Green Fund Task Force, August 2016.

2.4 National carbon market ready to start

China will become the world's largest carbon market. The international carbon market originating in the Kyoto Protocol is an important market mechanism for tackling climate change. The Paris Agreement, which came into effect on November 4, 2016, proposes to hold the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. The nations to the agreement aim to global peaking of greenhouse gas emissions as soon as possible and net zero carbon emissions by the second half of this century. The carbon market is expected to play an increasingly important role in achieving the ambitious emission reduction targets of the Paris Agreement. At present, the highly financialized European Emissions Trading Scheme (EU ETS) is the largest and most developed carbon market in the world. China's national emissions trading system will overtake EU ETS after the official launch in 2017. The orderly transition to a national carbon market from seven pilot areas, including Guangdong, Beijing, Tianjin, Chongqing, Guangdong and Hubei, is underway. The carbon market is also increasingly financialized with the introduction of rich and perfect trading tools, financing tools and marketing support tools.

Emissions trading activities have been active in seven pilot areas.

(1) Allowances. In the primary market, the allowances of seven pilot provinces and cities amounted to about 12 million tons, of which the vast majority are issued for free and a few by auction. By far, 17.007 million tons of allowances worth RMB798 million have been auctioned in Guangdong, Hubei, Shanghai and Shenzhen. In 2016, there was only one auction in Guangdong, involving 500,000 tons of allowances. The turnover totaled RMB 4.94 million and the average price was less than RMB 10 per ton. In the secondary spot market including the over-the-counter market, the seven pilot areas saw a cumulative volume of 1.15 billion tons and a cumulative turnover of RMB 2.464 billion as of December 31, 2016, representing an average transaction price of RMB 21.43 per ton. [2] Beijing topped among them, accounting for 10.98% and 19.25% of the national total volume and turnover respectively. The numbers read 12.5958 million tons, 474 RMB million, and RMB 37.66 per ton. The trading prices of allowances in the national carbon market remained relatively stable in 2016, according to the movements of China carbon indices published by Beijing Emissions Trading Association (BETA).

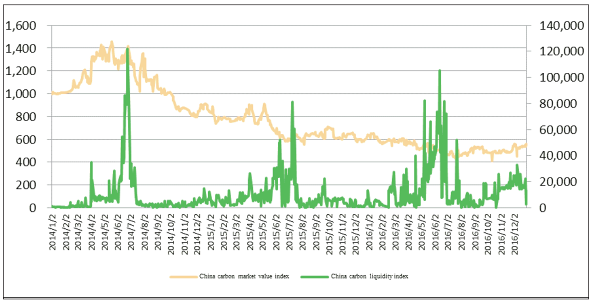

Fig. 2 China carbon index changes Source: BETA.

(2) China Certified Emission Reductions (CCERs). In the primary market, 2,742 CCER projects have completed the formal validation reports at the end of December 31, 2016.

[2]Source: China Beijing Environmental Exchange which tracked the data on carbon transactions in seven pilot areas which had been amended and corrected in some areas.

Among them, 861 were successfully filed and 254 recorded for emission reductions, representing 31.40% and 9.26% of the total respectively. In the secondary market, a total of 78.909 million tons of CCERs were traded in the seven pilot areas at the end of December 31, 2016. Beijing accounted for nearly 17% of the total and Shanghai, nearly 50%. The cumulative volume and turnover were 13,402,100 tons and RMB 85.0857 million in Beijing and 35,931,200 tons and RMB 341 million in Shanghai, making average transaction prices of 6.35 per ton and RMB 9.49 per ton respectively. There was no CCER transaction in Chongqing. In addition to CCERs, forestry carbon capture and sequestration and energy savings can be used to offset carbon emissions through transactions in Beijing. As of December 31, 2016, the cumulative volume and turnover of such transactions reached 7.5 million tons and RMB 2.7313 million, so the average transaction price was RMB 36.35 per ton.

Innovative carbon financial products and derivatives have emerged. Product innovation in carbon finance has been sustained since the open of trial carbon market. A variety of carbon financial products have been developed, including carbon indices, carbon bonds, allowance secured loans, carbon funds, allowance hosting services and green structural deposits. In 2016, Hubei and Shanghai made an important step forward in the innovation of trading instruments. In April, China Hubei Emission Exchange launched spot forward products of emission rights that can circulate in the market and serve for compliance. The benchmark price was RMB 21.56 per ton with the lowest margin for transaction set to 20% of the order value, 25% in the month before compliance and 30% in the compliance month. The price change rate was 4% of the previous day's settlement price or in the first day of listing, 4% of the benchmark price. In December, Shanghai began the trial forward transactions of allowances and launch carbon derivatives in the central counterparty clearing (CCC) model that supports agreements starting from February, May, August and November. The innovation in carbon finance in pilot areas is as shown in Table 6.

Table 6 pilot carbon markets mainly carbon financial innovation

Product	Market	Cooperation agency	Time	Scale	Influence	Market share
Carbon lending	Shanghai	Shanghai Wujing Power Generation Co., Ltd, Carbon Future (Beijing) Asset Management Co., Ltd.		5	10.20%	4.61%
		2016-01	10.49%	14	28.57%	10.43%
Carbon spot forward	Guangdong	Guangdong V-carbon Investment Co., Ltd.	2016-03	70,000 tons	—	3.70%
	Hubei	China Hubei Emission Exchange	2016-04	—	China's first tradable spot forward carbon product	81.26%
	Shanghai	Shanghai Environment and Energy Exchange	2016-12	—	China's first carbon derivative using the CCC model	100.00%

Source: China Carbon Finance Market, Carbon Finance Task Force, GFC-CSFB.

Preparations for the national carbon market have started. Issued by NDRC in January 2016, the Circular on Key Work to Start the National Emissions Trading Market (NDRC [2016] No.57) set down four tasks: (a) develop the list of enterprises in the national emissions trading system, which in the first phase, will cover such key industries as petrochemicals, chemicals, building materials, steel, nonferrous metals, paper, electricity, and aviation; (b) carry out accounting, reporting and verification of historical carbon emissions of covered enterprises through corporate accounting and reporting, third-party verification, and examination and submission; (c) cultivate and select third-party verification agencies and personnel. These agencies are required to have rich experience in the relevant fields, independent legal personality, plenty of professionals and robust internal management procedures and can provide third-party verification services for the region; (d) strengthen capacity building through targeted multi-level training according to systematic training programs, so as to provide personnel guarantee for national carbon market operations. The focus of training will be put on teams of lecturers and technical professionals.

Capacity building centers were established in the seven major carbon markets. In order to give full play to the role of demonstration of pilot areas and facilitate the integration of non-pilot areas into the national carbon market, with the official approval of NDRC, seven national capacity building centers based in Shenzhen, Hubei, Beijing, Guangdong, Chongqing, Shanghai and Chengdu have been established in 2016. They have carried out a series of capacity building activities, including multiple targeted training sessions through the local authorities, third-party verification agencies and corporate leaders. By sharing, exchanging and extending the three-year experience of pilot areas to non-pilot areas, these efforts will ensure that participants are fully aware and strictly enforce the specific provisions of the carbon market. Preliminary statistics show that more than 200 training capacity building activities have been organized nationwide, covering 22,000 persons from government departments, enterprises and third parties.

3. International concerns and emerging influence

China is an active advocate and practitioner of green finance. It provides a good paradigm for the development of global green finance through its top-level policy design and innovative market practice. At the G20 Hangzhou Summit, the international community showed significant attention to green finance in China and the international media "thumbed up" for innovation in green finance. In the country, there is also a wave of public attention to green finance and the concept of green finance has gradually penetrated into people's lives.

3.1 G20 Hangzhou Summit in favor of the global development of green finance

The G20 Summit held in Hangzhou of China during September 4-5, 2016, incorporated for the first time green finance into its agenda. The G20 Finance Green Synthesis Report (hereinafter referred to as the "Report") submitted by the G20 Green Finance Study Group (GFSG) further clarified the purpose, scope and challenges of developing green finance. As a reference for countries to develop green financial policies, the outcome provides new thinking and innovative model for a green low-carbon transition of the global economy.

The Report explains why countries should develop green finance. (a) Green finance supports environmental sustainable development. Green finance can be understood as financing of investments that provide environmental benefits in a context of sustainable development. These environmental benefits include reduction in air, water and land pollution, reductions in GHG emissions, improved energy efficiency, as well as mitigation of and adaptation to climate change and their co-benefits. (b) Green finance provides growth opportunities. Enhancing green finance could facilitate the growth of high-potential green industries, promote technological innovation and create business opportunities for the financial industry. For example, China's renewables represented approximately 62.5% of net additions to global power capacity and its market size of electric vehicles expanded 60% in 2014. (c) Green finance may alter the way in which environmental factors impact financial institutions. As the greening of the financial system will likely accelerate the re-allocation of resources, it may impact the risk-return profiles of some economic activities and financial assets, as well as the credit and market risks faced by financial institutions. (d) Green finance mobilizes both the public and private sectors into green development. Private green financial flows will likely make up the bulk of future green finance. It is estimated that over 85% of China's total green investment will need to be financed by private capital.

The Report analyzes the general and specific challenges to green finance. These challenges include (a) inadequate internalization of environmental externalities. For example, the return of a renewable energy project, in the absence of measures to internalize the benefit of reduced pollution, may be too low to attract private investment. A number of countries have used subsidies, tax credit, feed-in-tariffs, emissions trading systems to address such externalities with varying degrees of success; (b) maturity mismatches. In some markets, the financing of long-term green infrastructure projects relies heavily on bank lending, while banks are constrained in providing sufficient long-term loans due to relatively short tenor of liabilities; (c) lack of clarity in green finance. Without appropriate definitions of green finance, which is the basis for budgeting, accounting and performance measurement, it is difficult for financial institutions to allocate financial resources for green projects and assets. In addition, the lack of clarity may also deter the efforts of environmental risk management and policy design; (d) information asymmetries. The lack of environmental information disclosure by companies increases the "search costs" for green assets and undermines the identification of green companies; and (e) analytical capability constraints. The general understanding of the financial implications of environmental risks is still at an early stage. Many financial institutions have yet to develop the capacity to identify and quantify the credit and market risks that may arise from their assets.

The Report provides guidance for greening the banking system, bond market and institutional investors. Two priorities and four options are clarified for greening the banking system. The two priorities are integrating environmental factors into banking operations and supplying credit and raising capital for green investments. The four options include promoting voluntary sustainable banking principles, deploying innovative instruments to support financing for long-term investment and overcome maturity mismatch, coordinating policy responses and expanding capacity building networks. For greening the bond market, it is recommended to raise awareness of benefits of green bonds via promotion and demonstration; support the development of local green bond market; reduce risk premiums and facilitate cost-efficient verification and reporting; develop green bond indices, ratings, and stock exchange lists; promote international collaboration to facilitate cross-border investment in green bonds; and incubate local green investors. Three options are presented for greening institutional investors: provide strategic policy signals and frameworks; promote voluntary adoption of responsible investment principles; and strengthen market responsiveness and product innovation.

The Report offers options for voluntary adoption by countries on green finance. Many green finance options on an international scale, such as the development of green financial products, as well as risk analysis and management methodologies involve innovations by the private sector. The Report consolidates a number of key options, including (a) provide strategic policy signals and frameworks. National authorities could provide clearer environmental and economic policy signals for investors regarding the strategic framework for green investment; (b) promote voluntary principles for green finance. National authorities, international organizations and the private sector could work together to develop, improve and implement voluntary principles for and evaluate progress on sustainable banking, responsible investment and other key areas of green finance; (c) expand learning networks for capacity building. Nations could mobilize support for the expansion of knowledge-based capacity building platforms such as the Sustainable Banking Network, the Principles for Responsible Investment as well as other international and domestic green finance initiatives; (d) support the development of local green bond markets. On request of countries that are interested in developing local currency green bond markets, international organizations, development banks and specialized market bodies could provide support via data collection, knowledge sharing and capacity building; (e) promote international collaboration to facilitate cross-border investment in green bonds. National authorities or market bodies could promote cross-border investment in green bonds, including through bilateral collaboration between different green bond markets; (f) encourage and facilitate knowledge sharing on environmental and financial risk. To facilitate knowledge exchange, the G20/GFSG could encourage a dialogue, involving the private sector and research institutions to explore environmental risk; and (g) improve the measurement of green finance activities and their impacts. G20 and national authorities could promote an initiative to work on green finance indicators and associated definitions and to consider options for the analysis of the economic and broader impacts of green finance.

China's international influence continues to improve in the field of green finance. China's green financial development and G20 Green Finance Initiative have exerted a very positive impact on global financial policies and operations. Many countries and regions have begun to explore innovation and pathways to green finance including green bond market. International financial institutions acknowledge China's progress in green finance and the international implications. Euromoney top executives commented that China's green bond market "grew from zero to hero" within a year. India, Singapore and Latin American countries also contact China, seeking reference for green financial practices and support from G20. "China's efforts to build a green financial system are groundbreaking and have begun to impose a global impact", said Simon Zadek, Co-Director of the UNEP Inquiry into Design Options for a Sustainable Financial System. He believes that "countries and regions including Sweden, Brazil, Kenya and Indonesia are advancing green financial plans and practices while international financial centers such as London, Hong Kong, Singapore and Switzerland are racing for the top."

3.2 Public attention to green finance

The degree of attention developed by Baidu tells to what extent people attach attention to an event, activity or project. In order to better reflect social concerns on some issues, learning from Google, Baidu introduced the search index and defined the degree of attention as the weighted sum of keyword search frequency based on search volume in Internet search engines. The report uses Baidu index to analyze the degree of public attention to green finance. It should be noted that Baidu index mainly measures the search frequency of hot words directly related to the heat degree of green financial policies.

The social community becomes increasingly concerned about green finance, with continued advancement of green development strategy propelled by party and state leadership and the relevant ministries. The performance on the whole presents two characteristics: (a) the public attention rose from August 2016 onwards, and a few climax emerged in late August and early September, as shown in Fig. 3, owning to the G20 Summit and its report on green finance. (b) Public concerns about green finance exhibit significant provincial, city and regional distribution. At the provincial level, Beijing, Zhejiang, Guangdong, Shanghai, Jiangsu, Shandong, Hubei, Fujian, Sichuan and Tianjin are more concerned. The most concerned cities include Beijing, Shanghai, Guangzhou, Hangzhou, Shenzhen, Suzhou, Tianjin, Wuhan, Nanjing and Jinan. From a regional perspective, East China, North China and South China attach more attention to green finance.

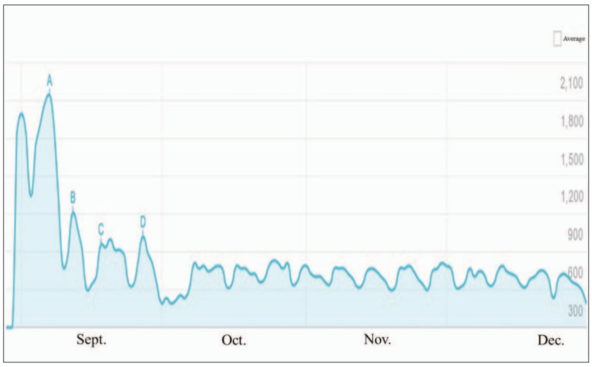

Fig. 3 Time-based changes in public attention to green finance
Note: The time frame is from August 26, 2016 to December 31, 2016.

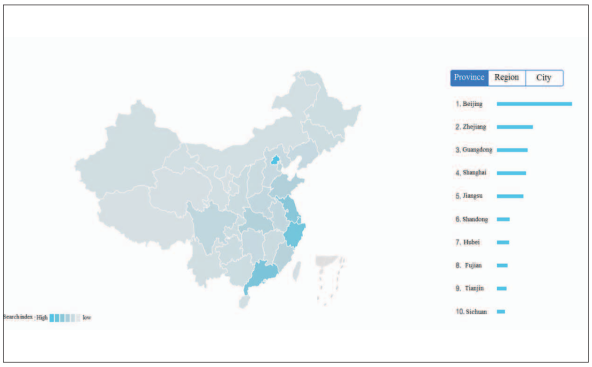

Fig. 4 Provincial distribution of public attention to green finance
Note: The time frame is from August 26, 2016 to December 31, 2016.

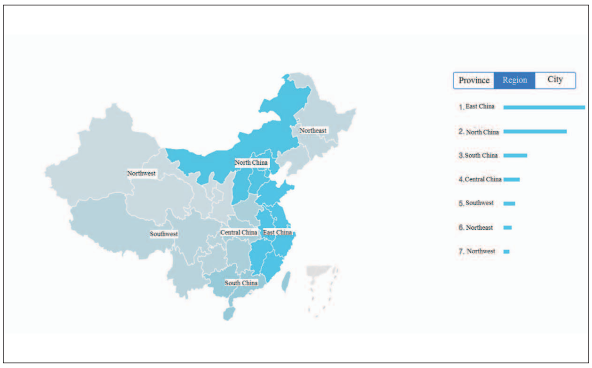

Fig. 5 Regional distribution of public attention to green finance
Note: The time frame is from August 26, 2016 to December 31, 2016.

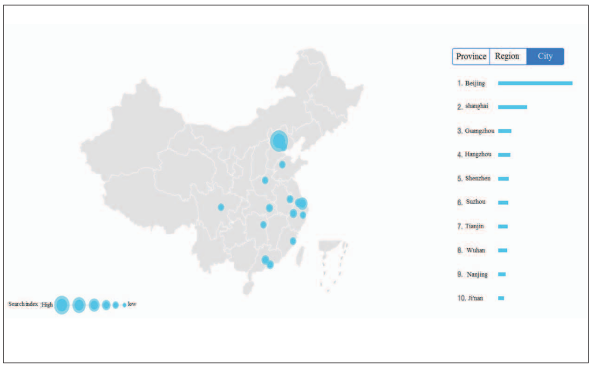

Fig.6 City distribution of public attention to green finance
Note: The time frame is from August 26, 2016 to December 31, 2016.

3.3 Academic attention to green finance

There is an exponential growth in the academic achievements on green finance. The academia shows increasing attention to green finance as the public. The report found that the research into green finance had already begun before 2010 according to the number of "green finance" centered papers published in CNKI during 2010-2016. There were very limited papers on green finance prior to 2010 and only about dozens each year. The number of such papers grew from 2010 onwards, and reached 1,579 in 2016 according to the keyword of "green finance", as shown in Fig. 7. More papers will be found if "green bonds" and "carbon trading" are used as keywords for search instead of "green finance".

The research into green finance involves a wider range of fields and disciplines. Green finance covers both social sciences and natural sciences, as shown in Fig. 8, including industry guidance (up to 60.64%), basic research (13.41%), policy research (13.26%), industry technical guidance (4.85%), basic and applied basic research (2.33%), vocational guidance (2.22%), engineering technology (1.37%), and economic information (0.99%). Fig. 9 shows that as many as 30 disciplines are related to green finance, including finance (39.38%), macroeconomic management and sustainable development (12.12%), investment (10.62%), economic reform (9.39%), environmental science and resource utilization (8.79%) and securities (4.88%).

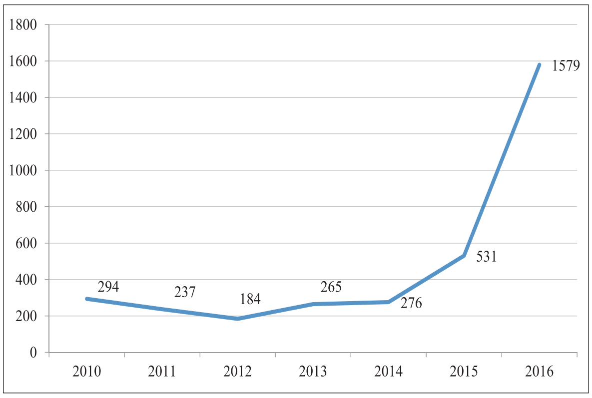

Fig. 7 Academic papers published with the keyword of "green finance" during 2010-2016 Source: CNKI

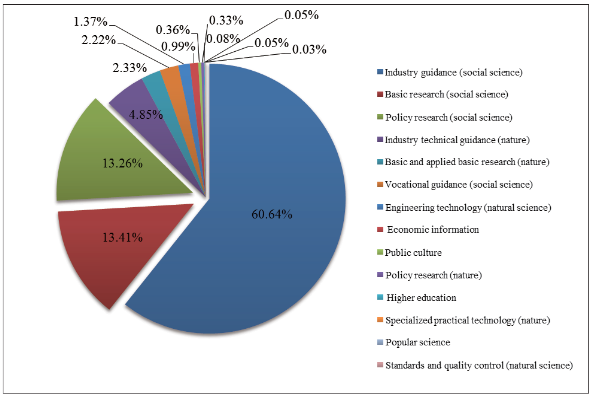

Fig. 8 Research into "green finance" by levels Source: CNKI
Note: There are totally 3,762 papers founded by the keyword of "green finance".

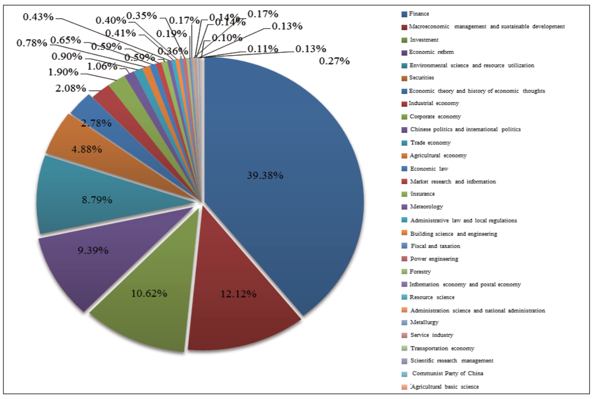

Fig. 9 Research to "green finance" by disciplines Note: There are totally 3,762 papers founded by the keyword of "green finance". Source: CNKI

4. Huge demand and business opportunities

China has huge green financing needs at present and in the future. The development of green finance will optimize the allocation of resources and guide financial capital into green industries. As environmental governance deepens, the market demand for environmental protection industries has been effectively liberated, covering air, water and soil. This provides new industrial opportunities in the field of environmental protection, especially business opportunities for the financial sector. The favorable factors include supply-side structural reform, tightened environmental enforcement, strong public will for environmental governance, and such international strategies as "One Belt and One Road".

4.1 Enormous green financing needs

Given the large green financing demand and prospective green financial market, the robust mechanisms of green finance will provide an important way to solve the financing difficulties of environmental protection industries and contribute to effective and optimal allocation of resources. Green finance will effectively mobilize financial capital to invest in green industries and reflect environmental costs in the price of resources through financial transactions of priced assets.

According to the study of Professor Ma Zhong led research group of Renmin University of China, the report categorizes green financing needs into six fields, i.e. renewable energy, infrastructure, environmental remediation, industrial pollution control, energy and resource efficiency and green products. The sources of funds are divided into financial capital, fiscal capital and the combination. Green financing needs during 2014-2020 are estimated in three scenarios. The low scenario considers the national green development goals, environmental protection levels and green investment in 2013. The medium scenario is expected to reach environmental standards established in 2013 and green development goals set in 2015. In the high scenario, the investment should support green development goals and environmental standards renewed in 2015. The results are shown in Table 7.

Table 7 Green financing needs in China (2014-2020)   Unit: RMB 1 trillion

<table>
<tr><th>Funding source</th><th>Field</th><th>Category</th><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><td rowspan="6">Financial capital</td><td rowspan="2">Renewable energy</td><td>Renewable and clean energy (electric)</td><td>3.23</td><td>4.58</td><td>4.58</td></tr>
<tr><td>Biomass power (non-electric)</td><td>0.19</td><td>0.36</td><td>0.36</td></tr>
<tr><td rowspan="3">Industrial pollution control</td><td>Industrial wastewater treatment</td><td>0.33</td><td>0.67</td><td>0.99</td></tr>
<tr><td>Industrial waste gas treatment</td><td>0.08</td><td>0.49</td><td>0.84</td></tr>
<tr><td>Industrial solid waste treatment</td><td>0.01</td><td>0.72</td><td>0.96</td></tr>
<tr><td>Environmental remediation</td><td>Commercial and industrial site remediation</td><td>3.20</td><td>4.20</td><td>6.20</td></tr>
</table>

Financial capital and fiscal capital	Infrastructure (environmental infrastructure)	Urban water supply	0.72	1.53	1.53
		Urban drainage	0.17	0.90	1.44
		Urban rail transit	3.85	4.55	4.55
		Municipal solid waste treatment	0.13	0.36	0.65
	Energy and resource efficiency	Energy efficiency	0.80	1.35	1.35
		Water efficiency	0.30	1.20	1.20
	Green products	Green building	0.53	1.32	1.32
		New energy vehicles	0.22	0.65	0.65
Fiscal capital	Environmental remediation	Cultivated soil remediation	0.40	0.60	1.20
Total			14.6	24.3	29.9

Source: China Green Financing Needs, research group led by Professor Ma Zhong, excerpted from CCICED research report Green Finance Reform and Green Transformation.

4.2 Opportunities for the financial sector brought by environmental protection industries

China has fostered a diversified industrial structure in the field of environmental protection after 20 years of development, covering sewage, waste gas and solid waste treatment and disposal and environmental services, such as environmental consulting, environmental equipment, engineering design and operation and maintenance of facilities. Released in recent years, the action plans to prevent and control air, water and soil pollution also provide market-based policy support for environmental protection industries and thereby pave the industrial foundation for the development of green finance.

Environmental protection industries will usher in new opportunities in the 13th FYP period. First, the policy portfolio concerning gas, water and soil will open up a broad market for environmental protection industries. For example, the Action Plan for Air Pollution Prevention Control is estimated to involve a direct investment of RMB 184 million. This will boost the development of related industries by creating a lot of opportunities. Second, the supply-side structural reform favors specialization and refinement of environmental protection. With the adjustment and transformation of industrial structure and energy mix, the increment of environmental pollution will be effectively controlled while the stock gradually resolved. Derived therefrom will be the demand for more specialized and refined environmental services. Third, strict enforcement of environmental laws will stimulate the demand for environmental treatment. With the implementation of the newly amended Environmental Protection Law, the systems laid down in the Integrated Reform Plan for Promoting Ecological Progress, and the vertical management system for environmental monitoring and enforcement departments at the provincial level and below. Industrial enterprises are urged to fully comply with emissions standard and a more refined environmental big data platform will be established. This will create an enormous pollution control market by driving the large-scale development of environmental monitoring technologies and services. Fourth, public environmental services become more integrated driven by strong public demand for environmental governance, covering smog, urban water black-odor, rural pollution, urban garbage and soil pollution. In addition, the "One Belt and One Road" strategy will make it easy for environmental protection industries to go out. The initiative will bring new opportunities for Chinese enterprises by enhancing international cooperation with international enterprises and facilitating access to the international environmental market. A number of competitive environmental benchmarking enterprises will be thereby fostered.

4.3 Business opportunities for financial institutions

Green finance provides more business opportunities for financial institutions by expanding and extending financial business, especially the development of financial products and related services, including green credit, green bonds, green funds, green insurance and green rating.

Business opportunities arise from rich green financial products for financial institutions and businesses. First, the green credit market augments the credit business of banks. Mortgaging green assets that enables enterprises to revitalize and realize green assets is a supplement the credit service of banks. The Industrial and Commercial Bank of China and Industrial Bank Co., Ltd. have carried out green credit business with a lower non-performing loan ratio than general loans. Second, green bonds enable businesses and financial institutions to finance by issuing bonds and the diversification offers more business opportunities for small and medium-sized businesses. Many business opportunities will appear with the investment in green infrastructure projects which is estimated to reach RMB 10 trillion in the next five years, covering railway, light rail, intelligent transportation system, urban clean energy, green building, urban eco-friendly water supply and solid waste treatment. Third, green funds leverage more commercial capital by leading financial institutions to fund projects, and further expand financing channels and diversify investors. Fourth, green insurance promotes the development of pollution damage identification enterprises, but also enriches the financial management business of insurance enterprises. Underwriters and insurance companies can enter into the business through the market-oriented mechanisms for risk transfer, social mutual aid, financial intermediation and social governance. Fourth, green rating is also important in creating business opportunities. Environmental and social risk management teams develop and use environmental and social risk assessment procedures and tools and apply the results to customer risk rating and asset allocation analysis model. The work will facilitate continued product innovation and capacity building in a variety of ways, and beef up environmental and social risk management and green financial service capability.

5. Conclusions

Green finance is an important institutional innovation for investing in and financing green industries. Green projects can have higher return of investment (ROI) and financing availability. By directing to the private capital into green industries, green finance adapts to the current features and trends of eco-friendly development, but also provides new ideas, mechanisms and approaches to accelerate the ecological progress and achieve green development.

In China, the foundation for a full-fledged green financial system is consolidated owning to the positive results achieved through a series of measures in policy design, institutional building and market practice. Recalling 2016, the green financial sector has made many breakthroughs and positive developments. From a policy perspective, a top-down policy framework and the blueprint for green finance have been built. From an institutional perspective, many refined and realistic systems are gradually taking shape, covering green credit, green bonds, carbon finance and emissions trading. In addition, extensive practice and exploration have been conducted in the fields of green credit, green bonds and carbon finance. With the further advancement of "One Belt and One Road" initiative, China has further deepened the cooperation on green finance with other countries and improved its global voice and influence through important G20 international conferences (Hangzhou Summit).

Looking to the future, aimed at green development and ecological civilization, China will further enrich innovative green financial practices while perfecting the policy system. It is believed that under the current policy framework, green finance will inject a profound and lasting impetus to the sustainable development of China and the world, with the concerted efforts of all sectors of society and extensive cooperation of the international community!

REFERENCES

1 The research group of Tianjing University. Strategic research analysis on the construction of green finance system[J]. Economic Research Reference, 2011(39): 1-25.

2 Deng Xiang. Review of Research into Green Finance [J]. Journal of Zhongnan University of Economics and Law, 2012 (6): 67-71.

3 Dong Jie. Green Finance in China: Status Quo, Problems and Policy Options [J]. Industrial Technology & Economy, 2013 (3): 156-160.

4 Li W, Hu M. An overview of the environmental finance policies in China: retrofitting an integrated mechanism for environmental management [J]. Frontiers of Environmental Science & Engineering, 2014, 8(3): 316-328.

5 Zhang Chenghui, Xie Mengzhe. China Green Finance: Experience, Pathway and International Reference [M]. Beijing: China Development Press, 2015.

6 Weng Zhixiong, Ge Chazhong, Duan Xianming, et al. Comparative Study of Green Financial Products at Home and Abroad [J]. China Population, Resources and Environment, 2015, 25 (6): 17-22.

7 Ge Chazhong, Weng Zhixiong, Duan Xianming. Green Financial Policies and Products: Status Quo and Suggestions [J]. Environmental Protection, 2015, 43 (2): 32-37.

8 Yang Fan, Shao Chaofeng, Ju Meiting. Opportunities and Challenges of Green Finance in China and Policy Options [J]. Ecological Economy, 2015, 31 (11): 85-87.

9 Mai Junhong, Xu Feng. Research on the driven factors of China's green finance based on conjoint analysis [J]. Macro Economic Analysis, 2015 (5): 23-37.

10 Chen Yulu: Increase the Supply of Green Finance to Boost the Green Transition of Economy, 2016.

11 Wang Yao, Xu Nan. Development of Green Bonds in China and Comparative Study of Chinese and International Standards [J]. Finance Forum, 2016 (2): 29-38.

12 Dong Zhanfeng, Yuan Zengwei. Investment and Financing Needs for the Implementation of Action Plan for Air Pollution Prevention and Control and Impact Assessment [J]. Chinese Journal of Environmental Management, 2016, 8 (2): 47-51.

13 Xinhua net, Chinese Initiative for Green Finance in G20, August 22, 2016. http://news.xinhuanet.com/fortune/2016-08/22/c_129248244.htm.

14 Ng T H, Tao J Y. Bond financing for renewable energy in Asia[J]. Energy Policy, 2016, 95: 509-517.

15 Wang Y, Zhi Q. The Role of Green Finance in Environmental Protection: Two Aspects of Market Mechanism and Policies[J]. Energy Procedia, 2016, 104: 311-316.

16 Yu Lan. The development and innovation analysis on green finance[J]. Economic Issues, 2016 (1): 78-81.

17 BMa Jun. Green finance: China and the G20 [J]. Overseas Investment & Export Credits, 2016 (6): 3-10.

18 Liu Yujun. The development of green finance, focused issues and recommendations [J]. Finance and Economic, 2017(1):76-78.

19 Liang Jingyi. The opportunities and challenges for China's green finance[J]. Modern Finance, 2017(1): 19-31.

20 Tian Guoli. Green finance and financial institutes' social responsibilities [J]. International Finance, 2017 (1): 3-4.

Chinese Academy for Environmental Planning

8 Dayangfang, BeiYuan Road, Chaoyang District, Beijing 100012, China

Editor in chief: Prof. WANG Jinnan

Vice President, Chinese Academy for Environmental Planning

Contact person: Ms. YANG Xiaolan

Tel: 86-10-84916891

Fax: 86-10-84918581

E-mail: yangxl@caep.org.cn

Web: www.caep.org.cn