

E3G

China's Low Carbon Finance and Investment Pathway

Annex B: China's Climate Finance and Investment Gap

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1. Introduction

Broadly speaking, ‘climate financing demands’ can be defined as the additional total investment entailed when an economy shifts from high carbon emissions to low carbon emissions, including the mitigation costs for achieving emission control targets and the adaptive costs arising from climate change damage. In a narrower sense, climate financing demands mainly refer to investment demand on low-carbon technologies, including alternative energy, energy efficiency technologies, carbon capture and storage technology (CCS) and so on. Alternative energy technologies – such as wind power, solar energy, tidal energy, biomass, geothermal energy etc. – are greatly affected by the natural environment and are characterized by low-intensity and fluctuated energy supply. The initial investment cost of energy efficiency technologies, such as industrial sector emissions, cogeneration and other waste energy recycling technology, boiler efficiency, combined-cycle power generation, building energy efficiency, clean coal technology, hybrid technology and so on, may be quite expensive. CCS is an ideal abatement technology, but its high investment costs may hinder its commercial application.

Due to the complexity and diversity of low-carbon technologies, the definition of demands under different climate policies may vary greatly. Taking into account the objectives and viable methodology for this study, this report adopts the narrower definition of climate financing demands, i.e. defining climate financing demands from the perspective of investors. Because of significant uncertainties and the long tail effect of as well as the significant differences in discount rate selection for climate adaptation cost, this report focuses mainly on investment demand for climate mitigation, which refers to investments that have a significant and positive correlation with China’s climate policy or carbon price, including energy, industries, transportation and construction sectors.

2. Climate Funds Supply

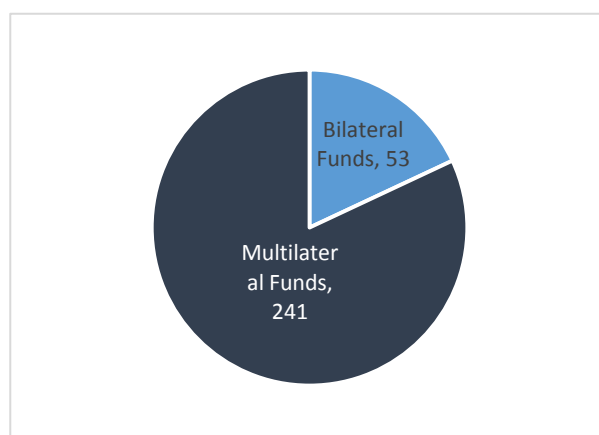
2.1 Public funds supply

2.1.1 International public funds

China is one of the main recipients of public funds supplied by developed countries

In the past few years, China had been one of the main recipients of public funds supplied by developed countries. From 2008 to November 2012, 46 projects approved in China received a total of 294 million USD of climate finance commitments.¹ As seen in Figure 1, the amount of projects approved by the Multilateral Funds in different years fluctuated greatly, with no project approvals in 2009, but the total amount of approved projects in 2010 reaching 130 million USD, and subsequently decreasing from 2011 through 2012.²

Figure 1 International Climate Funding Provided by Multilateral Funds, 2008-2012



Source: <http://www.climatefundsupdate.org>

Within Asia, China was also the country that received the largest amount of climate funds through bilateral channels. The United Nations Framework Convention on Climate Change (UNFCCC) national communications data shows that, up to 2010, China had gained 1.09 billion USD of climate funding from bilateral sources.³ Analysis by the Organization for Economic Cooperation and Development (OECD) indicates that, in 2009, Development Assistance Committee (DAC) countries' commitments to

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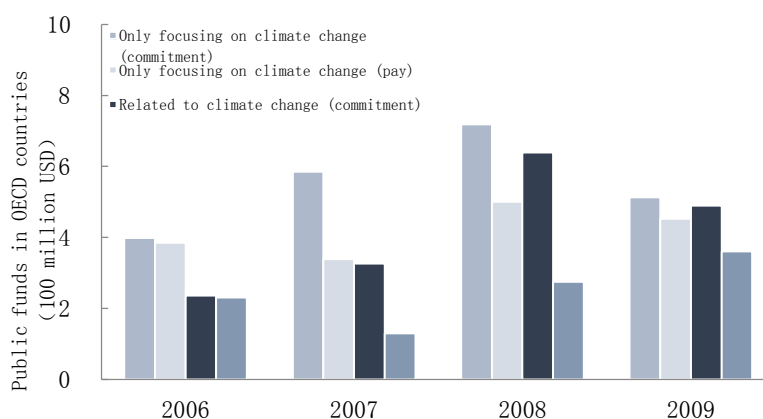
1 Source: <http://www.climatefundsupdate.org>, downloaded in November 2012. The site is currently following the trend of 25 funds, covering all multilateral funds focusing on climate change (part of which is the financial mechanism under the Convention), as well as some of the major bilateral funds/action. Therefore, this report uses multilateral funds data from Climate Funds Update to estimate the inflow of China's international climate funds through multilateral channels.

2 Regarding the scale of funding from multilateral funds, taking into account the difficulties of lack of proper channels and timeliness for information on actual payment, the report uses the "project approved amount" for our analysis.

3 Heinrich Böll Stiftung (HBF) and the Overseas Development Institute (ODI). 2011. Climate Finance Fundamentals publication series, Regional Briefing: Asia and the Pacific. Available at: <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/7475.pdf>

provide development assistance in areas related to climate mitigation in China reached 607 million USD (including aid to climate change as a primary or important goal, 79% of which was in the form of loans), which was the fourth highest among developing countries.⁴ The “Rio Markers” in OECD DAC CRS database can help to provide a rough analysis of trends in the number of funds invested for climate change, biodiversity and desertification-related goals. The database shows, from 2006 through 2009, OECD countries provided a total of 1.68 billion USD in development aid for China’s climate change related targets, of which funds dedicated to climate change objectives reached \$ 1 billion.⁵ Among the DAC countries, Australia, Germany and France were the main providers of large-scale climate funding to China. As seen in Figure 2, the total amount of development aid commitments in 2009 declined from 2008, and the negative impact of the economic crisis is reflected in the willingness of developed countries to provide development assistance to developing countries.

Figure 2 The Amount of Development Assistance Funds in Relevant Climate Change from OECD Countries to China (2006-2009)



Source: OECD, <http://stats.oecd.org/>

In addition, the developed countries support export trade in the form of export credit, including the provision of loans, export credit insurance, export credit guarantees and investment insurance, etc.. According to OECD estimates, from 2002

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 4 *Tracking Aid in Support of Climate Change Mitigation and Adaptation in Developing Countries*, OECD, 2011. Available at: <http://www.oecd.org/investment/aidstatistics/48708083.pdf>

5 OECD, available at : <http://stats.oecd.org/#> ; This statistic includes DAC countries through bilateral channels or EU funds provided to China. Research has also pointed out there are some limitations in OECD DAC CRS database, which may cause double counting or omissions in the data, but the problem is not related to the research focus of this report. The report cites only existing data and provides only a rough estimate of the size of China's climate funds. OECD statistics database provided both amount promised and actually paid. This report uses data from the OECD's major amount actually paid for analysis, but also shows the amount committed.

to 2009 the medium- and long-term export credit provided by OECD countries were mainly invested in the transport (37%), industry (26%), and energy (11%) sectors, of which only 1% flowed to the field of renewable energy and energy efficiency, with an average amount of about 200 million USD annually.⁶ However, research has also pointed out that the scale of export credit to invest in the field of climate had increased more quickly in recent years, and the scale of export credit for renewable energy and cogeneration/distributed energy rose to 700 million USD in 2009.⁷ Overall, the current export credit directly investing in climatic areas is relatively small in scale and suffers from lack of credible data.

According to the 'Plan of Utilizing Foreign Capital and Overseas Investment' in the 12th Five-Year Plan (FYP), China received total preferential loans of 2338 billion USD (amount actually deployed) from foreign governments and international financial organizations during the 11th FYP period, which mainly focused on investment in agriculture, forestry, water, transportation, energy, energy conservation and environmental protection, education, health and ecological construction and other fields.⁸ At the end of 2011, Chinese loan balance borrowing from foreign governments and from international financial organizations was 33.3 billion USD and 35 billion USD respectively.⁹ The State Administration of Foreign Exchange and the Utilization of Foreign Capital and Overseas Investment Department, an internal department of the *National Development and Reform Commission (NDRC)*, have statistics from different angles on China's use of funds from multilateral and bilateral financial institutions, but there is currently no public statistical data on the amount of capital involved in projects related to climate change.

The scale of public capital flows from developed countries to China may be reduced in the future

The U.S. subprime mortgage crisis and the European sovereign debt crisis occurred in 2008 and 2010 respectively, resulting in Europe and the United States starting to implement austerity measures. The global economy is in a slow recovery process, which will directly affect implementation of the transfer of funds to developing countries for climate change purposes. At the same time, the willingness of developed countries to give China development assistance has also decreased on account of the growing strength of China's economy in recent years. Many countries

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6 *Financing Climate Change Action and Boosting Technology Change*, OECD, 2011. Available: <http://www.oecd.org/dataoecd/34/44/46534686.pdf>.

7 *The Climate Finance Landscape*, CPI, 2011.

8 12th Five-Year Plan on Utilising Foreign Capital and Overseas Investment (2011-2015) . Available: <http://wzs.ndrc.gov.cn/zcfg/zhp/W020120724319223822264.pdf>

9 National Debt Summary Table (End of 2011), State Administration of Foreign Exchange, 2012. Available: <http://www.safe.gov.cn/>

have announced their intention to cut development aid to China, which is bound to affect the supply of international climate funds.

2.1.2 Domestic public funds

The public funds invested in the field of climate change in China at present mainly come from the public fiscal budget. Through direct grants, incentives, tax exemption, policy funds, investment of state-owned assets, policy banks and so on, public funds have supported actions to tackle climate change in China in the early years and leveraged investments from the capital markets.

The scale of public funds to invest in the field of climate change has increased significantly in recent years

Since the 11th FYP, China has gradually promoted energy conservation, emission reductions and climate change to national strategy, and the corresponding fiscal investment has also increased significantly. During the 11th FYP period, the growth rate of the national fiscal investment in environmental protection and in science and technology far exceeded the GDP growth rate. In 2010, investment in environmental protection and in science and technology reached 325 billion RMB and 244.2 billion RMB respectively, which also reflected the growing trend of investments toward the fields of energy-saving and climate change. In the national public expenditure in 2011, total investment in the field of energy-saving and environmental protection (ESEP) reached 264.1 billion RMB, of which 43.944 billion RMB and 14.16 billion RMB went to energy conservation and development of renewable energy respectively. It is worth mentioning that, compared with previous practices of only publishing total expenditures on ESEP, for the first time the data of fiscal expenditure showed a detailed breakdown on spending directly linked to energy-saving, renewable energy and climate change. It indicates that climate finance has become an important part of the fiscal budget.

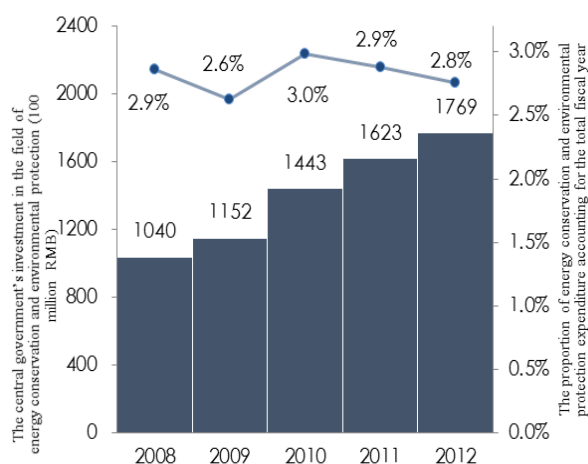
Since 2008, the central government's investment in the field of ESEP has grown rapidly (Figure 3). In 2012, the fiscal budget for ESEP reached 179.6 billion RMB.¹⁰ As there are no "climate change" expenditure stated explicitly, according to data released by the Ministry of Finance, it can be roughly calculated that the central government had invested more than 220 billion RMB under the 11th Five-Year Plan in areas related to climate finance (such as energy conservation, emission reduction

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10 Source: Central public expenditure and balance sheet published on the website of Ministry of Finance, visited in November 2012. Available: http://yss.mof.gov.cn/2012zhongyangyusuan/201203/t20120322_637093.html; http://yss.mof.gov.cn/2010juesuan/201107/t20110720_578437.html; http://www.gov.cn/gzdt/2012-07/11/content_2181162.htm

and renewable energy, etc.). In 2011, the central government spent 60.6 billion RMB on ESEP, an increase of 17% from 2010.¹¹

It should also be noted that the proportions of expenditure on ESEP in the central budget expenditures have had no significant increase from 2008 through 2012, and in the past two years have declined slightly. Although public finance is not the main source of financing for climate change related activities, China’s climate and low carbon sector is still in its early stage of development, and needs the support of public funds to grow.

Figure 3 The Central Government’s Investment in the Field of Energy Conservation and Environmental Protection (2008-2012)



Source: Ministry of Finance published on the website of the central public expenditure budget and final accounts, browse in November 2012.

Public fund income directly related to climate change is very limited

Fiscal funds generally come from tax revenues, public funds, incomes from state-owned assets and the issuance of bonds. In addition, there are also specific climate change related income sources such as levies on the Clean Development Mechanism (CDM) projects and renewable energy tariffs. In most cases, revenues from the public budget will be distributed to specific areas such as climate finance in accordance with a set goal, which also ensures that budget allocation has a relatively large degree of flexibility. This means that there is no inevitable correlation between the scale of the revenue and the scale of public budget ultimately used as climate finance.

¹¹ Available: http://www.mof.gov.cn/zhuantihuigu/czjbqk2011/czzc2011/201208/t20120831_679877.html

In August 2011, China promulgated the Administration Measures to Run the Clean Development Mechanism (Amendment), which laid down the percentage of levies on CDM projects imposed by the government (Table 1). Owners of CDM projects in China need to pay the levies to the Chinese government from each batch of Certification Emission Reduction (CER) issued by the Clean Development Mechanism Executive Board (UN CDM EB). By the end of 2012, government revenues from the CDM levies totalled 12.1 billion RMB.¹² Using these revenues, the government set up the China Clean Development Mechanism Fund in August 2006 to support climate change related activities. Other income sources for the Fund include allocation from the public budget, operating profit from the Fund, and donations from institutions, organizations and individuals at home and abroad.

Table 1 The Proportion of National Income Received from CDM Projects

CDM project category	National income ratio
Hydrofluorocarbons (HFC) Projects	65%
Nitrous oxide from adipic acid production process (N ₂ O) Projects	30%
Nitrous oxide from nitric acid production process (N ₂ O) Projects	10%
Full hydrogen fluoride (PFC) projects	5%
Other types of projects	2%

Furthermore, in order to promote the development and diffusion of new energy, the central government imposes tariffs for renewable energy on electricity users, which generate additional income that can be directly used to address climate change. Since 2012, the standard rate of renewable energy tariff in China increased to RMB 0.8 from the previous RMB 0.4 per kWh, and the annual amount levied is estimated to be 20-30 billion RMB. Combined with and through the Renewable Energy Development Special Fund supported by public finance, these provide financial support for the development and utilization of renewable energy in China.

Apart from levies on CDM projects and tariffs for renewable energy, there are no other income sources in China's public finances directly associated with climate change. This increases the pressures on public finances supporting action on climate

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 12 Ibid.

change, and also prevents sustainable growth of the proportion of public finance used for climate change purposes.. Therefore, new public revenue sources associated with climate change need to be explored in the future.

2.2 Private capital supply

2.2.1 Traditional financial markets

“Traditional financial markets” refers to the traditional direct and indirect financing markets, in which funds comes from institutional and private investors, such as banks, securities companies, fund companies, insurance companies, etc.. As domestic policies successively roll out to support energy saving and climate change related causes, companies and projects related to climate change are gradually able to attract more capital investment, and financial markets are becoming an increasingly important source of climate financing.

Debt financing market is the main source of climate funding

Currently, bank loans are the main financing channels for Chinese enterprises. In the credit markets, banks actively strengthen credit support for energy saving, environmental protection and the low-carbon economy. In 2011, the number of projects and loan amount related to ESEP supported by banks grew by 28.79% and 25.24% respectively from the previous year; and loans granted to strategic emerging industries reached 363.46 billion RMB, an increase of 36.5% from the previous year.¹³ Compared with 2010, the growth of loan amount from banking financial institutions for ESEP increased in 2011, even exceeding the growth of the overall loans granted in that year (Figure 4). By the end of 2011, the aggregate loans provided by just six banking financial institutions – China Development Bank, Industrial and Commercial Bank of China, Agricultural Bank of China, China Construction Bank and Bank of Communications – for ESEP was more than 1.9 trillion RMB.¹⁴ According to statistics, the loans of banking institutions for ESEP projects reached 856 billion RMB in 2009, which accounted for 8.93% of total loans. Although loans in the field of ESEP grew rapidly, compared with the traditional industries, however, loans obtained by the projects of energy saving, environmental protection and low-carbon industrial still comprise a small proportion of the total.

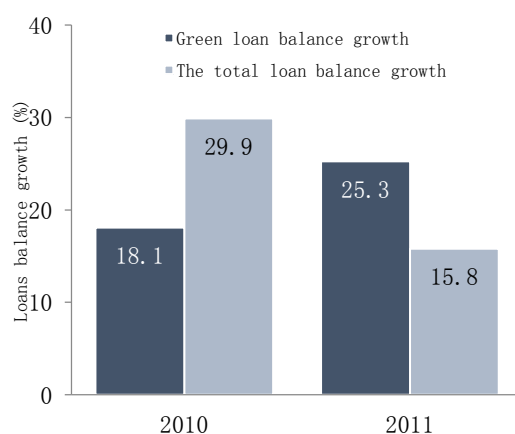
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13. Yang Zaiping, Corporate Social Responsibility Report of China Banking 2011, *Hexun Net*, 2012. Available: <http://bank.hexun.com/2012-06-19/142618405.html>

¹⁴ CBRC issued green credit guidelines requiring the banking industry to promote energy conservation and environmental protection by leveraging investment, CBRC, 2012. Available: <http://www.cbrc.gov.cn/chinese/home/docView/BC52BC0456C94FBAA11212B99ED908ED.html>

However, due to the lack of a uniform definition and statistical methodology,, there are currently still no public statistics for total national green credit (or ESEP loans). In recent years, the China Banking Association released the China Banking Social Responsibility Report, which disclosed incomplete statistical data as to the amount of credit and credit balance for ESEP. Nonetheless, data from different years are not really comparable as the statistical methodology for 2006 to 2009 and 2010 to 2011 was changed from “the amount of credit” to “credit balance”.

Figure 4 Banking Financial Institutions’ Loan Balances of Energy Conversation and Environmental Protection Projects Successively Increase (2006 -2011)



Source: People’s Bank Financial Statistical Report: China Banking Association’s Annual Report on Banking Social Responsibility

The corporate bond market has gradually become one of the sources of climate finance. In 2011, green bonds in China reached 6 billion USD, accounting for about 3% of total “green bonds” globally.¹⁵ The scale of financing received by new energy enterprises bond issues rose fourfold, reaching 4.3 billion USD (accounting for 72%); the rest was mainly concentrated in the transportation industry.

China encourages the use of traditional international financial markets in climate-related fields

Traditional international financial markets are an important part of China’s utilization of foreign capital, including loans from foreign banks and other financial institutions, buyer’s credit, the issue of foreign bonds, international financial leasing, outbound bonds issues and outbound listings and so on.

¹⁵ Bonds and Climate Change: the State of the Market in 2012, Climate Bonds Initiative, 2012.

During the 11th Five-Year Plan, China's international commercial loans (excluding the difference between investment and registered investment by foreign-invested enterprises) were about 66.05 billion USD.¹⁶ According to data released by the State Administration of Foreign Exchange, the scale of China's foreign debt was 694 billion USD at the end of 2011, of which 70.5 billion USD was borrowed from foreign banks and other financial institutions, and the balance of foreign bonds issued by Chinese-funded enterprises was 1.5 billion USD.¹⁷ Over the past decade, annual international commercial loans was already approaching or exceeding foreign direct investment over the same period; these loans were mainly used in transportation, energy, raw materials, finance and other sectors. Although there are still no publicly available data on funding for the climate sector, in the future international commercial loans in the fields of energy saving, environmental protection and strategic emerging industries will be encouraged by the government.¹⁸

Equity financing has grown rapidly, but now in difficult times

The venture capital and private equity (VC / PE) market in China has developed very rapidly in recent years. Since enterprises associated with climate change and low carbon technologies are typically start-ups or small and medium enterprises, the VC / PE market is also very critical to climate funding. In 2011, VC / PE investment in the field of clean technology totalled 1.72 billion USD, up from 1.27 billion USD in 2010, but this was mainly the result of the overall trend of rapid development in the VC / PE market from 2010 through 2011. In fact, the clean technology industry accounted for 4.25% of all investment in 2011, which was a relatively significant decline compared with the 8% in 2010.¹⁹ Since 2012, due to overcapacity, shrinking international market and other problems, financing situation for the clean technology industry in the capital market is not optimistic.

Insurance funds' low-carbon investment

The portfolios of some asset management companies in the insurance industry have injected funds into climate-related infrastructure projects (Box 1), but the relevant statistics have yet to be released.

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¹⁶ 12th Five-Year Plan Utilization of Foreign Capital and Overseas Investment (2011-2015) , available at: <http://wzs.ndrc.gov.cn/zcfg/zhp/W020120724319223822264.pdf>

¹⁷ SAFE 2012 National Debt Summary Table (End of 2011). Available at: <http://www.safe.gov.cn/>

¹⁸ "Actively Use International Commercial Loans to Promote Economic and Social Development Better and Faster", *Hexun Net*, 2012. available at: <http://bank.hexun.com/2012-08-10/144624664.html>

¹⁹ Summary of China Venture Capital Annual Research Report (VC and PE, 2010 and 2011), Qingke Research Centre. <http://www.zero2ipogroup.com/research/report.aspx>

Box 1: Insurance in new energy sector -- a case study of

Pacific Insurance investment in new energy

China Pacific Insurance Company (CPIC) is one of the insurance companies that own the most infrastructure-related investment permits in China. It invests in various sectors including infrastructure (i.e. Shanghai Expo Park), transportation and renewable energy. In November 2008, Pacific Insurance Asset Management Company (PIAM), a wholly owned subsidiary of CPIC, initiated the debt investment plan for the 'CPIC –Wujiang Hydropower Project'. With a total investment of 2.7 billion RMB over a 10 year investment horizon, this project is to construct and operate the Goupi Tan Hydropower site developed by Guizhou Wujiang Hydropower Development Company, a subsidiary of the state-owned power generator China Huadian Corporation.

In 2010, China Insurance Regulatory Commission (CIRC) approved PIAM's proposal on innovation of debt investment of infrastructure projects and products, and it is one of the first four asset management companies that received the approvals.

The company also introduced the "Pacific - Hebei Construction Investment New Energy Wind Farm Project Debt Investment Plan" in 2010, with a total investment of 1.3 billion RMB covering an investment period of 7 years. The investment plan intended to fund the construction of two wind farms located in Hebei Province: The Dongxingying Wind Farm in Guyuan County and Yudaokoumuchang Wind Farm in Weichang County, Chengde City. The construction scale of Yudaokoumuchang Wind Farm was 150,000 kW, and the intended annual generating capacity was approximately 406 million kWh, while the scale of Dongxingying Wind Farm was 199,500 kW, and the intended annual generating capacity was approximately 406 million kWh. In the process of investing, great attention had been paid to integrating economic and environmental benefits. By the end of 2010, all units at the wind farms were fully connected to the grid.

Source: Pacific Insurance Company Website

<http://www.cpic.com.cn/cpic/cn/responsibility/report/zgtbx2010/hjdtbbsfz/dzdtcy/>

2.2.2 Direct investment by enterprises

(1) Potential of foreign direct investment in low-carbon

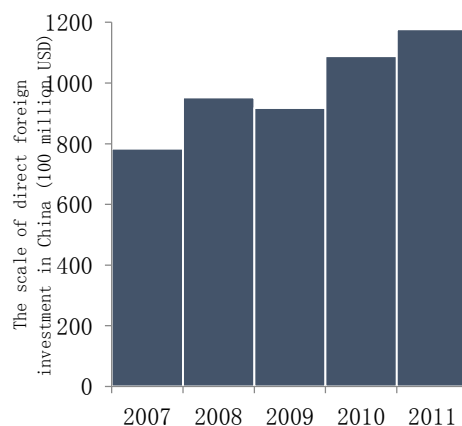
Generally speaking, foreign direct investment (FDI)²⁰ consists of flow of funds used to acquire equity in projects or enterprises. Part of the capitals of FDI (probably most

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²⁰Foreign direct investment refers to cash, in-kind and technology investment (including re-invested earnings) by foreign enterprises and economic organizations or individuals in accordance with relevant Chinese policies, laws and regulations in setting up wholly foreign-owned enterprises, joint

of them) is sourced from traditional international financial markets. The current size of the global FDI market is immense and is rising, reaching 1.5 trillion USD in 2011 – up from \$ 1.3 trillion in 2010 – of which 684 billion USD was invested in developing countries.²¹ In addition to the in-flow of foreign capitals, FDI also facilitates or enables the transfer of environmental friendly technology and knowledge to developing countries, hence playing an important role in addressing climate change.

Figure 5 The Scale of Foreign Direct Investment in China is Rising (2007-2011)



Source: Han Qi, 2012. Analysis of utilization of foreign capital. Situation in new energy industry in China, *International Economic Cooperation*, 2012 07
<http://www.gygov.gov.cn/gygov/1442575838578081792/20120925/343953.html>

Due to the ambiguous definition of ‘green FDI ’ and ‘low-carbon FDI’ in a global context, there is currently no data on the scale of global climate change associated FDI.. However, according to United Nations Conference on Trade and Development (UNCTAD) statistics, from 2003 to 2009, the scale of foreign investment in the production of clean energy electricity, recycling, and manufacturing of environment technology worldwide totaled 344 billion USD – 90 billion USD in 2009 alone – of which 135.8 billion USD were invested in developing countries²², which shows great potential for future low carbon investment.

Although China’s foreign investment has been increasing in recent years, reaching 117.7 billion USD in 2011 (Figure 5), official statistics on climate-related foreign investments are still absent. Based on incomplete statistics, the number of foreign

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 venture/merger or joint resource development with local enterprises in the host country, as well as capital investment in enterprises borrowed from abroad.

²¹ *World Investment Report 2012*, UTTCAD.
http://10.10.4.12/download/29626222/37296842/3/pdf/186/87/1347708825530_855/UNCTAD-WIR2012-Full-en.pdf

²² *World Investment Report 2010*, UTTCAD.
<http://archive.unctad.org/Templates/webflyer.asp?docid=13423&intItemID=5539&lang=1&mode=downloads>

investment projects in new energy industry in China from 2005-2011 reached 105, in, all together worth about 25 billion USD.²³

Domestic enterprises actively invest in low-carbon sector

Capital investment by domestic enterprises in energy-saving and new energy projects, and low-carbon equipment, products or services can also be considered as part of low-carbon finance. Inevitably, this investment will be supported by capital from the financial markets. Currently there are no statistics regarding the direct investment of domestic companies in the field of climate change in China; instead, this can be inferred from the scale of domestic direct investment in the following three areas. Firstly, total clean energy investment (including both domestic and foreign direct investment) in China reached \$ 45.5 billion (about 295.7 billion RMB) in 2011, ranking second in the world. Secondly, according to the 12th Five-Year Energy Conservation and Emission Reduction Plan total investment in key energy-saving and emissions-reduction projects during the 2011-2015 period will reach 2.366 trillion RMB, with key energy-saving projects accounting for about 982 billion RMB, most of which will come from investment by enterprises (including SOEs). And thirdly, the 12th Five-Year Energy-Saving and Environmental Protection Industry Development Plan has put forward the goal of increasing the output value of ESEP industry to 4.5 trillion RMB in 2015, most of which will also come from direct enterprise investment.

Considering the increasingly stringent energy conservation and emission reduction policies as well as government's initiatives to develop strategic emerging industries , the scale of direct investment by enterprises in the climate field will likely further increase, especially in energy conservation, new energy, electric vehicles markets. Currently, China has FDI statistics based on industrial sectors, geographical regions and investment characteristics, but there are no data particularly on FDI related to climate change.

2.2.3 The Carbon Market

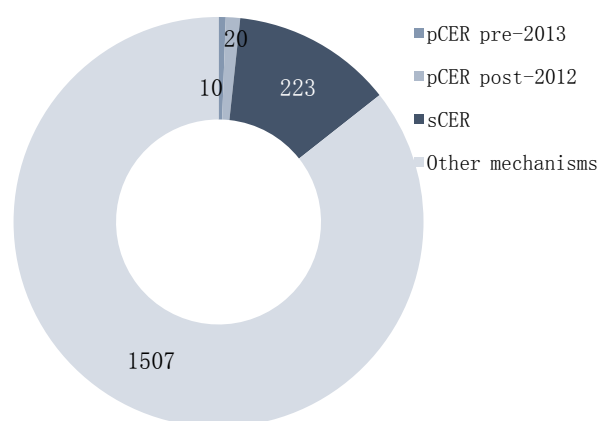
Many developing countries are engaged in the CDM market. The transaction size of the CDM market was \$ 25.2 billion in 2011, including both the primary and secondary markets (Figure 6)²⁴. Over the course of 2011, pre-2013 Certification Emission Reduction (CER) contract average price dropped to 10.9 USD / ton (7.9 EUR / ton) from 11.8 USD / ton (9.1 EUR / ton) in 2010. In addition to the shrinking of

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²³.Han Qi, Analysis of Utilization of Foreign Capital, Situation in New Energy Industry in China, *International Economic Cooperation*, 2012 07, available at: <http://www.gygov.gov.cn/gygov/1442575838578081792/20120925/343953.html>

²⁴. State and Trends of the Carbon Market 2012, World Bank.

market size, current CDM is also not a major driver of international carbon market nor a major component of international climate finance given the small size of its scale. In addition, capital channelled through the carbon market to developing countries only partially compensated the relevant incremental cost of emission-reduction projects, instead of meeting the full capital cost (i.e. the total investment need).

Figure 6 CDM-related Transactions Scale in the International Carbon Market in 2011
(Unit: 100 million USD)



Source: World Bank, *State and Trends of the Carbon Market 2012*

Even so, the international carbon market is still of vital significance for China as it is a key player in the CDM market and the largest carbon credit provider. By the end of December 2012, China had 2,915 CDM projects registered with the United Nations²⁵; the total of Certification Emission Reductions (CER) issued for China reached 703 million tons²⁶, and the cumulative revenue of the CDM facility reached 12.15 billion RMB. This seems utterly inadequate given the capital requirements in China, but the role of CDM is not only to provide climate funds for China, but also to develop various infrastructures that are necessary to develop the domestic carbon market. As alternative to CDM mechanism post-2012 is yet to be determined, the international carbon market financial flows to developing countries may be substantially reduced or even disappear.

Domestic pilot carbon markets have already started in China. By the end of 2013, the Shenzhen Stock Exchange trading volume reached 10 million RMB, and Guangdong

²⁵ Available at: <http://cdm.unfccc.int/Statistics/Issuance/CERsIssuedByHostPartyPieChart.html>

²⁶ Available at: <http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>

Carbon Trading Market raised 180 million RMB in the first auction. The domestic carbon market will generate significant capital in the future.

2.2.4 Philanthropy funds

Philanthropic and related non-governmental organizations are also involved in climate funding. Private donors and businesses provide funding or donation through charitable foundations, corporate social responsibility initiatives, as well as non-governmental organisations' activities, etc. Although a useful source of climate fund, they are unlikely to be a major source in the long term given the scale of the investment needed.

China's domestic philanthropy associated with climate change has only just commenced and funding in climate change field mainly involves donations from corporations, community groups and individuals, disbursed through green foundations and corporate social responsibility initiatives. Domestic green foundations include the China Green Foundation and China Green Carbon Foundation. Major sources of funding for these foundations are donations by natural persons, legal persons and other organisations (both domestic and foreign), government funding and capital appreciation. According to the *2011 China Charitable Contributions Report*, in 2011 the total amount of money and goods donated by domestic and overseas entities was 84.5 billion RMB in China, of which 4.62% flew to the field of ecology/ environment.²⁷ Corporate donations, especially from private enterprises, are a major force in China in the field of charity. The total revenue of China Green Foundation was 324 million RMB in 2011, of which 315 million RMB came from donations.²⁸

The Voluntary Carbon Market refers to a carbon emissions trading market where companies or individuals not bound by the Kyoto Protocol voluntarily contribute capital to offset the carbon footprint they generate and alleviate the greenhouse effect caused by their activities. The current size of this market is relatively small. In June 2012, the Interim Trading Management Measures of Voluntary Greenhouse Gas Emissions Reduction was formally promulgated, which set out the foundation for China's voluntary carbon market, i.e. voluntary emission reduction and the emission reduction target of the 12th FYP, although the market is yet to be active.

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27 Available at: <http://news.anhuinews.com/system/2012/06/29/005050344.shtml>

28 Available at: <http://www.cgf.org.cn/jiandu/>

3. Analysis of supply and demand gap

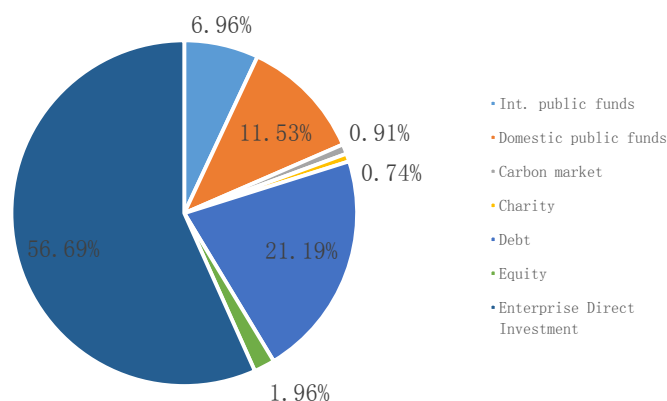
3.1 Structural imbalance leads to a huge funding gap

Due to differences in statistical methodology and lack of data sources, there is great uncertainty when analysing funding sources for climate change. Using data collected by different types of financial institutions, a rough estimate of the data from 2008 to 2012 is possible, as shown in Table 2 and Figure 7. The annual average climate finance invested from 2008 to 2012 amounted to \$ 87.6 billion, 56.69% of which was direct investment by (mainly clean energy-based) enterprises, followed by bank debt financing (21.19%) and finally domestic public funds (11.53%). However, this figure may be overestimated as a rigorous climate finance statistics system is not available: companies tend to overestimate the amount of money they invest in the low-carbon sector, while many environmental projects may also be included in the statistics.

Table 2 The Estimates of Climate Capital Supply, 2008-2012

<i>Sources of climate funding</i>	<i>Annual average (100 million USD) 2008-2012</i>
<i>International public funds</i>	<i>61.0</i>
<i>Domestic public funds</i>	<i>101.0</i>
<i>Carbon markets</i>	<i>8.0</i>
<i>Charity Funds</i>	<i>6.5</i>
<i>Debts</i>	<i>185.7</i>
<i>Equities</i>	<i>17.2</i>
<i>Direct investment of enterprises</i>	<i>496.7</i>
<i>Total</i>	<i>876.0</i>

Figure 7 The Structure of Climate Funding Supply, 2008-2012 (Annual Average)



Source: Estimated according to RCCEF, 2012 China Climate Financing Report.

According to the results of Energy Research Institute’s (ERI) model, financing needs will reach 2.7503 trillion RMB in 2020 if the 2 degrees Celsius scenario is to be realised, but the scale of the current supply is merely 525.6 billion RMB. The funding gap was more than 75% in 2010, and it will be 80% in 2020, exceeding more than 2 trillion RMB. For investors, whether to invest in the area of climate change depends on the opportunity cost. In the absence of a clear carbon price signal, carbon emission-reduction projects do not have significant investment appeal. In the past few years, except for the new energy industry, large-scale capital investment has been relatively scarce even though investors have increasingly paid attention to the climate finance market. There are two reasons to this. Firstly, investment in low-carbon technology is restricted by the associated high risks, which include technical risk, operational construction risk, market risk, policy risk, financing risk and so on. Due to the large number and diversity of low-carbon technologies, there is a significant knowledge gap for investors, causing difficulties with risk assessment. Secondly, the climate finance market is a fragmented market and lacks economies of scale. The fragmentation of the market comes from the diversity of techniques and decentralized applications, and also from institutional segmentation resulting from policy design and institutional settings.

3.2 Significant financing needs in renewable energy

Climate financing needs from 2010 through 2050 are shown in Figure 8. The total financing needs in 2030 will be 2.852 trillion RMB, of which the energy industry accounts for 984 billion RMB, and energy-saving accounts for 1.84 trillion RMB. Total

financing need will peak at 3.0431 trillion RMB in 2040, with energy industry and energy-saving accounting for 1.4180 trillion RMB and 1.6251 trillion RMB respectively.

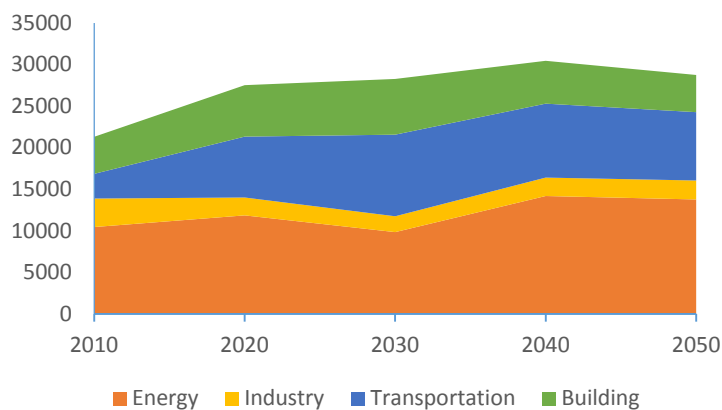
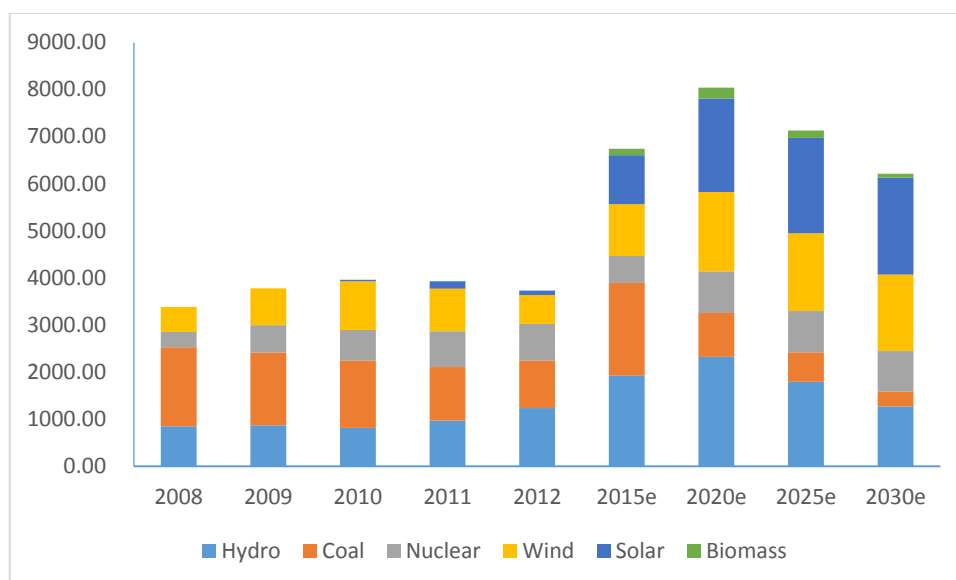


Figure 8 Climate Financing Needs, 2010-2050 (100 Million, prices in 2010)

Source: Jiang Kejun, China's Investment Pathways to 2030 (2014)

Figure 9 illustrates the industrial structure of the energy sector alongside the investment needs from 2008 to 2030. Under the scenario of 2 degrees Celsius, significant progress in the wind and solar power sector is deemed to be necessary, and hence the financing needs in 2020 will reach 168.3 billion RMB and 198.8 billion RMB respectively. As shown in Table 3, the financing gap of wind and solar power in 2020 will be 107.5 billion RMB and 188.9 billion RMB respectively.

Figure 9 Funding needs in the energy sector from 2008 to 2030



Source: Jiang Kejun (2014)

Table 3 Energy investment gap (100 million RMB) in 2020 and 2030

<i>Energy Sectors</i>	<i>Gap in 2020</i>	<i>Gap in 2030</i>
<i>Hydroelectricity</i>	<i>1084</i>	<i>33</i>
<i>Thermal power</i>	<i>-68</i>	<i>-690</i>
<i>Nuclear power</i>	<i>99</i>	<i>79</i>
<i>Wind Power</i>	<i>1075</i>	<i>1014</i>
<i>Solar Power</i>	<i>1889</i>	<i>1964</i>
<i>Power of biomass and others</i>	<i>228</i>	<i>80</i>
<i>Total</i>	<i>4308</i>	<i>2481</i>

Sources: Jiang Kejun (2014) and 2012 Power Industry Investment Yearly Statics 2012

In 2013, the proportion of renewable energy in the power sector in China increased significantly again, following the trend of the past few years. China's installed capacity of renewable energy and nuclear power increased by 36 million kW in the first 10 months of 2013, compared to the increase of 31 million kW of non-fossil fuel installed capacity in the whole of 2012. It is also noteworthy that the incremental installed capacity of renewable energy in China has surpassed the one of fossil-fuel (coal and natural gas) and nuclear power. In the first 10 months of 2013, the incremental installed capacity of renewable energy, including hydropower, wind power and solar energy, reached 33.8 million kW, while in the same period, the incremental installed capacity of fossil fuels and nuclear power generation was only 27 million kW. In other words, renewable energy and nuclear power accounted for 57% of the incremental increase in power generation capacity, compared to 43% for fossil fuels in 2013. This implies that the national power system, which supports the whole country's modernisation and industrialisation, is moving towards a renewable energy-oriented system and does no longer rely solely on traditional fossil fuels.

4. Policy recommendations

4.1 Expand sources of public funding

> **Integration of existing financial resources related to climate change**

Tackling climate change is a key part of the national strategy and should be strengthened within the operation of the Chinese government. Public expenditure categories demonstrate the functions of the government as well as the structure of public finance management. Currently, an independent 'climate change' category is absent in Chinese public expenditure – all climate change related spending from the central budget are embedded in more than 10 different categories, such as “energy saving and environment protection”, “agriculture, forestry and water affairs” and so on. Consequently, the disbursement and distribution of climate related funds are governed by various different government departments as well as different management and monitoring regulations. Due to the fragmentation, climate funds from different departments have been used for the same key projects, which reduces the efficiency of public finance. The lack of a 'climate change' category in public expenditure is incompatible with the strategic importance of climate change issue for the Chinese government.

Recommendations: All existing climate change associated expenditure should be integrated and a stand-alone category on climate change should be set up in the public budget. The government could also add new expenditure classification or take out and amalgamate current climate change related work/projects from other expenditure classifications.

> **Expand Domestic Sources of Public Funding through the Auction of Carbon Credits**

Because of the fixed nature of primary carbon market quotas, the infrequent issuing times, and the relatively low market activity, auctioning is the most efficient capital allocation and pricing mechanism in the primary market.. Meanwhile, auctioning generates substantial amount of revenue for the government, which can be used to improve environment protection or social welfare. If the auction revenue is spent inefficiently, the revenue cycle may increase macroeconomic costs. In contrast, “double dividends” or “co-benefits” can be achieved where efficiency of auction revenue is increased through the revenue cycle. As carbon market auctioning is an effective way to raise funds, under the same carbon constraints, the effective use of funds raised by auctioning can significantly reduce the carbon costs borne by enterprises. In 2013 Guangdong Province auctioned 3% of its emission quotas in its carbon market, which, if adopted nationwide, can become a major source for China’s

carbon market public finance in the future. Even a small proportion of carbon credit being auctioned will bring various benefits to the development of carbon market.

Recommendations: Auctioning can create powerful market price signals while some key parameter designs, such as the auction reserve price, frequency of issue and treatment of excess quota, can become important means of regulating the carbon market.

> **Efficient use of national CDM income**

A direct source of public climate change fund comes from government revenues from CDM projects, which amounts to approximately 15 billion RMB. Currently, this public revenue is managed by the China Clean Development Mechanism Fund Management Centre (CDMF). The CDMF utilises its revenue through grants and investments to support climate change activities and industrial development, and also carries out wealth management activities.

In practice, investments are inefficient as it is mainly based on entrusted loans, which also bears a great risk due to lack of diversity. There are three principal reasons for this situation: first, the lack of flexibility in fund governance structure, in which decision-making by the CDMF Board composed of multiple departments results in poor efficiency and high managerial costs; second, the relatively vague direction of investment funds means that it is difficult to form an efficient operation model; and finally, poor fund management performance due to lack of investment and operation experience in the management team. Therefore national revenues from CDM projects could not be used efficiently, and the CDMF has not yet fully utilised the role of leveraging private investment and promoting low-carbon industrial development.

Recommendations: The government should re-evaluate the role and functions of CDMF, adjust its governance structure, and redesign its business modules. It should also identify comprehensive risk control measures and liberalise restrictions on the use of funds and increase level of leverage, to better promote CDMF's transition to a national climate change fund.

> **The potential of sovereign financial capital**

The capital of sovereign financial institutions, such as sovereign wealth funds and pension funds, is a huge potential financing source – their long-term investment profile is compatible with the need for long-term investment of mitigation actions/projects. Some pension funds and other institutional investors across the world have shown interest, while some have already taken actions, in climate change investment. However, since pension funds have a fiduciary responsibility to ensure

that returns from investments are sufficient to provide for pension holders, and they need to invest in accordance with strict risk criteria and investment diversification.

Recommendations: The government needs to identify a clear long-term signal to combat climate change, to improve capacity building for private investors and to develop policy portfolios to reduce risk. Only when climate change investment offers the same or better risk-return ratio as other types of investment can pension funds allocate a greater share of investment to the climate sector. The government should pay great attention to helping institutional investors to identify climate change risks and opportunities, to resolve outstanding policy and management issues that hinder the development of the climate capital market for investors, as well as to encourage best practice in its analysis and to establish strategies for investment and risk management.

4.2 Construct a ‘Climate Fund’ led public funding system

In the context of China’s overall economic reform, a more market-based approach to using public fund will also be a trend for climate finance. For this reason, it is particularly important to pool together sources of funding and to build a market-oriented, orderly public funding system. It will be essential to fully explore the intermediary role of national climate fund, local climate or carbon funds, and policy banks.

> **Promote the transition of CDMF into National Climate Fund**

Climate change is seen as the major challenge facing the global environment and development in the 21st century. The Chinese government has invested heavily both in terms of finance and manpower to address the issue. With growing investment in climate change, many developing countries have established or are preparing national climate funds to provide new climate financing channels, and simultaneously to collect, coordinate and strengthen national control over climate finance. National climate funds can combine a variety of resources together, including public, private, multilateral and unilateral resources, which jointly support action to combat climate change. They can use capital raised at the national level on climate change actions more effectively and systematically, and can also better coordinate relationships between climate change stakeholders.

Founded as the first national-level climate fund in China, CDMF has assumed some functions of a national climate funds since its inception. Built on this basis, if CDMF was given more flexibility and became a collection of multilateral, bilateral and national level public funds, it could carry out more exploration and effort to leverage types of all resources, especially regarding public and private sector resources

cooperation. When the time is ripe, CDMF can evolve naturally into China's National Climate Fund and can play a central role in the market-oriented use of public climate funds.

Recommendations: As a National Climate Fund, the CDMF should strengthen cooperation with international public finance regimes to expand sources of funding and promote the development of pilot projects and capacity building activities. At the same time,, it should cooperate with domestic public funds in establishing a climate fund mechanism, formatting a climate finance market framework, and promoting the development of low-carbon economy and technological innovation. In addition, the CDMF should become a "fund of funds" (FoF) and use more market-oriented mechanisms and investment experience of its professional team to diversify investment risks.

> **Set up a Climate Finance Revolving Fund**

The higher expected investment risk and unfamiliarity with the field of low carbon are the fundamental causes for the reluctance of financial funds to invest in low-carbon projects, including capital investment in energy conservation and emission reduction, new energy development, eliminating backward production capacity, and other climate change mitigation activities.

Recommendations: To rectify this, a Climate Finance Revolving Fund that can offer an interest-free loan facility to local commercial banks and other investors should be set up under the CDF. Banks are then supported to provide low-interest loans to low-carbon projects. In this process, government intervention in the financing mechanisms is minimized, and the state only plays a role in leveraging bank financing. As the revolving fund is implemented, local commercial banks' knowledge of low-carbon projects and financing capacity will be increased. The revolving fund can be phased out gradually and local banks can provide loans on their own in the absence of government support for low carbon projects.

> **Set up a Climate Technology Fund**

Due to the lack of technical support and understanding of present and future climate risks as well as inadequate government support, advanced climate technology often faces barriers preventing its application and development. Climate technology solving long-term environmental problems is likely to face more obstacles, which are not fully reflected in market prices. These barriers create additional risks for climate technology investments and therefore it is difficult to receive private capital support when low carbon technology enters the market.

Recommendations: A specialized Climate Technology Fund should be set up within the CDMF, which will mainly grant preferential, long-term, low-interest loans, and

commit to promoting the demonstration, application and diffusion of low-carbon technologies. The Climate Technology Fund can also act as a guiding fund for other public and private sector investors. The Fund can also strengthen collaboration with the Pilot Asia-Pacific Climate Technology Network and Finance Centre, a joint project of the Asian Development Bank (ADB) and United Nations Environment Programme (UNEP), which is committed to enhance the dissemination of new climate technologies. By resolving key problems at the early stages of technology research and development, the climate technology innovation mechanism will help to consolidate and elevate technology start-up financing to the national or regional strategic levels, and identify potential risks. At present, China has a large number of climate technologies, which also attracts the interest of numerous venture capital funds. However, asymmetric information and lack of policy support create an unfavourable environment for the development of climate technologies. Therefore, it is important to establish a climate technology knowledge sharing platform to help venture capitals build up a mechanism for technology assessment and project management, which, coupled with public finance support, can also facilitate venture capital investments in climate technology.

> **Set up a Climate Finance Seed Fund**

Adequate funding is the basic financial necessity to respond to climate change effectively.

Recommendations: A special one-off fund of 3 billion RMB should be set-aside in the government's central budget, which ought to be used to establish a Climate Seed Fund under the Ministry of Finance and managed by the China Clean Development Mechanism Fund Management Centre. The Seed Fund is to provide additional financial support to other public or private investments in the low-carbon sector. Sources of funding may include: government central budget, CDMF, capital market credit funds, public-private partnership funds, domestic and foreign donations and grants, etc.. In accordance with the overall national strategic deployment to address climate change, as well as priorities and objectives of national development strategies established by the National Economic and Social Development 12th Five-Year Plan, investments from the Seed Fund could go to: mitigation activities such as economic and industrial restructuring, energy conservation and emission reductions, new energy development, and the elimination of backward production capacity; and adaptation activities including infrastructure development in agriculture, forestry and water sectors and investment in public health. The seed fund will offer a wide range of financial products as the needs of every industry differ. The initial product portfolio may include equities, mezzanine and debt instruments; and with the

passage of time, the Fund could increasingly provide a new types of capital investment, various forms of guarantees or similar insurance products, and so on.

> **Develop a carbon fund mechanism with local-national government collaboration**

The absence of a top-level framework has created a relatively fragmented market structure and has limited the further integration of climate finance market in the past. The key issue of the climate finance market in the coming years is to promote market integration and policies linkages through a top-level framework, in order to form a complete market structure with stable price incentives (shown in Figure 10). In this structure, the source of public funding can be further diversified, with revenues from carbon market auctioning becoming an important funding source.. Regarding mechanism innovation, regional public carbon funds will play a major role in increasing carbon market capitalization and “financialisation” through flexible use of public-private cooperation mechanisms and capital market convergence. Meanwhile, effective redistribution of public funds can create “multiple dividends”, achieve convergence between different incentives, and promote connections between climate finance markets such as the carbon market, energy management contracts (EMC) market and new energy market. This in turn will, establish a more robust price incentive system, and will eventually create a relatively uniform climate finance market.

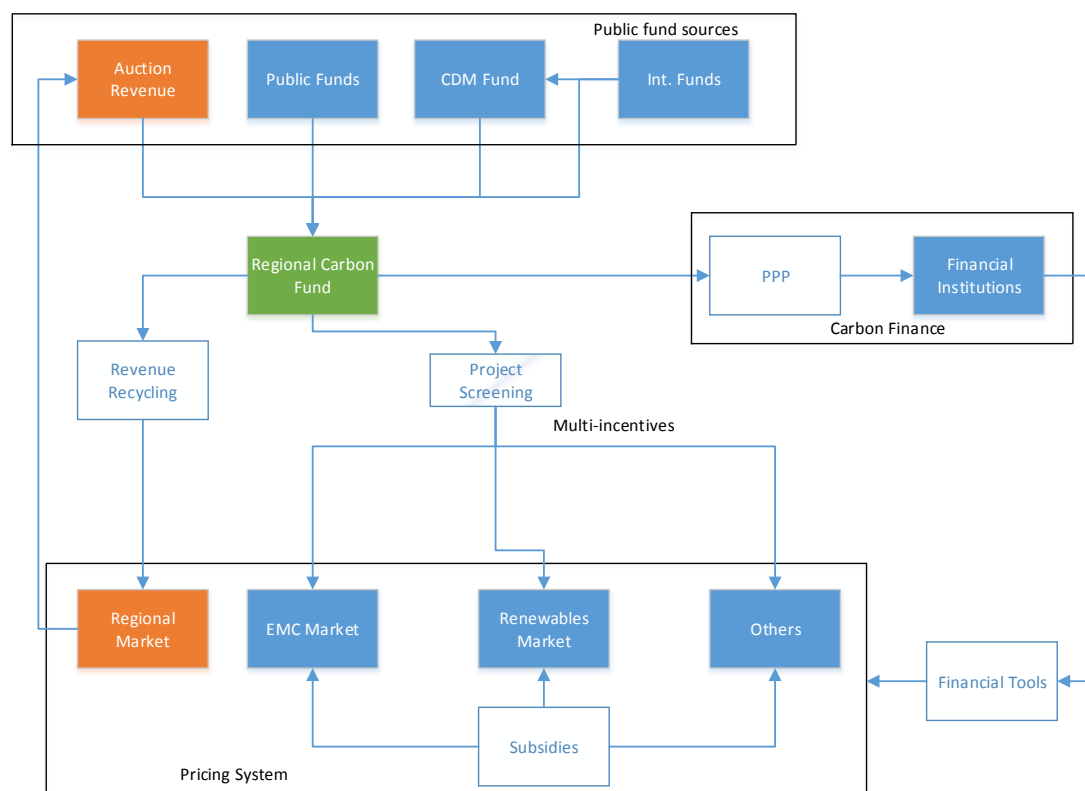


Figure 10 The Design of Climate Finance Public Funding System Based On Carbon Fund in China

Recommendations: Regional carbon funds set up jointly by the CDMF and the carbon emission trading pilot provinces can form a public finance cooperation mechanism. CDMF and local regional carbon funds can become a major public funding framework for China's future climate finance markets. And through payments transfer, equity investment and other means, they can form a network of National Climate Change Fund that coexists with multi regional carbon funds. The CDMF can play a leading role in providing stable policy signals, ensuring successful completion of national low-carbon economy and climate change objectives, and catalysing and accelerating the development of the green and low-carbon economy. Meanwhile, combining regional characteristics and development priorities, local carbon funds can establish public-private partnership platforms in line with local characteristics. In this way, public funds can not only be more effective and reduce the crowding out effect (i.e. reducing private sector's investment in the same field), but also prevent duplicated investment.

Carbon funds or other specialist funds can increase the leverage of carbon market through the use of auctioning revenues in energy efficiency or new energy markets as well as linking up the various market mechanisms such as energy performance contracting, new energy subsidy, carbon compensation and ecological compensation. This new 'capital redistribution' mechanism needs to find a new approach to project screening on the basis of existing market mechanisms, in order to identify projects and corporations with good credit records and development potential. It also needs to accentuate the hierarchy and differentiation of the coverage of existing mechanisms to reflect the guiding role of public funds.

> **Set up a special Green Investment department/agency in the China Development Bank**

Although policy banks have played a major role in renewable energy investment, their support in energy efficiency is still insufficient. This is mainly because the energy efficiency market is characterised by "technology deconcentration" (large number of different technologies), higher risk and lacks economies of scale, which makes it difficult to attract large-scale capital investment. Therefore, a connection mechanism between the policy banks and energy efficiency markets needs to be established to help reduce barriers to entry.

Recommendations: Carbon funds can help to improve energy efficiency technology risk assessment, aggregation and management. For example, similar types of projects may be managed together, and carbon funds can use collaterals to improve project credibility, increase project scale and reduce investment risk, thereby establishing linkages with policy banks.

In addition, a special Green Investment department or agency should be set up within the China Development Bank, targeting specifically green investment that is sorely needed but struggles to get capital investment. Adhering to an independent market operation model, the agency or department should fully utilise the leveraging power of public finance in green investment by providing financial support to projects that are in difficulty and in need of public finance aid. Joint investment with public funds can reduce investment risk and enhance the confidence of private investors, and stimulate private capital investment in the green sector. Crucially, this new agency/department should not be involved in projects that have the backing of private capital to avoid crowding out private investors and defeating the original intention of the agency. The new department must act according to the dual goals of investment: on the one hand, it should help to achieve green goals including greenhouse gas emission reductions, environmental protection, the efficient use of natural resources, protection of biodiversity and sustainable development; on the other hand, as a profit-oriented organisation, it should invest in projects through stocks, bonds and guarantees but should not provide preferential loans or subsidies. In addition, it should set clear investment priorities and systematically identify green investments that are most in need of investments but struggle to get private capital. Also, strategic investment priorities should be determined in accordance with China's national development strategy to prevent an over-large scope of investment priority.