



Green Finance for Low-Carbon Cities

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Michael R. Bloomberg

UN Secretary-General's Special Envoy for Cities and Climate Change, Founder of Bloomberg L.P. and Bloomberg Philanthropies

As the world's two largest economies, the United States and China play a critical role in confronting climate change. Both countries are taking action – and in both countries, cities are helping to lead the way.

Cities account for most of the world's carbon emissions, but they are also where the greatest progress is being made. But despite forward-thinking policies and support from the central government, they still face obstacles to making the kinds of investments that both protect public health and improve the economy.

This new report series, a product of the collaboration between Bloomberg Philanthropies and the Green Finance Committee of China Society for Banking and Finance, in partnership with the Paulson Institute, Energy Foundation China and the Chinese Renewable Energy Industries Association, sets out a path for overcoming those obstacles. Bringing together environmental and finance experts for the first time, it identifies opportunities for cities to attract more private funding on projects to reduce emissions in the building, transport, and energy sectors – and to do so in ways that drive economic growth and help China meet its national policy goals.

One way that cities can achieve these goals is through public-private partnerships that increase the capital available for infrastructure projects. As Mayor of New York City, for instance, we enlisted the help of the private sector to create the Clean Heat Fund, which helped buildings finance a shift to cleaner-burning heating oil. This public-private partnership helped us lower New York's emissions by 19% in just six years – and give the city its cleanest air in 50 years.

Finding new ways to connect cities to the capital needed to invest in sustainable infrastructure will go a long way toward achieving the climate goals that China, the U.S. and the world have set. I hope this report will be helpful to Chinese cities as they look to finance sustainable development projects – and build a brighter and more prosperous future for their people and future generations.



Ma Jun

Chief Economist,
Research Bureau of
People's Bank of China

Over its thirty years of reform and opening up, China has seen unprecedented economic growth, leading it to become the world's second largest economy. But its extensive mode of growth, combined with poor protection of the environment, has resulted in grave problems: resource shortages, severe pollution and weakened ecosystems. There is an urgent need for a change in that mode of economic growth. Meanwhile China has, as a responsible power, committed as part of the Paris Agreement to bring carbon emissions to a peak in or around 2030 and to strive to do so earlier if possible.

It is clear that China needs to change its mode of growth and bring about a green, low-carbon transition: both to increase sustainable domestic demand under the new economic normal and to realize the commitments it has made as part of the international response to climate change.

Cities are the centers of economic activity, as well as the main consumers of energy and emitters of greenhouse gases. Given that China is pushing ahead with urbanization, green and low-carbon urban planning and policies will be essential, if China is to develop in an environmentally friendly manner and keep its carbon commitment. Greening of transportation, building and energy will be crucial, as these sectors are the main sources of urban emissions.

Finance is at the heart of the economy, and green urban development cannot happen without support from green finance. Green finance refers to all financial activities in support of environmental improvements and the response to climate change: the use of tools such as green loans, green bonds, green industrial funds and carbon finance, as well as related policies, to spur private investment in green industries. We need close oversight of the three key sectors of transportation, building and energy; faster development of an urban green finance system; promotion of innovation in green finance products; popularization of the idea of green finance; solutions to low-carbon finance problems for transportation, building and energy; and sustainable solutions for low-carbon urban financing.

Aristotle said that people come to the city to live but stay in the city to live better. Green finance working in service of the urban economy will lay a solid foundation for green and low-carbon development and promote the welfare of those living in our cities!

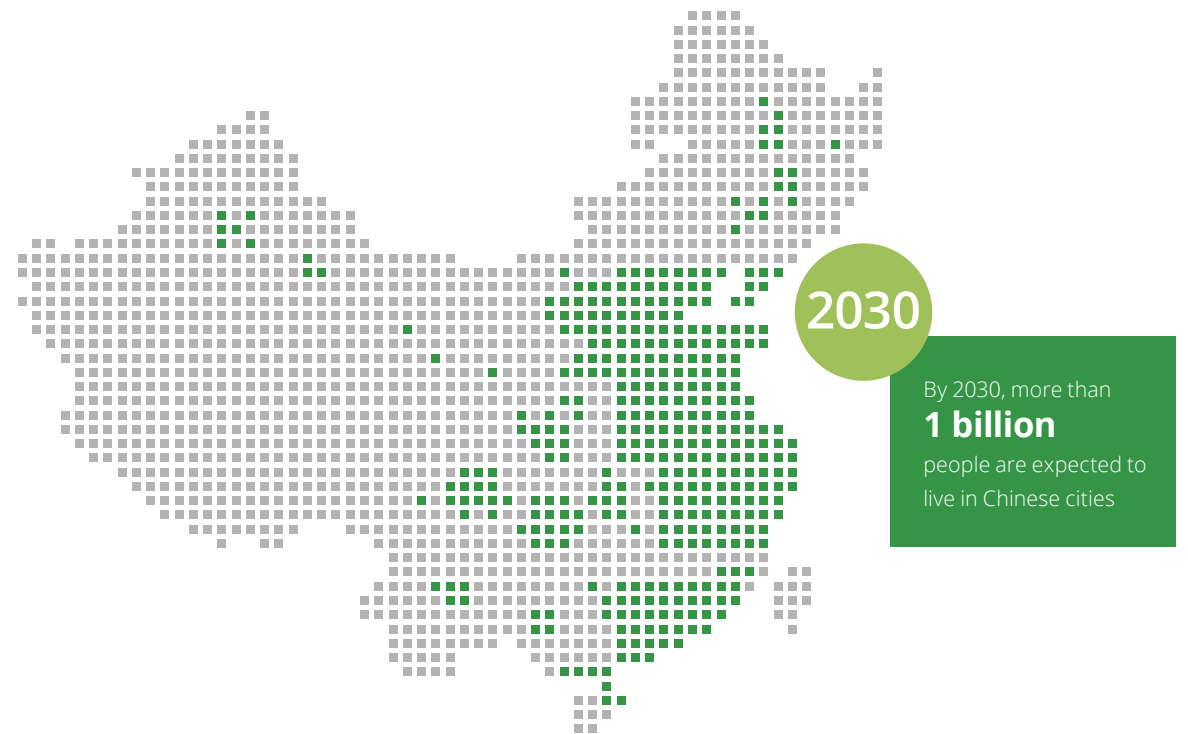


Cities are key to reaching China's national and global climate targets

In the U.S.-China Joint Announcement on Climate Change presented in Beijing on November 12, 2014, China committed to peak its overall carbon emissions around 2030. Chinese cities contribute 70 percent of the country's total energy-related carbon emissions,¹ making these cities' low-carbon transition the priority to achieve China's climate targets.

At the same time, China is still rapidly urbanizing, with 60 percent of the country's population projected to reside in cities by 2020. This would represent 845 million people, making China home to the world's largest urban population². By 2030, more than one billion people are expected to live in Chinese cities – or roughly 1 in 8 people on Earth³. Recognizing the urgent need to ensure the quality of urbanization, the Chinese government vowed to pursue “ecological civilization and green and low-carbon growth,” as one of the guiding principles in the National Plan on New Type of Urbanization (2014-2020).

Given the ambition of China's climate targets, the urgency to tackle severe pollution at local levels and the rapid pace of China's urbanization, low-carbon cities present the greatest opportunity for meeting national and global climate targets, as well as the country's long-term development strategy.



¹ Baeumler, A., Ijjász-Vasquez, E. and Mehndirata (2012). Sustainable Low Carbon City Development in China: Why It Matters and What Can Be Done. World Bank

² The State Council (2014). National Plan on New Urbanization (2014-2020). National Bureau of Statistics (2016); Statistical Communiqué of the People's Republic of China on the 2015 National Economic and Social Development

³ Mckinsey Global Institute, Preparing for China's Urban Billion, <http://www.mckinsey.com/global-themes/urbanization/preparing-for-chinas-urban-billion>

Greatest opportunity in buildings, transport and energy sectors

China is both rapidly urbanizing and striving to transition to low-carbon urban economies based around the service sector. Energy-hungry and polluting industries have been shut down or relocated, meaning that emissions from transportation, buildings and energy are rapidly growing and now account for a large proportion of emissions.

BUILDINGS Within China's economy, the building sector is growing most significantly. As the service sector has grown to account for 70 percent of Beijing's GDP, buildings now consume half of the total energy in Beijing, more than in any other Chinese city. Shanghai's urban centers display a similar pattern. For example, the service sector now accounts for 90 percent of the economy in Shanghai's Changning District and 70 percent of carbon emissions come from buildings. Meanwhile, a 2013 inventory of carbon sources in New York City found that buildings accounted for 75 percent of the city's emissions.

For some time to come, China's cities will need to work on two aspects of cutting building emissions: encouraging developers to build green buildings to avoid carbon emissions that will be locked in for decades; and the retrofitting of energy-saving methods in hundreds of millions of existing buildings.

TRANSPORTATION Globally, the transportation sector was responsible for approximately 23 percent of total CO₂ emissions in 2010, with approximately 40 percent of the total energy consumption in the transportation sector occurring in cities⁴. Along with rapid urbanization, China also experienced explosive growth in automobile use and ownership, which has

resulted in an alarming increase in traffic congestion and air pollution. As a result, motorized transportation has become one of the country's fastest growing major emission sources.

A 2012 study showed that transportation-related CO₂ emissions in China grew from 151.6 million metric tons in 1991 to 602.3 million in 2009, representing a 15.6 percent compound annual growth rate⁵. To reduce emissions and satisfy the growing demand for urban transport, it is imperative to accelerate the development of urban green transportation.

ENERGY It is essential to reduce the carbon intensity of China's energy supply and control air pollutants, and China has been making every effort to scale up its renewable energy industry. In addition to meeting its climate pledge, China's focus on renewables is also motivated by the need to tackle the severe air pollution found in mega-cities. For example, coal-burning contributed to about 50 percent of local air pollution in the Jingjinji region⁶. Hence, a cap on coal consumption and a target for renewable energy use has been adopted. Wind and solar have a significant role in this process. By 2015, cumulative installed capacity of wind had reached 120GW, with solar reaching 43GW.

Distributed solar in particular has been identified for its flexibility and cleanness, as well as its potential to advance the smart urban energy system in the context of unfolding electrical market reform. Cities have created policy and financial incentives to compete in the "rooftop revolution." In the last three years, the installed capacity of distributed solar in China grew from 3.77GW to 6.06GW; the latest draft of the 13th Five-Year Plan on renewable energy has made a significant 70GW solar target by 2020⁷, more than ten-fold the existing solar capacity. The target for wind has also been lifted from 200GW to 250GW.

⁴ Transport. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

⁵ Chi Xiongwei (2012). Analysis of Carbon Emissions from China's Transport Sector, Boyang Lake Academic Journal, No.4, 2012.

⁶ Guan Dabo, Liu Chu (2014), Source Analysis and Control Strategies for PM2.5 Pollution in Beijing-Tianjin-Hebi. China Environment Press

⁷ National Energy Administration, China



“Chinese culture values harmony between man and nature and respects nature. Going forward, ecological endeavors will feature prominently in China’s 13th Five-Year Plan. China will work hard to implement the vision of innovative, coordinated, green, open and inclusive development. China will, on the basis of technological and institutional innovation, adopt new policy measures to improve the industrial mix, build low-carbon energy systems, develop green buildings and low-carbon transportation, and build a nationwide carbon-emission trading market, so as to foster a new pattern of modernization featuring harmony between man and nature.”⁸

- Xi Jinping, President, People’s Republic of China



Role of green finance

There is huge investment demand in green industries. Based on this study, during the 13th Five-Year Plan period, an **estimated 6.6 trillion yuan, about USD \$1 trillion, of investment will be needed for low-carbon buildings, green transportation and clean energy**. According to the previous analysis of the Green Finance Committee of China Society for Finance and Banking, government finance is only capable of funding 10–15 percent of the necessary investment. Therefore, we need to develop green finance through feasible financial policy incentives and innovative products and mechanisms to overcome the barriers for private capital to access green industry. Here are some ways we can encourage the private sector to take action:

First, fully leverage public funds. Government subsidies have traditionally funded the construction of green and energy efficient buildings. By establishing models such as green building funds and insurance, government funds can be leveraged on a market basis, provide guarantees for green projects and lower the overall financing costs. With models such as a Green Guarantee fund we can facilitate risk diversification, low-cost financing, and sectoral development.

Second, provide diversified green financial instruments. Currently most green transportation projects are funded by government investment and bank credit. This pattern can be changed by integrating the use of green credit, green bonds, green funds, refinancing and other tools. This diversification allows for the securitization of long-term and stable funding, reducing the risk of investing in projects with a long payback.

Third, establish early-warning and risk-sharing mechanisms. Green finance can make up for investors’ weakness in judging and analyzing environmental risks. Stress tests and risk analyses can guide investors to allocate more resources to green and low-carbon industries, instead of carbon-intensive industries.

Fourth, introduce policy incentives. Green transportation, green buildings and renewable energy projects all require major financing, which still comes mainly from bank credit and bonds. Government can encourage banks to grant more credit and lower the financing costs for green projects by effectively institutionalizing subsidized credit for green projects. Government can also greatly stimulate investment enthusiasm and encourage funding for green projects by providing tax incentives or credit-enhancement measures.

Fifth, define standards and monitor implementation of green projects. The inherent environmental information disclosure mechanism of green finance will encourage enterprises to fully disclose relevant information of their own accord, thereby reducing the identifying costs for investors and improving the ability of the capital markets to distinguish green and brown enterprises.

To ensure green urban development and transformation, it is vital for us to build a green financial system with institutional innovation, product innovation, policy incentives and financial infrastructure as its framework, hence providing effective, convenient and diversified financing for green buildings, green transportation, clean energy and other green sectors.

⁸ United Nations’ Climate Change Conference at Paris (2015)

⁹ Green Finance Committee, Establishing China’s Green Financial System, April 2015

“The world is facing serious environmental challenges. We need to make stronger commitments to addressing them. We have tried many ways, including environmental regulations, pricing reforms, and fiscal policies. These have all worked in some way in controlling pollution and slowing the pace of global warming, but they are not enough. The financial system should also play an important role in promoting the green transformation of our economies.”¹⁰












- Zhou Xiaochuan, Governor, People’s Bank of China



¹⁰ China's Green Finance Gives Birth to Trillions' Worth Market. YiCai, April.17, 2016. <http://www.yicai.com/news/5003364.html>

Investment demand estimate for key sectors in the 13th five-year plan (2016-2020)

The table below shows the investment needs of three types of low-carbon urban projects – efficient buildings, green transportation and clean energy in the next five years.

| | Project Category | Required Additional Amount | Investment Needs (billion RMB) | Investment Needs (billion USD) |
|--|--|----------------------------|--------------------------------|--------------------------------|
|  Efficient buildings |  New green buildings | 3080 million square meters | 224.8 | 34.58 |
| |  Existing building retrofit | 2080 million square meters | 1,426.2 | 219.42 |
|  Green transportation |  Rail | 3,000 km | 2,400 | 369.23 |
| |  Bus | 181,000 public buses | 627.1 | 96.48 |
| |  Electric vehicles | 4.8 million charging spots | 132 | 20.31 |
| |  Bike | 171,350 public bikes | 0.86 | 0.13 |
| |  Urban roads | 64,600 km | 1292.1 | 198.78 |
|  Clean energy |  Distributed solar PV | 64 GW | 500 | 76.92 |
| | Total | | 6,603.06 | 1,015.85 |



Efficient Buildings

There are two main obstacles to transitioning to low-carbon buildings in cities. First is the development and construction of new buildings in rapidly urbanizing cities. Although energy efficiency practices are often included in designs, without sufficient funding few projects develop past the design phase. Second is the lack of available funding for retrofitting buildings in existing cities. During the 12th Five-Year Plan period (2011-2015), China made energy-saving changes to homes covering 700 million square meters of building area in northern China. But more than 80 percent of funding for this came from central and local government subsidies, with very little private capital investment. Investments in energy savings in Chinese buildings are still overly reliant on government funding subsidies.

Barriers

- Energy-efficiency renovation in existing buildings mainly relies on subsidies from central, provincial and county governments, rather than on market mechanisms and private capital. Without green legislation to encourage private investors, stakeholders are reluctant to invest in the research and development of energy-saving technologies and products. This makes it difficult to make up for the huge financing gap and for cities to adapt to the requirements for early peaking of emissions from urban buildings. At the same time, over-reliance on public financing results in excessive government intervention, thus discouraging private capital from entering the green-building market.
- Lack of transparency makes financing difficult. The requirement on disclosure of building energy efficiency is clearly stated in Regulations on Energy Conservation in Civil Buildings (2008), but has never been enforced. Because of the lack of building energy-efficiency information in the market, consumers can't identify energy-efficient buildings, energy-saving service providers can't identify high-consuming owners and owners have no idea of their energy efficiency.

Barriers and recommendations

- Without information on the long term performance of green buildings, it is difficult to implement financial subsidies or incentives. Current evaluations are based on building plans and designs, which give little insight into the operating energy efficiency of the building. Without better knowledge of long term performance, investors are reluctant to develop green buildings.

Recommendations

- Mandate performance-based, predetermined contracts between owners and energy-saving service providers to protect the interests of both parties and prevent disputes.
- Adopt or encourage diversified and innovative financing tools that cover the whole industry chain—including green building industry funds; urban energy-efficiency renovation bonds; third party certified, discounted loans for green buildings; and low-interest bank loans for consumers to buy green houses.
- Establish a guarantee mechanism for green buildings, which would be based on a third-party rating system and help build a credit-enhancement mechanism to attract private capital and incentives, as well as subsidies from the government.
- Strengthen international cooperation and use international green loans and funds, while relaxing restrictions on investment quota and asset movement in-and-out of the country for Qualified Foreign Institutional Investors (QFII) in domestic energy efficiency transformation and green building projects.



Green transportation

The construction of green transportation infrastructure in Chinese cities was greatly accelerated during the period of the 12th Five-Year Plan. This progress is evident in the proportion of investment in fixed assets in urban transportation that public transit has received, primarily in first-tier cities. Nevertheless, the overall development of green transportation infrastructure in China still lags behind many foreign cities that enjoy advanced green transportation development. Under the framework of the overall energy-saving and emission-reduction objective in the 13th Five-Year Plan, strategies for planning goals of green transportation development have also been set in many cities in China, requiring further expansion of investment.

Barriers

- Investors lack power to set the price of transportation post-construction. As the need for more railway public transport increases, the non-market-driven pricing mechanism limits the potential revenue for these projects and contributes to a shortage of capital required to construct green transportation facilities.
- Neither the investment entities nor the financing channels are diversified. The heavy reliance on local government debt leads to the over-concentration of credit risks. As a result, the entry-level for non-public funding becomes very high and the protection for equities inadequate.
- Funding is scarce for underserved locations. Funding is more readily available for the more developed, eastern provinces than for the western provinces. Similarly, larger-scale cities are more likely to receive funds, compared to smaller cities within a province. This does not address the areas with real investment needs.

- Financial institutions focus on qualifications of project developers rather than efficacy of the project itself when allocating funds. There is a lack of sectoral standards regarding subsidies and performance measurement. Project developers of different ownership types are also treated very differently by the banks – with the preference for state-owned enterprises.
- A good business model is lacking for the construction of new energy vehicle-charging facilities.

Recommendations

- Provide a variety of long-term and low-cost financing resources, including credit assignment, equity transfer and carbon trading.
- Improve the yield of green projects by separating productive assets from non-productive assets as well as from fiscal subsidies.
- Maximize social investments in green transport infrastructure with limited public funds through diversified investment entities, including Public-Private Partnership (PPP), Rail + Property, and other project financing methods.
- Activate stock assets through financial leasing and asset securitization.





Clean Energy

Some less-developed cities in China are facing increasing pressure arising from their energy mix, while other developing small and medium cities are expected to experience huge growth in energy consumption. Against this backdrop, city administrators need to achieve triple targets: ensuring adequate supply of energy, minimizing energy costs and protecting the environment. These triple targets have created room for clean energy represented by distributed PV. Yet, because of their special properties, distributed PV projects are financially challenged.

Meanwhile, with the gradual liberalization of the power market, consumers may purchase power directly from the power plant via the electricity trading center; therefore, they can choose clean-energy-generated power. The recent Guidance on Establishing the Targeted System for the Renewable Energy Development and Utilization issued by the National Energy Administration has explicitly set the non-hydro renewable energy feed-in proportion target for all provincial administrative regions in 2020. The Guidance will guide regions without sufficient power generated by renewable energy to buy such resources from other regions. The Guidance provides the institutional grounds for purchasing clean energy from other regions.

Barriers

- The conventional financing mode cannot effectively support clean energy projects, due to the huge up front investment in equipment, the short initial construction period, and high overall costs.
- Although the distributed project is usually grid-connected, due to its small and medium scale, it usually involves many stakeholders. The lack of standardization results in high trading costs.

- When managing risks, banks in China usually value guarantees and collateral. Small and medium-sized projects are mainly developed by small and medium enterprises (SMEs), which usually lack guarantees and collaterals, making financing such projects especially difficult.
- Banks in China do not differentiate when evaluating enterprises. This “one-size-fits-all” financing mode hinders the promotion of distributed PV.

Recommendations

- Create more green financial instruments, including green bonds, green credit and green asset securitization, to help achieve green financing for various parties.
- Establish a government-backed investment and financing platform to facilitate the integration of local resources for unified development and financing for local construction projects.
- Establish a national guarantee fund financed by budget funds to lower financing costs through credit-enhancing professional guarantees for clean energy projects.
- Explore ways to purchase green electricity from other cities so as to increase clean energy use, to expand market demand for renewable energy and to help cities to achieve the low-carbon objectives.

Conclusion

The investment potential in China's low-carbon urbanization is enormous. Funding required by the three main sectors (buildings, transport and energy) amounts to a total of 6.6 trillion RMB (about 1 trillion USD) in the next five years. In order to meet the investment needs:

- The government should adopt environmental and climate policies to provide clear direction for investment and also promote the standardization of green definitions and relevant information disclosure.
- Public funding should play a leveraging role and facilitate the entry of a large amount of private funding in the low-carbon development of Chinese cities.
- The financial sector should encourage innovation, and design suitable financing mechanisms to suit the special features of the different sectors and to manage the risks. Also, the financial sector should establish a system to differentiate potential projects based on their environmental benefits, so that green finance can effectively direct funding to low-carbon urbanization.



Research partners

This research initiative is carried out under the collaboration between the **Bloomberg Philanthropies** and the **Green Finance Committee of China Society for Banking and Finance**, in partnership with the Paulson Institute, Energy Foundation China and the Chinese Renewable Energy Industries Association.



Buildings

Author

Paulson Institute

Research Support

Research Center for Climate and Energy Finance, China Central University of Finance and Economics



Transportation

Author

Energy Foundation China

Research Support

China Sustainable Transportation Center; Research Center for Climate and Energy Finance, China Central University of Finance and Economics



Energy

Author

Chinese Renewable Energy Industries Association

Research Support

Bloomberg New Energy Finance; Research Center for Climate and Energy Finance, China Central University of Finance and Economics; China Photovoltaic Investment and Financing Alliance

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Green Finance Committee of China Society for Banking and Finance was initiated and administered by People's Bank of China (PBC). The Committee consists of 140 institutional members including major banks, brokers, investment funds, and insurance companies, as well as policy makers, regulators and researchers and service providers in the area of green finance. Its mandate is to promote the establishment of the green financial system in China and build capacity for green investment by Chinese financial institutions.

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M. Paulson, Jr., the 74th Secretary of the Treasury and former Chief Executive Officer of Goldman Sachs, the Institute is based in Chicago and has offices in Washington, San Francisco, and Beijing.

Energy Foundation China, established in Beijing in 1999, is a grant-making charitable organization dedicated to China's sustainable energy development. It is registered under the Ministry of Civil Affairs as Energy Foundation Beijing Representative Office and supervised by the National Development and Reform Commission of China. It is a part of the Energy Foundation, which is based in San Francisco, California, U.S.A.

The Chinese Renewable Energy Industries Association (CREIA) was established in 2000 with the support of the United Nations Development Programme (UNDP), the Global Environment Facility (GEF) and the State Economic and Trade Commission (SETC). CREIA serves as a bridge between regulatory authorities, research institutes and industry professionals in order to provide a forum to discuss renewable energy development at the national level and subsequently advise the Government of China on strategic policy formulation. CREIA acts as a window to bring together national and international project developers and investors. It promotes technology transfer and raises awareness of renewable energy investment opportunities through an online Investment Opportunity Facility and regional networking and training activities.

Research Support:

Research Center for Climate and Energy Finance (RCCEF), is an inter-disciplinary academic research center and innovation platform at Central University of Finance and Economics (CUFE). RCCEF's main research fields include: climate finance, environmental economics and green finance, energy finance and forecasting of sustainable development of economy and society.

China Sustainable Transportation Center

(CSTC), established in Beijing in 2005, is a nonprofit organization that engages in sustainable city planning, sustainable transportation design and research on relevant policies. It is supervised by the Science and Technology Commission of Chaoyang District, Beijing, China. CSTC is committed to promoting the intensive land use and the transit-oriented urban development and advancing walking, cycling and the development of public transportation systems. They are dedicated to helping China's cities from the beginning of urban planning to effectively reduce energy consumption and air pollution, construct human-centered communities and transportation systems, take preemptive opportunities in energy-saving and emission reduction, and create a low-carbon, sustainable future.

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The China Photovoltaic Investment and Finance

Alliance (CPVFA) is organized by the Chinese Renewable Energy Industries Association (CREIA), with support from The Energy Foundation, China's National Energy Administration and the China Banking Regulatory Commission. CPVFA focuses on formulating and improving standard evaluation and certification systems for the Chinese PV industry; expanding financing channels and financial products innovation; and establishing a dialogue and matchmaking mechanism between finance institutions and the PV industry to build a professional and efficient platform for investment and financing.



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