



绿色创新发展中心
Innovative Green Development Program

●●● 2018 Annual Report







CONTENTS

P2

Mission

P3

Annual Review

P6

Climate Policy

P10

Green Low-Carbon
Urban
Transformation

P16

Green Economy
Policy

P20

Green Low-Carbon
Development Think
Tank Partnership

P24

Report

P74

Partners

P75

Contact Us



Mission

Mission

Innovative Green Development Program (iGDP) is a Chinese non-governmental think tank focusing on addressing green low-carbon development. Through systematically researching, comparing and evaluating policies, we promote the refinement and implementation of low-carbon environmental actions. We work closely with all stakeholders to examine the progress of China's green and low-carbon development and advance a future with zero emissions.

iGDP was launched by Energy Foundation China (EFC), which also provides funding and operational support. iGDP is the executing agency of the Green Low-Carbon Development Think Tank Partnership (GDTP) and a member of the Green Finance Committee (GFC). It is also a member of the United Nations Economic and Social Cooperation for Asia Pacific (UNESCAP) North-East Asia Low Carbon City Platform (NEA-LCCP) as an expert institution.

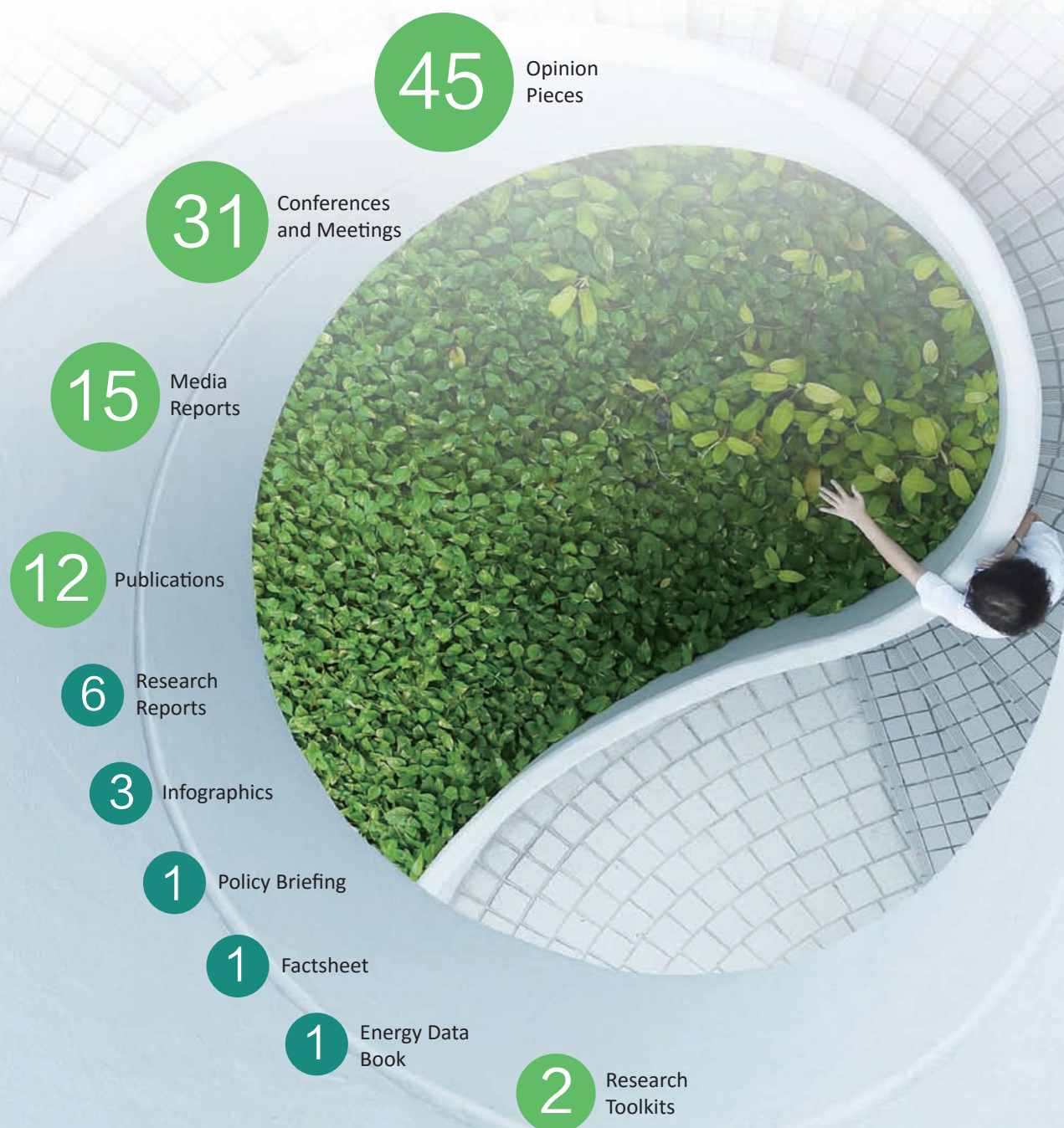
Focus

iGDP is currently focused on the following areas:

- ❖ Climate Policy
- ❖ Green Low-Carbon Urban Transformation
- ❖ Green Economy Policy
- ❖ Emissions Reduction Action

► Annual Review

2018
Statistics



Calendar

1/27

Beijing, China /
International Seminar:
Chinese Carbon Market

★ 1/26

Huzhou, China / GDTP
2018 Annual Conference

1/12

Beijing, China / Seminar:
Green and Low-carbon
City Financing Models
and Cases

4/21

Beijing, China /
Green Finance
Committee 2018 Annual
Meeting

4/10

Beijing, China /
Consultation Meeting:
Promotion of the
Construction of National
Carbon Market

6/19

Ulaanbaatar, Mongolia /
Third Northeast Asian
Mayor's Forum

★ 6/11

Wuhan, China /
International Seminar on
Low-Carbon City Roadmap:
"Green Transformation of
Wuhan"

January 2018

April 2018

June 2018

March 2018

May 2018

July 2018

3/5-7

Edmonton, Canada /
Seminar: Cities IPCC

★ 3/23

Beijing, China / High-level
Dialogue between the
World and China on Green
and Low-Carbon
Development Agenda:
China's Leadership and
Infrastructure Investment

3/28

Beijing, China / Seminar:
China's Mid-Century
Strategy for Climate
Mitigation Framing and
Methodologies

3/30

Bangkok, Thailand / Fifth
Asia-Pacific Forum on
Sustainable Development
(APFSD): Promoting
Low-Carbon Transformation
Pathways of Northeastern
Asian Cities for the
Implementation of 2030
Agenda for Sustainable
Development

5/12

Beijing, China /
Expert Seminar:
Carbon Disclosure and
Computing

7/18

Beijing, China /
iGDP Seminar:
LOGIC Sharing

7/19

Washington, U.S. /
Press Conference:
English Version of
LOGIC Report





Climate Policy

On December 12, 2015, 195 countries reached a landmark agreement—the *Paris Agreement*. The agreement set out a global plan for combating climate change after 2020. It also commits to keep global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The global commitment submitted to the Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC), *Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions (INDC)* commits China to a peak in carbon dioxide emissions around 2030 and an increase in the share of non-fossil fuels in primary energy consumption to around 20%.

The *Paris Agreement* entered into force on November 4, 2016 and the Marrakech Climate Change Conference (COP 22/CMP 12) from November 7 to 18, 2016 set plans for implementing it. The Bonn Climate Change Conference (COP 23/CMP 13) from November 6 to 17, 2017, further promoted its implementation and participants formally agreed upon the production of a common rulebook for putting the *Paris Agreement* into practice during the Katowice Climate Change Conference (COP 24/CMP 14/CMA 1) from December 2 to 16, 2018.

In October 2017, the report of the 19th National Congress of the Communist Party of China proposed to “promote green development.” Specifically, it includes accelerating the establishment of the legal system and policy guidance for green production and consumption, as well as establishing and improving the circular economic system of green and low-carbon development. It includes building a market-oriented system for green technology innovation, developing green finance, and expanding industries of energy conservation and environmental protection, clean production, and clean energy. It also includes promoting the revolution in energy production and consumption, and building a clean, low-carbon, safe and efficient energy system.

iGDP follows and compares the formulation and implementation of major countries' INDCs, and closely tracks China's sustainable development and green low-carbon energy transformation in order to examine the political, technological, economic and social development paths and analytical tools needed to realize the peaking of greenhouse gas (GHG) emissions. By becoming deeply involved in both domestic and international climate change cooperation as well as voicing opinions on relevant topics such as climate change narratives and youth participation, iGDP strives to promote interdisciplinary exchange and sharing in relevant fields.

Global Climate Action Summit

September 12 to 14, 2018

iGDP Senior Analyst Dr. Chen Meian attended the Global Climate Action Summit in California, U.S., and sent an on-the-spot observation article.

Field
Activities

24th Conference of the Parties to *United Nations Framework Convention on Climate Change*

December 2 to 16, 2018

24th Conference of the Parties to the UNFCCC (COP 24) was hosted in Katowice, Poland. iGDP Senior Analyst and Program Head Yang Li and Operations Director Wang Yanhui attended this conference as observers.

December 6, 2018

Yang Li was invited to give a speech about “Research on Green and Low-Carbon Development Index of Chinese Cities” at the “Urban Environment and Social Inclusion Index” conference.

December 10, 2018

Yang Li was invited to give a speech at the “China-Japan-ROK Joint Climate Research Project: Decarbonization and Sustainable Development Session” held in the Japan Pavilion. Yang Li introduced China’s low-carbon cities’ experience in green and low-carbon transformation using the case of Wuhan.

December 13, 2018

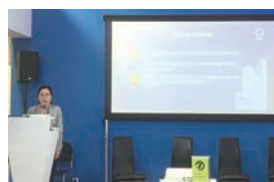
Wang Yanhui was invited to give a keynote speech about the findings in the “Public Awareness Survey of Chinese Low-Carbon Cities” in the “Experience Sharing on the Dissemination of Climate Change” session.

December 13, 2018

iGDP, Greenovation Hub and The Nature Conservancy (TNC) worked together to hold a session about “International Cooperation on Green Cooling and Climate Change.” Wang Yanhui hosted the session. Sun Zhen, deputy leader for the Department of Climate Change of the Ministry of Ecology and Environment (MEE), gave a speech. Yang Li gave a keynote speech on “Opportunities for Green and Low-Carbon Development of China’s Cooling Mechanisms.”

December 14, 2018

iGDP and Natural Resources Defense Council (NRDC) jointly held a press conference on “Chinese NGO Green Cooling Initiative” and proposed seven initiatives for Chinese green cooling actions.



Field Products

Policy Mapping

Policy Mapping (www.cepm.igdp.cn) is an interactive platform to track, synthesize and compare low-carbon development policies and actions across regions and cities in China. By identifying key publicly available policies and performance indicators on low-carbon development, Policy Mapping will promote best practices and learning by doing.

iGDP officially released Policy Mapping at COP 22 in November 2016 in Marrakech. Two mini workshops were held in March 2017 to gather user experience and update suggestions from users in relevant fields. Following that, iGDP added city pages in Policy Mapping's first updated version in June 2017 and added province pages in its second updated version in October 2017. By the end of 2017, the first statistical update was done, and more non-CO2 data was added. In 2018, Policy Mapping integrated more information about green finance into the data system and updated relevant information such as policies, regulations and administrative measures in the green finance innovation and reform pilot zones.

Media Reports



The Number of Air Conditioners May Increase 2.5 Times by 2050, the Cooling Industry Will become the "Great White Elephant" in the Field of Climate Change
2018/12/20



Katowice Climate Change Conference (COP 24): Chinese NGO Calls for Action on Green Low-Carbon Cooling
2018/12/18



Hu Min: "Challenging Humanity" is the Real Obstacle in Tackling Climate Change
2018/12/4



Opinion: The Climate Policy to Hope for under China's New Ecology Ministry
2018/8/20



Opinion: Regulatory Shakeup Gives Boost to Climate Change Reform
2018/4/17

How Demographic Trends Affect the Future of China's Carbon Emissions

2019/1/14

COP 24 Report Series

2018/12/3-12/21

Katowice Climate Change Conference: Chinese NGO Calls for Action on Green Low-Carbon Cooling

Solid Foundation: COP 24 Passed Rules for the Implementation of the *Paris Agreement*

Long Way to Go: Three Obstacles Need to be Removed before Reaching an Agreement

Unite Together: Corporations and NGOs are Indispensable in Climate Actions

Step Forward: Toward a Net Zero Emissions 2050

Call for Action: Talanoa Dialogue Calls for Politicians to have Higher Ambitions

Global Attention: China's Carbon Market is Expected to become a Model for the Implementation of the Paris Agreement through Market Mechanisms

On and Off: No Saturday for COP

Statistic Talks: Promote the Implementation of Climate Actions

Bigger Ambition: Zero Emissions is Not a Dream

Time Waits for No Man: The Most Important Climate Change Conference Since the Paris Agreement Came into Force Opened

Behavior Change is the Fundamental Driver in GHGs Emissions Reduction

2018/11/2

A Side Note of the Global Climate Action Summit

2018/9/18

Consulting with *New York Times*: Are China's Emission-Cutting Efforts Really Inadequate?

2018/8/2

Borrowing Other's Experience to Provide Advice for China's Approaching Zero Emissions Zone Constructions

2018/7/16



Green Low-Carbon Urban Transformation

China is experiencing large-scale and rapid urbanization. It is predicted that in the next 15 years, more than 300 million people will move to urban areas. In order to reach sustainable development goals, urbanization should be transformed from its traditional model to a green low-carbon model, which includes transforming drivers economic growth as well as realizing low-carbon development in transportation, construction, industry and lifestyles.

China started its low-carbon pilot program in 2010 and now has initiated 87 low-carbon pilots including 6 provinces, 79 cities and 2 counties which provide rich experiences to city administrators and others. During the first U.S.-China Climate Leader Summit in 2015, nine cities and two provinces launched the “Alliance of Peaking Pioneer Cities (APPC).” As of now, 23 provinces and municipalities have joined APPC and announced local peaking target schedules.

iGDP strives to explore cities’ low-carbon development plans as well as their GHG peaking roadmaps and practices. iGDP adopts both horizontal and vertical approaches to analyze cities’ low-carbon efforts—horizontally comparing policies and measures from different cities and vertically examining the contributions different industries make to the transformation. At the same time, iGDP combines overall principles and practical cases to provide independent, clear and comparable information to help city managers in making low-carbon plans.

China Low-Carbon & Green Index for Cities (LOGIC) Study

In order to track the green low-carbon development of Chinese cities and push forward new work in energy transformation models, iGDP worked with United States Department of Energy Lawrence Berkeley National Laboratory (LBNL) China Energy Department and Energy Foundation to produce the “China Low-Carbon & Green Index for Cities (LOGIC).”

Based on domestic and foreign low-carbon development trends and domestic urban characteristics, LOGIC is a comprehensive index system that quantifies the effects of green and low-carbon development actions and policies in key urban areas in China. In 2017, LOGIC built a massive urban database, including 23 indicators covering 7 dimensions of economy, energy, industry, construction, transportation, environment and land use, and 8 indicators reflecting the socio-economic characteristics of cities in 115 prefecture-level and above cities in 2010 and 2015.

LOGIC aims to track and compare the green and low-carbon development of Chinese cities, identify the strengths and weaknesses of different cities, promote cooperation between domestic and international cities, and provide research support for the adjustment of future urban actions. This study will continue to launch a series of reports based on periodic research results, providing reference for policy formulation and implementation in green and low-carbon urban development.

Field Activities



March 5-7, 2018

Analyst Chen Mei'an was invited to attend the IPCC Cities meeting and held a poster exhibition of LOGIC report.

June 19, 2018

iGDP was invited to attend the Third Northeast Asian Mayor's Forum in Ulaanbaatar, where Analyst Chen Mei'an introduced LOGIC research.

July 18, 2018

LOGIC's research and key findings were presented to nearly a dozen media outlets at iGDP Seminar held by iGDP at its Beijing office.

July 19, 2018

Senior Advisor Hu Min was invited to publish the English version of the LOGIC report at the Woodrow Wilson International Center for Scholars in Washington, DC.

“North-East Asia Low Carbon City Development: Peer Review and Comparative Study” Project

In the context of global warming and regional economic integration, strengthening the regional cooperation for low-carbon transformation at the city level is paramount. In 2014, the North East Asia Sub-regional Programme for Environment Cooperation (NEASPEC) established the North-East Asia Low Carbon City Platform (NEA-LCCP) with the purpose of promoting information exchange, technology research and capacity building in the development of low-carbon cities in northeast Asia, in which iGDP is an expert.

Based on the North-East Asia Low Carbon City Platform (NEA-LCCP), the “North-East Asia Low Carbon City Development: Peer Review and Comparative Study” project is composed of two parts: (i) developing a theoretical framework and methodology applicable to the evaluation of low-carbon city development in Northeast Asia based on cases studies to facilitate exchange and experience sharing among cities; (ii) establishing a methodology for the comparative study of low-carbon city development to understand and compare the low-carbon development status of China, Japan and South Korea.



On March 2, 2018,

Senior Analyst and Program Head Yang Li was invited to participate in the “Promoting Low-Carbon Transformation Pathways of Northeastern Asian Cities for the Implementation of 2030 Agenda for Sustainable Development” session in Fifth Asia-Pacific Forum on Sustainable Development (APFSD) held in Bangkok, Thailand. Yang Li also gave a keynote speech titled “The Peaking Process and Prospect of Peaking China’s Urban Carbon Emissions as Early as Possible—Taking Wuhan as an Example.”

On June 11, 2018,

iGDP held an international seminar low-carbon city roadmap titled “Green Transformation Focusing on Wuhan” in the city of Wuhan. Nearly a hundred experts from China, Japan and South Korea have analyzed Wuhan as an example of green transformation.



On January 25, 2019,

iGDP held the seminar “Chinese Green Low-Carbon Urban Development” in Guangzhou. More than 30 experts from China, Japan and South Korea, exchanged experiences of making green and low-carbon city policies after studying the progress of Guangzhou.

Low Carbon Development and Peaking City: Formulating Guidelines for Medium- and Long-Term Green House Gas Emissions Reduction Projects and Action Plans

The current project is based on the study “Planning Tools and Institutional Framework for Urban Development (Integrated),” which is also the third subtask of the project “Promoting a Clean, Green and Low Carbon Urban Development in China Through International Cooperation.” This project is jointly commissioned by DECC and the World Bank and co-consulted by iGDP and the School of Environment & Natural Resources of Renmin University of China. After learning from the experience and best practices of domestic low carbon pilot cities and foreign model cities, these guidelines will summarize and improve the basic principles of low carbon city planning, standardize the process and procedure of urban planning, strengthen the logic among the elements/links in the planning framework, and recommend alternative methods and tools to serve different purposes and stages. Urban planners can choose applicable quantitative analysis methods and model tools according to their actual needs, which will improve their ability to formulate low carbon development plans.

Municipal Solid Waste Management Project

Cities are not only responsible for reducing energy consumption and GHGs emissions in sectors such as industry, transport and construction, but also need to cut non-carbon dioxide GHGs emitted from municipal wastes and sewage treatment plants. Although emissions from the latter are relatively low, their high global warming potential makes their impact on global warming impossible to ignore.

iGDP promotes information sharing and capacity building in the field of municipal solid waste and sewage treatment by sorting out relevant policies and practices. iGDP is also researching China's low-carbon municipal solid waste and sewage treatment best practices based on case studies. The project has two main parts. The first part is to integrate urban practices and cases through field visits and expert interviews, and the second part is to share and exchange urban experience in this field through the green and low-carbon city platform.



From September 18 to 21, 2018,

Senior Analyst Chen Meian was invited by the Woodrow Wilson International Center for Scholars as one of the members from the “Technology Exchange Between China and the U.S.: Methane Recovery and Utilization in Wastewater Treatment and Low-Carbon Management Strategy” delegation group. Chen Meian paid a visit to several sewage treatment corporations and relevant regulatory departments in Los Angeles and Washington D.C. and gained substantial technical and regulatory experience about American sewage treatment.

Field Products

Reports

1. China Low-Carbon & Green Index for Cities (LOGIC) Study Report
2. Peer Review on North-East Asia Low Carbon City: Background Report of Wuhan
3. Peer Review on North-East Asia Low Carbon City: Background Report of Guangzhou
4. Peer Review on North-East Asia Low Carbon City: Methodology
5. North-East Asia Low Carbon City: Comparative Studies of Countries
6. Low Carbon Development and Peaking City: Formulating Guidelines for Medium- and Long-Term Green House Gas Emissions Reduction Projects and Action Plans

Low-Carbon City Roadmap Workshop

This series of workshops was jointly sponsored by iGDP and GDTP, focusing on capacity building projects in the design and practice of low-carbon transformation policies of provinces and cities. The project combines the expert teams of GDTP with the needs of low-carbon development in different regions, aiming to provide a solid scientific basis for the low-carbon transformation of cities and promote the exchange of experience among regions. The ultimate goal is to contribute to the realization of an early GHGs emissions peak in cities and the whole country.

Media Reports

中华环境

Focal Point for China's Green City Low-Carbon Development
September 2018

湖北日报

Wuhan Plans to Reach Its Carbon Emissions Peak by 2022
June 21, 2018

长江日报

Chinese and Foreign Experts Examine Green Low-Carbon Development in Wuhan
June 21, 2018

楚天都市报

Wuhan Achieved a Triple Jump in Green and Low-Carbon Transformation within Eight Years
June 21, 2018

中国新闻网
WWW.CHINANEWS.COM

Wuhan's Green and Low-Carbon Transformation Has Drawn Attention from Experts from China, Japan and South Korea
June 21, 2018

财经网
CAIJING.COM.CN

Garbage Siege, Traffic Congestion! How Will Green and Low-Carbon Drive Urban Development?
March 8, 2018

Two Challenges in Municipal Solid Waste Management
2019/1/7

From Sewage to Energy: U.S. Sewage Treatment Review
2018/12/4

Nearly a Hundred Cities Raised Peaking Goals
2018/9/19

Highlights of the Low-Carbon City Roadmap Study 2018/6/28-8/27

- ❖ Enhancing Environmental Synergies by Improving Cooling Efficiency
- ❖ Industry Strategies and Financial Means for Green Urban Transformation
- ❖ Experience from Japan
- ❖ Experience from Incheon and Seoul
- ❖ Urban Air Pollution and Carbon Dioxide Emissions Reduction
- ❖ City Peaking Planning and the Challenge, Solution and Successful Experience in Implementation
- ❖ Green Finance and Carbon Trading
- ❖ Study on Carbon Emissions Peaking Pathway in Wuhan Construction Sector
- ❖ Study on Carbon Emissions Peaking Pathway in Wuhan Industrial Sector
- ❖ Experiences, Challenges and Reflections on Making the Wuhan Carbon Emissions Peaking Action Plan
- ❖ Green and Low-Carbon Transformation of Chinese Cities: Driving Force, Current Situation and Focal Points for Future Development
- ❖ Wuhan Low-Carbon Construction
- ❖ Hundreds of Chinese and International Experts Gathered in Wuhan to Analyze Urban Green Transformation of Typical Cities

Eighteen Cities in Northeast Asia Discuss
Low-Carbon Development Plans
2018/6/22

First Cities IPCC: Focal Points in Urban Climate
Change Research and Action
2018/3/15

Wuhan Peaking Action Plan: Substantial
Progress in Promoting the Scientific Feature in
Urban Low-Carbon Planning
2018/1/9



Green Finance Policy

A green economy refers to one where growth is decoupled from carbon emissions, environmental pollution and resource exploitation. Instead, growth is based on environmentally friendly production, industrial and commercial practices. In a green economy, economic growth and sustainable development are mutually compatible. A green economy can realize the optimization of the economic structure, foster new engines of growth, create jobs and raise living standards.

Creating a green economy means improving resource productivity, especially natural resources, and providing investors with a stable price signal to encourage green investment and stimulate the market for green products, services and technologies.

iGDP closely studies green economic policies and believes that China should, and is capable of, exploring its own way of reaching a green economy. We strive to refine specific economic policies including carbon market, green pricing, environmental taxes, fossil fuel subsidies and green financing policies, promote their implementation, and draft independent policy recommendations.

National Carbon Market Development Promotion Program

In order to promote healthy development and a favorable public opinion for national carbon market construction, iGDP has been deeply involved in its relevant research, capacity building and strategic communication since the beginning of 2017. In 2018, the department in charge of China's carbon market was transferred from the National Development and Reform Commission (NDRC) to the Ministry of Ecology and Environment. Carbon market has proceeded smoothly. iGDP contributes to this by providing suggestions and helping with capacity building, strategic publicity.

December 19, 2018

As one of the co-sponsors, iGDP participated in the media seminar "Review and Outlook of National Carbon Market under New Circumstances" held in Beijing. Senior Analyst Chen Meian, led the discussion on "Synergies among Carbon Markets and Other Environmental Policies". Senior Analyst and Program Head Yang Li also shared her views.

Urban Green Finance Project

Chinese cities have huge demand for investment and financing in the green and low-carbon sectors. According to the forecasts of different institutions, China's green low-carbon investment demand during the 13th Five-Year Plan period is between 6.6 trillion and 14.5 trillion yuan. These funds are currently coming mainly from the government budget, and there is a significant funding gap. In order to ensure that the city's green and low-carbon investment and financing needs are met, the government needs to design environmental and climate policies to clarify market signals, guide more private capital investment, and improve environmental quality. iGDP combines green investment and financing with the urban low-carbon development perspective to promote the formation of a financial policy environment that promotes urban green and low-carbon transformation.

China's green and low-carbon urban development is in full swing. The government, enterprises and research institutions have carried out extensive and in-depth analysis and research on green and low-carbon financing. It is particularly important to summarize and promote the innovative practices in this field. Green Finance Committee (GFC) regards the book *The Practice and Exploration of Green and Low-Carbon Financing in Chinese Cities* as one of its priorities. As a member of the committee, iGDP undertook the work of compiling this book.

Field Activities



It aims at bringing macroscopic plans and related financing plans of urban green low carbon development together. By identifying key investment areas and financing channels, this book presents analysis tools for green low carbon finance, matches construction projects with financing sources, and identifies underlying drivers and best practices for public and private green low carbon investment and financing both at home and abroad. Finally, this book will propose a roadmap for urban green low carbon financing. This book was compiled with both expert submissions and institute contributions. It is scheduled for publication in 2019.

In June 2017, premier Li Keqiang presided over an executive meeting of the State Council and decided to build green finance reform and innovation pilot zones (trial zones) in the five provinces of Zhejiang, Jiangxi, Guangdong, Guizhou and Xinjiang. Subsequently, the overall plan of the pilot zones was jointly issued by seven departments, including the People's Bank of China and NDRC. The pilot zones, based on their respective industrial characteristics and urban development, focus on promoting green finance innovation and development at the regional level to gain experiences that can be replicated.

On the occasion of the first anniversary of the pilot zone, iGDP collected public information, summarized and sorted out the work plan, policies and actions of the pilot zone to provide a reference for low-carbon pilot zones and regions considering green finance.

On September 27, 2018,

Senior Analyst and Program Head Li Ang attended the green finance sub-forum of the 2018 Green Development Innovation Conference in Suining, Sichuan province, to share the findings of the above research results.



Field Products

- Policy Overview:
The First Anniversary Review of the Green Finance Reform and Innovation Pilot
- Policy Recommendations:
Where China's Carbon Market Can Learn from Commissioned Auctions



Replicable Experiences in Institution and Mechanism Building: GFC Reform and Innovation in Five Provinces
2018/12/1



Green Finance Reform and Innovation: Regulations Need to be Results-Oriented
2018/10



Money Grows on Trees – Financing China's Green Future
2018/12/18



China's National Carbon Market: Mapping Out the Road Ahead
2019/1/4

Media Report

Where China's Carbon Market Can Learn from Commissioned Auctions
2018/11/14

The First Anniversary of the Green Finance Reform and Innovation Pilot: Regulations Need to be Results-Oriented
2018/9/27

Frequent Extreme Weather Events: The Visible and Invisible Climate Risks
2018/8/3

Promote Differential Pricing Policies to Curb the Expansion of Energy-Intensive Industries through the Price Mechanism of Green Development
2018/7/5

The Environmental Protection Tax Declared 6.66 billion RMB for the First Period: Tax System Still Under Development
2018/5/23

The Anniversary of the Green Finance Reform and Innovation Experiment: Pushing Forward
2018/5/10

EU Releases "Action Plan: Financing Sustainable Development"
2018/3/13

Environmental Taxes were Imposed
2018/1/2

Opinion Pieces



GDTP

The Green Low-Carbon Development Think Tank Partnership (GDTP) was set up by the China Energy Research Council Energy Systems Engineering Committee. It was launched on National Low-Carbon Day in June 2014 and it serves as a platform that brings together China's leading low-carbon research institutes, economists, and well-known energy and environmental experts.

GDTP facilitates communication and research cooperation between partners and experts, focusing on the best low-carbon research tools and practices at home and abroad and building practical support systems for technology and decision-making. GDTP promotes green transformation and contributes to the global impact of China's low-carbon development experience. A member of the China Engineering Academy, Mr. Du Xiangwan, Professor He Jiankun, Professor Liu Yanhua, and Professor Zhou Dadi are GDTP senior advisors.

GDTP has 45 low-carbon think tank partners and 75 experts. The GDTP Secretariat executive office is in Beijing.

October 15, 2018

The Taishan Science and Technology Forum and GDTP Shandong Seminar was jointly hosted by Shandong Association of Science and Technology, Shandong Academy of Sciences, Energy System Engineering Committee of China Energy Research Association and GDTP in Jinan. The Shandong seminar focused on “Green Low-Carbon Construction and the Transformation from Old to New Drivers.” More than ten GDTP experts conducted a comprehensive analysis of this topic. More than 80 industry insiders from all over the country attended the seminar.

Professional Meetings



January 19, 2019

2019 GDTP Symposium and the 5th Anniversary Expert Reception was held in Beijing. Over 120 GDTP experts and partners attended the meeting. Under the theme of “Building a Green and Low-Carbon China for 2030,” attendees held a discussion on such topics as green and low-carbon energy transformation, city peaking and zero-carbon future, national carbon market construction and international cooperation on climate change. The “Green and Low-Carbon China Photography Competition Award-Winning Works Exhibition” was also held.



Books Published

2018 Energy Data Manual (Chinese version)

Wang Qingyi, a GDTP expert, has devoted himself to studying China's energy statistics for more than a decade releasing the Energy Data Manual every year. Collecting data from domestic and overseas sources, this Manual uses internationally accepted energy indices, definitions, and approaches to process data. A great deal of work has been done in the collection, calculation and analysis of comprehensive statistics and internationally comparable data. With support from iGDP, both Chinese and English versions of *2015 Energy Data Manual*, *2016 Energy Data Manual Chinese version* and *2017 Energy Data Manual Chinese version* have been released.

Series of Translated Books by Low-Carbon Think Tanks

Professor He Jiankun, a GDTP expert, led this project. With support from iGDP, The Northeast University of Finance and Economics Press organized a translation team to publish this series of titles. Thirteen titles were published by the end of 2017.



Publicity Platforms

GDTP's official website and WeChat account was established at the end of 2014. Both platforms are used by GDTP partners and experts to share their opinions and interact with the field.

Keep Moving Forward: GDTP 2019 Annual Symposium and Its Fifth Anniversary Celebration Have Concluded Successfully
2018/11/2

Series of Shandong Seminar Reviews
2018/10/18-/12/6

Liu Bing | Accelerating the Transformation from Old to New Drivers of Growth in Shandong Province with a Focus on Green and Low-Carbon Development

Jiang Kejun | Economic Development and Deep Carbon Cuts

Sun Zhenqing | Impact of Economic Trends on Achieving Carbon Emissions Peak and Air Quality Targets—Taking Tianjin as an Example

He Jiankun | Promoting Green and Low-Carbon Transformation of Energy and Economy under the Guidance of Xi Jinping Ecological Civilization Theory

GDTP Shandong Seminar: Maintaining Strategic Focus on Green and Low-Carbon Development

Pan Jiahua: Economists' Approach to Climate Change in the Context of Nordhaus' Nobel Prize
2018/11/12

Zou Ji: Low-Carbon Transformation of the Energy Sector Requires Concrete Action
2018/10/29

Green Development has Changed China
2018/8/15

Cars are Ruining Our City
2018/4/28

Series of GDTP 2018 Article Reviews
2018/1/27-4/2

Li Ang | Guidelines for Urban Low-Carbon Development Plan Making

Wang Zhigao | How International Agencies Can Help Cities Realize Carbon Emissions Peaks

Liao Cuiping | Review and Prospects of Low-Carbon City Construction in Guangzhou

Wang Yan | Current Situation and Challenges of GHGs Emissions Control in Zhejiang Province

Zhang Xiliang | Thoughts on National Carbon Market Construction

Meng Hao | How National Science and Technology Innovation Programs Deploy Green and Low-Carbon Development

Wang Sheng | Overview of Green and Low-Carbon Development in Chongqing and Suggestions for Green Think Tanks

Tang Jie | Exploration of Green and Low-Carbon Development in Shenzhen

GDTP 2018 Annual Seminar Held in Huzhou



Opinion
Pieces

► Reports



LOW-CARBON DEVELOPMENT STRATEGIES AND POLICIES IN WUHAN, CHINA

BACKGROUND REPORT

June 2018

Innovative Green Development Program (iGDP)

This report was commissioned by United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), under its North-East Asia Low Carbon City Platform (NEA-LCCP). It provides an overview of Wuhan's low-carbon strategies and policies. NEA-LCCP chose Wuhan as a case study to better understand low-carbon development in China. This report reviews Wuhan's low-carbon performance and provides an overview of socio-economic data, urban development strategies, and the key drivers of the city's low-carbon growth. It also includes a comprehensive examination of the strategic measures and policy instruments that local governments have implemented.

Contents

1. Introduction and Summary	26
2. City Profile	28
3. Key Driving Factors Behind Wuhan's Carbon Dioxide Emissions ...	31
3.1 Demography	31
3.2 Economic Growth and Structure	31
3.3 Energy Consumption	33
3.4 Carbon Dioxide Emissions	34
4. Low-Carbon Development Strategies and Policy Practices	35
4.1 Low-Carbon Management System	35
4.2 Key Areas	36
4.2.1 The Energy System	36
4.2.2 Industry	38
4.2.3 Buildings	42
4.2.4 Transportation	44
4.2.5 Environment and Land Use	46
5. Conclusion	47
References	50



1 Introduction

In 2010, China's National Development and Reform Commission (NRDC) launched the country's national low-carbon pilot program. This program promotes climate change mitigation and low-carbon development at the city and provincial administrative levels, and currently operates in six low-carbon pilot provinces and 81 low-carbon pilot cities. The city of Wuhan is one of these low-carbon pilot pilots.

Wuhan is a large city in central China, with an economy that is dominated by heavy industry and a development experience that is in many ways typical of China's recent pattern of economic growth and urbanization. Wuhan is the provincial capital of Hubei; a province that was chosen to be in the first batch of low-carbon pilot provinces. A few years later, Wuhan itself was selected to be in the second batch of low-carbon pilot cities, though the city had been independently developing low-carbon policy since 2010. Indeed, low-carbon concepts have helped Wuhan restructure its economy, upgrade its industry, and improve the quality of its urban infrastructure and public services.

At the 2015 Sino-U.S. Climate Summit, the mayor of Wuhan announced that the city would peak its carbon emissions by 2022, and this commitment was incorporated into *Wuhan's 13th Five-Year Plan for National Economic and Social Development*. In 2016 and 2017, Wuhan issued *Wuhan 13th Five-year on Low Carbon Development, and Wuhan Carbon Peaking Action Plan (2017-2022)* respectively. In its seven years of low-carbon policy, Wuhan has developed strategic measures, institutional mechanisms, policies and other instruments that can serve as models for other cities in China pursuing low-carbon development.

Low-Carbon Policy Considerations

The effectiveness of the implementation of low-carbon development strategies and policies depends on a number of factors, such as climatic conditions, natural geography, regional characteristics, culture, local resources, industrial structure, administrative levels, and the strategic positioning of urban functions and development priorities. These factors also affect how the key drivers behind low-carbon development will change going forward. Carbon emission reduction and environmental protection in cities can be considered as public goods, and government is the key driver of urban low-carbon transformation. Decision-making has to be implemented at the central and provincial government levels, but local government should also introduce and implement specific measures and policies, according to local condition, to encourage a low-carbon transition.

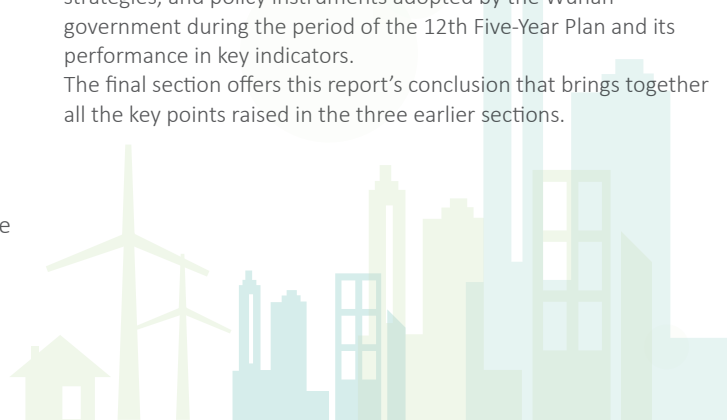
Report Structure

This report seeks to answer the following questions: Which of Wuhan's natural, social, economic and political characteristics are impacting low-carbon development practices? How did the key driving factors affecting low-carbon development change during the *12th Five-Year Plan (2011-2015)*? What kinds of strategic measures and policy tools were utilized by local governments? This background report on Wuhan is divided into four sections and is more factual than analytical or commentary in nature.

The first section concerns Wuhan's urban data and future development path. China's vast territory means its cities vary widely in terms of geographical location, resource endowments, industrial profile and local culture and traditions. These characteristics, just like "invisible hands", impact urban development. With a better understanding of Wuhan and its long-term development strategies, we can get a clearer picture of the obstacles and challenges to low-carbon development that lie ahead.

The second section provides an overview of the changes in some key drivers during the *12th Five-Year Plan (2011-2015)*. The key element that distinguishes low-carbon development from other development concepts is carbon reduction. Reducing carbon emissions is a systemic problem that depends on multidimensional factors such as population, economic development, energy consumption, energy mix and the availability of low-carbon technologies. Understanding these changes and predicting future trends for those factors affecting Wuhan's carbon emissions will allow us to better gauge the city's low-carbon development and the challenges it faces in the future.

The third section is the report's "core". It presents Wuhan's low-carbon development strategies and policy practices. These span a number of sectors including urban construction, energy, industry, transportation, buildings, municipal environmental infrastructure, land use, and so on. It also delves into the management systems, strategies, and policy instruments adopted by the Wuhan government during the period of the 12th Five-Year Plan and its performance in key indicators. The final section offers this report's conclusion that brings together all the key points raised in the three earlier sections.





2 City Profile

Wuhan is a city with a 3,500 year history, a present day population of more than 10 million residents and a GDP topping 1 trillion yuan. It is located in central China and along the middle reaches of the Yangtze River. It is a modern city with a rich history and culture. Wuhan, as growing city, has a unique geographical attributes, climatic and ecological environment and social, economic and cultural foundations. It is important to understand the relationship between these characteristics of climate, geography, culture, resources, industrial structure, administrative structure and low-carbon development strategies and policy practices.



As an economic center and mega city in China's central region, with its particular geography and climate, Wuhan has long been an energy-intensive city. However, given its high dependency on energy imports and increasingly severe environmental constraints, it is inevitable that it will adopt a low-carbon development path.

Wuhan endures cold winters, hot summers, and abundant rainfall. It is located in a subtropical monsoon climatic zone with an average annual precipitation of 1,200 mm in its urban area. Wuhan is one of China's famous three "summer as hot as a stove" cities.

Wuhan's geographical features have led to the multi-center nature of its urban spatial development. Its administrative area is 8,569 km², of which 3,261 km² is made up by the current urban development zone and 678 km² is the area of the city proper. Wuhan has been shaped by its relationship with the surrounding mountains, lakes and rivers; for example, the urban development area traces the riverside. Wuhan's urban spatial development is unbalanced, making central allocation and balanced development for land use difficult.

Wuhan is located in the hinterland of China's central plains and is the country's economic and geographical center with advantages

of geography extending outwards in all directions. As a central city in the central region, Wuhan acts as a gateway between the east and the west; it also connects the north and the south. It has been called the "thoroughfare to nine provinces." Wuhan is China's largest inland land, sea and air transport hub, linking railways, highways, waterways and aviation.

Wuhan has few local energy resources but it is rich in non-metallic minerals and these have spurred the development of its manufacturing sector (mainly the metallurgical, building materials, chemical and fertilizer industries). But industry has driven a high demand for fossil fuels. Wuhan has "no coal, no oil, and no gas". It imports its energy from outside the city, including from four major hydropower stations (Gezhouba, Danjiangkou, Geheyan and the Three Gorges dams) and Pingdingshan Coal Mine.

Wuhan's long-term rapid economic growth has put pressure on its environmental capacity, ecological restoration, and pollution reduction efforts. Between 2005 and 2015, more than 10% of its annual GDP growth was driven by energy-intensive and resource-intensive industries, such as electricity, steel, building materials and chemicals. In addition, as people's living standards have improved and urban transportation has developed, pollution from industry, traffic and the public have complicated and exacerbated the city's environmental problems. The pollution issue spans traditional soot, ozone, fine particles, volatile organic compounds, water pollution, and solid waste.

Wuhan has a long history and a rich culture; its people are characterized by the traits of openness, flexibility, inclusiveness and diversity. It is also rich in scientific and technological innovation resources which provide strong ideological foundations and capacity for embracing and pursuing low-carbon development.

*Wuhan's regional culture is pluralistic and inclusive, influencing decision-making, strategic thinking and implementation. Wuhan incorporates *Jingchu* culture (a culture that grew up along the river) and a Yangtze River culture. People from the *Jingchu* culture are characterized for their "pioneering spirit and their pursuit of excellence;" a product of the cultural exchanges between people from the central plains and the south, the upper, middle and lower reaches of the Yangtze River.*

Wuhan is a city with high concentrated scientific, technological and intellectual resources. With more than 200 specialized research institutes and more than 80 universities, Wuhan is an important science and technology education center in China. Its innovation resources are second only to Beijing and Shanghai.

As a heavy industry city that is in the process of industrial restructuring, the long-term key priority areas for Wuhan in securing a low-carbon transition are industry and energy.

Traditionally, Wuhan's economy has been dominated by heavy industry but it is now in the process of transforming itself into an advanced manufacturing base. The local government long prioritized manufacturing – as far back as 100 years ago, during the late Qing Dynasty, Wuhan led the country in iron, clothing, spinning, textile and firearms manufacturing, earning it the reputation of being China's industrial center. After the founding of New China in 1949, Wuhan became one of the country's key cities for the development of heavy industry by virtue of its industrial base, geographical location and strategic position. It built a comprehensive industrial network based on the metallurgical industry, machinery manufacturing and textiles. After Reform and Opening Up that began in 1978, Wuhan started developing a consumer goods industry – household appliances, plastics, and textiles. By the late 1990s, Wuhan had expanded its industrial base from textiles, metallurgy, chemicals and home appliances into more capital-intensive areas, such as automobiles, steel, optoelectronics and pharmaceuticals. With the support of a series of national and local development strategies, focusing on western China, central China, Wuhan city, and on upgrading Wuhan's industry, Wuhan's industrial structure became characterized by its four pillar industries-- steel, automobiles and machinery equipment, electronic information, and petrochemicals, as well as some other key sectors such as environmental protection, tobacco and food, home appliances, textiles and clothing, medicine, paper and packaging and printing. During the 12th Five-Year Plan period (2011-2015), Wuhan focused on its industrial development, and established itself as an advanced manufacturing center; with some industries topping 100 billion yuan in terms of production output, including IT, automobiles, equipment manufacturing, steel, petrochemicals and food. Wuhan's traditional industries, such as steel and textiles, are on the decline and it's predicted they will be replaced by IT, biomedicines and smart production.

As a sub-provincial city, the capital of Hubei Province, and a national pilot, Wuhan has abundant administrative resources to support a low-carbon transformation.

Wuhan has a special administrative status which gives it more administrative resources. Wuhan's extensive administrative capacity can support public policy making and city governance with its interactions with the central government, the provincial government and other local governments in the region. In 1984, Wuhan was approved as a pilot city for economic reform. It implemented its own separate plans having been given the authority to make provincial-level economic and social management decisions. In 1994, Wuhan was upgraded to a sub-provincial city, which means its government was given more administrative capacity and thus wielded considerable influence over local public resource allocation. Furthermore, as a pilot city in a number of initiatives, it has an extensive support base in terms of funding, innovative institutions, policy, and capacity building. During the 12th Five-Year Plan period (2011-2015), Wuhan was not just designated a low-carbon pilot city but also a pilot city for a number of other categories-- sustainable urbanization, a smart city, a low-carbon industrial zone, renewables for buildings, alternative fuel vehicles, low-carbon integrated transportation planning, and a public transit city.

Wuhan is currently undergoing shifts in its industrial and urban structures. Advancing an Industrial Manufacturing City and Strengthening and Improving Urban Construction is one key

development strategy supporting its long-term vision of making Wuhan a national central strategic city. Low-Carbon City Development is another strategy that is also supporting Wuhan's economic transformation and upgrading and improving its urban functionality.

The strategic vision of becoming a National Central City and a Key Development Area do not represent a real status, but rather they are long-term goals that guide a city's future development, which means they do have an impact on how the key driving factors on low carbon development change over time.

Wuhan has set its long-term strategic vision and objective on becoming a National Central City, the highest in China's urban hierarchy. Wuhan has had this goal since 2011. In 2016, the NDRC issued *Guiding Opinions on Supporting the Construction of Wuhan as a National Central City*. It proposed that the four top functions of a future Wuhan should be national economic center, top-level scientific and technological innovation center, trade and logistics center, and international exchange center. In September 2016, the State Council issued Outline for Planning the Development of the Yangtze River Economic Belt, which positioned Wuhan as a megacity. The strategic visions of megacities mean that in the future Wuhan will focus more on urban functionality, industrial agglomeration and acquiring human resources.

During the 12th Five-Year Plan period (2011-2015), Wuhan launched a series of plans: *the Industrial Doubling Plan, the Service Industry*

Upgrading Plan, the Strengthening and Improving Urban Construction Plan and the Improving Innovation Capacity Plan.

Wuhan will focus on improving its capacity for innovation. In 2013, Wuhan launched the *Enhancing Innovation Capacity Plan* and proposed setting up the city as a national innovation center with plans to build centers for high-tech innovation, emerging industries, science and technology, senior talent, and a culture of innovation. In early 2017, Wuhan launched its *Business Start-up and Employment Plan for Attracting a Million Graduates* to improve the quality of its human resources. It aims attract college graduates and high-tech industry professionals to come to Wuhan and start their own businesses and work in the city.



Wuhan implemented its *Industrial Doubling Plan* with the support of a local strategy on advanced industrial manufacturing. Industry is at the heart of Wuhan's development plan. *The Wuhan Action Plan on Manufacturing 2025* proposes making Wuhan into a state-level advanced manufacturing center by the year 2025. Wuhan will speed up the transformation and upgrading of its traditional industries, such as automobiles, equipment manufacturing, steel, petrochemicals, food, tobacco, household chemicals and others. Its *Emerging Industries Doubling Plan* focuses on electronic information, the life and health sector, and smart manufacturing.

infrastructure construction and implemented 24 projects to improve urban structure, transportation hubs, urban transport infrastructure, urban environmental quality, the urban landscape, engineering design, and construction. The *13th Five-Year Plan on Wuhan's Land*

Use and Spatial Planning, issued in 2017, incorporated the Yangtze River Main Section and the Yangtze River New City into Wuhan's *13th Five-Year Plan (2016-2020)*.

In 2013, Wuhan implemented the *Service Industry Upgrading Plan* to help develop a modern service industry. It introduced a series of supportive measures and policies to promote the development of the top ten service industries such as modern logistics, commerce and trade, finance, real estate and convention and exhibition tourism.

During the 13th Five-Year Plan, Wuhan's strategic deployment will include three dimensions: upgrading the economic structure (power and industry), upgrading urban public infrastructure (function and quality), and improving local livelihoods (security and governance).



3 Key Driving Factors Behind Wuhan's Carbon Emission

Total carbon emissions are the product of four elements: population, GDP per capita, energy consumption per GDP (or energy intensity), and carbon dioxide emissions per energy consumption (or carbon intensity). This section analyzes how these four key driving factors changed during Wuhan's 12th Five-Year Plan period (2011-2015).

3.1 Demography

Wuhan's population has risen steadily as it has become more urbanized. Most workers have found employment in the manufacturing and tertiary sectors. Wuhan is also an aging society.

Wuhan's population rose steadily. The population climbed to 10.6 million in 2015 from 7.1 million in 1995 (an increase of nearly 50%). In 2015, the city's population passed the "ten million" category. The annual growth rate of Wuhan's population was 1.4%, second only to Beijing and Tianjin. In addition, Wuhan has a floating population of almost 3 million. The continuous rise in demographic dividend has also driven urban construction and economic growth, and has been a source of strong demand in the real estate market. Wuhan's population is expected to continue to grow. According to a study on

Wuhan's population growth by Beijing University, the city's population is predicted to reach 15-17 million by 2030; while by 2050, that figure should reach between 17 and 22.5 million.

Wuhan has an obvious aging population. Wuhan's population began aging from 1993, when the over 60's numbered 710,000 (or 10% of the total registered population). By 2010, that figure was 1.13 million, accounting for 14.58% of the city's total population; showing the aging population issue in Wuhan. By the end of 2015, the number of people over the age of 60 in the city reached 1.63 million (or 19.74% of the total population).

Wuhan has also steadily become more urbanized. In 2015, urbanization was 79.41%. Over those five years, 882,200 new urban residents were added to the city, that's an average annual increase of 176,400 people. The total number of households increased from 2,745,800 in 2010 to 2,971,000 in 2015. The average household size dropped from 2.90 people per household in 2010 to 2.66 in 2015. The urban residential construction area per capita rose to 37.25 m² in 2015 from 31.85 m² in 2010. The urban residential disposable income per capita increased from 20,806 RMB in 2011 to 36,436 RMB in 2015.

Table 1: Urbanization, Wuhan (2011-2015)

	2011	2012	2013	2014	2015
Urbanization	78.71%	79.26%	78.26%	76.36%	79.41%

Most of the employed population is focused in the manufacturing and tertiary sectors. Between 2011 and 2015, the share of the urban employed population in Wuhan's total number of employed increased from 70.7% to 84.6%. Most workers in Wuhan are employed in manufacturing, and increasingly in the tertiary sector. Wuhan's employment structure (agriculture: secondary sector : tertiary sector) shifted from 13.2: 36.9: 49.9 in 2010 to 9.1: 38.4: 52.5 in 2015 showing an obvious decline in primary sector share in total employment. The implementation of the Industrial Doubling

Plan helped boost manufacturing's share of employment in the secondary sector by the end of 2015 to 20.1% of the total employed population. The top three sectors with the highest employment are manufacturing, construction, and wholesale and retail. The tertiary sector is the main area that has been absorbing rural surplus labor, college graduates and the re-employment of laid-off workers, especially wholesale and retail, transportation, warehousing and postal services, and the accommodation and catering industries.

3.2 Economic Growth and Structure

Wuhan's economy has grown at a remarkable rate and its secondary and tertiary sectors are now roughly equal in size.

Wuhan's GDP has entered the "trillion RMB club," an unofficial classification in China of cities with an annual GDP of more than 1 trillion RMB. There are currently 15 cities that have entered this

"club", including Beijing, Shanghai, Guangzhou, Shenzhen, Chengdu, and Hangzhou. During the 12th Five-Year Plan period (2011-2015), Wuhan's GDP grew at an average annual rate of 10.4%, shifting down a gear from high-speed to medium-high speed growth; and ranking fifth among those 15 cities. Its GDP almost doubled from 556.593 billion RMB in 2010 to 1,090.560 billion RMB in 2015.

Table 2: GDP, annual GDP growth, GDP per capita, Wuhan (2011-2015)

	2011	2012	2013	2014	2015
GDP (100 million)	6762.20	8003.82	9051.27	10069.48	10905.60
GDP per capita (RMB)	68315	79482	89000	98000	104132
Annual GDP growth (%)	12.5%	11.4%	10.0%	9.7%	8.8%
National average growth (%)	9.5%	7.7%	7.7%	7.3%	6.8%

Wuhan's economy is the strongest in China's central region; it is the only city in central China to enter the "trillion RMB club;" its per capita GDP of 104,132 RMB in 2015 was the highest of all the central cities. Wuhan's local fiscal revenue and fixed asset investment are much higher than other cities in the central region. Wuhan is one of China's six traditional industrial cities; it has a fully functional and sound industrial structure. Its steel, automobiles and machinery manufacturing, electronic information and petrochemical industries occupy pivotal levels in the country. Wuhan's tertiary sector also leads other cities in central China.

Wuhan is in the mid- to late- industrialization stage, where the secondary and tertiary sectors make up similar-sized shares of the economy. The secondary sector is dominated by heavy manufacturing while the tertiary sector is currently undergoing rapid growth. During the 12th Five-Year Plan period (2011-2015), Wuhan implemented its Industrial Doubling Plan and Services Upgrading Plan. In 2015, the primary: secondary: tertiary ratio of GDP was 3.3%: 45.7%: 51%. During that the 12th Five-Year Plan period, the tertiary sector grew the fastest. Between 1998 and 2015, except for 2012 and 2013, when the share of the secondary sector exceeded that of the tertiary sector, Wuhan's tertiary sector was its largest sector.

Table 3: Industrial structure, Wuhan (2011-2015)

	2011	2012	2013	2014	2015
Primary sector (%)	3.0	3.8	3.7	3.5	3.3
Secondary sector (%)	38.1	48.3	48.6	47.5	45.7
Tertiary sector (%)	48.9	47.9	47.7	49.0	51

The Industrial Doubling Plan has helped Wuhan establish a modern industrial structure and supported industrial innovation and development, green low-carbon development and industrial upgrading. During the 12th Five-Year Plan period, Wuhan's industrial value-added grew an average annual 11.8%, rising from 207.982 billion RMB in 2010 to 408.1 billion RMB by 2015. The proportion of light to heavy industrial output value shifted from 1:3.30 in 2010 to 1:3.05 in 2015. High-tech industry output grew 10.7% in 2015,

accounting for 52.7% of gross output value of industrial enterprises above a designated size. Energy consumption per unit industrial value-added fell 30.67% between 2011 and 2015. There were five key industries with an output of over 100 billion RMB in 2015 (see Table 4). Wuhan is nurturing its New Economy. With the rapid development of the Internet economy, new formats, models and products are constantly emerging. The New Economy-- such as information consumption, e-commerce and logistics and express delivery – is booming.

Table 4: Five key manufacturing industries, Wuhan (2015)

Industry	Industrial Output Value (100 million RMB)	Share of gross output value of industrial enterprises above a designated size
Automobiles and components	2614.46	21.1%
Electronic information	1780.21	14.4%
Equipment	1584.78	12.8%
Food and tobacco	1528.61	12.4%
Energy & Environmental Protection	1032.52	8.3%

3.3 Energy Consumption

Wuhan is highly dependent on imported energy resources. Its energy consumption continues to increase and coal dominates its energy mix. Even though Wuhan is working continually on optimizing its energy structure and its energy intensity is declining, it is still in the early phases of utilizing new energy resources and making clean energy popular.

Because Wuhan is oriented towards heavy industry, energy demand has been rising. During the 12th Five-Year Plan period, Wuhan's total energy consumption increased from 36.11 million tce in 2010 to 48.58 million tce in 2015. There was a marked improvement in energy efficiency, with energy intensity falling 19.9% between 2011 and 2015. Some new energy-intensive projects, such as one led by Sino-Korean (Wuhan) Petrochemical Co., Ltd, which launched in 2013, have also posed a challenge for improving energy intensity.

Table 5: Energy intensity, Wuhan (2011-2015)

	2011	2012	2013	2014	2015
Fall in energy intensity	4.3%	4.47%	3.51%	2.88%	5.95%

Wuhan is continuously improving its energy mix; while coal continues to dominate, the proportion of low-carbon and non-fossil fuels is rising. Coal consumption as a fraction of total energy consumption decreased from 53.81% in 2010 to 50.03% in 2015. Crude oil rose from 20.59% in 2010 to 23.55% in 2015; natural gas

rose 2.69% in 2010 to 4.77% in 2015. Electricity consumption increased from 35.4 billion kWh in 2010 to 46.4 billion kWh in 2015, showing a decline in total energy consumption from 12.04% to 11.75% over the same period. The share of non-fossil energy in primary energy consumption increased from 8.75% to 11.50%, again over the same period.

Table 6: Energy mix, Wuhan (2010, 2015)

	2010	2015
Coal in total energy consumption	53.81%	21.1%
Crude oil in total energy consumption	20.59%	14.4%
Natural gas in total energy consumption	2.69%	12.8%
Electricity use in total energy consumption	8.75%	12.4%
Share of non-fossil fuels in primary energy consumption	12.04%	8.3%

The secondary sector consumes most of Wuhan's energy, but the tertiary sector's share is gradually increasing, and this is depressing energy intensity. In 2015, the ratios between primary, secondary and tertiary in terms of energy consumption in total

energy consumption were 0.5% : 63.1%: 26.3%. The secondary sector's share slipped 2.2% compared with 2010, and the tertiary sector's share rose 2.5% over the same time period.

Table 7: Energy consumption share, the three sectors, Wuhan (2010, 2015)

	2010	2015
Primary sector	0.5%	0.5%
Secondary sector	65.3%	63.1%
Tertiary sector	23.8%	26.3%

During the 13th Five-Year Plan period (2016-2020), total energy consumption is expected to continue to increase. By 2020, Wuhan will control energy consumption at 56.43 million tce, with an average

annual increase of 3.04%. The proportion of non-fossil fuels in primary energy consumption is expected to pass 15%. Total coal consumption will be kept capped at 20.63 million tce.

3.4 Carbon Dioxide Emissions

During the 12th Five-Year Plan, Wuhan's carbon dioxide emissions increased, but carbon intensity decreased, indicating that carbon dioxide emissions have effectively been decoupled from economic growth.

Wuhan's total carbon dioxide emissions in 2015 were 130 million tons, an increase of 23.7% over 2010. This increase was smaller than was seen in Beijing, Shanghai, Guangzhou and Shenzhen over the same period.

Carbon intensity decreased from 2.09 tons/ 10,000 RMB in 2010 to 1.32 tons/ 10,000 RMB in 2015; an accumulated decrease of 25.8%. This indicates that Wuhan had effectively decoupled carbon dioxide emissions from energy consumption.

In 2015, Wuhan's carbon dioxide emissions per capita was 13.58 tons with an annual growth rate of 2.68%.



4 Low-Carbon Development Strategies and Policy Practices

During the 12th Five-Year Plan period (2011-2015), Wuhan began using top-level design (planning), regulatory systems and mechanisms, strategic measures and policy instruments for low-carbon development. This was a requirement from the central and provincial governments. It also introduced strategic measures and policies tailored to local circumstances to support a green low-carbon transformation.

Low-carbon development is not only necessary for Wuhan's socio-economic development, but it is also a key part of national strategy to deal with climate change and construct an ecological civilization. The internal requirements for low-carbon development are for Wuhan to find new drivers for economic growth, create jobs, and achieve sustainable development. The external driving force comes from senior levels of government. Cities have mandatory energy saving and emission reduction targets and must also implement action plans.

Wuhan has gradually improved its top-level design of low-carbon development projects and also improved guidance on green and low-carbon development. Urban low-carbon development requires the coming together of different departments, such as those over-seeing production and consumption. Top-level design is necessary to provide the structure for implementing low-carbon

development in enough detail to complete tasks and meet targets. In 2011, Wuhan incorporated the concepts of green and low-carbon development into its 12th Five-year Plan for National Economic and Social Development. In 2011 Wuhan issued the *Comprehensive Work Program on Energy Saving, Consumption Reduction and Climate Change during the 12th Five-year Plan* and in 2013, it issued the Action Plan on Wuhan's Low-Carbon Pilot. These set out Wuhan's low-carbon ideas, principles, objectives, main tasks, and policy actions. Wuhan pledged to peak carbon dioxide emissions by 2022; this pledge was included in its 13th Five-Year Plan on National Economic and Social Development. In 2016 and 2017, Wuhan issued *Wuhan 13th Five-year on Low Carbon Development, and Wuhan Carbon Peaking Action Plan (2017-2022)* respectively.

As a provincial capital, part of the first batch of national low-carbon pilot provinces and part of the second batch of national low-carbon pilot cities, Wuhan has already established administrative management systems to support low-carbon development. Wuhan set up a Leading Group for the Municipal Low-carbon City Pilot which is headed by the mayor. Municipal agencies are responsible for making strategy and policy actions, and to ensure that key tasks are completed and targets on low-carbon development are met within the fields under their jurisdiction (see table 8).

Table 8: Key agencies and their low-carbon development responsibilities, Wuhan

Agencies	Responsibilities
Leading Group for the municipal low-carbon city pilot	Coordination, supervision and evaluation of municipal low-carbon work
Municipal Development and Reform Commission	Regulatory institutions and mechanisms Monitoring and evaluation of carbon emission reduction International cooperation
Municipal Bureau of Statistics	Carbon reduction statistics
Municipal Bureau of Energy	Low-carbon energy
Municipal Commission of Urban-Rural Development	Low-carbon buildings
Municipal Commission of Economy and Informatization	Low-carbon industries
Municipal Commission of Transport	Low-carbon transport
Municipal Bureau of Environmental Protection	Waste management systems

According to local resource endowment and its economic and social conditions, Wuhan has been exploring low-carbon development in the areas of energy, industry, buildings, transportation, the urban environment and land use, low-carbon infrastructure and consumption patterns. Wuhan has already moved from its previous high-carbon dependence to a low-carbon pathway. In order to better understand this transition, the following section will summarize Wuhan's low-carbon development strategies and policy practices in some key areas during the period of the 12th Five-Year Plan.

4.1 Low-Carbon Management System

Develop a municipal greenhouse gas inventory and roadmap to peak carbon emissions. Wuhan started developing a greenhouse gas inventory in 2013 and released reports on greenhouse gas inventories in 2005, 2010 and 2012 to encourage the establishment of a regular system to report greenhouse gas inventories. Wuhan has also been researching how to peak its carbon emissions by studying

data on its historical emissions. It has made a number of scenarios and utilized tools to analyze its medium- and long-term carbon emission trends and how to peak emissions. This can help it draw up a roadmap to reduce emissions, plan low-carbon development targets and source policy in science.

Gradually improve the city's low-carbon development and management capacity. Wuhan established a preliminary system for keeping a database on greenhouse gas emissions, assessing targets, and reporting on performance. The Wuhan Municipal Bureau of Statistics has completed a preliminary round of reports on reporting statistics on greenhouse gas emissions; it also established a system to evaluate low-carbon performance and a responsibility system for assessing greenhouse gas emissions targets, integrating low-carbon development indicators into targets for municipal and district governments and allocating the national carbon emission reduction target to key enterprises and conducting annual assessments. Wuhan has set up a system to appraise carbon emissions from fixed assets investment, adding indicators on carbon emissions and non-fossil energy consumption in energy-saving assessments into the reviews of fixed-asset investment projects. Wuhan has also set up a special fund for low-carbon development in the municipal budget, which will be used mainly for research, capacity building and publicity. Additionally, Wuhan has encouraged the establishment of a contract energy management mechanism and issued a series of incentives to provide financial support for contract energy management projects. It is establishing three management platforms for low-carbon development, namely the Wuhan Low-Carbon Energy-Saving Smart Management System to manage energy consumption data and carbon emissions for the city, districts, key industries and key enterprises; Wuhan Energy-Saving Evaluation and Examination Information Management System to track the carbon emissions of new projects; and the Wuhan Low-Carbon Life and Home Platform to encourage slow-carbon green production and lifestyles.

4.2 Key Areas

Wuhan has been constantly improving its top-level design and

administrative management capacity on low-carbon development. Various departments have also put forward strategies and a timetable for green and low-carbon development targets. This section focuses on low-carbon development goals, strategic measures and policy tools in the five key areas of energy, industry, buildings, transportation, urban environment and land use. The policy tools include control directives, market-based policies, voluntary measures and information regulations. Each area includes three parts: 1) the completion of the 12th Five-Year Plan low-carbon indicators; 2) future development goals; 3) strategic measures and policy tools.

4.2.1 The Energy System

Overview

Wuhan has few natural resources; it is constrained by a "lack of coal, lack of oil and lack of gas." It is highly dependent on energy resources from outside. Wuhan's power sector is dominated by coal-fired power; and it has just started to incorporate new energy. All coal is imported, (making up 48%); 100% of refined oil, 100% of natural gas, and 80% of other energy resources are also imported. Uncertainties in each year's power generation plan, the supply of hydropower, changes in temperature, the production and operation status of enterprises, etc, are all factors that impact Wuhan's power sector. In 2015, the city generated 21.755 billion kwh, of which 21.0821 billion kwh was thermal power generation, accounting for 96.9% of the city's total generating capacity. It generated 674 million kwh from landfill gas, accounting for 3.1% of the city's total generating capacity. Hongshan Chuangyi Tiandi Natural Gas Distributed Energy Project, now in operation, is one of the four demonstration projects assessed by the National Development and Reform Commission. A nearly 60MW photovoltaic power generation project has been completed. Currently, annual biomass power generation is 850 million kwh, accounting for 0.59% of the city's total energy consumption.

Table 9: Power Generation, Wuhan (2011-2015)

	Total Power Generation	Growth (%)
2011	210.58	13.4%
2012	213.01	1.2%
2013	243.24	14.2%
2014	213.32	-12.3%
2015	217.55	2.0%



Performance of Low-carbon Indicators

Energy mix optimization has four main indicators: total energy consumption per capita, energy intensity, the share of primary fossil

fuels in primary energy consumption and the share of coal in total energy consumption. Wuhan's performance in these four indicators is shown in the table below:

Table 10: Low-carbon development indicators, Wuhan's energy sector (2010, 2015)

Indicators	2010年	2015年
Energy intensity (tce/ 10,000 RMB (current price))	2.09	1.21
Annual energy consumption per capita (tce/ person)	3.69	4.58
Non-fossil fuel energy share of primary energy consumption (%)	8.71%	11.5%
Coal share in total energy consumption (%)	53.81%	50.03%

Strategic Measures and Policy Tools

Wuhan's energy sector is focused on developing new energy and renewable energy (including wind power, photovoltaic power,

ground source heat pumps, river water source heat pumps, biomass, etc.) and encouraging the energy conservation of existing power plants, coal efficiency of boilers, and the implementation of a cogeneration strategy as part of its low-carbon development plan.

Table 11: Key areas, key tasks and policies and measures to reduce energy consumption and carbon emissions for energy sector during Wuhan's 12th Five-Year Plan Period

Area	Improving efficiency of carbon use	Improving energy technology
Key tasks	--Prioritize the development of non-fossil fuel energy sources --Raise the proportion of natural gas utilization --Place strict controls on coal consumption	Encourage cogeneration
Policy Instruments	Regulatory Instruments: <ul style="list-style-type: none"> Average coal consumption of coal-fired generating units is less than 310 grams of standard coal / kWh Issue industry access Construct no high-pollution fuel zones Eliminate small boilers Prohibit the sale of inferior coal on the market Market Incentives: <ul style="list-style-type: none"> Tax breaks Carbon trading scheme Research and development Voluntary measures: <ul style="list-style-type: none"> Demonstration projects 	

Case study

Controlling coal consumption

Wuhan has released a series of Plans to improve air quality, optimize the energy mix, and peak carbon emissions as soon as possible. These are: Wuhan's *13th Five-Year Plan on Energy Development*, its *13th Five-Year Plan for Embracing Blue Skies*, and its *Action Plan on Peaking Carbon Emissions (2017-2022)*. In particular, Wuhan aims to reduce total coal consumption by five million tons during the 13th Five-Year Plan (2016-2020) and has in

place a series of measures to do so. These include strict controls on all new coal-fired projects, replacing small coal-fired boilers and industrial kilns with heat and power cogeneration, central heating, natural gas and electricity, and banning coal for residential use in certain areas. Between 2016 and 2017, Wuhan shuttered more than 200 small coal-fired boilers and kilns and 115 bulk coal shops.

4.2.2 Industry

Overview

Wuhan's industrial structure is made up of a large proportion of traditional industries. Steel, petrochemicals, tobacco and automobiles account for half of the total industrial output. In 2015, industry's carbon emissions made up 59.1% (including electricity emissions) of the city's carbon emissions.

Wuhan has made progress in energy saving work including in direct energy-saving and structural energy-saving; improvements have also been seen in industrial energy efficiency. Between 2011 and 2015, energy consumption of value-added of large-scale industrial units dipped 30.67%.

Table 12: Reduction in energy consumption of value-added of large-scale industrial units, Wuhan (2011-2015)

	2011	2012	2013	2014	2015
Decline in energy intensity	78.71%	79.26%	78.26%	76.36%	79.41%

The energy consumption of major energy-intensive industrial enterprises dropped significantly. During the 12th Five-Year Plan period, comprehensive energy consumption per ton of steel produced fell 4.4%, comprehensive energy consumption per ton of

cement produced fell 58.3%, comprehensive energy consumption of processing units fell 8.6%, and the standard coal consumption of power plants fell 3.9%.

Table 13: Energy consumption for eight products, Wuhan (2010-2015)

	2010	2015
Total energy consumption per ton of mixed yarn produced (line) (kg of standard coal / ton)	871.03	613.91
Total energy consumption of machine produced paper and cardboard (kg of standard coal / ton)	600.99	279.20
Energy consumption for coking process per unit (kg of standard coal / ton)	96.06	89.41
Comprehensive energy consumption of crude oil processing	71.23	65.61
Comprehensive energy consumption per ton of cement produced (kg of standard coal / ton)	36.46	19.78
Comprehensive energy consumption per weight of box flat glass produced (kg of standard coal / ton)	14.35	13.15
Comprehensive energy consumption per ton of steel produced (kg of standard coal / ton)	637.92	609.60
Comprehensive energy consumption of coal-fired power plants (kg of standard coal / ton)	306.40	295.82

Ferrous metal smelting and rolling, raw chemicals and chemical products, and electricity production and supply were the biggest energy-intensive industries in Wuhan. Industries above a designated size-- paper and paper products, petroleum processing, coking, nuclear fuel processing, chemicals and chemical products, non-metallic minerals manufacturing, ferrous metal smelting and

rolling, electricity production and supply, consumed 45.1% of the total energy consumption of the city in 2015, 1.4 percentage points lower than that of 2010 (46.5%). The energy consumption of these six energy-intensive industries slowed significantly but still accounted for 22.55% of total industrial output, 8.1 percentage points lower than that of 2010 (30.6%).



Table 14: Share of six energy-intensive industries in energy-intensive sector, Wuhan (2010, 2015)

Energy-intensive industry	2010	2015
Ferrous metal smelting and rolling	69.4%	50.5%
Chemicals and chemical products	2.1%	19.7%
Power production and supply	17.5%	20.5%
Coking, nuclear fuel processing	3.5%	4.1%
Non-metallic minerals	5.9%	5.1%
Paper and paper products	1.7%	0.7%

Performance of Low-carbon Indicators

Low-carbon development indicators in industry include the heavy industrial value share in total industrial value for industries above a designated size, energy consumption of total industrial output value,

and the share of hi-tech manufacturing value-added in total industrial value-added. Wuhan's low-carbon development indicators for the industrial sector for 2015 are listed below.

Table 15: Low-carbon development indicators for the industrial sector, Wuhan (2010, 2015)

Indicator	2010	2015
Heavy industry output share of total output for industries above a designated size (%)	76.76%	73.81%
Comprehensive energy consumption of total industrial output value/ 10,000 RMB (tons of standard coal / 10,000 RMB)	0.29	0.19
Hi-tech manufacturing value-added share of total industrial value-added	45.5%	54.8%

Strategic Measures and Policy Tools

During the 12th Five-Year Plan, Wuhan set limits on the production capacities of existing energy-intensive industries, such as electricity, steel, petrochemicals, building materials, flat glass and paper. It also phased out energy-intensive, low value-added production capacity by implementing strict industrial policies, industry access, environmental protection and safety standards. It also began monitoring energy-saving measures adopted by key energy-consuming units and set energy consumption limits on energy-intensive products. Meanwhile, it worked on upgrading coal-fired boilers and speeding up the replacement of the energy-intensive steel industry chain. Wuhan also set up a special investment fund for technological transformation. The fund provides discounts or subsidies at 8% for the purchase and renovation of advanced equipment in projects that qualify under industrial restructuring and upgrading and with an investment in fixed assets of over 50 million RMB. These measures are supporting the transformation and upgrading of traditional industries, improving technology, optimizing product structure, and improving product quality.

Strategic measures to help low-carbon development in industry are focused on four main aspects:

First, making control of carbon emissions more effective. Industrial enterprises need to use more low-carbon energy and control greenhouse gas emissions to optimize their energy structure.

Second, making raw materials production more energy efficient. Industrial enterprises need to use better quality production machinery and more energy-efficient technologies; they need to improve their recovery and utilization of residual energy, waste heat, cogeneration, and by-product gas.

Third, improve resource productivity. They can do this through the comprehensive utilization of solid waste, extending the industrial chain of energy-intensive enterprises and increasing the resource: output ratio.

Fourth, optimize product structure. This can be achieved by improving product quality, extending service life, increasing the proportion of low-carbon products to promote energy saving and emission reduction in downstream industries.

Table 16: Key areas, key tasks and policy measures for carbon reduction in industry sector during Wuhan's 12th Five-Year Plan Period

Area	Carbon emissions	Energy efficiency of raw materials production	Resource productivity	Product quality
Key tasks	Encourage the use of more low-carbon energy and the use of clean energy in coal-fired facilities	--Improve technologies used --Improve the recycling rate of residual heat pressure	Comprehensive utilization level of resources	Transformation and upgrading of traditional industries, optimization of product structure
Policy Instruments	<p>Regulatory instruments:</p> <ul style="list-style-type: none"> Implement strict energy saving and emission reduction standards for energy-intensive enterprises Energy and carbon assessment system for fixed assets investment projects Wuhan industrial directory for doubling industry 10,000 enterprises assessment and evaluation of energy-saving targets Special air pollution emission limits Energy consumption limits on energy-intensive products (output value) to reach domestic advanced level Enterprise energy management Cleaner production audit <p>Market-based instruments:</p> <ul style="list-style-type: none"> Implement differential pricing for cement and steel industries that fail to meet energy consumption limits requirements Special fund for industrial investment and technological transformation Carbon trading (covering companies whose annual comprehensive energy consumption is 60,000 tons of standard coal and above) Government procurement <p>Voluntary:</p> <ul style="list-style-type: none"> Enterprise energy efficiency benchmarking standards (international advanced level as benchmark) Information sharing Industrial enterprises' energy consumption, other statistics and monitoring <p>Capacity building:</p> <ul style="list-style-type: none"> Fixed assets evaluation of energy conservation, contract energy management and carbon asset management trainings New energy-saving technologies, new product financing, and best practices trainings 			

Case study

Improving industrial energy efficiency

Wuhan has been encouraging industry to adopt technologies to help them improve their energy conservation and efficiency. It has released several measures and programs to this end including: *Interim Measures on Special Funds Management for Industrial Energy-Saving, Supportive Measures for Improving the Energy Efficiency of Motors, Special Action Plan on Transforming Machinery in the Injection Molding Industry, Proposal on Accelerating the Implementation of Contract Energy Management, Supportive Measures for Contract Energy Management Projects, Management Measures for Preferential Income Taxes for Contract*

Energy Management, Projects in Energy-Saving Services, and Operational Guidelines on Contract Energy Management Project Loans. They focus on offering financial support, tax incentives, preferential loans, and other kinds of assistance to support energy conservation and contract energy management projects. These measures have helped reduce Wuhan's industrial energy intensity by 19.9% between 2014 and 2017, and industrial carbon intensity by 22.5% over the same period. Wuhan is in the first batch of "Made in China 2025" pilot demonstration cities that was announced in 2016.

4.2.3 Buildings

Overview

The buildings sector is a key contributor to Wuhan's carbon emissions. In 2015, the sector was responsible for about 30.3% of Wuhan's total carbon emissions. As the urbanization rate rises and living standards also improve, this sector will be a major growth area for Wuhan's future carbon emissions.

Performance of Low-Carbon Indicators

Wuhan's low-carbon development indicators for the buildings sector focus on the proportion of newly-added green buildings in all new buildings and the implementation rate of building energy efficiency standards. The indicators are as follows:

Table 17: Low-carbon development indicators, the buildings sector, Wuhan (2010, 2015)

Indicator	2010	2015
Proportion of newly-added green buildings in all new buildings that year (%)	--	22.4%
Implementation rate of building energy efficiency standards (%)	--	100%

Strategic Measures and Policy Tools

During the 12th Five-Year Plan period, the key areas for low-carbon development in the buildings sector include energy-saving and retrofit, green building and renewable energy building applications, promotion of energy-saving appliances, and promotion of green building materials. The main policy measures include mandatory energy conservation standards, green buildings and energy-saving buildings labeling, fiscal incentives, demonstration projects, technical consultation, and education programs and trainings on energy saving. However, because the vast majority of existing buildings are not energy saving, the cost to retrofit them is high, and Wuhan still needs to improve energy efficiency standards for construction, improve research and development, energy-saving product quality and construction durability. At the same time, more emphasis should be placed on smart metering, smart communications, and peak-load management to make heating, cooling, lighting and appliances more energy efficient.

Key strategic measures supporting low-carbon development in the buildings sector are:

First, improve the efficiency of carbon emission controls, such as encouraging the integration of renewable energy into buildings (using photovoltaic energy), and the use of ground, water and air sourced heat pump systems in new residential buildings;

Second, make buildings more energy efficient with the use of better technologies. This covers green building materials technology and products (wall, roof and windows); improve equipment efficiency, use intelligent technologies and products such as electrical appliances, lighting, air conditioning, ventilation and refrigeration systems;

Third, make the whole building more energy efficient, such as constructing low-energy buildings, using central heating/cooling, green buildings, retrofitting existing buildings, and the use of prefabricated buildings;

Fourth, reduce energy demand, including encouraging people to adopt low-carbon consumption behaviors and lifestyles and employ smart metering.



Table 18: key areas, key tasks and policy measures for carbon emissions in the building sector during Wuhan's 12th Five-Year Plan Period

Area	Carbon emissions	Energy efficiency	System efficiency (full life cycle)	Reduce energy demand
Specific tasks	--Increase the number of renewable energy buildings --Encourage the use of ground, water, and air sourced heat pump systems in new residential buildings	--Encourage the use of green building materials technologies and products --Encourage the use of HVAC, refrigeration systems, green lighting and intelligent technologies and products	--Increase proportion of green buildings in new buildings --Retrofit existing buildings Construct prefabricated buildings	Encourage the use of smart meters
Key policies	Regulatory Instruments: <ul style="list-style-type: none"> • Strict implementation of building energy efficiency standards: 65% of Hubei Province Low-energy residential building design standards DB / T559-2013 and Public building energy efficiency design standards GB50189-2015 Market-based Instruments <ul style="list-style-type: none"> • Special energy-saving funds • Government procurement • Contract energy management Information sharing <ul style="list-style-type: none"> • Green Building Information Platform • Energy efficiency evaluation and labeling • Green building identification system • Green building demonstration areas and top-level green building demonstrations • Energy-saving monitoring platform for buildings • Technical support, education and trainings 			

Case study

Modernizing the construction industry

Wuhan's *Proposal on Accelerating the Modernization of the Construction Industry* proposed that the city use the period between 2015 and 2017 to encourage developers to design and build pilot demonstration projects as examples of modern construction. These should include affordable housing and projects with state investment. Under this scheme, the area of new construction projects should be at least 2 million m², of which no less than 500,000 m² should be started in 2015; 600,000 m² in

2016; and 900,000 m² in 2017. From 2018 onwards, Wuhan has been encouraging the modernization of the construction industry throughout the city with the aim of making sure that at least 20% of all construction projects are "modernized" in the first year, with an annual growth of 5%; and that the prefabrication and assembly rate should be at least 30%.

4.2.4 Transportation

Overview

While carbon emissions from the transportation sector are lower than that from industry and buildings, it has been growing rapidly. In 2015, transportation was responsible for 10.7% of Wuhan's total carbon emissions. During the 12th Five-Year Plan period, the city's passenger traffic reached 2.41 billion passengers, an increase of 24% over 2010; cargo turnover was 295.2 billion tons-km, a jump of 30% over 2010. Wuhan has also experienced an explosive growth in the number of private vehicles. In 2015, the number reached 2.13 million, 50% higher than in 2010; the number rose an average 13% per year during that period. Private trucks also rose to 1.652 million, up 29.2% from 2014. In 2015, the average number of vehicles per 1,000 people was 155.7.

Prioritizing a good public transport system and encouraging new energy vehicles are two major ways a city can steer towards a low-carbon transportation sector. Wuhan City is in the first batch of integrated transport service pilot cities, a "transit city" demonstration project, and a low-carbon transport system pilot city. In 2015, Wuhan's had 8,310 regular buses, 1,300 more than in 2010.

1,750 km by 2015. It has 39 bus lanes with a total length of 155 km. Wuhan has focused on building an expressway network and rail transit; it built four lines running 126 km during the 12th Five-Year Plan period. In 2015, the city's public transport share was 46.2%, of which rail transit accounted for 24%.

Wuhan is a national model city for new energy vehicles. During the 12th Five-Year Plan period, over 90% of the taxis in Wuhan were using clean energy such as natural gas; and another 700 new hybrid electric vehicles, 1,000 new electric buses and 10,539 new energy vehicles were in use.

Performance of Low-Carbon Development Indicators

Low-carbon development indicators for the transportation sector in Wuhan include public transport's share, public transport vehicle ownership per million, the proportion of rail transit in public transport trips, and the number of new energy vehicles. Below is Wuhan's performance based on these indicators:

Table 19: Low-carbon development indicators for the transportation sector, Wuhan (2010, 2015)

Indicator	2010	2015
Proportion of public transport in all motorized trips		58.90%
Public transport share	--	46.2%
Public transport vehicles per million	15.5	13.8
Rail transit share of public transport trips	--	24%
New energy vehicles	--	10539

Strategic Measures and Policy Tools

During the 12th Five-Year Plan period, key areas for low-carbon development in Wuhan's transportation sector were new energy vehicles and optimizing the transportation infrastructure. The main policy measures were tax subsidies, government procurement, and infrastructure investment. For Wuhan to control carbon emissions from its transport sector, it must not only better implement existing areas and policies, but it must also make policies to reduce demand for motorized travel by using measures such as establishing a slow traffic system, a compact urban form, mixed land use patterns, and introducing congestion charges. *Wuhan plans to reduce carbon emissions from the transportation sector with the following five measures:*

First, improve the carbon intensity of fuel and support the use of new energy vehicles.

Second, improve energy efficiency and encourage energy-efficient vehicles.

Third, optimize the structure of transport infrastructure, improve the public transport infrastructure and create a slow traffic system by encouraging the use of public transport, bicycles and walking.

Fourth, reduce car use both in terms of number and duration through a more integrated, compact and mixed model use of urban space via regional restrictions, pricing policies (parking fees), advocacy and education.

Table 20: Key areas, key tasks and policy measures for carbon emissions in transportation sector during Wuhan's 12th Five-Year Plan Period

Area	Carbon intensity of fuel	Energy efficiency	Optimize transport infrastructure	Reduce transportation demand
Key tasks	Support the use of natural gas-powered taxis, hybrids and electric buses	Encourage the use of energy-saving vehicles	Improve public transport infrastructure and encourage use of public transport over private vehicles	Functional zoning for green travel
Policy instruments	<p>Regulatory instruments:</p> <ul style="list-style-type: none"> ● Implement fuel consumption limits on passenger cars, light commercial vehicles ● Limiting private vehicles by car license plates for areas in Wuhan Yangtze River Bridge and Jiangnan Bridge ● Special lane for BRT <p>Market-based instruments:</p> <ul style="list-style-type: none"> ● Transportation infrastructure investment ● Government procurement, encouraging the use of new energy vehicles for public service vehicles and public transport services such as commuting, renting, sanitation, afforestation and logistics ● Subsidies for new energy vehicle purchase and charging infrastructure ● Subsidy policy for replacing old cars ● Subsidies for phasing out (more polluting) yellow-labeled cars ● Regular bus transfer discounts ● Free public bicycle rental ● Downtown parking fees <p>Voluntary measures:</p> <ul style="list-style-type: none"> ● Special day, week for public transportation and green travel 			

Case study

Expanding rail transit and encouraging use of new energy vehicles

By the end of 2017, Wuhan's metro system had seven lines: Line 1 to 4, Line 6, Line 8 and the Yangluo Line. It has 167 stations and a total length of track of 237 km, 7th in length in mainland China. There are another 16 lines (360 km) under construction. By 2020, it is estimated that Wuhan will have 11 metro lines with a total length of 400 km to form a "main city network, new city link" rail transit network system. Public transport makes up 62.5% of all motorized transport, while rail transit makes up 53% of all public transport.

Wuhan has issued several Plans to support new energy vehicles such as: *New Energy Vehicles Promotion and Application Plan 2016*, *New Energy Vehicles Promotion, Application and Industrialization Implementation Plan (2017-2020)*, and *Notice on*

Accelerating the Promotion and Application of New Energy Vehicles. These suggest that Wuhan should encourage the use of new energy vehicles in the city so that there are no less than 3,000 in 2017; 4,000 in 2018; 5,000 in 2019, and 6,000 in 2020. It also called for building and putting into operation no less than 3,000 charging piles by 2017; 3,500 by 2018; 4,000 by 2019; and 4,500 by 2020. A number of measures are being used to achieve these targets such as providing financial support such as subsidies, using preferential traffic rules to give greater road access to new vehicles, preferential taxes and fees, supportive electricity pricing, building new vehicle charging infrastructure, including new energy vehicles on government procurement lists, encouraging use of new energy vehicles for officials, public transport, and public services that require transport such as sanitation and logistics.

4.2.5 Environment and Land Use

Strategic Measures

Urban form and land use patterns impact urban production and consumer behavior. Wuhan's urban spatial planning will affect low-carbon development strategies and policy tools in the fields of energy, industry, transportation and buildings from top-level decision-making. They can also affect carbon emissions, for example through the use of greening policy and environmental municipal facilities.

Improving air quality has been Wuhan's focus during the 12th Five-Year Plan period.

The key areas of pollution control are connected with coal utilization,

dust production, motor vehicle emissions, and volatile organic compounds and require cooperation between the departments of energy, transportation and buildings. They are focused on promoting energy-saving emission reduction measures and strategic measures on the use of coal, low-emission unit transformation, delimitation of highly-polluting fuel combustion zones, emissions monitoring for highly-polluting industries, special law enforcement and remediation, online monitoring systems, and other types of air pollution control measures.

Performance of Low-Carbon Indicators

Table 21: Urban environment and land use low-carbon development indicators, Wuhan (2010, 2015)

Indicator	2010	2015
Park area per capita (m ²)	9.24	11.12
Green coverage in built-up areas (%)	37.48%	39.65%
Forest coverage (%)	26.63%	28%
Water consumption of urban residents (L / day.person)	179.1	174
Waste production per capita (tons)	0.26	0.31
Wastewater treatment rate in central city area (%)	-	93.8%
Domestic waste harmless treatment in central city area (%)	90%	100%
Annual average concentration of PM ₁₀ (ug/m ³)	-	104
Annual average concentration of PM _{2.5} (ug/m ³)	-	70
Percentage of days with good air quality (%)	-	52.6%

Case study 1

Building a Sponge City

In April 2015, Wuhan became one of the cities in the first batch of Sponge City pilots. Accordingly, Wuhan then drew up a *Special Sponge City Plan (2016-2030)* and issued its Sponge City Construction Pilot Project Implementation Plan, Management Measures on *Sponge City Construction*, and *Notice on Accelerating the Construction of a Sponge City*. It drew up seven local technical standards (see *Wuhan Sponge City Construction Technical Guidelines (trial)*), built a monitoring and evaluation platform; and

employed a rainwater runoff control rate of 38.5 km². It also drew up standards on reducing non-point source pollution. The cumulative investment into the pilot was RMB 9.548 billion. The pilot's Dai Jia Lake Park won the China Habitat Environment Model Award. The Ministry of Housing and Urban-Rural Development incorporated the Lin Jiangwan Community Restoration Project into the first batch of case studies in the Sponge City Pilot program.

Case study 2

Huashan New Eco-City and Sino-French Eco-City

Hubei Province has released several Plans on building eco-cities focused on low emissions. These include: Hubei's 13th Five-Year Comprehensive Work Plan on Energy Saving and Emission Reduction, Hubei's 13th Five-Year Plan Implementation Scheme on Greenhouse Gas Emissions Control, Wuhan's 13th Five-Year Plan on Climate Change and Energy Saving, Wuhan's 13th Five-Year Plan for National Economic and Social Development, Key Points on the Comprehensive Reform for Constructing a Resource-Saving and Environmentally-Friendly Society in Wuhan, and Wuhan's 13th Five-Year Plan on Low-Carbon Development. These were used to support Huashan New Eco-City and Sixin Eco-city as demonstration projects that target near-zero emission areas. The Sino-French Eco-City is envisaged as a joint country initiative to create a model for sustainable city development.

Huashan New Eco-City

When Huashan New Eco-City is finished it should cover about 66.4 km² of which 18 km² will be construction land and home to around 200,000 people. It is one of eight national low-carbon cities (towns) pilot projects listed in the NDRC's Notice on Accelerating National Low-Carbon City (Town) Pilots. Its aim is to create a low-carbon city and become a model for other eco-cities in China. It will build an integrated public transport system, with metro and bus rapid transit systems at its core, linked by a regular bus system, and supplemented by taxi services and slow traffic. In building a smart city, it will employ IT and communications technologies to integrate key urban data; as an example, work on the Chu Tian Yun Big Data Industrial Park project has been started. It has promoted the use of clean energy vehicles in its public transport system and put more than 30 electric buses into operation in 2016. Yida Yunshan Lakes, a residential project, was 100% served by solar photothermal systems in 2016. Schools are being targeted first to join a pilot project for separating garbage; this will be extended

later to residential communities and industrial parks. An eco-demonstration Wetland Park was built around Yanxi Lake and Huashan River. There are currently 27 hectares of estuarine wetland park.

Sino-French Eco-city

This joint project between China and France has been supported by a number of Measures, including: *Proposals on Accelerating the Sino-French Eco-City, Policies and Measures to Support French-funded Enterprises in Wuhan's Sino-French Eco-City (Trial), and Suggestions on Supporting the Modern Service Industry in the Sino-French Eco-City. The Sino-French Eco-City Master Plan (2016-2030)* was drawn up after specialist advice from both countries. Caidian District was chosen as the site for the eco-city. Its mission is to become a model of sustainable development using low-carbon concepts. The planned core area is about 39 km², which will later be expanded by 62 km² with a further 120 km² of peripheral area. It will use expertise, experiences and technologies from both countries in sustainable development in urban planning, design, construction and management. It will focus on renewable energy, low-carbon transport, green buildings and so on, to create a joint endeavor between China and France that showcases low-carbon living, industrial innovation and the concept of a liveable city, while embracing industrialization, informatization, urbanization and agricultural modernization. So far, the project has been running smoothly and the major projects that have been built, or are in the planning stage, include the sustainable use of water resources and the Dongfeng Renault production base. One of the world's largest power producers plans to invest more than RMB 1 billion yuan in the initial period into programs involving geothermal energy and natural gas and waste heat recovery from wastewater treatment plants.

5 Conclusion

Wuhan's low-carbon development is rooted in its local characteristics and will depend on its plans for the future. Wuhan's development is typical of industrial cities in China.

- As an economic center and megacity in China's central region, and because of its particular geographical and climatic conditions, Wuhan has long been an energy-intensive city. However, given its high dependency on energy imports and increasingly severe environmental constraints, it must adopt a low-carbon development path.

- Wuhan has a long history and rich culture. Openness, flexibility, inclusiveness and diversity are firmly anchored in its history and culture. It also has rich science and technological innovation resources; these provide strong ideological foundations and a capacity for absorbing, building and pursuing low-carbon development.
- Wuhan is currently undergoing transitions in both its industrialization and urbanization paths. *Advanced Industrial Manufacturing City and Strengthening and Improving Urban Construction* are key development strategies underpinning Wuhan's

long-term vision of becoming a national central city. Low-carbon city development will provide strong support to successfully transform and upgrade Wuhan city.

- As a city with a large heavy industry that is currently being restructured, Wuhan is focusing on industry and energy in pursuit of a low-carbon transition.
- As a sub-provincial city, the capital of Hubei Province, and a national pilot city, Wuhan has plentiful administrative resources to support a low-carbon transformation.

During the period of the 12th Five Year Plan, Wuhan further urbanized and industrialized, while focusing on improving its industrial structure and energy mix, reducing energy intensity and carbon intensity to bring down its carbon dioxide emissions.

- Wuhan's population has climbed steadily while its urbanization rate has also increased. Wuhan is an obvious aging society. The majority of the city's workers are employed in industry and the tertiary sector.
- Wuhan is transitioning from rapid urbanization to stable

urbanization. Its urbanization rate is close to that of global cities in the developed world (80%-90%).

- Wuhan's GDP in 2015 passed one trillion RMB, leading all China's sub-provincial cities. Its 2015 GDP per capita was 104,132 RMB (16,705 USD), qualifying as high-income according to the World Bank (above 12,475 USD).
- Wuhan is in the mid- to late-industrialization stage; its secondary and tertiary sectors are roughly equal in size. The city continues to improve its industrial structure, while lowering energy consumption per unit of industrial value-added (energy intensity).
- Wuhan's total energy consumption is rising, however, its energy mix is becoming more low carbon. The share of coal in total energy consumption is declining, while non-fossil fuels are increasing rapidly in primary energy consumption.
- Wuhan is in the process of decoupling economic growth and carbon dioxide emissions; GDP output per unit carbon dioxide emissions continues to rise. Carbon dioxide emissions per capita slowly increased from 11.9 t in 2010 to 12.4 t in 2015.

Table 22: Key driving factors for carbon dioxide emissions, Wuhan (2010, 2015)

Driving factor	2010	2015
Population (million persons)	9.78	10.61
Aging rate (%)	14.58%	19.74%
Urbanization rate (%)	70.5%	79.77%
GDP (100 million RMB)	5565.9	10905
GDP per capita (RMB)	58000	104132
Primary: Secondary: Tertiary share of the economy (total GDP)	3.1:45.5:51.4	3.3:45.7:51.0
Total energy consumption (tce)	3615	4858
Share of coal consumption in total energy consumption(%)	53.81%	50.03%
Share of non-fossil fuel in primary energy consumption(%)	8.71%	11.5%
CO2 emissions per unit GDP (t/10000 RMB)(current price)	2.09	1.21
Carbon dioxide emissions per capita (t)	11.9	12.4

During the period of the 12th Five-Year Plan (2011-2015), Wuhan gained experience in exploring institutional mechanisms, strategic measures and policy tools on low-carbon development. It has now built a feasible working plan for low-carbon development:

- Wuhan has established a Leading Group for Low-Carbon Development, which is led by the mayor. Local government has used a number of scientific methods and tools to create a low-carbon development action plan that defines targets and actions for low-carbon development, has designated a year by which carbon emissions should be peaked, and allocated targets

and key tasks to agencies and districts (counties). It has made low-carbon development strategic measures and policy tools in key fields such as energy, industry, buildings and transportation.

- Wuhan has established innovative management systems and mechanisms on low-carbon development. It has made mandatory targets for carbon intensity, set up accounting and responsibility systems, and evaluation mechanisms for greenhouse gas emission targets as well a system to evaluate fixed assets investment projects by carbon emissions. Wuhan has adopted a market-based approach, using carbon trading, special funds for low-carbon development, and green credit.

- Wuhan must focus on industry if it wants to reduce its carbon emissions. With socio-economic development and rising living standards, carbon emissions from buildings and the transportation sector are constantly increasing. Wuhan has a number of strategic measures and policy tools to transform its energy mix and reduce carbon emissions in industry, transportation and buildings. These include improving energy efficiency, using new technologies, reducing carbon emissions per unit energy consumption, and reducing energy demand. It has employed policy tools, new regulations, market incentives, mandating the supply of information and introducing voluntary practices.

- Although Wuhan has established a comprehensive and systematic low-carbon development strategy and policy framework, it still faces challenges on how to effectively implement these. The city needs more laws and regulations to give legislative support for low-carbon development; it also needs to improve the monitoring and evaluation of the implementation of these policies and their effects.



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ANNIVERSARY REVIEW OF CHINA'S GREEN FINANCE REFORM AND INNOVATION PILOT ZONES

September 2018

Abstract

It is estimated that China's green low-carbon investment demand during the 13th-Five Year Plan period ranges from 6.6 to 14.5 trillion RMB. China's national and local governments are only able to provide a fraction of this capital, creating a significant unmet financing gap. To meet the need for green low-carbon financing in its cities, China needs environmental and climate policies that allow markets to provide clear signals of investment opportunities and risks. These signals will in turn drive increased private investment in China's green and low-carbon sectors – parts of the economy that could be central in supporting growth the coming decades. At the same time, the financial sector must furnish innovative financing tool are tailored to the unique characteristics of different environmentally-friendly projects.

Green finance is now a component of China's drive to build an 'ecological civilization'. In June 2017, a State Council executive meeting chaired by Premier Li Keqiang tasked the provinces of Zhejiang, Jiangxi, Guangdong, Guizhou and Xinjiang to develop green finance reform and innovation pilot zones. Five overall provincial plans for these new pilots were subsequently issued by the People's Bank of China, the National Development and Reform Commission, and five other government agencies. On the basis of these policy documents, these pilot zones are now developing green finance measures in Chinese regions with different economic characteristics.

Starting 2010, NDRC has overseen the successive launching of three batches of low-carbon pilots, now totaling 87 pilot regions. Over the past eight years, these pilots have gained experiences that can be replicated and scaled up throughout China. They are driving innovation in green and low-carbon policies, but increased access to financial resources is necessary for them to facilitate investments in complex and long-horizon projects. China's green finance and low-carbon pilot efforts could be united to match financial capital with low-carbon development.

Marking the first anniversary of China's green finance pilot program, this report provides an overview of China's green finance low-carbon pilot zones. It summarizes the work plans, policies and actions in each pilot zone. In Section 7, iGDP offers an assessment of China's green finance pilots and suggestions for refinement of this pilot program going forward.

Table of Contents

1. Background	52
2. Green Finance Policy Framework	52
3. Provincial and Municipal Characteristics of Green and Low-carbon Development in Pilot Zones	55
4. Green Finance Pilot Zones Overall Plan	57
4.1 Overview of the Overall Plans	58
4.2 Focus Areas with Each Overall Plan	60
5. Innovative Practices in Pilot Zones	60
5.1 Supporting Policy	60
5.2 Institutional Setting-up and Complementary Measures ..	64
5.3 Green Financial Products and Service Innovation	66
6. Pilot Zone Progress to Date	67
7. Summary and Recommendations	67S

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1 Background

In September 2015, the Central Committee of the Communist Party of China and the State Council promulgated the "General Plan for Reforming the System of Ecological Civilization". Among other measures, it proposed to:

1. Promote green credit, strengthen the construction of relevant systems in the capital market, support the establishment of various green development funds, and establish corporate environmental information disclosure and environmental cost assessment systems; and
2. Establish a system of compulsory environmental liability insurance stipulating enterprises connected with high-environmental-risk industries.

China's 13th Five-Year Plan for National Economic and Social Development (2016-2020) also contains green finance goals: "Establishment of a green financial system, encourage the development of green credit, green bonds, and the establishment of a green development fund." In 2016, the People's Bank of China (PBOC), the National Development and Reform Commission (NDRC), and other five ministries jointly issued "Guidelines for Establishing the Green Financial System." This succession of policy documents shows that support for green finance has achieved consensus among China's leaders. Implementation is now underway.

In June 2017, a State Council executive meeting chaired by Premier Li Keqiang announced the creation of green finance pilot zones in selected areas within Zhejiang, Jiangxi, Guangdong, Guizhou and Xinjiang provinces. Subsequently, an overall plan for each pilot zone was jointly issued by the PBOC, NDRC, and other five ministries, with local green finance goals based on the economic and urban development characteristics of each area.

Cities are the main consumer of resources and energy, and the main emitters of greenhouse gas emissions (GHGs). According to the United Nations Development Program, cities consume two-thirds of the world's primary energy and generate 70 percent of carbon emissions¹, and this proportion is gradually increasing. China's National New Urbanization Plan (2014-2020) forecasts that the urbanization rate will reach 60 percent by 2020, and the Development Research Center of the State Council estimates that China's urbanization rate will reach 65 percent by 2030. This means that an additional 300 million more people will move to China's already densely populated cities, highlighting the importance of enacting policies that promote low-carbon urban development.

2 Green Finance Policy Framework

Prior to the release of "Guidelines for Establishing the Green Financial System", China had issued piecemeal green finance policies, addressing a range of issues including green credit, green insurance, green bonds, and environmental information disclosure. The State Council, the People's Bank of China, the Environmental Protection Department, banking and insurance regulatory authorities², and the stock exchanges all participated in policy formulation. This diversity of institutional attention illustrates the cross-sectoral nature of green finance policy.

This section provides a chronology of policies related to green finance issued by the central government and financial regulatory agencies. The objectives of these policies are to raise the investment rate of return of green projects, reduce the financing costs of green projects, and improve the availability of environmental information. Regional government policies are not covered in this report.





Top-level Design	Overall Plan for Building a Green Finance Reform and Innovation Pilot Zone People's Bank of China; National Development and Reform Commission; Ministry of Finance; Ministry of Environmental Protection; China Banking Regulatory Commission; China Securities Regulatory Commission; China Insurance Regulatory Commission The overall green finance pilot plan for Ganjiang New District of Jiangxi Province, Gui'an New District of Guizhou Province, Hami City of Xinjiang Uygur Autonomous Region, Changji Prefecture and Karamay City, Guangzhou City of Guangdong Province, Huzhou City of Zhejiang Province and Zhangzhou City.	2017	Administrative Measures on Compulsory Liability Insurance for Environmental Pollution (Draft for Comment) Ministry of Environmental Protection; China Insurance Regulatory Commission Regulates the scope of compulsory insurance coverage and insurance liability, the uniform terms and rates, the floating rate, liability limit, insurance contract, underwriting, notification obligation, contract cancellation, notice of contract cancellation to environmental protection department, insurance period and renewal, insurance method, etc.	Green Insurance

3 Provincial and Municipal Characteristics of Green and Low-carbon Development in Pilot Zones

China's green and low-carbon pilot zones have been selected against two main criteria. First, they represent different stages of economic development. The pilots are located in China's eastern, central and western provinces, which vary in economic development, industrial structure, urbanization rates, and resource endowments. Second, the pilot zones have policy experience in green and low-carbon development. Many have been selected as green eco-city demonstration, low-carbon

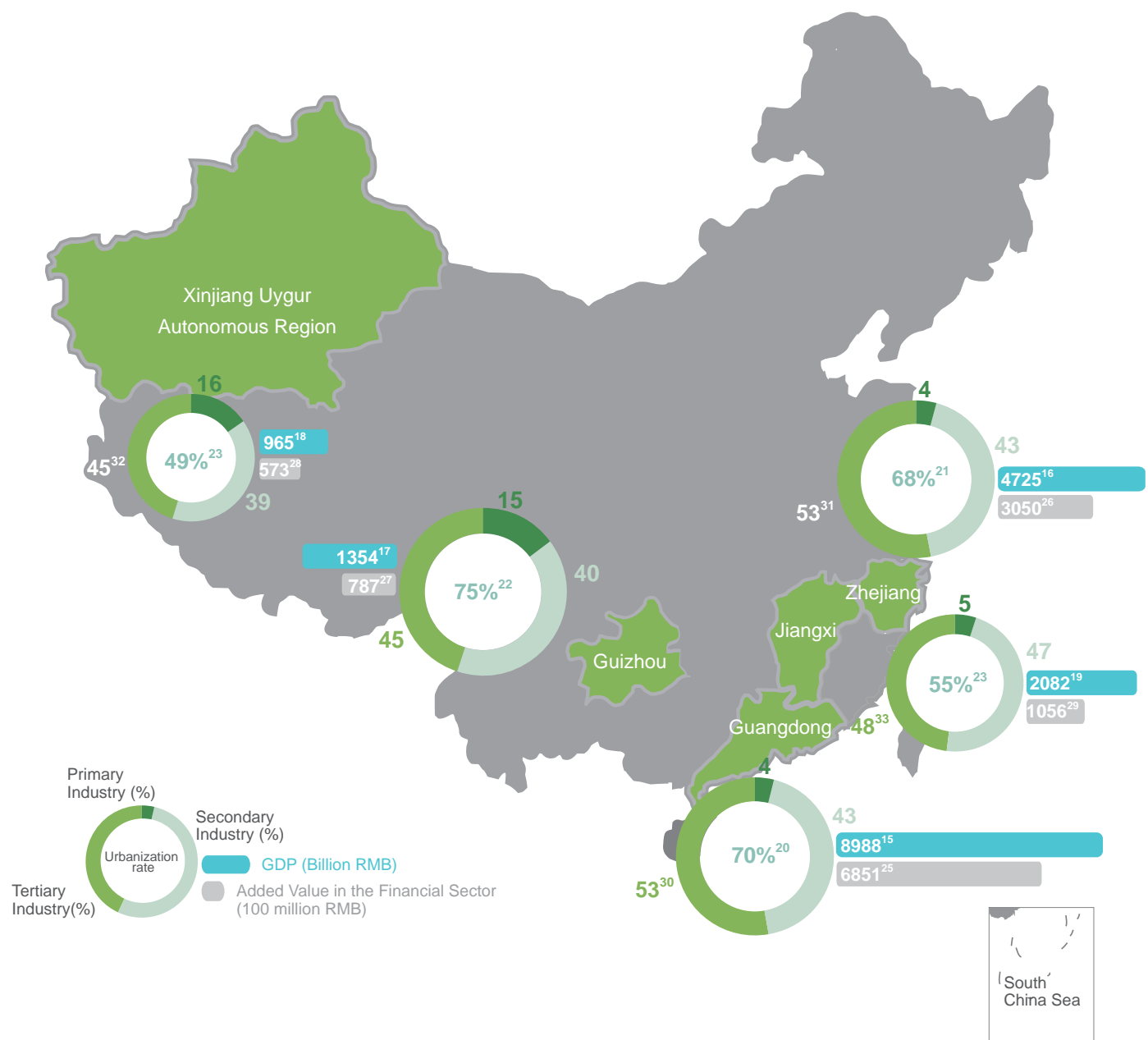
(city, industrial park, community) pilots, and ecological civilization demonstration zones. These demonstration projects have promoted low-carbon economic and industrial development to varying degrees, laying a foundation for green finance policy experimentation. This table includes macroeconomic indicators, social and economic characteristics, and other factors relevant to green development in China's five green finance pilot areas.

Green and Low-carbon Development in Pilot Zone Cities³

	Guangzhou	Huzhou	Quzhou	Guiyang	Changji	Karam	Hami	Nanchang
Carbon Emissions Peaking Year	2020		2022	2025	2025			2025
Low-carbon Pilot City	●	● ⁴	●	●	●			●
Low-carbon Pilot Community	●	● ⁵	● ⁶		● ⁷	● ⁸		
Carbon Emissions Trading Pilot	●							
Comprehensive Demonstration of Fiscal Policy for Energy Conservation and Emission Reduction				●				
New Energy Pilot Demonstration City				●				
National Low-carbon Industrial Park Pilot				●				●
New Energy Vehicle Promotion and Application City	●			●				●
Transit Metropolis pilots	●	●		●				●
Green Circular Low-carbon Traffic Pilots	●			●				●
Green Ecology Demonstration City				●				
Urban Demonstration of Renewable Energy Building Applications				●				●
National New Urbanization Comprehensive Pilot	●	●	●					
Ecological Civilization Pilot Zone		●	● ⁹	●	●			●
National Smart City Pilot	●		● ¹⁰	●	●	●		●
Pilot of Kitchen Waste Utilization and Harmless Treatment	●	●	● ¹¹	●		●		●
Domestic Waste Classification Demonstration City (District)	●	●		●				

Overview of the Socio-economic Development of the Pilot Zone Cities in 2017¹²

Unit: Billion RMB				Unit: 100 million RMB				
3414	2150	3414	2150	71	1	28	Guangdong Guangzhou	2569
				48	5	47	Zhejiang Huzhou	
				138	6	45	Zhejiang Quzhou	
				328	4	39	Guizhou Guiyang	
				1051	57	75%		
				354	20	47	Xinjiang Changji	
				122	1	69	Xinjiang Karamay	
				114	30	n/a		
				72	8	58	Xinjiang Hami	
				53	4	53	Jiangxi Nanchang	
1036				43	73%			55 ¹⁴
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4 Green Finance Pilot Zones Overall Plans

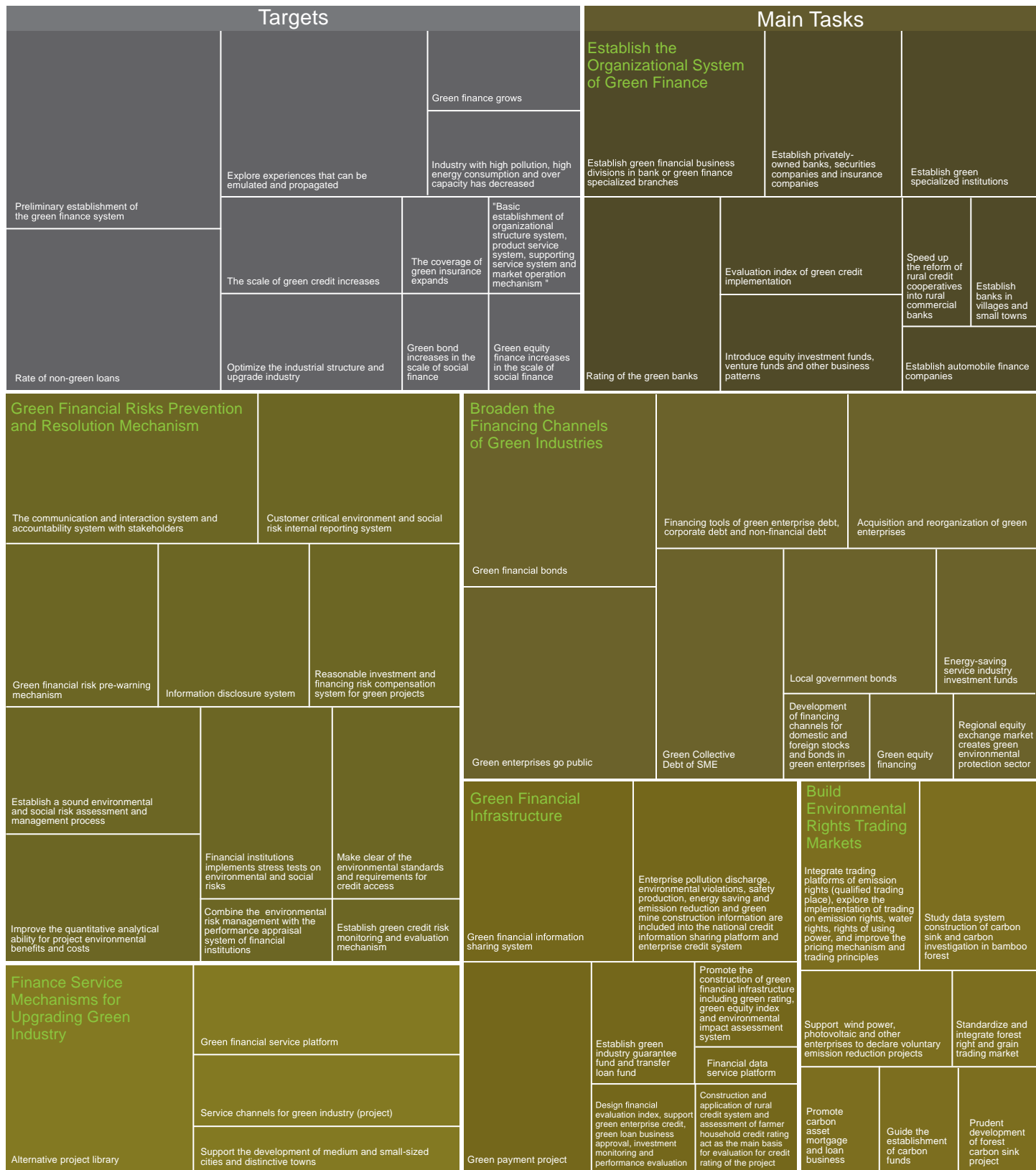
In June 2017, the People's Bank of China, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Ecology and Environment, the China Banking Regulatory Commission, the China Securities Regulatory Commission, and the China Insurance Regulatory Commission jointly issued five overall green finance plans for Ganjiang New District in Jiangxi Province, Gui'an New District in Guizhou Province, Hami, Changji and Karamay in Xinjiang Uygur Autonomous Region, Huzhou and Quzhou in Zhejiang Province, and Huadu District in Guangdong Province.

These plans lay out pilot requirements regarding objectives, activities and complementary measures. The main tasks include building a green financial system, promoting innovation in green financial products and service methods, broadening the financing channels for green industries, building environmental rights trading markets, and constructing green financial infrastructure. The plans have different emphases based on the different industry and economic conditions in each pilot zone.

4.1 Overview of the Overall Plans

The figure below shows the main content of each overall plan. The square area indicates the frequency of occurrence in the plan - the larger the square area, the more pilot zones are

setting this target or applying this measure. A smaller square area may reflect the local specialty of the pilot zone.

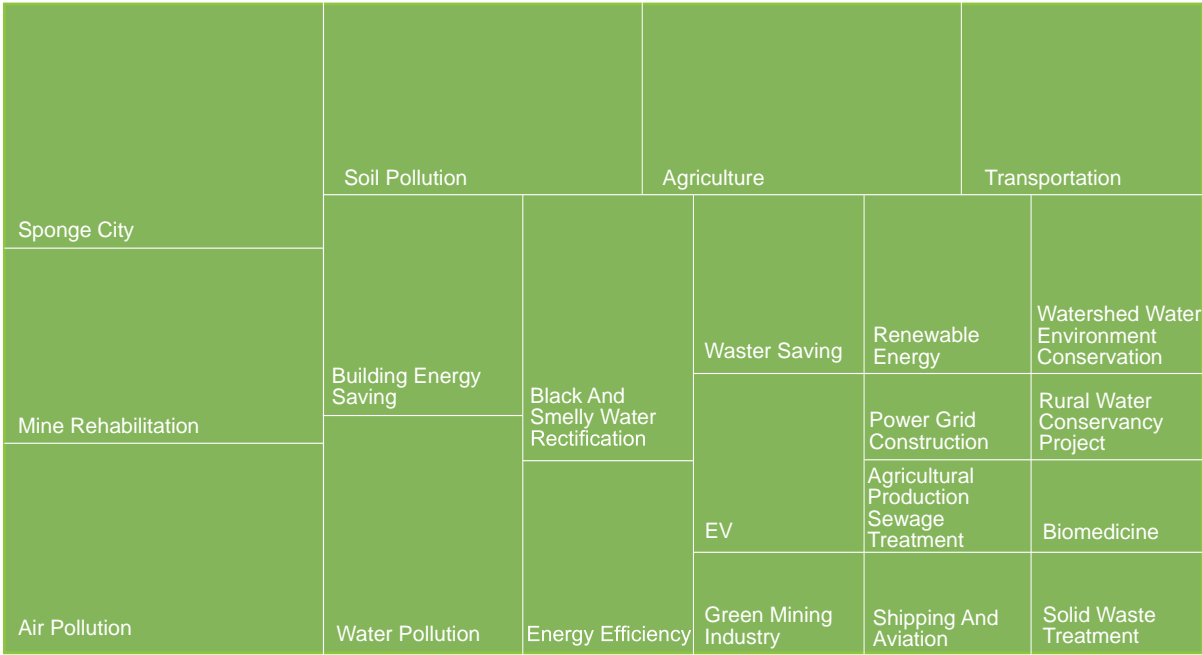


Green Insurance						Complementary Measures																													
Insurance fund investment on green project		Amend the laws or administrative regulations of compulsory liability insurance on environmental pollution				Establish green development professional insurance Company		Policy Support				Improve risk sharing mechanism of revenue and cost				The major policy matters shall be submitted separately				Take the results of ratings as a reference for financial subsidies and government projects															
		Promote environmental pollution liability insurance		Put more efforts on agricultural insurance		Development of oil pollution and damage liability insurance in Huzhou																													
Green architecture insurance				livestock & poultry insurance for small holders		Establish green insurance compensation fund		Wind power and photovoltaic power generation index insurance		Financial support				Link environmental risk management of financial institutions , green credit implementation and green bank rating results with supervision ratings and institutional access to senior executives				Give policy support to financial institutions in the pilot zone				Support foreign financial institutions to set up branches													
		Deepen the pilot work of compulsory liability insurance on environmental pollution		Contract energy and contract water-saving breach insurance		Financial institutions pay attention to the situation of enterprises insuring environmental pollution liability insurance in the catalogue of Supreme People's Court and Supreme People's Procuratorate																													
Guarantee insurance of green enterprise loan				The first major equipment insurance																															
Innovation In Green Financial Products and Service																																			
The innovation of hypothecation model on environmental rights and interests						Innovation in green credit products																													
Securitization of green credit assets						Green industry funds				New energy automobile lease service																									
Contract energy management, water conservation management and environmental service finance		Credit products of PPP project		Establish financial risk mitigation funds		Medium small and micro-enterprise transferloan funds and the linked products of government, bank and insurance				Law Enforcement						Establish a corporate environmental and social responsibility investigation mechanism																			
				Green credit products benefiting farmers		Enterprises with excessive emission under strict control over increasing new credit line																													
Green credit hypothecation guarantee model		Securitization of green financial assets		Investment and loan linkage pilot		New Energy vehicle consumption loan products		Innovation of loan products for fuel-saving and technically-improved small freight vehicles		Increase inspection and enforcement of energy, environment, safety supervision, etc.						Strengthen social supervision																			
Communication and Cooperation																																			
Green credit policy		Innovation of green credit product		Funds from overseas enter the pilot zone to set up institutions to carry out green project investment		Strengthen cooperation with Hong Kong and Macao		Support cross-border financing under the framework of a full-scale macroprudential policy				Talent Guarantee				Formulate high-level financial talent supporting policies				Organization and Coordination				Make clear of the responsibility division, supervision and evaluation				Green finance reform and innovation enforcement regulations				Financial reform and innovation leader group			
Industry standard		Employ experts to provide advice		Green financial trading institutions and foreign exchanges set up joint ventures		Promote the reform of enterprise foreign debt registration system management		Support foreign parent companies or subsidiaries of foreign-funded enterprises in pilot zones to issue RMB green bonds in domestic interbank market by rules																											
										Establish a committee of green financial reform experts or think tanks, hire consultants				Strengthen cooperation with third-party organizations to cultivate comprehensive talents in the fields of finance and environmental protection				Deepen cooperation with universities, research institutions and financial institutions to conduct financial development research				Cultivate comprehensive talents in finance and environmental protection				Advocacy programs				Performance evaluation by third-party					

4.2 Focus Areas Within Each Overall Plan

The overall plans of each pilot zone describe the main areas and industries for green finance development. These include sponge city construction, green mines, air pollution, and soil pollution - areas that are consistent with the national environmental protection goals in the 13th FYP and also reflect local green transformation priorities.

The graph below shows the main supported areas in each overall plans. The size of each square is proportional to the number of cities active in the policy area. The bigger size of the square, the larger the number of cities.



5 Innovative Practices in Pilot Zones

The overall plan is the core guidance document in each pilot zone. These plans serve as the foundation for specific actions such as policy design, implementation rules, and division of responsibilities. This

section summarizes the specific actions in each pilot area in the past year.

5.1 Supporting Policy

In the initial stage of green finance pilot activity, local governments are tasked with providing relevant policies for stakeholders such as banks, institutional/private investors, and project developers. Supporting

policies differ from the provincial level to the district level depending on local development characteristics. The following chart details the specific supporting policies in each pilot zone.

Supporting Policy	Guangdong	Zhejiang		Guizhou	Xinjiang Uygur Autonomous Region			Jiangxi
Pilot Zone	Huadu District, Guangzhou	Huzhou	Quzhou	Gui'an New District, Guiyang	Hami	Changji	Karamay	Ganjiang New District, Nanchang
Overall Plan	Overall Plan for Building a Green Finance Reform and Innovation Pilot Zone in Guangzhou City, Guangdong Province	Overall Plan for the Construction of Green Financial and Innovation Pilot Zone in Huzhou City and Quzhou City, Zhejiang Povince		Overall Plan for the Construction of Green Finance Reform and Innovation Pilot Zone in Gui'an New District, Guizhou Province	Overall Plan for Building a Green Finance Reform and Innovation Pilot Zones in Hami, Changji, and Karamy, Xinjiang Uygur Autonomous Region			Overall Plan for Building a Green Finance Reform and Innovation Pilot Zone in Ganjiang New District, Jiangxi Province
	—	13th Five-Year Plan for Green Finance Development in Huzhou City ³⁴	13th Five-Year Plan for Green Finance Development in Zhangzhou City (under preparation)	—	Planning a corresponding five-year plan			Construction Plan of Green Finance System in the '13th Five-Year Plan' of Jiangxi Province ³⁵
Provincial Document	—	Promoting the Action Plan for the Construction of Green Finance Reform and Innovation Pilot Zone in Huzhou and Quzhou City ³⁶		Mission List of Building Green Finance Reform and Innovation Pilot Area in Gui'an New District ³⁷ , Implementation Opinions on Accelerating the Development of Green Finance ³⁸ , Implementation Rules for the Construction of Green Finance Reform and Innovation Pilot Zone in Guizhou Province	Implementation Opinions on the Construction of a Green Financial System in the Autonomous Region ³⁹ , "Implementation Rules for the Pilot Program of Xinjiang Green Finance Reform and Innovation Pilot Area: Notice on Conscientiously Implementing the Spirit of the 19th National Congress of the Communist Party of China to Accelerate the Construction of the Pilot Area for Green Finance Reform and Innovation in Xinjiang			Implementation Opinions of the People's Government of Jiangxi Province on Accelerating the Development of Green Finance" ⁴⁰ , Implementation Rules for the Construction of Green Finance Reform and Innovation Pilot Area in Ganjiang New District ⁴¹
Municipal Policy Document	—	National Green Finance Reform and Innovation Pilot Zone Construction Implementation Plan in Huzhou City ⁴²	Opinions of the Municipal Government of Quzhou City on Promoting the Construction of a Green Finance Reform and Innovation Pilot Zone ⁴⁴	—	Implementation Plan for the Construction of Green Finance Reform and Innovation Pilot Zone in Hami City; "Integrated Action Plan for Ecological and Environmental Issues"; "Hami City Energy Consumption and Strength Dual Control and Emission Targets Implementation Plan	Changji Prefecture Construction Green Finance Reform and Innovation Pilot Zone Implementation Plan ⁴⁵ , Notice on Strengthening the Guiding Opinions on the Construction of the Green Finance Franchise System ⁴⁶	Implementation Plan for the Establishment of a Comprehensive Green Financial Innovation Pilot Zone in Karamay City; Green Technology Demand in Karamay City	—

Supporting Policy	Guangdong	Zhejiang	Guizhou	Xinjiang Uygur Autonomous Region	Jiangxi
District Document	Implementation Rules of Green Finance and Green Industry Innovation and Development in Huadu District, Guangzhou ⁴⁷ ; Implementation Rules of Green Finance and Green Industry Innovation and Development in Huadu District, Guangzhou ⁴⁸ ; Implementation Rules for the Development of Green Listed companies in Hued District, Guangzhou ⁴⁹ ; Implementation Rules of Green Finance and Green Industry Innovation and Development in Huadu District, Guangzhou ⁵⁰	-	Three-Year Action Plan for the Development and Construction of the Green Financial Port in the Western Region of Gui'an New District (2015-2017) ⁵¹ ; Policy Measures to Support Green Finance Development in Gui'an New District; Gui'an New District Green Finance Reform and Innovation Pilot Area Construction ⁵² Implementation Plan Implementation Opinions on Supporting the Introduction and Cultivation of Green Finance Professionals in Gui'an New District	-	Implementation Opinions on Promoting the Development of Green Finance ⁵³ ; Work of Green Finance Reform and Innovation Pilot Area in Ganjiang New District
Bank	-	Huzhou Green Bank Evaluation Standards ⁵⁴ ; Huzhou Green Finance Specialized Organization Construction Code; Huzhou Green Bank Franchise System Construction Code ⁵⁵ ; Notice on Promoting the Construction of Banking Green Finance Franchise System in Huzhou ⁵⁶ ; Green Banking Three-Year Action Plan in Zhejiang; Green Finance Franchise System Supervision Standards	-	-	Opinions on Supporting the Development of Green Bank Institutions in Ganjiang New District, Jiangxi Province ⁵⁷ ; In 2017, the banking institution of Ganjiang New District, Jiangxi, created the 'Green Branch Bank' Working Plan ⁵⁸ ; Interim Measures for the Administration of Green Branches in Ganjiang New District in Jiangxi ⁵⁹ ; Notice on Doing a Good Job in the Establishment of 'Green Branches' in Banks in Jiangxi Province in 2017 ⁶⁰ ; Interim Measures for the Administration of Green Branches of Ganjiang New District in Jiangxi
Green Credit	-	Taxonomic Labeling Mechanism of Green Credit	Implementation Measures for Green Credit Evaluation; Opinions on Supporting Green Credit Products and Collateral Innovations	Comprehensive Service Program on Green Credit ⁶¹	Interim Measures for the Assessment and Evaluation of Green Credit Work and Differentiation Supervision; Implementation Opinions on Green Credit Work of Jiangxi Banking Industry

Industrial Policy	Green Project/Enterprise	Measures for the Management of Green Enterprises and Project Library in the Green Finance Reform and Innovation Pilot Zones ⁶² ; Rules of Green Enterprise Certification; Rules of Green Project Certification	Working Guide on Green Evaluation in Quzhou City; Certification Evaluation Methods on Green Enterprise in Huzhou City ⁶³ ; "Green Project Recognition Evaluation Methods in Huzhou City" ⁶⁴ ; Rules of Green Finance Project Evaluation; Rules of Green Financing Enterprise Evaluation	Guiding Opinions on Credit Grants for Green Enterprises and Typical Green Projects in Guizhou Province; Establish certification standards for green businesses and projects	-	Develop standards for green project
	Insurance	-	Notice on Deepening Green Insurance Innovation and Accelerating Environmental Pollution Liability Insurance in Huzhou City; ⁶⁵ Safety Production and Environmental Pollution Comprehensive Liability Insurance	Implementation Plan on Green Insurance Innovation Work in Gui'an New District	-	-
	Other Policy	Guidelines and Policy compilation for Green Finances; Green Financial Products Compilation in Guangzhou City; Compilation of Project Financing in Green Industry	Construction Plan for Green Finance and Credit Information-sharing Platform"	Guiding Opinions on Green Finance to Promote Forestry Reform and Development; Green Financial Risk Monitoring and Evaluation Measures; Green Financial Risk Early Warning Working Plan in Gui'an New District; Opinions on Supporting the Instruction and Cultivation of Green Finance Professionals in Gui'an New District	Implementation Rules of Monetary Policy Tools that Support Green Economy Development in Green Finance Reform and Innovation Pilot Zone (Provisional)	-

5.2 Institutional Set-up and Complementary Measures

In 2017, pilot zones started to build institutional mechanisms and complementary measures to provide a foundation for activating green financial markets, including establishing leadership working groups, talent introduction mechanisms, arranging transformation funds, and establishing databases to provide support from different angles. The table below summarizes institutional mechanisms and safeguards in each pilot area.

Pilot Zone		Guangdong province		Zhejiang province		Guizhou province		Xinjiang province			Jiangxi province	
		Guangzhou	Huadu district	Chouzhou	Quzhou	Guian new district	Hami	Changji state	Karamay			
Green Financial Reform And Innovation Leadership Group	Set up a group	✓		✓		✓	✓	✓	✓	✓	✓	
	Set Up An Office	no special office, the provincial Finance office to undertake the daily work.		–	Set under the municipal Finance office	Set under in the Finance Office of the provincial government.	Set under Urumqi Central branch of the People's Bank.			Set under the Finance Office of the provincial government.		
	Group Leader	Administrative leaders in province		Secretary, Mayor	Mayor	Governor	Vice president of the Autonomous Region party committee, chairman of the Autonomous Region			Executive Vice Governor		
	Work Mechanism	Guangdong green financial reform and innovation work leading group working system		–	Under research and formulation	Provincial Government Finance Office set up a special working class from Guiyang Central Sub-branch of People's Bank of China, Provincial Environmental Protection Department and relevant financial institutions	–	Joint conference system of green finance				
Financial Investment	Management Methods Of Special Funds	Huadu District of Guangzhou supports the management measures of green finance and green industry development special fund		–	–	Measures for the management of Financial Industry Development Award in Guizhou Province	–	–			–	
	Establish Special Funds	1 billion yuan per year		1 billion yuan per year	1 billion yuan per year ⁶⁶	–	–	–			–	
Talent Guarantee	Talent Subsidy Policy And Fund	✓		✓		✓	–	–			✓	

Green Project/ Enterprise Library	Green Project/ Enterprise Library	✓	✓	✓				
Capacity- Building	Establishment Of Expert Committees/ Advisory Group	Green Finance Special Committee of Guangdong Finance Society	Green Finance Special Committee of Huzhou Finance Society ⁶⁷ Green Finance Reform and Innovation Expert Advisory Committee ⁶⁸	Green Finance Special Committee of Quzhou Financial Society	—	The Green Finance Special Committee of Jiangxi Provincial Finance Society ⁶⁹		
Cooperation	Promoting the establishment of the first pilot regional joint conference mechanism	China Standardization Research Institute cooperates with Huzhou People's government to promote Huzhou green manufacturing and green finance standardization ⁷⁰ construction work	—	A report on the construction of Guizhou's green finance system by the Guiyang branch of the People's Bank ⁷¹	Xinjiang Green Finance reform and Innovation Pilot Zone work leading group signed strategic cooperation agreement with Lianhe Equator ⁷²	The Green Finance Research Institute of Central University and Jiangxi Provincial government Finance office work together to deepen Beijing-Jiangxi Green Financial cooperation ⁷³		
Green Finance Specific Branch	ICBC, Bank of China, CCB and other banks upgrade Huadu branch to Green Branch, Guangzhou Bank, Industrial Bank, Pudong Development Bank has set up the Green Finance Division, the construction Bank in Huadou District set up a green financial innovation center	There are thirteen green franchises in the city, of which Huzhou Bank has become one of the pilot financial institutions for environmental information disclosure in China and the United Kingdom, Anji agricultural and commercial firm set up a bank green Finance Division with small legal person, and Nanxun agricultural firm set up a green franchise branch ⁷⁴	There are fourteen green finance pilot banks, six demonstration banks, the coverage rate for agency type is 100 percent. The People Property Insurance Quzhou Branch establishes the first Green Insurance Business Department in the system. ⁷⁵	The Guiyang branches of Industrial Bank, Huaxia Bank, Agricultural Bank of China, Guizhou Bank and has set up the green finance division; PICC Insurance Group has set up a green Product service innovation laboratory in Guian new district; the Green PPP finance division is established at the Guiyang branch of Pudong Development Bank; the original Guiyang branches of Bank of China and CCB has carried out green transformation; Guiyang Bank has set up a green finance division. ⁷⁶	Nine Green Finance Divisions and one green Finance special branch have been set up ⁷⁷	24 banking financial institutions in the district have established color Finance division, Green outlets or green counters	Xinjiang Karamay Kunlun Bank Zhonglou Sub-branch	ICBC and other six banks has set up green sub-branch in the Ganjiang new district; Jiujiang Bank has set up green finance division; the Construction Bank, Industrial Bank and postal Reserve Bank has set up green Branches; PICC property insurance has set up Green Insurance Innovation Laboratory

5.3 Green Financial Products and Service Innovation

Green finance support focuses on pollution control, infrastructure construction, building, transportation and industry as well as clean energy. Projects within these areas have different features and require

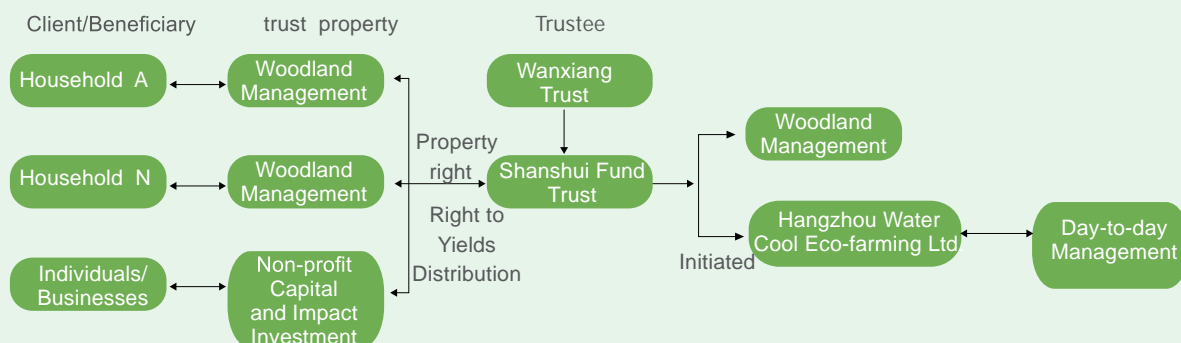
different kinds of green financial products to meet capital needs. Information sharing mechanisms also help to lower the threshold for enterprise financing.

Case 1

Longwu Land Trust⁷⁸

Founded in 1981, Longwu reservoir provides drinking water for about 4000 people living in surrounding villages. In 2014, the water quality was found to have dangerously high levels of nitrogen, phosphorus, and dissolved oxygen, originating from pesticides and chemical fertilizer used by local farmers to boost the yield of Moso bamboo. To help finance water resource protection projects, Hangzhou Wanxiang Trust set up Shanshui Fund Trust in November 2015. With The Nature Conservancy in an advisory capacity, the trust brought scientific management and environmentally-friendly industrial development to

nearly 500 mu (about 82.37 acres) of bamboo forest water. Upon admission into the trust, farmers signed a contract describing management rights. Public welfare assistance and impact investment were also included. A part of the fund was used to pay for the trusteeship of farmers' forest land, and limited funds were used to set up Hangzhou Shuike eco-agriculture development Co., Ltd. gradually transforming the farmer's mode of production and income structure. The trust structure is as follows:



After two years, the water quality of Longwu Reservoir improved to the first level (previously it was at level four), the indicators of total phosphorus and dissolved oxygen decreased greatly (only total nitrogen didn't see reduction). Shuike company also advanced the

production of green agricultural products in Qingshan Village to promote green consumption, community leadership and ecotourism. Local farmers were able to increase incomes by means of agritourism and the public deepened its awareness of environmental protection.

Case 2

Huzhou Online Green Finance Service Platform for SMEs⁷⁹

Huzhou Finance Affairs Office built an online financing service platform for small and medium enterprises, call "Ludaitong", as the innovative finance approach of linking banks and enterprise. The platform performs three functions. First, as a green credit and loan product market it helps SMEs communicate their financing needs and identify lending banks. Second, the platform promotes the transformation of bank services. Banks provide on-the-spot services after enterprises communicate their financing needs. Third, the platform enables financing information and data to be shared and exchanged between enterprises, and provides a reference for banks to evaluate enterprise credit.

By integrating data from Zhejiang Public Data Management Center, Huzhou Information Center and a third party, the platform improved the credit database for enterprises. The financing channels for enterprises were enriched by gathering credit and loan product information from financing institutions throughout the city. Financial services were further strengthened by allocating service resources for the relevant departments and city financing institutions. The platform emphasized providing SMEs with comprehensive financial services by widening the financing channels, aiming to establish a precise exchange platform between the funders and enterprises, and improving the service efficiency of financial institutions.⁸⁰

6 Pilot Zone Progress to Date

Guangdong Province

- By the end of March 2018, the green loan balance of banks in Guangzhou was 259.6 billion RMB, increasing by 34.7% compared to last June when the pilot zone was approved. This was higher than the total loan growth rate of 20%.⁸¹
- By the end of December 2017, Huadou District had 784 new companies with registered capital of more than 10 million yuan growing 50%; the green loan balance in banking industry was 5.105 billion yuan, accounting for 6.52% of total loan balance.⁸²

Zhejiang Province

- By the end of 2017, the green credit balance of the whole province was 687.5 billion RMB with year-on-year growth of 44%.⁸³
- The green credit balance reached 79.99 billion yuan in Huzhou, accounting for 24.38% of the total credit balance. The overall scale of green industry funds in the whole city has now reached 23.521 billion RMB.⁸⁴
- The green credit balance of Quzhou reached 31.27 billion yuan, accounting for 13.3% of total loans.⁸⁵

Guizhou Province

- By the end of 2017, the green loan balance of the whole province (according to green loan statistical caliber of People's Bank of China)⁸⁶ was around 168.97 billion yuan, accounting for 8.1% of the total RMB loan balance of financial institutions in the province. Thirteen financial institutions have already established or are preparing to establish green branches (or a green financial business division) in Gui'an New District. Guizhou Bank and Guiyang Bank are preparing to issue green financial bonds and list 60 green companies in the Guizhou Stock Exchange Center within a year. Four green funds were set up and more than 3.8 billion RMB was collected.⁸⁷

Xinjiang Uygur Autonomous Region

- By the end of 2017, the green project in Xinjiang Uygur Autonomous Region had a total of 1664 projects, including 365 complete green projects conforming to the green standard and 1299 normal projects.⁸⁸ The balance of green loans in banking financial institutions was 189.377 billion RMB. By the end of March 2018, the credit balances in three pilot zones were 33.609 billion yuan, accounting for 14.27 percent of the loan balances, among which the green credit balance in Hami was 22.566 billion yuan, increasing 26.41 percent year-on-year, and was higher than the average growth of loans by 21.04 percent. The non-performing loan rate was zero, lower than the average rate of non-performing loans by 1.46 percent percentage points. Green credit accounted for as much as 39.09 percent of the RMB loans, up 6.66 percent from a year earlier.⁸⁹

Jiangxi Province

- At the end of 2017, the balance of green credit in Jiangxi province exceeded 170 billion yuan with 38.4 percent growth, among which the balance in Ganjiang new district was 5.5 billion RMB, with growth of 29.6 percent. A total of thirteen green enterprises were listed in the NEEQ, and there were more than 200 green enterprises listed in the Jiangxi Joint Equity Trading Center. In 2017, Pingxiang HSBC successfully issued Jiangxi's first green enterprise bond with a circulation of 2 billion yuan.⁹⁰

7 Summary and Recommendations

Although the green finance pilot zone overall plans have different areas of emphasis, they are all designed to promote economic and industrial restructuring through the establishment of a green financial system, and to help drive local green development. The focus of the work in each pilot zone over the past year has been on building institutional mechanisms, where government plays a leading role but

allows markets to allocate resources to support the construction of ecological civilization with higher efficiency and lower cost. After a year of practice, the green finance work in the pilot zones has been fruitful. According to PBOC, as of the end of March 2018 the balance of green loans in the five pilot zones had reached more than 260 billion RMB, with a 13 percent increase since the initial approval

of the pilot zones. This rate of increase is higher than other loans in the pilot zones. As the total volume has expanded, the non-performing rate of green credit assets was only 0.12% - 0.94% lower than the average non-performing rate in the pilot zones.

Working plan priorities vary by pilot zone

The plans for Quzhou and Huzhou prioritize upgrading the industrial structure. Local plans have promoted livestock insurance products, such as insurance coverage for deceased pig stock, as well as ship oil pollution damage liability insurance.

Huadu District in Guangzhou is highlighting overseas investment cooperation, especially financial cooperation in Hong Kong and Macau and the support of overseas investment in local green finance. It is also committed to innovation in new energy vehicle financial products.

The three pilot zones in Xinjiang Uygur Autonomous Region draw on the abundant natural resources of the region, focusing on the development wind power and photovoltaics, and improving the development level of high-end manufacturing through innovative financial products such as wind power and photovoltaic power generation index insurance.

Given the high proportion of primary production in the Guizhou, the green financial products and services in this pilot zone focus on modernizing agriculture, rural water conservancy projects and rural production, and sewage treatment. Rural development is emphasized in building the financial infrastructure, using household credit ratings as the basis for project credit rating.

In Ganjiang New District in Jiangxi Province, to support key industries and infrastructure, the pilot will establish a construction and development guidance fund for the development of Ganjiang New District through a state-owned capital operation company. Fiscal risk mitigation funds, SMEs loan transfer funds, political and banking insurance products for SMEs, and other products will play a role in supporting the development of green finance policy.

Progress made in institutional mechanisms, policies and complementary design

Pilot areas have established green finance work leading groups to promote the work of the green financial pilot zones through government leadership at the provincial and municipal levels. Working groups in some pilot zones are led by the provincial or municipal government leadership, reflecting the provincial government's importance in the construction of the pilot zone.

In terms of policy design, some pilot zones have established a policy framework consisting of provincial, municipal, district and industry regulations, covering green credit, green insurance, industry supervision, and evaluation indicators. But it is important to note that green finance involves not only the financial industry and regulatory authorities, but also the ministries of ecological environment, development and reform, agriculture, housing construction and transportation. Policy formulation needs to be based on the establishment of information sharing and cooperation mechanisms. Inter-departmental cooperation and policy docking mechanisms are not clearly stated in working plans, but they are likely to appear in the "Implementation Rules" to be issued in each pilot zone.

In terms of the complementary mechanisms, some pilot zones have set up special funds to ensure the effective implementation of the pilot work. In addition, the pilot areas have established a talent guarantee mechanism and subsidy funds to attract new professionals to pursue careers in the green finance industry. They have also promoted local green financial research institutions or platform institutions to strengthen exchanges and cooperation with other regions.

Building the green financial system, green credit grows fastest, and low-carbon elements need to be strengthened

"Guiding Opinions on Building a Green Financial System" shows that the green financial system mainly includes green credit, securities market, green development funds, green insurance and environmental equity markets. Specific work in these areas includes policy mechanism design, statistical system construction, evaluation indicators, information sharing mechanisms, and finance tool development.

Notably, green credit is the focus of the pilot areas at this stage. Pilot areas have carried out work in green project/enterprise identification, green credit performance evaluation systems, credit statistics systems, and environmental risk stress tests. This has improved key indicators such as the green credit balance.

It should be pointed out, however, that low-carbon considerations do not currently play a prominent role in pilot area working plans. Despite the fact that "Guiding Opinions on Building a Green Financial System" calls for "institutional arrangements for supporting the green economy transition through financial instruments, such as green credit, green bonds, green insurance, carbon finance and related policies" and emphasizes the development of carbon-related financial products and derivatives such as "carbon futures contract, carbon swaps, carbon options, carbon leases, carbon bonds, carbon asset securitization and carbon funds", carbon finance has not yet been assimilated into the green financial system frameworks of the pilot areas.

Some pilot zones have proposed actions on forest carbon sinks, carbon stock assessment, carbon inventory, carbon emission rights collateral, carbon funds and other aspects. These practices are distinguished with the Guiding Options in terms of the scale and comprehensiveness.

Given the fact that five green finance pilots are located within China's national low-carbon pilots and one provincial low-carbon pilot city. These low-carbon pilot cities have proposed peak years for carbon emissions and have already accumulated years of experience in low-carbon research, industrial restructuring, institution-building, and policy measures. It is precisely in these low-carbon development pilots where green finance can lend support to low-carbon efforts.

Financial product and service innovation needs to correspond to the attributes of green projects

Low-carbon infrastructure can be divided into purely public welfare projects, quasi-public welfare projects, and commercial projects, depending on the products and services provided by the infrastructure and the possibility of charging based on the services used. Pure

Fields	Industries	Properties	Investment and Financing Mode
Pollution Control And Ecological Restoration	Water pollution, air pollution, soil pollution, etc.	Strong public welfare great investment long cycle period	Policy bank loans financial funds commercial bank loans
Resource Saving And Efficient Utilization	Power transmission, natural gas, heat transmissions, and water supply system, etc. Sewage/solid waste treatment, etc.	Quasi-public welfare great investment Long cycle period steady revenue	PPP (franchise, government purchase of service) green corporate bond green asset pledge
Transportation	Rail Transit	Strong commercial property great investment Long cycle period steady revenue	PPP (franchise, government purchase of service)
	Bus Transit	Quasi-public welfare (relying on government subsidies) Investment scale is smaller than rail transit. Stable revenue	Green bond
Energy	Scale-up Renewable Energy Power Station	Strong commercial property great investment Long cycle period steady revenue	Green bond Green credit
	Distributed power station	Commercial property small investment (small scale) Long cycle period steady revenue	Green finance lease
Architecture	Energy saving reconstruction of existing buildings newly-built energy saving buildings	Commercial property small monomer size, large overall investment	Green credit Green insurance

public welfare projects can be developed by special government funds and financial leasing. Quasi-public welfare projects such as water conservancy, power generation facilities, water supply pipelines, waste treatment, and sewage treatment can cover costs with pricing, while government authorities guide the provision of capital. Commercial projects such as power transmission and distribution, and natural gas production and transportation can be mainly supported by private capital.

Certification methods for green project/enterprises need to be unified, and environmental quality improvement should be incorporated in green financial work assessment

The pilot zones are prioritizing the establishment of green project/enterprise certification methods. Almost all pilot zones have developed certification methods and established green projects/enterprise catalogues, but the standards for green projects have not yet been nationally unified. Additionally, public information about regional standards is limited, making it difficult to fully understand the specific conditions of each pilot zone. This diversity of standards is hampering market integration, coordinated development, and international cooperation. Comparing every pilot zones, Huzhou's standard system stands out as relatively complete, with certification methods and specifications including green projects, green enterprises, and green banks already established.

The "Financial Industry Standardization System Construction and Development Plan (2016-2020)", released in 2017, lists green finance standardization as a key project. Standardization will lead to the adoption of product standards, information disclosure standards, and financial institution green credit ratings. The ultimate goal is to build a green financial standards system, involving different levels of national standards, industry standards, group standards, and corporate standards. Green finance pilot zones can provide experience in standard setting for the construction of the national green financial standards system.

Innovation in local green finance is still in the early stages. In addition to the need to strengthen the standards system, the pilot zones are also faced with such challenges as inadequate access to environmental information, imperfect green financial statistical systems, and lack of knowledge of environmental protection, energy conservation, and emission reduction. During the 13FYP period, the core objective of environmental governance is the improvement of environmental quality, to be measured by changes in specific environmental indicators. To complement this national effort to improve environmental governance, green finance pilot zones should incorporate environmental indicators into their performance appraisal systems.

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- ⁹ Provincial Ecological Civilization Pilot Zone
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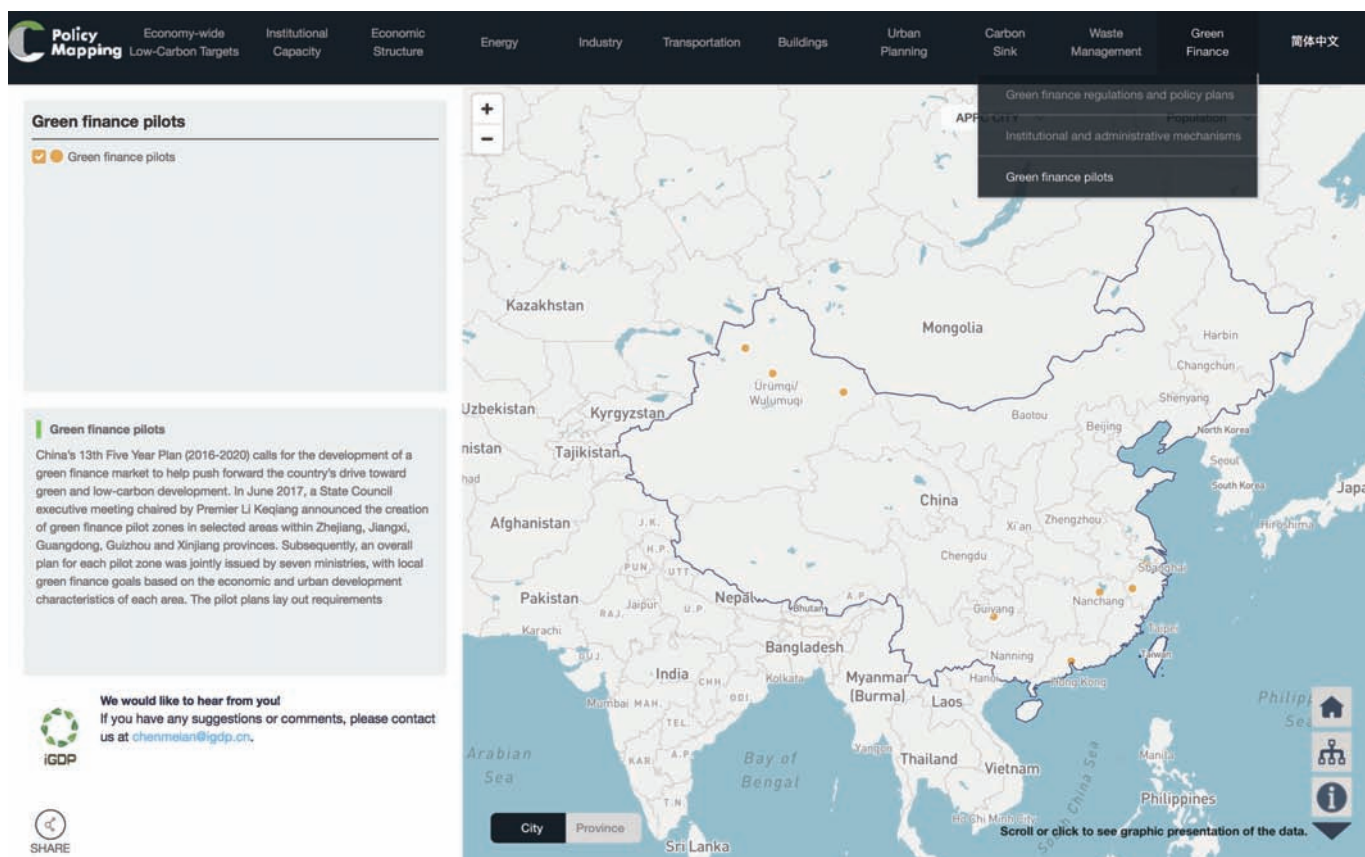
iGDP Policy Mapping

iGDP Policy Mapping is an online database and interactive platform that tracks China's green and low-carbon development policies and actions at both national and subnational levels. iGDP Policy Mapping promotes best practices and learning-by-doing by displaying publicly-available key policies and performance indicators on low-carbon development. The iGDP Policy Mapping team also regularly issues Policy Progress Factsheets and Regional Low-Carbon Development Performance Reports.

To address climate change and promote green and low-carbon economic growth, the Chinese government has launched multiple pilot programs at the subnational level. Pilot provinces and cities are encouraged to explore and test policies that can then be scaled-up to the national level. Because these pilots differ in their geographic, demographic, and economic characteristics, they have developed a wide variety of policies, measures, and other approaches that fit local conditions. iGDP Policy Mapping uses a comprehensive policy framework and a consistent set of indicators to provide a structured overview of these different low-carbon policies throughout China.

iGDP Policy Mapping applies a holistic framework of ninety-nine indicators under eleven categories to track efforts and progress on low-carbon development. The eleven categories are: Economy-wide Low-Carbon Development Targets, Institutional Capacity, Economic Structure, Green Finance, Energy, Industry, Transportation, Buildings, Urban Planning, Carbon Sink, and Waste Management. These categories and indicators are based on commonly-used international and domestic analytical frameworks for the assessment of green and low-carbon policy. The policy data in iGDP Policy Mapping comes from government documents on low-carbon development issued by the State Council and others central government agencies during the 12th Five-Year and 13th Five-Year Plans, China's official statistical yearbooks, and the websites of provincial and municipal governments.

iGDP Policy Mapping, which can be accessed at www.cepm.igdp.cn, is continuously expanding to cover more cities and policy areas. It is updated annually, with the most recent update occurring in December 2018.



About innovative Green Development Program

Innovative Green Development Program's (iGDP) mission is to advance robust policy and actions to address green growth challenges at the subnational level. We create analytical tools, share professional knowledge, and facilitate multidisciplinary dialogues that foster integrated solutions for regions, cities and communities. To tackle the climate change challenge, we believe real solutions lie at the intersection between the economy, environment and energy, and require innovation in policy, business and public behavior.

iGDP was launched with funding and operational support from Energy Foundation China. iGDP also serves as the committee member of the China Green Finance Committee and the executing agency of the Green Low Carbon Development Think Tank Partnership.

Our areas of focus are:

- Sustainable Cities
- Green Economic Growth
- Climate Policy
- Behavioral Change

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