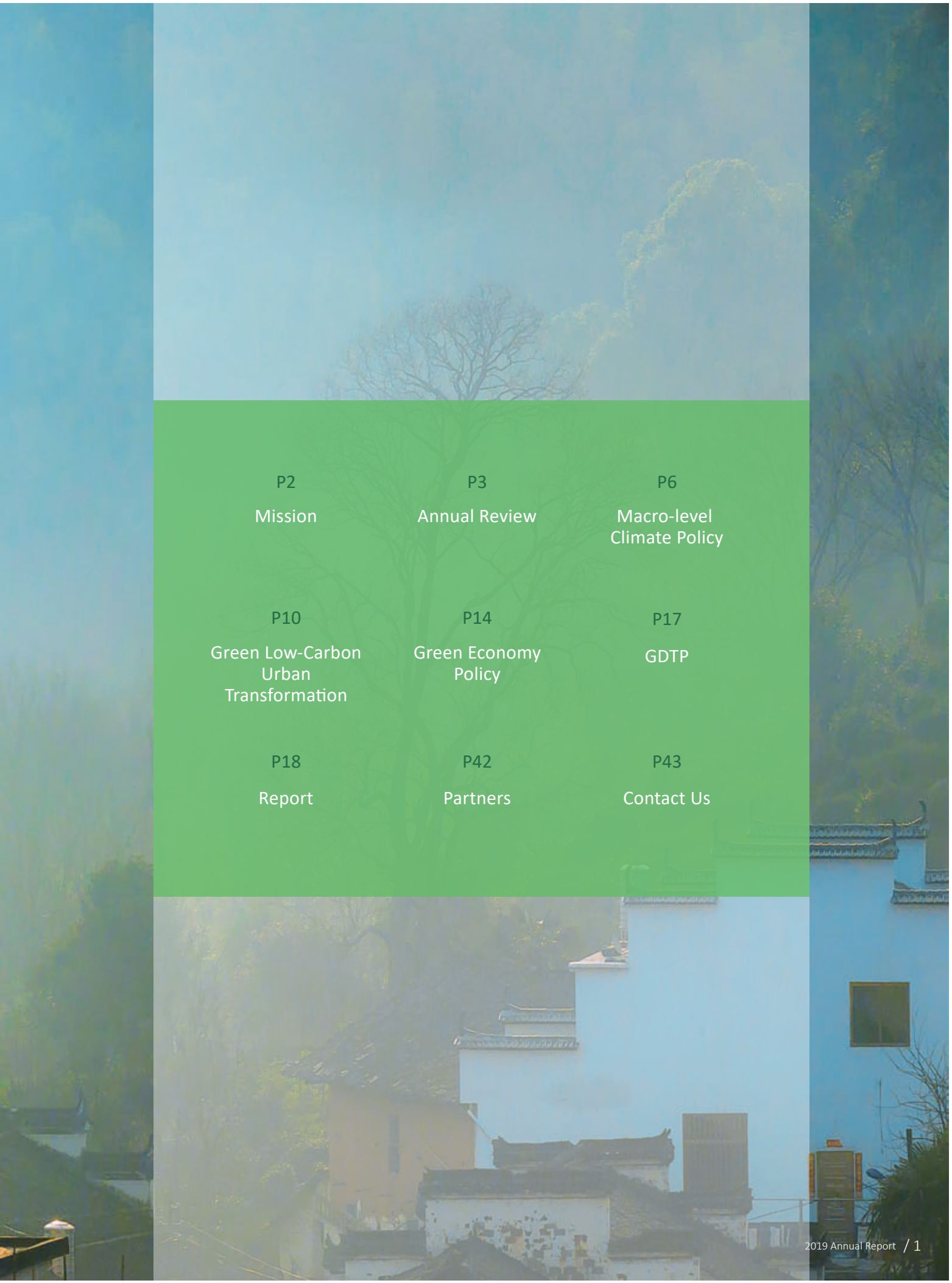
绿色创新发展中心

Innovative Green Development Program

2019 Annual Report

IGDP

Contents



Mission

Mission

innovative Green Development Program (registered name: Beijing Green Partnership Consulting Company Limited) is a non-profit policy and strategy consultancy that focuses on green and low-carbon development. It works to strengthen China's low-carbon environmental policy design and implementation through interdisciplinary, systematic and empirical policy research. We work with all stakeholders to promote a zero-emissions future and tell the story of China's green and low-carbon development.

innovative Green Development Program was initiated by Energy Foundation China. It is the secretariat of China's Green and Low-Carbon Development Think Tank Partnership, sits on China's Green Finance Association Experts Committee, and is a member of the North-East Asian Subregional Programme for Environmental Cooperation's Low-Carbon City Platform.

Focus

innovative Green Development Program's research, consulting and communications focus on the following areas:

- Macro-level Climate Policy
- Urban Green and Low-Carbon Transformation
- Green Economic Policy
- Behavioral Change

Annual Review

↘ 2019 Statistics

32 Opinion Articles

8 Media Reports

36 Expert Meetings

4 Research Reports

3 Working Papers

3 Implementation Guides

2 Policy Recommendations

1 Infographic

Annual Review

Event Calendar by Month

January 2019

★ 1/25

Guangzhou, China /
Guangzhou's Low-Carbon Strategy International Consultation Workshop

★ 1/19

Beijing, China /
GDTP 2019 Annual Conference

February 2019

2/22

Beijing, China /
China's Carbon Pricing System Design Consultation Workshop

March 2019

3/26

Beijing, China /
iGDP Seminar: Achievements and Challenges of California Air and Climate Policy

3/22

Beijing, China /
4th Meeting of the Dialogue Series on Global and China's Agenda of Green and Low-Carbon Development

3/8

Guangzhou, China /
Kick-off Meeting: Guangdong-Hong Kong-Macao Greater Bay Area Energy Transition Medium and Long-Term Scenario Research Project

3/6-8

Guangzhou, China /
The UK-China Cold Chain Workshop

April 2019

4/11

Seoul, South Korea /
NEASPEC NEA-LCCP Comparative Study Final Review Meeting

4/17-18

Beijing, China /
International Workshop on Modelling Mid-Century Low-Carbon Strategies

4/25

Beijing, China /
Environmental Risk Quantitative Analysis Methodology and Environmental Data Application Workshop

June 2019

★ 6/22

Beijing, China /
Total Carbon Emissions Control for the 14th Five-Year Plan Workshop

July 2019

★ 7/16

Beijing, China /
Kick-off Meeting: Waste-free Baihewan Project

★ 7/25

Beijing, China /
Symposium: Medium and Long-Term Deep Emission Reduction Actions in Cities

August 2019

8/15

Beijing, China / iGDP Seminar: How Far is the "Zero Waste" Concept from Reality

September 2019

9/17

Beijing, China / iGDP Seminar: Outlook for the UN Climate Action Summit

9/26

Qingdao, China / C40 Climate Action Planning Project Qingdao Kick-off Meeting

October 2019

10/29

Beijing, China / Belt and Road Green Development Partnership Annual Conference "Sustainable Infrastructure and Low-Carbon Cities" Sub-forum

10/24

Shanghai, China / 2019 China Greenbuild Summit

10/15

Guangzhou, China / Seminar: Medium and Long-Term Scenarios for Energy Transition in the Guangdong-Hong Kong-Macao Greater Bay Area

10/3-4

Paris, France / 19th Annual IEA-IETA-EPRI Workshop on Greenhouse Gas Emission Trading

10/24

Gwangju, South Korea / International Consultation Workshop on Gwangju's Low-Carbon Development

10/16

Beijing, China / Kick-off Meeting: Evaluation on the Research of the Medium and Long Term Low GHG Emissions Development Strategy and Pathway

10/9-10

Ulaanbaatar, Mongolia / NEASPEC 23rd Senior Officials Meeting

November 2019

11/7

Beijing, China / 1st Appraisal Meeting: Research on the Medium and Long Term Low GHG Emissions Development Strategy and Pathway

11/19-21

Barcelona, Spain / Smart City Summit & Expo (SCSE)

11/28

Qingdao, China / Qingdao Climate Action Planning Strategy Workshop

★ 11/14

Chongqing, China / China Municipal Solid Waste and Municipal Sludge Treatment Best Practice Guide: Roundtable Review

11/26

Beijing, China / Carbon Market Consignment Auctioning Project Kick-off Meeting

December 2019

12/13

China Pavilion Side Event / Chinese Industry's Actions and Effects on Climate Change

12/10

1st Meeting / EF China Advisory Roundtable on China's Long-term Strategy for Low-GHG Emission Development

12/2 ★

UNFCCC Side Event / Green Cooling: Meeting the SDG Gaps

12/2-12/13 COP25 Madrid, Spain

12/5

Wuhan, China / C40 Climate Action Plan Project Wuhan Kick-off Meeting

12/13

Panda Pavilion Side Event / Climate Action in Chinese Cities

★ 12/11

International Roundtable / Sustainable Finance and Energy Transformation

12/8

China Pavilion Side Event / Climate Communications and Public Awareness

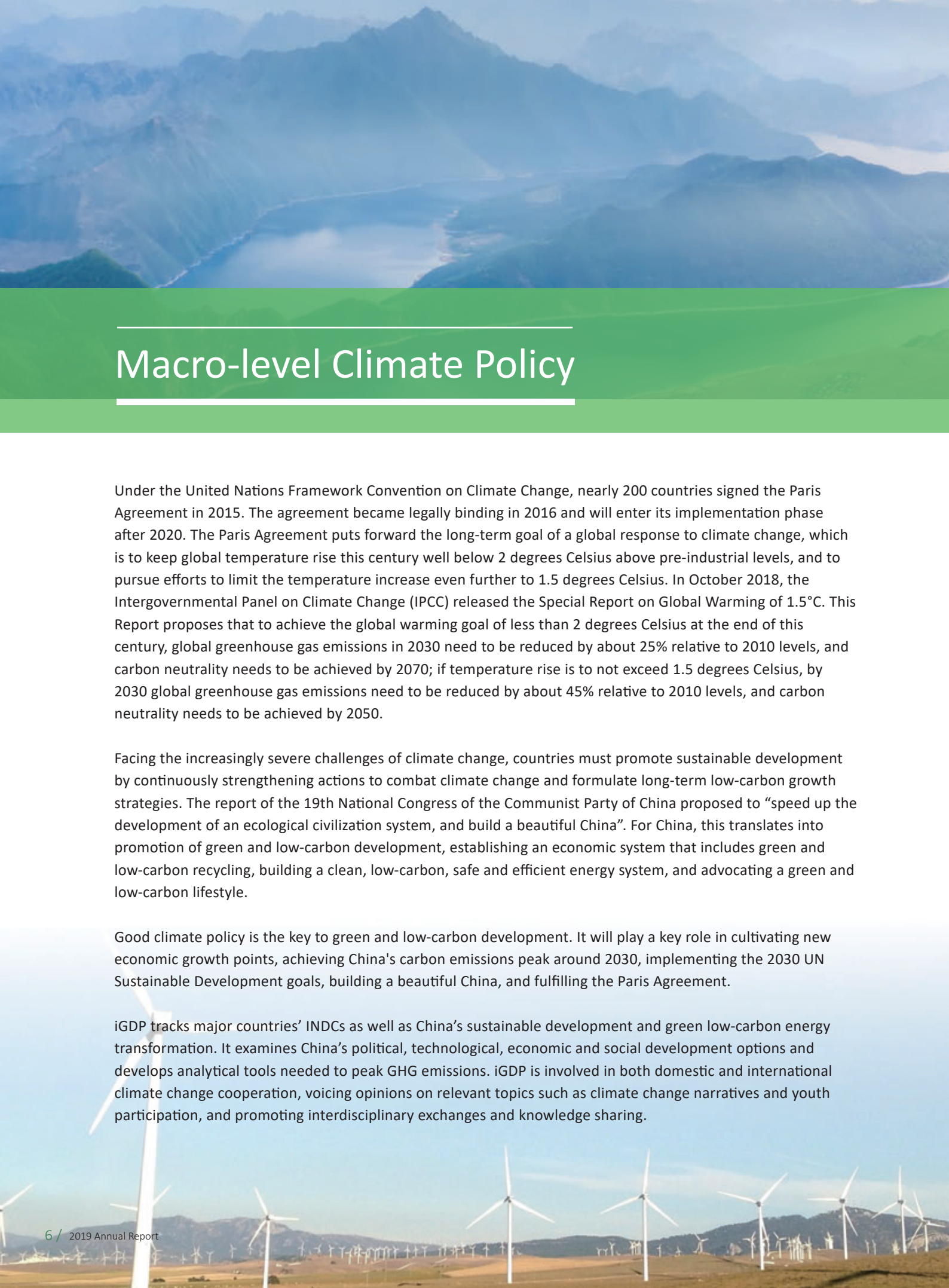
Macro-level Climate Policy

Under the United Nations Framework Convention on Climate Change, nearly 200 countries signed the Paris Agreement in 2015. The agreement became legally binding in 2016 and will enter its implementation phase after 2020. The Paris Agreement puts forward the long-term goal of a global response to climate change, which is 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. In October 2018, the Intergovernmental Panel on Climate Change (IPCC) released the Special Report on Global Warming of 1.5°C. This Report proposes that to achieve the global warming goal of less than 2 degrees Celsius at the end of this century, global greenhouse gas emissions in 2030 need to be reduced by about 25% relative to 2010 levels, and carbon neutrality needs to be achieved by 2070; if temperature rise is to not exceed 1.5 degrees Celsius, by 2030 global greenhouse gas emissions need to be reduced by about 45% relative to 2010 levels, and carbon neutrality needs to be achieved by 2050.

Facing the increasingly severe challenges of climate change, countries must promote sustainable development by continuously strengthening actions to combat climate change and formulate long-term low-carbon growth strategies. The report of the 19th National Congress of the Communist Party of China proposed to “speed up the development of an ecological civilization system, and build a beautiful China”. For China, this translates into promotion of green and low-carbon development, establishing an economic system that includes green and low-carbon recycling, building a clean, low-carbon, safe and efficient energy system, and advocating a green and low-carbon lifestyle.

Good climate policy is the key to green and low-carbon development. It will play a key role in cultivating new economic growth points, achieving China's carbon emissions peak around 2030, implementing the 2030 UN Sustainable Development goals, building a beautiful China, and fulfilling the Paris Agreement.

iGDP tracks major countries’ INDCs as well as China’s sustainable development and green low-carbon energy transformation. It examines China’s political, technological, economic and social development options and develops analytical tools needed to peak GHG emissions. iGDP is involved in both domestic and international climate change cooperation, voicing opinions on relevant topics such as climate change narratives and youth participation, and promoting interdisciplinary exchanges and knowledge sharing.



Field Activities

"Total Carbon Emission Control Policy" Project

An expert consultation meeting titled" Total Carbon Emissions Control for the 14th Five-Year Plan Workshop" was held in Beijing on June 22, 2019. iGDP put forward policy recommendations that China should set binding carbon emission control targets during the "14th Five-Year Plan" period to ensure that the carbon emissions peak promised in the Paris Agreement is achieved, and that the Ministry of Ecology and Environment should accelerate integration into existing emission control systems. This can lay the foundation for the implementation of the national carbon market in the short term. In 2019, iGDP was commissioned by the World Bank to conduct a political and economic analysis to promote Shanxi Province's formulation of a more ambitious climate policy.

"Statistical Analysis of China's Energy and Carbon Emissions Data" Project

Tracking, evaluating and predicting the effectiveness of China's carbon emission control cannot be achieved without systematic, complete, timely and effective data support. The "Statistical Analysis of China's Energy and Carbon Emissions Data" project compares and analyzes publicly available statistical data to answer the following questions: What carbon emissions-related indicators have been published? Does China's energy and carbon emissions data provided by international databases reflect China's current situation? What are the differences from domestic data? What needs to be done to make public China's carbon emissions information?

"Policy Mapping" Project

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 promotes best practices and learning by doing. iGDP officially released Policy Mapping at COP 22 in November 2016 in Marrakech. Two workshops were held in March 2017 to gather user experience and solicit advice 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 China's green finance innovation and reform pilot zones. In 2019, the low-carbon policy library revised and improved the indicator methodology and initiated the collection and collation of China's green low-carbon country-level policy information. A new national page will be added in 2020.

25th Conference of the Parties to the United Nations Framework Convention on Climate Change

From December 2nd to December 15th, 2019, the 25th Meeting of the Parties to the United Nations Framework Convention on Climate Change (COP25) was held in Madrid, Spain. iGDP Executive Director Hu Min, Project Director / Senior Analyst Yang Li, Project Director / Senior Analyst Li Ang, and Operations Director Wang Yanhui, attended the conference, where they released and disseminated iGDP research results and took part in and organized numerous events.

December 2, 2019

iGDP serves as the secretariat of the “China Energy Conservation Coalition” (CCEC). The partner institutions of CECC, together with the European Mediterranean Climate Change Center and other institutions jointly, hosted a UNFCCC side event with the theme “Green Cooling: Meeting the SDG Gaps”. On behalf of the research team, Operations Director Wang Yanhui shared progress in zero-emission roadmap research in China’s food cold chain industry.

December 9, 2019

iGDP Operations Director Wang Yanhui attended the “Climate Communication and Public Awareness” event at the China Pavilion and discussed communications around progress in China’s climate action.

December 13, 2019

iGDP Executive Director Hu Min attended "Actions and Results of China's Industry on Climate Change" at the China Pavilion, where she introduced the progress of the Kigali Cooling Efficiency Program (K-CEP) and chaired a roundtable discussion.

iGDP Project Head / Senior Analyst Li Ang attended the side event “Climate Action for Chinese Cities” held by WWF and introduced the “Cities Beyond 2 °C” project.

Report: "What to Expect in China's Second Nationally Determined Contribution: Towards a Global Carbon-Neutral Future"

In September 2019, before the UN Climate Action Summit was held, iGDP released a report, supported by Chinadialogue, on international and domestic sustainable development trends and the implementation process of China's NDC since the Paris Agreement. The report reviews the strategic plans and highlights policies introduced during China's "13th Five-Year Plan" period and policies to watch for in the upcoming revised NDC. The contents of this report were communicated to the international media during the Chile-Madrid Climate Conference.

Field Products

Reports

Accelerate the Transition of Carbon Intensity Control to Total Control and Lead the Transformation of High-quality Green Development

Raising Climate Ambitions: A Political and Economic Analysis of Shanxi's High-Quality Growth

Working Papers

International Comparison of Statistical Analyses of China's Energy and Carbon Emissions Data

Opinion Pieces

How will demographic trends affect China's future carbon emissions?

2019/1/14

Heat waves are sweeping the world. How can climate risks be integrated into mainstream rating systems?

2019/8/1

Amazon rainforest fire rings alarm on climate disaster

2019/9/24

COP 24 Report Series

2019/12/2-12/13

- Climate crisis ready to go COP25 opening
- On the first day of COP25 a “Green Cooling” theme side event was held
- Popular topics on COP: NDC and LTS
- Article 6: Why is it so difficult to negotiate
- The Greta effect swept inside and outside the COP venue
- Climate crisis alarm calls for increased adaptation
- The longest COP in history ends in disappointment, you and I need to work hard to restore hope
- China's urban climate action looks forward

Media reports

“Belt and Road” needs Chinese “Soft Power”

Author: Hu Min 2019/4/28

Leveraging China's "Green Soft Power" For a Responsible Belt and Road Initiative

Author: Hu Min, Diego Montero 2019/5/14

"Social Organization: Pollution Prevention Campaign of the Lookouts and Accelerators"

Author: Wang Yanhui 2019/7/5

"Green Cooling: China to address climate change may be underestimating the big move"

Author: Hu Min 2019/9/24

Green Low-Carbon Urban Transformation

China is experiencing large-scale and rapid urbanization. Expert predict that in the next 15 years, more than 350 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 the drivers of economic growth as well as realizing low-carbon development in transportation, construction, industry and lifestyles.

China started its low-carbon pilot program in 2010. After three successive selections of low-carbon pilot cities, as many as 87 cities and regions have joined the low-carbon pilot scheme. During the U.S.-China Climate Leader Summit in 2015, 9 cities and 2 provinces established the “Alliance of Peaking Pioneer Cities (APPC)” and announced greenhouse gas peak target dates.

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.

Field Activities

"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 Program 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, areas of work in which iGDP has expertise. Within the NEA-LCCP framework, iGDP undertook a project titled "North-East Asia Low-Carbon City Development: Peer Review and Comparative Study", 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.

C40 Climate Action Planning Program

The C40 Cities Climate Leadership Group (C40), a global network of cities formed to tackle climate change, connects 96 cities worldwide, including 13 member cities in China, representing a quarter of global GDP. In recent years, C40 launched Greenhouse Gas Emissions Inventory & Scenario Planning programs, energy and building efficiency programs, Climate Positive programme etc, and most recently the C40 Climate Action Planning programme, which was launched in Qingdao, Wuhan, Fuzhou, Nanjing and Chengdu in 2019.
As a technical partner of C40, together with National Center for Climate Change Strategy and International Cooperation and Carbon Trust, iGDP is providing support to these five cities five cities to develop climate action plans consistent with the goals of the Paris Agreement. The work includes appraisal of current cities' climate actions, development of climate action plans, capacity building to meet cities' needs, and other technical support and knowledge exchange. For more info, please visit www.resourcecentre.c40.org

"Cities Beyond 2 Degrees" Project

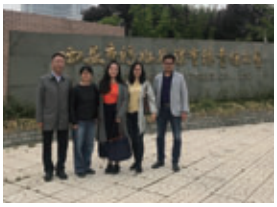
The Paris Agreement proposes to "control the increase in global average temperature to less than 2 °C above the pre-industrial level and strive to limit the increase in temperature to 1.5 °C above the pre-industrial level." Controlling the temperature rise at 2 °C means that emissions in 2050 will be reduced by 40-70% compared to 2010, and the temperature control target of 1.5 °C means that the world will reach the "zero emission" target by 2050. According to the United Nations, there are currently 65 countries, 11 regions (including the European Union), 102 cities, 93 companies and 12 investors committed to achieving net zero carbon dioxide emissions by 2050. Cities are the main drivers of climate action. In cooperation with WWF, iGDP reviewed and summarized the actions taken by domestic and foreign cities to achieve net zero carbon emissions from the perspective of goal setting, planning and policy formulation. The work provided detailed content for policy makers and researchers who want to understand the deep reduction of urban emissions, explores domestic urban actions, and proposes actions for Chinese cities' long-term response to climate change.

“Waste-free Baihewan” Project

iGDP and Jiuyuan Cornerstone Tourism Co., Ltd. jointly launched an environmental protection project "Waste-free Baihewan" in Baihewan Area, Liulimiao Town, Huairou District, Beijing. The goal of the project is to achieve "zero waste" in the Baihewan area by 2025. The project was officially launched in July 2019. It mobilized the government, enterprises, villagers, tourists, partners, and social organizations to carry out various activities to achieve this goal. Actions included implementing waste classification, achieving source waste reduction, recycling waste and resource utilization. A series of "no waste spaces", including "no waste restaurants", "no waste homestays", and environmental protection theme bookstores, and small theaters were created. Thematic activities included environmental education, art exhibitions, and behavioral contests.

“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 waste 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, commissioned by the US Environmental Protection Agency to assist in research on best practices and urban cases for low-carbon municipal solid waste and wastewater treatment in China. The project is mainly divided into two parts. The first part is to integrate urban practices and cases through field visits and expert interviews. The second part is to share and exchange urban experiences in this field through the green low-carbon city platform.



“Sustainable Energy and Climate Action Plan” Project

Since the 1990s, Germany has promoted urban "Sustainable Energy and Climate Action Plans" ("Climate Action Plans") to closely integrate climate goals and local policy measures and guide the formulation of urban macro policies. The federal government has funded the preparation of 900 climate action plans, and a total of 40 German cities have now prepared long-term climate action plans with the goal of reducing energy consumption by 50% and greenhouse gas emissions by 95% by 2050. iGDP cooperated with German international cooperation agencies to introduce the preparation process, tools, and policy design of the German Climate Action Plan, explore the applicability of the German experience in Chinese cities, and provide a reference for Chinese cities to compile low-carbon plans and formulate climate policies.

Field Products

Report

"San Francisco Ray Area Low-Carbon Transformation: Lessons for China's Bay Area"

Policy Recommendations

"Recommendations on Reducing Plastic Waste and Targeting Poverty Alleviation in the Baihewan Region"

Opinions on the "Amendments to the Beijing Municipality's Regulations on the Management of Domestic Waste (Draft for Review)"

Implementation Guide

"Babaotang Village Waste Sorting Operation Manual"

Opinion Pieces

China's Urban Garbage Management Faces Two Major Challenges

2019/1/7

Series Articles on Guangzhou's Low-Carbon Strategy International Consultation Workshop

2019/1/29-4/30

- Research on the status and future development of Low-Carbon in Guangzhou
- China's urban green low-carbon development strategy practice-Guangzhou case
- Case Study of Seoul Energy Transformation
- Incheon's Low-Carbon Development Strategy
- Tokyo Metropolitan Government's mechanism to promote green and low-carbon policies

Construction of "Waste-free Baihewan" Helps Rural Revitalization Strategy Implementation

2019/8/26

Reducing Food Waste Is a Required Question for Cities to Achieve Carbon Neutrality

2019/9/10

Opinions of iGDP on the "Amendments to the Beijing Municipality's Regulations on the Management of Domestic Waste (Draft for Review)"

2019/11/14

Municipal Solid Waste Classification Policy Helps Reduce Emissions

2020/1/6

Media Reports

澎湃

If You Don't Categorize Well, Your Municipal Waste Will Accelerate Global Warming.

Author: Chen Meian / Wang Yanhui 2019/2/2

RBC

Zero Waste Village "No Waste Baihewan" Experimental Project

Author: Chen Simin 2019/7/29

中华环境

Waste-Free Rural Construction Practice, Challenges And Prospects - The Waste-free Babaotang Example

Author: Chen Simin 2019/12/4

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 in the field of 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 explore 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.

Fields Activities

International Roundtable on Sustainable Finance and Energy Transformation

On December 11, 2019, iGDP and Funds People jointly hosted the "International Roundtable on Sustainable Finance and Energy Transformation" at Comillas University in Madrid. The meeting was supported by the Energy Foundation, the Green Finance Professional Committee of the China Finance Association, and the University of Comillas, Spain. Participants discussed the possible impacts of the sustainable financial classification method and energy transition on the financial industry and explored ideas for further cooperation between China and Europe.

"Urban Green Finance" Project

Chinese cities have huge demand for investment and financing in the green and low-carbon sectors. It's estimated that China's green low-carbon investment demand during the 13th Five-Year Plan period was 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. To ensure that cities' 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 an urban low-carbon development perspective to promote the formation of a financial policy environment that can accelerate 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. To promote innovative practices in this field, iGDP compiled the book "The Practice and Exploration of Green and Low-Carbon Financing in Chinese Cities" for China's Green Finance Committee (GFC).

Promoting A Strong National Carbon Market

To promote the healthy development and a favorable public opinion for the national carbon market, iGDP has been deeply involved in research, capacity building and strategic communication since 2017. In 2018, the department in charge of China's carbon market was transferred from the National Development and Reform Commission to the Ministry of Ecology and Environment. iGDP contributes to this work by conducting research and analysis.

Field Products

Implementation Guide

Carbon Market Quick Practice Guide-Local Authorities Edition
Carbon Market Quick Practice Guide-Enterprise Edition

Working Paper

Carbon Pricing Policy in Alberta, Canada: Parallel Mechanisms for Trading and Taxes

Infographic

A picture of the Alberta's carbon pricing policy

Opinion Article

"International Roundtable on Sustainable Finance and Energy Transformation" Explores the Potential of China-EU Cooperation

2019/12/25

Carbon pricing policy in Alberta, Canada: parallel mechanisms for trading and tax

2019/11/4

Media Reports

CHINADAILY 中国日报

China 's National Carbon Market: Mapping Out the Road Ahead

Authors: Chen Meian, Diego Montero 2019/1/4

GDTP

Organization Introduction

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.

Expert Meeting

July 25, 2019

The "Implementation of the Paris Agreement-Symposium on Medium and Long-Term Deep Emission Reduction Actions in Cities" hosted by GDTP was held in Beijing. The seminar focused on the current situation, policy actions and practical experience of domestic and foreign cities in implementing the Paris Agreement. More than 30 experts and scholars from relevant national and local government departments and research institutions conducted in-depth discussions and exchanges. In addition, during the early stages of the 14th Five-Year Plan, experts also exchanged views on the green and low-carbon content of the city's 14th Five-Year Plan.

Opinion Articles

Retrospective Series Articles: Symposium on Medium and Long-Term Deep Emission Reduction Actions in Cities

2019/7/29 - 2019/8/27

Hu Xiulian | Significance, Methodology and Focus of Medium and Long-term Urban Emission Reduction Research

Yang Xiu | Urban Low-Carbon Development at 1.5 ℃ Goal

Liu Jia | Discussion on the Low-Carbon Path in Shanghai's 14th Five-Year Plan

Li Fen | Concepts and Practices of Near-zero Energy Buildings

Tian Zhiyu | Policy and Technology Choices for Medium and Long-term Actions on Urban Energy Conservation and Carbon Reduction

2019/5/5

Wang Qingyi: Clean Coal Technology Is The Key To Reducing Carbon In China

GDTP 2019 Annual Conference Review Series Articles

2019/1/20 - 2019/4/1

Liu Yanhua | Building a Green and Low-Carbon China for 2030 based on National Interests

Zou Yan | Major Strategic and Policy Issues to Promote China's Green Low-Carbon Transition Research

Pan Jiahua | A Critical Perspective on Climate Change Economics and Low-Carbon Development

He Jiankun | 5th Anniversary Review and Prospect of GDTP

Jiang Liping | Discussion on issues related to energy transition and power development

Wang Zhongying | Greening Electric Power Is a Weapon for Promoting High-quality Economic Development

Report

绿色创新发展中心
innovative Green Development Program

低碳政策库
Policy Mapping

INTRODUCING AN ABSOLUTE CARBON CAP INTO CHINA'S FIVE-YEAR PLAN:

RATIONALE AND RECOMMENDATIONS

HU MIN, YANG LI, CHEN MEIAN,
DIEGO MONTERO, LI ANG

JUNE 2019

INNOVATIVE GREEN DEVELOPMENT PROGRAM

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.

This report would not have been possible without the support of the World Bank. Ms. Huang Dafei has provided valuable expertise and guidance in the development of this report. Discussions at the workshop "Total Carbon Emissions Control for the 14th FYP", organized by iGDP, Energy Foundation China and the World Bank Beijing Office on June 21st also informed the development of this report. We are thankful for the insights shared by key speakers at the workshop including, among others, Mr. Wang Yi (China Academy of Sciences), Mr. Zou Ji (Energy Foundation China), Mr. Wang Jinnan (China Academy of Social Sciences), Mr. Xu Huaqing (National Climate Strategy Center), Prof. Zhang Xiliang (Tsinghua University), and Ms. Zhang Lixin (China Quality Certification Center).

We would also like to thank the following experts for their insights: Mr. Chen Buyu (Department of Ecology and Environment of Shanxi Province), Mr. Wu Dongsheng (Shanxi Development and Reform Commission), Mr. Tian Zhiyu (Energy Research Institute National Development and Reform Commission), Mr. Su Xudong and Mr. Yang Juchen (Ecological Environmental Research Center of Shanxi Province), Prof. Yuan Jin (Taiyuan University of Technology), Mr. Zhao Xudong (Energy Saving Office, People's Government of Shandong Province).

ABOUT IGDP

iGDP, innovative Green Development Program, is a non-governmental Chinese think tank that focuses policy research and implementation on green and low-carbon development. Our goal is to strengthen China's low-carbon environmental policy design and implementation through interdisciplinary, systematic and empirical policy research. We work with all stakeholders to promote a zero-emissions future. The innovative Green Development Program was initiated by Energy Foundation China. It is the secretariat of China's Green and Low-Carbon Development Think Tank Partnership (GDTP), sits on China's Green Finance Association Experts Committee, and is a member of the North-East Asian Subregional Programme for Environmental Cooperation's Low-Carbon City Platform.

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Contents

Tables & Figures

Abbreviations & Acronyms

CO_2	Carbon Dioxide
CPC	Communist Party of China
FYP	Five-Year Plan
GDP	Gross domestic product
GHGs	Greenhouse gases
IEA	International Energy Agency
iGDP	Innovative Green Development Program
IPCC	Intergovernmental Panel on Climate Change
MEE	Ministry of Ecological Environment
MRV	Monitoring, Reporting and Verification
NDCs	Nationally determined contributions
NDRC	National Development and Reform Commission
tce	Tonnes of coal equivalent
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

"Green growth" has become a ubiquitous mantra in China's political pronouncements and building a "beautiful China" is now one of the country's five core development goals. Among leading emitters, China has made the greatest reduction of carbon emissions per unit of GDP in the past twenty years. China is also the world's leading investor in renewable energy and has the largest installed capacity of wind and solar power. This progress is attributable to a comprehensive policy system in China that promotes energy efficiency, renewable energy development, and limiting coal consumption, and aims to peak CO_2 emissions around 2030. However, there are countervailing trends. China's carbon emissions are still growing rapidly, contributing between 27% and 46% of global CO_2 emissions growth in 2016 and 2017, and China's CO_2 emissions per capita and per unit of GDP both remain higher than the global average. China is also still investing in coal power plants, despite the fact that the risk of stranded assets continues to grow and renewable energy has become more economically competitive than coal.

Absolute carbon cap targets are policies that set successive absolute caps on the quantity of domestic CO_2 emissions in some specified interval time, e.g. a five-year period. An absolute carbon cap can play the core role in an environmental policy system designed to lead the way towards a low-carbon and green economic system. As an environmental policy, it provides clear targets for what should be achieved when a national long-term strategy for low-carbon and green growth is set out, and provides a clear indication of what is needed to mobilize investment in low-carbon technology and infrastructure to meet these national low-carbon imperatives.

There is a need to set a strong economy-wide climate goal to decarbonize economic growth throughout China's provinces. Without such a goal, a change in investment behavior toward green growth projects is unlikely to happen. Even with existing robust environmental policies and clean energy development objectives, the climate impact of China's future economic growth remains unclear. With only a short time window left to meet global climate safety goals, introducing enhanced climate policies to limit China's carbon emissions growth is crucial to the world's sustainable development.

Implementing an absolute carbon cap is feasible. *China's Third National Communication Report* has already predicted greenhouse gas (GHG) emissions under different scenarios. This can provide the basis for setting a carbon cap. Also, the new Ministry of Ecology and Environment (MEE) has extensive experience implementing emission caps for various pollutants. Local governments, especially those participating in low-carbon pilot program, have already experimented with carbon caps in their jurisdictions.

To implement an absolute carbon cap in the 14th Five-Year Plan (FYP), this report suggests setting a mandatory goal based on other binding economic and energy goals. This cap should reflect China's long-term emissions mitigation vision. This goal should be allocated to regions in different forms including growing or declining caps. China has set a series of binding indicators for energy saving and carbon control since 2006. An absolute carbon cap is a useful and robust instrument to link and harmonize the targets for these indicators.

An absolute carbon cap is not a silver bullet to all problems. However, it provides more certainty about carbon emission trajectories and the strong, long-term market signals that are necessary to guide investment behavior and tackle climate change. A well-designed absolute carbon cap can be the first step to leverage a systematic policy system that effectively and efficiently reduces emissions. This system includes stringent sectoral GHG emission standards, a GHG information disclosure mechanism, as well as an instrument to mainstream climate polices into macro development and financial strategies

BACKGROUND

CHINA'S POLITICAL COMMITMENT TOWARDS GREEN GROWTH

China's national strategy for addressing climate change has been raised to new heights. Promoting "ecological civilization" is a core component of President Xi's political agenda and green growth is one of the five pillars in the current administration's platform. China aspires to step up as a world leader in low-carbon development as its works to mitigate its high levels of pollution and GHG emissions.

The report of the 19th National Congress of the Communist Party of China (CPC) describes China as exercising leadership in international cooperation on climate change and states that the country has become an important participant, contributor and leader in global efforts to protect the environment and develop sustainably. Speeding up reform of the system for developing an ecological civilization and building a "beautiful China" are now vital long-term guiding principles in China's long-term national development. A vision and targets for "quality growth" and green growth towards 2030 and 2035 were set out at the 19th National Congress of the Communist Party of China in 2017.

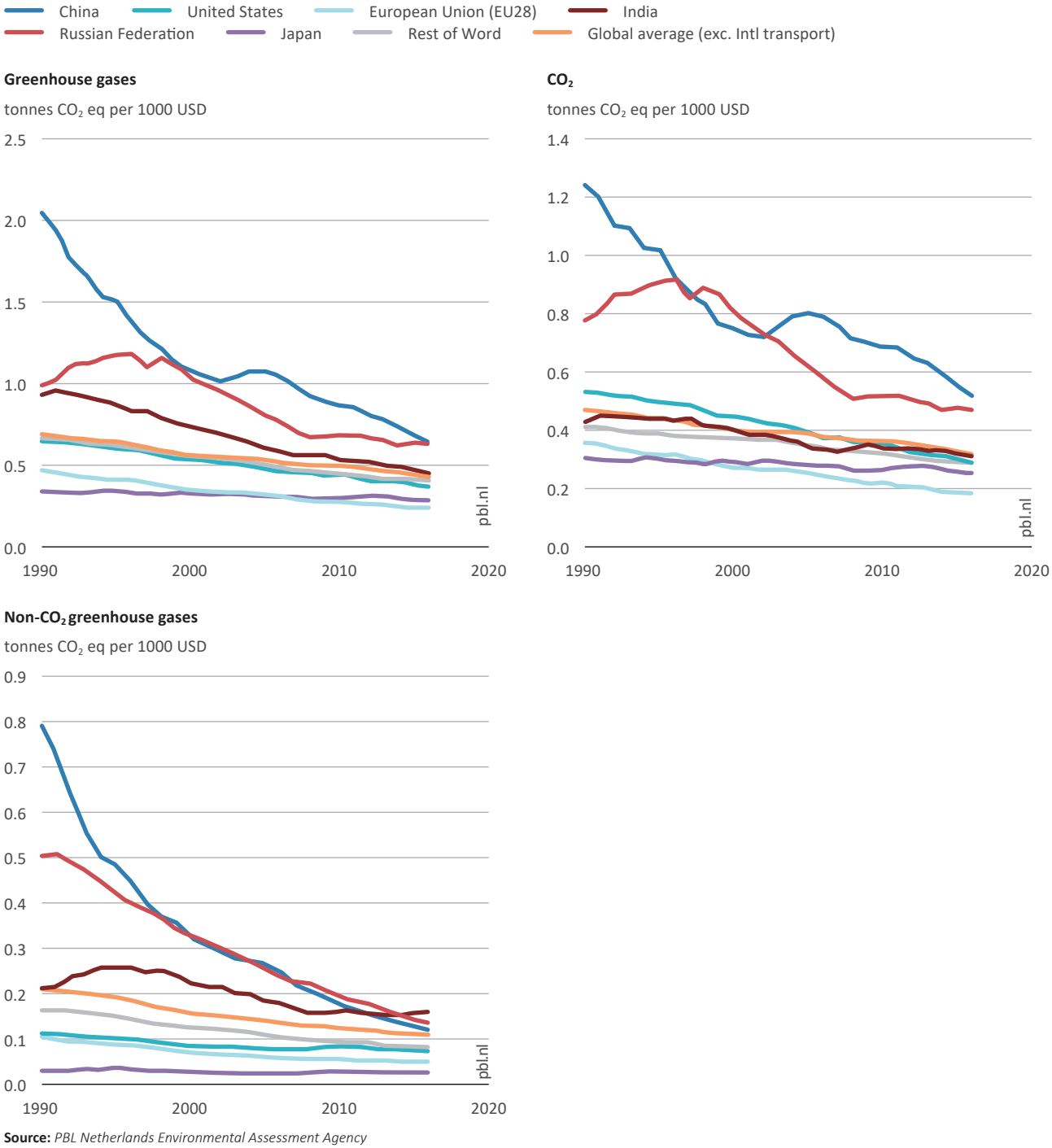
Table 1 | Highlights of indicators for China's 2030/2035 development goals

2030 GOALS	DESCRIPTION	NATIONAL STRATEGIES
GDP	2035 Modernization Goal	19th CPC National Congress Report
Income	2035 Middle Developed Countries	Same as the above
Innovation	2035 Innovation-driven Country, Expenditure on R&D per GDP: 2.8%	Same as the above National Strategic Plan for Innovation Driven Development toward 2035
Clean Air	All cities annual average PM2.5 concentration meeting WHO guidelines	National Plan for Air Pollution control
Clean Water	The water quality in seven key basins reaching above average	National Plan for Water Pollution Control
Carbon Emissions	Peaking energy related CO_2 emissions before 2030	National Determined Action of China, 2016

China's Nationally Determined Contribution (NDC) to the Paris Agreement committed that the total amount of CO_2 emissions should peak around 2030 and that the country will strive to reach the peak as early as possible. It also commits to CO_2 emissions per unit of GDP to be 60%-65% lower than in 2005, and for non-fossil fuels to account for about 20% of primary energy consumption by 2030 (NDRC, 2015).

China has made notable progress toward its climate change commitments, shown in Table 4. China is now the world leading renewable energy investor with the largest solar and wind installed capacity. China has also achieved the greatest improvement in carbon intensity. As indicated in Figure 1, China's CO_2 emissions per unit of GDP declined around four times faster than the global average between 2000 and 2017 (Olivier & Peters, 2018)

Figure 1 | Emissions per US Dollar of GDP, at PPP 2011 prices



Source: *PBL Netherlands Environmental Assessment Agency*

This political momentum and policy progress can be attributed to China's domestic need to increase economic efficiency, fight air pollution and improve its overall environmental quality. At present, with the reform of China's environmental protection management system, it has become particularly important to integrate and find synergies between policies that address climate change, pollution, and environmental management.

Table 2 | China's Climate and Energy Goals

POLICY AREAS	OBJECTIVES	MANDATORY TARGETS[1]	LOCAL-LEVEL IMPLEMENTATION	NATIONAL STRATEGIES
Total CO_2 Emissions	N/A	N/A	A few pilots	*N/A*
Total CO_2 Emissions Peak Year	Peak around 2030	Yes	Over 20 cities aiming at early peak	*NDC*
Carbon Intensity	In 2030, 60-65% lower than 2005 level	Yes	All local governments	*NDC and The 13th FYP Guidelines*
Energy Intensity	In 2020, 15% lower than 2015 level	Yes	All local governments	*The 13th FYP for Energy Development*
Total Energy Consumption	5 Billion tce by 2020	No	All local governments	*The 13th FYP for Energy Development*
Non-fossil fuel Energy Share	15% in 2020 20% in 2030	Yes	All local governments	*The 13th FYP for Energy Development*
Coal Use	4.1 Billion tons by 2020	Yes	Key Air Quality Regions	*The 13th FYP for Energy Development, The Work plan for Strengthening Coal Consumption Cap in Key Cities for Air Pollution Control*

Source: *iGDP Policy Mapping*

[1] There are two types of targets in China's Five-Year Plan, one is A mandatory target, and the other is A predictive target. The former will receive more institutional and policy support than the latter.

RATIONALE FOR SETTING AN ABSOLUTE CARBON CAP[2]

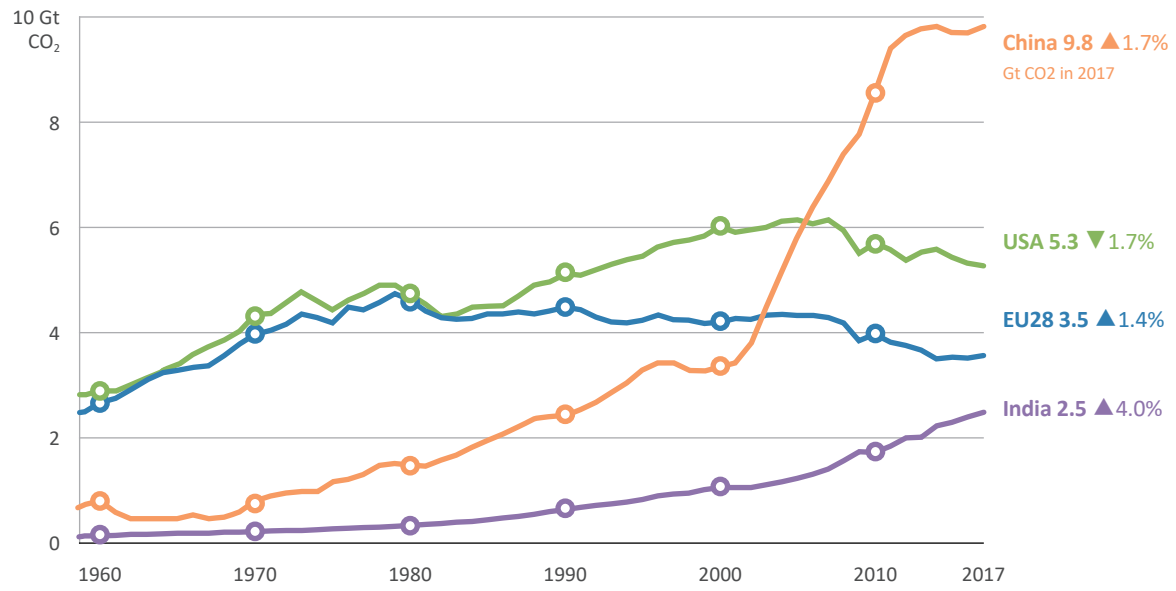
Setting an absolute carbon cap for China's 14th Five-Year-Plan will enhance China's climate action at both the international and domestic levels. It can make a contribution to global GHG emission reduction efforts and strengthen China's commitment to combatting climate change. At the domestic level, an absolute carbon cap can facilitate China achieving its carbon peaking target, as well as allow China to develop a long-term policy signal for green and low-carbon development, and to align carbon emissions control policy with the existing emissions control governance under the Ministry of Ecology and Environment.

I. URGENCY

1. Global Carbon Neutral Goal Requires Enhanced Climate Policies

The recently issued IPCC 1.5 Degree Report indicates that the world needs to achieve carbon neutral by mid-century to avoid catastrophic climate impacts (IPCC, 2018). While China is on track to achieve all the energy and environment targets in its strategic plans, there appears to be a lack of urgency with regard to total CO_2 emissions. China's CO_2 emissions continue grow, contributing 46% of global total growth in 2017, a significant leap up from 27% in 2016. China's per capita CO_2 emissions level is already higher than the EU average, and CO_2 emissions per unit of GDP remain higher than the global average. As indicated in Figure 2, while China is on track with current policies to achieve its 2030 targets, its total emissions are still increasing.

Figure 2 | Annual emissions: top four emitters



Source: *Global Carbon Project, 2018*

[2] Please see the Appendix for detailed discussion on carbon cap vs. carbon intensity targets and energy cap.

To keep global temperature rise within two degrees this century, total global CO_2 emissions should start declining now. What matters most to climate safety is the level at which emissions will peak, not the peaking year. In other words, a peaking year goal alone is not enough for long-term sustainable and climate-safe development. China needs an absolute carbon cap.

2. An Absolute Carbon Cap Can Send a Clear Policy Signal to Reduce Carbon Emissions

An absolute carbon cap can also send a policy signal to show China's commitment to green transformation. Unlike energy and air quality goals that indirectly affect carbon emissions, a carbon cap can provide a clear and direct policy signal to control carbon emissions. China's economic development model still relies heavily on fossil fuel consumption. The core measures for tackling air pollution have to do with adjustment of the country's energy and economic structures. The Revolutionary Strategy for Energy Production and Consumption (2016-2030) released in 2016 has proposed that "from 2021 to 2030, renewable energy, natural gas and nuclear energy utilization will continue to grow, and the use of high-carbon fossil fuel will be greatly reduced. Total energy consumption will be controlled within 6 billion tons of standard coal, non-fossil fuel will account for about 20% of total energy consumption, and natural gas will account for about 15%". This is a powerful target for transforming the national energy structure, but the one-size-fits-all approach may lead to social problems during implementation.

China's environmental goals have been the main driver of improving energy efficiency, limiting coal use and reducing carbon emissions. But environmental policies can deliver a state in which energy efficiency and overall environmental quality are high while total carbon emissions still grow, as observed in developed countries. In addition, environmental and energy efficiency goals can have unintended consequences regarding carbon reduction efforts. For example, electric vehicle (EV) programs can help cities meet the clean air goals, but increase demand for electricity from dirty sources. Though the long-term impact on climate might be positive, in the short term EV policies could create a surge in demand for electricity generated by a power system heavily dependent on coal as a primary fuel.

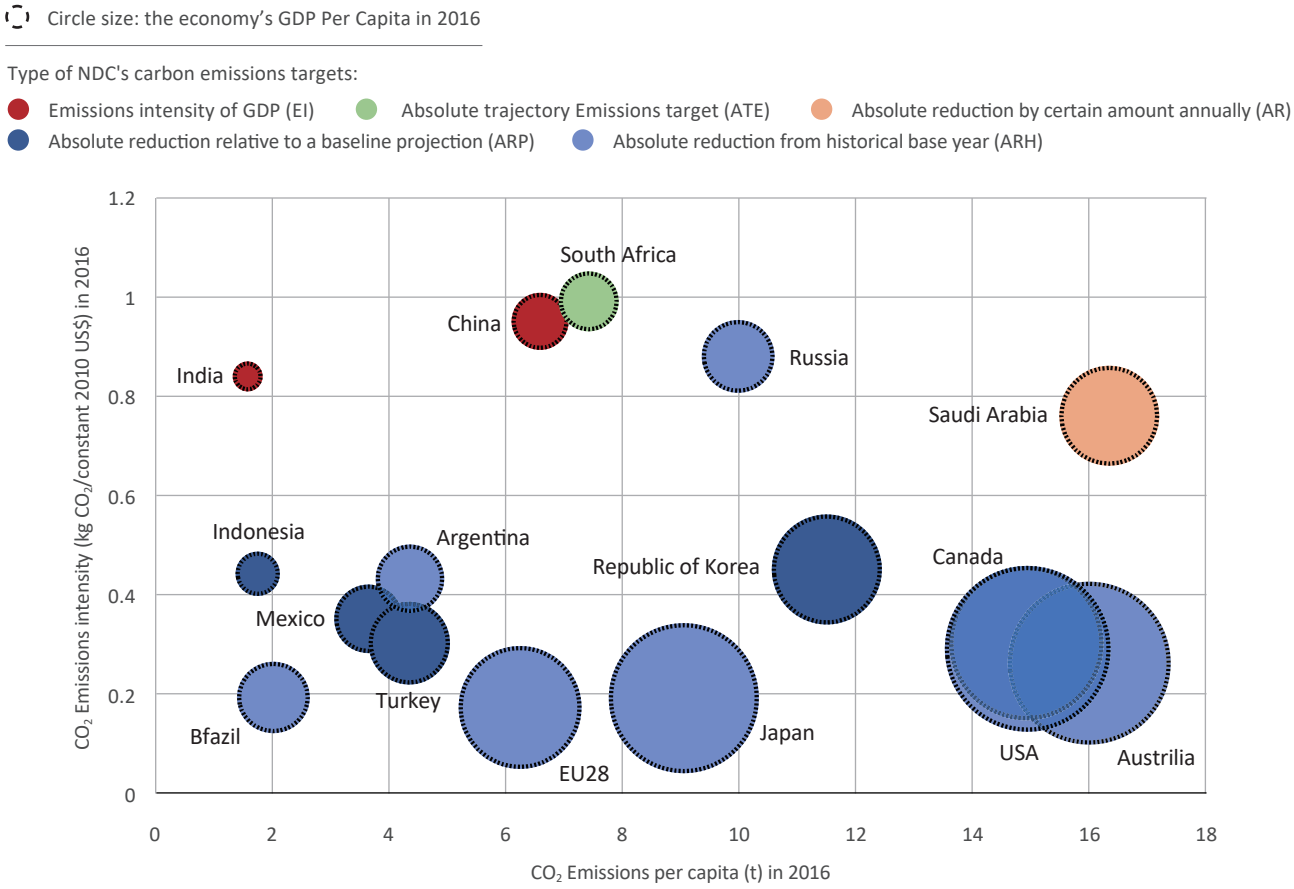
A carbon cap gives local governments more flexibility, balances between coal control and renewable energy development, and encourages local governments to try to increase the proportion of renewable energy consumption and expand the space for economic development. It does this not only by adjusting the energy structure but also by greening industrial structures.

3. Absolute Carbon Cap Setting in Other Countries

Most leading GHG emitters have set their absolute carbon emission goals, some of which are developing countries such as Mexico, Brazil, Indonesia and Argentina. As one of the largest GHG emitters with per capita carbon emissions that have exceeded the EU average (see Figure 3), by setting a carbon cap China can strengthen its commitment to climate change and demonstrate its climate leadership.

There are four different ways for countries to set absolute carbon emission targets. First, a goal based on the emissions projection. South Africa's NDC consists of a 'peak, plateau and decline' GHG emissions trajectory, which gives a range of 398–614 $MtCO_2e$/year between 2025 and 2030, reaching a peak between 2020 and 2025 and a plateau for the following decade, before starting to fall. Second, setting an absolute GHG emissions reduction goal without a baseline. Saudi Arabia, for example, has committed to reducing carbon emissions by 130 Million tons of CO_2 equivalent, although a baseline was not defined. Third, setting an absolute emission goal based on a projected future emission baseline, such as Indonesia, Mexico, Turkey and South Korea. For example, Mexico's NDC proposes to unconditionally reduce combined GHG and black carbon emissions by 25% compared to "business-as-usual" projections in 2030. Fourth, developing absolute reduction goals based on historical emissions baselines. All developed countries are obligated to set these goals while different countries pick different base years. The European Union, for example, committed in its NDC to reducing emissions by at least 40% compared to 1990 levels by 2030.

Figure 3 | Carbon emissions goals of the top 16 GHG emitters



Source: *The circle sizes represent per capita GDP.*

II. FEASBILITY

1. China's Emission Trend is Clear

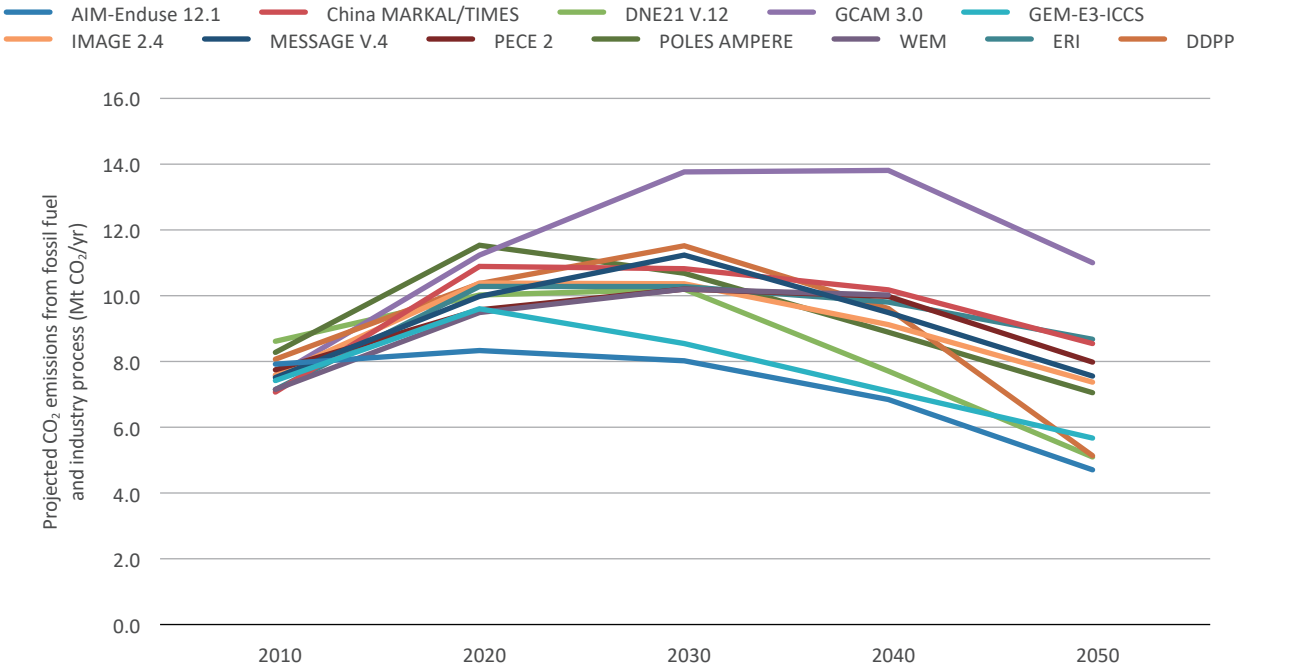
Setting an absolute carbon reduction target is an achievable next step given the progress China has made on carbon intensity (carbon emissions per unit of GDP) reduction as well as the scenario analysis of China's carbon emissions projections.

China's prospects for peaking emissions earlier than 2030 look good. In 2017, China's carbon intensity had decreased by about 46% compared with 2005, thereby achieving its target of a 40-45% reduction in carbon intensity by 2020 three years ahead of schedule. However, more must be done. China will have to reduce its carbon emissions after peaking, as the Paris Agreement requires carbon neutrality by the second half of this century.

Although China did not put an absolute emissions reduction target when it declared its carbon peak year commitment, it is still possible to estimate China's future energy-related carbon emissions in total and by sectors based on China's econmic growth and energy consumption. Despite uncertainties in the domestic and international political and economic outlook, China's economic growth is likely to shift from high-speed to medium-high-speed growth, and policymakers are determined to achieve what they are calling "high-quality development". Aside from this, China's FYPs also include a set of economic and energy policy indicators that can be used to predict China's carbon emissions. For instance, research of Liu et al. (2017) uses 12 scenarios to explore the implications of enhanced

policies compared to the current Chinese policy environment in 2030 and 2050. As Figure 4 shows, the majority of the alternative scenarios illustrate a carbon peak near 2030. Total carbon peaking emissions range from 8.4Gt CO_2 to 13.7Gt CO_2, with a median value of 10.3Gt CO_2. in 2050, projected absolute carbon emissions range from 4.7 to 11Gt CO_2 with a median of 7.4Gt CO_2.

Figure 4 | China's CO_2 emissions projection under the "alternative scenario" 2010-2050



Source: *Liu et al., 2017*

2. Emissions Cap Practices of China's Environmental Regulatory System

The task of addressing climate change has been transferred to the newly formed MEE from the National Development and Reform Commission (NDRC). This is a major institutional rearrangement for the CPC Central Committee and the State Council, and can enhance the synergy between climate change and environmental pollution prevention and control, and bolster overall environmental protection. In the future, the work of tackling climate change, from policy and target formulation, to monitoring and implementation, will have to be better coordinated with environmental pollution control and ecological protection. China's existing environmental monitoring mechanisms, especially for atmosphere and water, mainly use the approach of total pollution emissions control for planning, standards, licensing, monitoring, and law enforcement. For example, China's environmental regulatory system has set a total emissions control for major air pollutants. The formulation of a total carbon emission control would be an important step in the integration of the emission monitoring reporting system and the improvement of the multi-pollutant emission standard system.

3. Pilot Experiments in Provinces and Cities

During the 13th FYP period, carbon caps have been implemented in many areas, including Zhenjiang and Beijing. Working backward from the city's carbon emission peak target, Zhenjiang has established a reverse mechanism based

on carbon emission growth and economic development trends to determine the its carbon caps. In 2014, a pilot assessment of carbon emission increments and intensity was conducted. Beijing implements a dual-control and dual-drop mechanism[3] for total energy consumption and intensity, total carbon emissions and intensity, and implements a target responsibility system of three-level dual-control for municipal, district, and key energy-using units. The work of these pilots can provide valuable experience for developing an absolute carbon cap at the national level.

Table 3 | Carbon cap pilots

CITIES	CARBON CAP PILOTS
Beijing	• Local legislation on emissions cap • Setting annual absolute targets for carbon emissions *Decision on Beijing' Implementation of Carbon Emissions Under Strict Control of Carbon Emissions* issued by Municipal People's Congress
Shanghai	• Setting a five-year absolute target and annual incremental amount for carbon emissions during the 13th FYP • Setting an absolute emissions reduction target in 2035 compared to the level of carbon peaking *Working Plan on Energy Saving, GHGs Emissions Control for 13th Five-Year Plan* issued by Shanghai Municipal government *Shanghai Master Plan 2017-2035: Striving For the Excellent Global City* issued by Shanghai Municipal government
Wuhan	• Setting an absolute target for carbon emissions peaking year of 2022 • Furtherly allocate the city-wide target into sectors and municipal districts *Wuhan's Action Plan on Carbon Emissions Peaking (2017-2022)* issued by Wuhan municipal government

Shanghai's Carbon Cap Under Long-term Reduction Target

Through the Shanghai Master Plan 2017-2035, the Shanghai municipal government has publicly committed to:

- Peaking total City-wide carbon emissions and per capita carbon emissions before 2025
- Reducing carbon emission by approximately 5% of the peaking level by 2035

Shanghai is currently the leading city that has incorporated its carbon cap into its municipal FYPs and long-term city development plan, which are legally -binding and can provide top-level guidelines for medium- and long-term city development. Since 2015, Shanghai has set annual incremental targets and made an absolute cap for carbon emissions in 2020 at the level of 250 Mt.

[3] Dual control refers to total energy consumption control and energy intensity control. Dual drop refers to total carbon emissions reduction and carbon intensity reduction.

Table 4 | Annual targets for incremental amount of CO_2 emissions (2015-2019)

YEAR	TARGET
2015	Within 8.7 Mt CO_2, striving to reach 7.8Mt or so
2016	Within 6.45 Mt CO_2, striving to reach 6Mt or so
2017	Within 5.8 Mt CO_2
2018	Within 5.15 Mt CO_2
2019	Within 9 Mt CO_2

To ensure Shanghai is on track to meet its carbon targets, the local government has also developed an assessment mechanism to evaluate the city's carbon reduction based on its effective existing MRV system for energy-saving. Annual incremental carbon emissions were decomposed into industrial and transportation sectors, which account for almost 80% of city-wide total emissions, while targets for carbon intensity were allocated among 14 administrative districts of Shanghai. However, compared with mandatory indicators such as energy saving and carbon intensity, Shanghai's city-wide carbon cap target is not mandatory and therefore receives less legal and institutional support.

Source: *Shanghai Urban Master Plan (2017-2035) & Shanghai 13th FYP for Energy Saving and GHGs Emission Reduction and Control*

One Lake Bishui Reflecting Sunset, Anhui, Hefei. (Photo by Zhang Quanyue)

RECOMMENDATIONS TO DESIGN AND IMPLEMENT AN ABSOLUSTE CARBON CAP IN CHINA

I. DESIGN AN ABSOLUTE CARBON CAP

1. Strengthen the Legal Basis for a Carbon Cap

China considers climate change to be a part of its long-term domestic environmental strategy and an important component of the ecological civilization vision of President Xi. However, one of the shortcomings of Chinese climate policy has been that it lacks a firm legal basis. Correcting this would fall in line with MEE's mandate to develop macro-level climate strategy, plans and policy.

The goals set in China's 12th and 13th FYPs, reducing carbon emissions per unit of GDP by 16% and 18%, respectively, are legally binding and undoubtedly powerful in the context of China's political framework. However, a law on climate change or a legal definition of CO_2 as a pollutant would be a far stronger spur for policy action. The transfer of the climate portfolio from NDRC to MEE could change that. This handover could change carbon mitigation from a token of international negotiations into a domestic environmental priority. There are three ways this could happen.

The first approach would be to give climate policy a firmer institutional foundation--to classify GHGs as pollutants that are subject to environmental law. Climate policy could be integrated into China's Environmental Protection Law, which will likely see revisions when MEE announces its work plan. The second approach would be to redefine the term environment in the law to encompass climate, making dangerous climate change a direct target of China's increasingly assertive, legally mandated environmental protection efforts. The third approach would be for China's legislature to finally create a standalone Climate Change Law. This would provide a legal basis to drive China's climate policy forward in a focused manner. Because creating such a law would be a lengthy process, adopting a more ambitious carbon cap would be an intermediate measure that runs in parallel to legislation.

2. Set a Carbon Cap Reflecting China's Long-term Vision

China set forth its long-term vision to make China A "great modern socialist country" by mid-21st century in the 19th CPC National Congress. Setting a carbon cap can facilitate the transformation of economic structure and energy system for carbon emissions reduction, while ensuring China maintains its high-quality economic growth to become one of the world's advanced economies by 2050.

The absolute carbon cap does not need to be constructed from scratch, but can be based on the existing energy and environment binding indicator system. Unlike developed countries, which use absolute carbon reduction targets in the context of international compliance, China's China's goal would be a quantity range linked with the speed of economic development. China's total carbon control target would be a comprehensive indicator reflecting the overall development of the economy, energy and environment, determined based on potential economic development targets at the local level.

In the absence of significant changes in the use of carbon capture technology, the annual rate of change in energy intensity and the rate of change in the proportion of non-fossil fuel in energy consumption converge. The existing GDP development target, GDP energy intensity reduction target, and the non-fossil fuel proportion of total energy consumption target can collectively approximate a total carbon control target. For example, in China's Third National

Communication on Climate Change, it is estimated that China's energy-related carbon emissions can peak with the level of 10-11.5Gt CO_2 during the period of 2025-2030, when its annual GDP growth rate in 2020-2025 and 2025-2030 will be 6% and 5% respectively, with the mandatory indicator for annual reduction rate of carbon intensity at the lowest level of 4% (see Table 5).

Table 5 | Alternative Scenarios Envisaged in Carbon Emissions Forecast by 2030 Indicators

YEAR	POLICY SCENARIO I	POLICY SCENARIO II
Population	Projected to reach 1.45 billion by 2030 with slow annual growth rates	
Annual Growth rate	2020-2025: 6% 2025-2030: 5%	
Economic structure	Share of tertiary section in the whole GDP: above 60%	
Energy Sector	Facilitate deployment and scaling up of low-carbon technologies; Implement more stringent energy efficiency standards; Strengthen incentive policies for the promotion of renewable energy and natural gas; Introduce national emissions trading system	
Climate Policy	Impose a rigidly carbon emissions control target based on the economic policies that promote economic transformation and upgrading	
	Annual reduction rate of Carbon intensity : 4-5%	Annual reduction rate of Carbon intensity : 5-6%
Energy Consumption	by 2030: 5.6-6.2 Gtce	by 2030: 5.5-6.0 Gtce
Energy-related Carbon emission	By 2030: 10.5-115 $GtCO_2$	By 2030: 98-106 $GtCO_2$ Peaking around 2026

Source: *Ministry of Ecology and Environment, 2019*

3. Define an Absolute Carbon Cap based on Existing Binding Targets

Under the 13th FYP (2016-2020), five key indicators which are incorporated into the administrative assessment and evaluation system can be directly used to calculate the amount of total CO_2 emissions for a specific period. These indicators are 1) Energy consumption reduction per unit of GDP (%); 2) Non-fossil fuel share of primary energy consumption; 3) CO_2 emissions reduction per unit of GDP (%); 4) GDP growth rate; and 5) total energy consumption.

A simple equation between total energy-related carbon emissions and the five indicators above can be expressed as follows:

$$C_{co2,t}=C_{co2,0}*(1-ef)^t*(1+gd)^t*(1-rn)^t$$

- $C_{co2,t}$ refers to total carbon emissions in the target year of t
- $C_{co2,0}$ refers to total carbon emissions in the base year of 0
- *ef* refers to annual average energy consumption reduction per unit of GDP(%)
- *gd* refers to annual average GDP growth rate
- *rn* refers to annual average substitution rate of non-fossil fuels in primary energy consumption
- *t* refers to number of years between base year and target year

The value for the three variables with *ef, gd, rn* can be derived from the 13th FYP as shown in Table 6.

Table 6 | Key indicators and targets for the 13th FYP

INDICATOR	2015	2020	5-YEAR AVERAGE	5-YEAR CHANGE IN TOTAL	TYPE OF INDICATOR
GDP growth rate	n/a	n/a	>6.5%	n/a	Predictive
GDP (trillion of yuan)	67.7	>92.7	n/a	n/a	Predictive
Energy consumption reduction per unit of GDP (%)	n/a	n/a	3.2	15	Mandatory
Non-fossil fuel share of primary energy consumption	12.1	15	0.57	n/a	Mandatory
CO_2 emissions reduction per unit of GDP (%)	n/a	n/a	3.89	18	Mandatory
Total energy consumption	n/a	50	n/a	n/a	Predictive

Source: *values in dark red are based on iGDP analysis*

The analysis above shows existing energy and economic indicators point towards an "invisible" carbon emissions cap by detailing many of the factors that would be required to set one. Transforming this invisible cap to a visible policy indicator, ideally a mandatory goal, is not only feasible but also critical to send strong policy signals and provide certainty.

II. IMPLEMENT AN ABSOLUTE CARBON CAP IN CHINA'S POLICY CONTEXT

1. Differentiated Regional Carbon Caps

The allocation and negotiation of the target can be based on both top-down and bottom-up considerations. Through central and local consultations, according to regional economic development, targets in different regions can either *involve an increase in total carbon emissions to a defined limit, or an absolute reduction in carbon emissions.* Which type is used in a specific region or industry would be determined and phased in in reference to local factors such as trends

in economic development, local structural adjustment and technology upgrades, energy substitution potential, and air quality and total air pollution control requirements.

The regions and industries that should give priority to the implementation of an absolute carbon cap requiring absolute carbon emission reductions should be those that are first to achieve carbon emission peaks before or around 2020, that are striving to achieve negative growth in total coal consumption, and that require special emission limits for atmospheric pollutants. These include the areas in the Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta regions, as well as the steel, cement, and other similar industries.

For the less developed central and western regions, and industries that cannot achieve carbon peaks during the 14th FYP period, the total carbon control target should allow emissions to grow while controlling the total amount within a defined, enforceable limit in the FYP and annual plan for socio-economic development.

2. An Absolute Carbon Cap and National Carbon Market Are Mutually Reinforcing

The national carbon market currently establishes a total amount of emission allowances within the market in a bottom-up manner and then distributes them to key emitting industries. The absolute carbon cap would be basically implemented in a top-down manner that can be based on the carbon market, which already developed a carbon intensity cap and methods for emissions measurements, reporting and verification. Industry and regional goals are also mutually compatible. This forms a dual constraint that reflects the "polluter pays" principle and the legal responsibility of the local government for local environmental benefits.

An absolute carbon cap can also provide an institutional basis for the carbon market to some extent, and since carbon market-related legislation has been delayed, there is still room to tweak its implementation. If a total carbon emission target were incorporated into national planning, it could serve as the basis for monitoring carbon emissions. In this way, it could act as a rapid, short-term means of supporting the development of the carbon market compared to legislation or other means.

3. Integrating Carbon Cap Implementation with the Existing Policy System

The absolute carbon cap will be implemented under the existing environmetnal and energy regulatory system, aligning with current environmental policy instruments. The main pillars of this system are environmental quality and pollutants emissions standards, MRV, and environmental impact assessment. Within this environmental management system, GHG emission standards for power plants, vehicles and energy-intensive industries will continue to be important supportive policies, like in Europe and California, where standards systems play an important role in bringing down emissions.

First of all, after allocating to the cap to emitters, the total carbon emission control goals should adhere to the environmental permitting system, relying on the existing pollution monitoring systems. The basic pollutants statistics, reporting and accounting mechanisms could be improved to include GHGs emissions. In addition, the legal penalties for violations of potential carbon emissions standards and failure to accurately report carbon data should be increased. As the fundamental environmental policy instrument, including GHGs emissions into the permitting system would enhance climate policy implementation significantly.

Secondly, the climate impact assessment should be included into the environmental impact assessment system. This can be a very strong and direct policy goal to influence economic and investment behaviors. For example, if a project or investment was calculated to have a high carbon emissions impact, the national or local government would need to review it and make careful investment decisions even if it was relatively energy efficient. Environmental permit is another important tool that can allow climate policy implementation to touch on the sources of emissions. Integration of carbon emission requirements into China's current pollution permits system would be an important move in this direction. One example would be setting a carbon emissions permit for key emissions units.

The policy alignment would also ensure daily monitoring and strengthen legal supervision, helping achieve success in long-term regulation and control. The regular environmental inspections can be carried out in accordance with the national five-year planning system, increasing the flexibility of achieving the indicator for the period, allowing annual deployment, and reducing the impact of the actual annual GDP growth above or below expectations.

4. Leverage Further Policy Actions To Enhance China's Climate Policy System

An absolute carbon cap is the first step to enhance China's climate policy system. Such an economy-wide macro-level goal could leverage at least three strong mitigation policies moving forward.

First, an absolute carbon cap can enable sectoral GHG emissions standards including CO_2 emissions per KWH standards for power plants, life-cycle GHG emissions standards for key industrial products, and GHGs emission standards for vehicles, similarly to what EU countries and California have done. The existing policies serving such goals are mainly energy related; there is lack of high-level policy to guide the development of carbon-oriented sectoral policies.

Secondly, an absolute carbon cap would improve information disclosure of GHG Emissions and an integrated MRV system. The creation of a source-based emissions inventory would likely be the first step in bringing carbon under an MRV regime. The Environmental Protection Law and other laws on air, water and solid waste require pollutants emission data to be publicly disclosed to the public, but GHG emissions currently have no such requirement. Bringing transparency to carbon emissions would be a huge step forward.

Thirdly, a carbon cap would help to mainstream climate policy into development and finance strategies. Reducing both carbon emissions and air pollution requires "optimizing four structures" - economic, energy, transportation and land-use structures. This makes environmental economic policies, including green finance, green insurance, green pricing, and carbon pricing, more important than ever. Putting a price on climate change risk and incorporating this into investment decisions and infrastructure development will prove to be a key approach to merge climate and economic policy.

The beauty under low-carbon energy, Yanqi Lake, Beijing. (Photo by Zhang Xu)

APPENDIX

CARBON CAP vs. CARBON INTENSITY TARGET AND ENERGY CAP

1. An Absolute Carbon Cap is an Enhanced Climate Policy and Complementary to the Carbon Intensity Target.

A carbon intensity target is a policy to set emission reductions relative to economic output. The difference between an absolute carbon cap and carbon intensity is mainly determined by forecasts about future national economic growth trends (Wing, Ellerman, & Song, 2006). Carbon intensity targets can be achieved through the reduction of carbon emission or the increase of GDP, meaning absolute carbon emissions can still increase as the economy is growing. In other words, even if the stringency of the carbon intensity target will be enhanced, it can be easily achieved by increasing production capacity.

China has been using carbon intensity targets in its international commitments and domestic actions. At the Copenhagen Climate Summit in 2009, China pledged to reduce its carbon emission intensity by 40% to 45% compared to 2005. Subsequently, China has begun to include the carbon intensity reduction target as a "legally binding" target in its 12th and 13th FYPs. In doing so, China's carbon emission per unit of GDP has decreased by 46% compared with 2005 by 2017.

However, according to the IEA's World Energy Statistics, China's total carbon emissions increased by 31.89% from 6.9 billion tons in 2009 to 9.1 billion tons in 2016. Meanwhile, the total GDP increased by 208.46% from USD 3.17 trillion dollars to 9.78 trillion dollars[4]. Therefore, while China's absolute carbon emissions are rising, it can always meet its carbon intensity reduction target as long as its economy keeps growing.

The two indicators in Table 10 show that a carbon intensity reduction indicator is designed to allow the absolute level of carbon emissions to be adjusted by the underlying economic fluctuations, and appears to be an appropriate instrument for a developing economy.

Table 7 | Comparison of the carbon intensity reduction goal and an absolute carbon cap

	CARBON INTENSITY REDUCTION	CARBON CAP
Key Features	A relative target	An absolute target
Stringency	A soft cap that allows carbon emissions to grow and can be easily affected by economic development.	A hard cap cannot be flexible adapting to economic uncertainty.
Applicable Period	Economic growth with high-speed rate. higher uncertainty about future trend.	A transition from energy-intensive economy to high-quality economic development. lower uncertainty about future.

[4] On a constant price basis of the year 2000.

When China's economy as a whole shifts from high-speed growth to medium- and high-speed growth, it will become difficult to use economic growth to promote carbon emissions reduction. In place of this, introducing an absolute carbon cap in the 14th FYP can send a clear policy signal to encourage the transformation of economic development from energy-intensive growth to low-carbon high quality economic growth. However, because China's regional economic development will be not be balanced during the 14th FYP or 15th FYP periods, policymakers should make combined use of carbon intensity and absolute carbon caps. For example, they could encourage the use of carbon cap in regions that are first to achieve carbon emission peaks before or around 2020, but still keep the use of carbon intentsity in the less developed central and western regions, and industries that cannot achieve carbon peaks during the 14th FYP.

2. An Absolute Carbon Cap Provides More Flexibility for Local Government to Pursue Green Growth than an Energy Consumption Cap

An energy consumption cap has been a useful policy instrument to control the final energy demand for a country's economic development. Since the 13th FYP, China has added absolute energy consumption as a voluntary indicator to work together with energy intensity reduction to facilitate China's sustainable energy future. However, the policy measures of energy consumption cap are centered on energy self-sufficiency, as the policy was designed to reduce dependence on energy (fossil fuel) imports. Therefore, while the energy consumption can contribute to environmental concerns including climate change and air pollution, it is less likely to bring an economy-wide decarbonization.

Compared with an energy consumption caps, carbon cap targets are more conducive for promoting green growth (Herzog, Baumert, & Pershing, 2006). As shown by the Kaya identity (Total CO_2 emissions = Population × GDP/ Population × Energy use/GDP × CO_2 Emissions/Energy use), absolute carbon emissions levels are affected by population growth, economic growth, energy consumption and the energy structure.

A carbon cap reduces absolute carbon emissions, which is a global public good. In China, this aligns with the central government's objective of developing ecological civilization. A carbon cap is also in line with China's international commitments for carbon peaking. Setting a carbon cap would thus address both domestic and international carbon and energy concerns.

While both energy consumption and carbon caps are command-and-control policies, they take different approaches to transform the energy system. Energy consumption caps focus on making changes to a fossil fuel-dominated energy system, which makes it hard to provide full support for renewable energy development. A study from International Institute for Sustainable Development (IISD) indicates that although China's renewable energy subsidies have increased in recent years, they are still relatively small compared with fossil fuel subsidies, with coal being one of the most highly subsidized fuels (Benjamin et al., 2016). However, carbon caps focus on policy interventions to address the negative externalities from energy consumption, emphasizing the scale-up of renewable energy and energy electrification. In addition, they aim to increase the share of renewable energy, decarbonize the transportation sector and develop high-tech and emerging industries

Table 8 | Comparison of energy consumption and absolute carbon caps

	CARBON INTENSITY REDUCTION	CARBON CAP
Strategic Positioning	Energy security	Global climate change and energy security
Goal	Energy saving	Carbon emissions reduction
Scale of Impact	• Demand side of the energy system	• The supply and demand side of energy system • Energy structure • The social-economic system
Target of Impact	The total energy consumption control	Energy consumption, energy structure and low-carbon technology
Key Policy Indicators	• Energy consumption intensity • Coal consumption cap • Oil consumption increase • The share of natural gas in the primary energy consumption	• Carbon emissions intensity • The share of renewable energy • The development of high-tech and newly emerging industries • Urban-rural low-carbon development • Low-carbon transportation, etc
Policy Implementation	• Lock into the fossil fuel-dominated energy system • Target the power sector and key energy-intensive enterprises	• Transition to the scale-up of renewable energy use and the electrification of energy consumption • Target the power sector, transportation and building sectors • Promote the electrification of energy system
Time of Policy Implementation	• Pilots in 12th FYP • National scale-up in 13th FYP	• Pilots in the 12th and 13th FYP, such as Beijing and Yunnan Province[5]
Disadvantages	• Fail to consider green electricity • Focus on energy saving with technology advancement but not energy structure adjustment	• Lack of legal support • Emission data availability and quality needs to be improved • Lack of complementary measures
Advantages	• Provide legal, policy and data support • Encourage the use of energy saving technology	• Focus on the whole economy • Allow energy consumption to increase and promote the development of renewable energy • Facilitate the development of low-carbon industries

[5] See "Decision on Beijing's Pilot Work on Carbon Emissions Trading under the Carbon Cap" (2013) and "Notice of the Yunnan Provincial People's Government on Distributing the Work Plan for Establishing the Total Carbon Cap and Control System and Target Decomposition in Yunnan Province and Implementing the National Carbon Emissions Trading Market Construction Plan in Yunnan Province" (2016).

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Partnerships

Founding Organization

- Energy Foundation

Partners (Alphabetical order)

- ABT ASSOCIATES
- The C40 Cities Climate Leadership Group (C40)
- CARBON TRUST
- CHINADIALOGUE
- GIZ
- GLOBAL METHANE INITIATIVE
- JIUYUAN CORNERSTONE TOURISM CO., LTD
- U.S. ENVIRONMENTAL PROTECTION AGENCY
- UNESCAP
- WORLD BANK
- WWF

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